

Gradient Lens Corporation®

207 Tremont Street, Rochester, New York 14608

**800.536.0790**

Fax: 585.235.6645

REV. 513

Phone: 800.536.0790 Fax: 585.235.6645 [gradientlens.com](http://gradientlens.com) [info@gradientlens.com](mailto:info@gradientlens.com)



# User Guide

## Hawkeye® V2 Video Borescope



Gradient Lens Corporation®



### Hawkeye® V2 Video Borescope

We've improved the image quality in the new Hawkeye V2 with a higher resolution, more light sensitive camera, delivering bright, crisp, clear images! The new 5" LCD Monitor provides easy viewing, intuitive, easy to use controls, and photo and video capture at the touch of a button! We've increased the 4-way articulation range, and improved the feel. It's still small, lightweight, portable and delivers great image quality.



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### WARNING:

- This product is not for medical use
- Do not modify or disassemble the unit
- Do not use in explosive atmospheres



### CAUTION:

- Keep the device out of the reach of children.
- Do not look directly into the end of the insertion tube. The bright light may damage your eyesight.
- Do not forcibly twist or elongate the insertion tube, or bend it beyond its normal bend radius.
- Strong impact on the insertion tube may break the glass window or the video sensor at the tip.
- Do not use or store the device at a temperature higher than 60° C or lower than -20° C.
- Store the device in a dry and adequately ventilated environment.
- Keep the device away from acid or alkaline solutions, oil or gasoline, and do not use it in an atmosphere containing volatile/flammable vapors.
- Do not remove the SD memory card while data is being saved to the card. This may cause the data to be lost or the card to be damaged.



## V2 VIDEO BORESCOPE WARNINGS:

### Insertion Tube

All models have a stainless steel monocoil at their center for resistance to accidental crushing, and have a tungsten outer braid to resist damage while sliding over harsh surfaces.

**THE INSERTION TUBE IS ELECTRICALLY CONDUCTIVE. DO NOT ALLOW CONTACT WITH ELECTRICALLY LIVE OBJECTS. SERIOUS INJURY OR DEATH MAY RESULT!**

### Bending Section

The bending section houses the articulating collar assembly. This is the most flexible part of the scope, and the most vulnerable. It cannot tolerate the same rough handling as the insertion tube.

**TAKE CARE NOT TO CRUSH OR PINCH THIS AREA.**

### Articulation Levers

Maximum bending of the tip will be possible when the insertion tube is fully extended.

**DO NOT TRY TO FORCE THE TIP TO BEND WITH THE INSERTION TUBE COILED FOR STORAGE.**

### Articulation Locks

When engaged, the articulation locks will prevent the tip from bending.

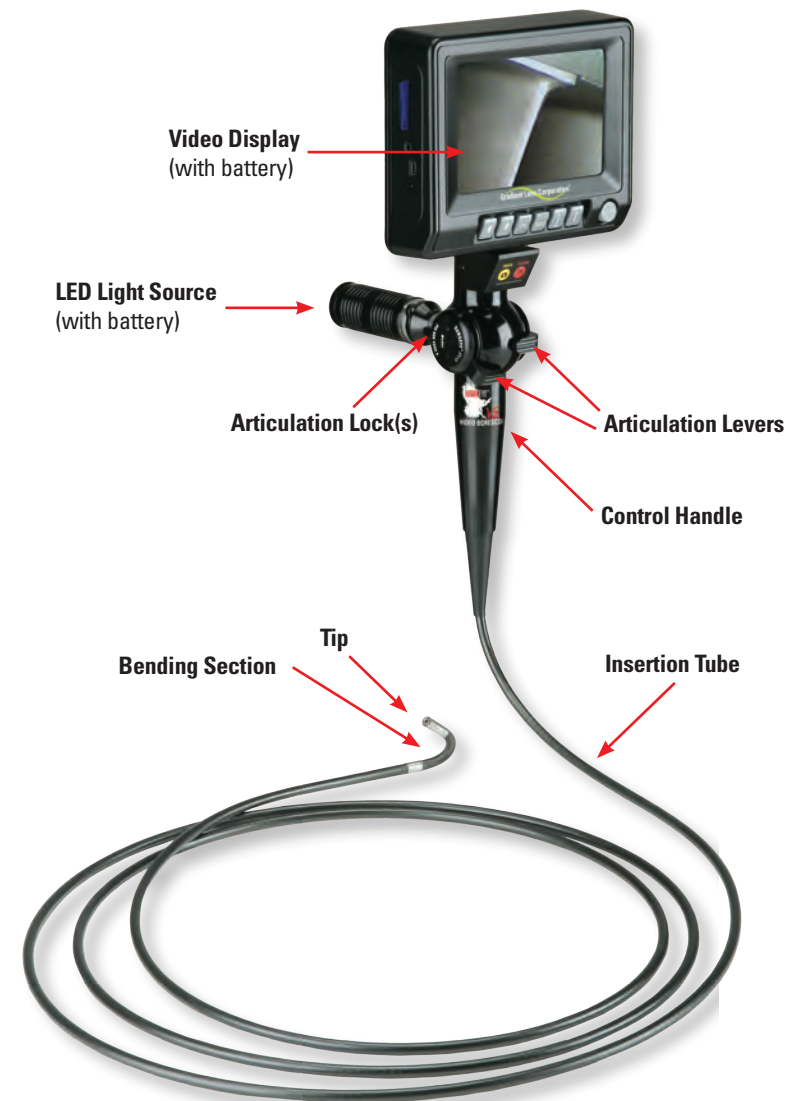
**DO NOT ATTEMPT TO WITHDRAW THE INSERTION TUBE FROM A CAVITY WITH THE LOCKS ENGAGED. DOING SO MAY DAMAGE THE ARTICULATION MECHANISM.**

## Hawkeye® V2 Video Borescope

The Hawkeye® V2 Video Borescope consists of a CMOS image sensor mounted in the tip of a flexible insertion tube.

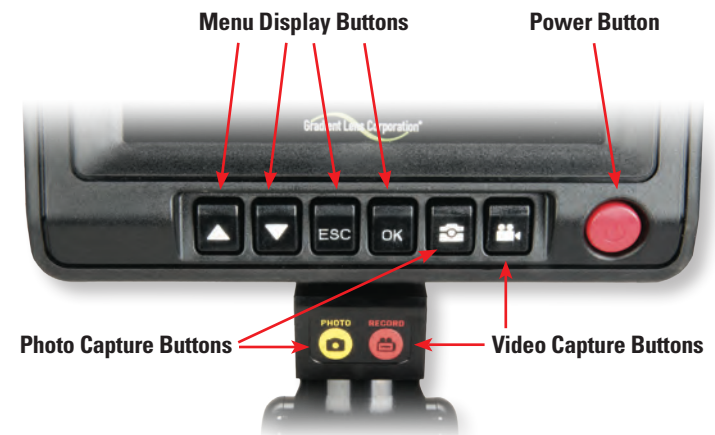
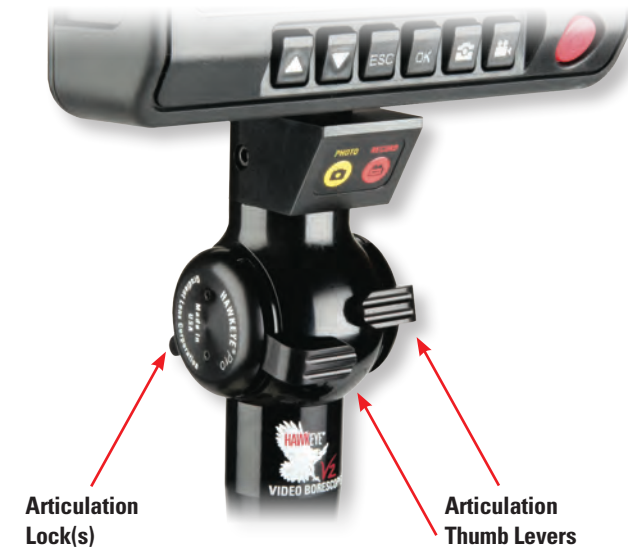
The insertion tube is attached to a control handle that allows remote control of the tip position.

The built-in video display monitors the image in real time. It can also capture and store still images or video clips.



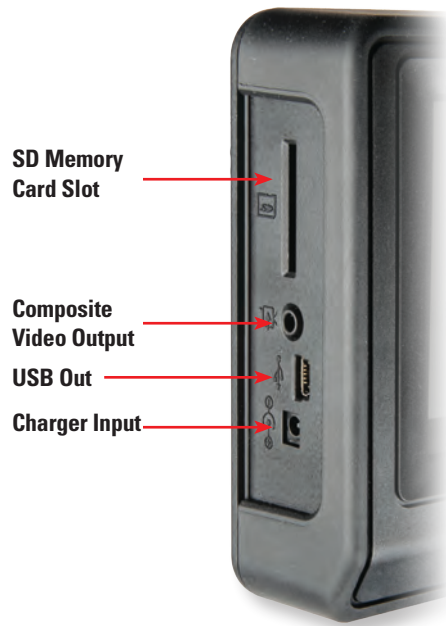
## Hawkeye® V2 Video Borescope Kit

The Hawkeye® V2 Video Borescope is shipped in a protective case. The case has space for an optional Luxxor® 24 Light Source.





## Input/Output Connections



The video display shows live video and captured still or moving images. It can output live video to an external monitor via a composite signal connector and the included cable.

Stored images can be downloaded to a computer via the USB port and included cable, or through the removable SD memory card.

## Hawkeye® V2 Video Borescope SETUP

### Install SD Memory Card

Insert the SD Memory Card into its slot as shown. Make sure the gold contacts are facing away from the video display screen as shown in the photo. Push the card in gently, as far as your finger will allow, and release. **DO NOT FORCE THE CARD INTO ITS SLOT WITH THE CONTACTS FACING THE WRONG DIRECTION.** The card will remain in place. To remove the card, push it in a little and release. It will spring out far enough to grasp and remove.



**CAUTION:** Do not remove the SD memory card during image capture operations; data will be lost and the memory card may be damaged.



### Install 90° Prism Tip

If the 90° Prism Tip is needed:

Remove the Tip Cap



Notice the locating flat on the scope tip



Thread the knurled portion of the Prism Tip on, just past the first set of threads on the Tip.



Rotate the Prism Tip until its internal flat engages the locating flat on the scope tip. Then continue threading the Prism Tip on until there is no side play in the Prism Tip. **STOP** threading at that point. **FINGER TIGHTEN ONLY OR DAMAGE MAY RESULT.**

A small gap will be present when Prism Tip is fully tightened in place. Do not force beyond this point.



**Always keep the Tip Cap or an adapter installed to protect the tip threads.**

## Charge Main Battery

Connect the power supply to the DC/IN jack as shown. Plug the power supply into an AC outlet and allow the PVM to charge its internal battery. A full charge takes about 3 hours and will run for 2-3 hours.



## Charge Light Source Battery

Insert one of the light source batteries into its charger. Make sure the metal contacts on the battery are at the same end of the slot as the contacts in the charger. Slide the battery fully into the slot until the contacts touch. Connect the power supply and charge the battery.

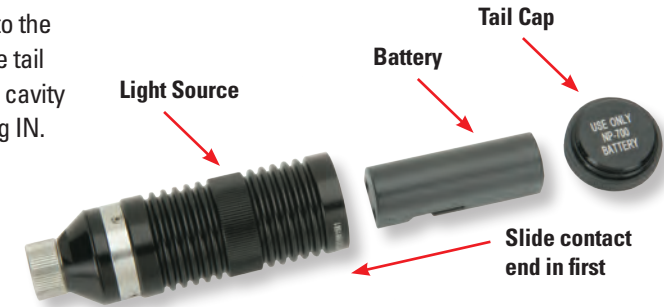
The red STATUS light indicates that power is ON to the charger.

The CHARGE light will flash green if the battery is not connected. When charging a discharged battery it will glow a steady red at first. Then it will flash alternately red and green. As the charge builds up, the red flashes will become shorter in duration until they finally cease. At that point the light will glow a steady green indicating that charging is complete. This takes about an hour or less. A full charge will last about 45 minutes at full intensity.



## Install Light Source

Install the charged battery into the LED Light Source: Remove the tail cap. Slide the battery into the cavity with the metal contacts facing IN. Replace the tail cap.



Check the operation of the LED Light Source. Rotate the switch tab and confirm that the light turns on and brightens as the switch is rotated.



Align the Light Source with the Light Post on the Control Handle and thread them together with the knurled ring. Tighten with fingers only.



## Power ON

Turn the video display power ON by pressing and holding the power button for 3-5 seconds. The system will start up and go into Normal Mode, displaying a live image from the CMOS sensor.

To turn the unit OFF, push and hold the power button for 1-2 seconds.



## Holding the Video Borescope

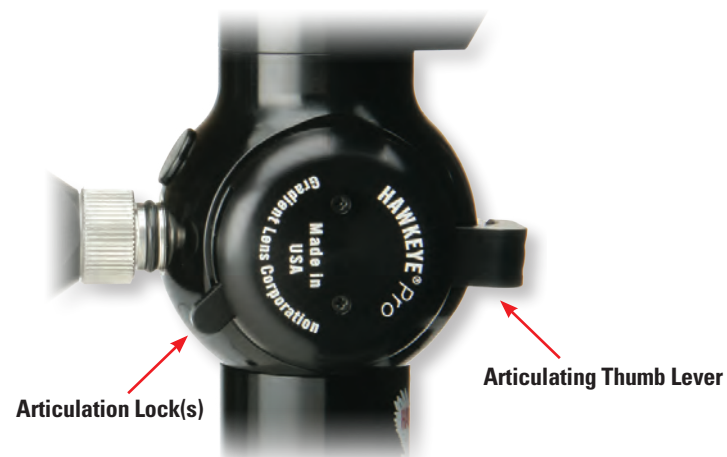
Hold the Control Handle in one hand in a way that is comfortable and allows you to both look at the LCD display and actuate the articulation thumb lever(s). Use the other hand to hold the insertion tube and guide it toward the inspection area.

## Articulating the Viewing Tip

In the 4-way configuration, one thumb lever controls right/left movement and the other controls up/down. Use caution when bending the insertion tube or bending section, excessive force can cause damage.

Use the articulation locks if necessary to hold the tip in position once the scope is in viewing position.

**REMEMBER TO RELEASE THE LOCK BEFORE WITHDRAWING THE INSERTION TUBE.**



## Inserting the Video Borescope

Before inserting the Video Borescope into equipment, ensure that the bending section is straight and the articulation lock is not engaged. The tip should move freely when the articulation thumb levers are moved.

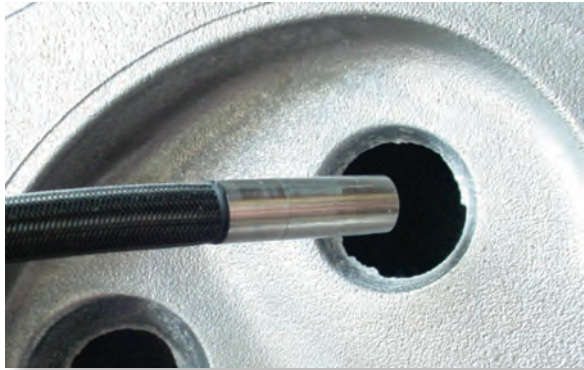
The more the insertion tube is coiled or bent, the less the tip can articulate. Maximum articulation is possible when the insertion tube is relatively straight.

When the locks are not engaged, their levers are loose and will move freely. Pushing the lever until resistance is felt will lock the corresponding thumb lever.

**REMEMBER TO RELEASE THE LOCK BEFORE WITHDRAWING THE INSERTION TUBE.**

Turn the light source on to maximum brightness.

With the tip in the straight-ahead position, slowly begin to insert the scope into the cavity to be viewed. Watch the image to see where the scope is pointed as you guide the tip to the inspection area.



If a bend must be negotiated, articulate the tip in the direction of the bend to keep the tip from buckling. If the scope is obstructed by objects or bends, rotate the tube back and forth while moving it forward.

This twisting motion helps to overcome snags on equipment edges. Continue guiding the scope forward until the target area is visible in the display.

### Withdrawing the Video Borescope

When the inspection is completed, or the scope needs to be repositioned, **BE SURE TO RELEASE ALL ARTICULATION LOCKS PRIOR TO WITHDRAWAL** to prevent damage to the articulation system. Move the articulation thumb levers back and forth to ensure they are in the loose neutral position and the tip is free to bend as needed during withdrawal.

Pull out the scope slowly, and be ready to catch the viewing tip when it exits to prevent possible damage to the tip. If the scope snags on equipment edges, try rotating the tube back and forth.

### Display / Image Capture



### Operating Modes

There are three operating modes:

#### Normal Mode

Displays live camera image and date/time if so enabled. From this mode still pictures and video are captured.

#### Image Review Mode

Displays captured still pictures and video.

#### Menu Mode

File maintenance, system settings, etc.

The unit powers up in **Normal Mode**.

From **Normal Mode**:


Enter **Image Review Mode** by pressing ▲ or ▼.




Enter **Menu Mode** by pressing OK.

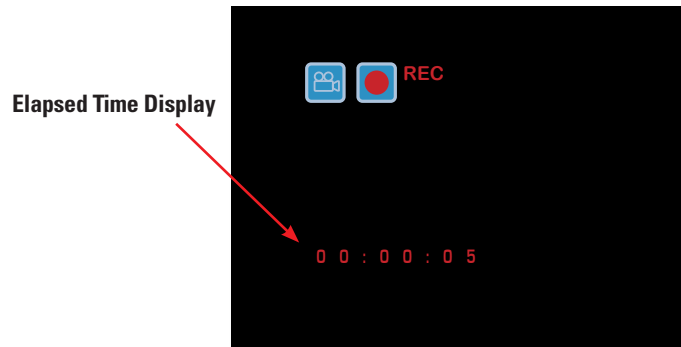
Return to Normal Mode from any other mode by pressing **ESC**.



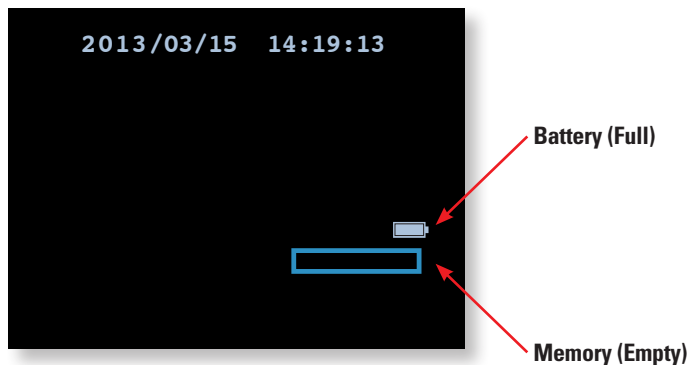
## Normal Mode

**Capture a Still Photo:** In Normal Mode, press the  button on the control handle (or on the display). Still photo files are saved as .JPG.







**Capture a Video Clip:** In Normal Mode, press the  button on the control handle (or on the display) to start recording. The elapsed time display will be visible in the lower left of the image to indicate that you are recording. Press the  button again to stop recording and save the clip. Pressing the  button will capture and store a still image during the video recording while recording continues. Video files are saved as .ASF.









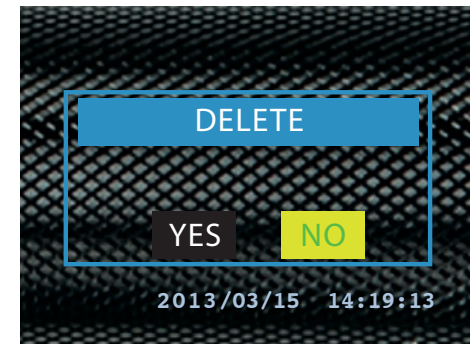
**Memory & Battery Charge Indicators:** In Normal Mode, press **ESC** to display the memory and battery indicators. Each is displayed as a bar. A fully charged battery is shown as a full bar. A partial charge is shown as one to four segments inside the battery bar. The memory bar is filled in as the memory fills up.



## Image Review Mode

**View Captured Photos or Video Clips:** Push the  or  button to enter Image Review Mode. You can scroll forward or back through the photos and videos using the  or  buttons. Video files may be played, paused and resumed by pressing the  button. Pressing the  button while a video is playing will capture and store the currently displayed frame from the video. To exit Image Review mode, press **ESC**.

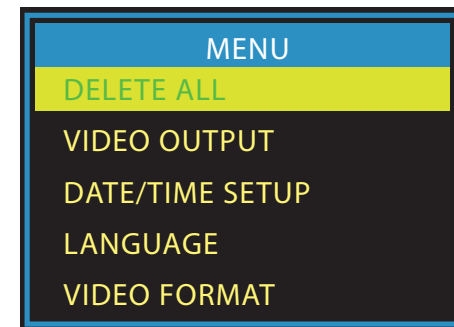
**Delete a Single File:** Press  or  to enter Image Review mode. Scroll to the required file using  or  buttons. When the required photo or video file is displayed press **OK**. A frame will be displayed to confirm the delete function. Select **YES** with  or  and press **OK** to confirm.



## Menu Mode

**Display Main Menu:** In Normal Mode press the **OK** button to display the Main Menu as follows:

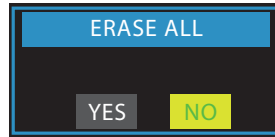
DELETE ALL  
VIDEO OUTPUT  
DATE/TIME SETUP  
LANGUAGE  
VIDEO FORMAT  
AUTO POWER OFF  
DIGITAL ZOOM  
MIRROR  
RESOLUTION



You can scroll through the functions on this menu using the  and  buttons and select the function using the **OK** button.

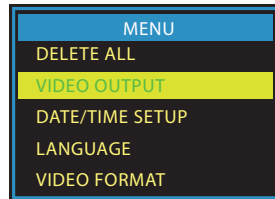
## Delete All

Deletes all saved files, video and still photos. When this function is selected, the unit displays a frame which includes two options. Use ▲ and ▼ to select **YES** or **NO** and press **OK** to confirm.



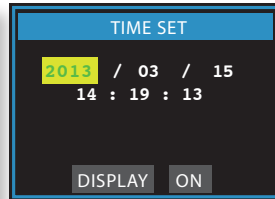
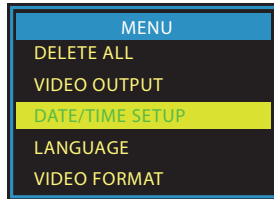
## Video Output

This function transfers the video signal to and from an auxiliary display using the supplied cable. The unit will automatically switch to the auxiliary display when the cable is connected and will revert to the built in display when the cable is disconnected. This function will allow you to toggle between displays if both are connected. Simply press **OK** while this function is selected to toggle between displays.



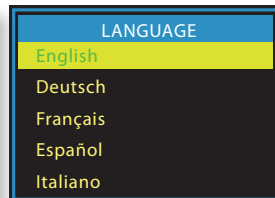
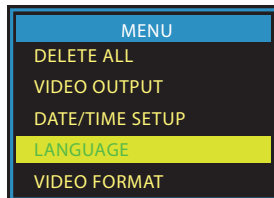
## Date/Time Setup

Sets the date and time. Select this function and use the ▲ and ▼ buttons to select year/month/day or hour/minute/second fields, then press the 📅 and/or 🕒 buttons to scroll through the numbers to set the date and time. If **DISPLAY** indicates **ON** status, the date and time will be displayed on the screen. Captured images will always include a time/date stamp. Confirm changes by pressing **OK**.



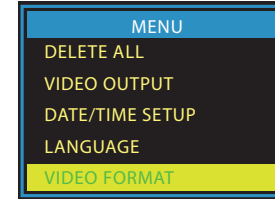
## Language

If your unit is supplied with a language option this function will allow you to select English or the optional language. Use ▲ and ▼ to select and press **OK** to confirm.

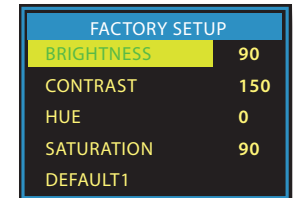


## Video Format

This function allows you to choose the format of the output video signal for an auxiliary display. The options are NTSC and PAL. Use the ▲ and ▼ to select and press **OK** to confirm.

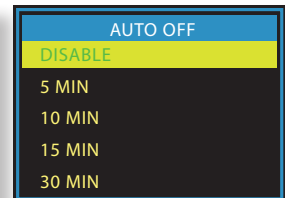
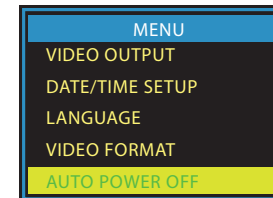


While the **TV OUTPUT** options are displayed, pressing the 📷 button will display the **FACTORY SETUP** menu. Here the factory settings for the video display may be changed or reset. Use ▲ and ▼ and press **OK** to select the property to be changed. Then use ▲ and ▼ to change the setting and **OK** to confirm. Holding the ▲ or ▼ buttons down for a couple of seconds will cause the settings to change more rapidly. Each unit is optimized from the default settings by Gradient Lens Corporation prior to shipping. These optimized settings appear on a label on the main unit should they need to be re-entered.



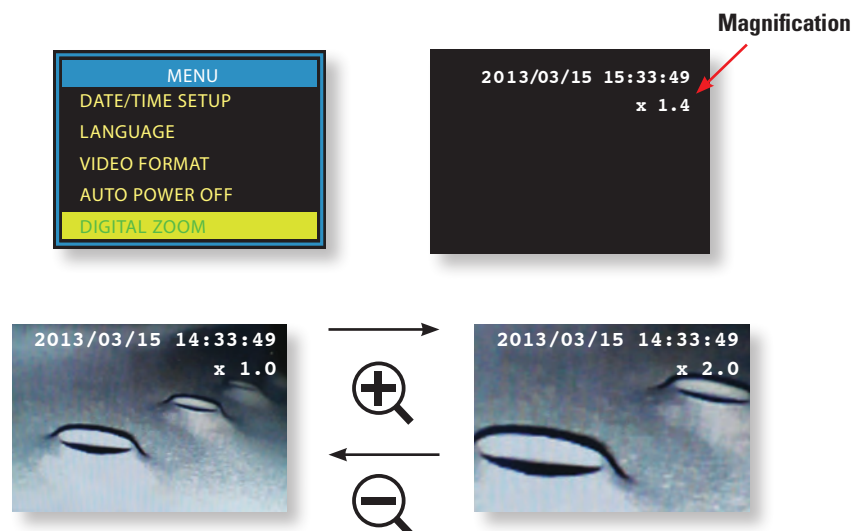
## Auto Power Off

Use the ▲ and ▼ buttons to select time for auto power off or to disable the auto power off function. Press **OK** to confirm.



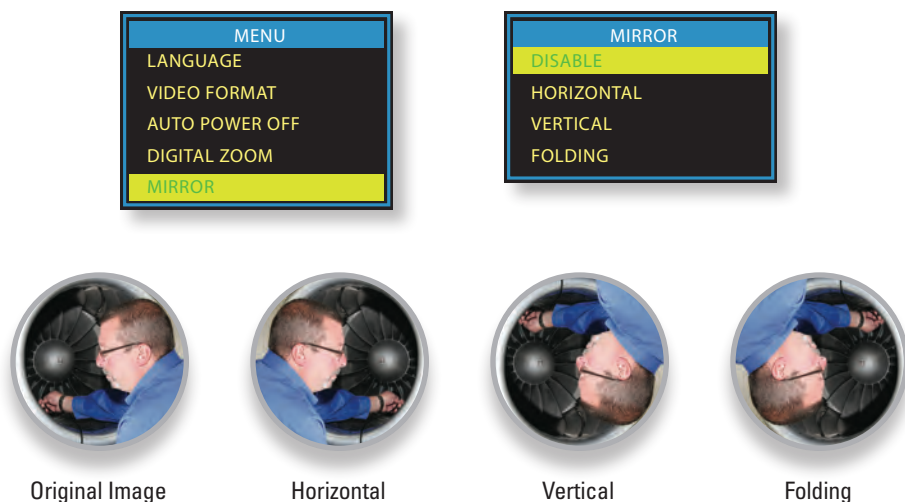
## Digital Zoom

Select this function by pressing the **OK** button. Use the **▲** and **▼** buttons to select the digital magnification of the display image from 1.0 to 2.0 in increments of 0.1. The selected magnification is shown on the display.



## Mirror

The live displayed image may be mirrored horizontally or vertically, as well as rotated 180° by selecting these options and pressing **OK** to confirm.



## Connecting to an Auxiliary Display

Use the included AV cable to connect your auxiliary display to the jack on the side of the video display. (**Note:** The auxiliary display must accept a composite input). The unit will automatically switch to the auxiliary display when the cable is connected. The displays may be toggled by using the VIDEO OUTPUT function on the main menu. The video display and the external display cannot be viewed at the same time.

The video output format to the auxiliary display may be switched between NTSC and PAL by using the VIDEO FORMAT function on the main menu.



AV Cable



Video Out

## Transferring Image Files to a Personal Computer

Use the included AV cable to connect your auxiliary display to the jack on the side of the video display. (**Note:** The auxiliary display must accept a composite input). The unit will automatically switch to the auxiliary display when the cable is connected. The displays may be toggled by using the VIDEO OUTPUT function on the main menu. The video display and the external display cannot be viewed at the same time.

The video output format to the auxiliary display may be switched between NTSC and PAL by using the VIDEO FORMAT function on the main menu.

Images stored on the SD memory card can be downloaded to a computer via the USB port. Plug in the Mini USB 1.1 connector to the USB port and open the drive associated with the USB port on your computer. The stored images are contained in the location "X:\DCIM\100DSCIM" where X is the drive letter. JPG's can be viewed with Windows Picture Viewer and .ASF video files play in Windows Media Player.



USB Cable



USB Out

Alternatively, images from the SD memory card may be transferred to your computer by removing the card from the video display and inserting it into your computer's card reader.

## Changing the Battery

To change the battery, remove the screw from the battery cover and remove the cover.



Carefully expose the battery wires and connector. Pull the connector apart and connect new battery. Replace the battery in its compartment and replace the cover and screw.



The following troubleshooting hints should help you to solve some performance problems on site. If a problem is not solved using these suggestions, call the Service Center at the number listed under the SERVICE section of the Warranty page and arrange to return your V2 Video Borescope for evaluation and repair.



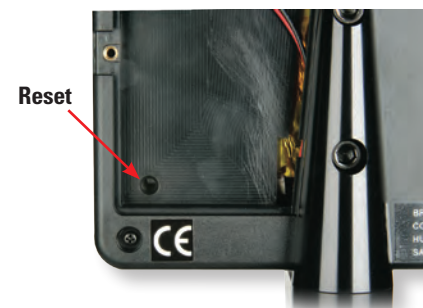
**NEVER Attempt to Disassemble the V2 Video Borescope**

### If Image is Not Clear and Sharp:

- If using a detachable tip adapter, the tip may not be properly attached. Detach tip adapter and reinstall.
- Lenses or glass windows may be dirty. Clean glass surface on insertion tube tip with alcohol and cotton swab (or soft cloth). Also clean detachable tip if being used.
- Light may be insufficient. Increase light source intensity or move viewing tip closer to object.

### If the Video Display & Capture Unit is Not Working Properly:

- Nothing on LCD screen: Battery power too low. Recharge battery.
- No Image - but words and status symbols on LCD display: Power and signal cable is not connected securely. Reattach cable.
- Cannot capture photos or video: No SD card inserted.
- Shut down: Battery has discharged below operating threshold. Recharge battery.
- !!! No functions working!!! If all functions freeze or fail, first try to power the unit off and restart. If the unit does not recover, remove the battery compartment cover. Move the battery to reveal the reset hole. Insert a toothpick, or other non-conducting probe, into the reset hole and push the reset button to perform a system reset.





**If Articulation is Difficult:**

- Articulation locks may be fully or partially engaged. Release locks.
- Articulation cable movement may be hindered by bends in the insertion tube. Keep tube as straight as possible during inspection.
- Viewing tip movement may be blocked due to its position inside equipment. Try to reposition tip by rotating tube or moving tip forward or backward.



**Do Not Apply Excessive Force on Articulation Controls**

**If Image is Not Bright Enough:**

- Light source intensity may be at a low setting. Turn to maximum intensity.
- Viewing tip may be too far from object. Move tip closer to object.
- If using a detachable tip adapter, the tip may not be properly attached. Detach tip adapter and reinstall.
- Lenses or glass windows may be dirty. Clean glass surfaces on viewing tip, light guide connector and eyepiece with alcohol and cotton swab (or soft cloth). Also clean detachable tips if being used.
- Light source capacity may be insufficient for application.

**Notes:**

- Do not remove the SD memory card during capture operations, data will be lost and the memory card may be damaged.
- We recommend 80X SD card or faster for best quality video clips.
- Use cotton swabs and lens cleaning solution or isopropyl alcohol (rubbing alcohol) to clean the tip optics.
- Clean the video display with a damp cloth only. Do not use chemical solvents.

Button	Normal Mode	Image Review Mode	Menu Mode
	Switches to Image Review mode and scrolls reverse through still images and videos.	Scrolls to previous still image or video.	Scrolls up through selections.
	Switches to Image Review mode and scrolls forward through still images and videos.	Scrolls to next still image or video.	Scrolls down through selections.
<b>OK</b>	Enters Main Menu.	To delete current image or video.	Confirm selection.
<b>ESC</b>	Displays battery and memory status.	Returns to Normal Mode and displays 'CAMERA' and battery and memory status.	Returns to Normal Mode and displays 'CAMERA' and battery and memory status.
	Captures a still image (JPG). While recording a video clip, pressing this button will stop the recording process.  (PHOTO button is duplicate of this)	While viewing a video file this button will play/pause/resume the current video clip.	Returns to Normal Mode.
	Pressing this button starts/stops video recording.  (REC button is a duplicate of this)	Returns to Normal Mode and displays 'CAMERA' and battery status.	Returns to Normal Mode.

## Warranty

Gradient Lens Corporation warrants that all Hawkeye borescopes and accessories will be free of defects in materials and workmanship for one year from the date of first retail purchase.

Video and lighting products have manufacturer's warranties for one year.

This warranty does not cover breakage or failure due to tampering, misuse, neglect, accidents, improper installation, modification, shipping, or to improper maintenance, service and cleaning procedures. This warranty is also void if the instrument is not used in accordance with the manufacture's recommendations or if required service is performed by anyone other than an Gradient Lens Corporation authorized agent. No other express or implied warranty is given.

### *Should service of the equipment be required:*

Call Gradient Lens Corporation to obtain a return material authorization (RMA) number and shipping directions.


Telephone: .....585.235.2620

Fax: .....585.235.6645

E-mail: .....info@GradientLens.com

Toll Free: .....800-536-0790 (in US only)

## CE Certification

<h3>Declaration of Conformity</h3> <h4>Application of Council Directive: 2004/108/EC</h4>	
Standards To Which Conformity Is Declared:	EN61326-1: 2006 EN55011 Class A Group 1  EN61000-4-2 EN61000-4-3 EN61000-4-4 EN61000-4-5 EN61000-4-6 EN61000-4-8 EN61000-4-11
Manufacturer's Name:	Gradient Lens Corp
Manufacturer's Address:	207 Tremont Street Rochester, NY 14608 585-235-2620
Equipment Description:	Borescope
Equipment Class:	Electrical Equipment Measurement, Control & Laboratory Use - Industrial
Model Numbers:	Hawkeye V2 Series
<p><i>I the undersigned, hereby declare that the equipment specified above, conforms to the above Directive(s) and Standard(s).</i></p>	
Place:	Rochester, NY USA
Signature:	
Full Name:	Leland G. Atkinson, III
Position:	Vice President

## FCC Certification

This device complies with part 15 of FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.