OPERATION MANUAL

V5 LE NON-CONDUCTIVE VIDEOSCOPE SYSTEM
# TABLE OF CONTENTS

Introduction ......................................................................................................................... 4

1.0 Important Safeguard and Operating Recommendations .................................................. 5

2.0 Product Overview ........................................................................................................... 6

3.0 System Setup ................................................................................................................ 7

4.0 Videoscope .................................................................................................................... 9

   4.1 Focus ....................................................................................................................... 9

   4.2 Articulation ............................................................................................................ 9

   4.3 Articulation Locks ................................................................................................. 9

5.0 Basic Operating Instructions .......................................................................................... 10

   5.1 Turning the Power ON ......................................................................................... 10

   5.2 Turning the Power OFF ...................................................................................... 11

   5.3 Capturing a Still Image ....................................................................................... 11

   5.4 Capturing a Video Clip ....................................................................................... 11

   5.5 Displaying Captured Images and Video ............................................................. 11

6.0 Main Control Panel ....................................................................................................... 12

   6.1 Main Power Switch .............................................................................................. 12

   6.2 White Balance Switch ......................................................................................... 12

   6.3 Video IN Source Switch ...................................................................................... 12

   6.4 Battery Voltage LCD Info Screen ........................................................................ 12

7.0 Touch Screen Menu Operation ...................................................................................... 13

   7.1 Menu Features ..................................................................................................... 13

       7.1.1 Power Down ................................................................................................ 13

       7.1.2 Photo Gallery .............................................................................................. 14

           7.1.2.1 Delete Files ......................................................................................... 15

           7.1.2.2 Replay Movie Clips ............................................................................ 15

       7.1.3 Still Image Capture ..................................................................................... 16

       7.1.4 Video Clip Capture ..................................................................................... 16

       7.1.5 Image Setup .............................................................................................. 17

       7.1.6 On Screen Display (OSD) ........................................................................... 17

       7.1.7 Back ........................................................................................................... 18

7.2 Reset Function ............................................................................................................. 18
INTRODUCTION

Thank you for selecting Instrument Technology, Inc. (ITI) to fulfill your remote viewing needs.

Since 1967, ITI has been the Leader in Remote Viewing. The only company of its type doing all its manufacturing in the United States, ITI consistently provides cutting edge technology to customers world-wide.

ITI specializes in the design, development and manufacture of Remote Viewing Instruments (RVI) and systems including Borescopes, Fiberscopes and Videoscopes.

ITI offers over 2,000 standard products as well as products custom designed for unique applications. No matter which ITI product is used, our customers find they are able to observe hostile and difficult to reach environments never dreamed possible before. Though ITI products can solve many remote viewing problems, it is always best to select the proper instrument for any given application. Only then can success be assured.

Your satisfaction is guaranteed with all products purchased from Instrument Technology, Inc. Feel free to contact ITI or your local ITI Representative with any questions.

WARRANTY

Instrument Technology, Inc. warrants that the equipment is fit for the purposes described herein for a period of one year after the date of shipment when used in accordance with the directions for use, and agrees to repair or replace any such defective component part at no cost to the customer.

There are no other express or implied warranties. ITI’s sole obligation and purchaser’s exclusive remedy for breach of any warranty shall be limited to repair or replacement of the product at the option of ITI. This warranty does not cover, and ITI will not be liable for any resulting direct, proximate, incidental or consequential damages. This warranty does not apply if the product has been subject to misuse, negligence, accident or improper application, nor shall ITI be responsible for work done or repairs made by others.

⚠️ WARNING: Read this manual completely.

SAFETY INFORMATION DEFINITIONS

- **DANGER**: Indicate[s] a hazardous situation which, if not avoided, will result in death or serious injury. The signal word "DANGER" is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved.

- **WARNING**: Indicate[s] a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved.

- **CAUTION**: Indicate[s] a hazardous situation which, if not avoided, could result in minor or moderate injury.

  **CAUTION**: [Signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.

- **NOTICE**: [this header is] preferred to address practices not related to personal injury. The safety alert symbol shall not be used with this signal word. As an alternative to “NOTICE” the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.
1.0 IMPORTANT SAFEGUARDS AND OPERATING RECOMMENDATIONS

DANGER: NON-IONIZING ELECTROMAGNETIC RADIATION SOURCE

This device (Only with Transmitter Configuration) radiates Microwave energy when operating. The Microwave energy is non-ionizing. Increasing distance from the Microwave emitting source decreases exposure. Always turn device off when possible to avoid unnecessary exposure to Microwave energy radiation.

Always consult this manual and ITI representatives before employing this product in high electrical powered application to prevent injury or death.

WARNING: Operators must be trained to safely operate electromagnetic EM energy emitting devices which may exceed FCC exposure and absorption limits (Only with Transmitter Configuration). This product is not a commercial product for general public uses.

WARNING: This product operates on Li-Ion Battery pack. Li-Ion cells are very sensitive to charging characteristics and if they are mishandled may explode.

CAUTION: The unit is not waterproof. To prevent a shock, hazard or fire, do not expose the unit to water or other liquids.

NOTICE: Avoid excessive vibrations or sudden shock. This device is not fragile but contains electronic circuit boards which may be damaged.

NOTICE: Do not immerse the video case into any liquids.

NOTICE: It is recommended to disconnect the battery from the charger shortly after fully charging (Do not leave on the charger for an extended period of time).

CAUTION: The batteries will become warm while charging. It is recommended removing the battery from the battery compartment while charging. Excessive heat generated will shorten the batteries life.

CAUTION: It is important the user reads this entire operation manual prior to handling, using, or maintaining this product. Failure to do so may contribute to personal injury or property damage.
2.0 PRODUCT OVERVIEW

ITI Non-Conductive Videoscope Kit includes:
(1) ITI Model 178708 Ø8mm Non-Conductive Videoscope
(1) ITI Model 178310 V5 LE Video Case
(2) Battery Pack P/N 122826
(1) Battery Charger P/N 122727
(1) Power Supply P/N 550-072
(1) Receiver (Optional) P/N 122721
(1) Head Up Display (Optional) P/N 122293
(1) ½” Dekoron Hose P/N 914-010
(1) Protective Carrying Case & Foam

ITI Series 178708 Videoscopes are long, small diameter, flexible tubes containing a high resolution color camera chip with lenses at the distal tip. The chip camera carries video signals by wires that terminate in a multi-pin connection extending from the operation handle. The flexible tube also contains:

1) 4-way articulation wires enabling distal tip movement.
2) Fiber optics for illumination.

The flexible tube is composed of an internal coil for crush resistance, braided wall reinforcement for torsional strength, and a plastic external layer as a flexible and environmental resistance seal. Videoscope models also employ a tungsten metal exterior braid for durability in sharp edged and abrasive environments. Other models use only non-conductive external materials to prevent shorting of electrical equipment being viewed.

DANGER: Always consult this manual and ITI representatives before employing this product in a high electrical powered application to prevent injury or death.

Videoscopes are normally used to view or inspect into inaccessible or hazardous environments when only limited access is available. The articulation control enables the operator to move the tip around for general observation and/or inspection.

The Videoscope is connected to the V5 LE Videoscope System. The V5 LE Videoscope System contains the controls to operate the Videoscope’s camera (see Figure 1).

FIG. 1: V5 LE VIDEOSCOPE CONTROLS SYSTEM
3.0 SYSTEM SETUP

CAUTION: Never attach or remove the Videoscope portion of the V5 LE System from the Video Case control portion when powered (ON) as the camera system will be damaged. The system must always be shut off and preferably removed from Mains power connection, prior to setup or disassembly.

NOTICE: Pressing the two latches found on the Videoscope’s switchable connector disconnects the power to the CCU. This acts as a safety feature to protect the camera in case of accidentally unplugging the connector from the video case while the main power is ON. If the latches are pressed while the Videoscope is ON then no video image is displayed. If the latches are released then a corrupt video image is displayed. Power cycle the DVR to return to normal operation.
1. Connect the Videoscope control cable video connector into the Main Videoscope Input connector located on side of **V5 LE Videoscope System** shown in Fig. 2 above.

2. Connect the second connector, Videoscope control cable Light Input, into Light Source to be used. White light source has a knob for dimming the light intensity, while each of the IR/Blue light sources has an illumination attenuation lever to shutter down the light intensity (Fig. 2 & 3). Adjust as needed.

3. If the system will use the internal DC Battery Pack for power, the AC/DC switch on the back of the video case shown in Fig. 4 must be set to DC position. See Basic Operations section for operation instructions.

4. If AC power is to be used, please connect the AC power supply (included in the kit) to the system’s AC input located on the rear panel, see Fig. 4. Ensure that the AC power cord is connected firmly to the AC inlet of the AC power supply. Next, plug the AC power cord securely into the power outlet and make sure that the AC/DC switch is set to AC position. See Basic Operations section for operation instructions.

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**CAUTION:** Reference the power input configuration tag located on the rear panel. Failure to use a proper cord and voltage supply could result in property damage, personal injury or system malfunction.

**CAUTION:** Inspect the power cord before use. Using a damaged power cord may result in electric shock.

**CAUTION:** The power supply included in the kit is not water proof. Do not use it in wet conditions where the risk of producing electric shocks increases.
4.0 Videoscope

4.1 Focus

The objective lens in the Videoscope is fixed and cannot be adjusted. An object will be in focus if it is between 1.0 inch and infinity.

4.2 Articulation

CAUTION: Do not attempt to articulate Videoscope in the coiled state, catastrophic failure to the articulation system will occur from added stresses placed on the system. The working length of the instrument should be in the elongated state at-all-times when articulating the instrument.

The Videoscope has four-way articulation (up, down, left and right). The knobs on the handpiece control the articulation, see Fig. 5. Rotate one knob to articulate up/down, and rotate the second knob to articulate left/right.

The Videoscope articulation system is considered at its “neutral position” when the distal end is lying in line with the working length. When neutral, the neutral dots on the Articulation Knobs should be in line with each other and the white neutral indicator line on the rear body housing. **The scope should always be returned to this position prior to withdrawal from area being viewed.**

![Fig. 5: Videoscope Handle Features](image)

4.3 Articulation Locks

Once an object has been acquired in the field of view, line of sight may be maintained by using articulation locks. Locks are oval rocking levers located to the side of knobs. Each knob has its own color-coded lock to switch on or off.

When "ON", the ratchet style locking system engages, while the "OFF" position allows Videoscope to articulate freely. The ratchet system holds the line of sight. It can also be overpowered by turning the knob to the next locking position. The operator will hear an audible click as the knob is advanced from position to position. This is the ratchet mechanism at work.

**CAUTION:** Always unlock and straighten Videoscope before withdrawal. Failure to do so may result in catastrophic failure. **Scope is straight when the knobs are returned to their neutral position.**
5.0 BASIC OPERATING INSTRUCTIONS

5.1 TURNING THE POWER ON

Two steps need to be followed in order to power ON the V5 LE Videoscope System.

1. Turn the Main Power Switch (located on the Main Control Panel) ON. This switch turns the power ON to all internal circuits. The monitor will have the backlight only turned on.
2. Turn the monitor ON. The monitor will be switched ON when the DVR is switched ON. To switch ON the DVR, hold down the “DVR POWER” switch for 3 seconds, until you hear a “beep”, then release. Almost immediately the ITI splash screen will appear. This will stay on screen for about 30 seconds during the boot sequence after which the video image will display.
5.2 TURNING THE POWER OFF

To power OFF the V5 LE Videoscope System, the same two steps need to be taken, as for powering ON, but in reverse order.

1. Turn the monitor OFF. This is simply done by touching the POWER icon twice on the touch screen monitor (for a complete description of the touch screen controls, see TOUCH SCREEN MENU OPERATION section of this manual).
2. Turn the Main Power Switch OFF.

5.3 CAPTURING A STILL IMAGE

Touching this icon once freezes the video image on screen. To save this picture press PHOTO again to save on the USB flash drive, and return to live video. For more information see TOUCH SCREEN MENU OPERATION section of this manual.

NOTICE: The USB flash drive needs to be inserted into the USB port, found on the monitor panel, before the V5 LE Videoscope System is powered ON. If the USB flash drive was not plugged into the USB port before the system was powered ON, then plug the USB flash drive and cycle the DVR power.

5.4 CAPTURING A VIDEO CLIP

Touch this icon once to activate a video clip recording. At this point just the VIDEO and BACK icons are visible, giving the user the ability to cancel the recording session by touching the BACK icon. The second activation of the VIDEO icon proceeds to recording. A movie record icon starts flashing at the top right of the screen. Touch VIDEO icon again to stop the video clip recording and return to live video. The clip is saved on the USB drive. For more information see TOUCH SCREEN MENU OPERATION section of this manual.

NOTICE: The USB flash drive needs to be inserted into the USB port, found on the monitor panel, before the V5 LE Videoscope System is powered ON. If the USB flash drive was not plugged into the USB port before the system was powered ON, then plug the USB flash drive and cycle the DVR power.

5.5 DISPLAYING CAPTURED IMAGES AND VIDEO

Touch this icon to access PHOTO GALLERY and play/view the previously recorded files. Use the navigation control to browse the recorded files. Touch OK to play/view the selected file. Touch BACK to return to the PHOTO GALLERY and touch BACK again to return to live video. For full description of the PHOTO GALLERY features refer to the TOUCH SCREEN MENU OPERATION section of this manual.
6.0 MAIN CONTROL PANEL

The video camera controls and the main power switch are found on the MAIN CONTROL PANEL.

**Fig. 6: Camera Control Panel**

6.1 MAIN POWER SWITCH

This switch turns ON and OFF both external AC and internal 12VDC circuits.

6.2 WHITE BALANCE SWITCH (Videoscope input only)

The camera is equipped with the AUTO / SET White Balance. AUTO mode detects the color-temperature of a subject to automatically adjust White Balance. The SET mode locks the White Balance, which is good for viewing in fixed color-temp illumination, such as the Blue and IR illumination. The White Balance should be used in the SET mode under most conditions. Each time the V5LE is used setup the White Balance. To setup: start in AUTO mode while viewing a well-lit white surface illuminated with white light, then push the switch to change to SET mode.

6.3 VIDEO IN SOURCE SWITCH

To switch between video sources use the Video IN Source switch. If the Videoscope is the desired video source then the switch should be set on VS. If an auxiliary video camera is the desired video source then the switch should be set on AUX. The auxiliary camera needs to be plugged into the auxiliary 10 pin connector found on the rear panel (see Fig. 4)

6.4 BATTERY VOLTAGE - LCD INFO SCREEN

The LCD will display the system voltage. If the system is running on external AC power the display will show a constant voltage of about 12VDC. However, if the system is running on the internal battery pack then the display will show the voltage of the battery. When the battery pack reaches the end of its charge, the LCD will display “LOW BATTERY” and the yellow LED (next to the LCD display) will flash. At this point the system should be turned off and the battery recharged (see Battery and Battery Charger Description and Operation). If the system is allowed to run longer, the red LED (next to the LCD display) will start flashing and soon after the system will not function properly as the battery voltage will be too low.
7.0 TOUCH SCREEN MENU OPERATION

After turning ON the MAIN POWER SWITCH and the DVR (see 5.1 Turning the Power ON), with a video camera connected (either the Videoscope or an auxiliary camera) the only on screen display (OSD) is the Date and Time. If there is a USB flash drive inserted then the File Count (showing the number of files on the USB flash drive) will also appear.

If the screen is touched anywhere, then 3 control icons will appear if video camera is not connected, or 7 control icons will appear if a video camera is connected.

![VIDEO CAMERA NOT CONNECTED](image1)

![VIDEO CAMERA CONNECTED](image2)

If the system was powered ON without having a video camera connected then to get a video image, connect a video camera and touch the BACK icon. The video image will then display after a few seconds.

7.1 MENU FEATURES

7.1.1 POWER DOWN

To power down touch the POWER icon once. All the icons will disappear, except for the POWER icon and BACK icon. To return to live video touch BACK. To power down touch POWER icon again. The “System Shut-down” message will appear at bottom left of the screen and a series of “beeps” will signal that the monitor and DVR will shut down. 3 “beeps” will then indicate shut down was successful.
7.1.2 **Photo Gallery**

This icon takes you to the photo gallery screen. Here, the thumbnail images of the stills and video clips stored on the USB flash drive are displayed six (6) at a time. The border surrounding the thumbnail indicates red for JPEG and blue for m4v files. Use the navigation control to browse the thumbnails. Touching the down arrow moves the gallery to the next page when on bottom line. The left info box displays the name of the selected thumbnail while the right info box displays the page number the selected thumbnail is and the total number of files stored on the USB flash drive. The filename assigned to the still images and video clips are comprised of 8 characters. The first 6 characters represent the date (when the image or clip was taken) in DD/MM/YY format while the last two characters are a sequence of characters that will give every saved file a unique name.

**NOTICE:** Video clips are saved as .m4v files. This movie file is playable on a PC by VLC Media Player, downloadable here: [http://www.videolan.org/](http://www.videolan.org/)

**NOTICE:** If the Photo Gallery is accessed when an USB flash drive is empty then “No Image Files” is displayed in the bottom right side of the screen followed by 3 beeps before returning to live video.

**NOTICE:** If the Photo Gallery is accessed after the USB flash drive was removed and inserted again in the USB port without cycling the DVR power, then “Card Install Failed” is displayed in the bottom right side of the screen followed by 3 beeps before returning to live video. Cycle the DVR power with the USB flash drive plugged and then access the Photo Gallery.

If third party software is not desirable, the .m4v video clips can be saved in .mp4 format, playable in Windows Media Player. The following steps should be taken if .mp4 format is desired:

1. If the gallery cursor is over a .m4v file then pressing the MP4 icon will leave the BACK and MP4 icons only.
2. At this point press BACK to cancel operation or MP4 icon to start the conversion. The MP4 icon will flash during the conversion while all the touch controls are removed.
3. When the conversion is complete, the photo gallery touch icons are turned back on. A file with the same name is written to the USB flash drive with a .mp4 file extension. The photo gallery will not display this file, only the .m4v file.

**NOTICE:** If the photo gallery cursor is over a .jpeg file, the MP4 icon is displayed but functionally disabled.
7.1.2.1 DELETE FILE (WHILE IN PHOTO GALLERY)

While in Photo Gallery, touching the DELETE icon will delete the selected file. Touch once to invoke delete option and a second time to delete the file from the USB flash drive. Touch BACK icon to return to live video.

If you select a file that you do not wish to delete, press BACK icon after the delete option was invoked to bring you back to the Photo Gallery.

NOTICE: If files were converted to .mp4 format than deleting a .m4v file from the photo gallery will delete the corresponding .mp4 file with the same name.

7.1.2.2 REPLAY MOVIE CLIPS (WHILE IN PHOTO GALLERY)

When a thumbnail image or video clip was selected from the gallery, by touching OK on the navigation control, the image will expand to full screen and start playing if it is a movie. Any text saved with the image will be displayed as well. Any time you can return to the gallery by touching the BACK icon. However, if you want to browse the images stored on the USB flash drive, in full size, then use the left and right arrows. Touch the left arrow to preview the previous image or the right arrow to view the next image. Images will replay in the same order as displayed in the gallery. This is a quicker method of viewing images than browsing the thumbnail in the gallery.

Also, on playback the PAUSE icon appears on screen along with the BACK icon so you can stop and start a movie clip at will. While the movie is paused a small PAUSE icon appears at top right of the screen to indicate the status.

NOTICE: Touching the screen anywhere there is no icon acts as a PAUSE key, making pausing very easy and convenient.
7.1.3 **Still Image Capture**

Touch this icon to capture a still image. As mentioned in section 5.3, touching this icon once freezes the video image on screen leaving just the PHOTO and BACK icons visible. Also, a STILL message appears at the top right side of the screen. To save this picture press PHOTO again to save on the USB flash drive (a CAPTURE message appears at the top right side of the screen signaling that the picture is being taken), and return to live video. If you do not wish to capture the image press BACK icon to cancel and return to live video.

7.1.4 **Video Clip Capture**

By touching this icon, a two stage video record sequence is activated. As mentioned in section 5.4, first stage gives the user the ability of canceling the recording process by touching the BACK icon. Touch VIDEO icon the second time to start a video clip recording. A movie record icon starts flashing at the top right of the screen signaling that a video clip is recording. Touch VIDEO icon again to stop the video clip recording and return to live video. The clip is saved on the USB flash drive.

Once a video clip started recording, touch PAUSE icon at any time to pause the recording. Pressing PAUSE again resumes the recording. The movie clip is then saved as a single file but missing the time period between PAUSE touches.
7.1.5 Image Setup

On the image setup screen the following image controls can be found: Contrast, Brightness, Saturation and Hue. Use the navigation controls up and down arrows to select the parameter you want to adjust, and then use the left and right arrows to make the adjustments. The image will change in real time in the background. Default settings are at 50%. Touch BACK to return to live video where the changes will be reflected in the live image.

**NOTICE:** If the input video format is PAL then the “Hue” control will have no effect.

7.1.6 On Screen Display (OSD)

OSD generally refers to text characters overlaid on the live image and which are saved with the image. The system displays an OSD such as the following at the top left of the screen for showing the current Date, Time and File Count.

First line displays current **Date** (American format) and **Time**.

Second line shows **File Count** on the USB flash drive. It is the number of the next file to be saved. The line is blank if no USB flash drive is installed and it shows 01 if an USB flash drive is present but empty with no files saved.

The File Count is a set of two characters that are automatically incremented through the sequence of characters 0-9. File count rage from 01 to 99. The file count characters will be automatically added as last two characters to the filename of the still image or video clip saved on the USB flash drive. When #99 is reached, the system will report an “SD Card Full” error message at the bottom of the display. If another video or still image is attempted to be captured, this error message is repeated and no more files are captured. At this point the USB flash drive needs to be emptied or replaced with an empty one.
By touching the OSD icon the shown input screen will appear.

- On entry, the cursor appears at the start of the text line. The text line is 19 characters long. The first 3 positions are reserved for the file count number (which cannot be edited). Use the navigation controls to enter a 16 character text message to annotate an image. The cursor is positioned along the text line using the left and right arrows. Auto wrap is supported.
- To enter the keypad area, use the up arrow. Dual cursors are displayed, one at the current text line position and the other over the character to be selected. To move around the keypad use the up, down, left, and right arrows. Auto wrap is supported.
- To select a character, in the keypad area place the cursor over the desired character and press OK. The selected character will be placed in the text line below at the current cursor position which is then incremented along. In the text line, pressing OK will overwrite the current cursor position with a space character then increment the cursor position.
- Touch BACK to return to the live video screen where the single line of text will appear on the same line as the File Count.

NOTICE: Vertical movement encompasses both the keypad and text line. So, if you are on the keypad top line then pressing the up arrow will wrap you to the text line below and only one cursor is displayed. Similarly, if you are on the text line then pressing the down arrow will wrap you to the keypad top line with dual cursors appearing.

NOTICE: The text string is recalled into the text line each time the OSD editor is accessed, allowing you to edit the previously created text. This text line is volatile and will only be stored while the DVR is powered on. Cycling the DVR power will clear the text line.

7.1.7 Back

This is the only icon to be displayed on screen at all times. Of course, when no icons are displayed, the BACK icon will also not be displayed. Touch this icon to go back one step. So, if you are for instance in the PHOTO GALLERY screen touch BACK to return to the main screen. If you touch BACK in the main screen then all icons will disappear until the screen is touched again.

7.2 Reset Function

If the DVR system does not respond to the touch commands or will not power down in the normal way it may be necessary to carry out a hard reset to re-initialize the system. To do this, hold down the RESET button (found on the touch screen panel – see fig. 7) for 4 seconds or until a series of “beeps” can be heard. After that the LCD screen will flash briefly and the system will power down.
The system can then be power ON again the normal way outlined in section 4.0. This procedure can be carried out at any point during the use of the system.

8.0 SYSTEM SETTINGS AND INFORMATION

8.1 SYSTEM SETTINGS

The language and date/time are factory setup. If different settings are needed than the factory setup settings, the Main Menu allows access to these settings. The Main Menu is accessed thru a keyboard that must be connected to the USB receptacle located on the monitor panel. First connect the keyboard while the DVR is powered down. Next power up the DVR by depressing the DVR power switch located on the monitor panel (see section 5.1 “Turning the Power ON” for more information)

After powering ON the system, to activate the Main Menu invoke F2.

```
Language, Clock Set >
On Screen Caption >
LCD Settings >
Composite Video Output
Regular Image
Zoom Image
Power Down (RH-C) >>
```

NOTICE: Although, seven options are displayed when accessing the Main Menu, only the Language, Clock Set and Power Down are fully operational. We do not recommend using the other options because they might crash the system.

The following actions can be performed using a desktop keyboard:

- To navigate press the arrow keys (UP, DOWN, LEFT and RIGHT)
- To Select press “Enter”
- To exit Main Menu press F2
To set the Language or Date/Time, select Language, Clock Set option.

<table>
<thead>
<tr>
<th>Language, Clock Set</th>
<th>English</th>
<th>Selects English language</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Screen Caption</td>
<td>German</td>
<td>Selects German language</td>
</tr>
<tr>
<td>LCD Settings</td>
<td>Spanish</td>
<td>Selects Spanish language</td>
</tr>
<tr>
<td>Composite Video Output</td>
<td>Italian</td>
<td>Selects Italian language</td>
</tr>
<tr>
<td>Regular Image</td>
<td>Clock Set</td>
<td>Selects Clock Set</td>
</tr>
</tbody>
</table>

Use UP and DOWN arrows to highlight the desired option then press ENTER to select. If no selection is required then use the LEFT arrow to return to the MAIN MENU without making any changes.

If the Clock Set option is selected a setup screen is displayed as follows:

![Clock Setup Screen](image)

Set Date and Time using the LEFT and RIGHT arrows to highlight the settings (as shown in the above picture) and then the UP and Down arrows to change them. Press ENTER to save and exit this option. The system must be power down by selecting Power Down option and then press F10. Remove keyboard to return to normal functioning of the DVR.

## 8.2 System Information

System information shows data relating to the software revision of the DM365 application code, as well as the revision level of the microcontroller firmware. It can be found in the same window as the Clock Setup. Please refer to section 8.1 for instructions on how to access this option.

![System Information](image)

The top line of the System Information field shows the software revision while the second line shows the revision level of the MSP430 microcontroller firmware.
9.0 Battery and Battery Charger

The V5 LE Videoscope System contains two 16VDC Li-Ion Battery packs. One battery pack located in the Battery Compartment and powers the system, and a spare battery pack located in the travel case.

As seen in fig. 8, the battery pack plugs into a power jack found inside the Battery Compartment.

To access the battery, unscrew the thumb screw that secures the Battery Compartment Cover and remove the cover.
The V5 LE Videoscope System is designed to operate using external AC power supply or internal 12VDC supply. The V5 LE will automatically switch to internal 12 VDC if the AC power supply is disconnected. If the AC power supply is reconnected while running on internal 12VDC then the system will automatically switch to the 115VAC power supply.

9.1 **Battery Pack Specifications:**

- Chemistry: Li-Ion
- Capacity: 10.4Ah
- Voltage: 14.8V (Peak at 16.8V)
- PCB: Protection Circuit Module – built-in IC chip prevents the battery pack from over charge and over discharge prolonging the battery life
- Dimensions: 5.75” x 2.88” x 1.50”
- Weight: 1.73 lbs

![Battery Pack Diagram](image)

**Fig. 9: Battery Pack**

**WARNING:** Li-ion cells are very sensitive to charging characteristics and if mishandled may explode.

**NOTICE:** User should have enough knowledge about Li-Ion rechargeable batteries for proper use. Only the recommended battery charger (see Battery Charger section) should be used to charge the battery pack. ITI Instrument Technology is not responsible for any damages caused by misuse or mishandling of the Li-Ion battery pack.

9.2 **Battery Charger Specifications:**

1. Input Voltage: 110-240 VAC, 50/60 Hz
2. Charger Type: Li-Ion / Li-polymer Battery Pack (14.8 V 4 cells)
3. Charging Current: 1.5A
4. Built in IC to cut off power automatically when battery is fully charged.

The Videoscope System kit is supplied with one battery pack charger and a power cord. Charger output is equipped with a jack connector that mates with the battery pack plug. The charger is supplied with an IEC AC cord which has an IEC-C13 socket.

![Battery Charger Diagram](image)

**Fig. 10: Battery Charger**
LED Charging Indicators:

- RED LED – indicates that the battery is charging
- GREEN LED – indicates a fully charged battery pack; also this LED will be ON when no battery is connected to the charger.

Charging Instructions:

- Disconnect the battery and remove it from the battery compartment inside the video case.
- Plug the battery into the charger and plug the charger into the AC power source. The battery is expected to charge fully in approximately 7 hours.

**WARNING:** Do not use this charger with any battery pack that doesn't have a built-in protection circuit board/module (PCB/PCM).

**WARNING:** Do not use this charger to charge battery packs with less than 1.5Ah capacity. It may cause battery explosion.

**CAUTION:** Never leave batteries unattended when charging. Do not place the batteries on wooden surface or carpet when charging.

**CAUTION:** Do not recharge packs which are hot to the touch; allow them to cool down to ambient temperature first.

**CAUTION:** The charger may become hot when operating – take care when touching the unit.

**CAUTION:** Do not cover the charger, provide adequate cooling.

**CAUTION:** Keep the charger, batteries, and cables away from flammable or temperature sensitive objects.

### 10.0 LIGHT SOURCES

The side panel of the V5 LE Videoscope System (see fig. 2) contains the white LED light source. The IR / Blue light sources are located on the IR/Blue Control Panel (see fig. 3). The top light source is the IR Light Source while the bottom is the Blue Light Source. Depending on configuration set up one or more of the sources may be omitted.

**WARNING:** The high intensity light at the front of the light sources and the tip of the Videoscope probe will create high temperatures and bright light. To minimize the risk of injury, avoid direct viewing or contact.

**CAUTION:** To prevent injury due to bright illumination and contact with heated parts, always plug the fiber optic bundle into the light source before turning the power on.

**CAUTION:** Never cover up the light output aperture with your hands or other parts of the body (risk of burn).

### 10.1 WHITE LED LIGHT SOURCE

The white high brightness LED light source is used to supply high quality, white light for video illumination. The light intensity level of the white LED light source is adjustable between 0% and 100% by rotating the light intensity control knob. The average LED lifetime is 50,000 hours (based on LED manufacturer rated wattage and thermal operation).
NOTICE: Do not insert anything other than the light guide connector found at the end of the video scope into the light source aperture. The inside lens can be damaged by scratches.

1. Plug the fiber optic bundle into the light source aperture before turning the power on. Light Source Power Switch / Light Intensity control knob should be in the OFF position, as the sweep indicates.
2. Turn ON the Power Switch.
3. Set the light intensity to the desired level by rotating the knob left to right.
4. Turn the Light Source Power Switch / Light Intensity knob to OFF position when not in use.

NOTICE: The White LED light source has no user replaceable parts. Contact ITI if repair is required.

10.2 BLUE LIGHT SOURCE

The Blue Light Source is used to supply a narrow frequency, high intensity, blue light, when a white light source is not appropriate for video and optical illumination.

1. The Blue Light Source will illuminate best if the White Balance (see Main Control Panel section 6) is in the SET mode. While the White Balance is in the AUTO mode, view a well-lit white surface illuminated with white light then push the switch to change to SET mode. This will lock the White Balance and prevent the camera from trying to compensate for the Blue Light.
2. Plug the fiber optic bundle into the light source before turning the power on. Turn the Blue Light Intensity Control to the minimum position by rotating the lever to the most right position.
3. Turn the IR/Blue Light Source Power switch to the Blue position. The bottom green LED will turn on signaling that the Blue Light Source is on.
4. Set the light intensity to the desired level by rotating the lever left and right.
5. Turn the IR/Blue Light Source Power Switch to OFF position when not in use.

NOTICE: The Blue LED light source has no user replaceable parts. Contact ITI if repair is required.

Specifications
Lamp: Royal Blue LED
Wave length: 440 nm peak emission
Lamp: 8 to 24 Volts DC, 5 Watts, 700 mA
Lamp life: more than 5000 hours
Dimming System: Manual shutter (light intensity control)
10.3 **INFRARED (IR) LIGHT SOURCE**

The IR Light Source is used to supply a high intensity, IR light, when a visible white light source is not appropriate for video and optical illumination.

1. The IR Light Source will illuminate best if the White Balance (see Main Control Panel section 6) is in the SET mode. While the White Balance is in the AUTO mode, view a well-lit white surface illuminated with white light then push the switch to change to SET mode. This will lock the White Balance and prevent the camera from trying to compensate for the IR Light.
2. Plug the fiber optic bundle into the light source before turning the power on. Turn the IR Light Intensity Control to the minimum position by rotating the lever to the most right position.
3. Turn the IR/Blue Light Source Power Switch to the IR position. The upper green LED will turn on signaling that the IR Light Source is on.
4. Set the light intensity to the desired level by rotating the lever left and right.
5. Turn the IR/Blue Light Source Power Switch to OFF position when not in use.

**NOTICE:** The Infrared LED light source has no user replaceable parts. Contact ITI if repair is required.

**Specifications**
- Lamp: Infra Red LED
- Wave length: 880 nm peak emission
- Lamp: 10-14 Volts DC, 6 Watts, 400 mA
- Lamp life: more than 5000 hours
- Dimming System: Manual shutter (light intensity control)

11.0 **WIRELESS LINK (OPTION)**

The V5LE Videoscope System can be configured with a video transmitter to enable the use of a remote monitor. The remote monitor requires a remote wireless receiver operating at the same frequency (2400~2480 MHz) as the transmitter, such as the ITI Receiver Pack shown.

11.1 **TRANSMITTER, VIDEO CASE**

A wireless link is available to connect the V5 LE Videoscope System to a remote monitor. The transmitter is located inside the V5 LE Videoscope System case and is controlled with the Transmitter Control Panel.

**Operating Instructions:**

**CAUTION:** Never power up the transmitter without the antennae attached, transmitter damage will occur.

1. With the V5 LE Videoscope System powered up turn on the transmitter using the panel’s slider switch labeled ON/OFF.

   **NOTICE:** The Power indicator light should be illuminated at this time.

2. Rotate the antenna to the vertical position.

3. Set the transmitter channel selector to the same channel as the ITI Receiver Pack.
11.2 RECEIVER PACK (ACCESSORY OPTION)

Using the V5 LE Videoscope System’s transmitter with a remote monitor requires a wireless receiver. The ITI Receiver Pack is compatible with the V5 LE system and requires only a power/video cable configured to mate it to a 12VDC power supply and a monitor. The receiver is frequently used with ITI’s Monitor Pack and Head Up Display, both have a viewing display monitor. The receiver can be configured with a custom cable for use with an existing monitor and power supply.

Operating Instructions:

1. Connect the 4-pin video cable to the Wireless Receiver’s 4-socket video out connector.

2. Connect the power supply or the battery pack cable to the power jack found on the side of the receiver.

   NOTICE: An LED power indicator light will be illuminated if the receiver is receiving power. If the power indicator is not illuminated check the electrical connection and power supply.

3. Rotate and raise antenna vertically.

4. Set the Channel Select Switch to the same channel as the transmitter. The channel selector is located on the Transmitter Control Panel.

   NOTICE: An LED is provided to indicate the transmitted signal is being received. If the signal light is not illuminated, ensure the receiver channel selector matches the transmitter. Distance and Radio Frequency (RF) reflecting, retarding, and grounding structures will also degrade the wireless signal and performance.

For additional information consult the Digital Wireless model 176120 operation manual.
12.0 HEAD UP DISPLAY (OPTION)

12.1 SPECIFICATIONS

ITI Model 126395 Heads Up Display includes:

1. Monocular Head-Up Display with Inline Interface Control Box and connector
2. Pair of Eye Glasses
3. Eye Glasses Protective Case

This kit is intended to provide maximum resolution, portability and quick setup.

12.2 HUD SETUP

CAUTION: Cameras and HUD are delicate instruments, and should be treated accordingly. Proper handling and cleaning techniques will greatly increase the life of this instrument. Only trained operators should handle this equipment.

FITTING THE HUD

The HUD was designed to be mounted on a variety of ballistic eyewear. The HUD has a small clip, resembling a paper clip that slides onto the edge of the glasses. This clip provides a stable and quickly removable mount to the eyewear.

FIG. 13: HUD GLASSES

USING THE CONTROL BOX

- The top button, coming from the glasses, is Power ON/OFF.
- The middle button is used to flip the display from right eye to the left eye.
- The bottom 2 buttons are brightness controls and allow you to adjust the brightness up or down, depending on light conditions.

FIG. 14: INLINE CONTROL BOX CABLE

CONNECTING THE HUD ASSEMBLY TO THE VIDEO SOURCE

The HUD connects to the power / video source thru a 4 pin connector attached at the end of the Inline Control Box cable. For operating instructions, see the attached Head Up Display operations manual.
## TROUBLESHOOTING GUIDE

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE PROBLEM</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark Image</td>
<td>Low Light Source [LS] intensity setting</td>
<td>Increase LS intensity</td>
</tr>
<tr>
<td></td>
<td>Object distance too far or object is extremely dark</td>
<td>Use higher intensity LS</td>
</tr>
<tr>
<td></td>
<td>Dirt on external optical surfaces</td>
<td>Clean optics</td>
</tr>
<tr>
<td></td>
<td>Damaged Light Guide - noticeable damage to LG jacket</td>
<td>Return to ITI for repair</td>
</tr>
<tr>
<td>Image Not Clear</td>
<td>Dirt on external optical surfaces</td>
<td>Clean optics</td>
</tr>
<tr>
<td></td>
<td>Object distance is out of scope’s range</td>
<td>Move scope to proper object</td>
</tr>
<tr>
<td></td>
<td>Dirt or liquid on internal optical surfaces</td>
<td>Return to ITI for repair</td>
</tr>
<tr>
<td>No Image</td>
<td>No or low LS intensity</td>
<td>Check LS</td>
</tr>
<tr>
<td></td>
<td>Dirt on external optical surfaces</td>
<td>Clean optics</td>
</tr>
<tr>
<td></td>
<td>Scope is damaged</td>
<td>Return to ITI for repair</td>
</tr>
</tbody>
</table>

**TROUBLESHOOTING – Image Color (White Balance)**

Most likely the problem is white balance. If the SET mode of white balance is selected, the white balance must be reset upon restart of the system. The previous setting is not retained in memory. See the White Balance section of this manual for directions. This does not apply to AUTO mode as it will continue to operate after system restart.

**NOTICE:** When system is started in AUTO white balance mode the image may appear orange-red in color. This is because an object is reflecting too much light onto the camera while it is starting up. The camera’s AUTO software algorithm is temporarily disabled due to the light. The remedy is to simply point the camera toward an open area, normal operation will resume.
14.0 PRODUCT SPECIFICATION

VIDEOSCOPE

Physical Specifications
- Diameter: 8.0mm nominal
- Lengths, Available: 2, 3, 4, 5, 6, 7, and 7.5 meters
- Articulation Angulation: 120° minimum (Up, Down, Left, and Right)
- Mounting attachment: ¼" - 20 UN - 2B thread

Optical Specifications
- Field of View: 80 degrees fixed
- Line of Sight: 0° Forward
- Depth of Field: 25mm to Infinity

Video Specifications
- TV System Format: NTSC
- Image Sensor Size/Type: 1/6"CCD
- Effective Pixels: 373K NTSC, 438K PAL
- S/N Ratio: 46dB minimum
- Electronic Shutter: Variable from 1/30 - 1/10,000 sec.
- White Balance: Auto and Manual (3200°K to 6300°K)

VIDEO CASE

Digital Recording
- Video: Motion - m4v file type
  - NTSC – 720 x 480, 30fps
  - PAL – 720 x 576, 25fps
- Recording Rate settings:
  - 45 min/Gb w/8GB USB Drive
- Still Images: JPEG file type
  - NTSC – 720 x 480
  - PAL – 720 x 576
- Storage Media: USB Flash Drive
  - 16 GB (included) up to 64GB max. capacity
  - (a 30min. video clip file takes approx. 650MB space on the USB Flash Drive)

Display
- Size and Type: 6.5" Color LCD
- Viewing Angle: 160° Horizontal, 140° Vertical
- Luminance: 800 cd/m² (800 NITS)
- Contrast Ratio: 600:1
- Resolution: VGA (640H x 480V)
- Touch Foil: 6.4" Capacitive

LED Light Source
- LED Type: White High Brightness LED
- Color Temp: 6500°K
Color Rending Index          Approx 72  
LED Dimming                Linear Current Control  
Average LED Lifetime       50,000 hours (based on LED manufacturer wattage and thermal operation).

**Video and Accessory I/O**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Video Input</td>
<td>10 pin connector</td>
</tr>
<tr>
<td>Video Output</td>
<td>Scope mounted ITI Monitor</td>
</tr>
</tbody>
</table>

**Misc. Features**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Text Overlay</td>
<td>1 line x 19 characters</td>
</tr>
</tbody>
</table>

**GENERAL SPECIFICATIONS**

**Power Requirements**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Current</td>
<td>12 VDC, 6.3A</td>
</tr>
<tr>
<td>Battery Runtime</td>
<td>2h30min (10.4 Ahr Li-ion )</td>
</tr>
</tbody>
</table>

**Environment**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temp, Case</td>
<td>-5°F to 115°F (-20 to 46°C)</td>
</tr>
<tr>
<td>Operating Temp, Probe</td>
<td>-13°F to 176°F (-25°C to 80°C)</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>95% RH maximum</td>
</tr>
<tr>
<td>Storage Temp</td>
<td>-15°F to 140°F (-26°C to 60°C)</td>
</tr>
</tbody>
</table>

**Physical**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight, Videoscope</td>
<td>2 lbs. (.91 Kg) – 2 meters length</td>
</tr>
<tr>
<td>Weight, Video Case</td>
<td>10 lbs. (4.5 Kg)</td>
</tr>
<tr>
<td>Dimensions, Video Case</td>
<td>10” x 8” x 6” (254mm x 203mm x 152mm)</td>
</tr>
</tbody>
</table>
15.0 INSTRUMENT CARE

15.1 CLEANING AFTER USE

Wipe instrument after use with a soft, clean cloth. If instrument is soiled, use a non-abrasive, neutral detergent on a damp cloth to clean it. Always store the instrument in a protective case.

NOTICE: Do not immerse instrument in liquid unless it has been specifically manufactured for underwater applications.

15.2 CLEANING OF OPTICS

Should cleaning of external surfaces be necessary, blow off dust with a triple-filtered, high pressure optical quality dusting spray. Wipe surface with a clean cotton swab moistened with laboratory grade alcohol. Excess alcohol can be blown away with the spray.

ITI Model 126110 RVI Cleaning Kit may be used.

CAUTION: Do not use beyond recommended temperatures, otherwise property damage to this instrument or collateral property may occur.

Maximum 150° F (65° C)
Minimum 32° F (0° C)

DANGER: Do not allow instrument to contact live or exposed wiring. It is an excellent conductor.

15.3 REPAIR POLICY

If your equipment requires factory attention, contact ITI’s Customer Service Dept. at (413) 562-3606 for a Return Material Authorization. Please be prepared to furnish your model and serial numbers. Return the equipment to ITI, freight prepaid.

Ship to:

Instrument Technology, Inc.
33 Airport Road
Westfield, MA 01085-1357

NOTICE: Please note Return Material Authorization on Purchase Orders and all shipping documents.

Upon receipt of your equipment, ITI will assess its condition to determine if repairs are needed. If repairs are required, we will quote repair costs and a schedule for repairs. Your options at this point are:

1) Accept Repair
   To proceed with the repair, ITI will require a purchase order for the full quoted repair price.

2) Decline Repair - Upgrade to a New Instrument
   Choosing this option requires a purchase order for the new equipment at its quoted price. ITI will ship out the next available unit.

3) Decline Repair
   Please Note - Most repair evaluations require a partial or complete disassembly of the equipment. Once disassembled, it is impossible to return it to the customer in “as received” condition. At the customer’s option, ITI will either return your equipment in its disassembled state, or dispose of it.