User Guide

Wireline Digital Camera 360° View

MOUNT SOPRIS
INSTRUMENTS

DGRT
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⚠ CAUTION

Please familiarize yourself with this manual before attempting to operate this product.

Contents

Before Operation

⚠ **CAUTION**

Disconnect all other Wireline surface units from the wireline winch and the encoder. Having multiple surface units connected can cause permanent damage to any system connected!

⚠ **CAUTION**

Consult your winch or encoder documentation to determine supported voltages and current requirements. This system can output 5V or 12V, so the encoder must be able to operate at one of these voltages.

⚠ **CAUTION**

If your encoder is self-powered, please contact DGRT for instructions to disconnect encoder power from the surface unit.

⚠ **CAUTION**

Connecting the encoder with the incorrect voltage settings may damage both the Camera System and your encoder.

General Information

DGRT Digital Camera Systems consists of:

- Camera Sonde
- Surface Unit
- Test and Power Cables

A general system setup is shown in Figure 3.

The surface unit provides camera power, control, and a live video preview to connected Wi Fi devices. The camera sonde, when instructed by the operator, records footage in high resolution to the internal USB storage. Front and side videos are recorded simultaneously.

When the Camera sonde is in close Wi Fi range of the surface unit (<3 ft), the recorded footage can be viewed directly from the surface unit or downloaded for later review. Footage is broken into 1-hour files to prevent data loss in case of power loss.

Note: The .html file requires approximately 30 seconds to generate after you stop recording or at the end of 1 hour of recording time. There is currently no notification to let you know when this process is complete. Do not power down or turn the system off in any manner during this time, otherwise the system will not create a .html file.

Dimensions

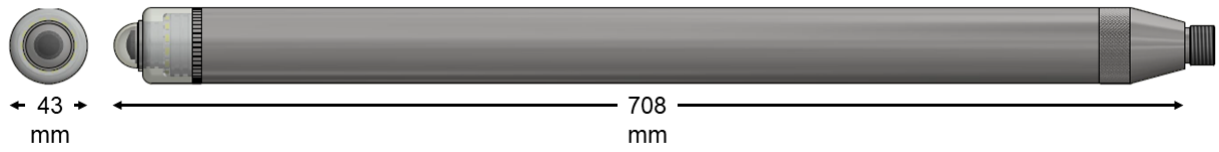


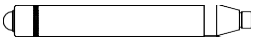
Figure 1

Technical Specifications

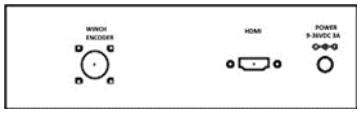
Parameter	Comments	Value	Units
Electrical			
Supply Voltage Range	At sonde head Max	70-120	V
Power Consumption	100% Lighting, 70 V input	15	W
Line Current	@70 V	215	mA
Communications			
Range	Max	2000	m
Baud rate max	Subject to cable length and condition	15	Mbps
Physical			
External Diameter		43	mm in
Total Length (approx.)	Not including connection thread	708	mm in
Total Weight (approx.)		3.5	Kg lb
Operating Temperature Range		0-70 32-158	C F
Maximum Operating Pressure		2900 20	PSI MPa
Camera Configuration			
Physical Cameras		1	
Frame Rate		10	Fps
Focus		Fixed	
Focal Length		30 mm – infinite	
Resolution		1280x960	
View Angle		180/360	Degrees
Recorded Video			
Container Format		Mpeg4(.mp4)	
Encoding		.H264	
Bit Rate	Forward Stream	2	Mb/s
	Side Stream	2	Mb/s
Frame Rate		15	Fps

Quick Connection Setup

1. Connect Camera to Winch

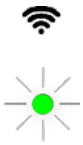


2. Connect Winch and Power to Surface Unit



3. Power on Surface Unit

4. Wait for WIFI



5. Join Network

6. Navigate to http://10.0.0.1 in Your Browser

Figure 2

System Diagram

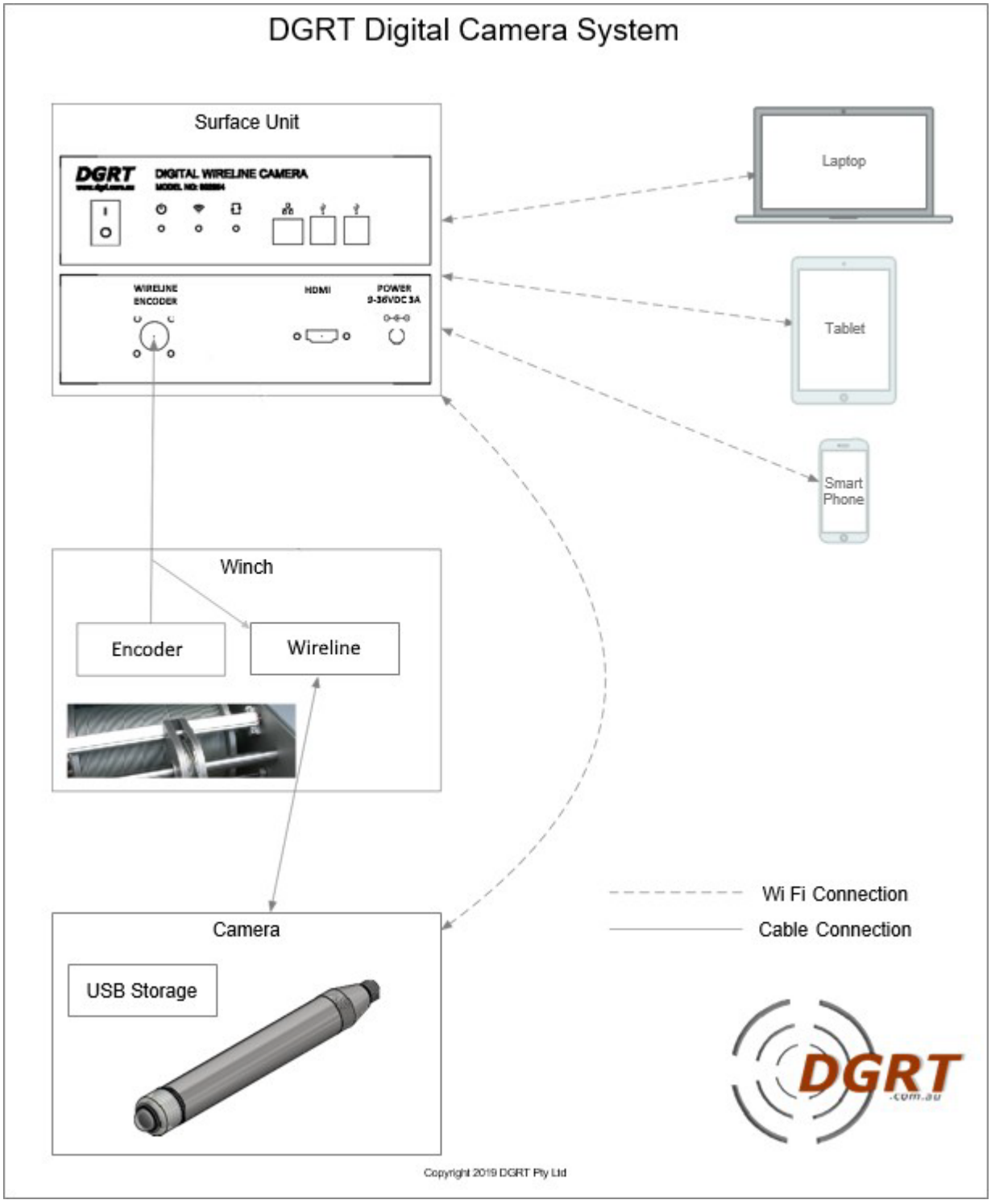
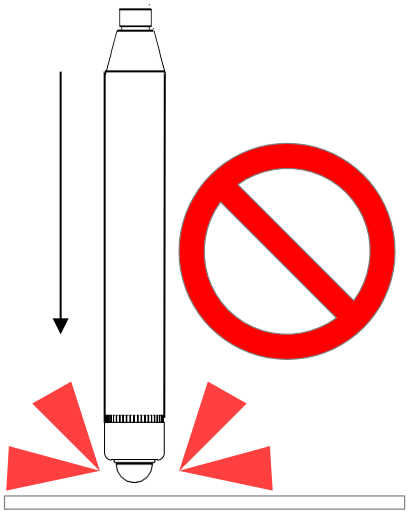


Figure 3

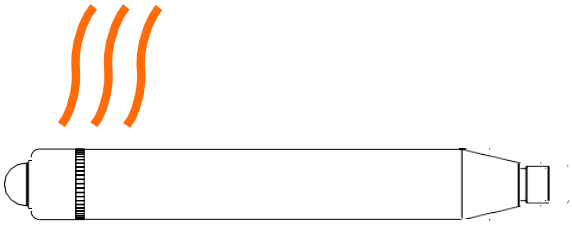
Handling

The Digital 360 camera has delicate electronics and glass components and should be handled carefully to ensure safe and effective operation.

- **DO NOT** drop or rest the camera on its dome or front window.



- The front of the camera body can become hot when running at full brightness.



- Wipe down the dome or clear casing before and after each use. Do not use strong solvents. Soapy water and a clean cloth are best.

- **DO NOT** operate if cracks or deformations are visible in the dome or clear housing.

Camera Sonde

The Digital 360 camera has a single 360 camera with selectable front and side views.

Up to 5 cameras in the camera sonde are recording simultaneously at full resolution while a low bandwidth preview is sent to the surface unit, which in turn is viewable on a computer/smartphone/tablet.

The operator can change the preview to any front, side or combined sides on the fly using the inbuilt web application on the surface unit's Wi Fi network.

Location of the camera features are shown in Figure 4.

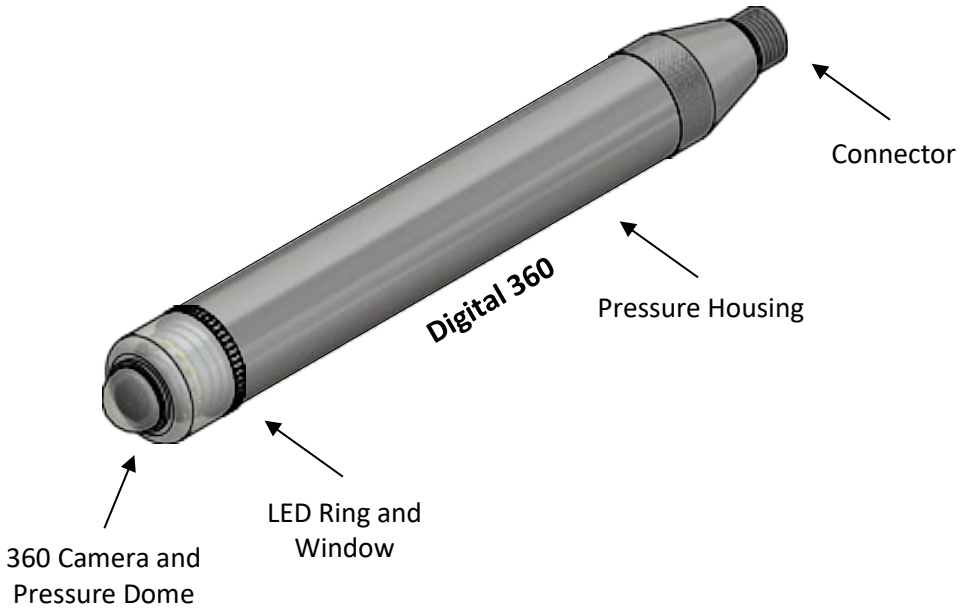


Figure 4

Surface Unit

The surface unit provides power and a communications bridge to the camera. The front of the surface unit in Figure 5 shows connectivity status. The meaning of each indicator is detailed in Table 1.

The primary connections are on the back of the unit, as shown in Figure 6. These are Mil-Spec type connectors and a DC barrel connector. The pinout and mating part numbers for cabling are listed in Table 2 for both the wireline connection and encoder connection.

Surface Unit Front

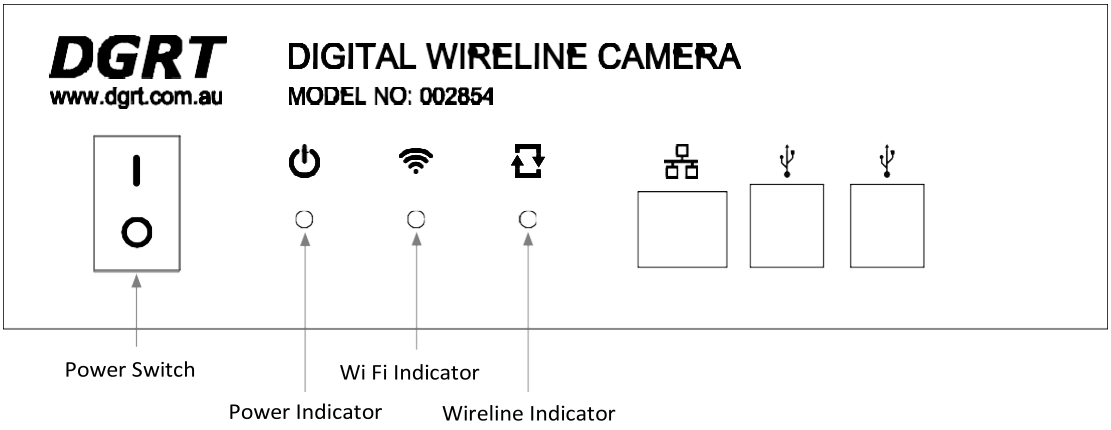


Figure 5

Symbol	Indictor	Status
		Surface unit is off
		Surface unit is on
		Booting Wi-Fi
		No Wi-Fi connection to camera
		Camera in range and connected to Wi- Fi
		System booting
		Wireline connection failed
		Wireline Connection active

Table 1

Surface Unit Back

Figure 6

The Surface unit can receive single ended or differential encoder signals. Signals must be driven (totem pole) or pulled up externally. Maximum signal level of 12V.

Encoder / Wireline Connector: PT07A14-18S		**Mating cable mount connector:** MS3111F10-6SW	
Connector Pin	**Function**	**Connector Pin**	**Function**
A	Wireline 1	F	Encoder Power Output (5V/12V)
B	Wireline 2	G	Phase A+
C	Wireline 3	H	Phase A-
D	Wireline 4	J	Phase B+
E	Wireline Armor	K	Phase B-
		L	Encoder Ground

Table 2

Basic Operation Sequence

1. Connect wireline and encoder cabling to winch
2. Connect the power cable to the surface unit
3. Connect the camera sonde to the wireline cablehead
4. Turn on the surface unit
5. Connect smartphone with Wi-Fi network ‘MSView’. Password is ‘Colorado’
6. Open web browser and connect to http://10.0.0.1/
7. Press record button and enter recordingname
8. Run winch
9. Press the record button again to stop recording
10. Return sonde to surface for Wi Fi access
11. Place sonde as close as possible (<3 ft) to the surface box to improve signal
12. Replay/download video

Surface Unit Wi-Fi Access Point

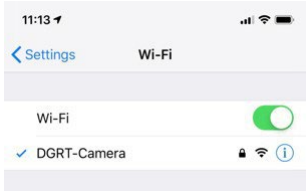
The camera surface unit provides a wireless access point for smartphones, tablets, and computers to connect. The following instructions demonstrate how to connect an iPhone; however, the procedure is similar for other devices. Please consult your device manual to connect to a Wi-Fi access point. If you have an Android phone, you may need to turn off mobile data in your phone's settings to connect to the control box.

Open the settings App

Select Wi-Fi

Look for the camera Wi-Fi access point called 'MSView' and select it

Type in the password 'Colorado' and then press Join



If the join was successful, the Wi-Fi screen will show the connected network as MSView. A message stating 'This network has no internet. Stay connected?' may appear on some devices. Select 'Yes' if this message appears.

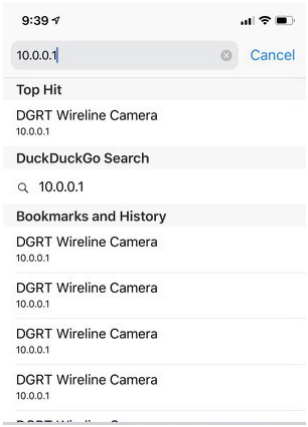
NOTE

If you have other Wi-Fi networks nearby, your device might automatically connect to them after powering off or sleeping. Check the Wi-Fi screen to make sure the MSView network is selected.

Access the Camera Application

Once successfully connected to the DGRT-Camera Wi-Fi network, the application can be accessed via the web browser on your device. Most modern browsers will operate as expected **except** Internet Explorer.

Open Web Browser



Type in ‘10.0.0.1’ into **browser** address field and press enter

Main screen will show camera feed if system is running. If your screen is black, you may need to turn off mobile data

Ethernet Connection Option

If you prefer to connect to the camera system via an ethernet connection, please see the steps below.

1. Turn off Wi-Fi on your computer.
2. Plug the ethernet cable ends into laptop and front panel of Digital Camera CCU.
3. Connect Digital Camera Probe to winch via cablehead.
4. Connect Digital Camera CCU to winch via supplied signal cable.
5. Connect winch to power via supplied power cord.
6. Connect Digital Camera CCU to power via supplied power cord.
7. Turn on Digital Camera CCU.
8. Navigate to http://D###.local where ### is the serial number printed on the front panel of the Digital Camera CCU.

Main Screen

Once the camera app has loaded, the main screen providing access to the preview video and all the controls and telemetry of the system will open (see Figure 7).

Table 3 lists the functions of each of the interface elements.

Button / Area	Function
Main Menu	Provides access to the LED brightness, video replay, settings, and preview channel selection
Depth / Speed	Shows the current Depth, speed, and recording time. Press to set depth
Snapshot	Takes a single full resolution image of front and side views and downloads them immediately via the browser
Start / Stop Recording	Asks for a recording name and begins recording. Turns red when recording. Press again to stop current recording
Display Area	Live video is displayed here

Table 3

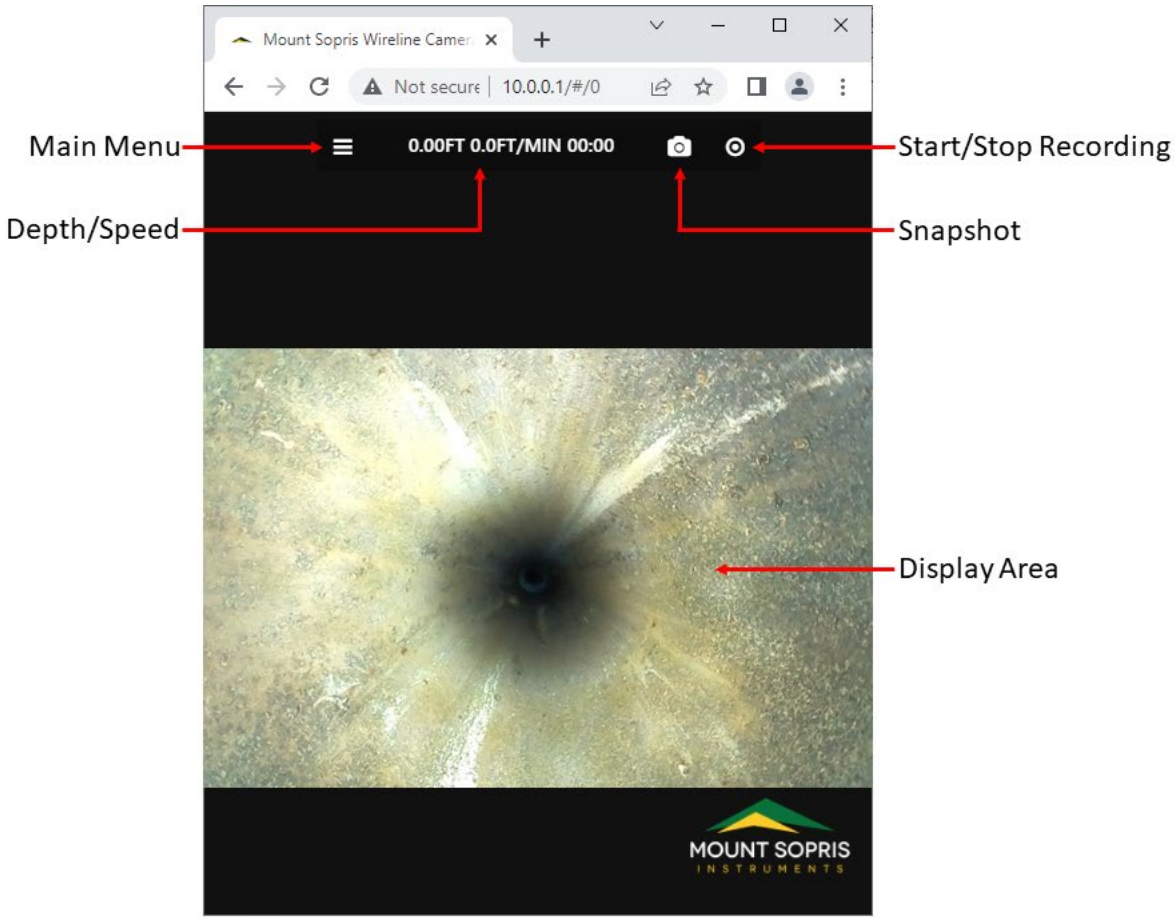


Figure 7

Menu

Press the Main Menu icon (three lines in the top left) to view the buttons in Figure 8. Each of the buttons are detailed in Table 4.

Button/Area	Function
Preview Front	Changes the preview to the forward or downhole direction
Preview Side Combined	Changes the preview to the combined 4 quadrant side cameras or the 2 slices of 360 camera side view
Preview Side 1/2/3/4	Changes the preview to a single side camera or a 90 deg section of the 360-camera side view
Settings	Accesses all settings of the camera system
Replay/Download	Accesses recorded data for playback and download
Front LED Brightness	Controls brightness of front LED ring
Side LED Brightness	Control brightness of side LEDs **(NOT applicable for Digital 360 camera)**

Table 4

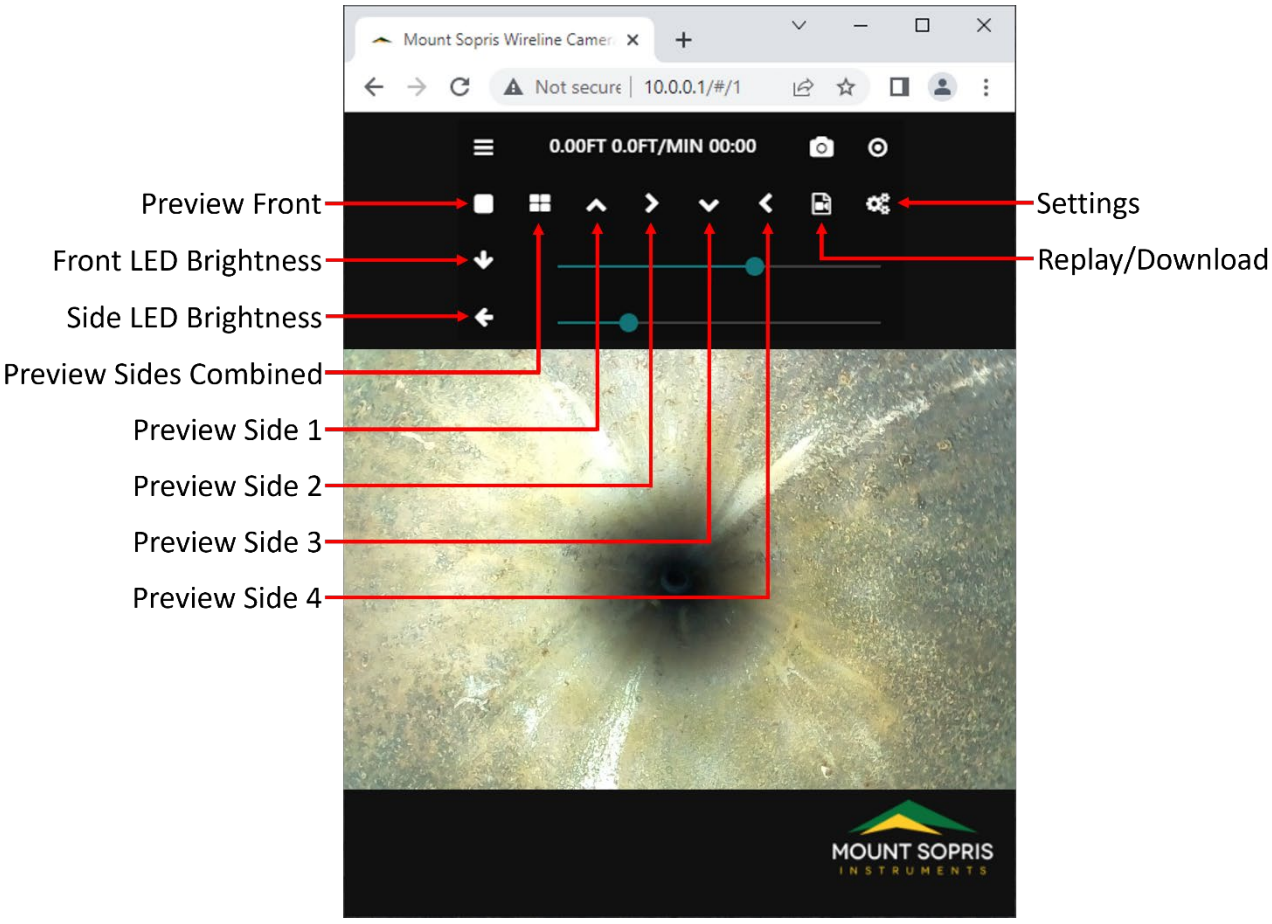
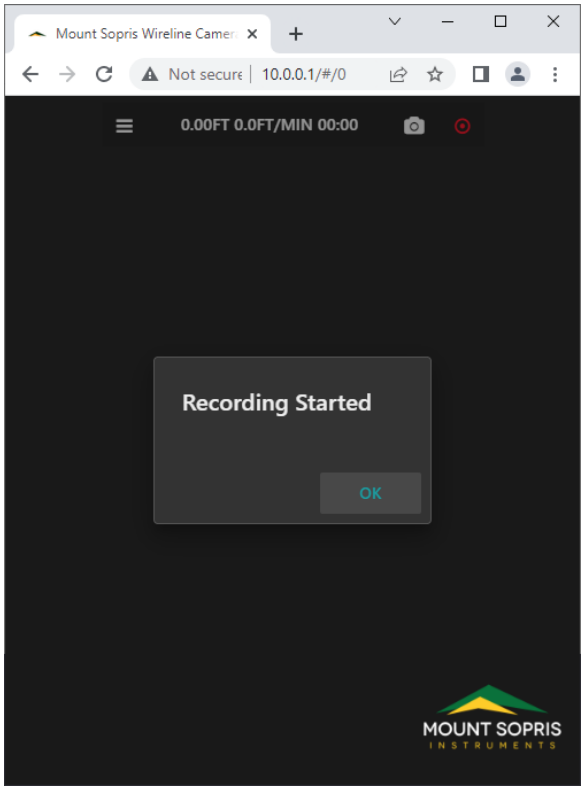


Figure 8

Note that Side LED Brightness does not apply to the CAM360, sliding the control has no effect.

Start Recording

Press the Start / Stop Recording button. You will be prompted to enter a name. Press the check mark to confirm the name.



A pop-up confirmation message indicates the recording has started. Also note the Start / Stop Recording Button has changed color to red. Press 'OK'.

Recording Capacity

Camera footage is captured up to 2 GB an hour. The camera has an internal memory of 64 GB and can store approximately 32 hours of footage. Be sure to manage your file space otherwise no additional footage can be recorded.

Recording Names

Video files are limited to approximately 1 hour each, at which point a new file is created automatically with a prepended file number. The automatic file name format is: *prefix_NAME_startdepth_direction.mp4*

prefix	Automatically generated number.
NAME	Name of the recording supplied by the operator.
startdepth	Depth in meters at the start of the recording. A dash is used in place of a decimal point.
direction	Camera direction, either FRONT or SIDE.

For example, the file name for a front view video starting at 0.00m would be *0001-Hole1-0-00m-FRONT.mp4*

Recorded Video Arrangement

Front videos are of a single view whereas side videos are a composite of all side views available. The 360 View camera has a 2 x 1 grid for side views as shown in Figure 9.

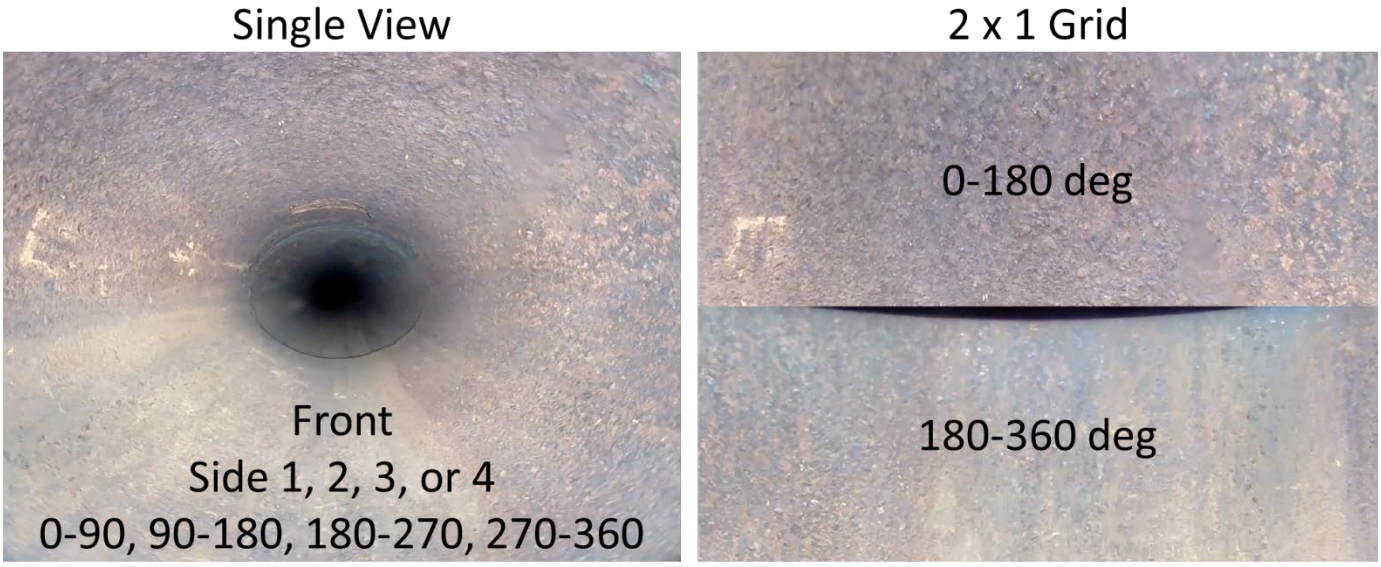
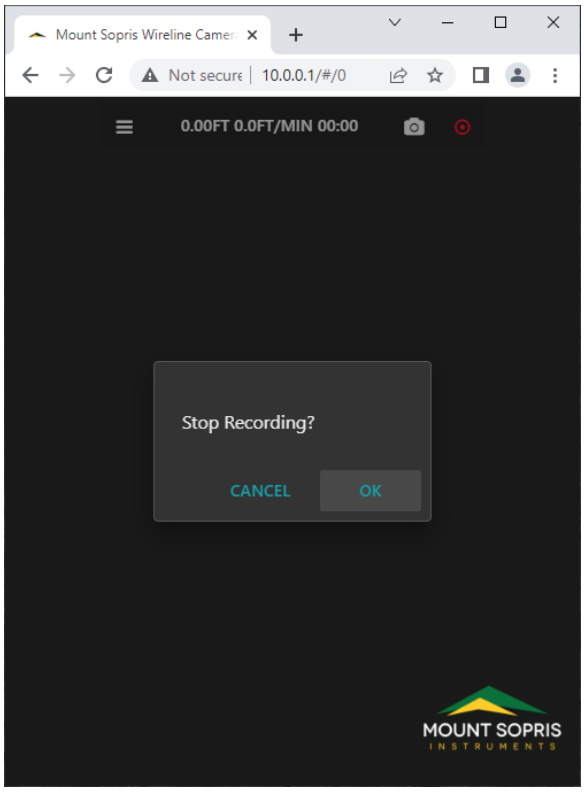
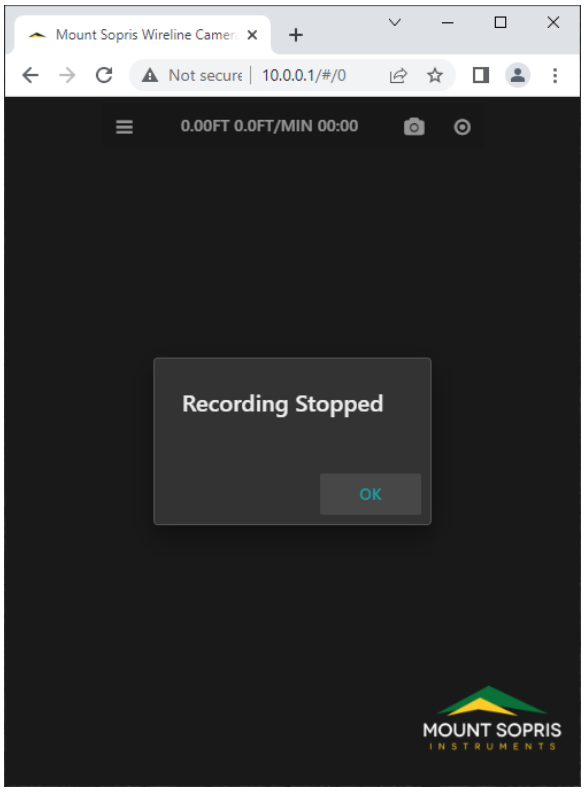


Figure 9

Stop Recording



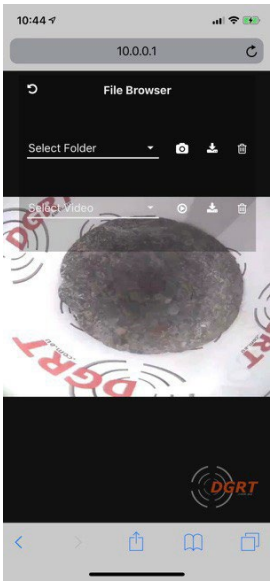
Press the Start / Stop Recording button when a recording is active to end the recording. A confirmation message will pop-up. Press ‘OK’.



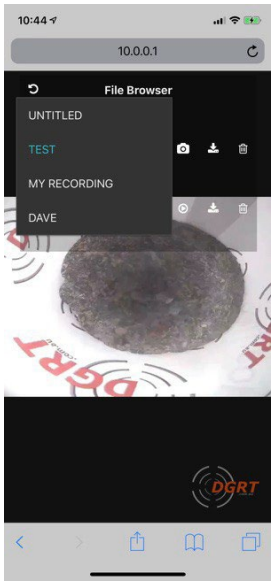
Once a recording has stopped, you are notified with a pop-up, and the Start/ Stop Recording Button color returns to normal. Press ‘OK’.

Playback

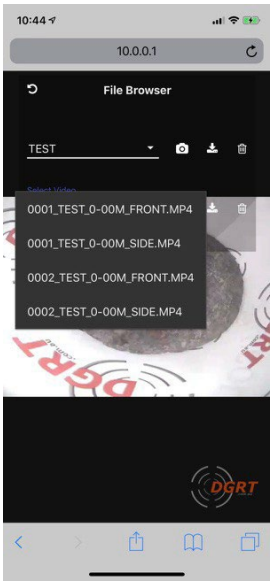
Videos are accessible when the camera is within Wi Fi range of the surface unit. For best performance, place the camera as close as possible to the surface unit (<3ft).



Press the Replay/Download button to open the File Browser.



From the Folder dropdown, select the name of the recording to play back.



After the Folder name has been selected, select the video to replay or download. **Press the download button next to the Folder name to download the entire folder.** Select the download button next to the Video name to just download the single video. See Figure 10 for download setup. Press the Trash Icon to delete a folder or video. A confirmation screen will pop-up.

Press the Play button next to the Video name to begin playback in the browser. Use the onscreen controls to make it full screen.

NOTE:

Smartphones and tablets might not have the ability to download the video and save it locally.

Recommended Camera Placement for Download

When downloading the files via Wi-Fi, place the dome of the digital camera on the right side of the CCU 1-2 inches from the front panel of the CCU. See Figure 10.

Figure 10

Output File Formats

The depth and speed data are recorded into the .vtt files and are activated using the subtitles features of your video player. The recommended program to view video files is VLC media player. Please note that there have been reports that the occasional release of the VLC player does not show subtitles.

The camera also has a feature that creates a synchronized playback .html file.

- *After stopping the recording, the camera will create a .html file which links to the video* files *and embeds the depth and speed data into the .html files.*
- ***This process will require up to 30 seconds after stopping the recording****.* Currently, there is no progress indicator. **Do not power down the camera for at least 30 seconds after pressing stop.**

Create .html File

If you need to create a custom .html file, follow the instructions below. Open Google Chrome and navigate to the following link:

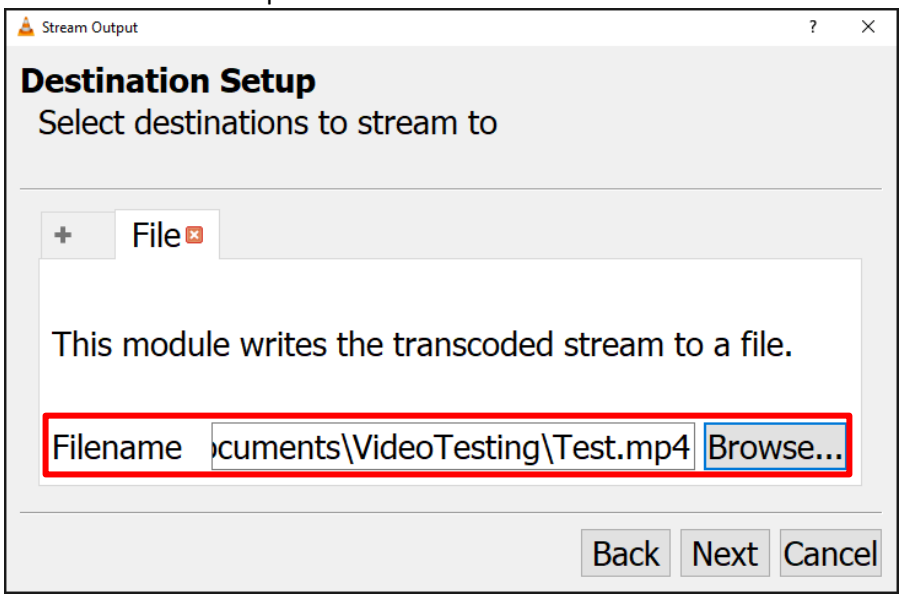
http://dgrt.dyndns-remote.com:9360/remake.html

1. Drag your operator logo on to the operator logo square
2. Drag your client logo on the client logo square (this is optional)
3. Multi select the files you want to process and drag onto recording files
    a. You can select more than one recording at a time
    b. Only the file names are uploaded
    c. The .vtt files and .jpg files are uploaded and embedded into the playback file and then discarded
4. Change the date and time to the date and time to be embedded in the playback
5. Click submit and wait for a .html file to download for each set of tracks uploaded
6. Copy the .html files into the same folder as the .mp4 files
7. Double click the .html files
8. Reload the page to do the next file

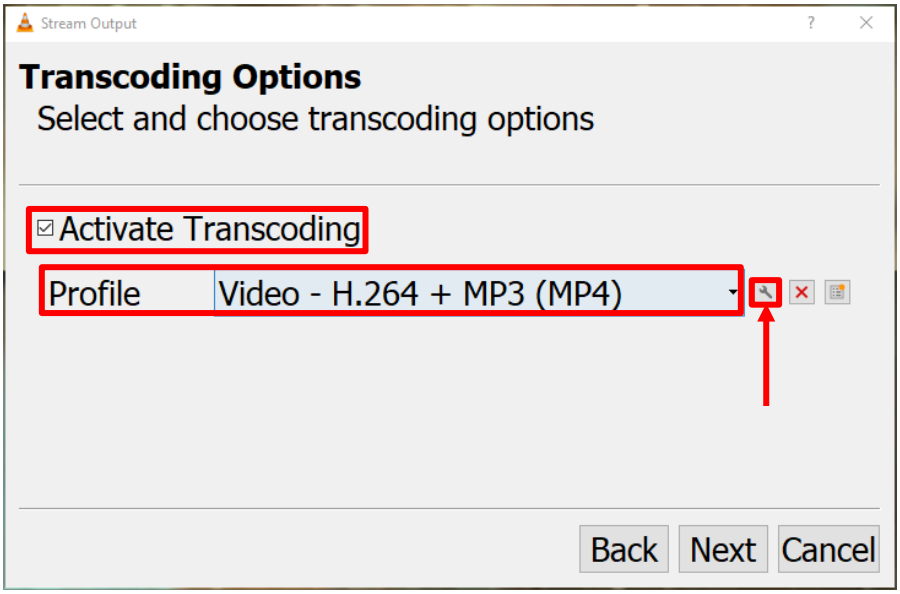
Embedding VTT Depth Information in a MP4 File

VLC media player can be used to imbed the depth information from the VTT file. See steps below:

1. Start VLC media player. Select Media then Stream.
2. Select Add and select the original MP4 file. Select 'Use a subtitle file'. Select the associated VTT file. Click Stream. The MP4 file you previously selected should be listed as the source file. Click Next.
3. In the Destination Setup, the New destination type should be file. Click Add, browse to the preferred output folder, and select an output filename. Make sure the output MP4 filename is different than the source MP4 filename. Click Save. The location and filename of the output file is shown in the Destination Setup. Click Next.



4. In the Transcoding Options, make sure 'Activate Transcoding' is checked. The recommended Profile type is 'Video - H.264 +MP3 (MP4)'.
5. Click the wrench icon next to the Profile type list. In the Encapsulation tab, MP4/MOV should be selected. In the Subtitles tab, 'Subtitles' and 'Overlay subtitles on the video' should be selected. Click Save. Click Next.



6. Click Stream. VLC should appear to be playing the video. The activity bar at the bottom will advance, but no video will display. This is normal. Wait until it is complete. This could take a significant amount of time depending on the video length.
7. When complete, close the VLC media player. Play the video to verify the depth is embedded.

Encoder Settings

Press the Settings button from the Main menu and select the Encoder Menu to show all encoder options.

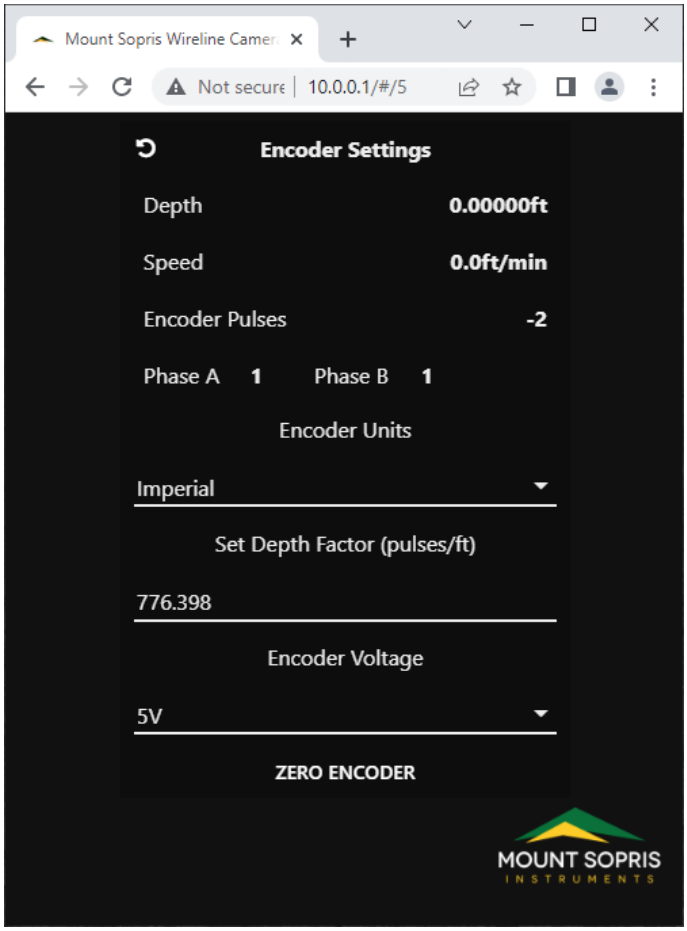


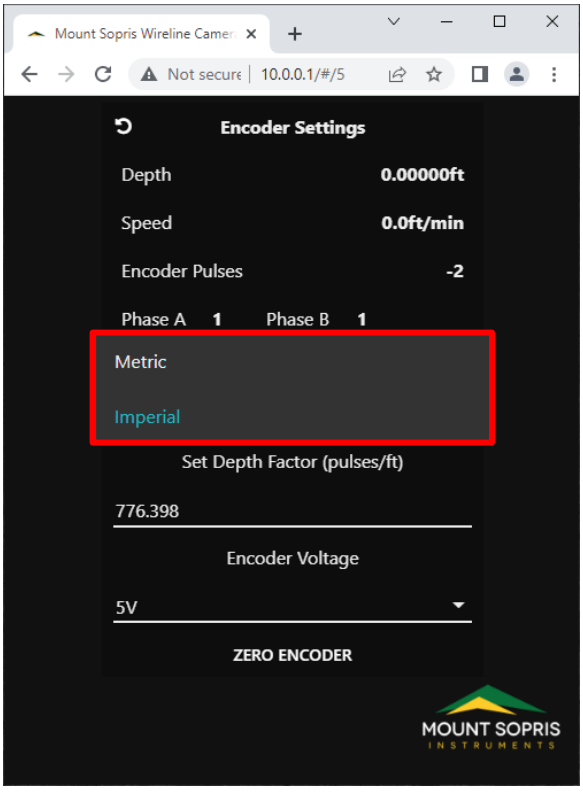
Figure 11

To measure wireline depth accurately, the surface unit must be configured to operate with your winch's encoder. You will need to know or calculate the following:

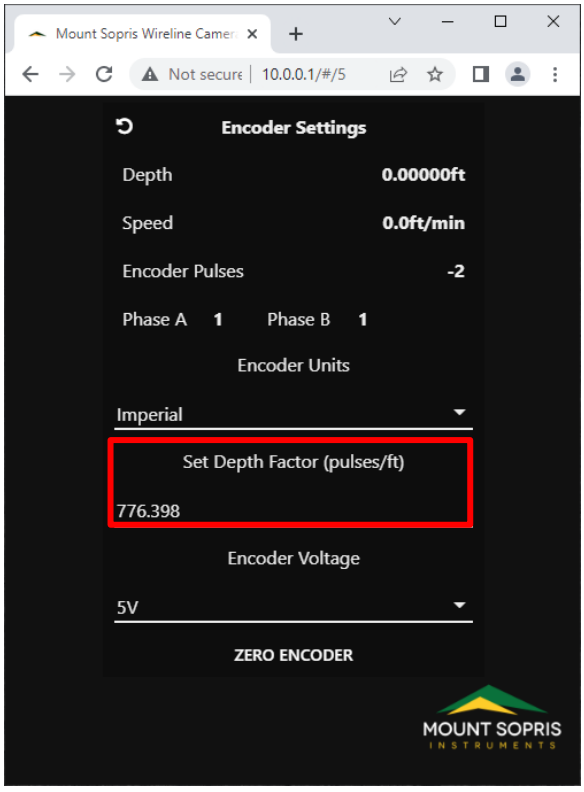
- Desired units (Imperial or Metric)
- Depth factor (pulses/ft or mm/pulse). See Table 5.
- Voltage requirements of the encoder (5V or 12V)

Encoder Type	Mount Sopris Winch Type	Depth Factor
200 pulse with 1/3 measure wheel	WFA, WNA, MXA, MXB, MXC	731.52 pulses/ft 0.41667 mm/pulse
128 pulse	Pathfinder, Mini Winch	782.28 pulses/ft 0. 38963 mm/pulse

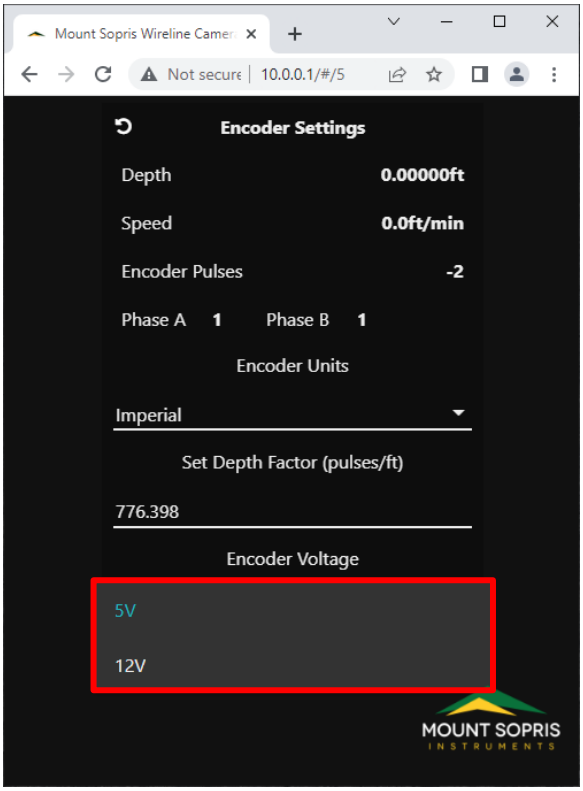
Table 5



Select the desired units.

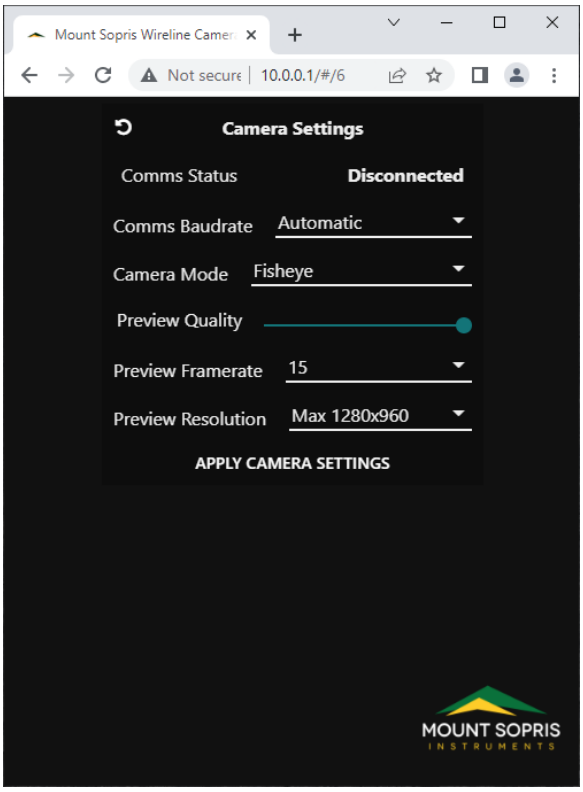


Enter the depth factor of your winch into the Set Depth Factor field.

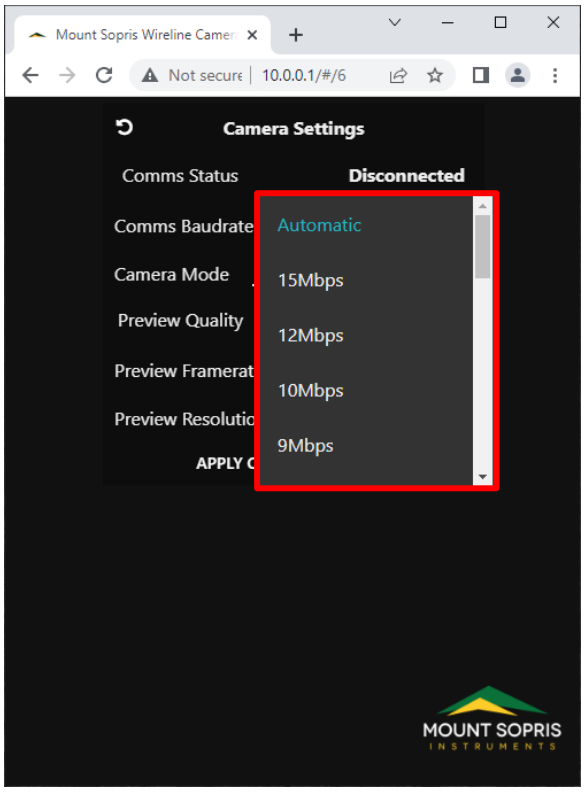


Consult the requirements for your encoder and select either 5V or 12V from the Encoder Voltage dropdown menu.

Camera Settings



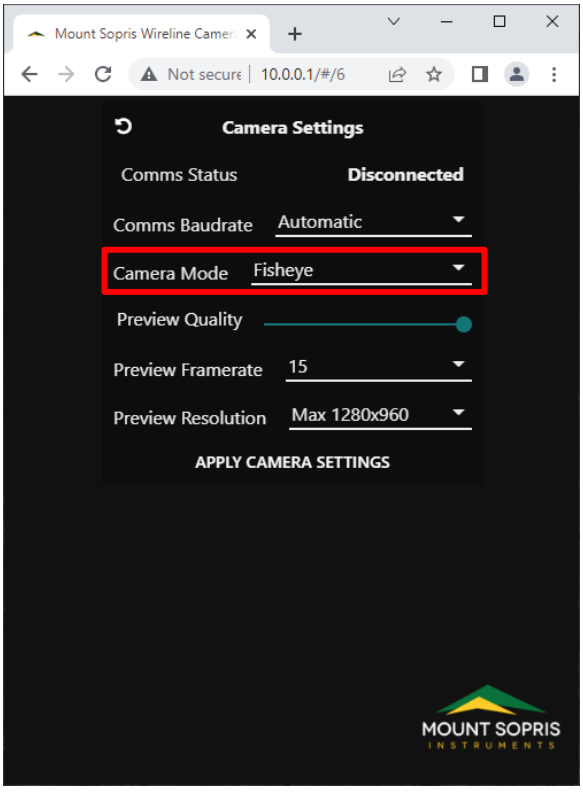
Select Camera Settings from the Settings menu to see the currently active configuration.



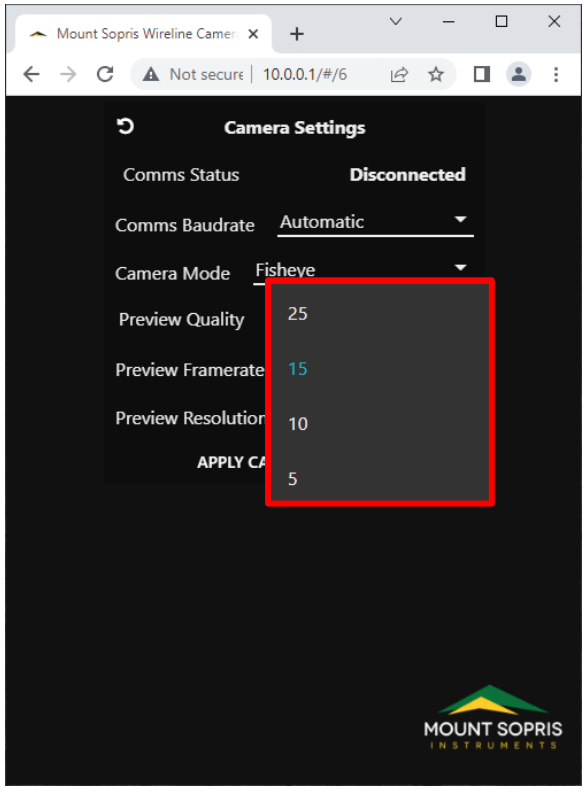
The Baudrate dropdown shows the available baudrates. The recommended starting baudrate is 1-3 Mbps.

NOTE

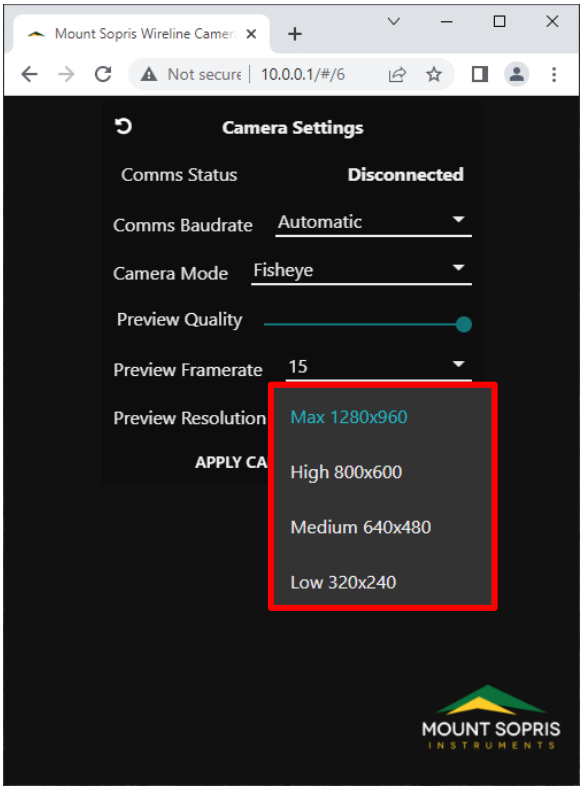
Functional and reliable baudrate is heavily dependent on wireline quality and winch wiring. The recommended starting baudrate is 1 - 3 Mbps.



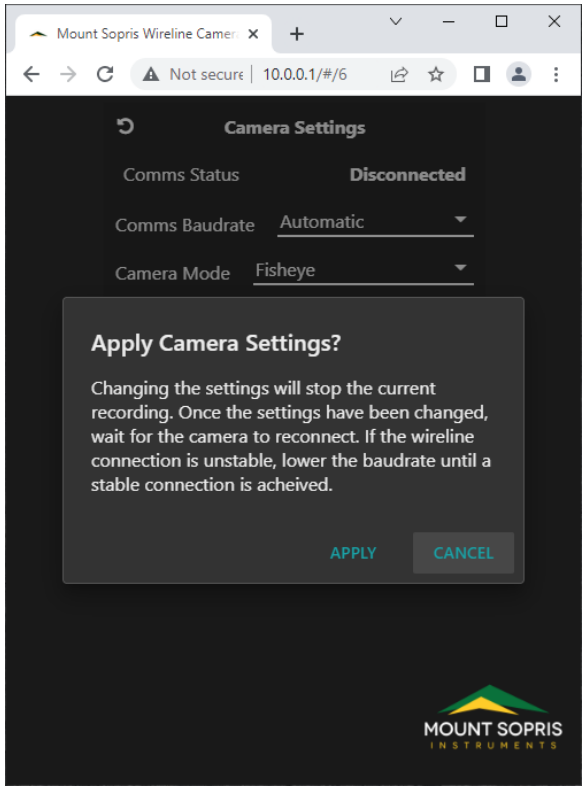
Camera Mode should not be altered from factory settings. Camera mode should be **'Fisheye'** for the Wireline Digital Camera.



Preview Resolution changes how much detail is displayed on screen for preview video. This does not affect the recording resolution.

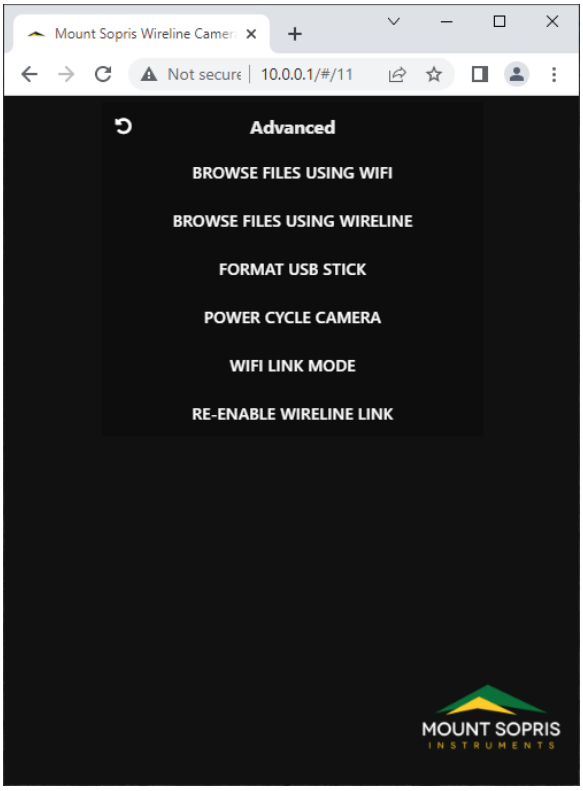


Adjusting the frame rate to the wireline length ensures low latency. It does not affect the recording framerate.

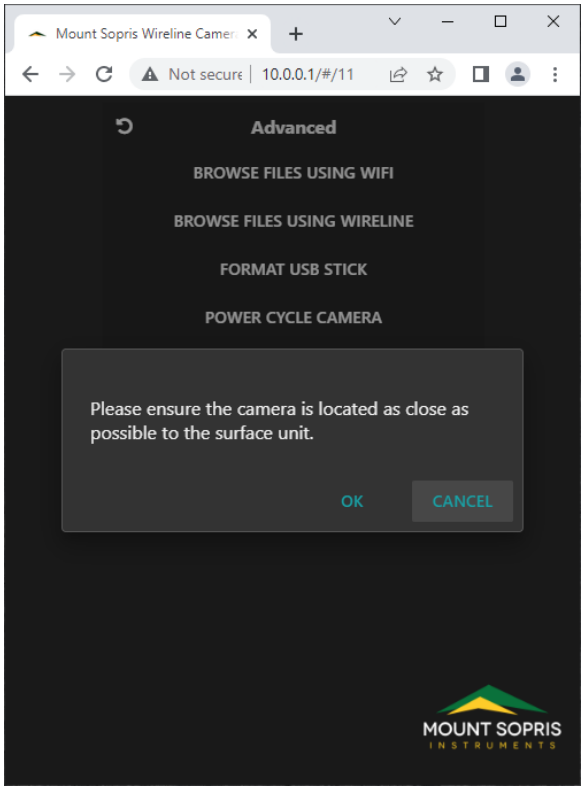


Press Apply Camera Settings button when you are finished, and press apply to confirm the changes.

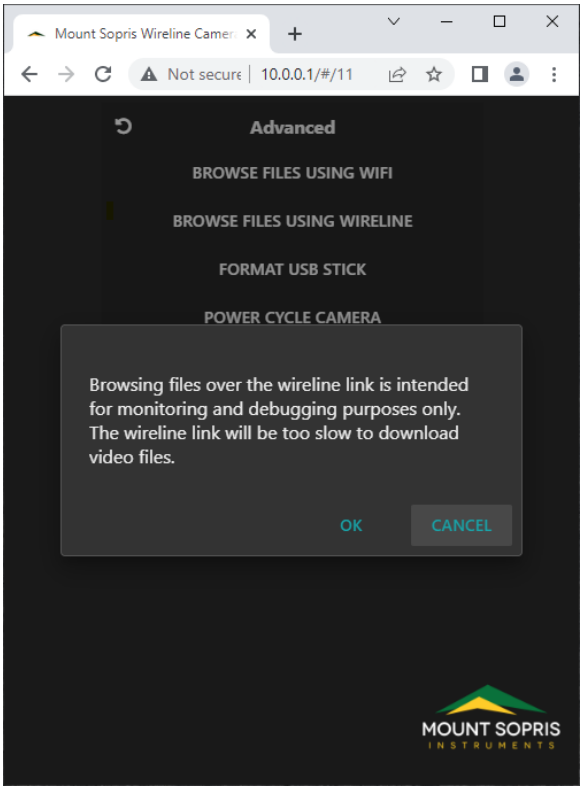
Advanced Settings



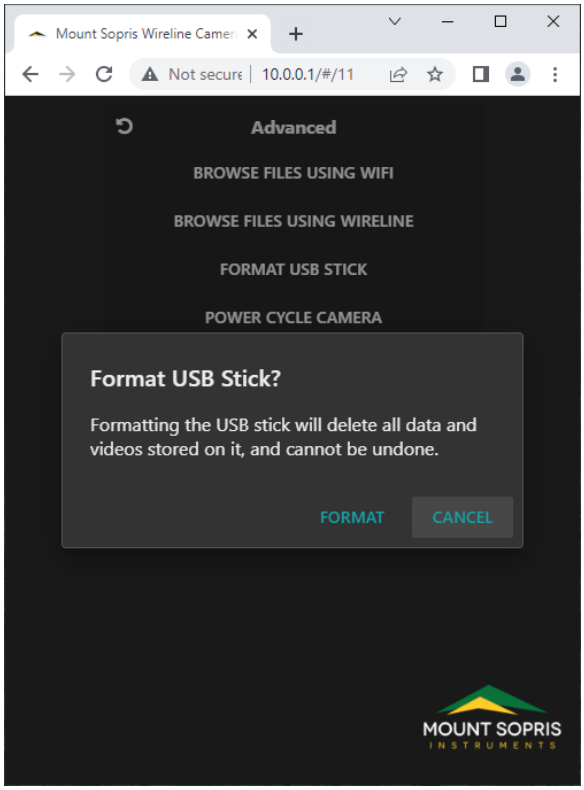
Select Advanced Settings from the main menu to access the advanced camera settings.



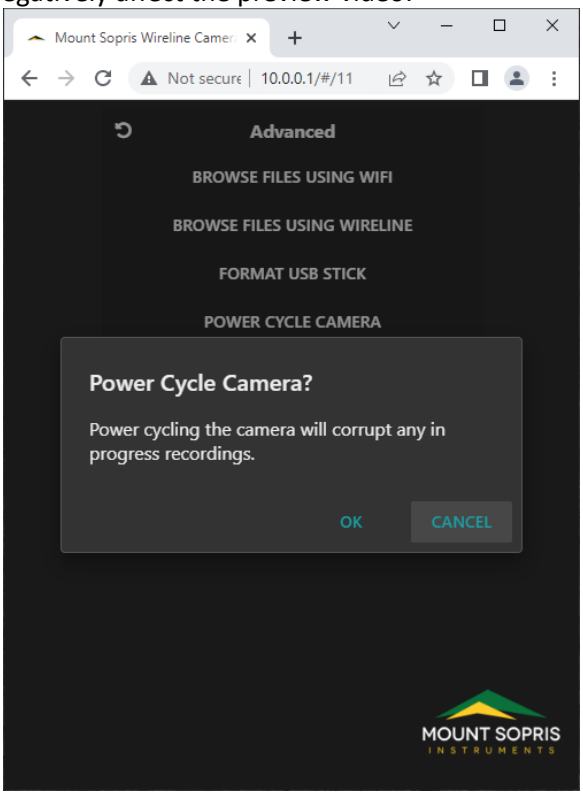
Browse Files Using Wi Fi opens a page in your browser listing the recording directories and files. Please ensure the camera is located as close to the Surface unit as possible (<3ft) to ensure good transfer speeds.



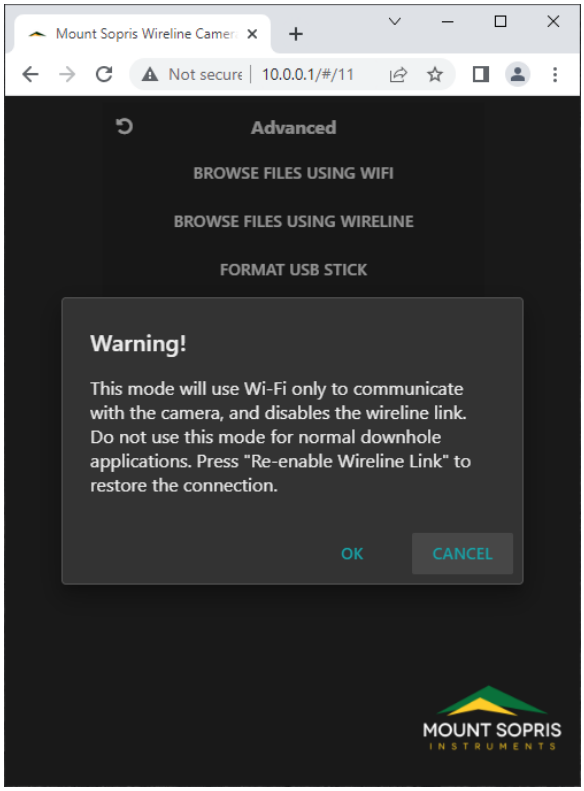
Browse Files Using Wireline should only be used to check that files have been created. In general, the wireline link is too slow to review the files and will negatively affect the preview video.



Formats the USB stick in the camera. All data will be lost after formatting. Please wait for 30 seconds to allow the process to complete.

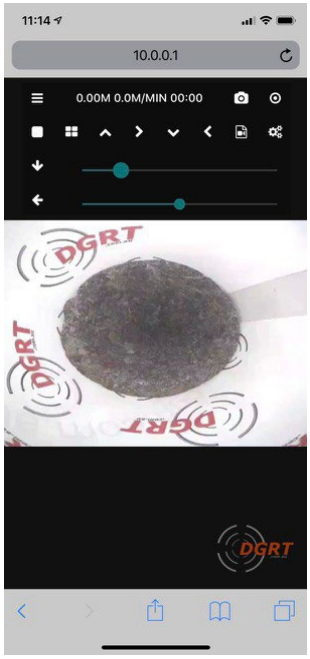


Power Cycle Camera should only be used to force the camera to reboot and re-establish wireline communications. Active recordings will be lost if not stopped beforehand.

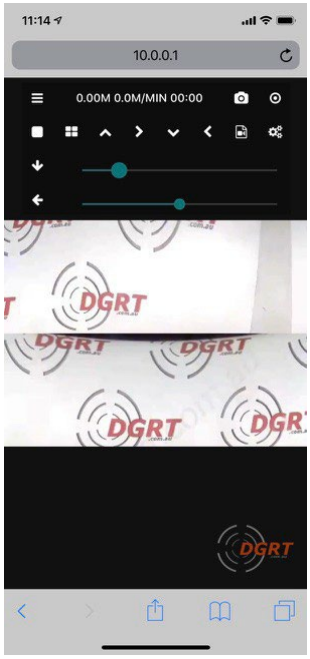


Wi-Fi Link mode causes the preview to operate over the Wi-Fi link and not use the Wireline. *Not for use in a borehole.*

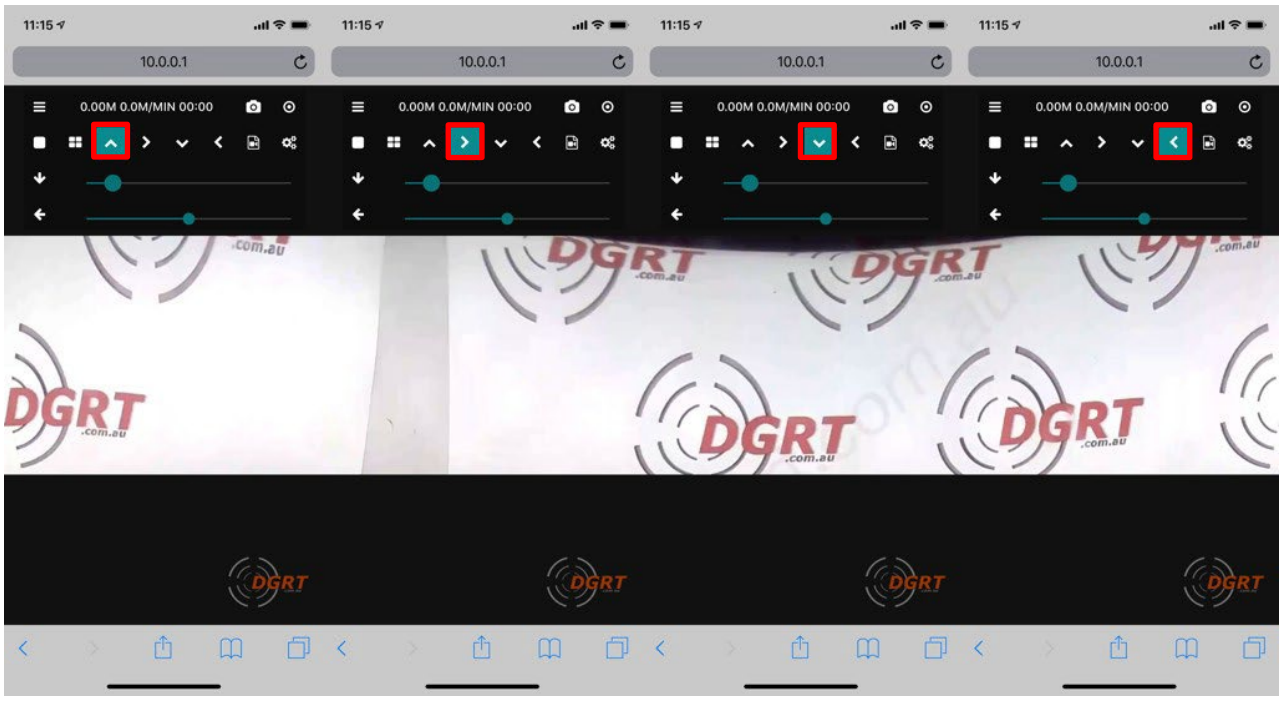
Sample Views



Front



Combined 360°



Side 1 360° Side 2 360° Side 3 360° Side 4 360°

Troubleshooting

The preview image suddenly stops updating
Press the reload button on the main screen or the refresh button in your browser.

Cannot connect to the Wi Fi network
Make sure your Wi Fi settings are correct. Most Wi Fi devices will switch networks automatically and might not join as expected. If you are using an Android phone, you may need to turn off mobile data.

The preview image stops updating when a snapshot is taken
Due to the low bandwidth of the wireline cable, the preview image maybe stopped when a snapshot is taken. Restart the preview after the snapshot transfer is complete by pressing any of the preview selection buttons

Accessing Internal Memory
The preferred method of accessing video files is via the Camera web application. In case of large files, however, the USB memory device can be removed from the camera directly and copied manually. In Digital 360 Cameras, the pressure housing must be removed.

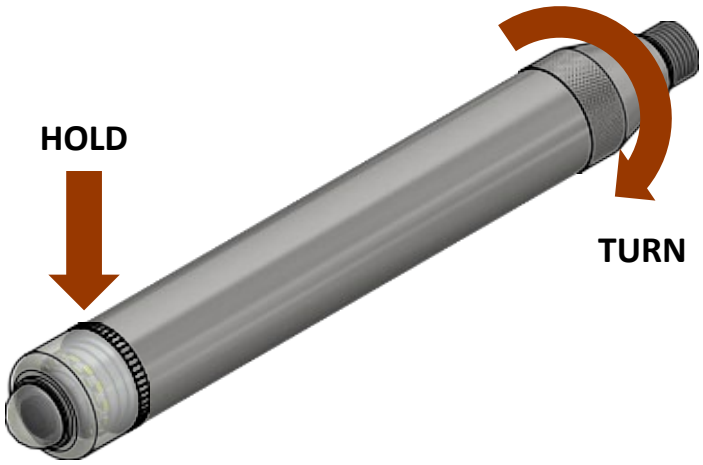


Figure 12

1. Hold the bottom of the camera sonde at the marked location in Figure 12, and unscrew the top sub.
2. After removing the top sub, *carefully slide off the pressure housing, noting the direction*.
3. Remove the USB stick from the USB port.
4. Copy the files to your computer.
5. Reinsert the USB stick into the USB port.
6. *Carefully slide the pressure housing over the sonde in the same direction it came off*.
7. Holding the bottom of the camera as step1 screw the top sub into the camera.

WARNING
This is not a recommended procedure. Ensure the top sub is hand tight. No tools are required to tighten.

USB memory device is not recognized by digital camera

The USB memory device must have the exFAT format to be recognized by the Digital 360 Camera. To reformat a USB drive:

1. Remove USB stick from the USB port on the Digital 360 Camera.
2. Insert USB stick into your computer's USB port.
3. Open File Explorer and right click on the appropriate USB drive.
4. Choose Format.
5. In the File System dropdown, select exFAT (see Figure 13).
6. Click Start.
7. Close the Formatting USB Drive window when finished.
8. Reinsert USB stick into the USB port of the Digital 360 Camera.

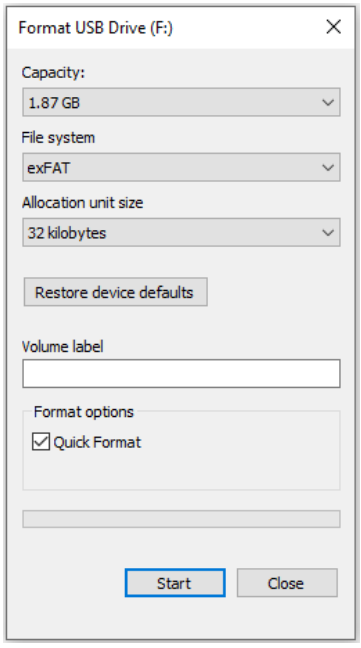


Figure 13

Maintenance

Dome Cleaning and Replacement

Immediately stop using the camera if you see a crack or leak in the camera dome. To replace the dome, please follow the steps below.

1. Turn off the camera system and disconnect the camera from wireline.
2. While firmly grasping the tool housing and LED light ring cover, use a spanner wrench to unscrew the dome. If you do not have a spanner wrench, you can use a size 32 drill bit.

3. Clean or replace the dome assembly.
4. Use spanner wrench, or drill bit, to reattach dome assembly. Make sure to firmly grasp the tool housing and LED light ring cover. Hand tighten only.

Note: Excessive tightening of the camera dome can compress the plastic LED cover onto the LED ring. When the LED ring is compressed too tightly, it can introduce short between the ring and the wireline armor (ground) causing communication issues.

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