RoadRunner

User Manual Version 1.3

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Introduction

RoadRunner scans all nearby cellular activity continuously for devices that can distract operators of heavy machinery and vehicles used in mining, railway and construction sites. Due to safety regulations, such devices are generally disallowed to be used by any operator while driving or using heavy machinery. Just like on public roads, the use of distracting cellular phones while driving has led to sharp increases in accidents and fatalities over the past decade. The mining and construction industries require the complete attention of operators in order to maintain a safe work site. RoadRunner aims to decrease unnecessary accidents and death caused by distracted operators. Depending upon placement and visibility, RoadRunner can be used as a reminder or deterrent for workers tempted to use their cellphones illegally. RoadRunner can also be used in evidence gathering for legal and insurance purposes.

When a cellular device is detected, the unit automatically snaps a series of snapshots to document and timestamp the unauthorized activity. All parameters including the number (burst) of images, cellular device region, sensitivity of event triggers and positioning of unit can be customized by the user.

RoadRunner is a self-contained system that requires no connection to any PC to fully function and can run continuously for over 24 hours using its internal sealed rechargeable battery. The unit consists of 3 primary components: receiver, antenna and camera. These components are connected through a rugged tripod and extendable pole system. The system can be transported and deployed for operation by a single user in under 20 minutes.

The heart of the unit is a high speed scanning receiver capable of detecting any cellular signal up to 1000 feet away (line of sight). However, due to practical limitations within the camera system, it is recommended that users do not attempt to record any activity further than 100 feet away if they wish to visually confirm an offender. The receiver's built-in touch screen allows users to raise or lower sensitivity depending upon the RF environment. RoadRunner is only attuned to cellular frequencies so it cannot be falsely triggered by Wi-Fi, Bluetooth or other wireless devices. The receiver includes a physical key lock to ensure that RoadRunner receiver detections cannot be tampered with by unauthorized personnel.

The cellular receiver comes preset for your region's cellular bands by default but RoadRunner can be configured at anytime to operate in many regions other including UNITED STATES, EUROPE, CANADA, AUSTRALIA, NEW ZEALAND, ISRAEL, INDIA, BRAZIL, SWEDEN, JAPAN, CHILE, PHILIPPINES, SOUTH KOREA, GUATEMALA, COSTA RICA and TRINIDAD. If your region is not supported, contact your BVS sales engineer for further details.

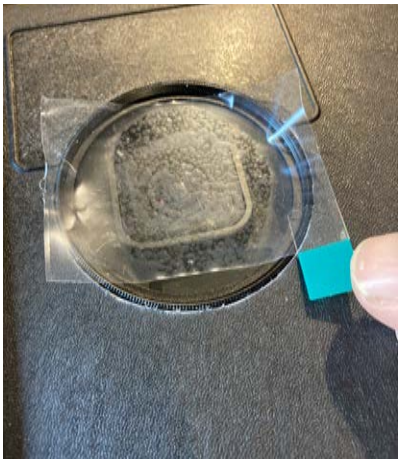
The angle and tilt of the directional antenna atop the pole is fully adjustable using its gooseneck mount. This direction finding antenna allows distant cellular signals to be detected and can also serve to only detect signals coming from specific areas of interest.

The camera system is mounted inside a weatherproof case and attached to the pole at eye level. When a cell phone is detected and breaks the preset threshold, the camera inside the box will snap a burst of images for a duration predetermined by the user. In order to maintain the highest image quality and hardware durability, Berkeley utilizes the latest GoPro Hero9 Black camera system. It is recommended that RoadRunner users download the latest GoPro app for their iPhone or Android phone in order to setup a live video feed to optimize camera placement and framing while avoiding unnecessary physical contact with the camera itself. Control over the camera system is accomplished in two different ways. Consult the camera section to learn more about these details.

Unboxing & Setup

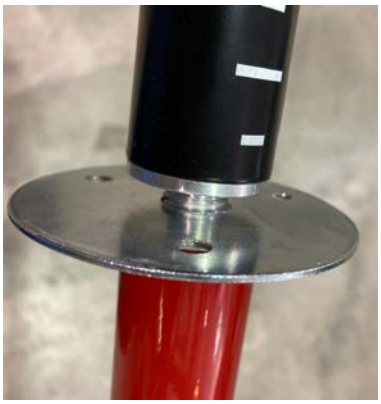
These boxes show the tripod, directional antenna, cable, vertical mounting poles and associated mounting hardware.

This box contains the receiver. Be sure to fully charge receiver using the supplied 110VAC power cord before operating your RoadRunner.



This box contains the camera box. Remove the protective lens tape once you have completed setting up.

Setup the tripod on a level and stable surface. It is important to use the built in bubble level to ensure RoadRunner does not collapse due to high winds or intense ground vibrations.



Erect the red and black poles together and connect them to the top of tripod. Feed the mount screw up through the camera box platform and tighten the camera box to the platform securely. Once you have set the camera box platform to the desired height, note the number of white tick marks to make setup easier at the next site.

Secure the entire unit by connecting the bungie cord to bottom of the tripod head and a heavy object such as a boulder or heavy piece of steel. You can use the RoadRunner receiver itself in a pinch.

Cellular Receiver

RoadRunner's cellular receiver is mounted directly into a watertight, crushproof and lockable transport case that includes an internal rechargeable battery system, touch screen and the receiver itself. The receiver case weighs approximately 15 pounds.

Before you can power on the unit, be sure the key is turned into the unlock position. If the unit is still locked, not only will it not power on or off but you cannot make any changes to the cellular detection settings while the unit is locked.

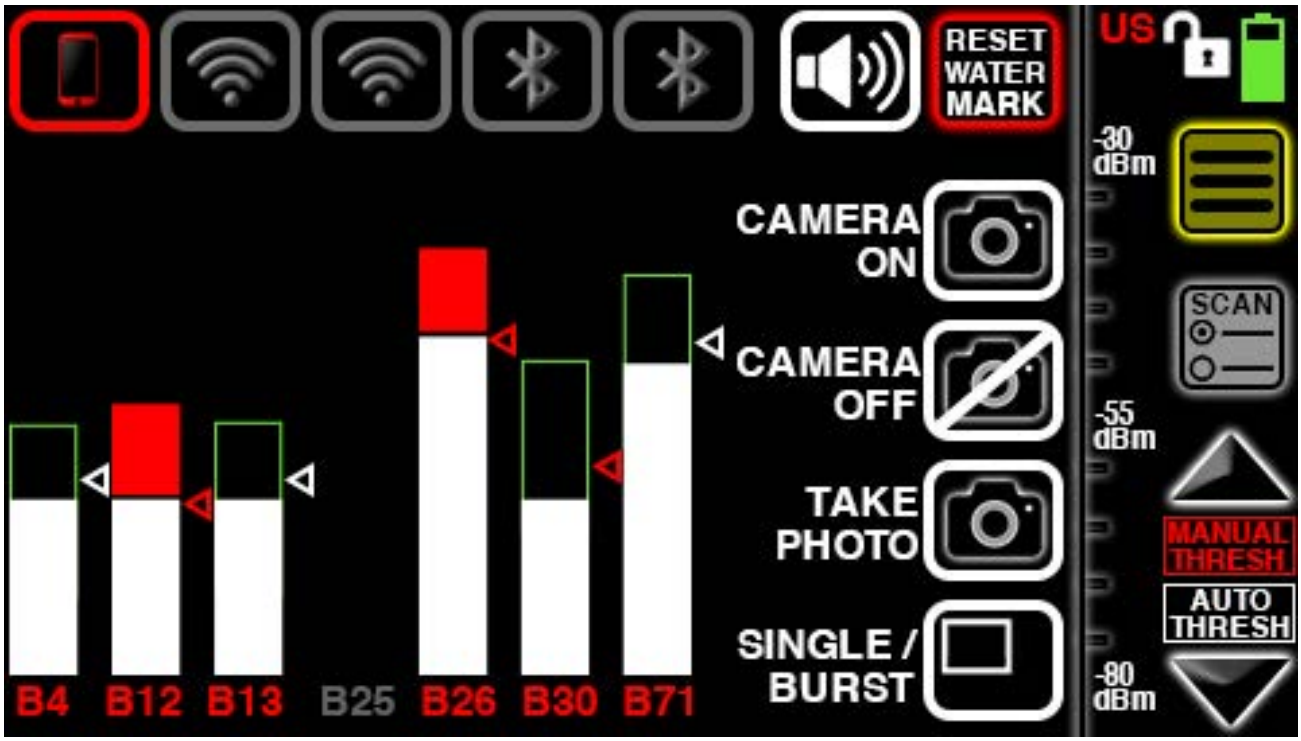
Once the unit is unlocked, press the power button to turn on the receiver. Be sure to give it a moment to warm up before making adjustments.

Upon powering up the unit, you will see this splash screen followed by the main measurement screen.

Plug the provided standard 110VAC power cable here to charge the unit. Green LED indicates that unit is on. If this LED is lit but you do not see anything on the screen, contact support@bvsystems.com for assistance. Yellow LED indicates charging in process but you may operate the unit while charging as well. From an empty battery, the unit takes approximately 8 hours to fully charge. We advise the use of a power generator if you wish to operate RoadRunner continuously on site for over 2 days.

The connector on the left goes directly to the RoadRunner's camera box. Use the supplied cable to connect the receiver to the camera box. The connector on the right side is for the direction finding antenna input. Use the supplied antenna cable.

Cellular Receiver Screens



Main Measurement Screen

RoadRunner Main Measurement screen allows control and monitoring over all cellular signals detected as well as threshold and camera settings.

Indicates cellular detection mode is enabled

Turns on camera ready to record cellular detection triggers

Turns off camera to stop recording cellular detection triggers

Takes photo manually to verify operational status

Toggles between single and burst photo mode for all cellular detection triggers

Toggle this icon (same button as below) to use audio commands for internal camera operation

Toggle this icon (same button as above) to use solenoid manual push button operation for internal camera

Resets all watermarks (thin green line above the current signal strength detected).

Displays current country code of cellular bands being scanned. Touch this country code to see all cellular band designations that are currently being scanned.

Shows security status of physical lock and key. A locked lock icon does not allow any changes.

Displays current charge to internal battery system. Internal battery lasts over 24 hours (continuously scanning with no triggers) with less operational time when cellular activity is repeatedly detected and recorded.

Cellular band being actively scanned (red indicates active).

Cellular band not being actively scanned (grey indicates no scanning).

Thin green watermark indicates strongest signal strength detected since last watermark reset.

Red bar indicates signal has surpassed the currently set threshold.

Manual threshold setting indicated by red color. Touch this indicator and once it blinks, it can be adjusted using the up/down threshold arrows only while the ‘manual thresh’ button blinks.

Auto threshold setting indicated by white color. Auto threshold can be toggled on and off by tapping the white ‘auto thresh’ button. If you have already manually adjusted any thresholds, you will probably see those white indicators automatically move into their auto threshold spots.

Navigates to main menu where users can fine tune a variety of alert and scan settings.

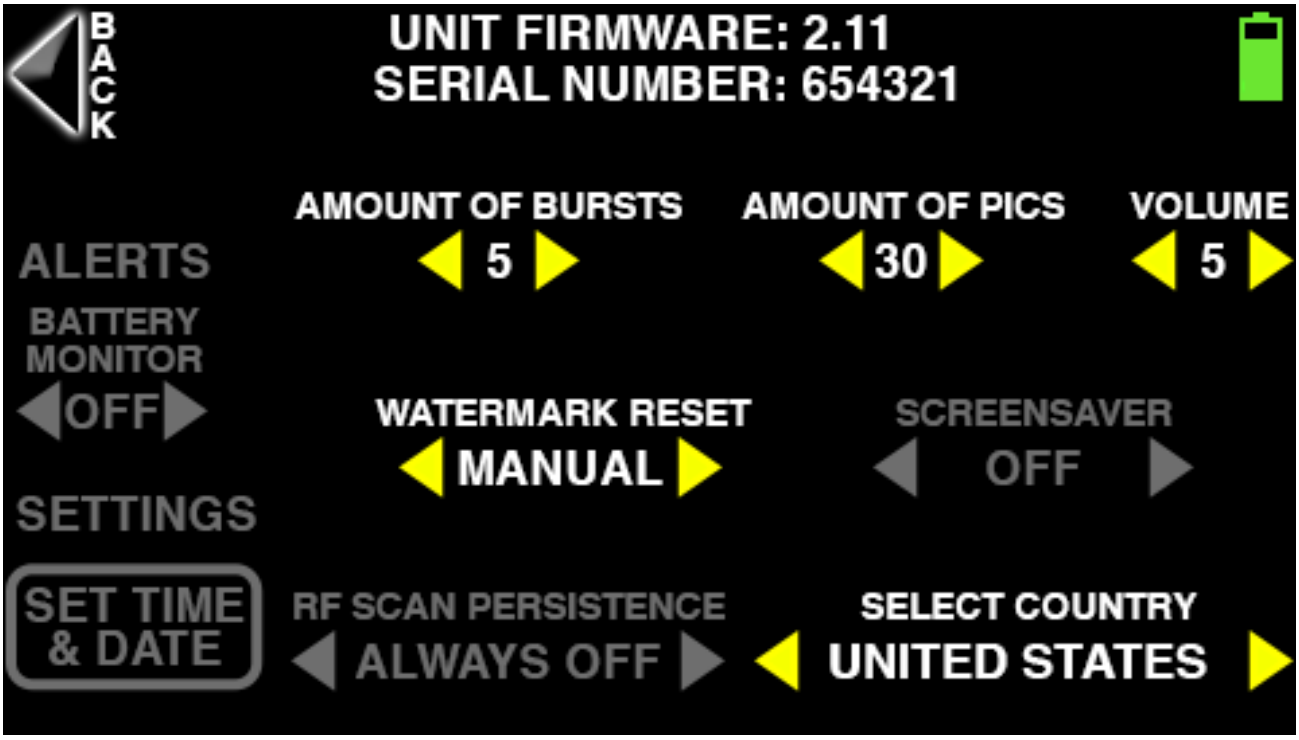
Inhibits scanning of all cellular signals. Simply touch this button and then choose one or more buttons on the top to inhibit.

Raises the threshold manually for any blinking red indicators. This should decrease the amount of alerts triggered for those particular signals.

Toggles thresholds to be adjusted manually. This button will continue to blink while in manual mode allowing each signal’s threshold to be manually adjusted.

Toggles thresholds into automatic mode allowing RoadRunner to determine the noise floor and most reliable threshold settings by itself.

Lowers the threshold manually for any blinking red indicators. This should increase the amount of alerts triggered for those particular signals.



Main Menu Options

RoadRunner Main Menu screen can be reached from nearly any other screen by touching the rectangular menu icon with three lines. This screen provides many adjustments as well as the unit's serial number and firmware.

Touch this button at any time in any screen to return to the previous screen.

Adjust the number of burst pictures taken for each alert from 1 to 5

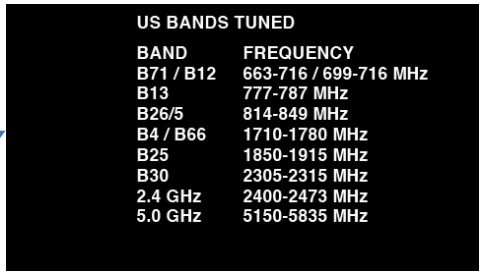
Adjust the number of pictures taken for each alert (burst) to 10, 20 or 30

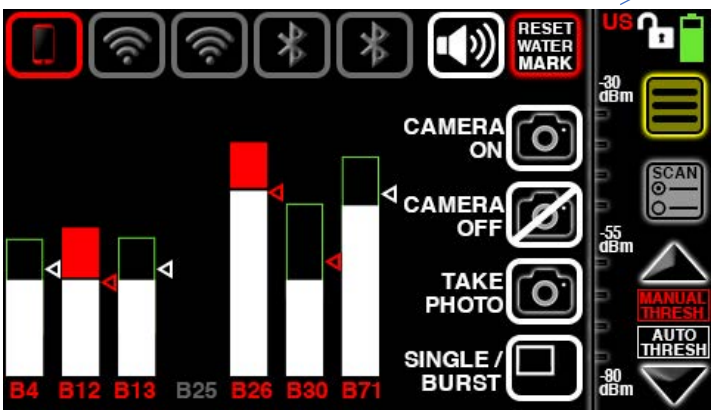
Adjust volume of voice control for camera from 1 to 5

Change the country you are operating RoadRunner within, thereby changing the cellular channels being scanned and displayed. Choose between UNITED STATES, EUROPE, CANADA, AUSTRALIA, NEW ZEALAND, ISRAEL, INDIA, BRAZIL, SWEDEN, JAPAN, CHILE, PHILIPPINES, SOUTH KOREA, GUATEMALA, COSTA RICA and TRINIDAD. The country selected is also displayed on the MAIN MEASUREMENT screen according to its 2 letter country code in the upper right corner of the Main Measurement Screen.

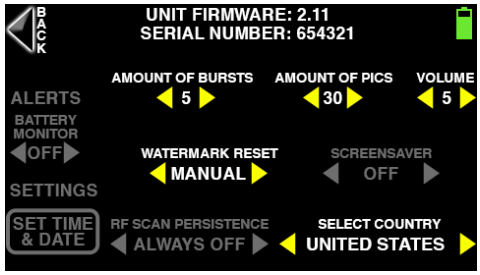
RoadRunner Screens Flow Diagram

Screen shows cellular bands currently supported for your region setting. You can change region setting by going to main menu options and choosing different region/country.





From this main measurement screen, users can navigate to additional menu options or observe all nearby cellular activity as well as set thresholds to trigger capture events and control the parameters of those events.



This main menu options screen allows users to control event triggers involving event triggers and capture of those events using the built-in camera.

Camera Box

The camera box attaches to the center of the pole stemming from the tripod.

Be sure to connect the camera box to the receiver before you begin using RoadRunner.

The camera box contains an audio speaker (to issue audible commands to camera), a solenoid (to manually trigger camera) and the camera itself. In the main measurement screen, users can toggle between using the audio commands (speaker icon) or the solenoid (coil icon) to trigger snapshots but not both at the same time. The main advantage to using the audio commands is that it requires less power which will allow RoadRunner to operate much longer. However, if RoadRunner is being used on a noisy site, it could interfere with some commands going through and miss some snapshots. Be sure to thoroughly test both methods to find the optimal one for your needs.

BVS recommends using the GoPro smartphone app to wirelessly communicate with the camera; physical access to the camera to remove the camera itself or the micro SD memory card is strongly discouraged to not violate the mechanical alignment of the shutter button and the solenoid axis. The included micro SD can store thousands of images so running out of space is highly unlikely for most users. Please refer to this included GoPro user manual PDF and app for further details.

Technical notes for controlling GoPro camera

1. User selectable software Trigger switch: "Audio Command/ Shutter solenoid".
- Advantage of using Audio commands is the reduced power consumption and longer system run time. Disadvantage – it can only be used if at the place of installation, the ambient noise does not overpower the "speaker – microphone" audio link.
- Either of control methods can be tested at the point of installation by pressing the software button "Take a photo" and verifying if the camera responded to this command in each of the two settings of the Trigger switch.
- BVS recommends use of a smart phone app to communicate with the camera; physical access to the camera to remove the camera itself or the memory card is strongly discouraged to not violate the mechanical alignment of the shutter button and the solenoid axis.
2. Depending on the Trigger switch setting, the system software either plays an appropriate audio command or sends a signal to solenoid. Active high Alarm ON signal (port RC13 on the PIC24) is used to turn ON the solenoid.
3. When a cell phone RF signal received by the system exceeds a set threshold, a series of control signals is sent to the camera. There are two operational modes described below:
4. A burst - the camera is set to take a series of pictures in a certain time interval, for instance 30 in 10 seconds. The system sends a single command "GoPro take a photo" or a single trigger signal to the solenoid.
5. A single shot – a photo is taken once per second for a set duration of time: 10 sec, 20 sec, 30 sec. In this mode the camera is set to a single shot; the system sends "GOPro take a photo" command once a second for a set duration of time or sends a sequence of control signals to solenoid – 0.5 sec ON, 0.5sec OFF – for a set duration of time.

Note:

The timing of signals sent to solenoid may need to be adjusted as the result of testing; we may even end up holding the solenoid turned ON for the whole time interval, since the GoPro appears to be taking a series of pictures when the shutter is pressed and held.

Brief blanks in sequence of snapshots for 2-3 seconds are possible in this mode since the camera may need to buffer bitmaps on long intervals. Also, if the solenoid is used in this mode, the system needs to block triggering following the activated time interval for at least the same length of time. This is necessary to satisfy the solenoid 50% duty cycle requirement.

Pairing GoPro Camera with Smartphone App

Before you begin, download GoPro apps for iOS or Android app stores. Learn more about these software apps and the GoPro Hero9 Black camera in the PDF user manuals provided on the included BVS USB stick or at www.gopro.com.

Turn on camera by pressing on/off button on side of camera

Carefully pull camera to upright position

Carefully pull camera to upright position

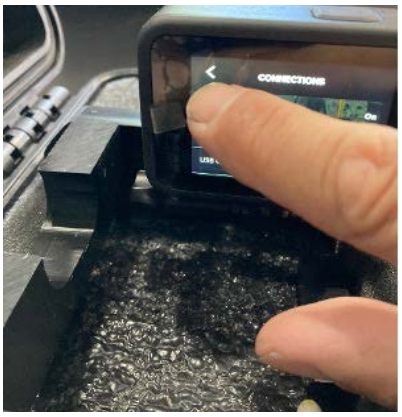
From this screen swipe down

Then swipe left on this screen

Choose “Connections”

And then choose “Connection Device”

Choose GOPRO APP
Then pair with smartphone app.



Close out by picking back arrow in upper left

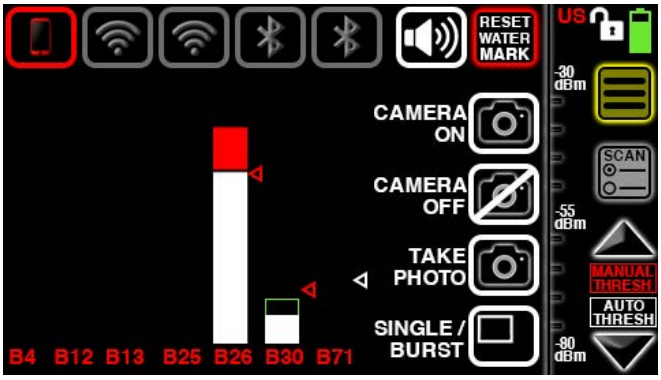
Push solenoid plunger up

Return camera to original position

Carefully push solenoid plunger so it is back against the camera

Rural RoadRunner Camera to Vehicle Test (100 Foot)

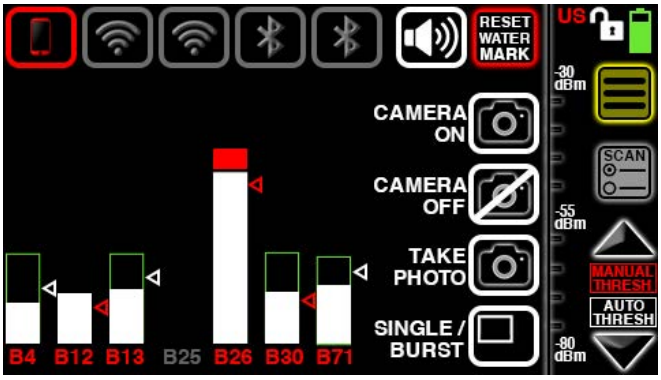
The test vehicle #93 shown in this rural test example has been marked using standard 6” identification numbers for trucks. An active cell phone was detected 100 feet away from the RoadRunner unit and the event was captured. When digitally, zoomed in, the RoadRunner’s camera image clearly displays the vehicle number allowing it to be identified by the user upon retrieving the event data.



This measurement screen shows what the RoadRunner was “seeing” during the test and indicates a cellular detection screen common to many rural mining and construction sites. Cellular band B26 broke the set threshold which triggered a series of captured images. RoadRunner detected other faint cellular activity but only the broken threshold triggered the capture event. Managers on working remote sites with strict cell phone safety regulations in place can lower the threshold (increasing trigger sensitivity) so that most cellular activity will trigger a capture event. Conversely, managers working near populated areas with looser cell phone restrictions in place can raise the thresholds (lowering trigger sensitivity) to minimize the amount of false trigger capture events.

Non-Rural RoadRunner Camera to Vehicle Test (100 Foot)

The test vehicle #93 shown in this rural test example has been marked using standard 6” identification numbers for trucks. An active cell phone was detected 100 feet away from the RoadRunner unit and the event was captured. When digitally, zoomed in, the RoadRunner’s camera image clearly displays the vehicle number allowing it to be identified by the user upon retrieving the event data.



This measurement screen shows what the RoadRunner was “seeing” during the test and indicates a cellular detection screen common to mining and construction sites located closer to public roads and buildings. Cellular band B26 broke the set threshold which triggered a series of captured images. RoadRunner detected other cellular activity but only the broken threshold triggered the capture event. Managers on working remote sites with strict cell phone safety regulations in place can lower the threshold (increasing trigger sensitivity) so that most any cellular activity will trigger a capture event. Conversely, managers working near populated areas with looser cell phone restrictions in place can raise the thresholds (lowering trigger sensitivity) to minimize the amount of false trigger capture events.

Power Specifications

We fully support all our products with a one year hardware warranty and the ability to purchase additional support warranty extensions. However, some users find it more convenient and fast to troubleshoot and replace parts themselves providing they have cleared this endeavor with BVS engineers and sales staff prior to repairing or replacing RoadRunner components. The items below comprise power for RoadRunner operation.

Ibex Battery Systems

Electrical Specifications

Maximum Operating Ratings

Line Voltage	116/232 to 132/264VRMS
Output Short Circuit Duration	Continuous
Hi-Pot Rating (Note 1)	2500VRMS
Output Voltage Isolation (Note 2)	150V Peak
Line Frequency (Min. & Max.)(Note 8)	50/60Hz
Operating Temperature	-40C to +60C
Storage Temperature	-55C to +105C

Electrical characteristics Unless stated otherwise, these specifications are valid over the operating temperature range.

Parameter	Conditions	Minimum	Maximum	Units
Max. Output Current (Note 3)	Vout > 12V	3.0	3.4	A
Foldback Current (Note 3)	Short Circuit	0.8	1.4	A
Absorption Mode Voltage	Ambient=+60C 23C 0C -40C	13.7 14.6 15.0 15.9	14.7 15.2 15.9 16.8	V
Float Mode Voltage	Ambient=+60C 23C 0C -40C	12.7 13.6 14.0 14.9	13.3 13.8 14.5 15.4	V
Output Ripple Voltage (Note 4)	-	-	50	mV pk-pk
Output Leakage (Note 5) Output Leakage (Note 6)	-	-	-30 -1.0	mA mA
LED Signal Output Currents	-	9	11	mA
Max. Load Current (Note 7)	Ambient=+60C +20C 0C -40C	-	4.2 5.0 5.0 5.0	A (RMS)

Note 1: 1 minute rating between the line-input terminals and the battery output or LED terminals or ground.
Note 2: Continuous rating between any output terminal and chassis.
Note 3: Battery voltage = 12V or higher during charging. Below 12V (Vfoldback), the current folds back linearly to the minimum value (at 0V).
Note 4: Assumes the output is connected to a minimum recommended size battery.
Note 5: This is the reverse leakage current that the battery supplies to the charger when the line voltage is removed and the charger has connected the +BAT terminal to the LOAD terminal.
Note 6: This is the reverse leakage current that the battery supplies to the charger when the line voltage is removed and the charger has disconnected the +BAT terminal from the LOAD terminal.
Note 7: The load current is fused with a polymeric fuse (Raychem RGE600 or equiv).
Note 8: With a 50Hz line frequency, the input voltage should not be higher than 126/252VAC.

Ibex Battery Systems

Mechanical Specifications

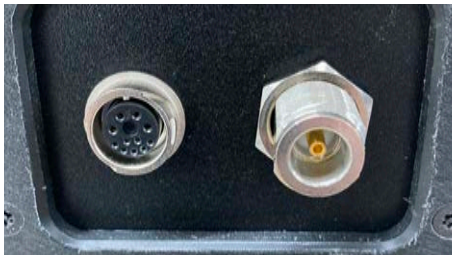
Mechanical Information Weight: 3.0 lbs.
Dimensions: 6.0"L x 5.0"W x 3.0"H

The mounting holes punched into the chassis will accommodate up-to #10 hardware. Also, the four circuit board mounting standoffs are threaded for 6-32 hardware available from the chassis back.

Directional Antenna Adjustment

The wideband directional antenna is mounted atop the pole and is adjustable using the ball mount. This antenna can detect all standard domestic and international cellular devices. It is ideal for monitoring areas such as active roadways from a distance. Be sure to aim the front, flat side of antenna in the general direction of the area of interest. Keep in mind that the directional angle of the beam is approximately 60 degrees so precise aiming is not required unless you plan to detect smartphones at a distance greater than the recommended 100 feet away in order to maintain visual contact. If your worksite maintains a more flexible policy on smartphone use, you might have to experiment a little with RoadRunner placement and antenna alignment in order to avoid false positives.

Connect the supplied cable to the antenna and make adjustments to the angle using the ball mount.



Connect the other end of the supplied cable to the RoadRunner receiver on the side of the case.

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

Customer Support

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Liberty Corporate Park
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