

USER MANUAL

Revision 3 – 4 March 2020

**Training videos for this manual content including
additional tips and tricks can be found at
www.boomcam.us**

The Boom Camera is designed and manufactured by Deep Analytics LLC in Montpelier, Vermont.

Visit the Boom Camera page for support documentation at www.boomcam.us

Get live support at support@boomcam.us or (802) 345-2053

Revision	Date	Summary
Release	23 September 2019	--
Revision 2	22 November 2019	Addition gimbal details; Updated pictures
Revision 3	4 March 2020	Revision to the front page

Note to the User:

The Boom Camera was designed during a yearlong R&D project sponsored by the Improvised Device Defeat (IDD) organization within the Counter Terrorism Technical Support Office (CTTSO) in 2018 and 2019. We would like to thank our user group that provided feedback during development: the Vermont State Police, the Vermont Air National Guard 158th EOD Team, and Massachusetts State Police. For those new to the Boom Camera, we're looking to make improvements based on real field usage so we can make Boom Camera a go-to tool for Bomb Squads and EOD teams. If something about the Boom Camera doesn't work right, or needs improvement, please let us know.

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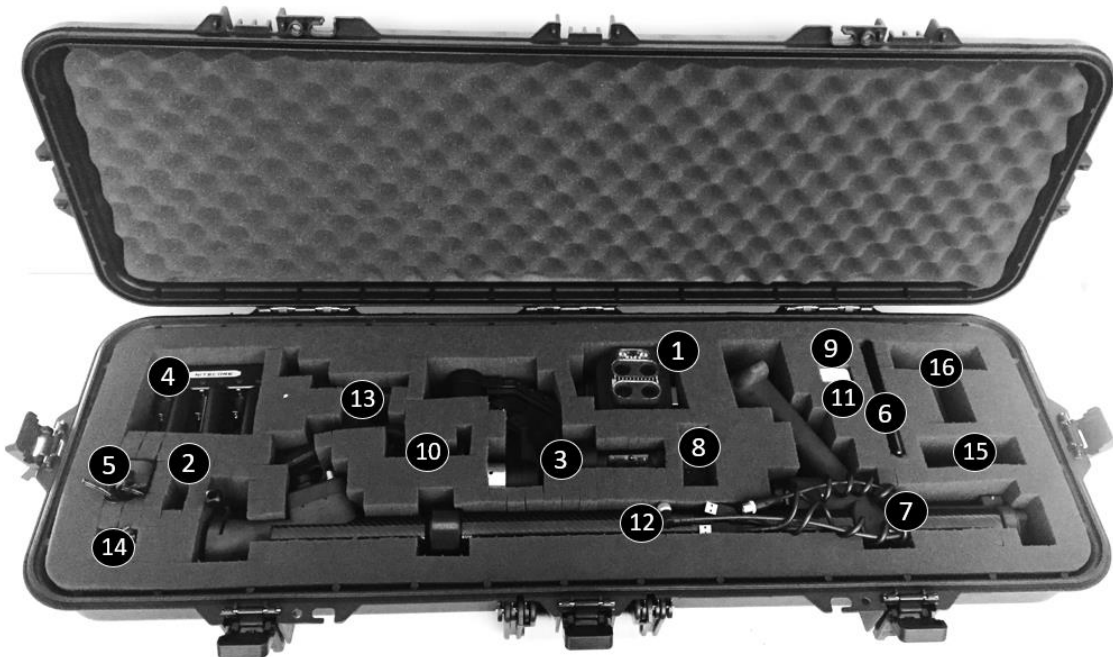
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Introduction to the Boom Camera

The Boom Camera is a pole-mounted camera system designed to make it easier to investigate for explosive threats while wearing a bomb suit. The Boom Camera streams and records 4k video to a grip mounted display, has high intensity white and near-infrared illuminators, and can capture 52 megapixel still images. The Boom Camera is mounted on a steerable gimbal, so users can tuck it into tight spaces and look around. Video and still pictures captured with the Boom Camera transfer to the grip mounted display (an Android smart device), and can be transferred via text, e-mail, SD, or USB cord. Control of the Boom Camera is accomplished with an Android App on the display, and buttons on the grip.

Kit Contents

The Boom Camera comes packaged in a gun case. Within the gun case are the following components:

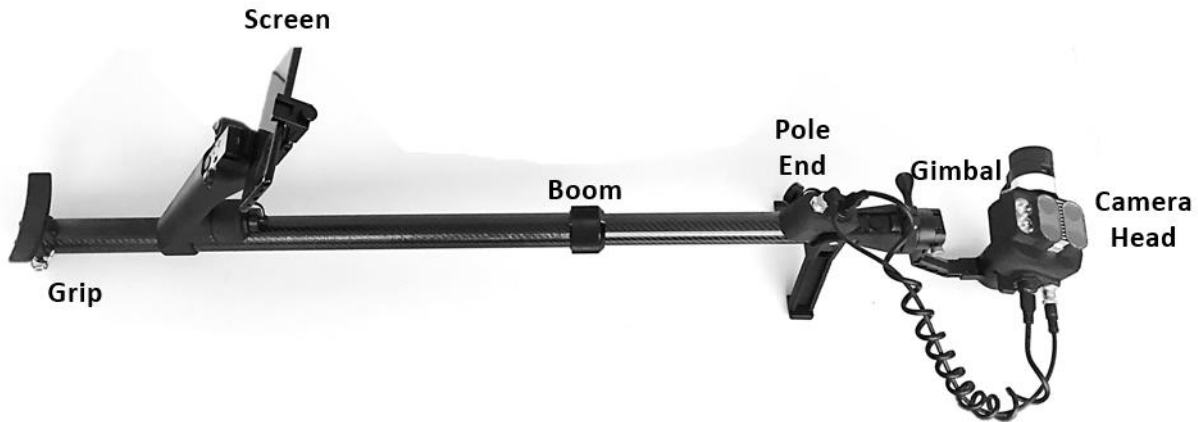


- | | |
|--|----------------------------------|
| 1. Boom camera head with mounting pin | 9. Samsung Note 8 charging cable |
| 2. Keys for the case | 10. Screen holder |
| 3. Gimbal | 11. Samsung Note 8 charger |
| 4. Charger, 3x batteries | 12. Boom camera grip |
| 5. AC adapter | 13. Bipod |
| 6. Samsung Note 8 with protective case | 14. Micro USB Cable |
| 7. System cables | 15. Small Arm Cup |
| 8. Gimbal remote | 16. Large Arm Cup |

If any items are missing, please contact us at support@boomcamera.us directly for replacement parts.

System Nomenclature

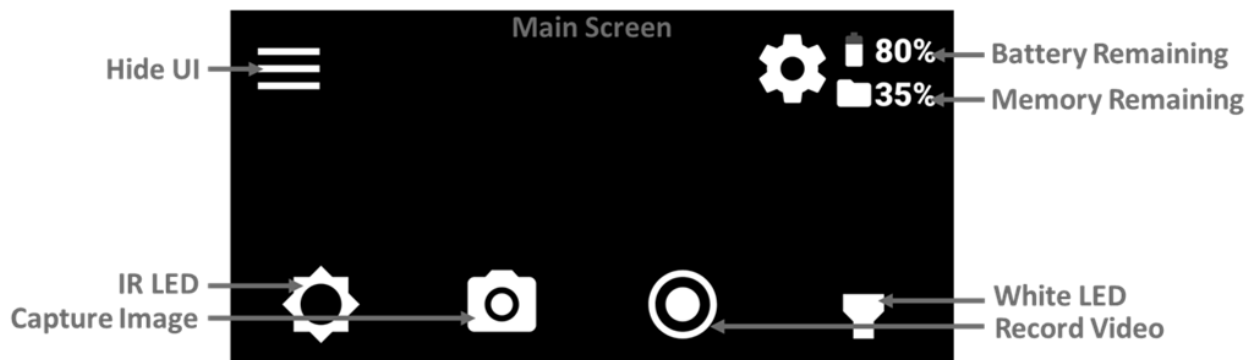
The system is comprised of six key components: the grip, the screen, the boom, the pole end, the gimbal, and the camera head. An assembled Boom Camera system labeled with these items is shown below.



Android Application Features

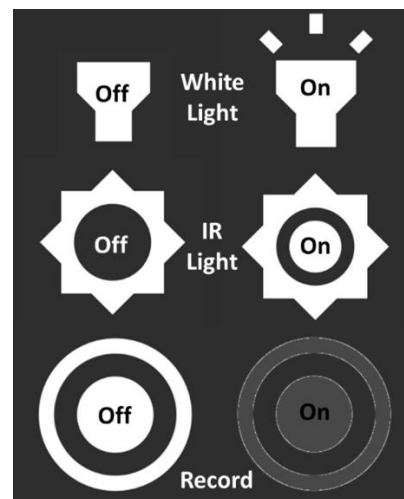
The Android Application has only two screens: Main and Options

The main screen is presented below with a black background. During normal operations, the black background will be replaced with live video.

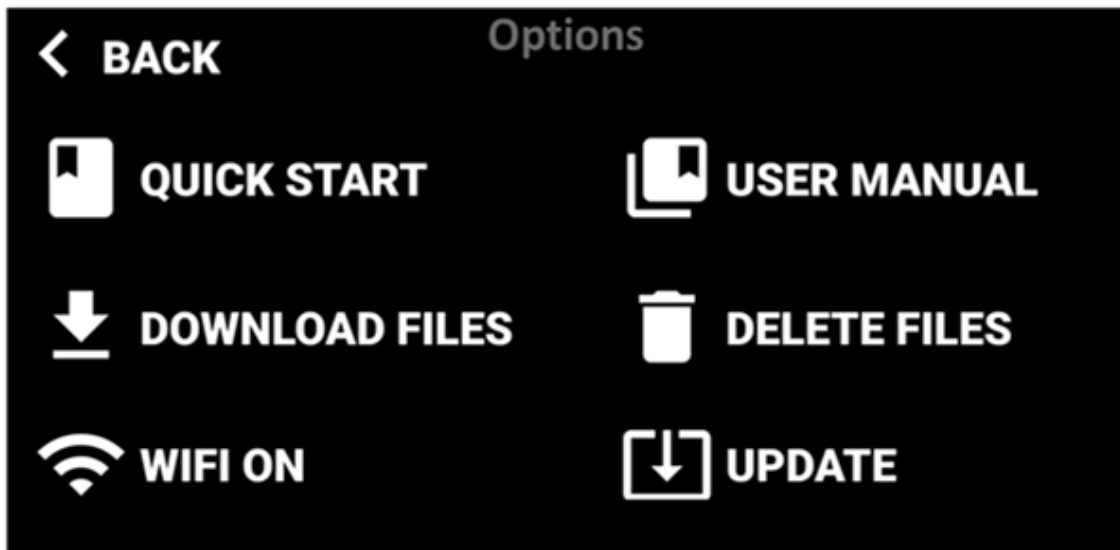


The main screen includes all the touch-buttons shown here. The user can hide all the buttons and just look at raw video with the Hide UI button in the top left. Functions that can be toggled on or off display their state.

The remaining function, Capture Image, takes a 52 megapixel image. When selected by touching the button, or by pulling the grip trigger, a loading wheel appears in the center of the app indicating for the user to hold still while the image captures.



The options menu is opened by selecting the gear icon ⚙️ on the main screen.



The options menu touch buttons have the following functions:

QUICK START – View the quick start guide on the Android device

DOWNLOAD FILES – Copy the video and pictures taken by the Boom Camera to the Android device's Picture folder

WIFI ON/OFF – Create a Boom Camera WiFi Hotspot so others can view the live feed

USER MANUAL – View this document on the Android device

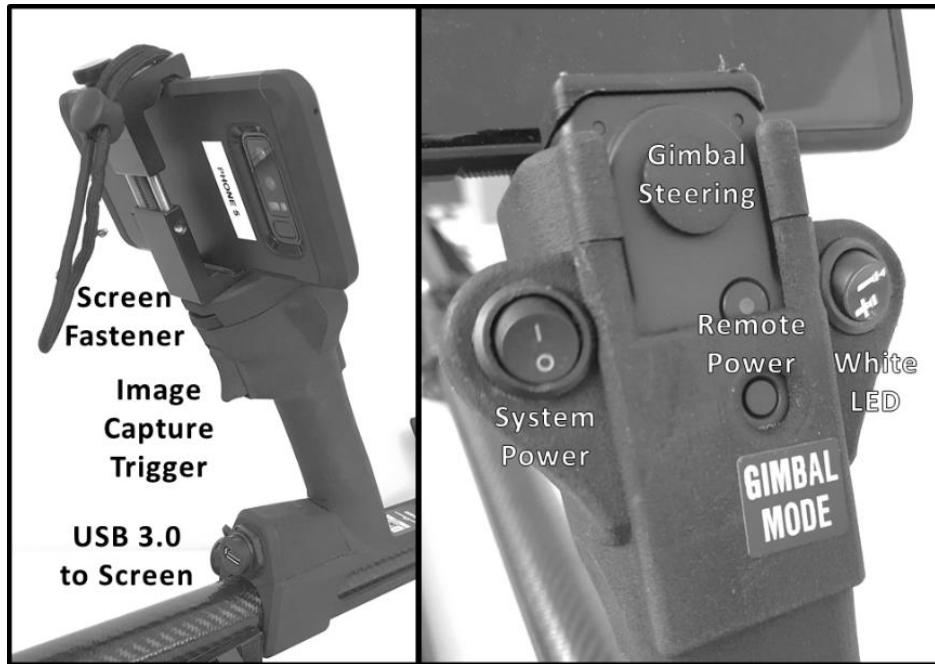
DELETE FILES – Clear the files off the Boom Camera (not the Android device)

UPDATE – Update the Boom Camera software (for future use)

Users can go back to the main screen by touching the **BACK** button in the top left of the Options screen.

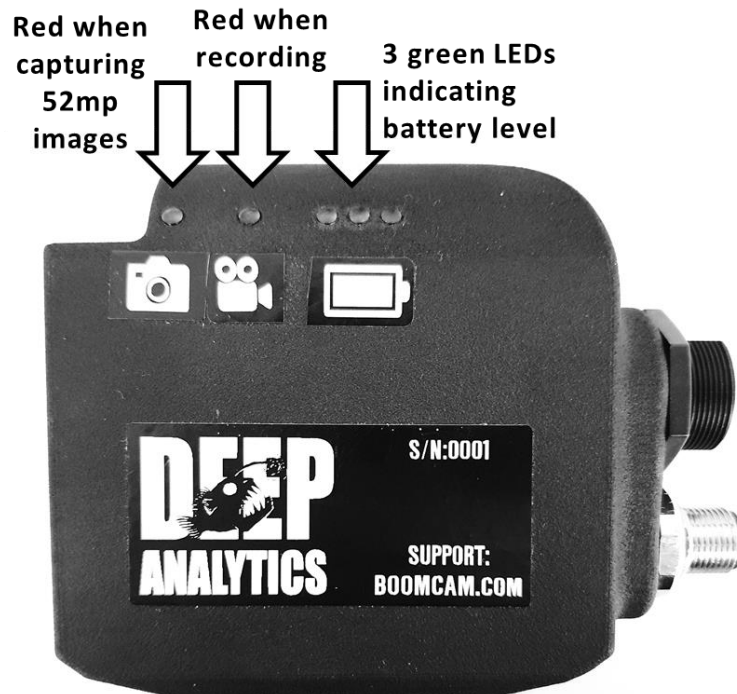
Grip Buttons

The grip buttons have several functions that mirror the app. These buttons enable the user to, for the most part, have single-handed operation of the Boom Camera. The grip buttons have the following functions:



Indicator LEDs

The rear of the Camera Head case has five indicator LEDs.

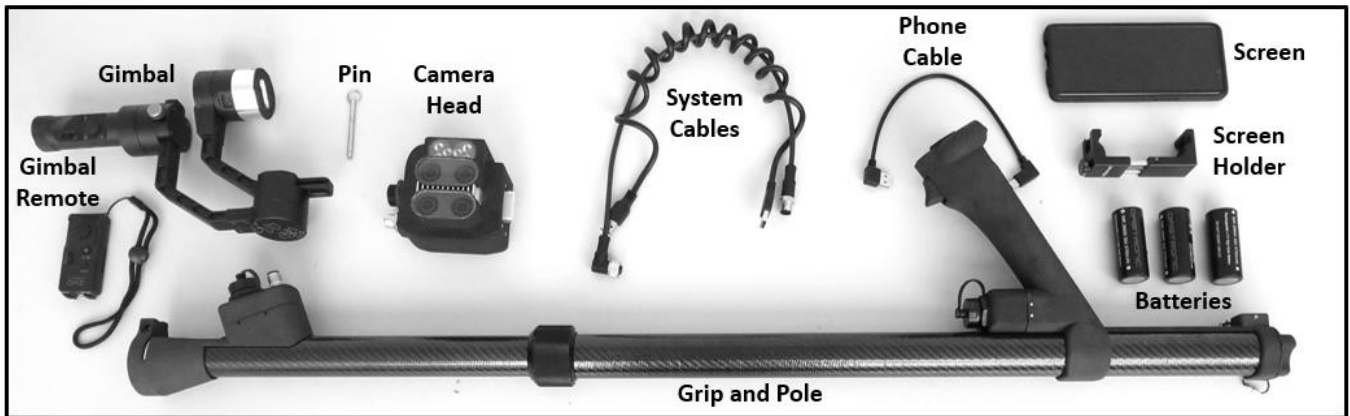


Assembly

Assembly of the Boom Camera takes only a few seconds. It's recommended the Android device and system batteries are fully charged before the first assembly. These steps will ensure the system is fully assembled.

List of Parts

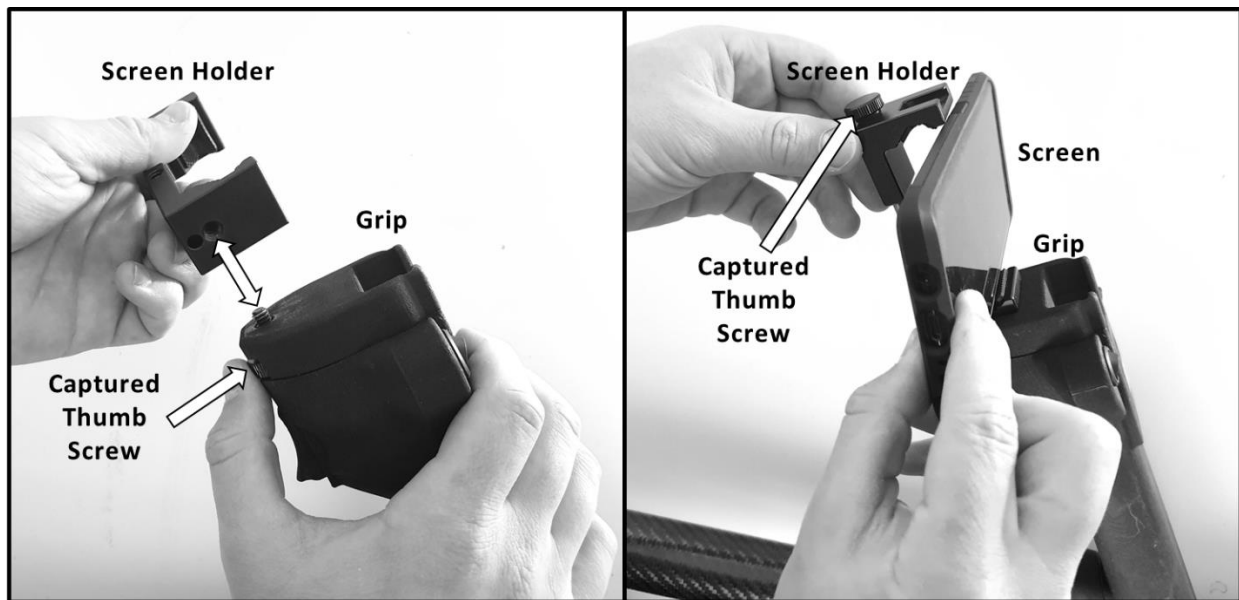
When fully disassembled and stored, the user will assemble the following items found within the Boom Camera case:



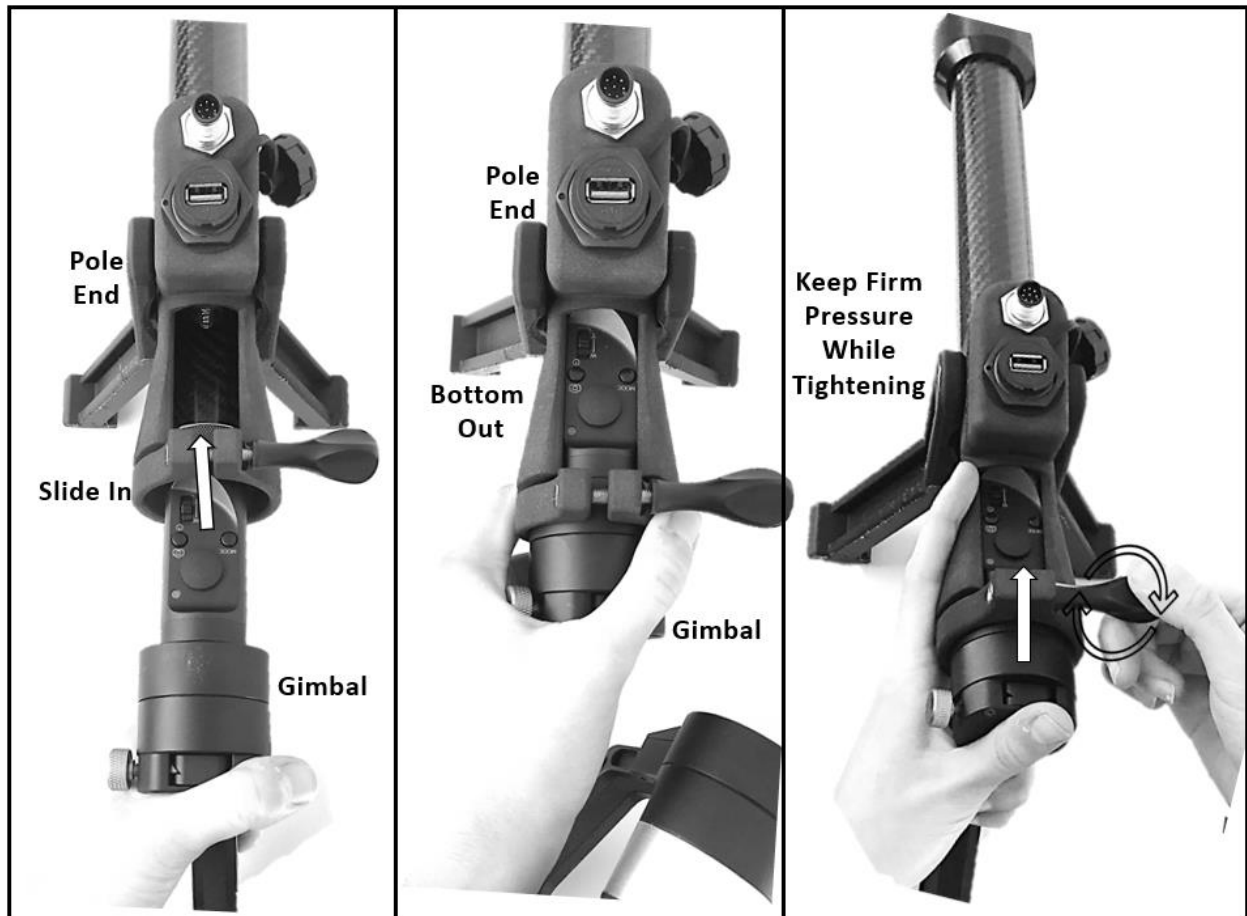
Please note the camera head is stored with the attachment pin already inside the mount. We recommend users store the pin there after usage.

Mechanical Assembly

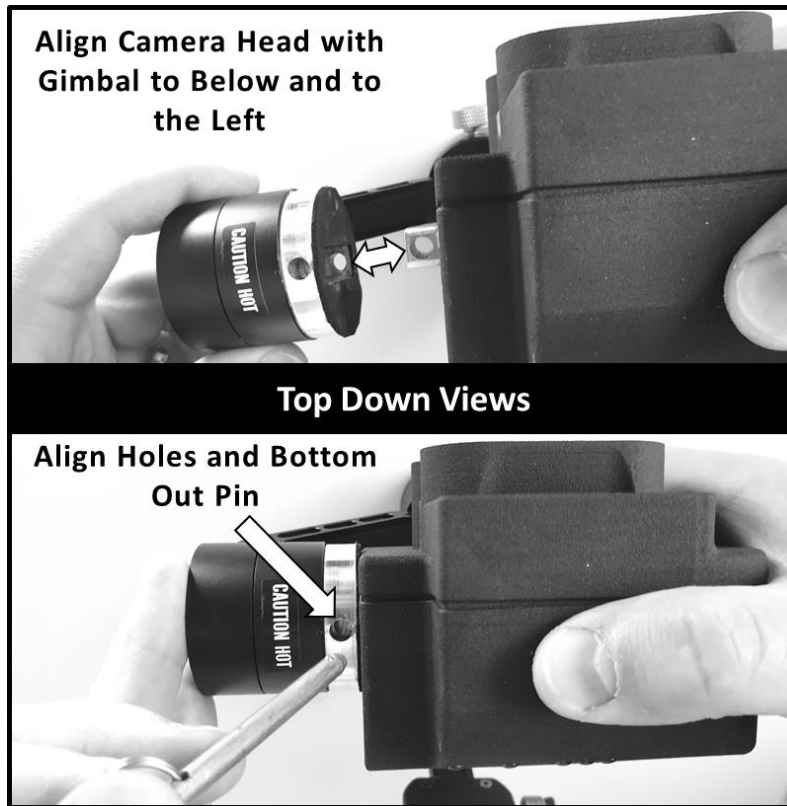
To begin assembly, locate the grip assembly, the screen, and the screen holder. Use the captured thumb screw on top of the grip to attach the screen holder. Then, place the screen in the holder and lightly tighten.



Next connect the gimbal to the pole end. Slide the gimbal into the pole end making sure to keep the controls in the provided window. Bottom out the gimbal into the pole end and keep pressure on the gimbal while tightening the screw. This pressure maintains electrical contact from the system to the gimbal.



Finally, the camera head needs to be attached to the gimbal. Orient the camera so when facing forward, the gimbal is below and to the left. Align the holes in the camera mount with the gimbal, and pin them together, being sure to bottom out the pin.



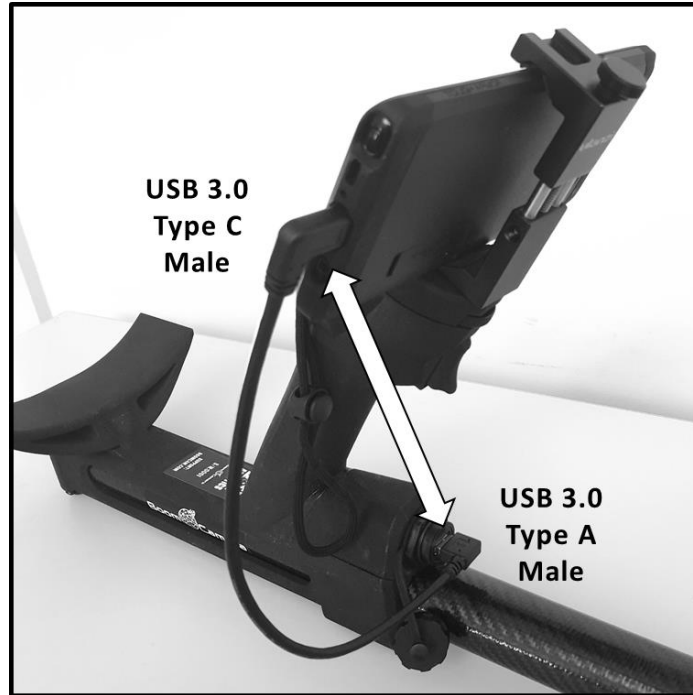
A correctly mounted camera will look like this:



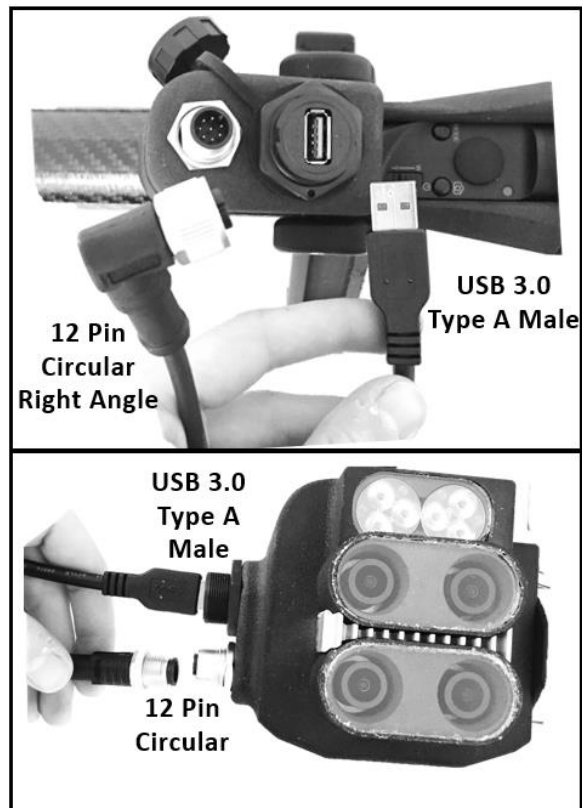
Connecting Cables

There are three cables to connect before powering up the Boom Camera system:

1. The Android device connects to the USB 3.0 connector mounted on the front of the grip



2. Power and button press signals run through the circular cable from the pole to the camera head
3. Video and App control run through the coiled USB cable



NOTE: The coiled USB 3.0 cable between the pole and the camera head must be coiled around the circular cable (as shown above). Any other configuration may prevent full range-of-motion of the gimbal head.

Pre-Operation

These sections include important steps to undertake prior to operation.

Charging System Batteries

The Boom Camera comes with 3x '26650' LiFePo4 'lithium' batteries, and a wall charger. To charge the batteries, simply slot each battery within the charger as shown below. Batteries can be charged all together, or individually. A green light in each charging lane indicates a fully charged battery.



NOTE: The batteries provided are “smart” and are internally protected with special electronics. When the batteries are drawn down below 3.2V, they may show 0V on the charger due to the protective electronics. A few tries with the charger will bring them back. The internal protection prevents any individual battery from destroying itself when being drawn too low. The protective electronics ensure the batteries will last many years.

Charging the Android device

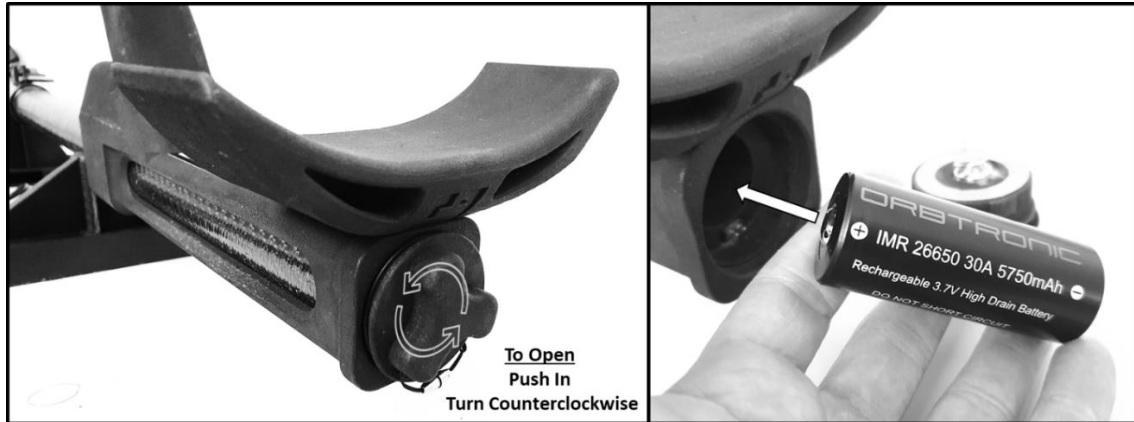
The Android device is a commercial off the shelf Samsung Note 8. This device is charged using the provided USB-C cable.

Charging the Gimbal Remote

The Gimbal Remote is charged with the accompanying USB Micro B cable. It can be charged with any 5V source, including any standard USB port or phone charger.

Loading and Changing System Batteries

Batteries are loaded into the base of the grip. A ¼ turn plug at the base is removed, and the batteries are loaded positive-side first. The system accepts three ‘26650’ batteries.



Operation

Powering Up


The system has a main power switch, but the Android device, gimbal, and gimbal remote need to be powered separately. To start the system up:

1. Toggle the main power switch on the grip – you’ll see the green power indicator LEDs on the Boom Camera head illuminate indicating power
2. Power the Android device
3. Power the gimbal and then gimbal remote – the gimbal will automatically move to home position when powered

WARNING: DO NOT POWER THE GIMBAL WITHOUT THE CAMERA ATTACHED.



Starting the Android Application

Before operation can begin, the Android device must connect to the Boom Camera head, and the Boom Camera Android application. The connection between the Android device and the camera head is quickly ascertained by validating the presence of a key icon  in the device task bar. **This may take several seconds to occur.**

The connection of the data stream between the Boom Camera head and the smart device is automatically handled by a special piece of software called 'Gnirehtet'. Users may see this software running in the background of the Android device if they examine the device alerts closely. If the user executes the Boom Camera Android application before this connection, the app will sit with a "connecting" message until the connection is established, at which point the app will automatically begin working as intended.

Starting the Boom Camera Android application is handled by touching the icon on the main screen of the Android device.

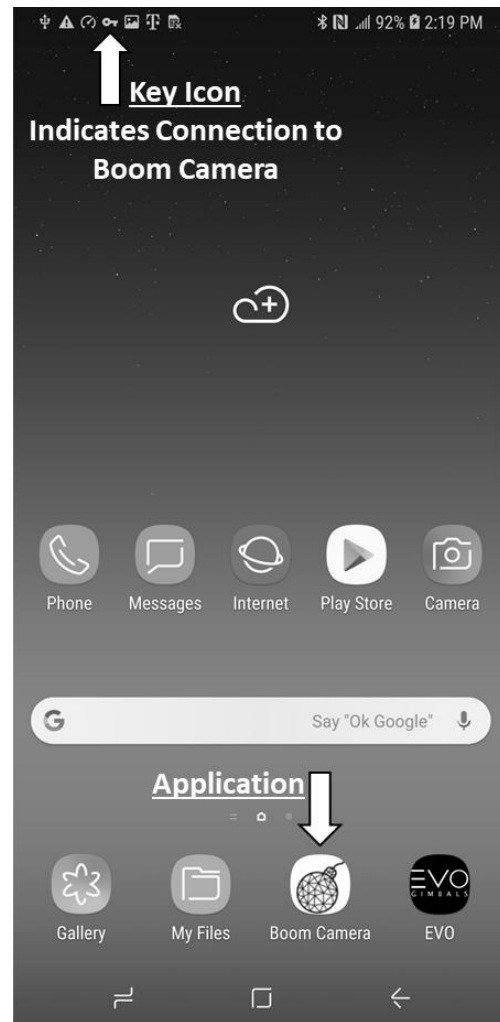
KNOWN ISSUE: When the Boom Camera connection is made, after about a minute the Android operating system will display a message indicating a USB device is connected. The user must press OK. There is no work around for this issue.

Gimbal Settings

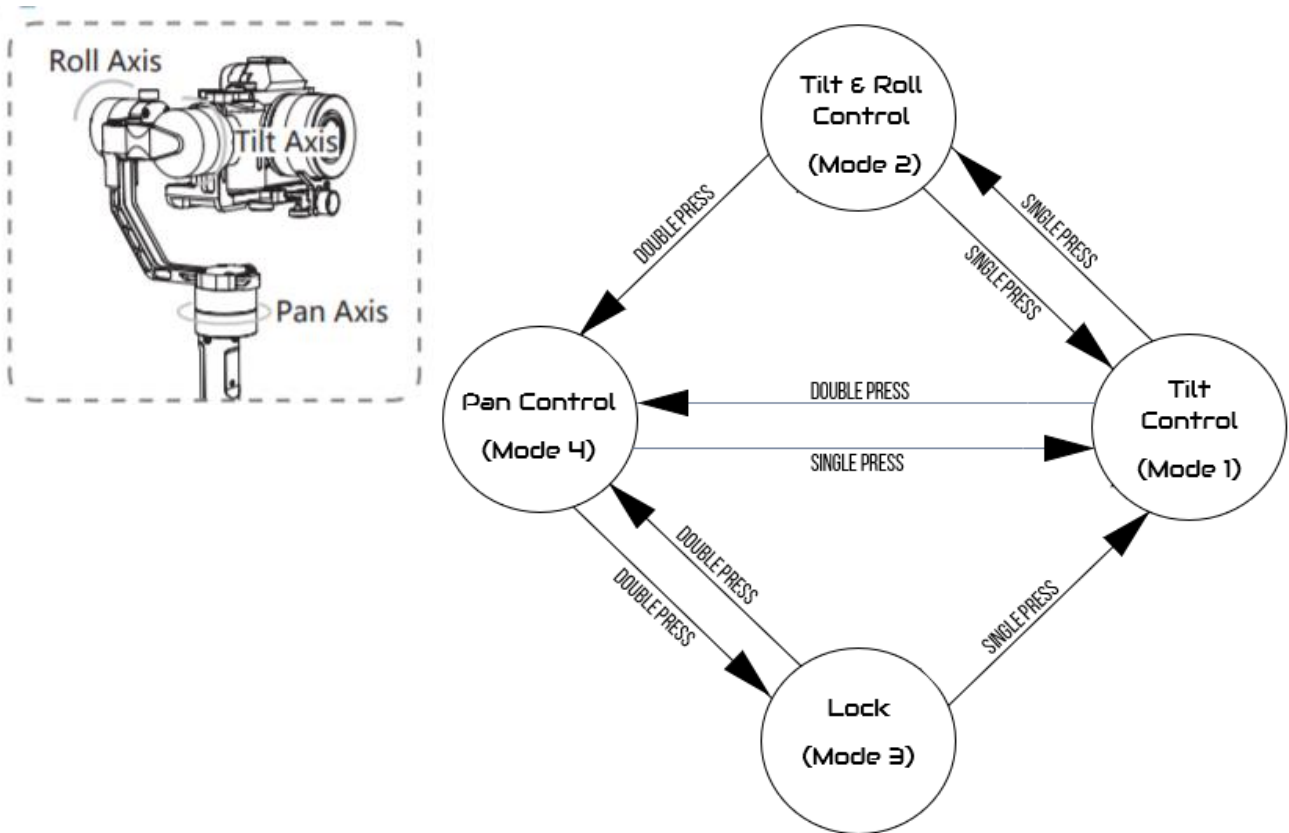
The Boom Camera gimbal has several stabilization settings:

1. Mode 1 – Default Mode – Pan Follow – Camera always looks forward, use the thumb stick to rotate about the tilt axis.
2. Mode 2 - Pan and Tilt Follow – Camera attempts to follow a point. Use the thumb stick to rotate about the roll and tilt axes.
3. Mode 3 - Lock mode – No stabilization or control from thumb stick. Locks the camera in its current position.
4. Mode 4 – Pan Control Mode – Camera rotates about the pan axis only. No stabilization on the tilt axis
5. Mode 5 – Standby Mode – No stabilization or thumb control for all 3 axes. Useful during gimbal firmware updates or setting changes.

Searching is best executed in Mode 1 with occasional use of Mode 3 for looking in tight spaces.



Follow the diagram below to toggle between Boom Camera Gimbal Modes. “Single Press” indicates pressing the mode button once. “Double Press” indicates pressing the mode button twice in rapid succession. Enter or leave standby mode at any time by holding the mode button.



Connecting Bluetooth Remote to Gimbal

On Bluetooth remote, press and hold Mode and Power button to sync Bluetooth. Bluetooth is connected when LED in lower left corner is solid blue.

Streaming Live Video

Streaming live video happens automatically. The live video stream resets if the user enters the option screen and returns to the main screen. This fact can be used to reset the stream if desired.

Capturing a 52 megapixel image

If the user pulls the trigger or selects image capture from the touch screen, a loading icon with ‘Capturing’ will display. A red capture LED on the Boom Camera head will illuminate.



Please hold still for the ~2-3 seconds it takes to capture a 52 megapixel image. If the capture fails due to motion, the Application will report an error.

Recording 4K video

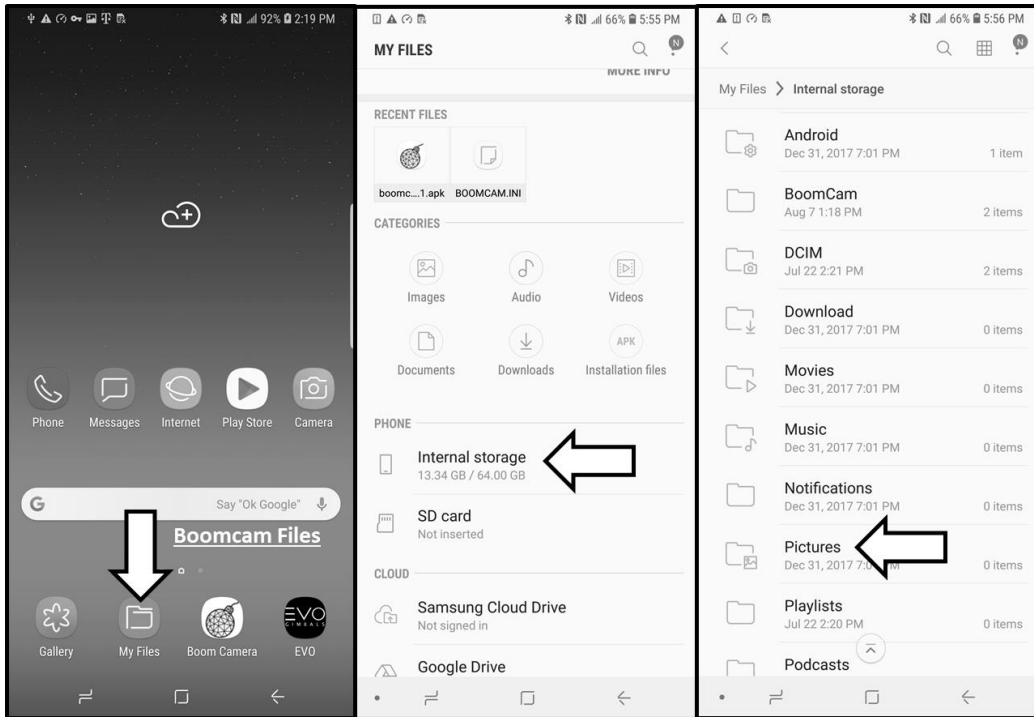
Pressing the record button on the app screen starts recording. The button turns red when recording. It may take several seconds for the recording to start. The red recording LED will illuminate on the back of the Boom Camera.

WARNING: 4K VIDEO IS VERY LARGE. PLEASE BE AWARE TRANSFERING LONG 4K VIDEOS CAN TAKE HOURS.

Transferring Video and Images

Video and images are stored on a 256GB internal memory card. The card cannot be removed, but the files are transferred to the screen by pressing the **DOWNLOAD FILES** button in the Options menu of the Boom Camera Application. The App will display the file download in real-time.

Images and video are transferred to the screen in the Android 'Pictures' Folder. They can be accessed by selecting 'Files' on the main Android screen, selecting Internal Storage, and selecting the Pictures folder as shown below.



Files in the Pictures folder are both 52 megapixel images and 4K videos. From the pictures folder, you can e-mail or text the files. Alternatively, the user can connect the screen to a computer via the USB port and transfer files that way.

Best Practices

Using the Boom Camera as a Screening Tool

In many scenarios, the Boom Camera will be used simply as a screening tool to help look around objects, illuminate dark spaces, and check in tight areas. Here are the key steps to using the Boom Camera:

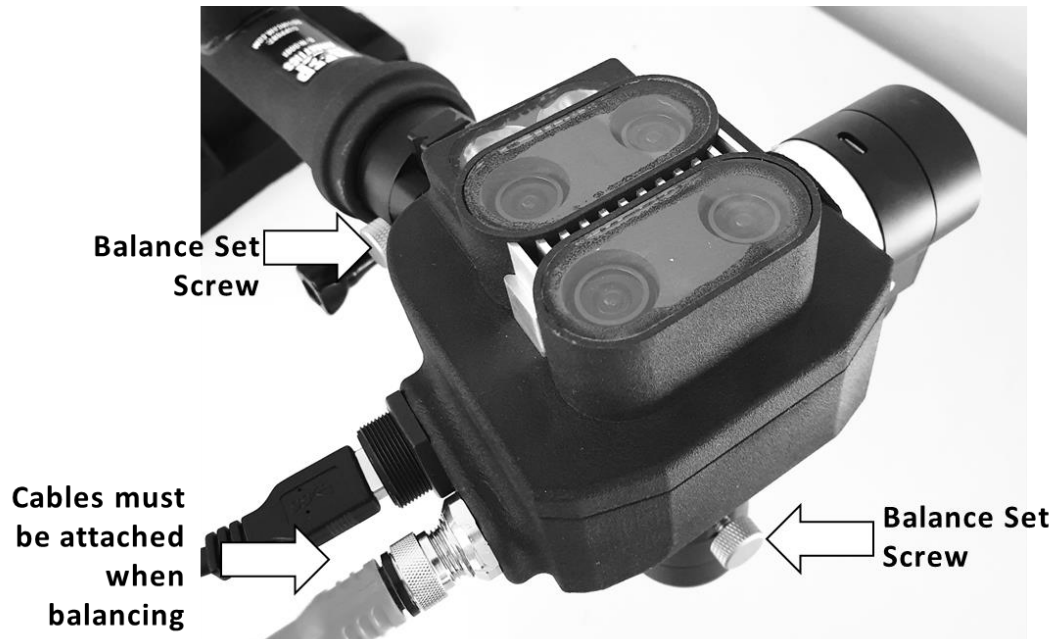
1. Adjust the length of the system so it is comfortable being held in a “metal detector” like fashion
 - a. When resting, the camera head should be close to the floor, but not touching
2. Use the LEDs to improve the image quality in dark spaces
 - a. White LEDs can be operated either by pressing the smart device button or the grip switch
 - b. IR LEDs, used for tactical scenarios, are activated with the touch screen
3. Practice with the different gimbal modes
 - a. The gimbal mode on power-up is our favorite, but it doesn't allow you to turn the gimbal left or right

Troubleshooting

Gimbal Balance and Vibration

DA balances the gimbal before it leaves our shop. However, the gimbal could be knocked out of balance during use. A well-balanced gimbal, when left unpowered, will stay where the user points it by hand. The cables of the Boom Camera somewhat prevent this, but the gimbal should be easily moved through it's normal travel without it rapidly swinging (when let go).

The Zhiyun Crane Gimbal has set screws on each axis to enable the gimbal to be balanced. Loosening the screws enables sliding the gimbal along that axis. Tightening them fixes the gimbal balance.



To balance the gimbal:

1. Power the gimbal down
2. Ensure the Boom Camera head is attached in the normal way
3. Ensure the cables linking the camera head are attached to both the head and the pole end
4. Loosen one axis set screw at a time
5. Adjust the position of the gimbal along its slider such that the gimbal will not rotate or “fall” on its own
 - a. Keeping in mind the tension on the camera because of the cables
6. Tighten the set screw and move to the next

You may refer to the manual of the Zhiyun Crane on www.zhiyun-tech.com/crane for additional information.

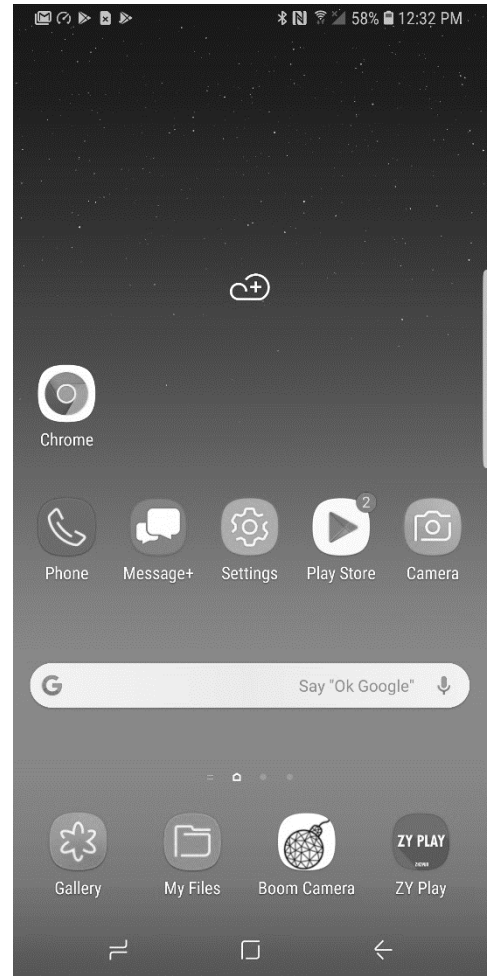
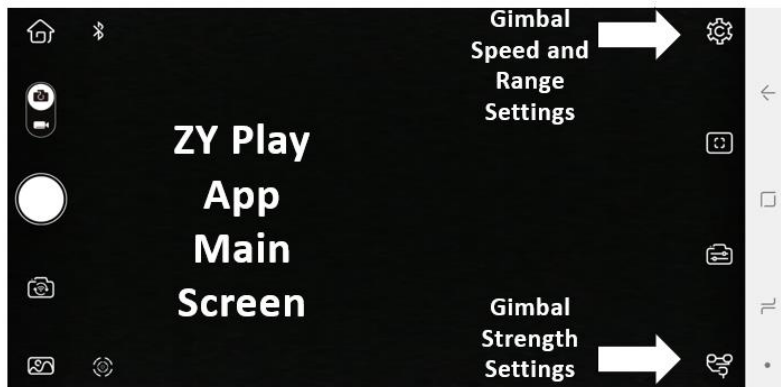
Gimbal Strength

The strength of the gimbal can be changed. DA sets the gimbal strength to “weak” out of the shop, as the gimbal is overbuilt for this application. However, if you want snappier response, or are having trouble with cable tension, the gimbal can be set stronger. Note, a stronger setting may adversely affect battery life.

Installed on each Boom Camera screen is the ZY Play Gimbal App. It’s found on the main screen.

When the App starts, swipe to the screen until the screen banner displays “For Pro Cameras”. If “CRANE” gimbal is not displayed by default, tap the menu icon in the top left and scroll until the Crane gimbal is found. To pair the app with the gimbal, the Bluetooth remote must be off.

When paired, the user will be brought to a multi-faceted menu. Many various gimbal settings can be set from these menus, including speed, range, dead zones, gimbal mode, and gimbal strength. Highlighted below are the key menu items.



DA Recommended Settings:

Setting	Tilt	Roll	Pan
Follow Rate (°/sec)	80	80	60
Control Rate (°deg/sec)	50	100	30
Smoothing Deg.	200	200	200
Dead Zone (Deg)	4	4	15

Black Screen or No Video Display

For video to stream from the camera to the app, the following criteria must be met:

1. The camera and phone must be powered on
2. The cables must be attached
3. Reverse tethering must have occurred (validate presence of the key icon as described in the Operation section)
4. The App must be started

Most of these issues can be resolved by power cycling the Boom Camera and/or the screen. More detail on specific issues are provided below.

A black screen in the app can be caused by the following failures:

1. The system isn't tethered
 - a. To force the system to tether, unplug and replugin the USB cable
2. The onboard video server isn't started
 - a. The server starts when the app is detected by the Boom Camera (after tethering)
 - b. Force the issue by closing and restarting the app
 - c. This error can sometimes happen with the known issue of the Android USB device dialogue as discussed in the operation section
3. An internal failure of the system to find all four cameras
 - a. The system will be presenting slowly blinking red lights if this occurs
 - b. A power cycle may solve the issue
 - c. If a power cycle does not solve the issue, call or e-mail the support line.