

XL Vu+™ VideoProbe®

Operating Manual



XL Vu+™ VideoProbe®

Video Borescope

Operating Manual

XLVUCMAN Rev. A
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ge-mcs.com

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Chapter 1. Introduction

1.1 About this Manual

This manual and the related equipment is intended for visual inspection technicians with a basic understanding of inspection principles and practices, and who are familiar with basic computer operations, but who may not have experience with a video borescope system.

The manual contains complete setup, operating, and maintenance instructions for the XL Vu+ video borescope system. The manual also provides a product overview, step-by-step procedures, and reference information.

To ensure operator safety, please read and understand this manual prior to using the system.

For additional assistance, go to www.ge-mcs.com or see the back cover of this manual for a complete listing of contact information.

1.2 Standard XL Vu+ System

The standard XL Vu+ package includes the following items:

XL Vu+ Instrument	USB Thumb Drive
2-hour Li-Ion Battery	Operating Manual
Storage Case	Documentation CD-ROM
AC Adapter/Battery Charger	Quick-Start Card
Optical Tip Storage Case	

1.3 Optional Accessories

The following optional accessories are available for the XL Vu+ system:

Spare 4-hour Battery	Sun Visor
VGA Video Cable	Headset
Insertion Tube Gripper	USB Thumb Drive
Insertion Tube Rigidizer	Belt Clip
Mini-Magic Arm	Keyboard
12 VDC Power Adapter	Optical Tips
Handset Holder	Measurement Optical Tips
Soft Case	Mini-Magic Clamp Kit
Neck Strap	Magic Arm Kit

1.4 Optional Software

The following optional software is available for the XL Vu+ system:

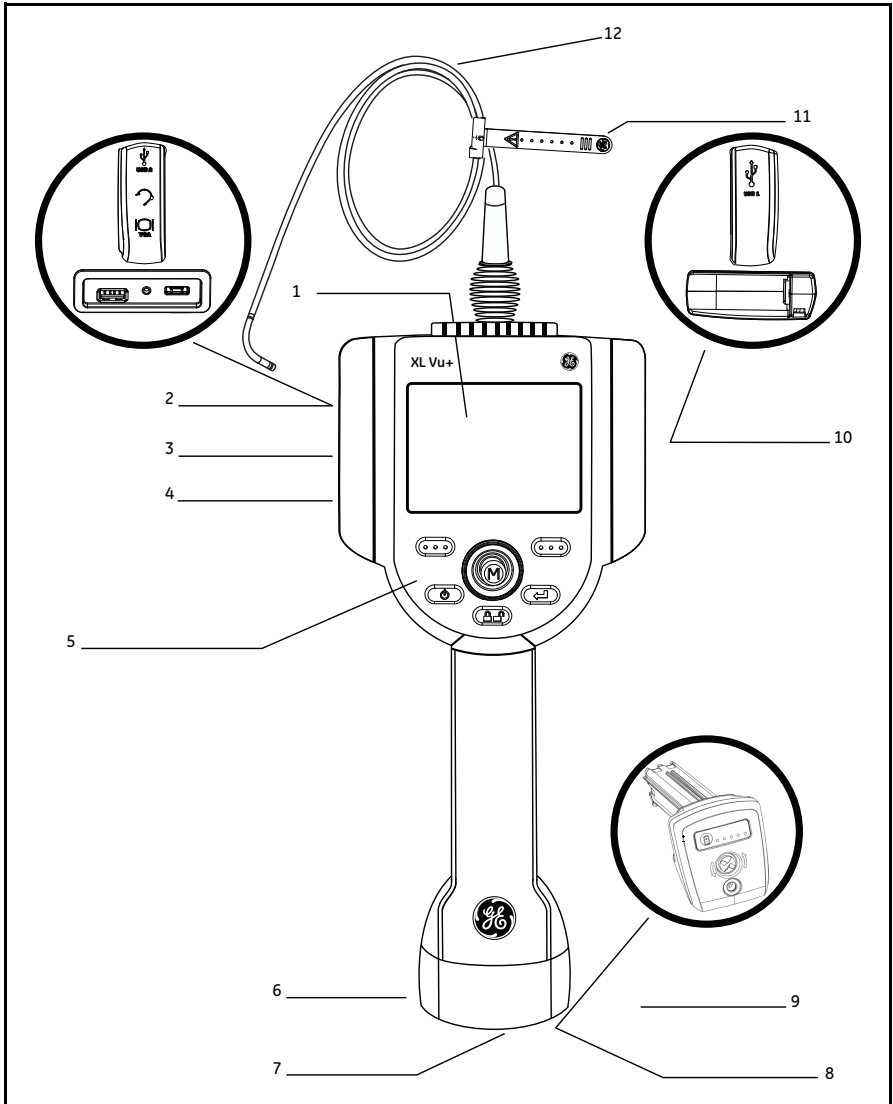
Menu Directed Inspection (MDI)

1.5 Indicators and Connectors

The XL Vu+ instrument includes the following indicators and connectors (see *Figure 1 on page 4*):










1. LCD Screen
2. USB2 Port
3. Integrated 2.5 mm Headset/Microphone Jack
4. VGA Output
5. Controls
6. 2-hour Lithium Ion Battery
7. Battery Locking Screw
8. Battery Charge Indicator
9. AC Adaptor Input
10. USB1 Bay
11. Insertion Tube Strap
12. Insertion Tube

1.5 Indicators and Connectors (cont.)



1.6 Button Controls

The buttons listed below and shown in *Figure 2 on page 6* control the basic and advanced operation of the XL Vu+ VideoProbe.

1.  **Left Soft Key** - Activates the screen command listed on the system LCD. This key most frequently returns the user **BACK** one screen.
2.  **Power/Exit Button** - Turns the system power ON/OFF. Also used to exit menus, return to live/frozen video and disable image control features.
3. **Joystick** - Controls articulation of the probe. Press to activate the *Live Main Menu*, *Recalled Image Menu*, and *Freeze Frame Menu*. Push the joystick left/right/up/down to navigate menus and sub-menus.
4.  **Steering Control** - Press and release to keep bending neck locked in place after the joystick is released. A  lock will appear on the LCD when enabled. Press and release again to unlock the steering control. The  lock will disappear from the LCD when disabled. Also, press and hold to engage the HOME function to straighten the bending neck. A blinking  HOME icon will appear on the LCD when enabled. This icon will disappear when finished.
5.  **Freeze/Enter Button** - Freezes the image on-screen. Also acts as an ENTER key for selecting menu options.
6.  **Right Soft Key** - Activates the screen command listed on the system LCD. This key most frequently serves to **SELECT** active menu choices. This key also provides an alternative method to access the **LIVE MAIN MENU**, by pressing and holding the  right soft key labeled **GOTO** for about three seconds.

1.6 Button Controls (cont.)

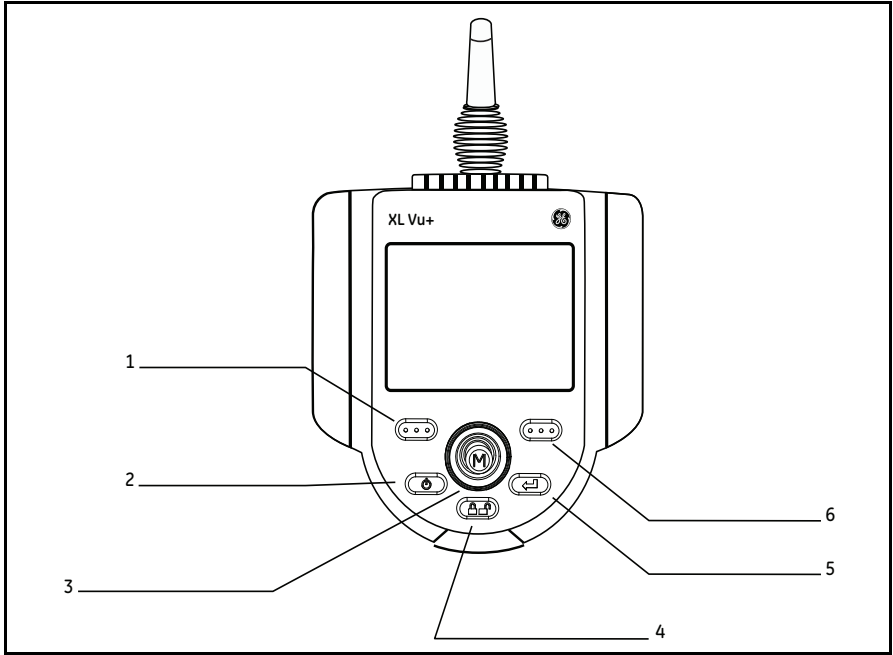


Figure 2: XL Vu+ Controls

Chapter 2. Safety Information

IMPORTANT: *Before using or servicing the XL Vu+ system, read and understand the following safety information.*

2.1 Symbols and Terms

The following symbol appears **on the product**:



See accompanying documentation.

2.2 General Warnings

The following warning statements apply to general use of the XL Vu+ system. Warning statements that apply specifically to particular procedures appear in the corresponding sections of this manual.



Do not allow the conductive insertion tube, system or its working tools to come in direct contact with any voltage or current source. Prevent all contact with live electrical conductors or terminals. Damage to the equipment and/or electrical shock to the operator may result.



Do not use this system in explosive environments.



USE PROPERLY. Using any piece of this equipment in a manner not specified by the manufacturer may impair the product's ability to protect the user from harm.

2.3 General Cautions



The following caution statements apply to use of the XL Vu+ system in general. Caution statements that apply specifically to particular procedures appear in the corresponding sections of this manual.

HANDLE PROBE CAREFULLY. Keep the insertion tube away from sharp objects that might penetrate its outer sheath. Keep the whole insertion tube as straight as possible during operation; loops or bends anywhere in the tube decrease its ability to steer the probe tip. Avoid bending the insertion tube sharply.

IMPORTANT: *Always use the Home button to straighten the bending neck before withdrawing the insertion tube from the inspection area or putting the probe away. Never pull, twist, or straighten the bending neck by hand; internal damage may result. At the first sign of damage, return the probe for repair.*

Certain substances may damage the probe. For a list of substances that are safe for the probe, see “*Chemical Compatibility*” on page 133.

2.4 Battery Warnings

Only use the battery (XLGOABATTA or XLGOABATTB) and power supply (XLGOACHGR or XLGOAAUTOC) specified for use with the XL Vu+ system.

Before using the XL Vu+ system, thoroughly review the instructions in this manual for using the battery and battery charger, Always observe these instructions during use of the instrument.

WARNING!

- Do not place the battery in fire or exceed the battery operating temperature.
- Do not pierce the battery with nails, strike the battery with a hammer, step on the battery, or otherwise subject it to strong impacts or shocks.
- Do not expose the battery to water or salt water, or allow the battery to get wet.
- Do not disassemble or modify the battery.



Battery Communication Error: If the XL Vu+ shows this error message on the display, please contact your nearest customer support center.

Using the battery outside its recommended operating range will result in degradation of the performance and service life. When storing the battery, be sure to remove it from the base unit.

The recommended temperature range for Li-Ion battery operation is:

Discharge (when using the instrument):	-20 to +46°C
Recharging:	0 to 40°C
Storage:	-25 to +60°C

IMPORTANT : *avant l'utilisation ou l'entretien du système, vous devez lire et comprendre les informations de sécurité qui suivent.*

2.5 Symboles et termes employés

Les symboles suivants sont apposés **sur le produit** :



Voir la documentation jointe.

2.6 Avertissements généraux

Les avertissements suivants s'appliquent à l'utilisation du système en général. Les avertissements qui s'appliquent spécifiquement à des procédures particulières sont indiqués dans les sections correspondantes de ce manuel.



Le système XL Vu+ et les outils de travail qui l'accompagnent ne doivent jamais entrer en contact direct avec une source de tension ou de courant. Évitez tout contact avec des conducteurs ou des bornes électriques sous tension. L'équipement risquerait d'être endommagé, ou l'opérateur de subir un choc électrique.



N'utilisez pas ce système dans un environnement à risque d'explosion.



UTILISER CORRECTEMENT. Si un élément de cet équipement est utilisé d'une manière non indiquée par le fabricant, l'utilisateur peut ne plus être protégé des risques de blessure.

2.7 Mentions générales « Attention »



Les mentions « Attention » qui suivent s'appliquent à l'utilisation de l'appareil XL Go en général. Les mentions « Attention » qui s'appliquent spécifiquement à des procédures particulières sont indiquées dans les sections correspondantes du manuel.

MANIPULER LA SONDE AVEC PRÉCAUTION. Maintenez la gaine de la sonde à l'écart d'objets pointus ou tranchants qui risqueraient de traverser son fourreau. Maintenez toute la gaine aussi droite que possible pendant l'utilisation : en cas de boucle ou de courbure, il est plus difficile de piloter le bout de la sonde. Évitez de trop courber la gaine.

IMPORTANT : *utilisez toujours le bouton de rangement pour redresser le béquillage avant de rétracter la gaine de la zone d'inspection ou de ranger la sonde. Ne manipulez jamais le béquillage à la main pour le tirer, le courber ou le redresser : vous risqueriez de l'endommager à l'intérieur. Envoyez la sonde en réparation au premier signe d'endommagement.*

Certaines substances risquent d'endommager la sonde. Pour consulter la liste des substances sans danger pour la sonde, voir "Chemical Compatibility" on page 133.

2.8 Avertissements liés à la batterie

Utilisez uniquement la batterie (XLGOABATTA or XLGOABATTB) et l'alimentation (XLGOACHGR or XLGOAAUTOC) spécifiées pour être utilisées avec le système XL Vu+.

Avant utilisation, lisez attentivement les instructions contenues dans ce manuel relatives à la batterie et au chargeur de batterie pour bien les comprendre, et respectez ces instructions pendant l'utilisation de l'appareil.



AVERTISSEMENT!

- Ne jetez pas la batterie au feu et ne dépassez pas sa température de fonctionnement.
- Ne percez pas la batterie avec des clous, ne la frappez pas avec un marteau, ne marchez pas dessus et ne la soumettez pas à des impacts ou des chocs violents.
- N'exposez pas la batterie à l'eau douce ou salée, et évitez de la mouiller.
- Ne désassemblez pas la batterie et ne la modifiez pas.



Erreur de communication de la batterie. Veuillez contacter le Service clientèle au numéro +1 315 554 2000.

L'utilisation de la batterie en dehors de la plage de fonctionnement recommandée entraînerait une dégradation de ses performances et de sa longévité. Lorsque vous stockez la batterie, veillez à la retirer de sa base.

Plage de température recommandée pour le fonctionnement de la batterie
Lithium-Ion :

Décharge (à l'utilisation de l'appareil) :	-20 à +46°C
Recharge :	0 à +40°C
Stockage :	-25 à +60°C

Chapter 3. Getting Started

3.1 System Removal

Gently remove the insertion tube from the internal storage reel and lift the handset from the storage case (see *Figure 3* below).

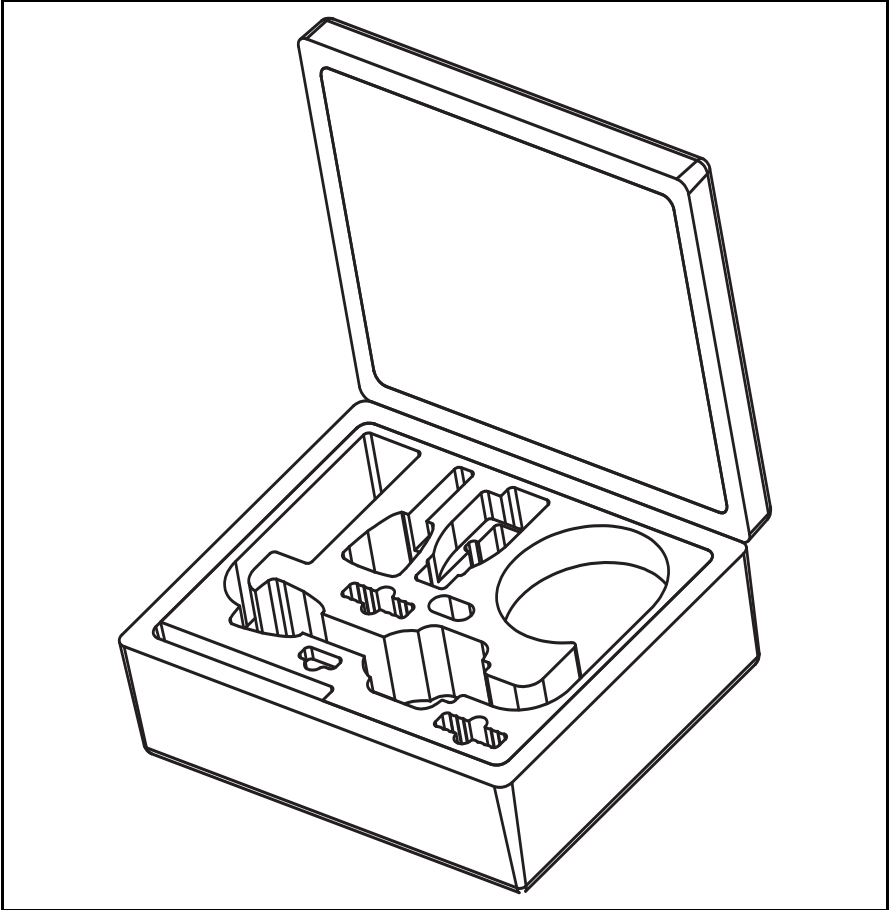



Figure 3: Removing the XL Vu+ from the Case

3.2 System Power ON

Press and hold the  Power/Exit key briefly to power the system ON. The buttons and Liquid Crystal Display (LCD) will light up and begin the power-up sequence (see *Figure 4* below). After approximately 30 seconds, select the desired language. The system screen will display live video and screen prompts, and is now ready for use.

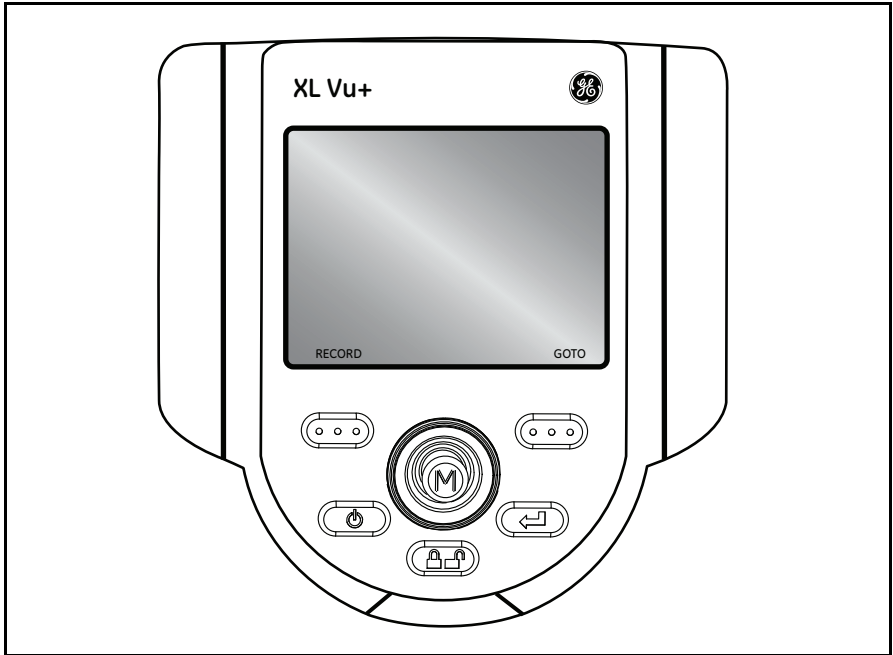



Figure 4: Powering the XL Vu+ ON

Note: All batteries are shipped with only a partial charge. The batteries should be fully charged prior to use.

3.3 System Power OFF

Press and hold the  Power/Exit key until the “SYSTEM SHUTTING DOWN” message appears. Illumination of the buttons and the LCD will be terminated when the system is completely powered down.

3.4 System Storage

Place the tip of the insertion tube into the orange funnel and gently feed it into the storage reel (see *Figure 5* below). Place the XL Vu+ handset into the designated foam cutout, with the LCD screen facing up.

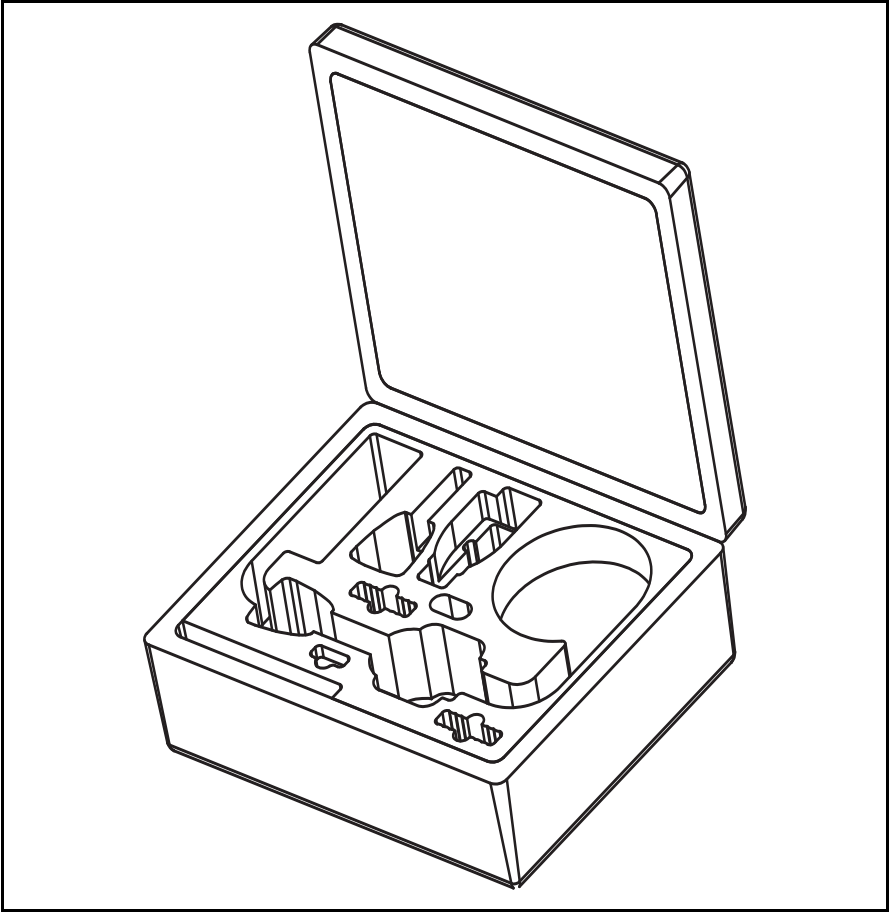


Figure 5: Storing the XL Vu+ in the Case

3.5 Mounting Accessories

Assemble the optional mounting accessories, as shown in *Figure 6* below, by screwing together the mini magic clamp, swivel ball, and handset holder.

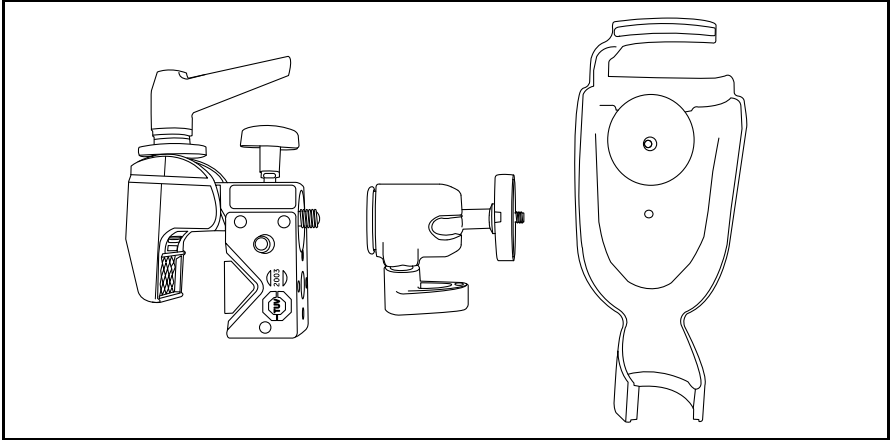


Figure 6: Assembling the Mounting Accessories

Secure the XL Vu+ mini magic clamp, as shown in *Figure 7* below, and place the XL Go system in the handset holder.

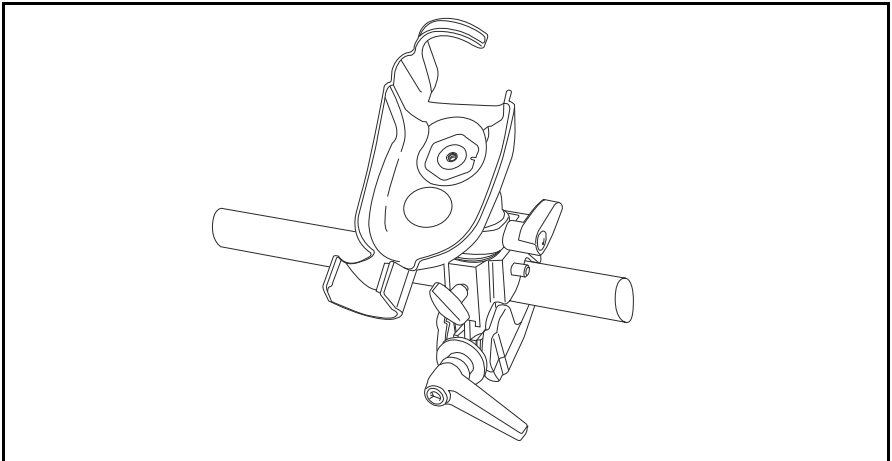


Figure 7: Securing the Mounting Assembly

3.6 The Battery

3.6.1 Installing the Battery

Insert the battery into the handset (see *Figure 8* below). The battery is installed properly only after the latching mechanism is engaged.

Note: *Do not force the battery into the handset, as damage may occur. The battery is keyed and can only be installed in the proper orientation.*

3.6.2 Removing the Battery

Using a slotted screw driver or coin, turn the locking screw counterclockwise and release the battery (see *Figure 8* below).

Note: *Do not remove battery while the system is operating.*

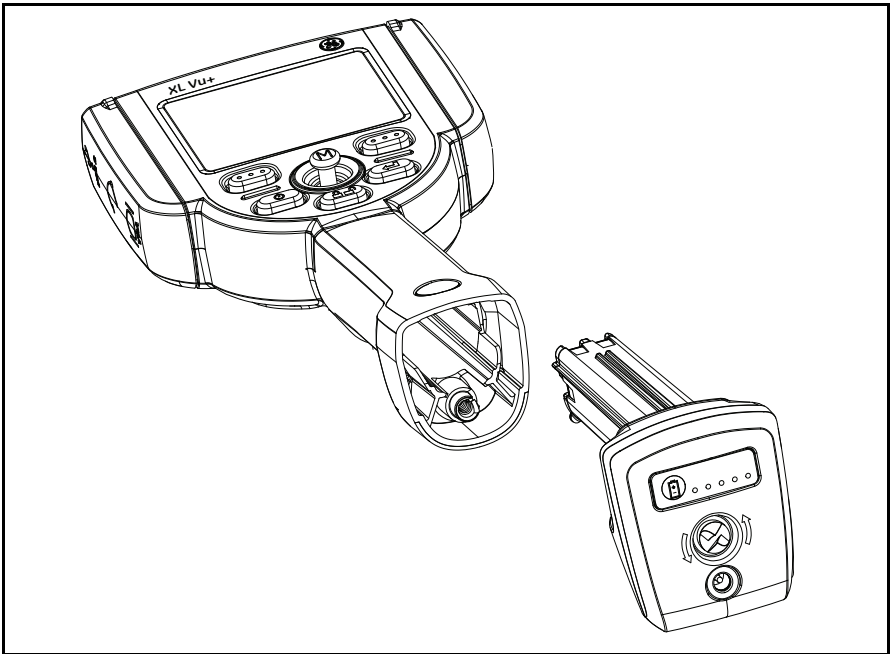


Figure 8: Removing/Installing the Battery

3.7 Battery Charge Level

Check the battery charge by pressing the battery symbol on the front of the battery (see *Figure 9* below). Each indicator light represents approximately 20% of the battery charge capacity.

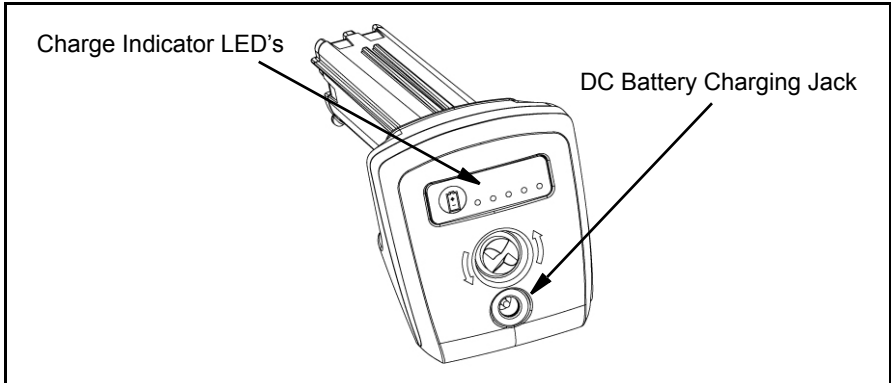


Figure 9: Checking the Battery Charge

3.8 Charging the Battery

Note: *Battery run time approximately equals the battery charge time. Thus, a four-hour battery will take approximately four hours to charge.*

Plug the included *AC-to-DC power adaptor* into a suitable AC power source and connect the DC output of the battery charger into the XL Vu+ battery (see *Figure 9* above). The LED battery lights will illuminate according to the amount of charge attained. The system may be operated while charging, but the battery may also be charged while disconnected from the system.

Note: *When the battery is fully charged, the LED battery lights will turn OFF.*

3.9 Keyboard Support


To use an external, USB keyboard, plug the approved device into one of the two XL Go USB ports.

For a list of approved keyboards, contact your sales representative or customer support.

The function keys on the keyboard act like the keys on the XL Vu+:

F1: Menu Function on Joystick

F2:  Left Soft Key

F3:  Power/Exit Button

F4:  Steering Control


F5:  Enter Key


F6:  Right Soft Key


Note: *External keyboards support only the top level functions and will not support the press-and-hold functions, such as video recording.*

3.10 Saving Images and Video


3.10.1 Still Images

To capture a still image, compose the picture and press and release 

Freeze/Enter. Press the  right soft key, labeled **SAVE** on the LCD above, to save to the default location.

Alternately, from live video, press and hold  Freeze/Enter to quick-save.

3.10.2 Video

To record live video, press and hold the  left soft key, labeled **RECORD** on the LCD above. A red **RECORD** symbol will appear in the upper right hand corner of the screen. When the video is stopped, it will automatically save to the default location.

Note: See “Capturing Measurement Images” on page 96 for instructions on saving images for future re-measurement on the XL Vu+ or on a PC.

3.11 Optical Tips

Optical tips are attached to the insertion tube using a double thread. This prevents the unintended loss of optical tips from the probe. Each optical tip provides a unique depth of field (DOF), field of view (FOV) and direction of view (DOV). A complete list of available tips is provided in “*Optical Tip Table*” on page 131.

3.11.1 Optical Tip Removal

To remove an optical tip (see *Figure 10* below), complete the following steps:

1. Grasp the head of the probe with one hand and gently loosen the tip counterclockwise with the other hand. The tip has cleared the first set of threads when it spins freely.
2. Gently pull the tip away from the probe and continue loosening counterclockwise until the tip has cleared the second set of threads.

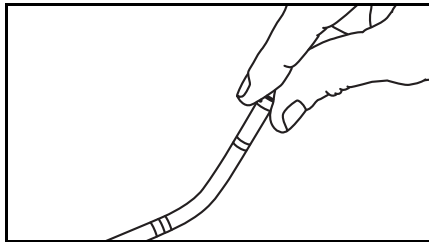


Figure 10: Removing An Optical Tip

3.11.2 Optical Tip Installation

To install an optical tip, complete the following steps:

1. Ensure that the optical tip is clean. If necessary, clean the tip as described in “*Cleaning Optical Tips*” on page 123.
2. Grasp the head of the probe with one hand and gently turn the tip clockwise with the other hand. The tip has cleared the first set of threads when it spins freely and then seats when gentle force applied.
3. Gently push the tip toward the probe and continue turning clockwise on the second set of threads until the tip is attached finger tight. Do not over-tighten the tip. Pull gently on the tip to verify proper attachment to the probe.

Note: *Never use tools or excessive force to install or remove an optical tip.*

3.12 Proper Use of the Tip Tool (3.9 mm only)

3.12.1 Removing Optical Tips

To remove an optical tip, complete the following steps:

1. Apply the empty tip tool to the probe head.
2. Apply pressure while turning the tool counterclockwise.
3. When the tip tool spins freely, gently pull up while twisting counterclockwise to release the second set of threads.
4. Remove the tip tool and the captured tip.

3.12.2 Installing Optical Tips



To install an optical tip, complete the following steps:

1. Apply the tip tool containing the desired optical tip to the probe head.
2. Apply pressure on the tool while turning it clockwise.
3. When the tip tool spins freely, gently push down while twisting the tool clockwise to engage the second set of threads.
4. Pull gently on the tip tool to verify proper attachment of the tip to the probe head.
5. Remove the tip tool.


IMPORTANT: *Never use excessive force to install or remove an optical tip.*

Chapter 4. Common Tasks

4.1 GO TO Menu

Many common operating tasks are available in the GO TO menu. This menu is available by pressing the  right soft key, labeled GO TO on the LCD above, during live video mode. To exit any menu, press  Power/Exit.

4.1.1 GO TO > File Manager

To enter the file manager menu (see *Figure 11* below), navigate to FILE MANAGER with the joystick and press the  right soft key, labeled SELECT on the LCD above.

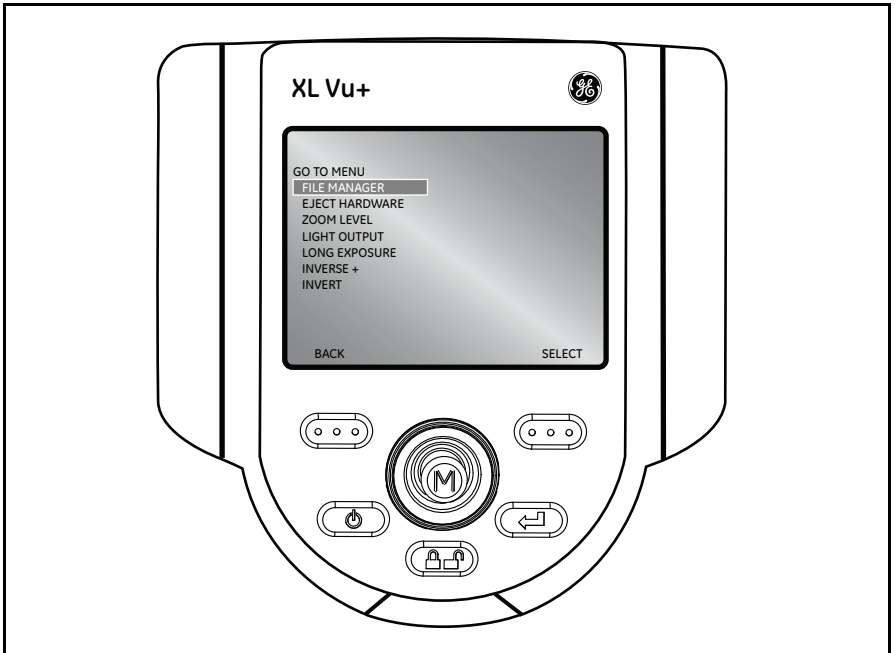



Figure 11: The GO TO > File Manager Menu

4.1.2 GO TO > Eject Hardware

To eject a USB thumb drive before removal, use the joystick to navigate to the right of the EJECT HARDWARE option (see *Figure 12* below). To eject the desired drive, press the  right soft key, labeled SELECT on the LCD above.

Note: *Always use EJECT HARDWARE before removing a USB thumb drive, to prevent loss of data.*

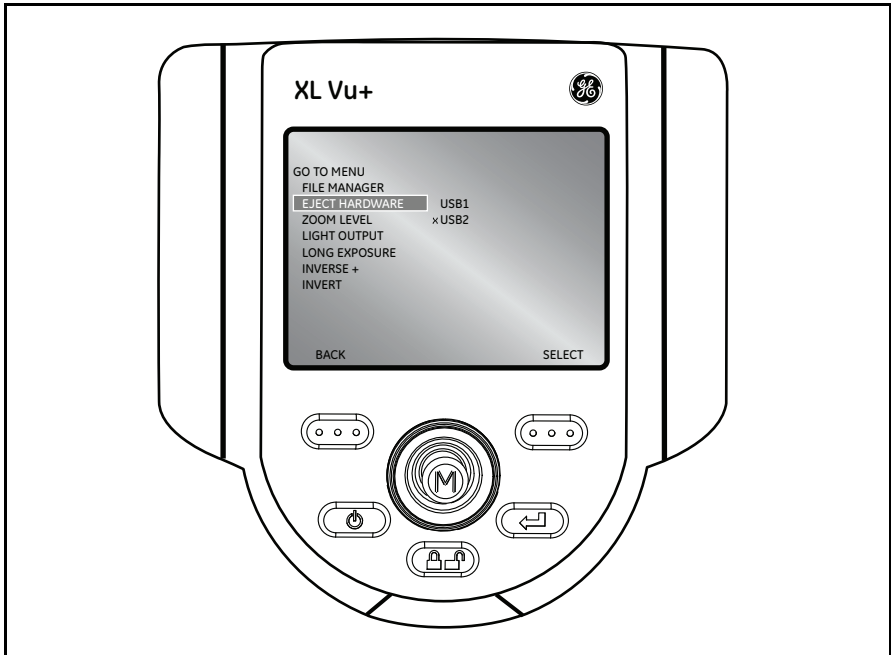


Figure 12: The GO TO > Eject Hardware Menu

4.1.3 GO TO > Zoom Level

Zoom levels from 1 (normal view) to 5 (5X normal view) are available. Navigate to the right of the ZOOM LEVEL option (see *Figure 13* below), and use the joystick to adjust the zoom level.

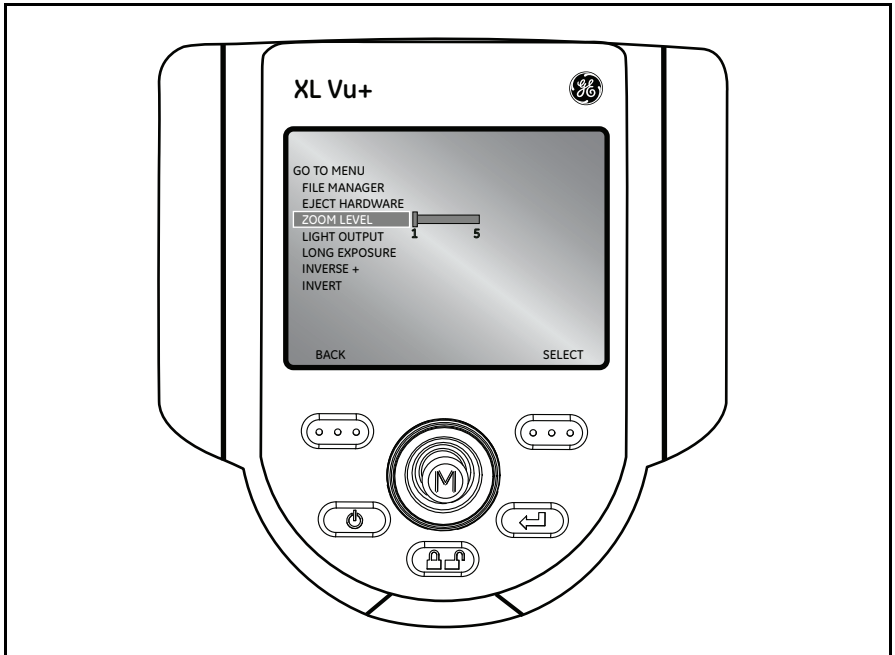



Figure 13: The GO TO > Zoom Level Menu

4.1.4 GO TO > Light Output

To turn the LED optical light ON or OFF, navigate to the right of the LIGHT OUTPUT option, and select either ON or OFF.




Figure 14: The GO TO > Light Output Menu

Note: Pressing the  Freeze Frame key is a convenient way to temporarily turn off the light output and is ideal for changing optical tips and conserving battery charge.

4.1.5 GO TO > Long Exposure

The XL Vu+ system can brighten the image by varying the exposure time. Keep the probe tip as still as possible when capturing an image with a long exposure, to minimize the risk of blurring.

Navigate to the **LONG EXPOSURE** option (see *Figure 15* below) to choose manual exposure, automatic long exposure, or to turn long exposure off. Long

Exposure may be turned off in live video mode by pressing the  Power/Exit button.

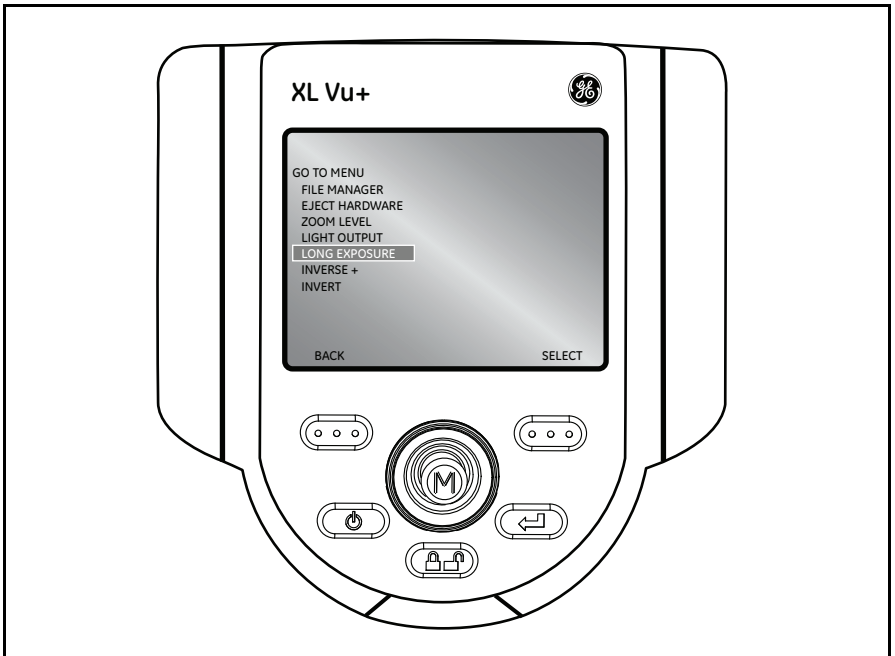


Figure 15: The GO TO > Long Exposure Menu


4.1.5 GO TO > Long Exposure (cont.)

After selecting LONG EXPOSURE (see *Figure 16* below), the following options are available: MANUAL, AUTO and OFF.



Figure 16: The GO TO > Long Exposure Options

4.1.6 GO TO > Inverse +

The INVERSE + option reverses the brightness of the image, similar to a photographic negative. This enhances the image contrast, making subtle details more visible. To activate or deactivate this function, navigate to The INVERSE + option (see *Figure 17* below), and choose either ON or OFF. INVERSE + may be turned OFF in live video mode by pressing the  Power/Exit button.

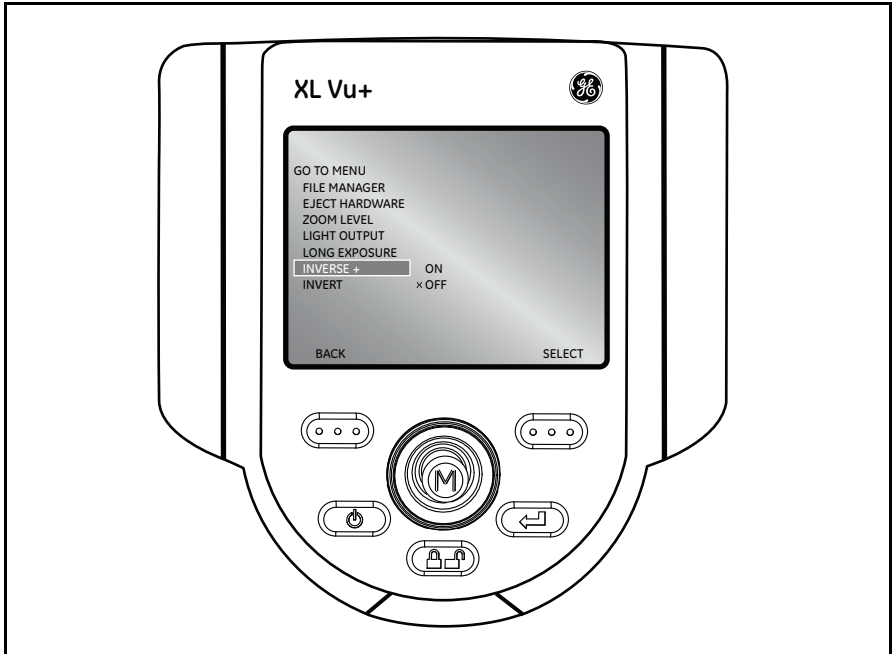



Figure 17: The GO TO > Inverse + Menu

4.1.7 GO TO > Invert

The INVERT function flips an image horizontally. To activate or deactivate this function, navigate to the INVERT option (see *Figure 18* below), and choose either ON or OFF. INVERT may be turned OFF in live video mode by pressing the

 Power/Exit button.

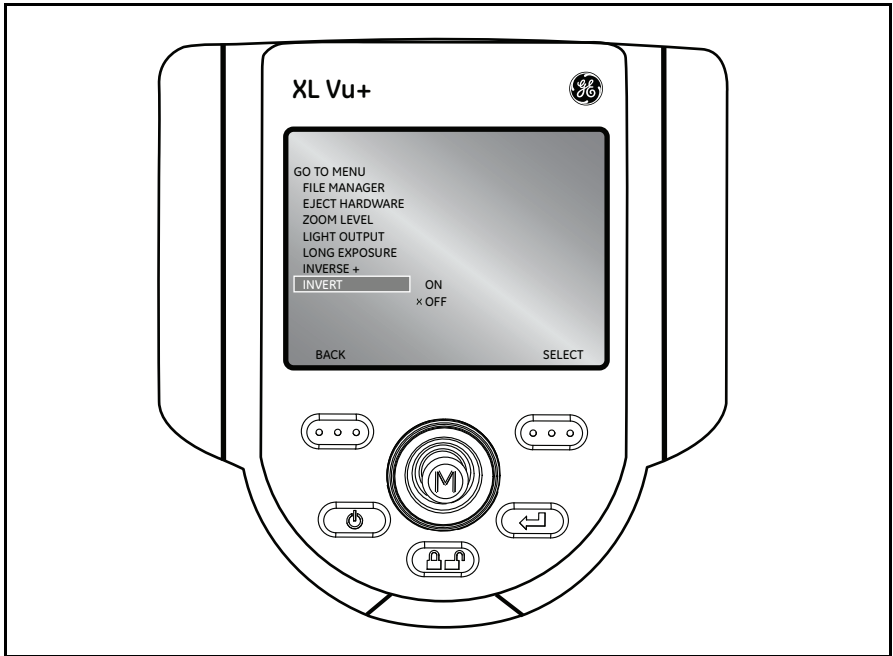




Figure 18: The GO TO > Invert Menu

Note: INVERT is typically used while a side view tip is installed in order to compensate for the inversion caused by this type of tip.

4.2 Live Main Menu


To activate the LIVE MAIN MENU, press and release the joystick. To exit any submenu, press the  Power/Exit button. An alternative method for accessing the LIVE MAIN MENU is to press and hold the  right soft key, labeled GO TO on the LCD above, for about three seconds.

4.2.1 Live Main Menu > Light Output

To turn the LED optical light ON or OFF, use the joystick to navigate to the LIGHT OUTPUT option (see *Figure 19* below), and select either ON or OFF.



Figure 19: The Live Main Menu > Light Output Menu

Note: Pressing the  Freeze Frame key is a convenient way to temporarily turn off the light output and is ideal for changing optical tips and conserving battery charge.

4.2.2 Live Main Menu > Image Control

From the LIVE MAIN MENU, select the IMAGE CONTROL option (see *Figure 20* below). Any changes made to the *Image Controls* take effect immediately.

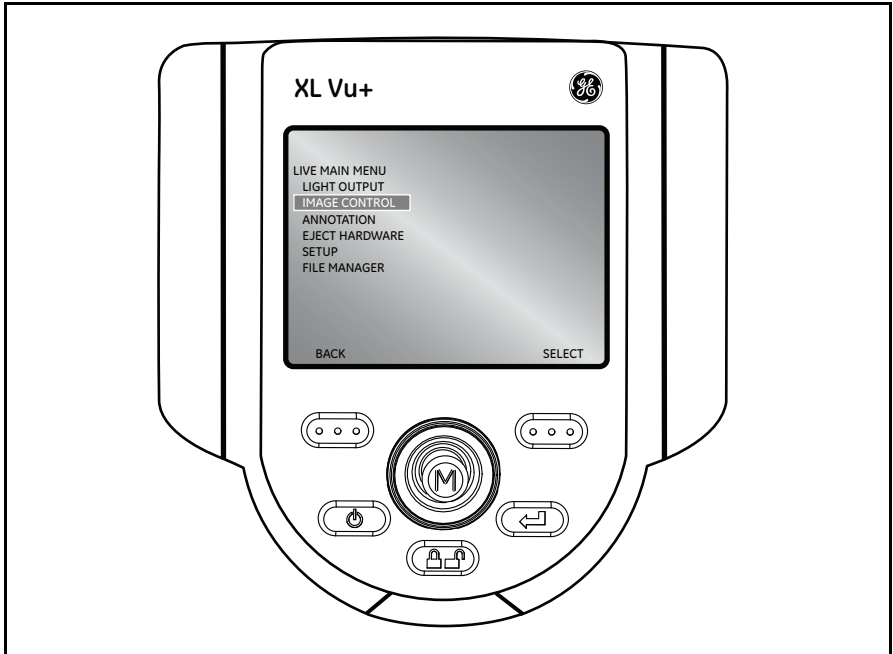



Figure 20: The Live Main Menu > Image Control Menu

The following *Image Control* options are available:

- Image Brightness (see *page 33*)
- Single View (see *page 38*)
- Zoom Level (see *page 34*)
- Inverse + (see *page 39*)
- Long Exposure (see *page 35*)
- Invert (see *page 40*)
- Split Screen (see *page 37*)

Note: By pressing the  Power/Exit button twice, any image control features will be turned OFF and returned to the factory default settings.

4.2.2a Live Main Menu > Image Control > Image Brightness

Navigate to **IMAGE BRIGHTNESS** from the **IMAGE CONTROL** Menu (see *Figure 21* below), and use the joystick to adjust the image brightness.

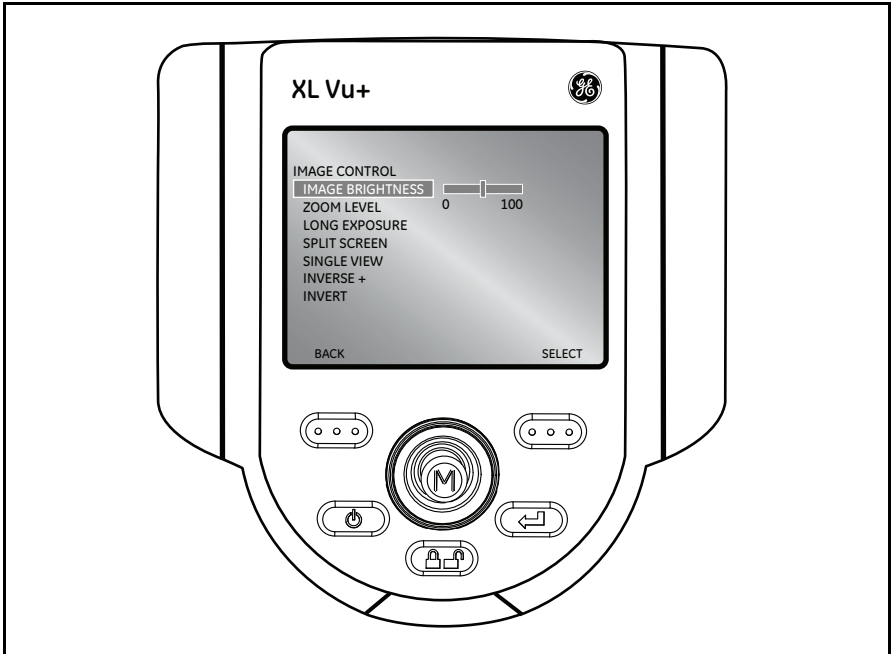


Figure 21: Live Main Menu > Image Control > Image Brightness

4.2.2b *Live Main Menu > Image Control > Zoom Level*

Navigate to ZOOM LEVEL from the IMAGE CONTROL Menu (see *Figure 22* below), and use the joystick to adjust the zoom level. Digital zoom levels from 1x to 5x may be selected.

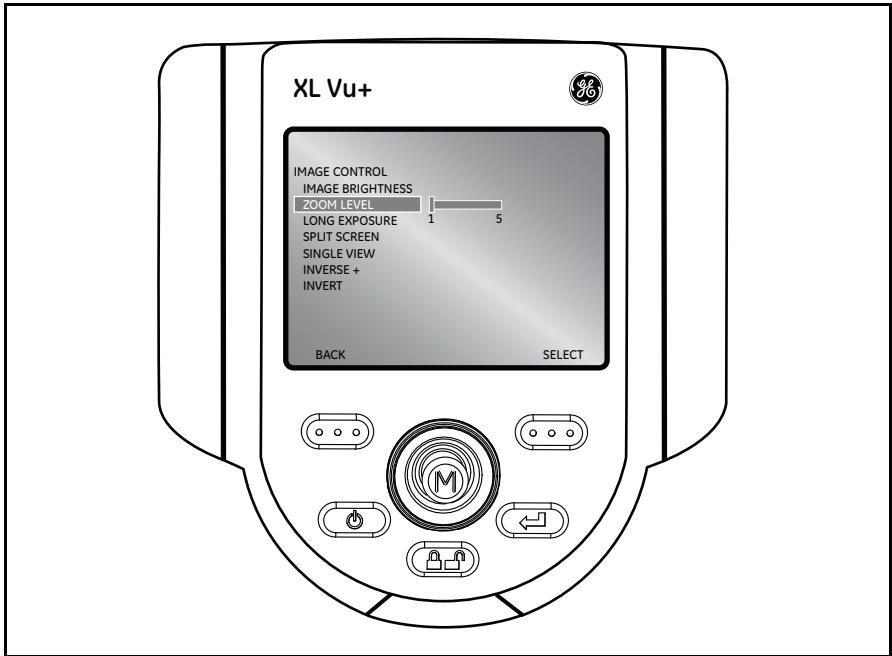



Figure 22: Live Main Menu > Image Control > Zoom Level

4.2.2c Live Main Menu > Image Control > Long Exposure

The XL Vu+ system can brighten the image by varying the exposure time. Keep the probe tip as still as possible when capturing an image with a long exposure, to minimize the risk of blurring.

Navigate to the **LONG EXPOSURE** option (see *Figure 23* below) to choose manual exposure, automatic long exposure, or to turn long exposure off. Long

Exposure may be turned off in live video mode by pressing the  Power/Exit button.

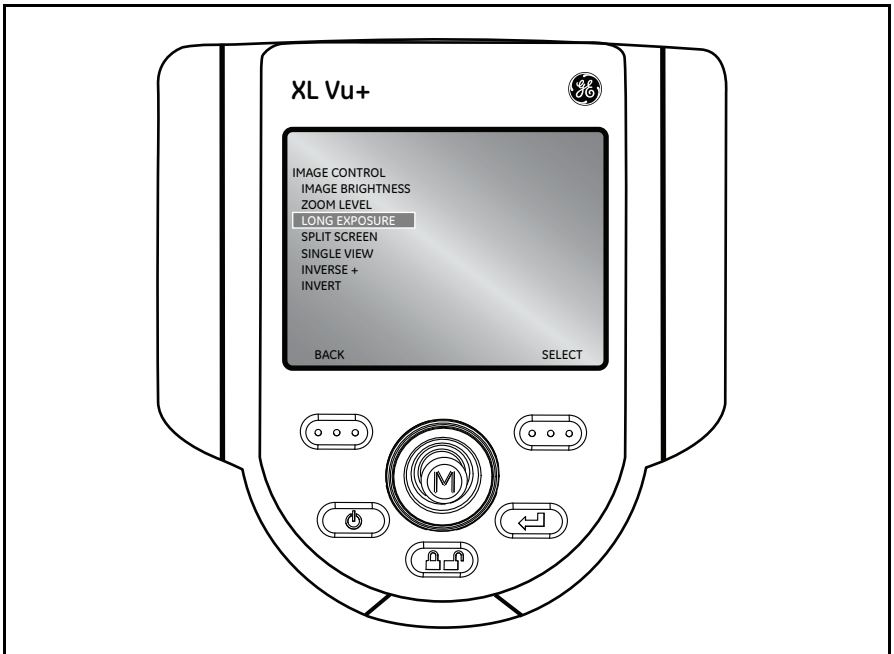


Figure 23: Live Main Menu > Image Control > Long Exposure

4.2.2c Live Main Menu > Image Control > Long Exposure (cont.)

After selecting LONG EXPOSURE (see *Figure 24* below), the following options are available: MANUAL, AUTO and OFF.

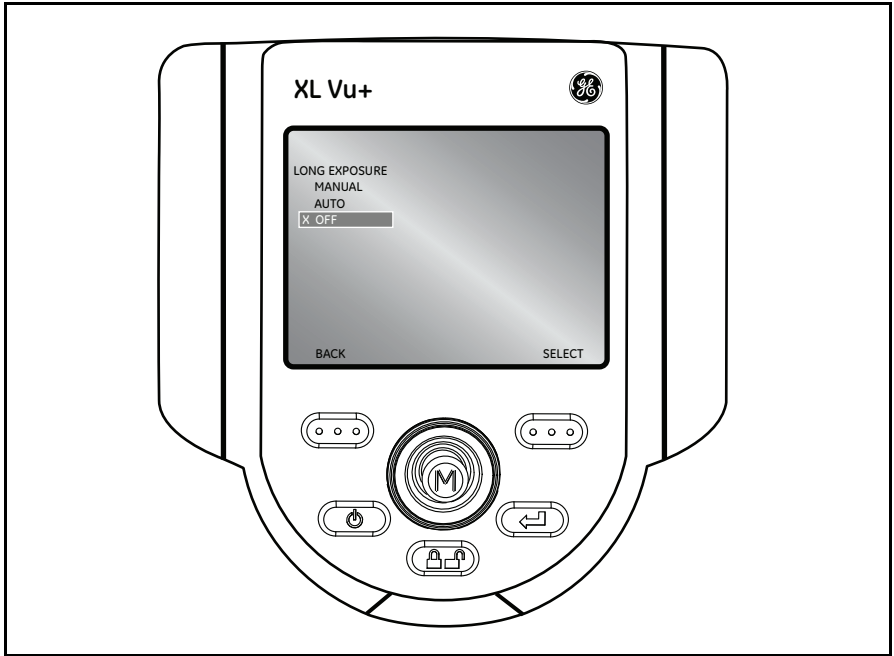




Figure 24: The Live Main Menu > Image Control > Long Exposure Options

4.2.2d Live Main Menu > Image Control > Split Screen

From a live, frozen, or recalled image, press the joystick to access the LIVE MAIN MENU > FREEZE FRAME Menu or the LIVE MAIN MENU > RECALLED IMAGE Menu. Navigate to the SPLIT SCREEN option (see *Figure 25* below), and press the  right soft key to SELECT. Choose the area of the screen to view by moving the joystick left or right and using the  right soft key to SELECT. The left image is frozen and the right image is live.

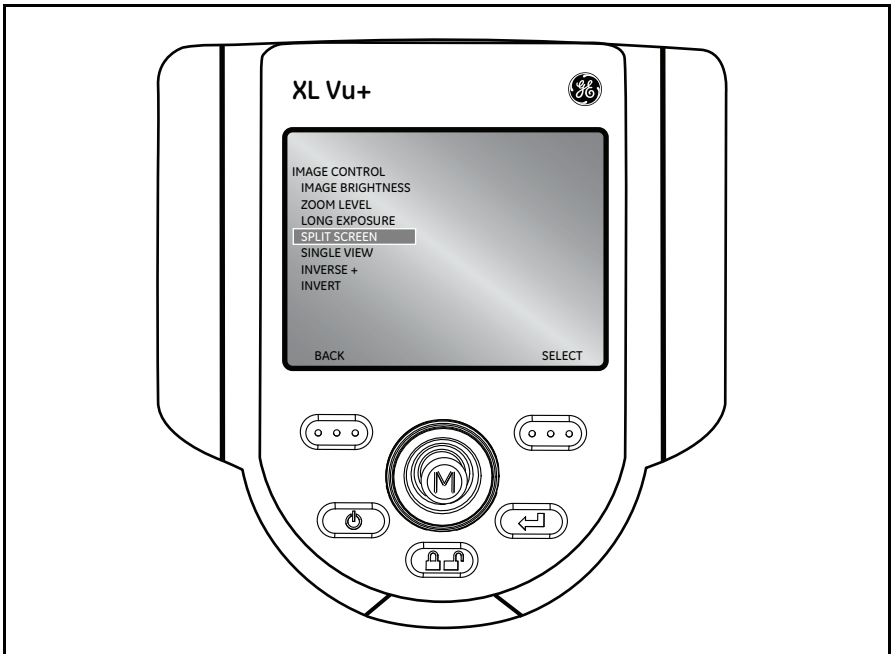


Figure 25: Live Main Menu > Image Control > Split Screen

4.2.2e Live Main Menu > Image Control > Single View

While using a stereo tip, SINGLE VIEW temporarily eliminates the second image. To access this feature, navigate to SINGLE VIEW from the IMAGE CONTROL Menu (see Figure 26 and Figure 27 below), and select ON or OFF. Pressing the


 Power/Exit button from live video disables SINGLE VIEW.



Figure 26: Live Main Menu > Image Control > Single View



Figure 27: Sample Single View Image

4.2.2f Live Main Menu > Image Control > Inverse +

The INVERSE + option reverses the brightness of the image, similar to a photographic negative. This enhances the image contrast, making subtle details more visible. To activate or deactivate this function, navigate to The INVERSE + option (see *Figure 28* below), and choose either ON or OFF.

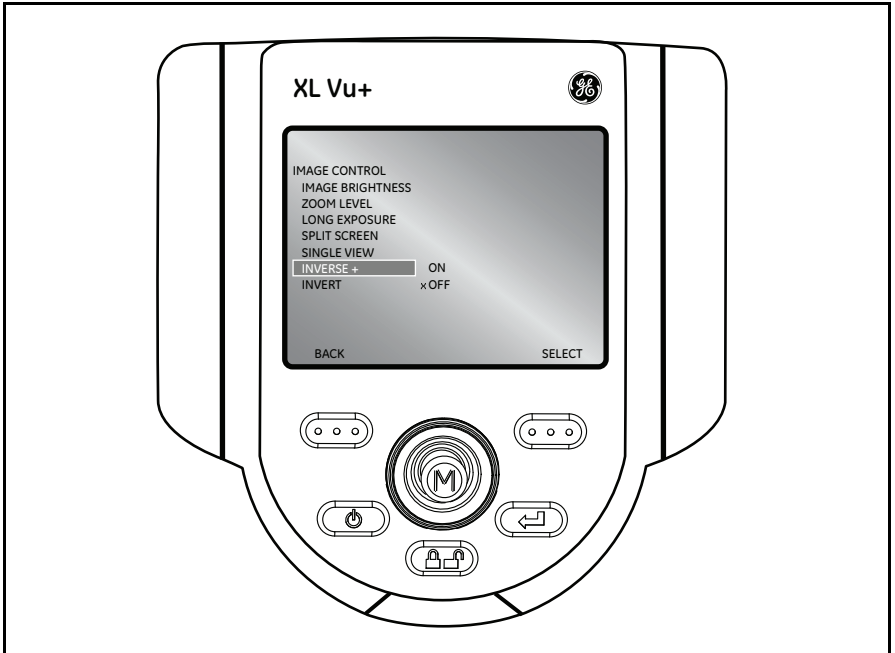


Figure 28: Live Main Menu > Image Control > Inverse +

4.2.2g Live Main Menu > Image Control > Invert

The INVERT function flips an image horizontally. To activate or deactivate this function, navigate to the INVERT option (see *Figure 29* below), and choose either ON or OFF.

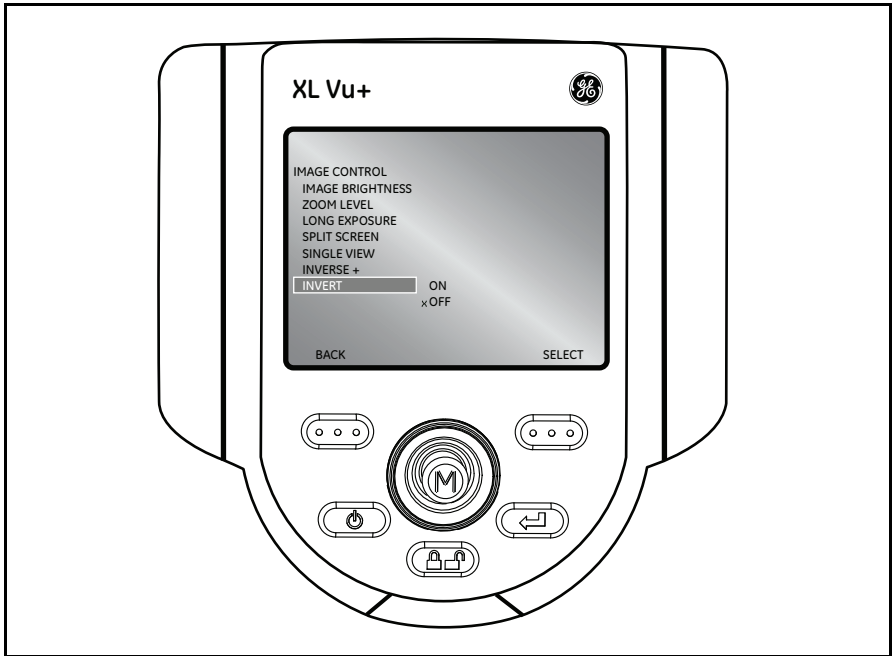


Figure 29: Live Main Menu > Image Control > Invert

Note: INVERT is typically used while a side view tip is installed in order to compensate for the inversion caused by this type of tip.

4.2.3 Live Main Menu > Annotation

Annotating an XL Vu+ image means adding *text or arrows* to describe or point out areas of interest such as cracks, defects, etc. Annotation may be used on live, frozen, and recalled images.

Note: See the FREEZE FRAME Menu to enable Audio Annotation.

To program the annotation settings, press the joystick to activate the LIVE MAIN MENU, and select the ANNOTATION option (see *Figure 30* below).



Figure 30: The Live Main Menu > Annotation Menu

Note: A maximum of 3 lines of text/arrows are allowed per annotation.

The following *Annotation* options are available:

- Arrow (see page 43)
- Preset (see page 44)
- Loading a Preset (see page 45)
- Hide Annotation (see page 46)
- Text (see page 47)

4.2.3 Live Main Menu > Annotation (cont.)

4.2.3a Asian Input Method Editors

The XL Vu+ supports text entry with advanced input methods for *Simplified Chinese* (Pinyin) and *Japanese* (Hiragana to Katakana/Kanji). To utilize these input methods, the user must have an external keyboard connected to the VideoProbe. These input methods are active by default when either Chinese or Japanese are selected as the system language. To return to an on-screen keyboard that does not utilize these input methods, toggle the “Input Method -/O” button.

Chinese:

The XL Vu+ supports the *Pinyin* text entry method. For each word or phrase that you wish to enter, complete the following steps:

1. Using the external keyboard, type the Pinyin representation of the character to be entered.
2. Use the numbers on the external keyboard to select the desired character from the candidate list.
3. Press the ENTER key to confirm the selection.

Japanese:

The XL Vu+ supports a text entry method that converts *Hiragana* to *Katakana* and *Kanji* characters. For each word or phrase you wish to enter, complete the following steps:

Note: *A maximum of 6 Hiragana may be entered for each word or phrase during Japanese text entry.*

1. Using the external keyboard, enter the *Hiragana* that make up the word being entered.
2. When all of the *Hiragana* that make up the word is entered, press the SPACE BAR on the external keyboard to get a candidate list of characters.
3. Use the numbers on the keyboard to select the desired word.
4. Press the ENTER key to confirm selection.

Note: *If the desired word is not shown in the candidate list, press Page Up/Page Down on the keyboard to cycle through more options.*

4.2.3b Live Main Menu > Annotation > Arrow

To add, edit or clear arrows on a specific image, select **ARROW** from the **ANNOTATION** menu (see *Figure 31* below).

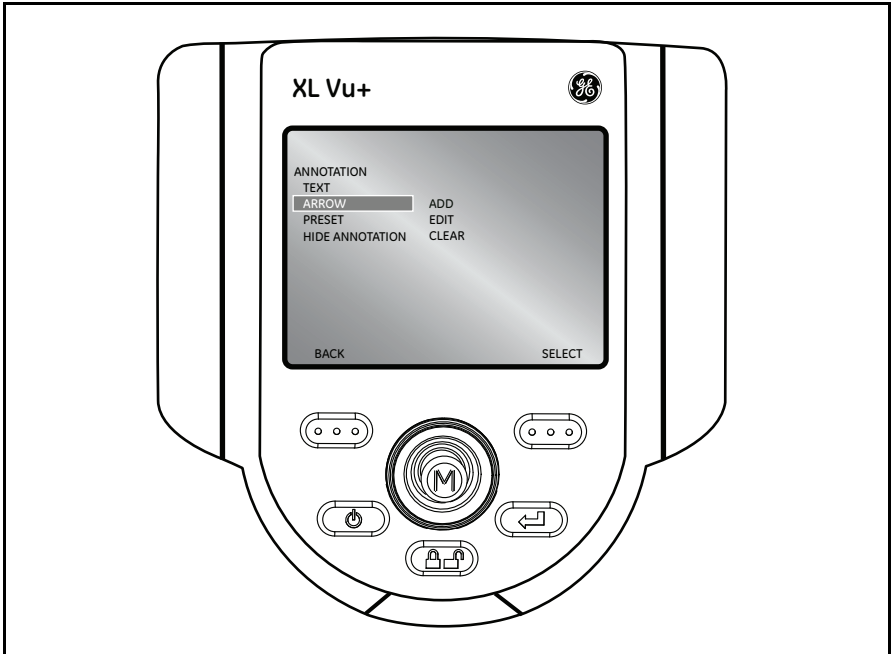


Figure 31: Live Main Menu > Annotation > Arrow

Note: The maximum number of arrow annotations is 25.

4.2.3c Live Main Menu > Annotation > Preset

To create, recall or delete a preset annotation that displays throughout an inspection or to load or export a file containing presets, choose **PRESET** from the **ANNOTATION** menu (see *Figure 32* below).

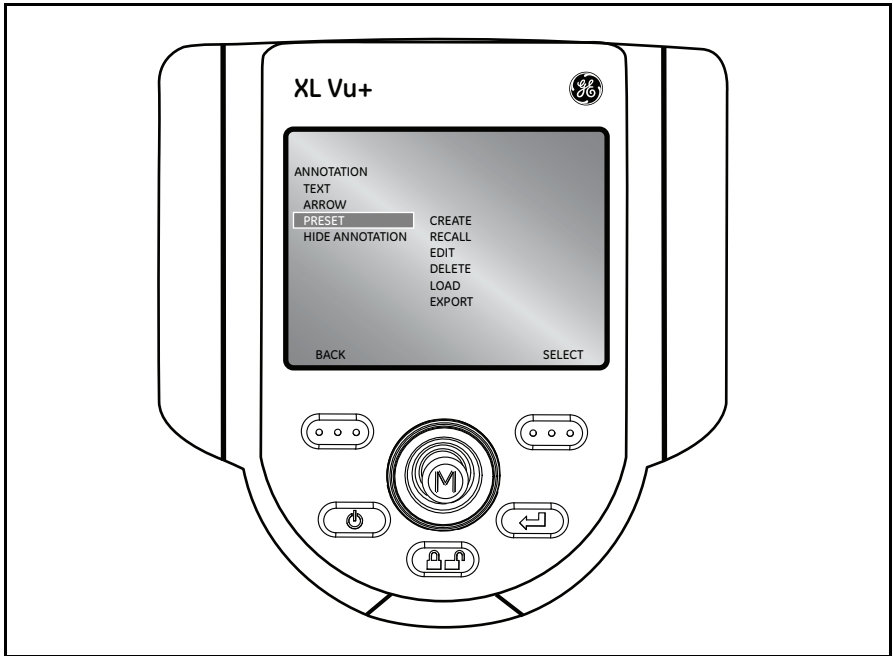


Figure 32: Live Main Menu > Annotation > Preset

Note:

- The maximum number of preset annotations is 100.
- Preset files must be line-delimited .txt files.
- The maximum preset annotation length is calculated by character width (approximately 28 characters).

4.2.3d Live Main Menu > Annotation > Loading a Preset

To load a file containing multiple presets onto the XL Vu+, a file may be created on a PC. This file must conform to the following specifications:

- Line-delimited (each preset must be on a separate line)
- File Type - .txt
- Encoding - UTF8
- Recommended Program - Microsoft™ Notepad

When saving the document, select .txt as the file type and UTF-8 as the encoding, as shown in the example in *Figure 33* below.

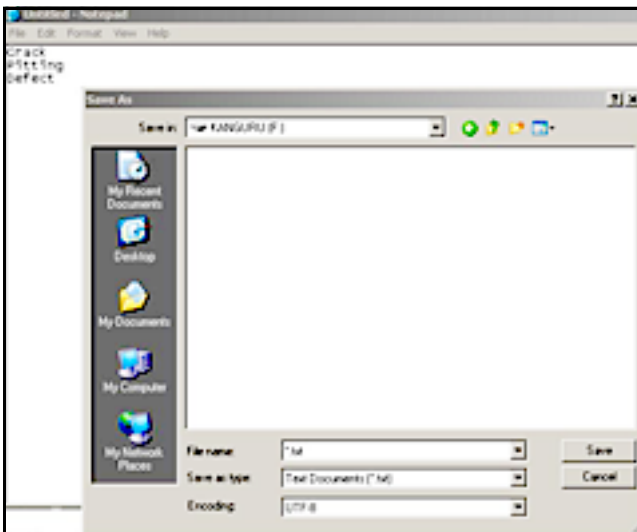


Figure 33: Saving a Preset File

To load the Preset File, complete the following steps:

1. Save the Preset.txt file onto external media (CF Card, USB Thumb Drive, etc).
2. Insert the external media into the XL Vu+.
3. Access the LIVE MAIN MENU by pressing the joystick.
4. Navigate to ANNOTATION, and then select PRESET > LOAD.
5. Locate and specify the file that you have created.

4.2.3e Live Main Menu > Annotation > Hide Annotation

To hide or unhide (i.e., display) an annotation, select HIDE ANNOTATION from the ANNOTATION menu (see *Figure 34* below), and SELECT either ON or OFF.

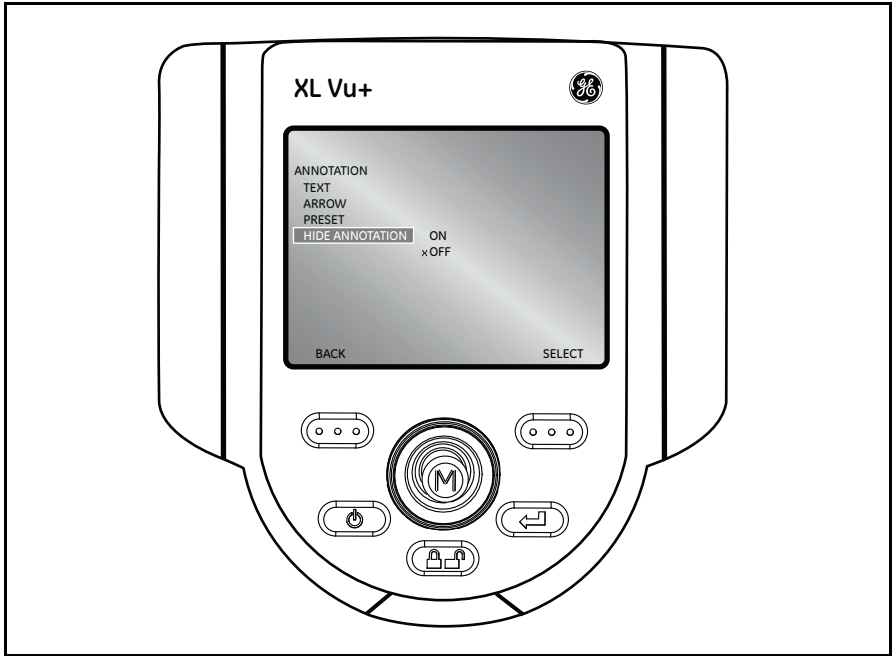


Figure 34: Live Main Menu > Annotation > Hide Annotation

4.2.3f Live Main Menu > Annotation > Text

To add, edit, or clear text on a specific image, navigate to the ANNOTATION menu, and SELECT the TEXT option (see *Figure 35* below). A maximum of 50 characters per annotation may be added at the screen shown in *Figure 36* below.

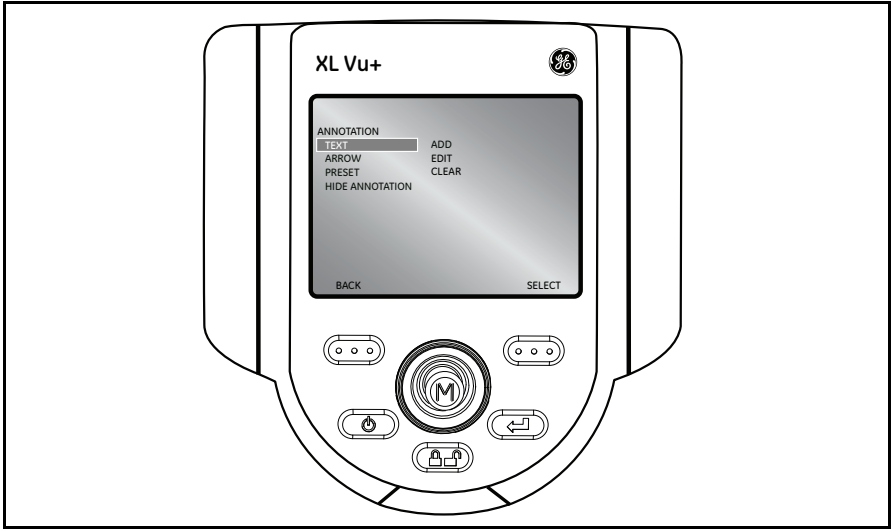


Figure 35: Live Main Menu > Annotation > Text

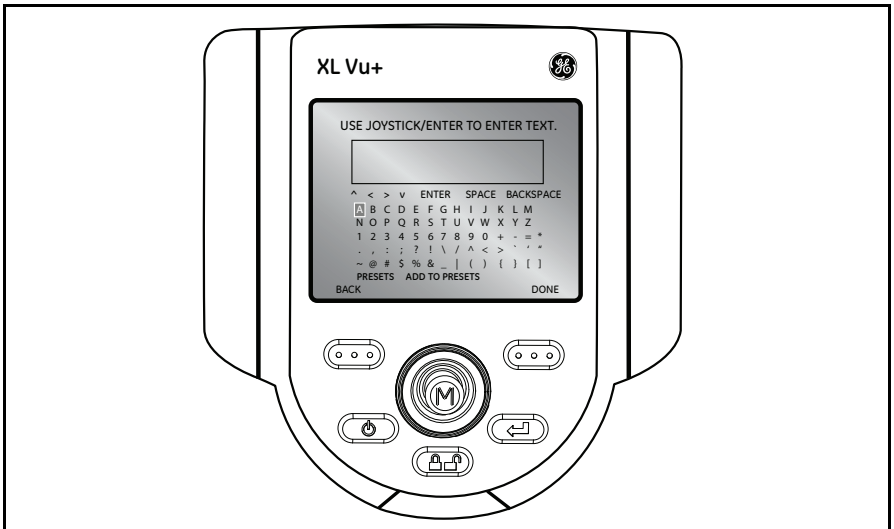



Figure 36: Keypad Text Entry Screen

4.2.4 Live Main Menu > Eject Hardware

To eject a USB thumb drive before removal, use the joystick to navigate to the right of the EJECT HARDWARE option (see *Figure 37* below). To eject the desired drive, press the  right soft key, labeled SELECT on the LCD above.

Note: *Always use EJECT HARDWARE before removing a USB thumb drive, to prevent loss of data.*

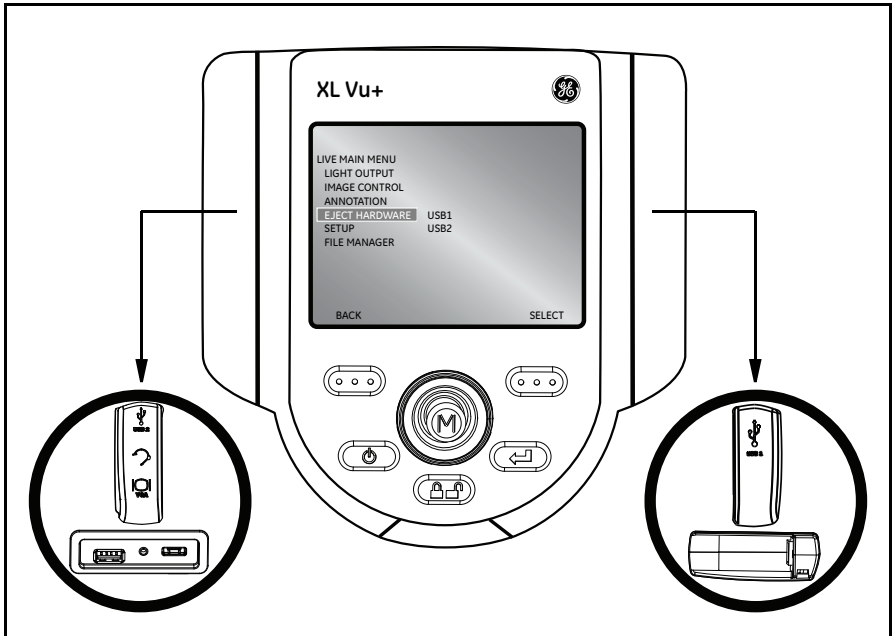


Figure 37: The Live Main Menu > Eject Hardware Menu

4.2.5 Live Main Menu > Setup

To change the XL Vu+ default settings, select **SETUP** (see *Figure 38* below). For more information on using this menu, see “*Live Main Menu > Setup*” on page 51.




Figure 38: The Live Main Menu > Setup Menu

[no content intended for this page]

Chapter 5. Operation

5.1 Live Main Menu > Setup

The *System Setup* Menu accesses the XL Vu+ default settings. To exit any menu, press  Power/Exit.

5.1.1 Live Main Menu > Setup > Screen/Display

To alter the display setup, press the joystick to activate the LIVE MAIN MENU. Then, select SETUP followed by SCREEN/DISPLAY (see *Figure 39* below).



Figure 39: Live Main Menu > Setup > Screen/Display

The following *Screen/Display* options are available:

- Battery Icon (see *page 52*)
- Date/Time (see *page 53*)
- Logo (see *page 54*)
- Text Color (see *page 55*)
- Temp Icon (see *page 56*)
- White Balance (see *page 57*)

5.1.1a Live Main Menu > Setup > Screen/Display > Battery Icon

To enable and disable the battery icon from the SCREEN DISPLAY menu, select BATTERY ICON followed by either ON or OFF (see *Figure 40* below).

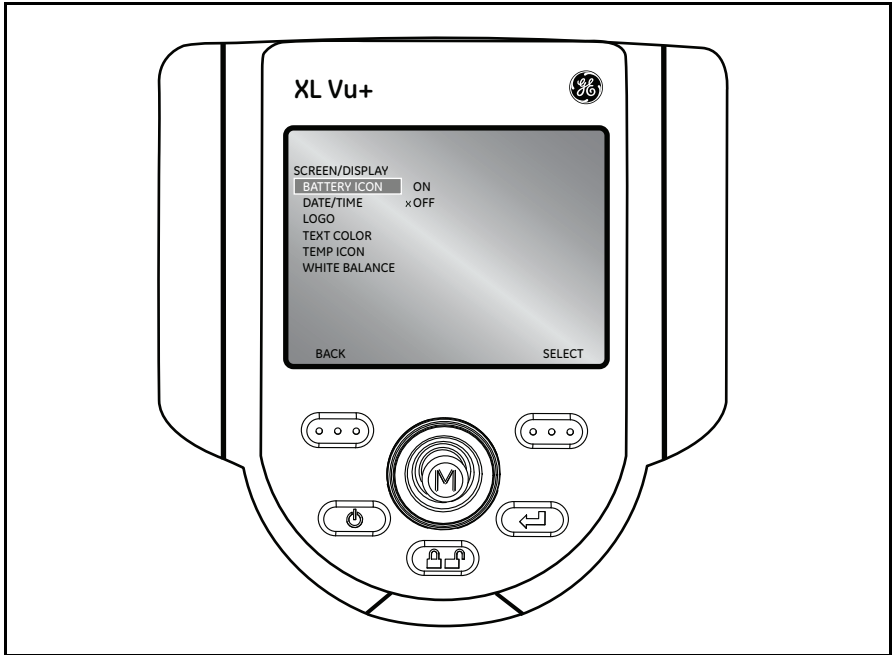


Figure 40: Live Main Menu > Setup > Screen Display > Battery Icon

5.1.1b Live Main Menu > Setup > Screen/Display > Date/Time

To enable or disable the date/time stamp, as well as set the date and time from the SCREEN DISPLAY menu, select DATE/TIME (see *Figure 41* below).

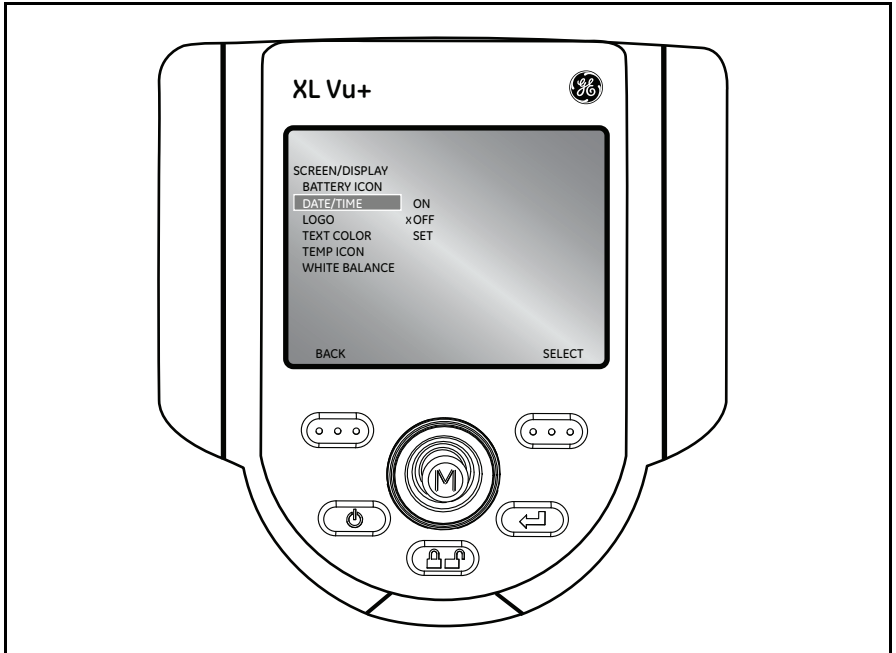


Figure 41: Live Main Menu > Setup > Screen Display > Date/Time

5.1.1c Live Main Menu > Setup > Screen/Display > Logo

A logo may be added to the screen, using a file named `logo.jpg`. To load a logo, or to turn a logo on or off, select LOGO from the SCREEN/DISPLAY menu and select the desired option (see *Figure 42* below).

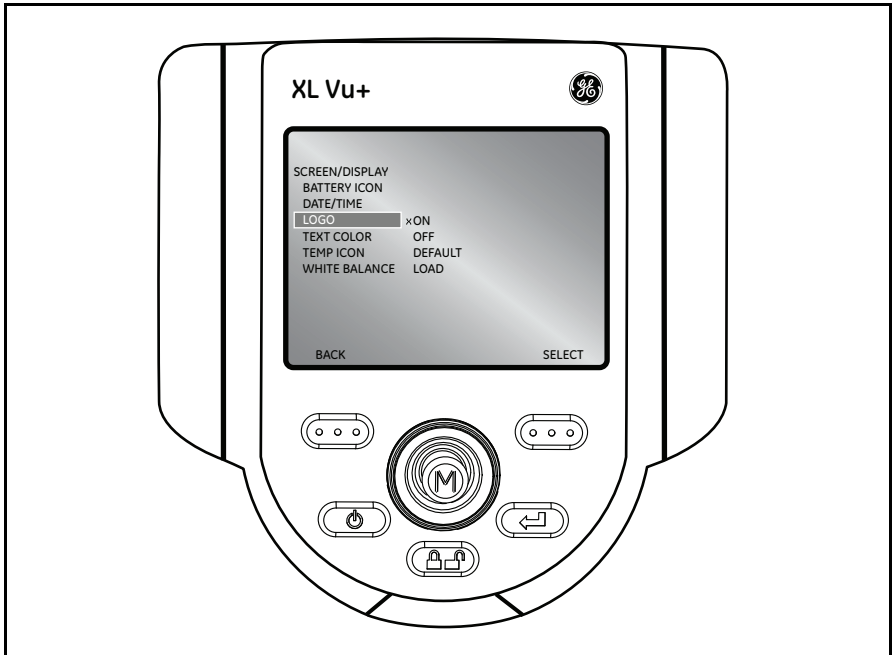


Figure 42: Live Main Menu > Setup > Screen Display > Logo

Note: See “Creating a Personalized Logo File” on page 143 for details on creating a logo file.

5.1.1d Live Main Menu > Setup > Screen/Display > Text Color

The most legible text color will vary with the coloring and brightness of the image. To change the color of the text displayed over images, select **TEXT COLOR** from the **SCREEN/DISPLAY** menu (see *Figure 43* below), followed by **GREEN**, **BLACK** or **WHITE**.

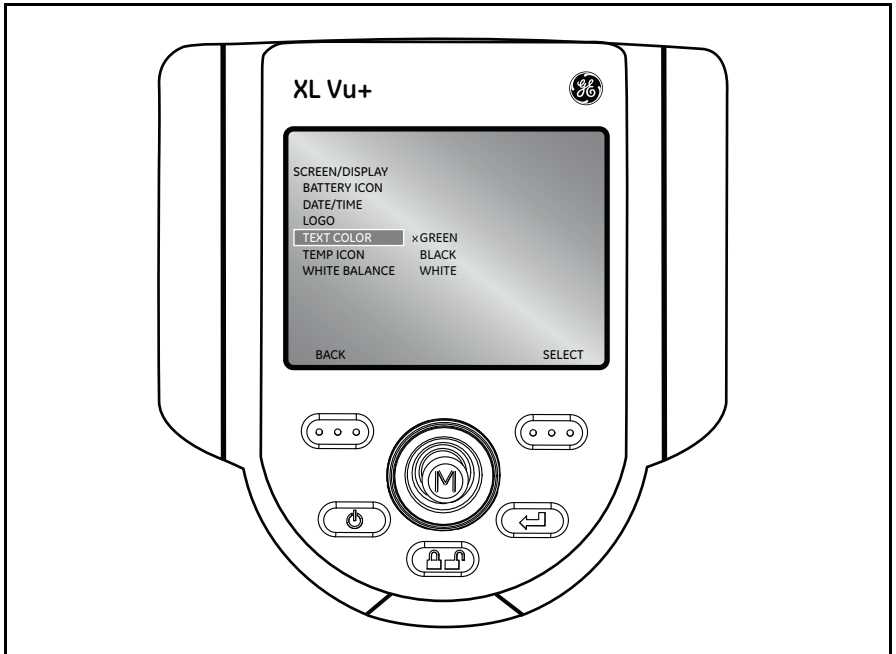


Figure 43: Live Main Menu > Setup > Screen Display > Text Color

5.1.1e Live Main Menu > Setup > Screen/Display > Temp Icon

To enable or disable the temperature icon on systems equipped with the temperature warning system, select TEMP ICON from the SCREEN/DISPLAY menu (see *Figure 44* below), followed by either ON or OFF.

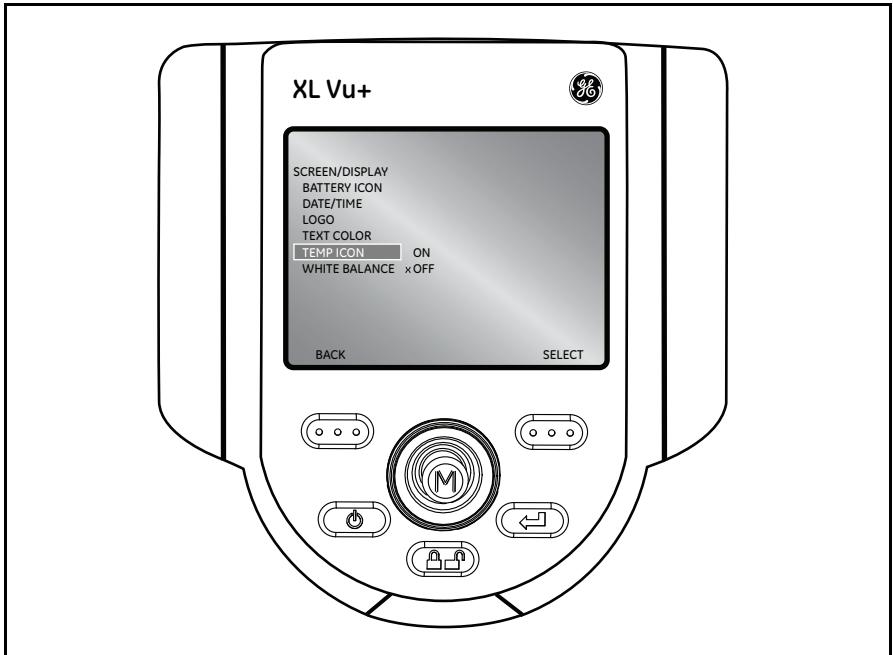


Figure 44: Live Main Menu > Setup > Screen Display > Temp Icon

5.1.1f Live Main Menu > Setup > Screen/Display > White Balance

White balance corrects color so that white appears white despite any slight hues that may be present under varying lighting and ambient conditions.

To execute white balance, select the **WHITE BALANCE** option from the **SCREEN/DISPLAY** menu (see *Figure 45* below). The available options are to either set a *custom* white balance or use the *default* settings.

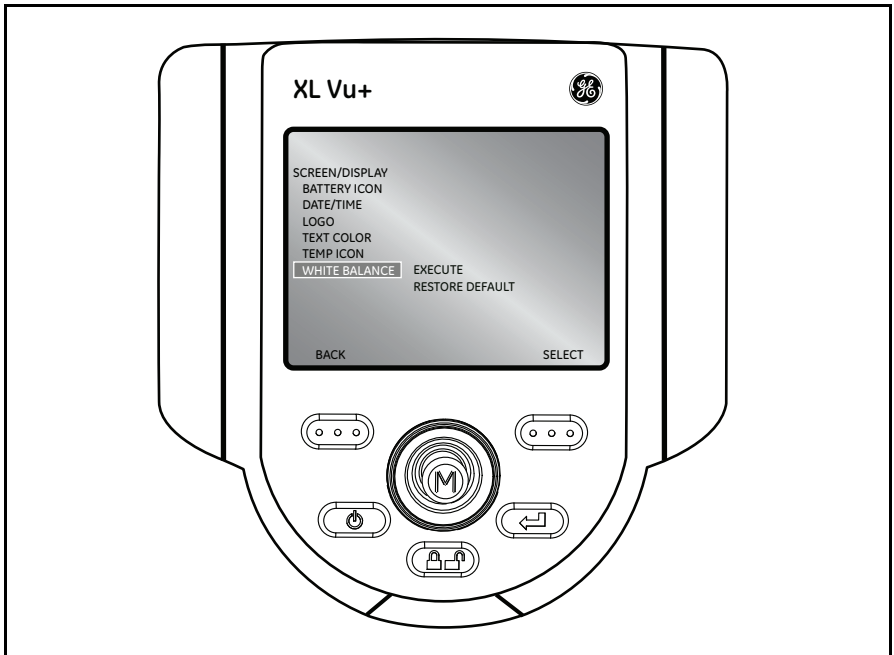


Figure 45: Live Main Menu > Setup > Screen Display > White Balance

5.1.2 Live Main Menu > Setup > Measurement Setup

To change the MEASUREMENT SETUP defaults, press the joystick to activate the LIVE MAIN MENU. Then, select SETUP followed by MEASUREMENT SETUP (see *Figure 46* below).

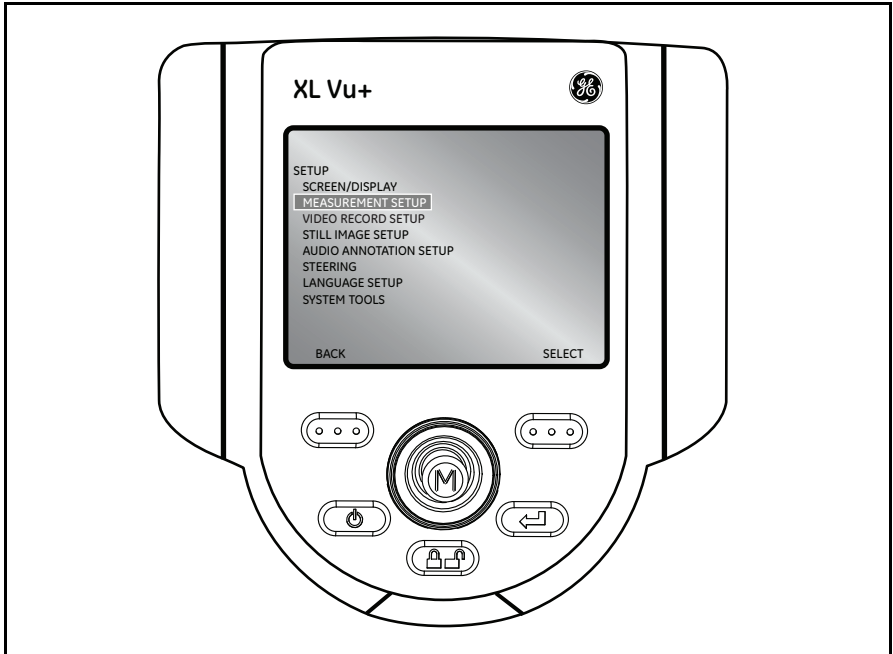


Figure 46: Live Main Menu > Setup > Measurement Setup

The following *Measurement Setup* options are available:

- Stereo Tip Utilities (see *page 59*)
- Accuracy Index (see *page 64*)
- Shadow Tip Utilities (see *page 61*)
- User Prompts (see *page 65*)
- Measurement Units (see *page 63*)

5.1.2a Live Main Menu > Setup > Measurement Setup > Stereo Tip Utilities

To access **STEREO TIP UTILITIES**, press the joystick to activate the **LIVE MAIN MENU**. Then, select **SETUP**, followed by **MEASUREMENT SETUP**, followed by **STEREO TIP UTILITIES** (see *Figure 47* below).

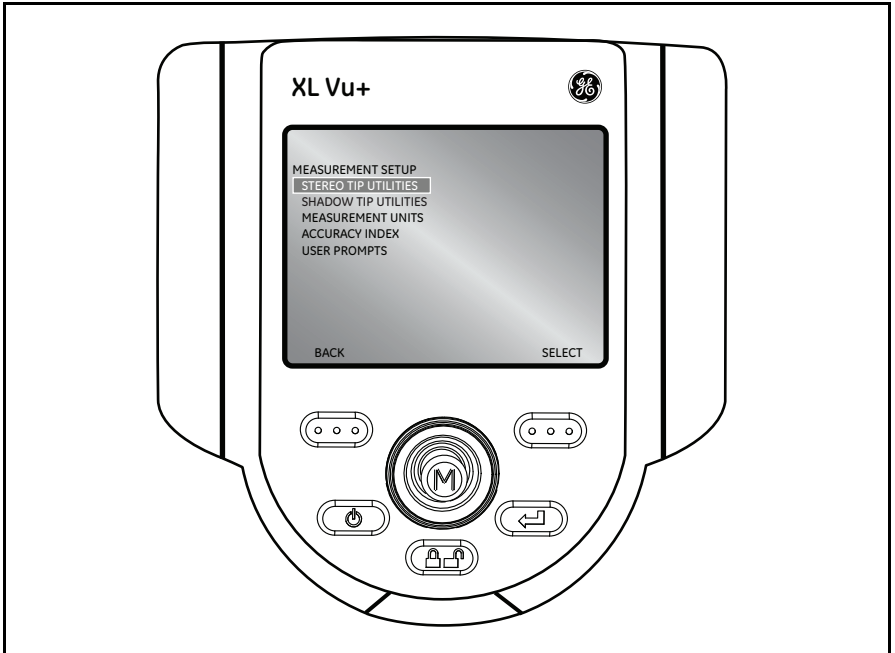


Figure 47: Live Main Menu > Setup > Measurement Setup > Stereo Tip Utilities

**Live Main Menu > Setup > Measurement Setup >
Stereo Tip Utilities > Cal Info**

To verify which stereo tip optics are calibrated to the probe, press the joystick to activate the LIVE MAIN MENU. Select SETUP, followed by STEREO TIP UTILITIES, followed by CAL INFO (see *Figure 48* below) to view the tip optic serial numbers.



**Figure 48: Live Main Menu > Setup > Measurement Setup >
Stereo Tip Utilities > Cal Info**

**Live Main Menu > Setup > Measurement Setup >
Stereo Tip Utilities > Add Tip**

IMPORTANT: *This menu is NOT FOR USE BY THE END USER.*

The ADD TIP menu feature allows stereo measurement tips to be added to the XL Go by your local service center.

5.1.2b Live Main Menu > Setup > Measurement Setup > Shadow Tip Utilities

To access **SHADOW TIP UTILITIES**, press the joystick to activate the **LIVE MAIN MENU**. Then, select **SETUP**, followed by **MEASUREMENT SETUP**, followed by **SHADOW TIP UTILITIES** (see *Figure 49* below).

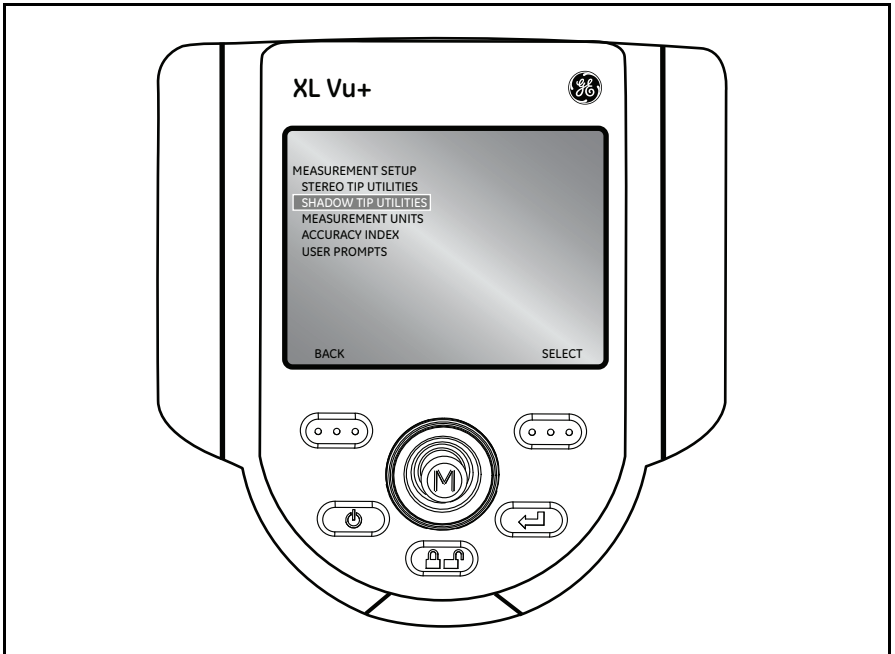


Figure 49: Live Main Menu > Setup > Measurement Setup > Shadow Tip Utilities

**Live Main Menu > Setup > Measurement Setup >
Shadow Tip Utilities > Cal Info**

To verify which shadow tip optics are calibrated to the probe, press the joystick to activate the LIVE MAIN MENU. Select SETUP, followed by SHADOW TIP UTILITIES, followed by CAL INFO (see *Figure 50* below) to view the tip optic serial numbers.



**Figure 50: Live Main Menu > Setup > Measurement Setup >
Shadow Tip Utilities > Cal Info**

5.1.2c Live Main Menu > Setup > Measurement Setup > Measurement Units

To change the MEASUREMENT UNITS, press the joystick to activate the LIVE MAIN MENU. Then, select SETUP, followed by MEASUREMENT, followed by MEASUREMENT UNITS, followed by INCHES or MM (see *Figure 51* below).

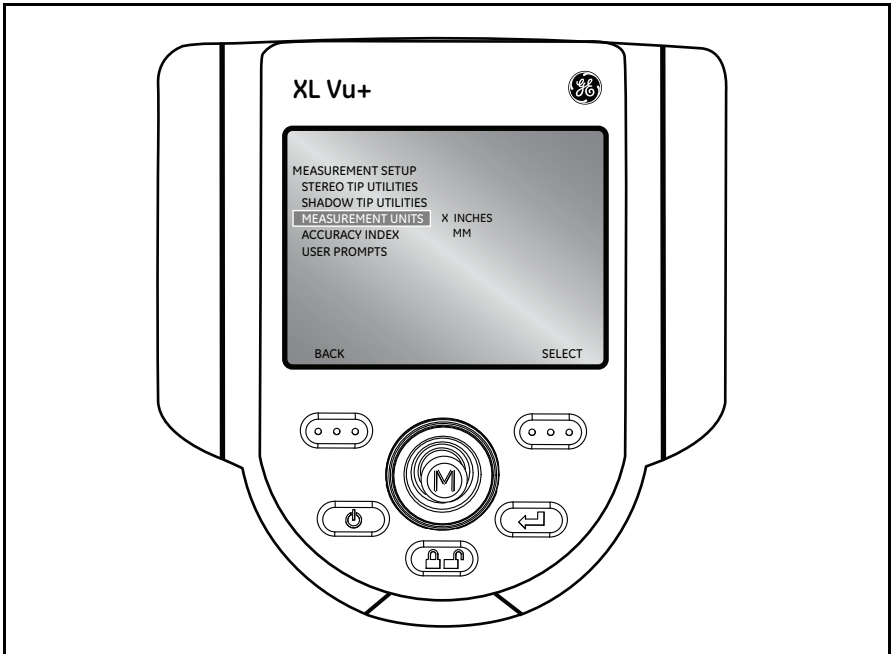


Figure 51: Live Main Menu > Setup > Measurement Setup > Measurement Units

5.1.2d Live Main Menu > Setup > Measurement Setup > Accuracy Index

To enable or disable ACCURACY INDEX, press the joystick to activate the LIVE MAIN MENU. Then, select SETUP, followed by MEASUREMENT SETUP, followed by ACCURACY INDEX (see Figure 52 below).

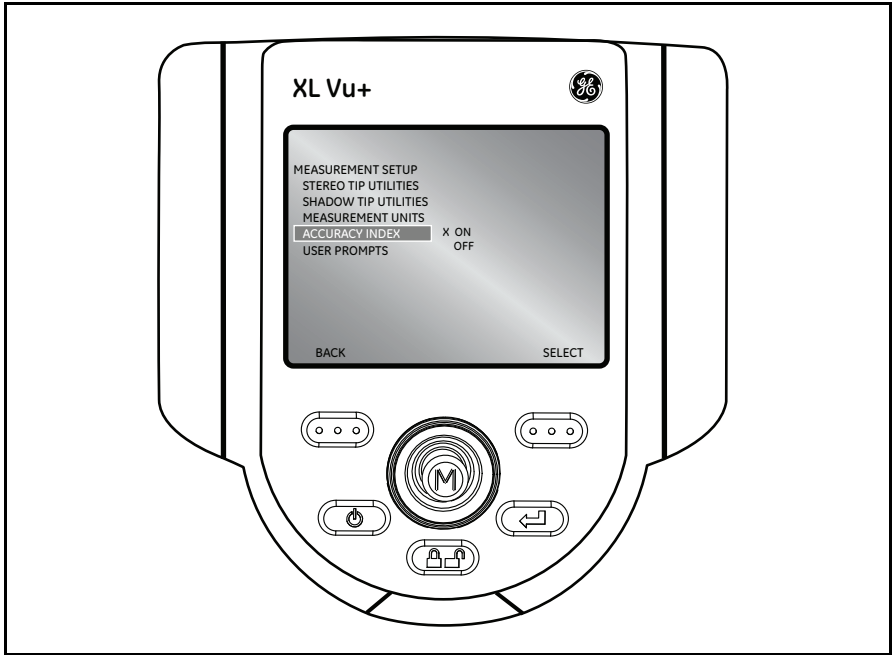


Figure 52: Live Main Menu > Setup > Measurement Setup > Accuracy Index

Note: *This feature allows the Accuracy Index to be shown on-screen during Shadow and Stereo measurements.*

5.1.2e Live Main Menu > Setup > Measurement Setup > User Prompts

To enable or disable **USER PROMPTS**, press the joystick to activate the **LIVE MAIN MENU**. Then, select **SETUP**, followed by **MEASUREMENT SETUP**, followed by **USER PROMPTS** (see *Figure 53* below).

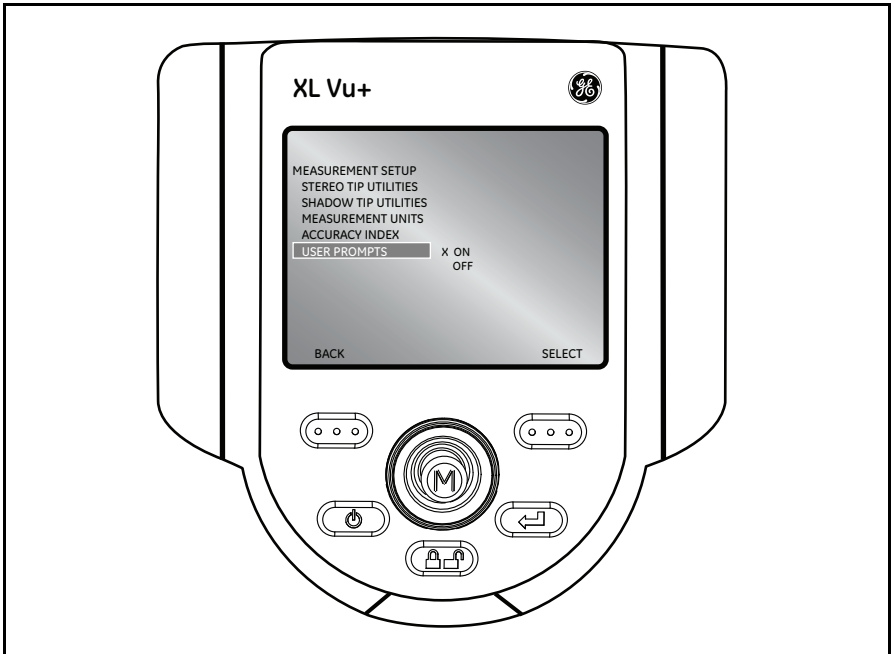


Figure 53: Live Main Menu > Setup > Measurement Setup > User Prompts

This feature allows advanced users to disable user prompts when in measurement mode.

IMPORTANT: *Only a trained professional should turn off user prompts.*

5.1.3 Live Main Menu > Setup > Video Record Setup

To change video record defaults, press the joystick to activate the LIVE MAIN MENU. Then, select SETUP followed by VIDEO RECORD SETUP (see *Figure 54* below).

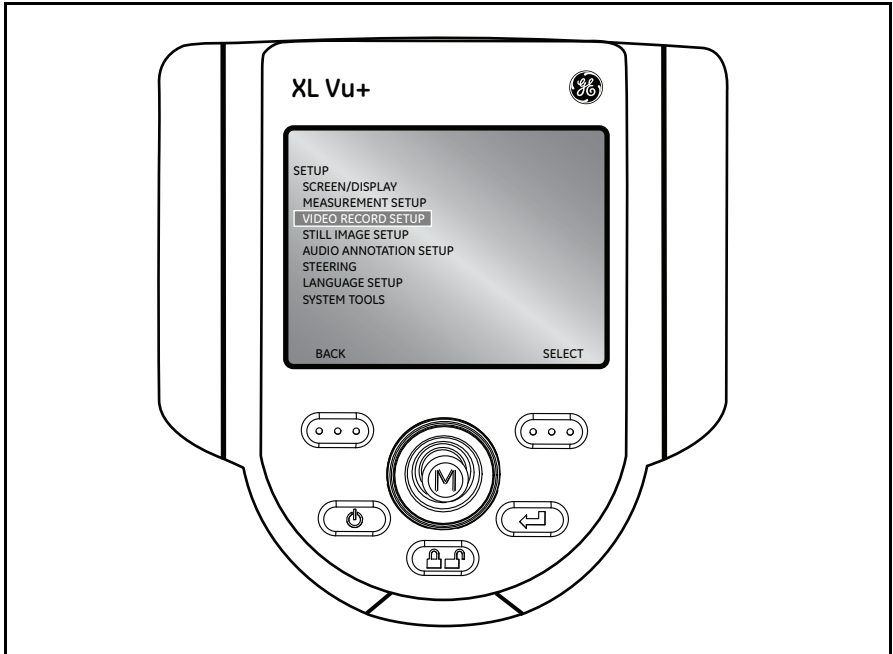


Figure 54: Live Main Menu > Setup > Video Record Setup

5.1.3a Live Main Menu > Setup > Video Record Setup > Save Location

Select **SAVE LOCATION** from the **VIDEO RECORD SETUP** menu and navigate to the desired location (see *Figure 55* below).

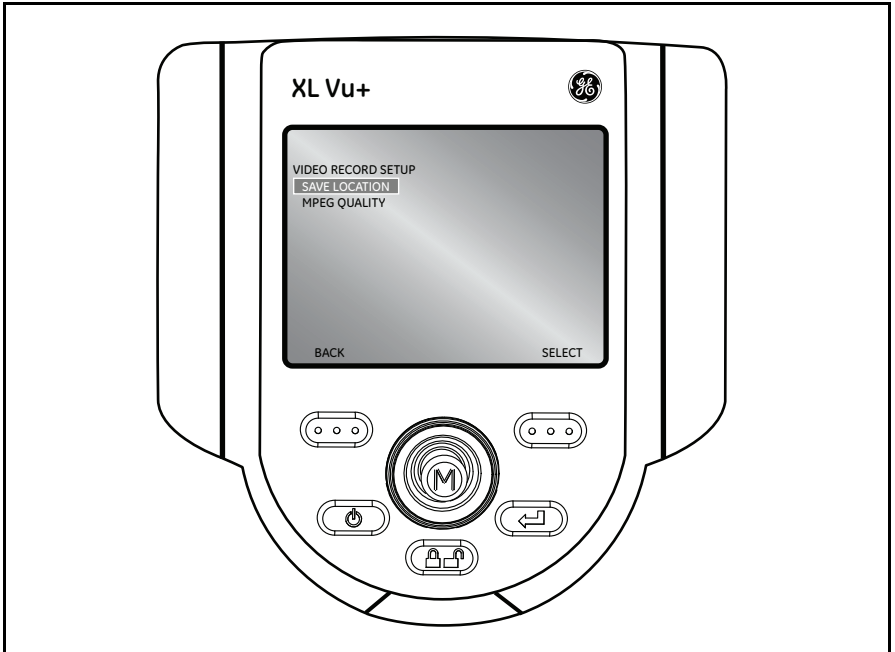


Figure 55: Live Main Menu > Setup > Video Record Setup > Save Location

5.1.3b Live Main Menu > Setup > Video Record Setup > MPEG Quality

To set the video quality, select MPEG QUALITY from the VIDEO RECORD SETUP menu, followed by LOW or HIGH (see *Figure 56* and *Table 1* below).

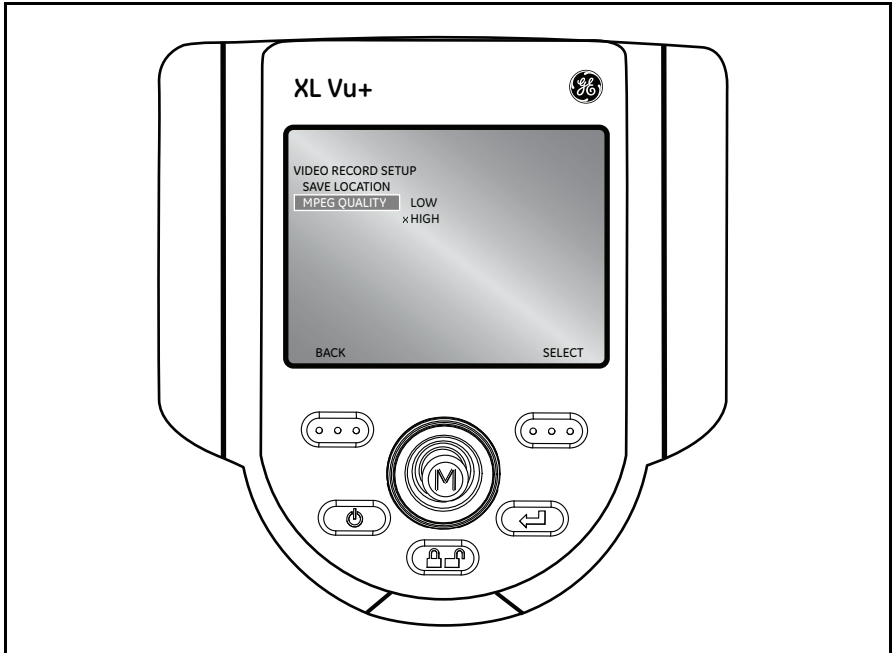


Figure 56: Live Main Menu > Setup > Video Record Setup > MPEG Quality

Table 1: MPEG Quality Options

MPEG Quality	Recording Rate	Minutes of Video (4GB thumb drive)
MPEG-4 High	4 MB/sec or 30 MB/min	~133 min
MPEG-4 Low	2 MB/sec or 15 MB/min	~266 min

5.1.4 Live Main Menu > Setup > Still Image Setup

To change the still image defaults, press the joystick to activate the LIVE MAIN MENU. Then, select SETUP, followed by STILL IMAGE SETUP (see *Figure 57* below).

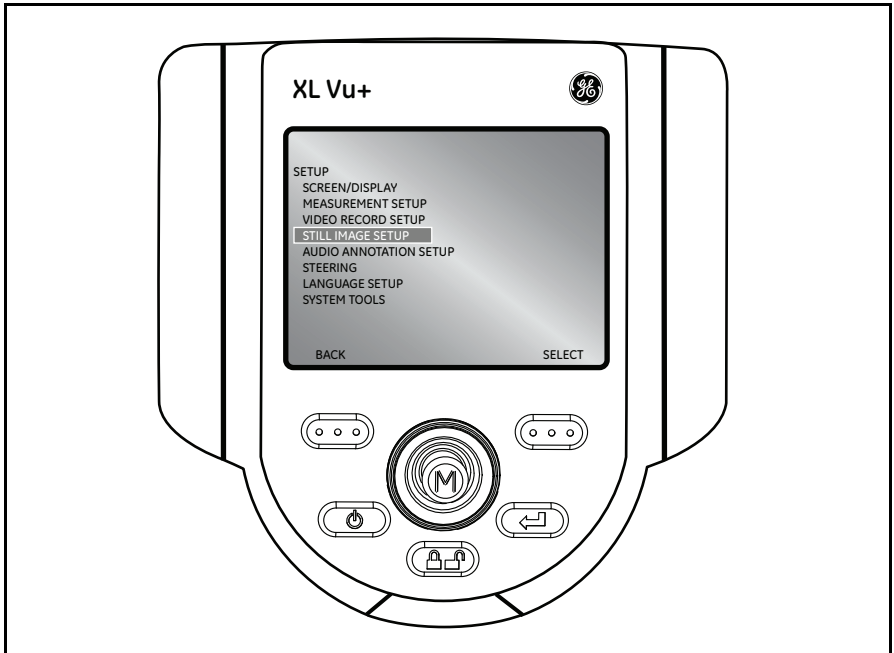


Figure 57: Live Main Menu > Setup > Still Image Setup

5.1.4a Live Main Menu > Setup > Still Image Setup > Save Location

Select **SAVE LOCATION** from the **STILL IMAGE SETUP** menu and use the joystick to navigate to the desired location (see *Figure 58* below).

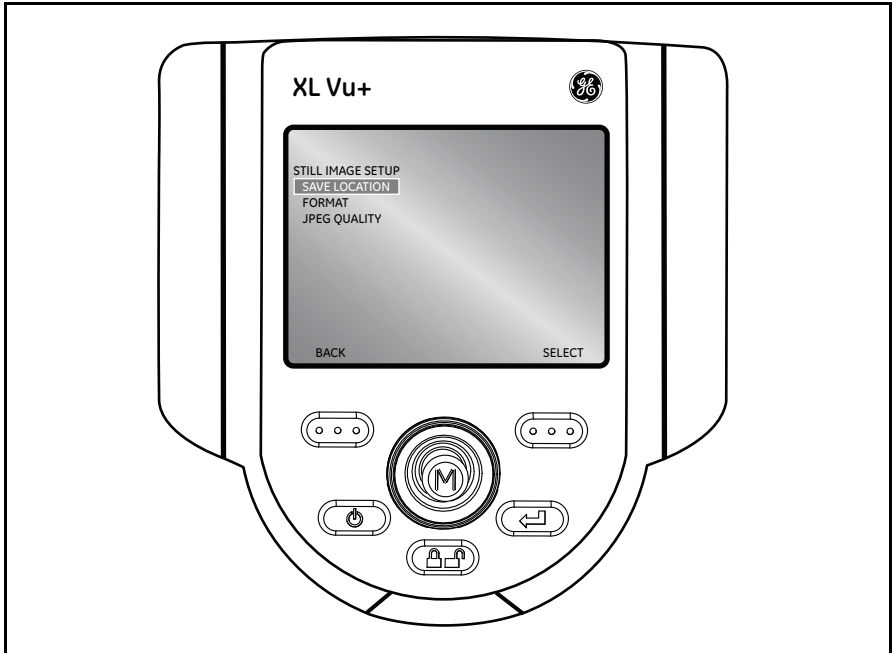


Figure 58: Live Main Menu > Setup > Still Image Setup > Save Location

5.1.4b Live Main Menu > Setup > Still Image Setup > Format

To choose the image format [*Bitmap* (BMP) or *JPEG* (JPG)], navigate to the right of **FORMAT** and select BMP or JPG (see *Figure 59* below).

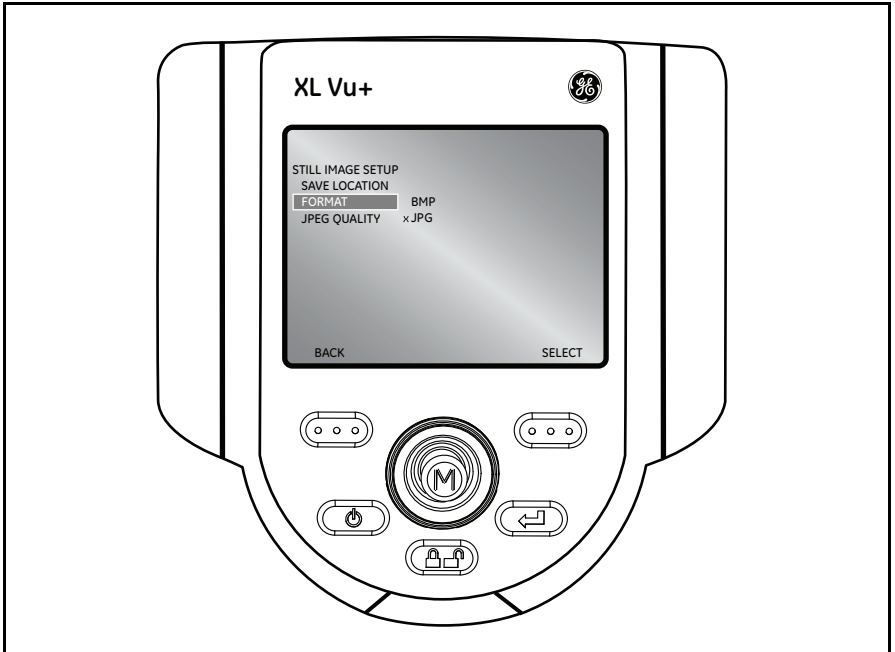


Figure 59: Live Main Menu > Setup > Still Image Setup > Format

Bitmap images are the highest quality images that can be saved. However, they also have the largest file size.

Note: *Bitmap images are the recommended file format for saving images containing measurements.*

5.1.4c Live Main Menu > Setup > Still Image Setup > JPEG Quality

To choose JPEG quality, you must first select the JPEG image format. Once selected, navigate to the right of JPEG QUALITY and select LOW or HIGH (see *Figure 60* below).



Figure 60: Live Main Menu > Setup > Still Image Setup > JPEG Quality

JPEG images use a compressed file format. They create smaller file sizes than bitmap images, but the image quality is not as good.

Note: JPEG Low is *NOT* recommended for saving images containing measurements.

5.1.5 Live Main Menu > Setup > Audio Annotation Setup

To change the audio defaults, press the joystick to activate the LIVE MAIN MENU. Then, select SETUP, followed by AUDIO ANNOTATION SETUP (see *Figure 61* below).

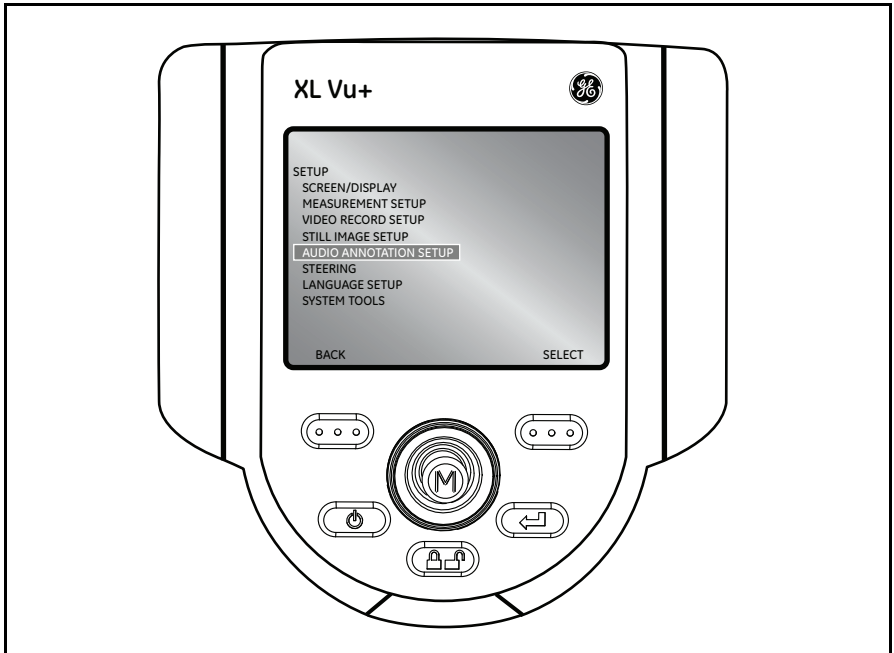


Figure 61: Live Main Menu > Setup > Audio Annotation Setup

Note: To PLAY, RECORD or DELETE AUDIO ANNOTATION, press the joystick from a frozen image. Then, select ANNOTATION followed by AUDIO.

5.1.5a Live Main Menu > Setup > Audio Annotation Setup > Playback Volume

To set the playback volume, select **PLAYBACK VOLUME** from the **AUDIO ANNOTATION SETUP** menu (see *Figure 62* below). Then, use the joystick to adjust the volume from 0 to 10.

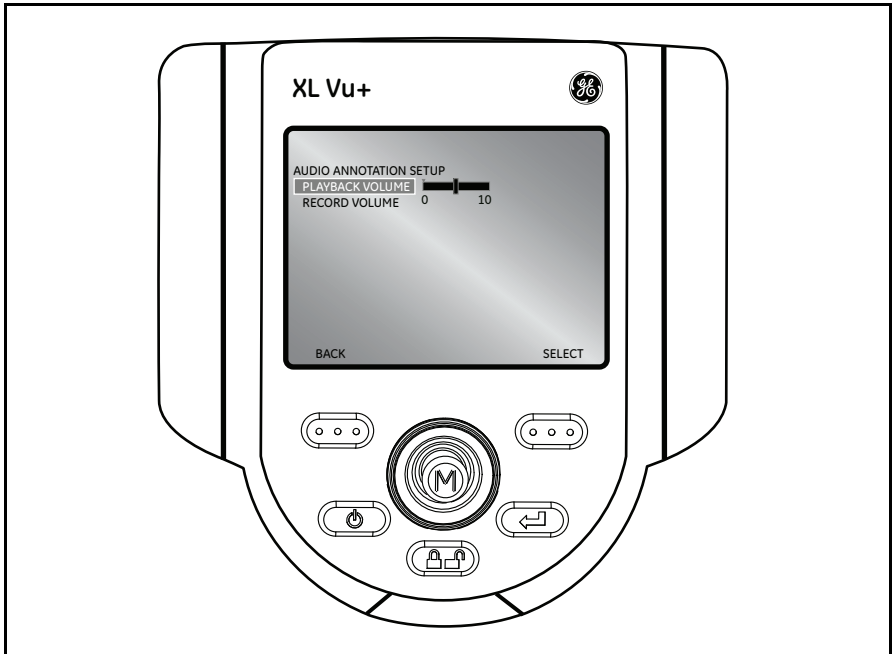


Figure 62: Live Main Menu > Setup > Audio Annotation Setup > Playback Volume

5.1.5b Live Main Menu > Setup > Audio Annotation Setup > Record Volume

To set the recording volume, select **RECORD VOLUME** from the **AUDIO ANNOTATION SETUP** menu (see *Figure 63* below). Then, use the joystick to adjust the volume from 0 to 10.

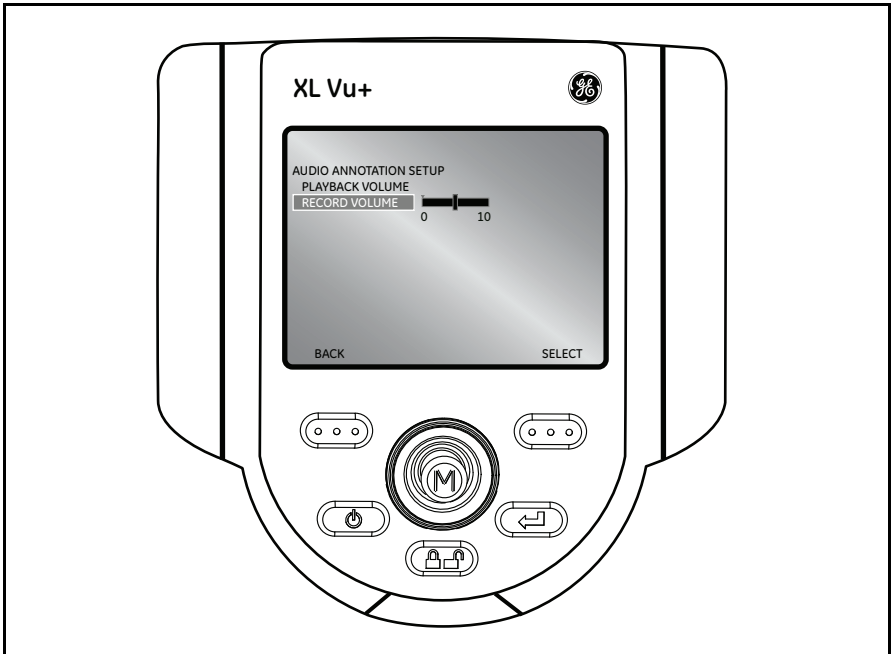


Figure 63: Live Main Menu > Setup > Audio Annotation Setup > Record Volume

5.1.6 Live Main Menu > Setup > Steering

To manage probe articulation, use this menu to select the steering increment. Press the joystick to activate the LIVE MAIN MENU. Then, select **SETUP**, followed by **STEERING**, followed by **COURSE** or **FINE** (see *Figure 64* below).

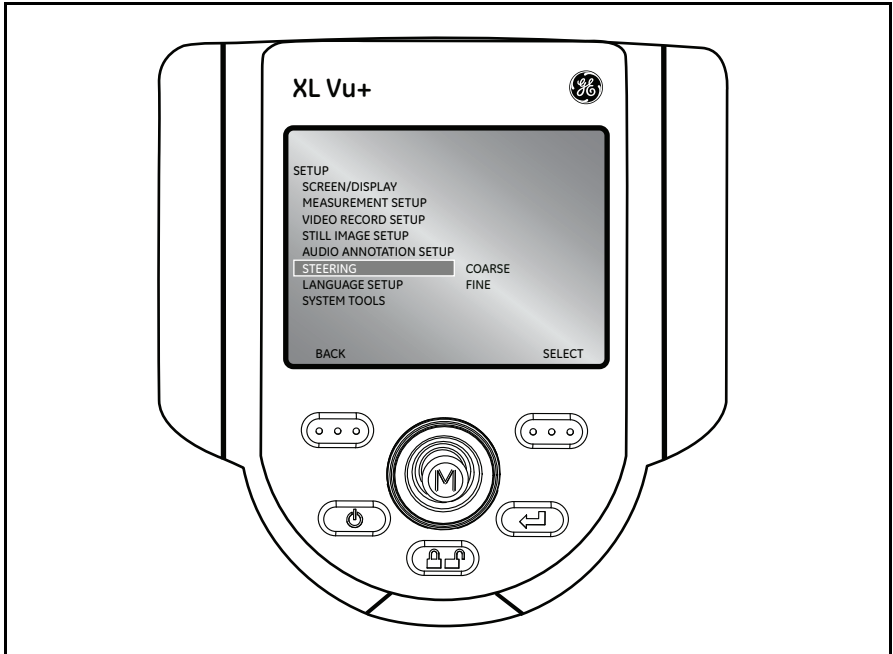


Figure 64: Live Main Menu > Setup > Steering

5.1.7 Live Main Menu > Setup > Language Setup

To load or change the system language or an external keyboard, select LANGUAGE SETUP from the SETUP menu, followed by the appropriate language (see *Figure 65* below).

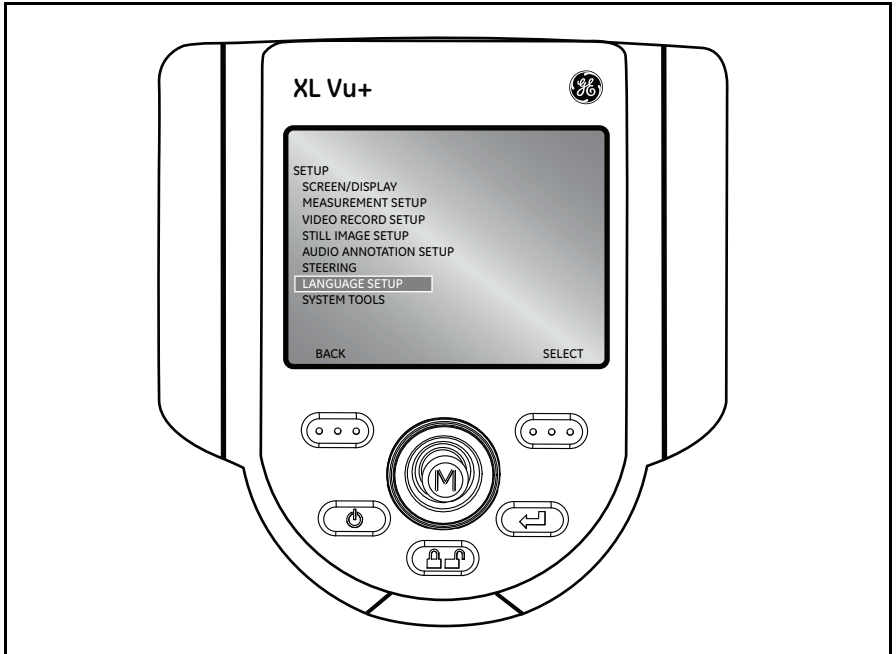


Figure 65: Live Main Menu > Setup > Language Setup

The following options are available:

- LOAD
- CHANGE
- KEYBOARD SETUP

5.1.8 Live Main Menu > Setup > System Tools

To view system information or adjust the power management settings, select **SETUP** from the **LIVE MAIN MENU**, followed by **SYSTEM TOOLS** (see *Figure 66* below).

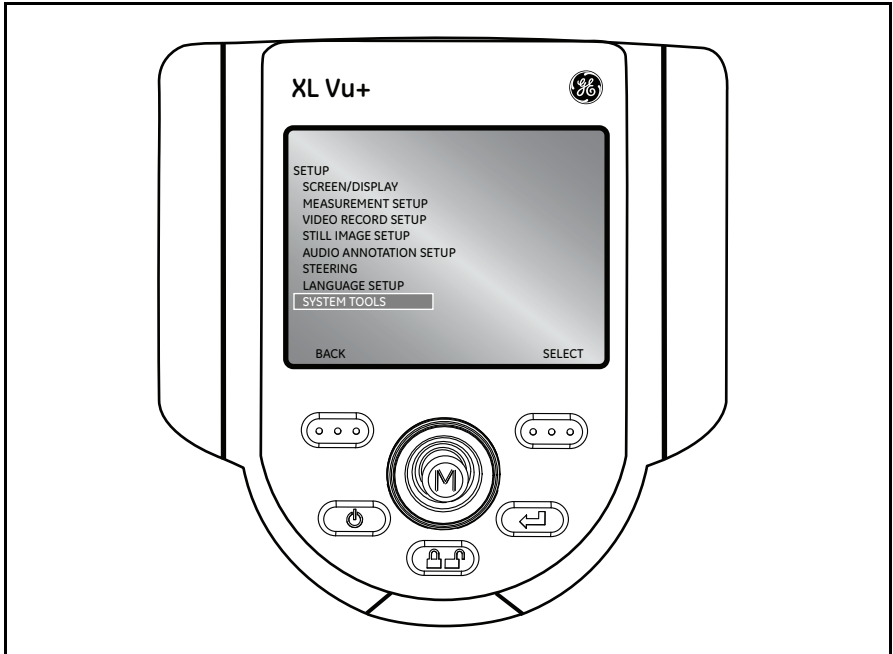


Figure 66: Live Main Menu > Setup > System Tools

5.1.8a Live Main Menu > Setup > System Tools > System Info

To view system information, such as the software version or the amount of free disk space, select **SYSTEM INFO** from the **SYSTEM TOOLS** menu (see *Figure 67* below).



Figure 67: Live Main Menu > Setup > System Tools > System Info

5.1.8b Live Main Menu > Setup > System Tools > Power Management

Power management enables *sleep mode/auto off* (see the descriptions below) to save battery power. To enable or disable power management, select **POWER MANAGEMENT** from the **SYSTEM TOOLS** menu, followed by **ON** or **OFF** (see *Figure 68* below).



Figure 68: Live Main Menu > Setup > System Tools > Power Management

Sleep Mode

Occurs automatically under battery power if no buttons have been activated for 15 minutes. Sleep mode is indicated by the push button lights flashing in a rotating circle around the joystick.

Auto Off

If sleep mode is not interrupted by any button activation within 15 minutes, the system will power OFF to conserve the battery.

5.2 Live Main Menu > File Manager

To manage files and folders on the XL Vu+ VideoProbe system, select FILE MANAGER with the joystick (see *Figure 69* below). For more details refer to “*File Manager*” on page 88.

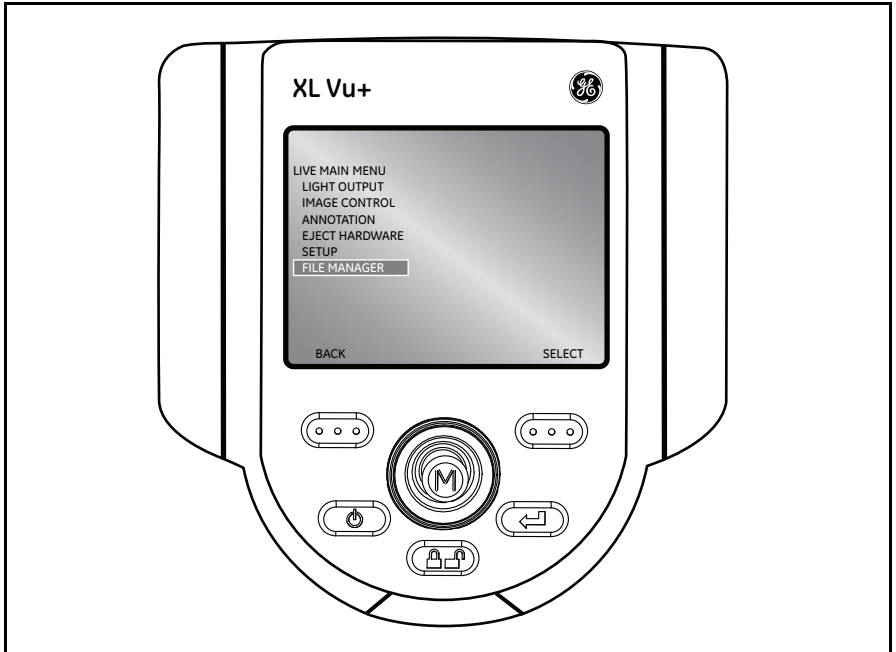





Figure 69: Live Main Menu > File Manager

5.3 Capturing Images and Video

Steering the VideoProbe

The joystick controls articulation (steering) of the probe tip. When viewing a live video image, move the joystick towards the desired inspection area.

Articulation Lock

To hold the bending neck in place while steering, press and release the  Steering Control key. A  lock icon will appear in the corner of the display to symbolize that *steer and stay* is enabled (see *Figure 70* below). The probe will now stay in place when the joystick is released. To unlock steering, press and release  Steering Control again, and the lock icon will disappear.

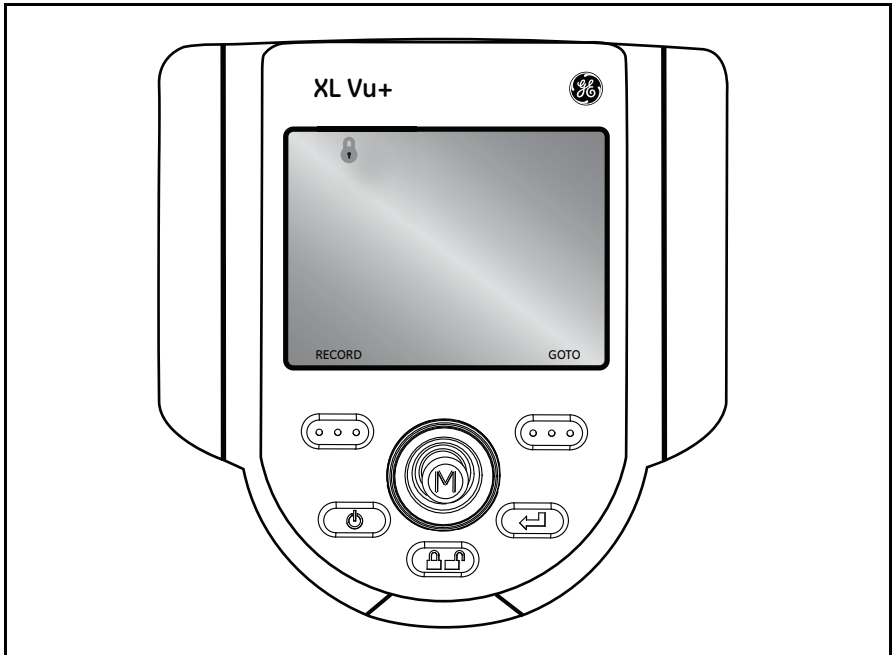




Figure 70: Articulation Lock Enabled

Note: While articulation lock is enabled, the XL Vu+ will steer in fine articulation mode.

5.4 Articulation Home

Press and hold  to engage the HOME function to straighten the bending neck. A blinking  HOME icon will appear on the LCD when this function is enabled (see *Figure 71* below). The HOME icon will disappear when the operation is finished.

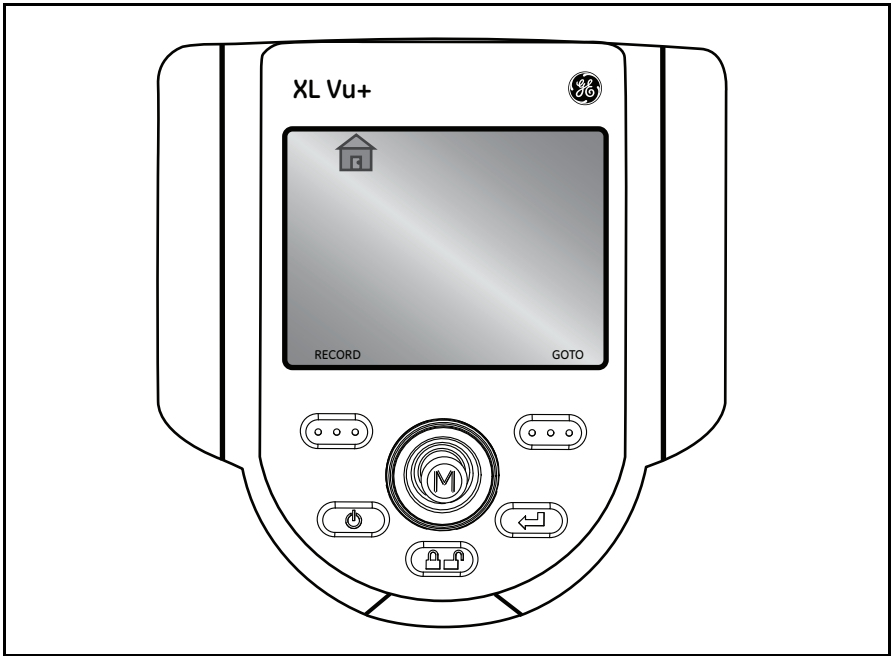




Figure 71: Articulation Home Enabled

5.5 Freeze Frame

Once the inspection area is in view, the image must be frozen before it can be measured or saved. To freeze an image, press  Freeze/Enter. An FF indicator will appear in the upper right corner of the display to symbolize that the image is frozen (see *Figure 72* below). To disable Freeze Frame, press  Freeze/Enter again and the FF will disappear.

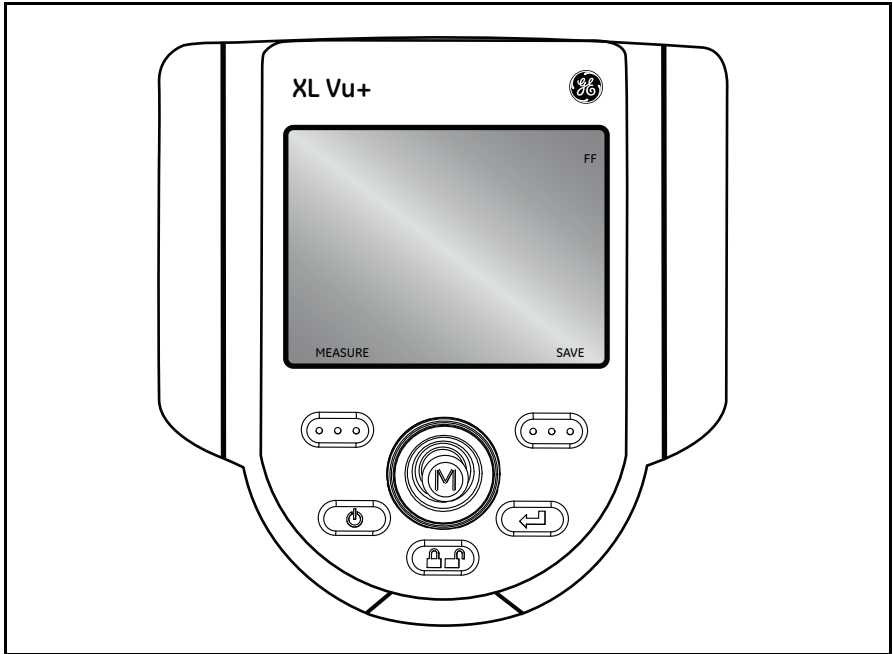


Figure 72: Freeze Frame Enabled

5.6 Freeze Frame Menu

Once Freeze Frame is enabled, press the joystick to enter the FREEZE FRAME MENU (see *Figure 73* below).



Figure 73: Freeze Frame Menu

The following menu options are available:

- SAVE AS
- ANNOTATION
- MEASUREMENT
- SPLIT SCREEN

5.6.1 Freeze Frame Menu > Annotation

To add, edit or delete an annotation, or to play, stop or pause an audio annotation, select ANNOTATION from the FREEZE FRAME MENU (see *Figure 74* below).

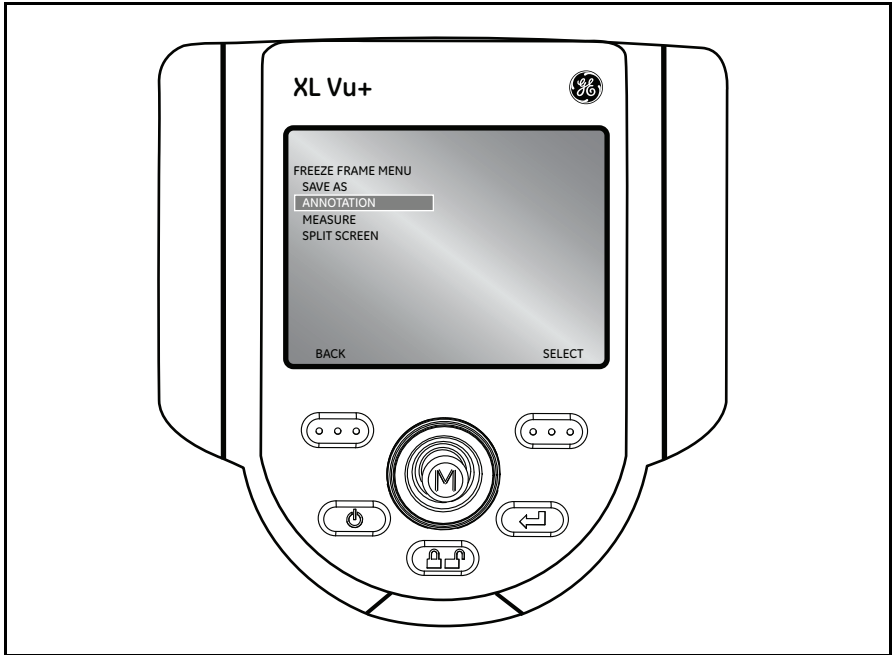




Figure 74: Freeze Frame Main Menu > Annotation

The following options are available:


- TEXT
- ARROW
- PRESET
- HIDE ANNOTATION
- AUDIO

5.7 Still Image Capture and Playback

To save/capture a still image if freeze frame is enabled, press the  right soft key, with SAVE on the LCD above, to save to the default location. Alternately, press and hold  Freeze/Enter to auto-save.

Note: For further information see “General Measurement Procedure” on page 96.

5.8 Video Recording and Playback

To record live video, press the  left soft key, labeled RECORD on the LCD above. A record symbol will appear in the upper right hand corner of the screen. When the video is stopped, it will automatically save to the default location.


To view recorded videos, use either QuickTime or VLC software. Both applications are included with the XL Vu+ system, and are located on the documentation CD.



5.9 File Manager

To access the FILE MANAGER, press the joystick to activate the LIVE MAIN MENU. Then, navigate to FILE MANAGER and select it.

5.9.1 Recalling a File

To recall a file, select RECALL from the FILE MANAGER menu (see *Figure 75* below). Move the joystick to the right to locate the file(s) and use the  right soft key to select the file.

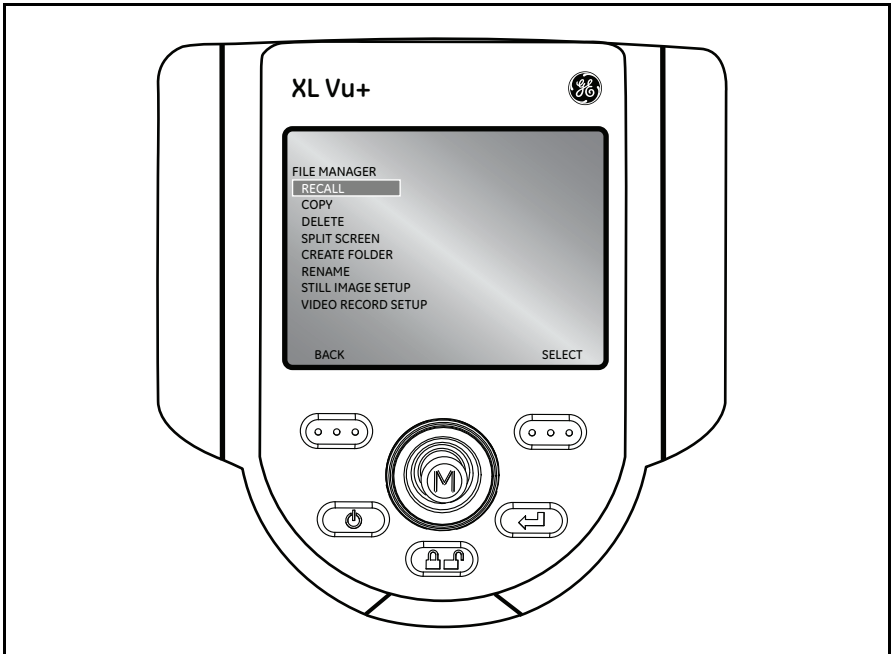


Figure 75: File Manager > Recall

5.9.1a Recalled Image Menu

After recalling an image, press the joystick to activate the **RECALLED IMAGE MENU** (see *Figure 76* below)

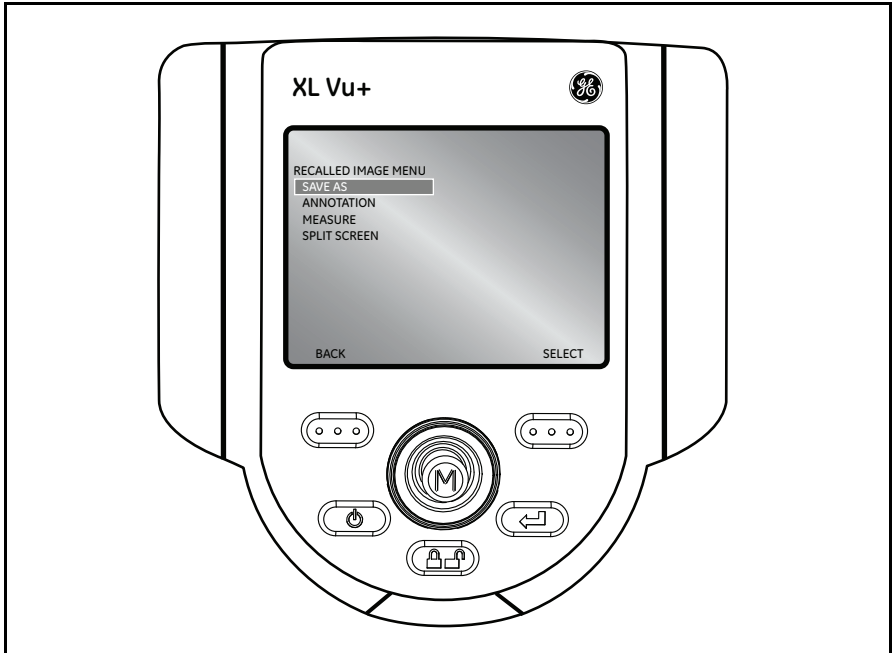


Figure 76: File Manager > Recall > Recalled Image Menu

The following options are available:

- SAVE AS
- ANNOTATION
- MEASURE
- SPLIT SCREEN

5.9.1b Video Playback Menu

After recalling a video, press the  left soft key to pause the video. Then, press the joystick to enable the PLAYBACK MENU (see *Figure 77* below).

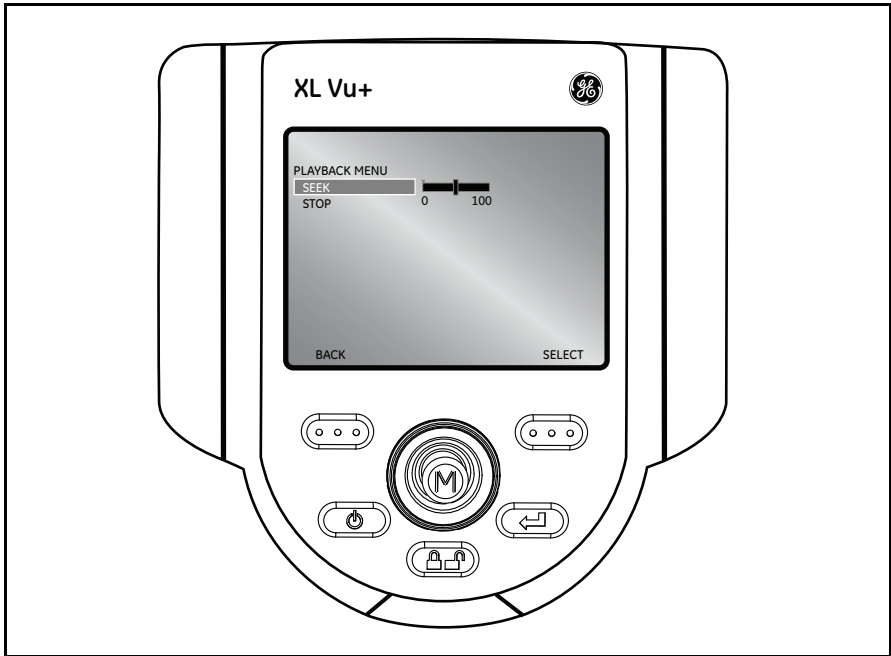





Figure 77: File Manager > Recall > Playback Menu



The following options are available:


- SEEK
- STOP

Note:

- Use the joystick to navigate through the video.
- Press the  right soft key to select the new playback start location.
- Press the  left soft key to return to the video playback starting scene.
- Press the  left soft key to resume the video playback.

5.9.2 Copying Files or Folders

To copy a file, select COPY from the FILE MANAGER MENU (see *Figure 78* below). Move the joystick to the right to locate the file(s) and use the  right soft key to mark/unmark the desired file(s). Then, press  Freeze/Enter to copy the file(s).

Choose the destination for the copied file. Then, use the joystick to navigate to the desired folder, and press  Freeze/Enter to paste the copied file(s).

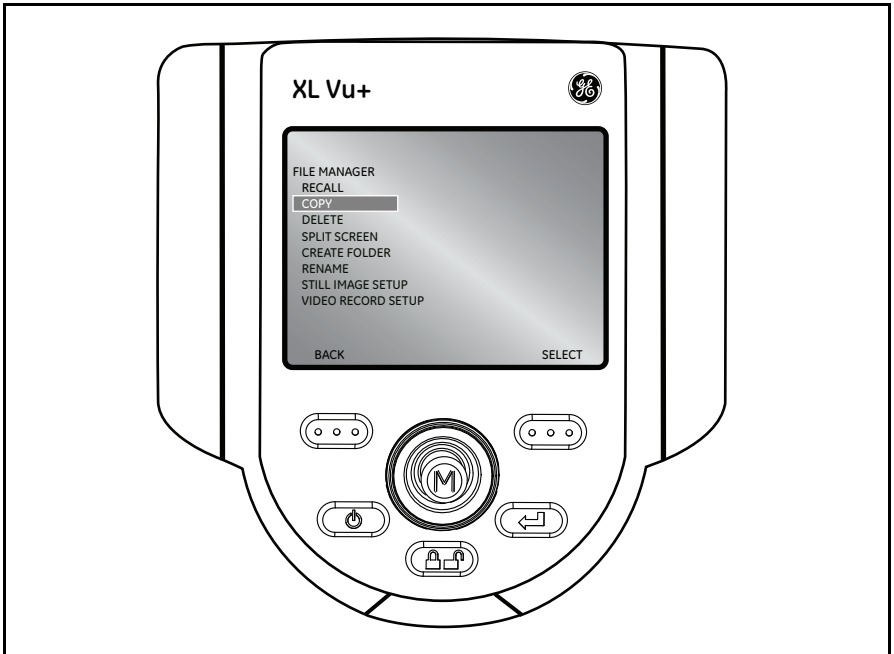


Figure 78: File Manager > Copy

5.9.3 Deleting Files or Folders





To delete a file, select DELETE from the FILE MANAGER MENU (see *Figure 79* below). Move the joystick to the right to locate the file(s) and use the  right soft key to mark/unmark the desired file(s). Then, press  Freeze/Enter to delete the file(s).



Figure 79: File Manager > Delete

5.9.4 Creating a Folder

To create a folder, select **CREATE FOLDER** from the **FILE MANAGER MENU** (see *Figure 80* below). Select the location of the folder, use the joystick to highlight the folder and press  Freeze/Enter to select each letter of the desired folder name. When done, press the  right soft key to save the folder name.

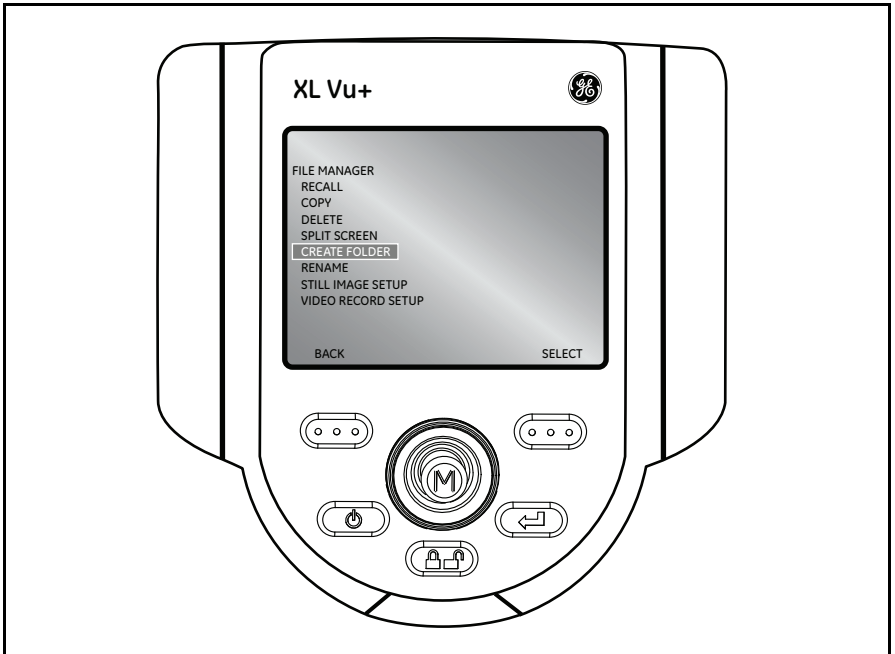





Figure 80: File Manager > Create Folder

5.9.5 Renaming Files or Folders

To rename a file or folder, select RENAME from the FILE MANAGER MENU (see *Figure 81* below). Navigate to the desired file or folder and use the  right soft key to select the file or folder. Then, use the joystick to highlight the file or folder and press  Freeze/Enter to select each letter of the desired file or folder name. When finished, press the  right soft key to save the file or folder name.

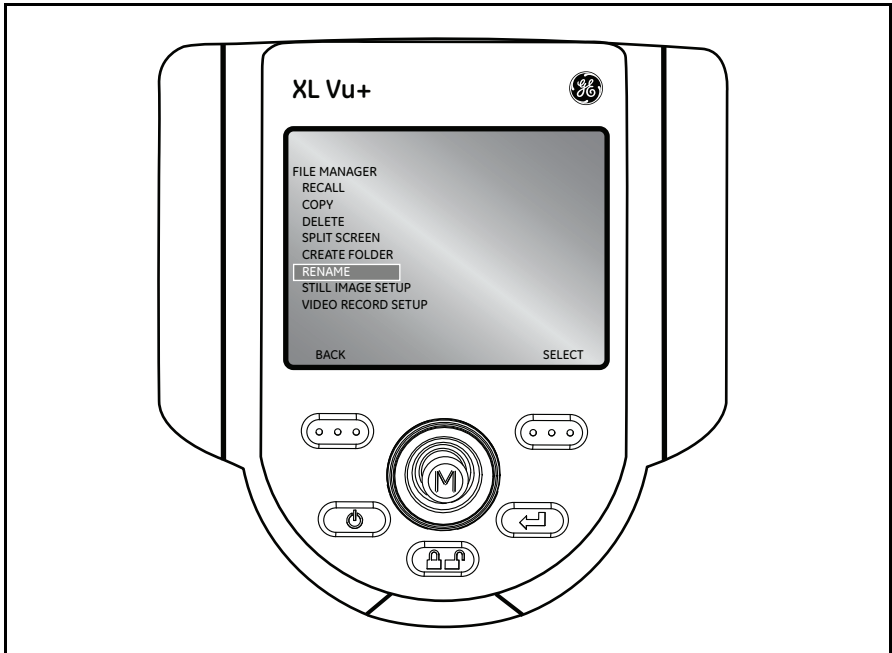


Figure 81: File Manager > Rename

Chapter 6. Measurement

6.1 About Measurement

Measurement capability is enabled once measurement tips have been calibrated to the XL Vu+ system. Features and defects may be measured either before or after saving an image, if the image was saved in measurement mode. Up to five measurements can be saved per image.

Measurement results are valid only for measurements taken in air. For measurements taken in liquid, contact *GE Measurement & Control*.

A measurement accuracy verification block is supplied with the purchase of measurement tips. Perform a measurement on this verification block to check the accuracy of your system.

All measurement images saved using the XL Vu+ system can be re-measured on a PC using *Inspection Manager (INSPMGR-CD)*.

6.2 Measurement File Formats

Measurement images, such as JPEGs or bitmaps, can be saved. These files can also be viewed, including the measurement results, in most .BMP or .JPG viewing applications, such as Windows™ Paint. To learn how to change the file format, see “*Live Main Menu > Setup > Still Image Setup > JPEG Quality*” on page 72.

Note: *The .BMP file format is recommended for measurement image capture.*

6.3 Measurement Optical Tips






ShadowProbe® and StereoProbe® measurement tips are factory-calibrated for use with specific probes. Tips are matched to systems by the serial numbers identified on each optical tip. A label located in the USB1 bay indicates which tips are calibrated to the probe.

To ensure that no mechanical damage has degraded tip accuracy, verify the measurement tips each time they are used. See “*Verifying Measurement Tips*” on page 137.

See “*Optical Tip Table*” on page 131 for a complete list of optical tips.

6.4 General Measurement Procedure

Attach a measurement optical tip to the probe, position the probe for maximum accuracy. Then complete the following steps:

1. Choose the measurement tip and the type of measurement.
2. Position the cursor and press  Freeze/Enter to save the cursor placement. Repeat for the remaining cursor(s).
3. Press the joystick's Main Menu button.
4. Select Save As and press  to select Measurement. Then press .
5. Complete the other optional fields and press . When complete, use the  soft key to select DONE.

6.4.1 Capturing Measurement Images

Stereo or Shadow measurement images can be saved, allowing the user to perform the actual measurements at a later time on the XL Vu+, Rhythm Review station, or on a PC using *Inspection Manager (INSPMGR-CD)*.

6.4.2 Accuracy Index

The *accuracy index* is a number that indicates the amount of magnification during shadow or stereo measurements. The higher the accuracy index, the greater the magnification. The greater the magnification, the more accurately you can place the measurement cursors allowing for more accurate results.

6.4.3 Measurement Types

6.4.3a Stereo Probe Measurements

Stereo measurements may be taken with the probe either perpendicular to or not perpendicular to the target. The following types of *Stereo Probe Measurements* are available:

- Length (see *page 105*)
- Point to Line (see *page 106*)
- Depth (see *page 107*)
- Area (see *page 108*)
- Multi-Segment Line (see *page 109*)

6.4.3b Shadow Probe Measurements

Shadow measurements require the probe to be perpendicular to the target (with the exception of “skew” measurements). The following types of *Shadow Probe Measurements* are available:

- Distance (see *page 113*)
- Skew (see *page 114*)
- Depth (see *page 115*)
- Point to Line (see *page 116*)
- Area (see *page 117*)
- Multi-Segment Length (see *page 118*)
- Circle Gauge (see *page 119*)

6.4.4 Measurement Type Selection

Table 2 below summarizes the pros and cons for each measurement type.

Table 2: Measurement Type Comparisons

Measurement Type	Advantages	Disadvantages
Stereo	<p><i>Over comparison measurements:</i></p> <ul style="list-style-type: none"> • More accurate • No known reference is needed • Measure depth • Surface does not need to be perpendicular to the probe view. <p><i>Over shadow measurements:</i></p> <ul style="list-style-type: none"> • The surface does not need to be perpendicular to the probe view. 	<p>The system may be unable to position matching cursors accurately with any of these conditions in the measurement area:</p> <ul style="list-style-type: none"> • Insufficient detail • Repeating patterns • Glare • Smooth, straight lines to measure along <p>In some cases, the problem can be eliminated by repositioning the probe tip and adjusting the brightness. Otherwise, try shadow measurement.</p>
Shadow	<p><i>Over comparison measurements:</i></p> <ul style="list-style-type: none"> • More accurate • No known reference is needed • Measure depth • Measure distance along a skew <p><i>Over stereo measurements:</i></p> <ul style="list-style-type: none"> • Height and depth contours are more discernible • Measure along smooth, straight lines 	<ul style="list-style-type: none"> • Measurement surface must be nearly perpendicular to the probe view for accurate measurement. • The shadow is sometimes difficult to see. • Cannot always place the shadow in the desired location.

Table 2: Measurement Type Comparisons (cont.)

Measurement Type	Advantages	Disadvantages
Comparison	<p><i>Over shadow and stereo measurements:</i></p> <ul style="list-style-type: none"> • Use standard optical tip • Measure with tip further away • Measure large objects • Check the approximate size of many items quickly 	<ul style="list-style-type: none"> • Less accurate than shadow or stereo measurement • Known references may not be present and may be difficult to deliver to the measurement site. • Measurement surface must be nearly perpendicular to the probe view for accurate results.

6.5 Stereo Probe Measurement

Stereo measurements require the use of StereoProbe measurement tips, which capture stereoscopic images of a target (i.e., two pictures of the same target from two different angles). To measure the target, the XL Vu+ processor uses triangulation based on these two side-by-side images. Stereo measurements can be taken either on a frozen image or on a recalled image that was saved in measurement mode.

6.5.1 Positioning the Probe Tip for Maximum Accuracy

Before freezing a stereo measurement image, position the probe tip to meet these criteria (see *Figure 82* and *Figure 83 on page 101*):

- *Visibility*: The item to be measured is fully visible in both the left and the right images.
- *Tip-to-target proximity*: The probe is positioned as close to the target as possible, while keeping it in focus.
- *Vertical orientation*: If measuring the distance between lines or across a circle, the image is oriented so that cursors can be placed at the left and right edges of the item to be measured, but not at the top, bottom, or diagonal points. The system needs differentiated details to the left and right of each cursor to accurately place the matching cursors on the right image.
- *Minimal glare*: Glare is minimized by adjusting the viewing angle and the image brightness in the areas where cursors will be placed. Small glare speckles do not present a problem, but larger glare areas may appear in different positions on the two sides, causing false matches.

6.5.1 Positioning the Probe Tip for Maximum Accuracy (cont.)



Figure 82: Bad Example

- Object is not fully visible on the right side.
- Object is not well lit.
- Object is not oriented to allow proper cursor placement.



Figure 83: Good Example

- Object is fully visible on both sides.
- Object is well lit.
- Object is oriented to allow proper cursor placement.

6.5.2 Accuracy Index

The *accuracy index* is a number that indicates the amount of magnification during stereo measurements. The higher the accuracy index, the greater the magnification. The greater the magnification, the more accurately you can place the measurement cursors, allowing for more accurate results.

When taking stereo measurements, you magnify the image, not by zooming, but by moving the optical tip as close as you can to the target.

6.5.3 Matching Cursors

For each cursor the user places on the left image, the system places a matching cursor on the right image (see *Figure 84* below).

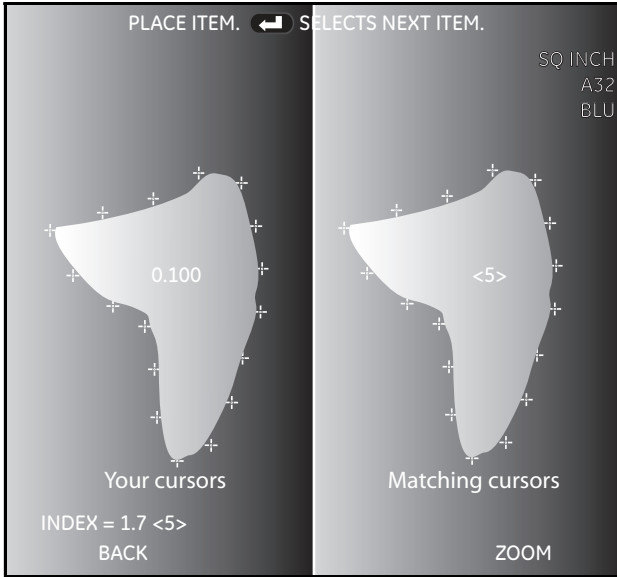


Figure 84: Example of Matching Cursors

The left cursors must be placed on an image point that has enough detail to distinguish it from surrounding points. If the neighboring points look the same as the point chosen, the system cannot accurately place a matching cursor.


For every matching cursor, the system calculates a match strength value between <0> (lowest confidence) and <5> (highest confidence). If too little detail is present, the system simply does not generate a matching cursor. Whenever possible, achieve a match strength of at least <3>. If this is not possible, capture another image.



Verify that the matching cursor appears to be in the same position as the selected cursor. A matching cursor that is off even slightly can have a significant impact on the measurement accuracy.

6.5.4 Taking Stereo Measurements

To take stereo measurements, complete the following steps:

1. Attach the stereo tip securely, and verify that it has been installed correctly.
2. Position the probe tip for maximum accuracy. Do this by centering the item of interest to be measured, while maximizing its magnification.
3. Freeze the image. Stereo measurements require a sharp focus for the best results.
4. Select the measurement type and the optical tip.
5. Place the cursors in the *left image*.

Measurement accuracy depends on all cursors being positioned accurately. To ensure accuracy, press the  right soft key to activate the zoom window for a close-up view of the image around the active cursor. As the first cursor is moved, the matching cursor in the *right image* moves accordingly.

6. Inspect each matching cursor as soon as it appears.
7. Do not become complacent in reaction to high match strength values. Always scrutinize the matching cursor's location.
8. If a matching cursor is not placed correctly, use the  left soft key to go back to the frozen image and start over or recapture a better image.
9. When the measurement result is displayed in the blue background, use the joystick to position it at a convenient location that is not blocking the item of interest.
10. Save the image, or press  Freeze/Enter to allow repositioning of any of the cursors or to reposition the location of the measurement result.

6.5.4 Taking Stereo Measurements (cont.)

Note: *Stereo images are saved without zoom windows, borders, and certain other screen graphics. This way, more of the image is visible if recalled for re-measurement.*

You may perform any of the following tasks while taking measurements, by pressing the joystick's MAIN MENU button to activate the STEREO MENU:

- Add up to five total measurements.
- Add an annotation.
- Clear some or all of the measurements.
- Change the measurement units.
- Select the correct optical tip in the software, if the optical tip currently selected is not the one actually in use.

6.5.5 Types of Stereo Measurements

6.5.5a Length

A *Linear (point-to-point)* measurement is illustrated in *Figure 85* below.

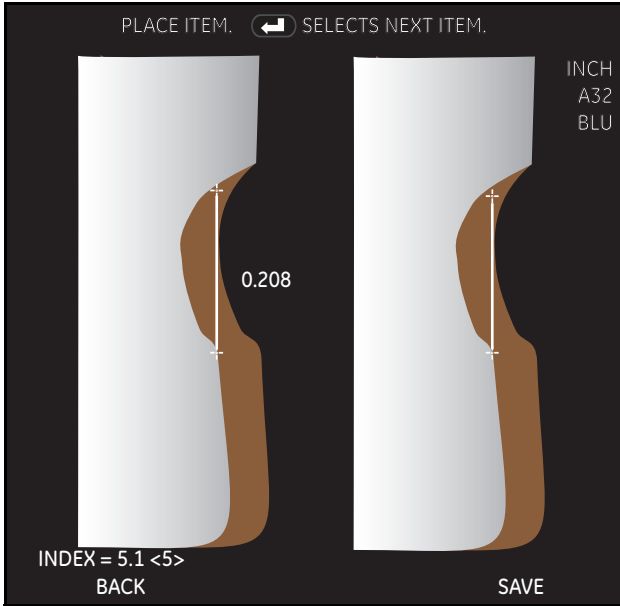



Figure 85: Example of a Length Measurement

Place the first cursor on the left image at the furthest point of the measurement area by pressing the  Freeze/Enter button. Place the second cursor at the opposite end of the measurement area to determine the *length* of the feature or defect of interest.

6.5.5b Point to Line

The *perpendicular distance* from a point to a line is illustrated in *Figure 86* below.



Figure 86: Example of a Point to Line Measurement

Place the first two cursors to define a reference line. Then, place a third cursor at the deepest point of the defect or feature. A perpendicular line is generated from the third cursor to the reference line, and the measurement displayed is the length of this perpendicular line.

6.5.5c Depth

The *perpendicular distance* between a surface and a point above or below it is illustrated in *Figure 87* below.



Figure 87: Example of a Depth Measurement

Place first three cursors on an even surface to define a reference plane. Then, place the fourth cursor at the point of uncertain depth.

Note: *Negative measurements indicate that the point is below the plane. Positive measurements indicate that the point is above the plane.*

6.5.5d Area

The *surface area* contained within multiple cursors placed around a feature or defect is illustrated in *Figure 88* below.

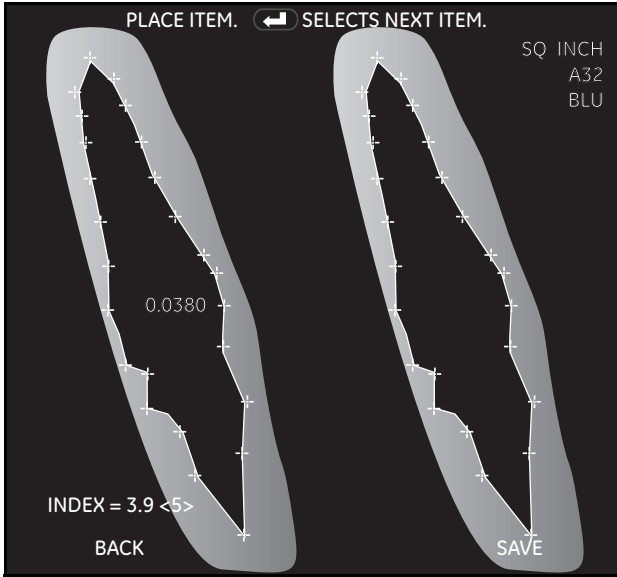



Figure 88: Example of an Area Measurement

Place between 3 and 24 cursors at the edge of the desired measurement area. Then press  Freeze/Enter twice to close the measurement area.

6.5.5e Multi-Segment Line

The length of a *nonlinear feature* or defect is illustrated in *Figure 89* below.



Figure 89: Example of a Depth Measurement

Place between 2 and 24 cursors along the feature or defect to create line segments.

To finalize the line, press  Freeze/Enter twice.

6.6 Shadow Probe Measurement

Shadow measurements require the use of a *Shadow Probe* tip, which project a shadow onto a target. To measure the target, the XL Vu+ processor uses triangulation based on the shadow's location. Shadow measurements can be taken on a frozen image or on a recalled image saved in measurement mode.

6.6.1 Positioning the Probe Tip for Maximum Accuracy

Before freezing a shadow measurement image, position the probe tip to meet these criteria (see *Figure 90* through *Figure 93 on page 111*):

- *Tip-to-target proximity*: The tip should be as close to the surface as possible while still viewing the entire item to be measured. The shadow moves toward the left as the tip approaches. Measurements can be made even if the tip is so close that the image is slightly out of focus. For depth measurements, the tip needs to be close enough to noticeably break the shadow so that the system can differentiate between the raised and recessed surfaces.
- *Perpendicular surface*: (1) The shadow should be straight up and down, indicating that the surface is vertically perpendicular to the probe view. (2) Visual cues, such as illumination and perspective, indicate that the surface is horizontally perpendicular to the probe view as well.

Note: *If the target cannot be located to be perpendicular to the probe tip (indicated by a slanted shadow line), a skew measurement may be performed on target defects located inside the shadow.*

- *Shadow's proximity*: The shadow should be near to and on the same plane as the item to be measured.

6.6.2 Accuracy Index

The *accuracy index* is a number that indicates the amount of magnification during shadow measurements. The higher the accuracy index, the greater the magnification. The greater the magnification, the more accurately cursors can be placed for measurement and the more accurate the results.

When taking shadow measurements, magnify the image not by zooming, but by moving the optical tip as close as possible to the target.



Figure 90: Bad Example

- Shadow is on right side of screen.
- Shadow is not quite vertical, and the surface appears skewed.

Note: *Linear measurements can be taken on a skew surface, but only if you select the “Skew” measurement type.*

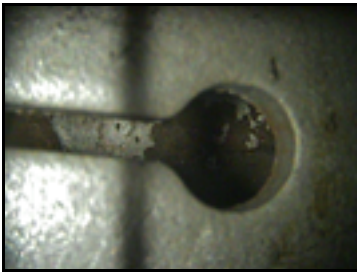


Figure 91: Good Example

- Shadow is further left.
- Shadow is vertical, and the surface does not appear skewed.
- Shadow is on the same plane as the item to be measured.

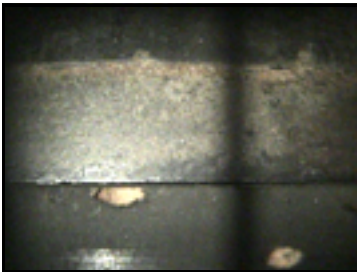


Figure 92: Bad Example

- From this in-focus distance, there is little difference between the shadow positions on the raised and recessed surfaces, so you are unlikely to get an accurate depth measurement.




Figure 93: Good Example

- With the tip closer to the surface, even though the image becomes blurry, the break in the shadow is more significant. Therefore, a more accurate depth measurement is achievable.

6.6.3 Taking Shadow Measurements

To take shadow measurements, complete the following steps:

1. Attach the shadow tip securely, and verify that it is installed correctly.
2. Position the probe tip for maximum accuracy.
3. Freeze the image.
4. Select the measurement type and tip.
5. If a vertical dashed line (called the shadow line) appears, center it over the shadow. Measurement accuracy depends on centering this line accurately in the center of the shadow shown in the image.
6. Place the cursors. Measurement accuracy depends on all cursors being positioned accurately. To ensure accuracy, press the  right soft key to activate the zoom window for a close up view of the active cursor.
7. (Optional) Perform any of these tasks:
 - Add up to five total measurements.
 - Clear some or all of the measurements.
 - Select the correct optical tip in the software, if the currently selected tip is not the one actually in use.
 - Adjust the position of the shadow line
 - Use the zoom window for more accurate cursor placement.
8. Save the image.

6.6.4 Types of Shadow Measurements

6.6.4a Distance

A *distance* measurement is a linear (point-to-point) measurement (see *Figure 94* below).

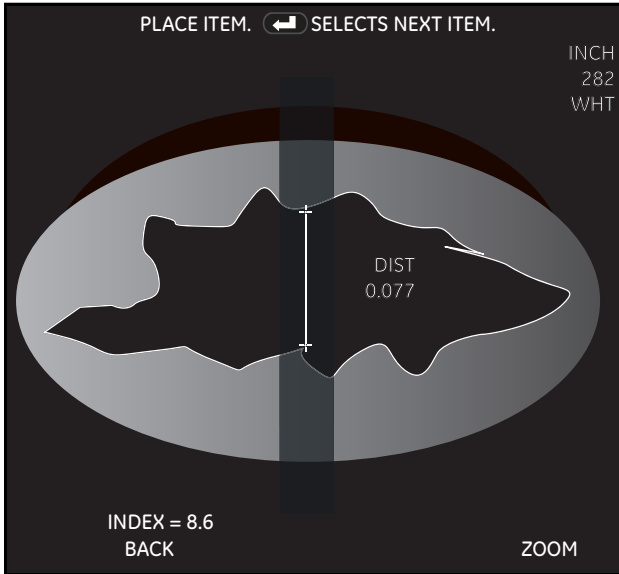



Figure 94: A Distance Measurement

Position the shadow across the measurement area. Then, position the dotted line cursor in the center of the shadow line and press  Enter. Place the cursors as close as possible to the shadow at points of the desired measurement area.

6.6.4b Skew

A *skew* measurement is a linear (point-to-point) measurement on a surface that is not perpendicular to the probe view (see *Figure 95* below). Skew measurements should only be used if a vertical shadow cannot be obtained.

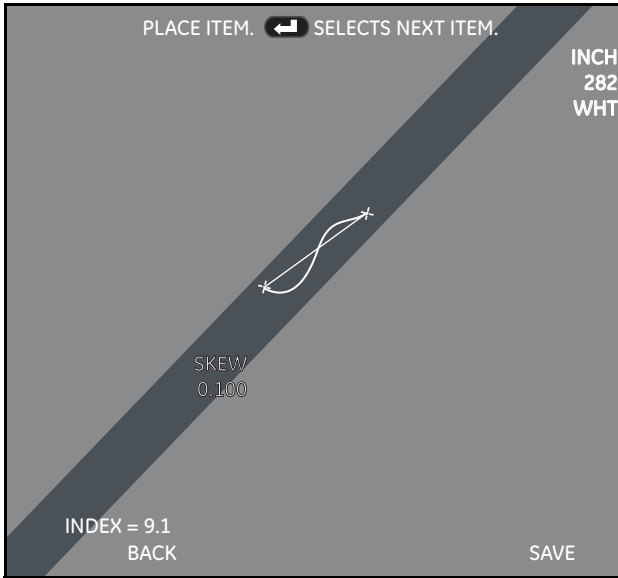


Figure 95: A Skew Measurement

Position the shadow across the measurement area. Then, place the cursors at the edges of the desired measurement area in the center of the shadow.

6.6.4c Depth

A *depth* measurement is the perpendicular distance between two surfaces (see *Figure 96* below).



Figure 96: A Depth Measurement

Position the shadow across the measurement area. Then, place the cursors on the raised and recessed surfaces in the horizontal center of each shadow.

Note: *Negative measurements indicate that the point is below the first surface. Positive measurements indicate that the point is above the first surface.*

6.6.4d Point to Line

A *point to line* measurement is the perpendicular distance from a point to a line (see *Figure 97* below).

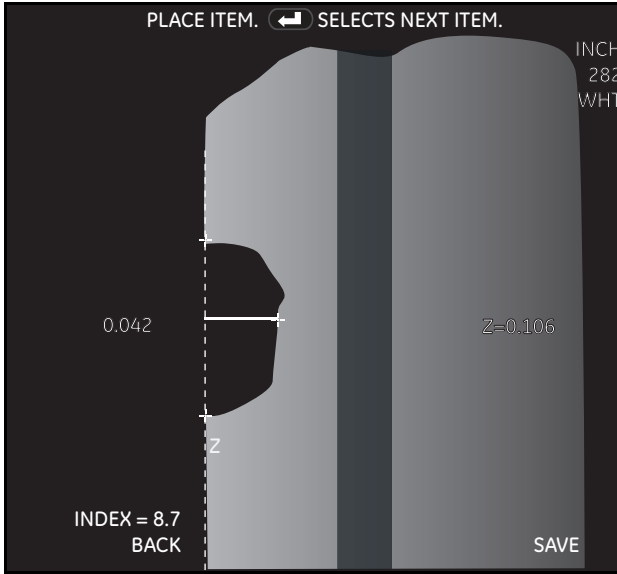



Figure 97: A Point to Line Measurement

Position the shadow near the measurement area. Then, position the dotted line cursor in the center of the shadow line and press  Enter. Place the first two cursors to define a reference line, and place a third cursor at the deepest point of the defect or feature. A perpendicular line is generated from the third cursor to the reference line, and the measurement displayed is the length of this perpendicular line.

6.6.4e Area

An *area* measurement is the surface area around a feature or defect (see *Figure 98* below).

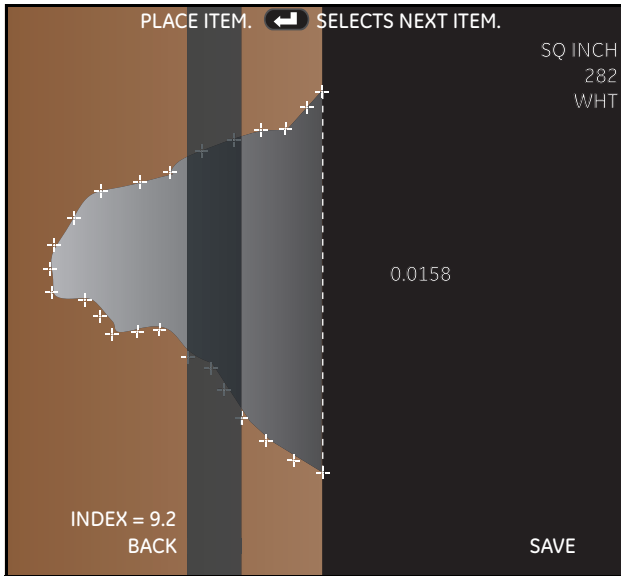




Figure 98: An Area Measurement

Position the shadow close to or across the measurement area. Then, position the dotted line cursor in the center of the shadow line and press  Enter. Place between 3 and 24 cursors at edge of desired measurement area. When you are ready to close area, press  Freeze/Enter twice.

6.6.4f Multi-Segment Length

A *multi-segment length* measurement is the length of a nonlinear feature or defect (see *Figure 99* below).

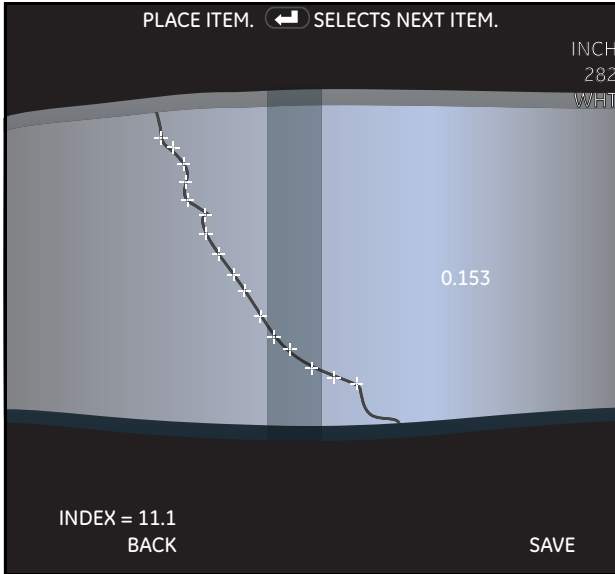


Figure 99: A Multi-Segment Length Measurement

Position the shadow close to or across the measurement area. Then, position the dotted line cursor in the center of the shadow line and press Enter. Place between 2 and 24 cursors along the feature or defect to create line segments. To finalize the line, press Freeze/Enter twice.

6.6.4g Circle Gauge

A *circle gauge* measurement is a quick method of determining whether or not defects fall within allowable limits (see *Figure 100* below).

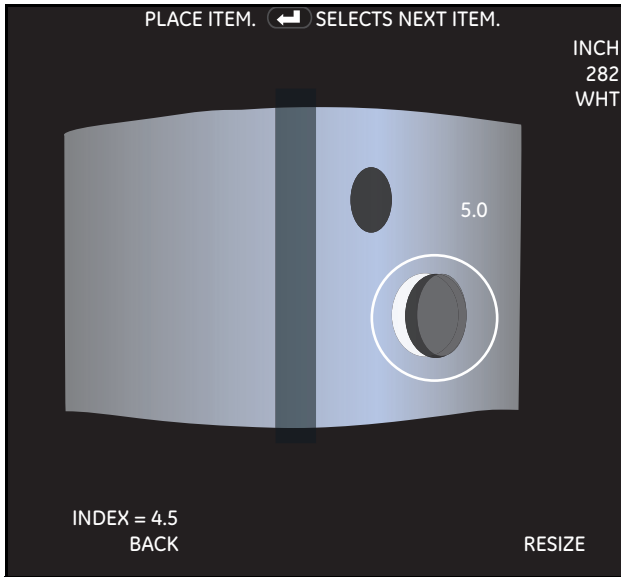



Figure 100: A Circle Gauge Measurement

Position the shadow near the measurement area. Then, position the dotted line cursor in the center of the shadow line and press  Enter. Follow the on screen instructions to enter the circle gauge size, and use the joystick to place the circle. Use the joystick to locate the circle on the target image to encompass the defect in question.

6.7 Comparison Measurement

Comparison measurements rely on the known dimensions of an object that have been set in the field of view either by the manufacturer or by the probe. The XL Vu+ processor uses these known dimensions as a reference scale for measuring an unknown target. Comparison measurements can be taken on a frozen image or on a recalled image.

6.7.1 Positioning the Probe Tip for Maximum Accuracy

Position the probe view so that the surface is perpendicular to the probe. The target and the known object should both be in the same view and plane. Position the probe tip to be as close to the target as possible.

6.7.2 Taking Comparison Measurements

To take comparison measurements, complete the following steps:

1. Attach any standard forward-view or side-view tip to the probe.
2. Position the probe tip for maximum accuracy. If the object and reference are small on the screen, zoom until the known object and the target fill the screen as much as possible.
3. Freeze the image.
4. Select the measurement type.
5. Establish the reference distance. Place the two reference cursors at the endpoints of a known distance, then adjust the displayed number until it matches that distance.
6. Place the cursors for the feature or defect to be measured, and follow steps for *“Taking Shadow Measurements”* on page 112.
7. (Optional) Reposition the cursors and the measurement result.
8. (Optional) Perform any of these tasks:
 - Add up a total of five measurements.
 - Clear some or all of the measurements.
 - Establish a new reference dimension.
9. Save the image.

6.8 Menu Directed Inspection (MDI)

Menu Directed Inspection (MDI) is the first software tool to standardize the inspection process in the NDT industry. MDI software helps guide inspectors through the inspection process and intelligently auto-generates a report, thus saving time, improving quality and increasing productivity.

Menu Directed Inspection (MDI) software provides an advantage and convenience during the inspection process. MDI makes labeling images and videos easier and automatically generates reports from the *VideoProbe* within a few steps (see *Figure 101* below).

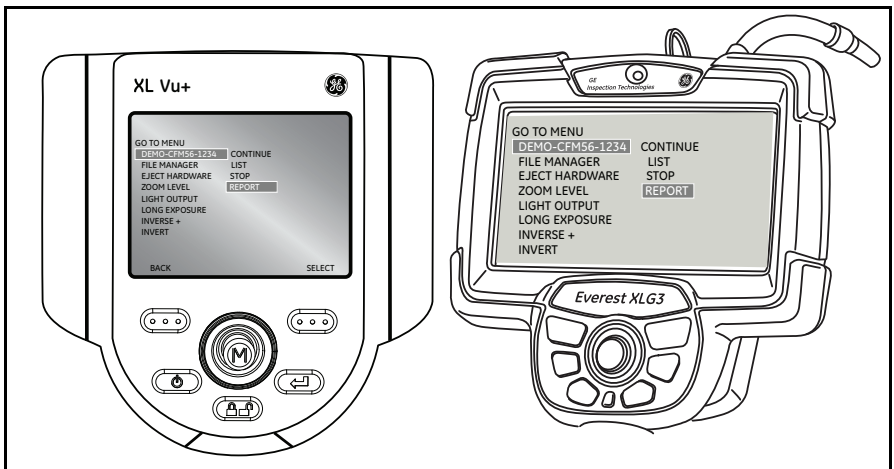


Figure 101: A Sample MDI Report

Benefits to using MDI include:

- Standardized Inspection Lists
- Consistent Report Creation in MS Word format
- Data Management
- Decreased reporting time by up to 70%
- Increased speed and ease of sharing data
- Reduction of errors with guided inspections

[no content intended for this page]

Chapter 7. Maintenance

7.1 Inspecting and Cleaning the System

You should inspect and clean the XL Vu+ system with a soft cloth and a 70% alcohol-to-water solution before and after each use. If using the system in a dirty environment, clean the components more frequently, as needed.

If damage is found, contact *GE Measurement & Control* for return instructions and an RMA (return material authorization) number. Early detection of minor conditions can prevent costly repairs.

7.1.1 Cleaning Optical Tips

Dirty optical tip surfaces cause distorted or blurred images. For best image quality, the optical tip and the camera head should be cleaned frequently.

To clean the probe tip, including the lens on the camera head, use either glass cleaner or a 70% alcohol-to-water solution and a pointed cotton swab (see *Figure 102* below). The three surfaces that require cleaning are: the *head can optics*, the *outside of the tip* and the *inside of the tip*.

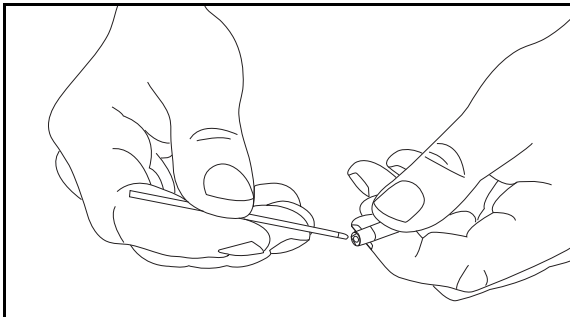


Figure 102: Cleaning An Optical Tip

7.2 Troubleshooting Measurements

7.2.1 Inaccurate Stereo or Shadow Measurements

Take the following initial steps to correct this problem:

- Move the probe tip as close as possible to the target, thus maximizing the magnification.
- Verify that the tip actually attached to the probe matches the tip information that is selected in the software.
- Verify that the correct type of measurement has been selected.
- Verify that the optical tip is threaded onto the probe head securely.
- Measure the target contained in the verification block to ensure that the tip has not been damaged. See “*Verifying Measurement Tips*” on page 137.

Incorrect measurements can result from dirty tip optics. A tip that visually appears clean may have a film of oil that will negatively affect measurement performance. To clean the tip, follow the instructions in “*Cleaning Optical Tips*” on page 123.

7.2.2 Inaccurate Stereo Measurements

Take the following initial steps to correct this problem:

- Avoid placing cursors in areas of significant glare. If necessary, adjust the brightness or reposition the probe tip to enhance details and reduce glare.
- Verify that the object to be measured is near the center of the screen.
- Verify that the matching cursor is correct within ± 1 pixel. If it is not clearly visible where the match point should be, select a different point, or capture the image from a different angle that better reveals details to allow better matching.
- Activate the zoom window to most accurately place the measurement cursors.
- Use shadow measurement instead, if there is little detail in the measurement area or measurement is needed along smooth, straight lines.
- Review the guidelines in “*Positioning the Probe Tip for Maximum Accuracy*” on page 100.

7.2.3 Inaccurate Shadow Measurements

Take the following initial steps to correct this problem:

- Verify that the surface is perpendicular to the probe view for all but skew measurements.
- Verify that the shadow is properly oriented, the any vertical dashed line is centered and the cursors are properly placed.
- Review the guidelines in “*Positioning the Probe Tip for Maximum Accuracy*” on page 100.

7.3 Sales and Technical Support

USA	1 888 332 3848 (toll free in USA only) 1 315 554 2000 (Phone) 1 866 899 4184 (Fax)
Canada	877 895 5665 780 430 9060
France	+33 2 28 23 08 00
Germany	+49 7471 98820
Hong Kong	+852 2877 0801
Italy	+39 39 65 1341
Japan	+81 422 67 7067
United Kingdom	+44 1993 822613

7.4 Web Site

www.ge-mcs.com

7.5 Service

To obtain service for a *VideoProbe* system, please contact one of the service centers below. If the problem cannot be corrected over the phone, a *Return Materials Authorization* number (**RMA**) will be given along with instructions for shipment to an authorized service center.

IMPORTANT: *Always contact an authorized GE Inspection Technologies service center for an RMA prior to returning a product for service and/or repair.*

USA

GE Inspection Technologies
721 Visions Drive
Skaneateles, NY 13152
Phone: 1 888 335 3848 (toll-free in USA only)
1 315 554 2000
Fax: 1 866 899 4184

Germany

GE Inspection Technologies GmbH
Lotzenacker 4
72379 Hechingen
Phone: +49 7471 98820
Fax: +49 7471 7882 30

Hong Kong

GE Inspection Technologies (HK) Ltd.
Floor 5, Linkchart Center
2 Tai Yip Street
Kwun Tong, Kowloon
Hong Kong
Phone: +852 2877 0801
Fax: +852 2877 0868

Chapter 8. Technical Specifications

8.1 Operating Temperature

Tip	-25 to +80°C (-13 to +176°F) Reduced articulation below 0°C (32°F)
System	-20 to +46°C (-4 to +115°F) LCD requires warm-up period below 0°C (32°F)

8.2 Storage

Temperature	-25 to +60°C (-13 to 140°F)
Relative Humidity	95% maximum, non-condensing
Waterproof	Insertion tube and tip to 14.7 psi (1 bar, 10.2 m of H ₂ O, 33.5 ft of H ₂ O)
Hazardous Environments	Not rated for use in hazardous environments.

8.3 Camera

Probe Diameter 6.1 mm (0.24”), 8.4 mm (0.33“)

Image Sensor	1/6” Color SUPER HAD™ CCD camera
Pixel Count	440,000 pixels
Housing	Titanium

Probe Diameter 3.9 mm (0.15”)

Image Sensor	1/10” Color SUPER HAD™ CCD camera
Pixel Count	290,000 pixels
Housing	Titanium

8.4 System

System Dimensions	9.5 x 13.3 x 34.3 cm (3.8 x 5.3 x 13.5")
Case Dimensions	50.2 x 19.0 x 39.4 cm (19.75 x 7.48 x 15.53")
System Weight	In Case - 6.87 kg (15.50 lb) Out of Case - 1.7 kg (3.8 lb)
Construction	Polycarbonate housing with integrated Versalon™ bumpers
LCD Monitor	Integrated 9.4 cm (3.7") active matrix VGA color LCD
Joystick Control	360° All-Way® tip articulation, menu access and navigation
Button Set	Access user functions, measurement and digital functions
Audio	Integrated 2.5mm headset/microphone jack
Internal Memory	1 GB flash memory
Data I/O ports	2 USB 2.0 ports 1 VGA Video Out port
Brightness Control	Auto and Variable
Illumination Type	White LED
Long Exposure	Auto: up to 16 seconds Manual: up to 2.5 seconds
White Balance	Factory default or user defined

8.5 Power

Lithium Ion Battery	8.4 V 38 Wh (2-hour) or 75 Wh (4-hour) Standard: 2-hour typical runtime Optional: 4-hour typical runtime
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8.6 Power Supply

AC	90-264 VAC, 47-63 Hz, <1.2 A rms @ 90 VAC
DC	10.2 VDC +5% / -3%, 4.9 A

8.7 Standards Compliance and Classifications

MIL-STD-810G	United States Department of Defense Environment Tests Sections 506.4, 507.4, 509.4, 510.4, 511.4, 514.5, 516.5, 521.2
Standards Compliance	Group 1, Class A: EN61326-1, UL, IEC, EN CSA-C22.2:61010-1, UN/DOT T1-T8
IP Rating	Internally tested to IP55

8.8 Software

Operating System	Real-time, multi-tasking operating system
User Interface	Simple drop-down, menu-driven operation, menu navigation using articulation joystick
File Manager	Embedded file manager software supporting: file and folder creation, naming, deleting, storing to internal flash or USB Thumb Drive, copying between USB and internal flash
Audio Data	PC compatible (.aac) file format
Image Control	Invert, Zoom (5x digital), Image Capture and Recall
Digital Zoom	Continuous (5x)
Image Formats	Bitmap (.BMP), JPEG (.JPG)
Video Format	MPEG4 (.MP4)
Text Annotation	Built-in full-screen text overlay generator
Graphic Annotation	User placement of arrows

8.8 Software (cont.)

Articulation Control	Steer & Stay Articulation lock/fine articulation, tip “Home” return to neutral forward-tip orientation, user-selectable fine or coarse control
Software Updates	Field upgradable via USB Thumb Drive®
Languages	English, Spanish, French, German, Italian, Russian, Japanese, Korean, Portuguese, Chinese, and Polish
Application Software	Menu Directed Inspection (MDI) software digitally guides inspectors through the inspection process, intelligently names files and creates MS Word® compatible inspection reports.

8.9 Probe Measurements

<u>Diameter</u>	<u>Length</u>
3.9 mm (0.15”)	2.0, 3.0 m (6.6, 9.8 ft)
6.1 mm (0.24”)	2.0, 3.0, 4.5, 6.0, 8.0 m (6.6, 9.8, 14.8, 19.7, 26.2 ft)
8.4 mm (0.33”)	2.0, 3.0, 4.5, 6.0, 8.0, 9.6 m (6.6, 9.8, 14.8, 19.7, 26.2, 31.5 ft)

8.10 Tip Articulation

<u>Insertion Tube Length</u>	<u>Straight Tube</u>
≤ 4.5 m	160° minimum
6.0 - 9.6 m	140° minimum

Note: *Typical articulation exceeds minimum specifications.*

Appendix A. Optical Tip Table

A.1 Tip Specifications

Table 3: Optical Tip Specifications






























Image	Diameter (mm)	View (DOV)	Color	Field of View (FOV)	Depth of Field (DOF)	Part Number
Standard Optical Tips						
	3.9	Forward	None	80	6-80mm .24-3.15"	PXT480FG
	3.9	Side	Brown	80	4-80mm .16-3.15"	PXT480SG
	3.9	Forward	Orange	90	3-40mm .12-1.57"	PXT490FN
	3.9	Side	Red	90	2-16mm .08-.63"	PXT490SN
	6.1	Forward	None	50	50mm-Inf. 1.97"-Inf.	XLG3T6150FF
	6.1	Forward	White	50	12-200mm .47-7.87"	XLG3T6150FG
	6.1	Forward	Black	120	5-120mm .20-4.72"	XLG3T61120FG
	6.1	Forward	Orange	80	3-20mm .12-.79"	XLG3T6180FN
	6.1	Forward	Yellow	90	20mm-Inf. .79"-Inf.	XLG3T6190FF
	6.1	Forward Oblique	Purple	50	12-80mm .5-3.2"	XLG3T6150FB
	6.1	Side	Brown	50	45mm-Inf. 1.77"-Inf.	XLG3T6150SF
	6.1	Side	Green	50	9-160mm .35-6.30"	XLG3T6150SG
	6.1	Side	Blue	120	4-100mm .16-3.94"	XLG3T61120SG
	6.1	Side	Red	80	1-20mm .04-.79"	XLG3T6180SN

Table 3: Optical Tip Specifications (cont.)

Image	Diameter (mm)	View (DOV)	Color	Field of View (FOV)	Depth of Field (DOF)	Part Number
Standard Optical Tips (cont.)						
	8.4	Forward	None	40	250mm-Inf. 9.84"-Inf.	XLG3T8440FF
	8.4	Forward	White	40	80-500mm 3.15-19.69"	XLG3T8440FG
	8.4	Forward	Gold	20	500mm-Inf. 19.69"-Inf.	XLG3T8420FF
	8.4	Forward	Yellow	80	25-500mm .98-19.69"	XLG3T8480FG
	8.4	Side	Brown	40	250mm-Inf. 9.84"-Inf.	XLG3T8440SF
	8.4	Side	Green	80	25-500mm .98-19.69"	XLG3T8480SG
	8.4	Side	Blue	120	5-200mm .16-7.87"	XLG3T84120SN
Shadow Probe Measurement Tips						
	6.1	Forward	White	50	12-30mm .47-1.18"	XLG3TM6150FG
	6.1	Side	Blue	50	7-24mm .28-.94"	XLG3TM6150SG
Stereo Probe Measurement Tips						
	3.9	Forward	Black	50/50	5-45mm .20-1.77"	PXTM45050FG
	3.9	Side	Blue	50/50	4-45mm .16-1.77"	PXTM45050SG
	6.1	Forward	Black	60/60	4-80mm .16-3.15"	XLG3TM616060FG
	6.1	Side	Blue	50/50	2-50mm .08-1.97"	XLG3TM615050SG
	8.4	Forward	Black	60/60	4-50mm .16-1.97"	XLG3TM846060FG
	8.4	Side	Blue	60/60	4-50mm .16-1.97"	XLG3TM846060SG

Appendix B. Chemical Compatibility

Chemical compatibility refers to the probe's ability to come into contact with various liquid substances and not be damaged.



WARNING! Do not use this system in explosive environments.

These substances are safe for a short duration of contact with the insertion tube:

- Water
- Aircraft Gasoline
- Jet-A-Fuel
- Isopropyl alcohol
- JP-4 Fuel
- Kerosene
- Synthetic Turbo Oil
- Gasoline
- Diesel Fuel
- Hydraulic Oil
- Inhibited Transformer Oil

Subsequent to contact with the above fluids, the insertion tube must be cleaned prior to storage.

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Appendix C. Warranty

GE Inspection Technologies warrants its VideoProbe components, when new, to be free from defects in material and workmanship and to perform in accordance with manufacturer's specifications under normal use and service for a period of one year from the date of purchase from GE Inspection Technologies or its authorized distributors, except that, the light source is warranted for a period of 3 years from the date of purchase, and servo motors in the articulation drive system are warranted for the life of this VideoProbe product.

GE Inspection Technologies' obligation under this warranty is limited to the repair or replacement of components determined by GE Inspection Technologies to be defective within the warranty period at no cost to the original purchaser, except for return shipping expenses. It shall be the purchaser's responsibility to return the product to GE Inspection Technologies or one of its authorized service centers.

This warranty extends to the original purchaser and cannot be assigned or transferred to any third party. This warranty shall not apply to any damage or product failure determined by GE Inspection Technologies to have been caused by misuse, accident (including shipping damage), neglect, improper maintenance, modification or repair by someone other than GE Inspection Technologies or one of its authorized service representatives.

These express warranties are in lieu of any other warranties, express or implied, including the warranties of merchantability and fitness for a particular purpose, and no other person has been authorized to assume for GE Inspection Technologies any other liability in connection with the sale of its VideoProbe products. GE Inspection Technologies shall not be liable for any loss or damages, whether direct or indirect, incidental, or consequential, resulting from the breach of any express warranty set forth herein.

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Appendix D. Verifying Measurement Tips

D.1 Verification Blocks

Verify measurement tips each time they are used to ensure that no mechanical damage has degraded their accuracy.

Every XL Vu+ system equipped with measurement tips is shipped with a measurement verification block. This tool allows for verifying the accuracy of the measurement tips. It contains optical measurement targets whose accuracy is traceable to the United States *National Institute of Standards and Technology* (NIST) measurement standards.

These are the part numbers for the verification blocks used with the XL Vu+ system:

- VER2400B For 3.9mm systems
- XLG3TM61VER For 6.1mm systems
- XLG3TM84VER For 8.4mm systems

Each measurement verification block comes with a calibration schedule and a *Certificate of Calibration* (C of C), which notes the calibration date and due date. Each block has two or more chambers, and each chamber contains two calibrated test targets: 0.1 inch and 1 mm.

D.2 Verification Procedure

To verify a measurement tip, complete the following steps:

1. Attach the shadow or stereo tip securely.
2. Insert the tip into the appropriate test chamber.
3. Measure the test target using the appropriate metric (inches or millimeters).
4. Evaluate the results.

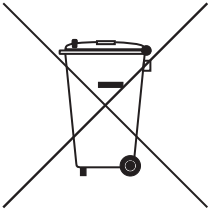
An experienced user can achieve a measurement of 0.100 ± 0.005 inches (1.00 ± 0.05 mm). If your measurement results do not fall within these limits, see “*Troubleshooting Measurements*” on page 124.

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Appendix E. Environmental Compliance

E.1 Waste Electrical and Electronic Equipment Directive

GE Sensing & Inspection Technologies is an active participant in Europe's Waste Electrical and Electronic Equipment (WEEE) take-back initiative, directive 2002/96/EC.



The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol invites you to use those systems.

If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

Visit www.ge-mcs.com for take-back instructions and more information about this initiative.

E.2 Battery Disposal



This product contains a battery that cannot be disposed of as unsorted municipal waste in the European Union. See the product documentation for specific battery information. The battery is marked with this symbol, which may include lettering to indicate cadmium (Cd), lead (Pb), or mercury (Hg). For proper recycling return the battery to your supplier or to a designated collection point.

E.2.1 What do the Markings Mean?

Batteries and accumulators must be marked (either on the battery or accumulator or on its packaging, depending on size) with the [separate collection symbol](#). In addition, the marking must include the chemical symbols of specific levels of toxic metals as follows:

- Cadmium (Cd) over 0.002%
- Lead (Pb) over 0.004%
- Mercury (Hg) over 0.0005%

E.2.2 The Risks and Your Role in Reducing Them

Your participation is an important part of the effort to minimize the impact of batteries and accumulators on the environment and on human health. For proper recycling you can return this product or the batteries or accumulators it contains to your supplier or to a designated collection point.

Some batteries or accumulators contain toxic metals that pose serious risks to human health and to the environment. When required, the product marking includes chemical symbols that indicate the presence toxic metals: Pb for lead, Hg for mercury, and Cd for cadmium.

- **Cadmium** poisoning can result in cancer of the lungs and prostate gland. Chronic effects include kidney damage, pulmonary emphysema, and bone diseases such as osteomalacia and osteoporosis. Cadmium may also cause anemia, discoloration of the teeth, and loss of smell (anosmia).
- **Lead** is poisonous in all forms. It accumulates in the body, so each exposure is significant. Ingestion and inhalation of lead can cause severe damage to human health. Risks include brain damage, convulsions, malnutrition, and sterility.
- **Mercury** creates hazardous vapors at room temperature. Exposure to high concentrations of mercury vapor can cause a variety of severe symptoms. Risks include chronic inflammation of mouth and gums, personality change, nervousness, fever, and rashes.

Visit www.ge-mcs.com for take-back instructions and more information about this initiative.

Appendix F. Agency Certifications

F.1 European Equipment Classification

Group 1, Class A

The **CE** mark on this product indicates it has been tested to and conforms with the provisions of the 2004/108/EC Electromagnetic Compatibility Directive. The XL Vu+ system is in conformance with the following standard: EN61326-1.

Declarations of Conformity are held by GE Inspection Technologies GmbH:

GE Sensing & Inspection Technologies
GmbH Product Service Center
Lotzenäcker 4
72379 Hechingen Germany
Tel: +49(0) 74719882 0
Fax: +49(0) 74719882 16

F.2 Safety Mark

The XL Vu+ system is in compliance with the following standards:
UL 61010-1, IEC 61010-1, EN 61010-1 and CSA-C22.2 No. 61010-1

F.3 Additional Certification Testing

MIL-STD-810G: 506.4, 507.4, 509.4, 510.4, 511.4, 514.5, 516.5, 521.2
UN / DOT T1-T8

F.4 Canadian Notice

This equipment does not exceed the **Class A** limits for radio noise emissions as described in the *Radio Interference Regulations of the Canadian Department of Communications*.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la classe A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

F.5 FCC Compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Appendix G. Creating a Personalized Logo File

The XL Vu+ allows users to display a personalized logo on-screen or to store with captured images. Typically, this file is a corporate logo.

G.1 Logo File Requirements

- 200 x 200 pixels maximum size (60 x 60 pixels optimum size)
- 24 Color
- File name must be logo.jpg
- File must be Microsoft® Windows® compatible

G.2 Creating the Logo File

1. Open the logo file with an image editor.
2. Create a custom background comprised of Red 255, Green 0, Blue 255. This will create a magenta-colored background that will appear transparent when loaded on the XL Vu+.
3. Save this file as a .png file.
4. Close the image editor.
5. Locate the saved file, right-click on it, and choose rename. Rename file from logo.png to logo.jpg. This will allow it to be recognized by the XL Vu+.
6. Transfer the file to the USB Thumb Drive provided with system.
7. Insert the Thumb Drive into the USB port on the XL Vu+.
8. Press the joystick to enter *Live Main Menu*.
9. Navigate to **SETUP > SCREEN/DISPLAY > LOGO**.
10. Select **LOAD**.
11. the prompt will display "LOGO COPY COMPLETE".

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Appendix H. Restoring Factory Defaults

To restore the factory defaults, press and hold both **Left** and **Right Soft Keys** for five seconds and confirm restoration of the factory defaults. Performing this action restores the following options:

- Battery Icon - On
- Date/Time - On
- Date Format - MM/DD/YYYY
- Logo - On
- Temp Icon - On
- Text Color - Green
- Image Format - BMP
- Power Management - On
- Steering Mode - Coarse
- Measurement Accuracy Index - On
- Measurement Units - Inches

Note: *Upon the next restart of the VideoProbe after restoring the factory defaults, select the desired language from the initial language selection screen.*

[no content intended for this page]

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