

# **Elikliv model DM9 Digital Microscope**

## **Enhanced User's Manual**

### Overview

The DM9 is a 'monocular' microscope that uses a solid-state sensor element to capture an image(s) of the subject, and a back-illuminated LCD display screen to allow viewing of the captured image(s). A microcontroller inside the LCD display handles image processing and display. In addition to capturing still images, the microscope also allows capturing video. Because the microscope is 'monocular', it can only manage 2-dimensional images, and cannot depict the third 'height' dimension, thus the user cannot perceive or judge depth in the displayed image.

The captured still images are stored as JPEG (JPG) files, and captured videos are stored as AVI files, with both types of files being saved to a microSD memory card (SD for short) that plugs into the side of the LCD display ("LCD" for short). The microscope does NOT save images and videos to the SD card if the LCD is plugged into a PC (personal computer) via a USB cable; in that case, the photo/video capture software on the PC will handle recording of images and videos to files, and the file types will depend on the application software used.

The microscope has an integral annular set of LEDs encircling the lens to provide illumination of the subject; a control wheel on the LCD allows adjustment of the brightness from this light source. The base of the microscope also has two auxiliary "gooseneck" LED lamps (henceforth referred to as "auxiliary lamps"); these have their own dedicated brightness control wheel on the rear of the base. Note that both brightness control wheels are poorly scaled, thus most of the adjust occurs near one end of the control wheel rotation, the rest of the rotation being a 'dead zone'.

### Basic Microscope Operation

Review the rest of this manual for details.

Turn on the LCD using the Power button. Turn the annual LED lamp in the microscope on or off as required, and adjust the brightness as desired; do similarly with the Auxiliary LED lamps on the Base. Place the 'subject' (the object that you will be looking at) on the Base, with the area of interest positioned directly below the lens in the bottom end of the microscope. Adjust the Focus Wheel near the bottom end of the microscope until the area of interest is in clear focus. To change the magnification, raise or lower the microscope on its stand by use of the two black knurled knobs that are on either side of the Holder by the Stand; it will be necessary to re-focus every time the magnification is changed. Minimum magnification is obtained with the microscope fully raised, maximum magnification requires the microscope to be fully lowered.

## Table of Contents

Overview	1
Basic Microscope Operation	1
Table of Contents	2
Power Source	3
Memory	3
Power & Battery Charging	4
Parts of the Microscope	5
Menu	7
Selecting the Mode	12
To Take a Still Photo	13
To Take a Video	13
Playback	13
Ports	15
Connecting to a PC	17
Specifications	18
A Note on the Magnification	18

## Power Source

The microscope and the LCD get their power from an integral, replaceable, type 18650 lithium-ion battery, which is located behind a sliding cover on the rear of the LCD. The 18650 produces 3.7V with a capacity of about 3000mAh. Circuitry integral to the LCD boosts the battery voltage as required, and also handles charge management of the battery. There is reason to expect that the LCD will not charge the battery very much, if at all, while the microscope is turned on; for best/fastest charging, the microscope should be turned off. Charging a mostly depleted battery should take between 1 and 2 hours, assuming that a USB power adapter/charger of at least 2A capacity is used (it is not included with the microscope and must be obtained separately). The battery can also be charged by connecting the LCD to a personal computer (PC) via a suitable USB cable. The cable must have a micro-USB plug on the end that will connect to the LCD.

The auxiliary gooseneck LED lamps are powered via another micro-USB socket, located on the rear of the microscope's Base. A PC or a USB power adapter/charger may be used as the power source for the Base's auxiliary lamps. Alternately, the same cable that is used to connect the wired remote control to the LCD has a branch cable that can reach the micro-USB socket on the Base, so that the LCD's battery (or USB power source) also supplies power to the lamps on the Base.

## Memory

The microscope can store still images (as JPG files) and video (as AVI files) locally on a microSD memory card that is plugged into the LCD. Any images or video saved to the SD card can be read back and viewed on the LCD. Purportedly, any connected PC might be unable to read the contents of the SD card while it remains plugged into the LCD, although the SD card may be unplugged from the LCD and inserted into an SD card reader on a PC for purposes of reading the card's files in that manner. If the LCD is connected via USB to a PC, the microscope's camera can be read directly and continuously as a generic 'PC camera' and whatever it sees can be viewed, manipulated, and stored on the PC.

When the LCD is connected to a PC, all pushbutton controls on the LCD and the wired remote control are disabled, so the only access to the microscope's camera is by way of the PC and its software.

Because most PC's do not have microSD card slots, it will be necessary to have a microSD to SD card adapter, in order to transfer saved image and video files to the PC (which is not the same thing as using the PC to directly read the microscope camera via the USB connection).

The microSD card plugs into a slot labeled "TF" on the right edge of the LCD; the card must be oriented with any writing or logos facing forwards and the notched/serrated edge facing upwards. Press the card into the "TF" slot until it is flush with the edge, and it should click into place. To

remove the card, press the end of it slightly into the “TF” slot (using a finger nail), and release it so that an internal spring can eject it.

The microSD card must have a capacity within the range of 8GB ~ 32GB.

The SD card must be formatted by the LCD’s formatting function in order to work correctly; do not format the SD card in any other device, unless then re-formatting is done by the LCD before use with the microscope.

An SD card-shaped icon on the LCD’s screen, centered vertically along the screen’s right edge, shows the status of the SD card and/or its “TF” slot. If an SD card is not installed in the LCD, or an unformatted SD card is installed, the icon will have a red “X” across it. Once a properly formatted SD card is installed in the LCD, the red “X” will disappear and just the shape of the SD card will remain as the status icon. *Note that after formatting an SD card, the icon will continue to show the red “X” until any active menu has been closed.*

On occasion, when trying to save/record an image or a video to the SD card, the LCD display might show a message about there being “No SD Card” (or similar) even though a formatted SD is in fact inserted into the LCD. When this happens, eject the SD card and re-insert it, giving the LCD controller a few seconds to evaluate the card and update the screen icon.

### Power & Battery Charging

The LCD has a small round LED located just above the three buttons at the lower right corner of the screen. It lights up red when the battery is charging, or green when the battery has been fully charged, and flashing blue when the LCD’s integral controller circuit is functioning correctly (the LCD must be turned on (powered up) for the LED to light up as flashing blue).

To turn the LCD on (this includes the microscope itself), press the POWER button for about 2 seconds. To turn the LCD off, press the POWER button again for about 2 seconds.

At the lower right of the display screen is an icon that looks like an ‘A’ cell (battery). This is the battery charge level indicator, and it will be filled in when the battery is fully charged, and should be progressively less filled in as the battery’s charge is depleted. When the battery is being charged via USB power, this same icon will change to show the image of an AC power plug superimposed over the battery symbol, and the composite icon will flash.

Assuming that the battery is mostly depleted, it should take between 1 and 2 hours to fully recharge, assuming power is coming from a USB power adapter/charger of at least 2A capacity.

***Sometimes the LCD’s controller might ‘crash’ or otherwise lock up, and all buttons are likely to become unresponsive and the display screen might show a static image. In this situation, it***

*will be necessary to reset the controller. Press and hold the POWER button for perhaps 20 seconds, or until the display screen changes, then allow the LCD to power up normally again.*

## Parts of the Microscope

To clarify the terminology/nomenclature used, the following part names are used:

- “LCD”: this is the microscope/LCD assembly
- “Holder”: this is the metal bracket that mounts to the “Stand” on its rear end and into which the microscope body fits on the front of the “Holder”
- “Stand”: this is the vertical post that the “Holder” & “LCD” raise and lower on
- “Base”: this is the metal plate which supports the “Stand” and the two auxiliary gooseneck LED lamps

The names of the major parts are listed below:

### *LCD*

- 7” diagonal backlit color LCD display, actual image is about 153mm wide
- Microscope with integral lens, surrounded by an annular array of LEDs, and with a transparent lens protector
- Focusing wheel located just above the bottom end of the microscope
- Battery cover on the rear of the LCD, slides down to open and detach
- Lithium-Ion battery, type 18650, under the battery cover

### *Holder*

- The front ring of the Holder has two small thumbscrews for securing the microscope that passes through the ring from the top
- Two large magnification adjusting thumbscrews, located at the rear of the Holder, a pinion gear inside the rear of the Holder engages the rack on the front edge of the Stand
- Magnification adjustment friction thumbscrew, which presses against a friction pad that slides inside an extruded groove on the rear of the Stand’s post
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### *Stand*

- The vertical post screws into a threaded hole on the top-rear of the Base, and is secured using a knurled locking ring (similar to a jam-nut)
- The vertical post has a threaded rack running vertically along the post’s front, which is engaged by the pinion gear on the Holder

### *Base*

- At the top rear corners of the Base are the mountings for the two auxiliary gooseneck LED lamps
- Under the rear edge of the Base is a plastic enclosure which houses the electronic dimming circuit for the auxiliary gooseneck LED lamps. A microUSB connector allows 5VDC power to be applied for use by the two lamps. A small knurled brightness control wheel allows adjustment, from OFF to full brightness, of the two auxiliary lamps. Note that most of the control's rotation has no effect on the lamp brightness, with its effective range being a small portion of the rotation

### *Light Barrier*

- The Light Barrier is a metalized plastic ring that can be used to replace the normal "transparent lens protector" that normally surrounds the lens.
- The "transparent lens protector" fits tightly, but can be removed from the microscope by firmly pulling down (away from the body of the microscope) while also using a wiggling or rocking motion.
- Once the "transparent lens protector" has been removed, the Light Barrier can be attached to the microscope using a 'bayonet' action; press it up against the bottom of the microscope near the lens, and twist about 45 degrees to lock it in place.
- The function of the Light Barrier is to reduce reflection when using the microscope for doing micro-soldering, for example of SMD electronic components on a printed circuit board.

## Menu

The microscope can be configured in many ways by use of a menu that is integral to the LCD.

- To enter the Menu, press the “M” button on the bottom edge of the LCD, or alternately press the [M] button on the wired remote control; this will bring up the menu.  
*Henceforth, this text will simply refer to “M” to mean either of the two buttons described above.*
- The menu is divided into two tabs, one being for camera settings (either Still or Video, depending on the currently selected mode) and the other being for general microscope settings; the Camera menu (represented by a camera shaped icon) is the first to be selected by the above step. Make any desired camera settings and configurations here.
- *There are actually three versions of the Menu, and the one you see depends on which mode the microscope is in: Still, Video, or Playback. **The following Menu description is based on the appearance of the Menu while the microscope is in the Still mode.***
- Pressing “M” will change the menu from the Camera to the General Settings menu (represented by a wrench-shaped icon). Make any desired non-camera settings and configurations here.
- Pressing “M” again will exit the menu and return the LCD to normal operation.
  - Use the ^ and v buttons on either the LCD, or the wired remote, to select options within each of the two menus.
  - Press the “OK” button on the LCD, or the Camera icon/OK button on the wired remote, to open the currently selected option. Henceforth, “OK” will refer to either method.
  - **Camera Settings Menu**
    - [MP] Resolution option applies to *still photos*. The choices are:
      - 12M (4032 x 3024 pixels)
      - 10M (3648 x 2736 pixels)
      - 8M (3264 x 2448 pixels)
      - 5M (2592 x 1944 pixels)
      - 3M (2048 x 1536 pixels)
      - Use ^ and v buttons to select the desired resolution, then press “OK” to select and return to the menu
    - Burst Shooting option applies to *still photos*. The choices are:
      - Off (default)
      - On
      - Use ^ and v buttons to select the desired option, then press “OK” to select and return to the menu
      - When selected to ON, the microscope will take a series of five (5) still images in quick succession, 1 second apart, starting when the button that triggers a picture to be taken is pressed

- Image Quality option applies to *still photos*. The choices are:
  - High quality
  - Standard (default)
  - Economic
    - Use ^ and v buttons to select the desired quality, then press “OK” to select and return to the menu
    - The number of photos at the current resolution that can fit onto the installed SD card will differ depending on the image quality selection
- Sharpness option applies to *still photos*. The choices are:
  - Intensive
  - Standard (default)
  - Soft
    - Use ^ and v buttons to select the desired sharpness, then press “OK” to select and return to the menu
- ISO (light sensitivity) option applies to *still photos*. The choices are:
  - Auto (default)
  - 100 (less sensitive to light)
  - 200 (more sensitive to light)
    - Use ^ and v buttons to select the desired sensitivity, then press “OK” to select and return to the menu
- Exposure Compensation option applies to *still photos*. The choices are:
  - +2/3
  - +1/3
  - +0.0 (default)
  - -1/3
  - -2/3
  - -1.0
  - -4/3
  - -5/3
  - -2.0
    - Use ^ and v buttons to select the desired compensation, then press “OK” to select and return to the menu
- Date tag option applies to *still photos*. The choices are:
  - Off
  - Date
  - Date/Time (default)
    - Use ^ and v buttons to select the desired option, then press “OK” to select and return to the menu
    - This option selects whether or not the date (and optionally the time of day) will be included as part of the stored/saved image(s)



- **Video Settings menu**
  - [MP] Resolution option applies to *videos*. The choices are:
    - 1080FHD (1920 x 1080 pixels)
    - 1080P (1440 x 1080 pixels)
    - 720P (1280x720 pixels)
  - Exposure Compensation option applies to *videos*. The choices are identical to those available when in Still photo mode (see above).
  - Date tag option applies to *videos*. The choices are identical to those available when in Still photo mode (see above).
- **General Settings menu**
  - Date/Time option
    - The internal clock of the LCD is not very accurate, and will likely need to be adjusted/reset fairly often, unless an accurate ‘Date tag’ (see above) is not required, or if the ‘Date tag’ option is turned OFF
    - Set the Date in one of three formats (see below), one group of digits at a time, from left to right (the active digits are highlighted)
      - By default, the Date format is YYYY/MM/DD
      - Use ^ and v buttons to change the highlighted digits, then press “OK” to move to the next group of digits; pressing “OK” after the right-most group, the highlight will move on to the Time (see below)
    - Set the Time, which is always in HH:MM:SS format, one group of digits at a time, from left to right
      - Use ^ and v buttons to change the highlighted digits, then press “OK” to move to the next group of digits; pressing “OK” after the right-most group, the highlight will move on to the Date Format (see below)
    - Set the Date Format from one of three choices:
      - YYYY/MM/DD (default)
      - MM/DD/YYYY
      - DD/MM/YYYY
      - pressing “OK” after the right-most group, the highlight will move back to the Date (see above)
      - To leave the Date/Time option, press “M”

- Automatic Shut-down. The choices are:
  - Shut [= OFF] (default)
  - 3 minutes
  - 5 minutes
  - 10 minutes
    - Use ^ and v buttons to select the desired option, then press “OK” to select and return to the menu
    - This is a battery saver which optionally will turn the power off if no buttons are pressed during the selected time period
- Screen Protection (= screen-saver/power-down). The choices are:
  - Shut [=OFF] (default)
  - 3 minutes
  - 5 minutes
  - 10 minutes
    - Use ^ and v buttons to select the desired option, then press “OK” to select and return to the menu
    - This is a battery saver which optionally will turn the LCD screen’s backlight off if no buttons are pressed during the selected time period
    - This option can be turned on while the more general Automatic Shutdown (see above) is turned off, and thereby function as a semi-battery saver
    - This option, if turned on, might be confusing because if the screen goes blank, the user might not be able to easily tell whether the microscope is turned off, or if it is turned on but the screen is turned off
- Language Selection. The choices are:
  - English (default)
  - Portuguese
  - Simplified Chinese
  - Japanese
  - French
  - German
  - Korean
  - Italian
  - Dutch
  - Russian
  - Spanish
  - Arabic
    - Use ^ and v buttons to select the desired option, then press “OK” to select and return to the menu

- Light Source Frequency. The choices are:
  - 50 Hz (default)
  - 60 Hz
    - Use ^ and v buttons to select the desired option, then press “OK” to select and return to the menu
    - This selection changes the microscope’s operation to minimize visual artifacts (banding, etc) in recorded videos, as a result of ‘beat frequency’ interaction with area lighting which invisibly pulses rapidly according to the AC line frequency in the part of the world where the microscope is being used; set according to the local AC line frequency
    - This may also be influenced by, or associated with, the TV video standard used in the part of the world where the microscope is being used; the PAL video format is mostly used where 50Hz AC power is used, and the NTSC video format is used on many areas where 60Hz AC power is used
- Line Assist. The choices are:
  - Off (default)
  - On
    - Use ^ and v buttons to select the desired option, then press “OK” to select and return to the menu
    - The purpose of this option is unclear, and is not described in the DM9 product’s Instruction Manual. However, a different Instruction Manual for the similar Elikliv DM3 microscope briefly mentions this feature without actually describing its function
    - By empirical experimentation, this Line Assist option, if turned on, simply places a crossed pair of vertical and horizontal red lines on the screen image, something like a target cross-hair. However, the red cross-hairs do not seem to be stored as part of the still and video files, so they do not appear in Playback of still images or videos
- Formatting (of the microSD card)
  - To use this menu option, there must be a microSD card inserted into the “TF” slot on the LCD
    - Select Cancel (default) or Confirm
    - If confirmed, it will probably be necessary to re-confirm, because proceeding will erase all photos and/or videos on the microSD card
    - A message “Hold On” appears while the microSD card is re-formatted/erased

- It is necessary to use the LCD to format the microSD card before the LCD will recognize it as a valid memory device for storage of still image and/or video files; formatting the SD card in a personal computer will probably result in the LCD not recognizing the SD card
- Default Setting. The choices are:
  - Cancel (default)
  - Confirm
    - If confirmed, the LCD will set all menu options back to their defaults
    - If cancelled, all menu options will remain as set by the user
- Version
  - Pressing “OK” shows the LCD’s current firmware revision level
  - Pressing “OK” a second time will return to the menu
    - If there is a method for updating the firmware, it is not described in the User’s Manual, and is not apparent from the context of the menu

### Selecting the Mode

- Press “M” on the LCD (or “[M]” on the wired remote) for 3 seconds (or, briefly click/press the [>] button on the wired remote) to cycle between the following three modes:
  - Still (indicated by a camera icon at the upper left of the LCD screen)
  - Video (indicated by a video camera icon at the upper left of the LCD screen)
    - If the message “No Card” appears when starting to take a still photo or start recording a video, and yet the SD card icon at the center right of the screen is showing OK (i.e. no red X on the SD card icon), then remove the SD card and re-insert it, and try recording the still image or video again
  - Playback (indicated by an [>] icon at the upper left of the LCD screen)
    - If there is no SD card installed in the LCD, or an improperly formatted SD card is installed, a message “No File” will appear on the screen

### To Take a Still Photo

- Select “Still” mode (see above)
- Press the button with the camera icon (or the “OK” button) on the bottom edge of the LCD next to the “M” button, or press the “Camera/OK” button on the wired remote
- The photo is taken and the message “Hold On” appears while the JPG file is being stored on the SD card
  - o The upper right corner of the screen shows the approximate remaining number of still photos that can still fit into the remaining space of the SD card, at the current still photo settings (see Menu)
  - o Just below the “remaining” number (see above) is an indication of the current selected still photo resolution, e.g. “8M” (see Menu)

### To Take a Video

- Select “Video” mode (see above)
- Using the pushbuttons on the LCD:
  - o Press the “OK” button on the lower edge of the LCD to start taking the video
  - o A flashing red dot appears next to the video camera icon at the upper left corner of the screen, showing that video is being recorded
  - o A red text time counter number is displayed near the upper center of the screen
  - o A white text readout appears at the upper right of the screen, showing the video resolution, e.g. “720P”
  - o Press the “OK” button to stop recording the current video
- Using the pushbuttons on the wired remote:
  - o Press the ‘video camera icon’ pushbutton (works like the “OK” button on the LCD)
  - o Same details as above
  - o Press the ‘video camera icon’ button to stop recording the current video

### Playback

- Select “Playback” mode (see above)
- While in Playback mode:
  - o The most recently taken still image or video will be selected by default
  - o On the upper left corner of the screen, there will be either a [ > ] icon (if the currently selected file is a still photo) or a ‘frame of movie-film’ icon (if the currently selected file is a video)
  - o To the right of the still photo or video icon described above will be the filename of the currently selected file; the filename will use yellow text, and will have a .JPG extension (if still photo) or an .AVI extension (if video)

- Use ^ and v buttons to scroll through all recorded files on the SD card
  - When scrolling, if a still photo file is currently selected, the complete image will be displayed on the LCD screen, and no other action is required to view it
  - When scrolling, if a video file is currently selected, a ‘thumbnail’ image from the video will be displayed on the LCD screen, and the user can continue scrolling, or can choose to play the currently selected video:
    - Press the “OK” button to start playing the currently selected video
      - A time counter with red numbering will appear at the upper center of the LCD screen
      - Pressing “OK” again while the video is playing will stop the playback of that video and return to the thumbnail view
  - The lower right corner of the LCD screen will show the Date/Time stamp of the still photo or video, unless the ‘Date tag’ option was turned off in the Menu. The format of the Date/Time stamp, if present, will show the information selected for the ‘Date tag’ in the Menu, i.e. Date alone, or Date & Time
- While in Playback mode, briefly pressing the “M” or “[M]” button will call up a special version of the Menu, with options for deleting a file(s) stored on the SD card; the choices are:
  - Delete Current (Still or Video)
  - Delete All (Stills and/or Videos)
  - Pressing “M” again will exit this Menu without needing to select either of the above two options
    - If one of the above two options is selected, a verification is required:
      - Cancel
      - Confirm
      - Press “OK” to select either of the above options
  - If all files have been deleted, a message “No File” will appear on the screen for as long as the LCD remains in “Playback” mode
  - There is also an option, encountered in the above menu screens, for “Protection”:
    - Lock Current
    - Unlock Current
    - Lock All
    - Unlock All
      - Files that have been Locked cannot be deleted using the controls and options on the LCD
      - Use this “Protection” menu option again to change the Lock settings on one or more stored still & video files
      - A file that was previously locked, but has been unlocked, can be deleted using the above Delete menu option

## Ports

- LCD
  - ‘DC5V’ jack
    - This jack accepts a microUSB plug on the end of a USB cable whose other end can be plugged into various USB power sources, such as a USB AC Power Adapter/Charger or a USB port on a PC
    - In order for the LCD to communicate with a PC, there MUST be a USB cable connected between this jack and a PC
    - Using the microscope as a stand-alone instrument, and with an adequate charge on the LCD’s battery, there is no need to connect a USB cable to this jack
    - With this jack connected to a USB power source via a USB cable, the LCD’s battery will be charged
  - ‘TF’ socket
    - This socket accepts a microSD memory card
    - The microSD card must be at least 8GB, and no larger than 32GB capacity
    - The microSD card must be oriented with its side have writing and text facing forward (towards the user), and the connectors on the left side as viewed from the front of the LCD (the serrated edge of the card will be on to top)
    - Press the microSD card into the TF socket until it is flush with the edge of the LCD; a mechanism in the socket should now lock in the SD card – if the card springs back out, it was not pressed all the way into the socket
    - Press the end of the microSD card slightly further into the socket, and then release; a spring mechanism in the socket will eject the card
  - ‘Key’ jack
    - This jack accepts the plug on the wired remote control’s cable
    - On versions of the microscope that have the two auxiliary LED gooseneck lamps on the Base (such as the DM9 model), the wired remote’s cable plug will have an additional cable coming out of it, with a microUSB plug on its other end. This additional cable & plug are intended to provide a USB power source for the Base’s auxiliary lamps, and the plug will fit into the microUSB ‘DC5V’ socket on the rear of the Base
  - ‘[- > +]’ wheel
    - This wheel allows adjusting the brightness of the microscope’s annular LED lamp that encircles the lens
    - Most of the useful adjustment range is within a small part of the wheel’s rotation; in the rest of the rotation, the annular LED lamp will be off

- Base
  - 'DC5V' jack
    - Any 5V USB power source having a microUSB plug can be inserted into this jack for the purpose of powering the pair of auxiliary LED gooseneck lamps
    - The cable from the LCD's 'Key' jack can be used as the USB power source for the Base; however, this will deplete the LCD's battery more quickly (unless the auxiliary LED lamps are turned off)
  - '[- > +]' wheel
    - This wheel allows adjusting the brightness of the Base's pair of auxiliary LED gooseneck lamps
    - Most of the useful adjustment range is within a small part of the wheel's rotation; in the rest of the rotation, the auxiliary LED gooseneck lamps will be off



## Connecting to a PC

The microscope's integral camera can be used as a camera for a PC, either Windows or Mac. Connect a USB cable (having a microUSB plug on one end) into the LCD's 'DC5V' jack. The PC will now power the microscope. Note that some USB cables only have two wires inside, and are only useful for providing USB power to devices; make sure to use a USB cable that is fully wired and thus can be used for USB communications.

On a Windows PC, run the "Windows Camera" or similar function (details of this will vary with the version of Windows). If the PC does not have this application, it might be necessary to do a Google search to find a download for "Windows Camera" and install it. With the application ready in Windows (but not yet running), connect the microscope LCD to the PC, and a menu will appear on the LCD, showing options for "Mass Storage" (the PC can access the files stored on the LCD's installed microSD memory card), "PC Camera", and "Charging Mode" (where the PLC is only being used as a USB power source for the microscope, not for communication). Select the "PC Camera" option and Confirm. Start the "Windows Camera" application on the PC, and it should detect the microscope and should show a real-time display, and the microscope's image can be viewed on the PC, and recorded (still image and video). If the PC's "Windows Camera" software does NOT automatically detect the microscope (and there might be an error message), unplug the USB cable from either the PC or the LCD, and plug it back in again.

On an Apple PC such as a MacBook or an iMac, make sure that the PC already has the "Photo Booth" application installed; if not, download it from the Apple 'App Store'. Connect the microscope LCD to the PC using a USB cable (it may be necessary to use a USB hub if the PLC does not have enough USB sockets available). A menu will appear on the LCD, showing options for "Mass Storage" (the PC can access the files stored on the LCD's installed microSD memory card), "PC Camera", and "Charging Mode" (where the PLC is only being used as a USB power source for the microscope, not for communication). Select the "PC Camera" option and Confirm. On the PC, start the "Photo Booth" application (Finder > Application > Photo Booth) and choose "General – UVC #2 (Default)" on the menu bar.

*Note that when the LCD is plugged into a PC via a USB cable, all pushbuttons on the LCD and the wired remote control are inactive. Use the PC software to interface with the microscope, take pictures and videos, and optionally access the microscope LCD's microUSB memory card.*

## Specifications

<b>Subject</b>	<b>Parameter</b>
Model	DM9
Maximum Pixel Resolution	1080 FHD (Full High Definition) / 12MP (megapixels)
Lens Optical Size	1/4"
Photo Resolution	3M, 5M, 8M, 10M, 12M (LCD must be in Still mode to adjust)
Photo Image Format	JPEG (.JPG)
Video Resolution	1080 FHD, 1080 P, 720 P (LCD must be in video mode to adjust)
Video Format	AVI (.AVI)
Focusing Adjustment	Manual, using Focus Wheel on Microscope
Focusing Range	10~40mm (1~4 cm)
Magnification Adjustment	Manual, using two thumbwheels on LCD Holder
Magnification Range	50x~1200x (per brochure), 500/1000 (per manual), <i>see note below</i>
Light Source (Microscope)	8 LEDS in annular arrangement encircling the lens
Light Source (Base)	2x gooseneck lamps, each with 1 LED in a parabolic reflector
White Balance	Automatic
Exposure	Automatic (Exposure compensation adjustable from Menu)
Aperture	F4.5
Lens Structure	2G+IR
Minimum lens-to-subject	Approx. 8mm
Supported Languages	12
PC Image Resolution	640 x 480, 1280 x 720
PC Image Transfer Rate	26 fps
PC Operating Systems	Windows XP, 7, 8.1, 10 and higher (and Apple Mac OS)

### A Note on the Magnification

The Amazon listing for this microscope, and the “Instruction Manual” included with the microscope, both specify the magnification as 50x minimum and 1200x maximum, a ratio of roughly 24. By contrast, the “Instruction Manual” specifications page gives the ‘magnification’ as “500/1000”, a ratio of 2; a big difference between this and 24!

The author of this “Enhanced User’s Manual” has done empirical evaluation of the actual magnification. A thin metal ruler with 1mm graduations was placed on the Base and the microscope’s “transparent lens protector” was lowered until it touched the ruler, then the focus wheel was adjusted for a clear image on the LCD screen. A distance of approximately 2.14mm on the ruler was magnified to take up the entire width of the screen. Then the microscope was raised on its stand as high as it would go, and the image was focused once more. Now a distance of approximately 14.5mm was magnified to take up the entire width of the screen. This gives a ratio of about 6.8, again quite different from the ratios of 24 and 2 given in the “Instruction Manual”. Based on these measurements, the microscope’s maximum magnification, subject-to-screen (the screen is 153mm wide), is  $153/2.14 = 71.5x$ , and the minimum magnification is  $153/14.5 = 10.5x$  ..... so **the magnification specification SHOULD BE 10.5x ~ 71.5x**.