

ML2000 Series

LABORATORY MICROSCOPES

INSTRUCTION MANUAL



MEIJI TECHNICO CO., LTD.

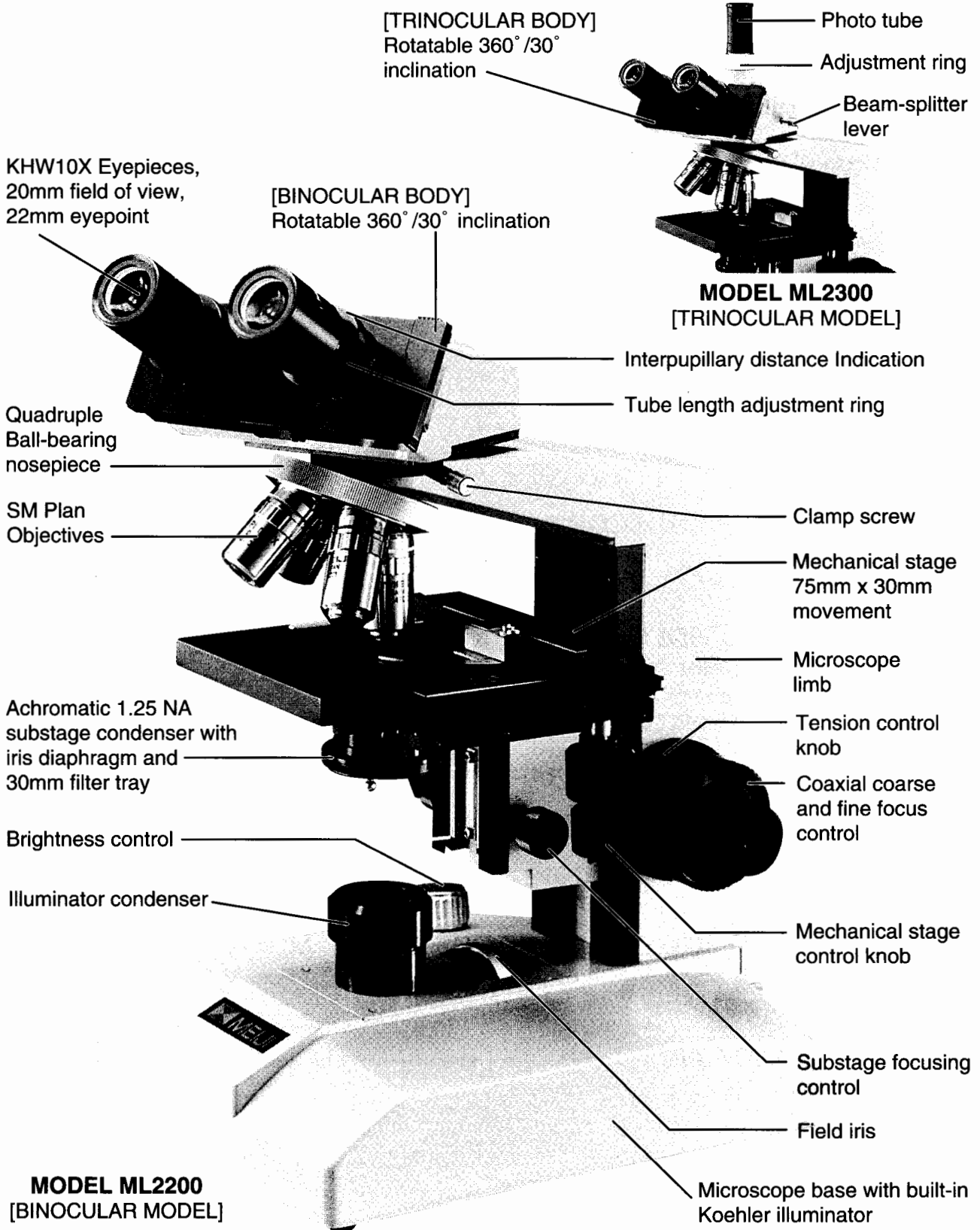
JAPAN

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UNPACKING, ASSEMBLY AND PREPARATION FOR USE

UNPACKING

All **MEIJI TECHNO** Microscopes are supplied in a polystyrene case which can be used for future storage or transport. Multiple components are included in the polystyrene case. Do not throw away any boxes or packing materials until the contents of the shipping container have been checked against your order and the packing list.

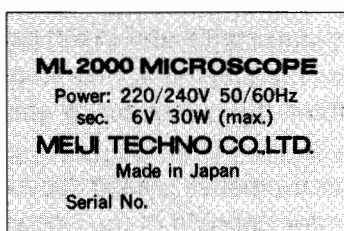
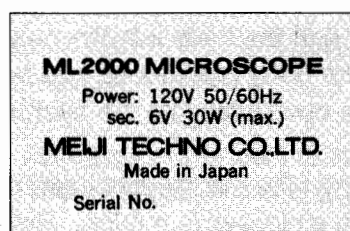
Remove the microscope and components from the polystyrene case and place them on a sturdy table or desk. The work area should be free of excessive dust, moisture, heat or fumes. If your order includes a wooden storage cabinet, release the fixing screws holding the limb and base of the microscope to the bottom of the cabinet and remove the stand.

IMPORTANT ELECTRICAL SAFETY PRECAUTIONS!

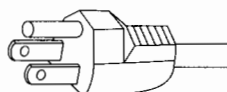
For your protection, please read these instructions carefully and comply with all the basic safety precautions.

Before plugging the microscope into any electrical outlet, make sure that the power source indicated on the Serial/Model plate matches the current available. The Serial/Model plate can be found attached to the bottom base plate of the microscope.

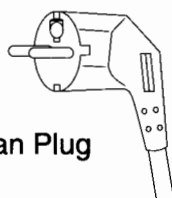
Example: The following labels are attached to the base plates.



All ML2000 6V 50/60Hz Models are equipped with a USA or European standard three-prong grounding AC plug. This plug is designed to fit into a grounding-type power outlet. It is important that your microscope is properly grounded. Do not attempt to defeat or bypass this safety feature. If you are unable to insert the grounding plug into the outlet, contact your electrician.



USA Plug



European Plug

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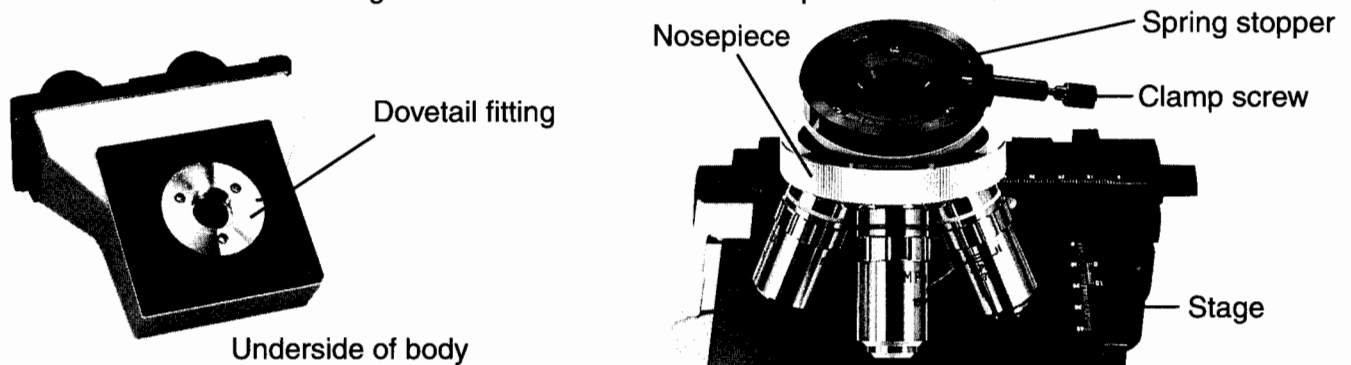
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There are eight different international power cords which cover the majority of the world. Most ML2000 220/240V 50/60Hz Models are equipped with the standard two-pin European plug. However, plug patterns may vary depending on your location. Use only power sources, plugs and plug receptacles approved for your specific situation.

The ML2000 is designed for indoor use. Do not use the microscope in or near water, in situations of extreme heat or humidity, or in areas that lack proper ventilation. When a power cord or plug is damaged, contact your service technician. Do not attempt to service the instrument yourself. Refer all servicing to qualified service personnel.

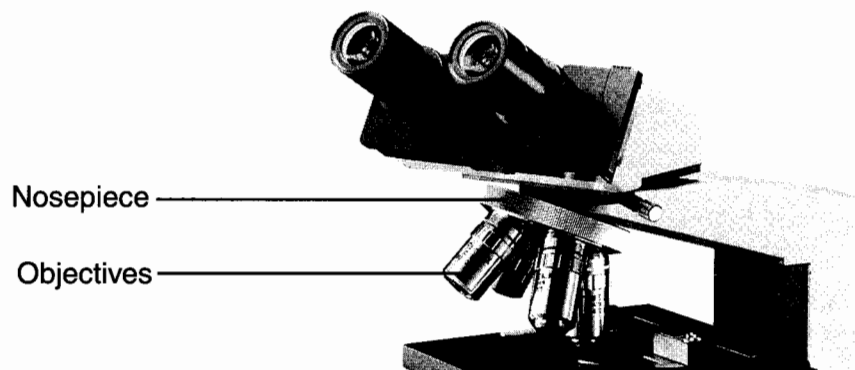
ASSEMBLY

The binocular or trinocular body should be mounted on the limb of the microscope and locked in place with the Clamp screw when it is square with the base. Once mounted, the body is fully rotatable in its mount and can be used facing the front or rear of the microscope.



To mount the body, loosen the clamp screw and insert dovetail fitting of the body into the mount on the top of the limb. Push the dovetail against the spring stopper until the body gently slips into position. When the body is seated, re-tighten the clamp screw and insert the eyepieces into the eyetubes.

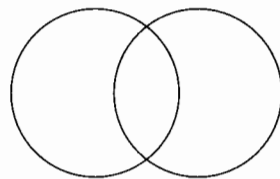
Remove the objectives from their protective plastic cases. Beginning with the lowest power objective, screw the objective into front center opening of the nosepiece using a clockwise motion. Rotate the nosepiece counter-clockwise and install the remaining objectives in ascending order from the lowest to highest power.



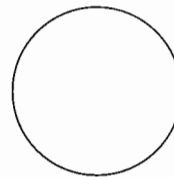
OPERATING INSTRUCTIONS

ADJUSTING OF THE BINOCULAR OR TRINOCULAR HEAD

Using a binocular or trinocular microscope body is much more efficient and less tiring than using a monocular body, but it must be properly adjusted to avoid fatigue. In a properly adjusted microscope the images coming from the two eyepieces are “fused” into one clear image in the eyes of the observer. Using the 10X objective, follow these steps to properly configure your microscope body.



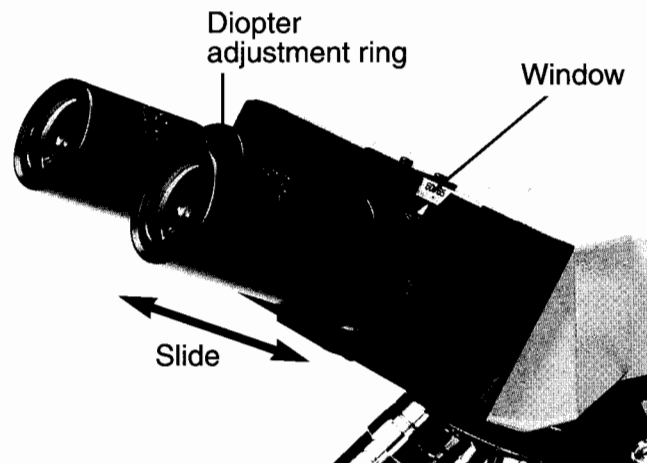
Field of view
before adjustment



Fused image
after adjustment

- (1) Set the correct interpupillary distance by sliding the eyepieces closer together or farther apart until the field of view is a fused image as pictured above. Note the interpupillary distance in millimeters as indicated in the Window above the right eyepiece.
- (2) Rotate the Diopter adjustment ring of the left eyepiece until the numerical graduation marked on the side of the eyepiece matches the interpupillary distance.
- (3) Close your right eye and focus the image in the left eyepiece using the coarse and fine focus.
- (4) Focus the image in the right eyepiece using the Diopter adjustment ring until the image is equally sharp in the right eyepiece.

Each user will have his/her own interpupillary and diopter settings, and remembering yours will allow you to set up the microscope more quickly.



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IMEI TECHNO

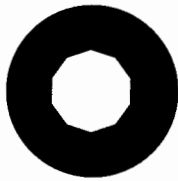
ADJUSTING YOUR MICROSCOPE FOR KOEHLER ILLUMINATION

Koehler illumination is a procedure for setting up and adjusting your microscope to achieve the best possible combination of contrast and resolution.

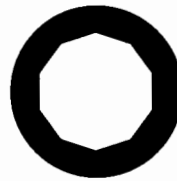
- (1) Turn on the microscope illuminator and place the specimen slide you wish to examine on the microscope stage. Rotate the 10X objective into position and focus on the image of your specimen.
- (2) Move the sub-stage condenser up to its top position using the rack and pinion focusing control.
- (3) Check to make sure that both the field iris (in the microscope base) and the aperture iris (in the sub-stage condenser) are fully open. Rotate the field iris control ring until the edge of the field iris is just visible at the outer edge of the field of view.
- (4) Using the rack and pinion focus control, raise or lower the sub-stage condenser until the edge of the field iris comes into sharp focus.
- (5) If the image of the field iris appears to be off-center in relation to your field of view, then it will be necessary to align the field iris so that it is centered in the field of view. Rotating the substage condenser centering screws in either direction allows you to move the image of the field iris until it is concentric with the field of view.



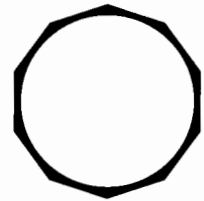
Field of view
before Condenser
alignment



Field of view
after Condenser
alignment



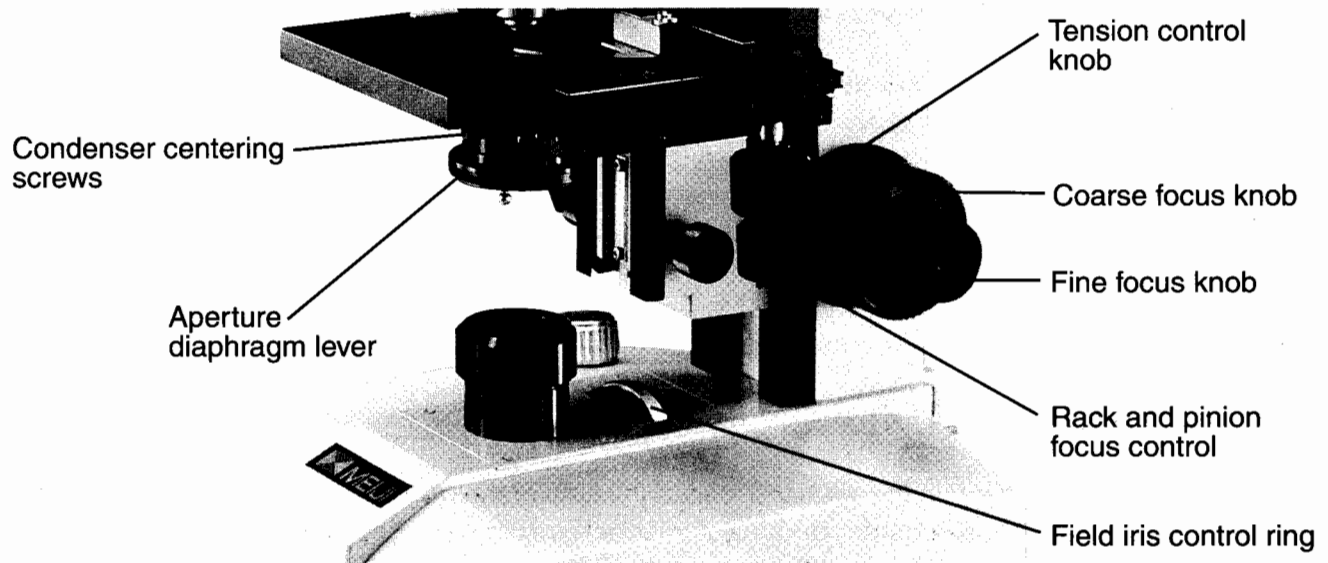
Field iris
partially closed



Field iris
fully open

- (6) With the image of the field iris centered and focused as sharply as possible, open the field iris diaphragm until the image of the edge of the iris diaphragm is just outside of the field of view.
- (7) Remove one of the eyepieces and look into the eyetube. Observe the disc of light coming from the back image plane of the objective. Close down the aperture iris using the aperture iris lever located on the side of the sub-stage condenser until approximately two thirds of the disc of light you are observing remains visible. Replace the eyepiece.

The microscope is now adjusted for Koehler illumination for use with the 10X objective. This procedure should be followed for each objective to guarantee critical illumination.



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SAFETY AND CONTROL FEATURES

In order to protect your microscope objectives and specimen slides from accidental damage, two critical safety features are incorporated into the design of the ML2000.

RETRACTABLE OPTICS

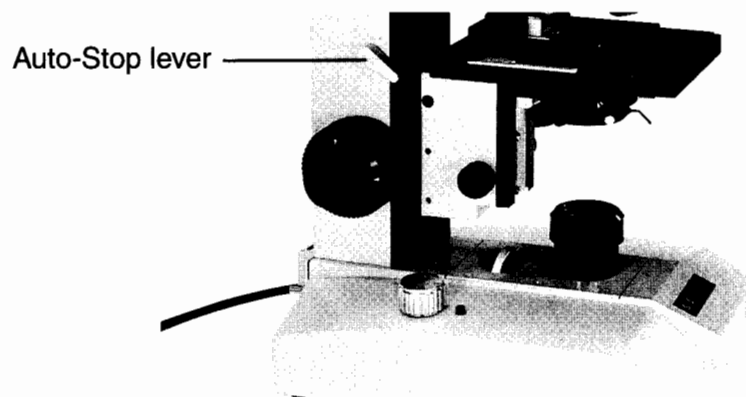
All objective lenses of 20X or higher magnification are designed to retract in their mounts upon contact with the microscope cover slip or slide. This protects the objective lens, cover slip and microscope slide from accidental damage.

SAFETY AUTO-STOP

The safety auto-stop is manually set to prevent the stage plate from rising beyond the focal plane of the objective to protect the objectives and specimen slide from accidental damage.

SETTING THE AUTO-STOP

- (1) Locate the Auto-stop lever on the left hand side of the limb of the microscope. Turning the auto-stop lever one or two revolutions counter clockwise unlocks the auto-stop mechanism. Before moving on to the second step, make certain that the auto-stop lever is in the unlocked position.
- (2) Focus on the specimen using the highest power objective. With the specimen clearly in focus, rotate the Auto-stop lever clockwise one or two revolutions or until a slight resistance is encountered. There is no need to apply undue force or pressure to the lever in order to engage the auto-stop mechanism. The stage plate's upward movement is now restricted to the position where the auto-stop lever was engaged. The auto-stop can be loosened and repositioned to accommodate various objective lenses, working distances, and specimens.



SETTING THE TENSION CONTROL

The tension control knob is provided to allow the individual user to adjust the focus tension to his or her own preference. The tension may be increased by turning the knob with a counter clockwise motion. A lighter tension may be set by turning the tension control clockwise.

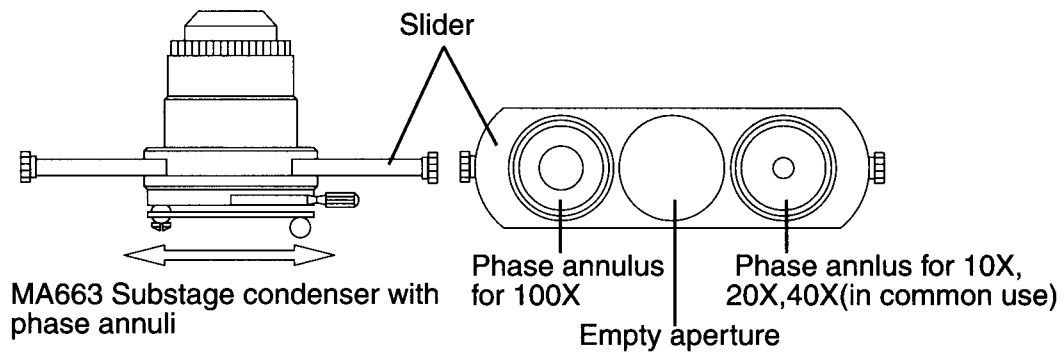
PHASE CONTRAST MICROSCOPY

SLIDER TYPE PHASE CONTRAST

Two types of phase contrast systems are available on the ML2000 Series Microscopes. The following models feature SLIDER TYPE PHASE CONTRAST: ML2800, ML2900, ML2850 and ML2950

COMPONENTS

1. MA663 Achromatic sub-stage condenser 1.25 NA with iris and phase annuli (10X, 40X, 100X) in sliding mount1 pc.
2. MA618 Phase 10X/0.25 NA SM Plan Objective1 pc.
3. MA620 Phase 40X/0.65 NA SM Plan Objective1 pc.
4. MA621 Phase 100X/1.25 NA SM Plan Objective, Oil Immersion1 pc.



HOW TO USE

- (1) Position the slider which contains the phase annuli so the open or empty aperture is located directly in the center of the condenser. This position is used for brightfield observation.
- (2) Focus on the specimen using the MA618 10X phase objective.
- (3) Push the slider to the left until it clicks into place and if necessary adjust the fine focus control. The phase contrast image should now be evident.
- (4) For phase contrast microscopy using the 40X objective, just rotate the nosepiece until the 40X objective is located in the front center position and re-focus on the specimen using the fine focus control. There is no need to reposition the slider as the 10X and 40X objective use a common annulus.
- (5) To use the 100X objective, push the slider past the open position to the far right until it clicks into position. Rotate the 40X objective partially out of position while placing a drop of immersion oil on the cover slip. Swing the 100X objective into the drop of oil and critically focus on the specimen. To increase resolution further, rack the condenser down and place a drop of immersion oil on top of the condenser. Rack the condenser upwards until the top of the condenser is approximately 1mm below the bottom of the slide and the immersion oil is in contact with both the slide and condenser. (Always remember to clean the objective and condenser after using immersion oil.)

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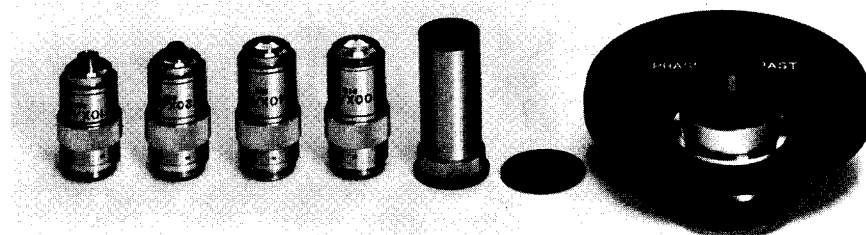
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ZERNIKE-TYPE PHASE CONTRAST

The following models feature ZERNIKE TYPE PHASE CONTRAST: ML2855 and ML2955

COMPONENTS

1. MA457 Zernike type phase condenser in turret mount with iris diaphragm, filter tray and individual centerable phase annuli.1 pc.
2. MA448 10X DIN Achromat phase objective1 pc.
3. MA449 20X DIN Achromat phase objective1 pc.
4. MA450 40X DIN Achromat phase objective1 pc.
5. MA451 100X DIN Achromat phase objective1 pc.
6. MA458 Centering telescope1 pc.
7. MA459 Clear Green filter, 32mm diameter1 pc.



HOW TO USE

- (1) Rotate the knurled condenser disc until the letter B (Brightfield) appears in the opening at the front of the condenser disc.
- (2) Focus on the specimen using the 10X objective.
- (3) Rotate the knurled condenser disc until the phase annulus matching the 10X phase objective appears in the opening at the front of the condenser disc.
- (4) Remove the right eyepiece and replace with the centering telescope. Focus the centering telescope on the back image plane of the objective by rotating the upper portion of the centering telescope. An image of concentric rings should appear.
- (5) If the annuli are not concentric, reach under the condenser and move the knurled silver ring which is located at the bottom rear portion of the condenser in a north, south, east, west direction until the rings are concentric.
- (6) The centering procedure is then carried out for each objective and matching annulus. The 20X and 40X objective utilize the same common annulus.
- (7) After checking and aligning each objective, remove the centering telescope and replace the eyepiece. The microscope is now adjusted for Zernike Phase.

PHOTOGRAPHY AND VIDEO EQUIPMENT

Photographic and video documentation of images is most conveniently achieved by using the trinocular microscope body in conjunction with the appropriate photo and video accessories. The trinocular microscope body accommodates video, Polaroid and 35mm SLR camera attachments.

The trinocular body is equipped with a sliding beam-splitter prism. With the beam splitter knob pushed in, the microscope functions normally with 100% of the light directed to the eyepieces. With the beam splitter knob pulled out, 80% of the light directed up through the photo tube while 20% of the light is directed to the eyepieces.

MEIJI TECHNO offers 35mm SLR, Large-format and CCD video options for the ML2000 Series Trinocular Microscopes. The accessories for each of these systems are described below.

35mm PHOTOMICROGRAPHY EQUIPMENT

Three parts are required for mounting a 35mm SLR camera body on the microscope:

1. The appropriate **T-2 Adapter Ring** for your SLR camera body.

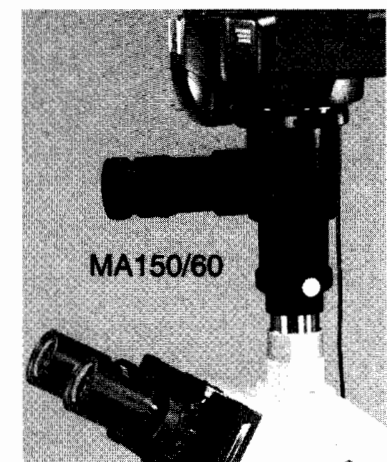
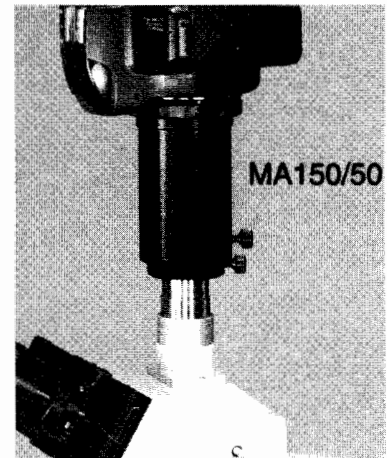
T2-1	Canon	T2-6	Olympus
T2-2	Minolta	T2-7	Contax, Yashika
T2-3	Pentax K	T2-8	Konica
T2-4	Pentax S (threaded)	T2-9	Canon EOS
T2-5	Nikon	T2-10	Minolta Alpha/Maxim 2000
- ◆ These adapter rings attach directly to your camera body's lens mount.

2. A **Photo eyepiece**. Available in the following magnifications:

MA512	2.5X magnification
MA500	3.3X magnification
MA508	5X magnification
- ◆ The photo eyepiece performs the same function as a standard 35mm camera lens (i.e. focusing the image at the plane of the film).

3. One of two **MA150 series Camera Attachments**:

MA150/50	Straight-tube camera attachment
MA150/60	Camera attachment with built-in focusing eyepiece
- ◆ These are used to mount the camera/T2 assembly to the photo tube.

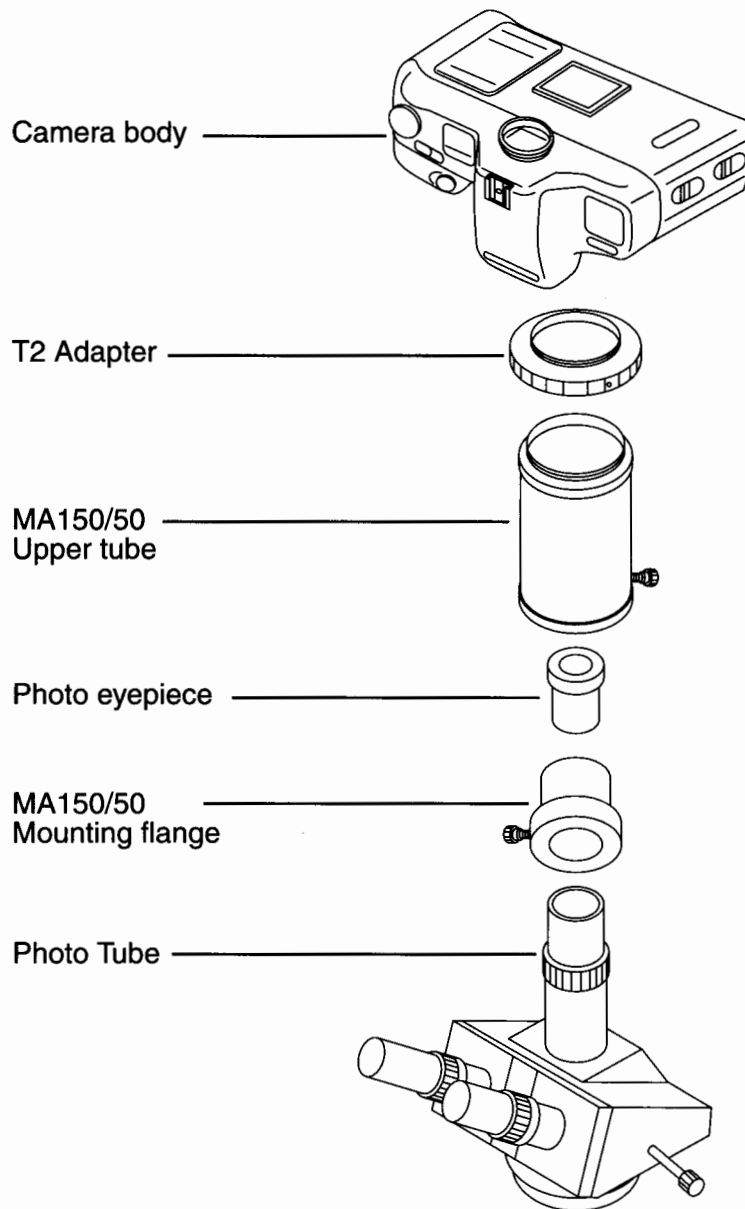


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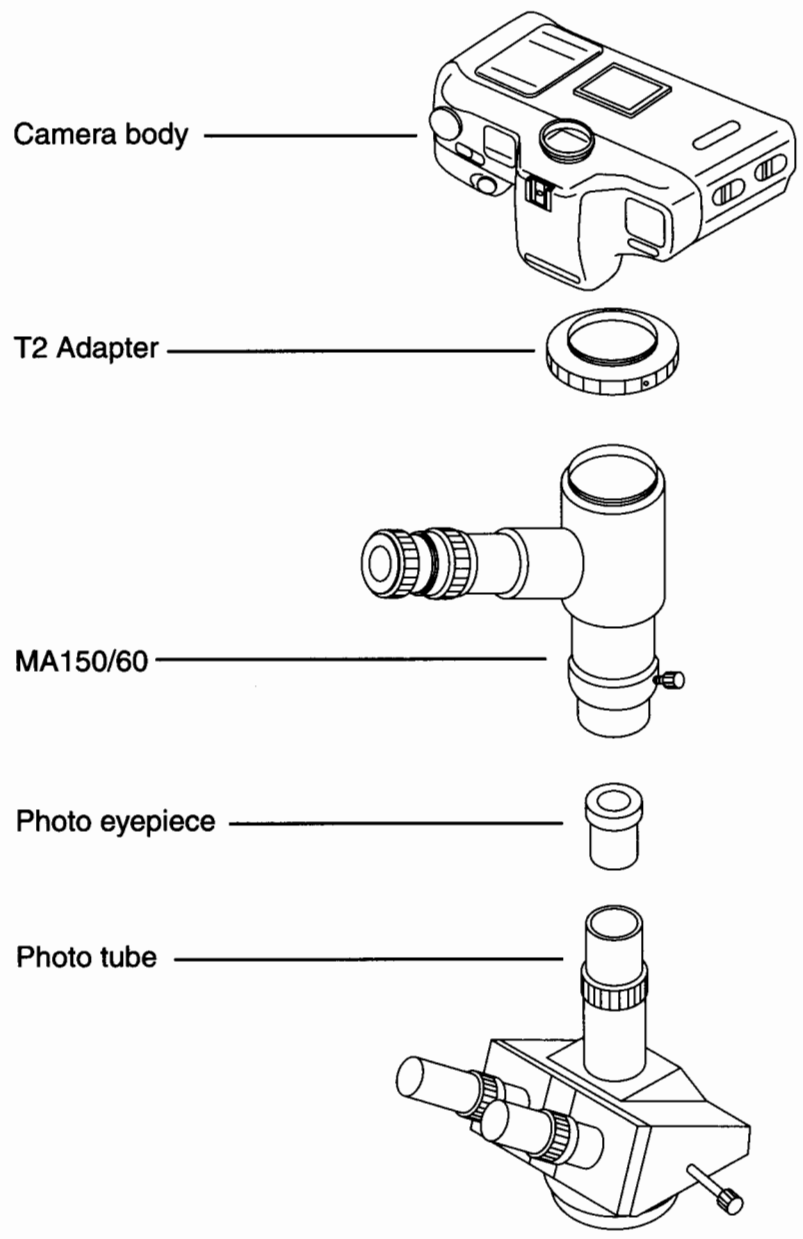
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35mm CAMERA ASSEMBLY AND INSTALLATION

◆ The **MA150/50** is comprised of two parts held together by a set screw: a small mounting flange that fits over the photo tube and locks down with a second set screw, and a larger upper tube with a threaded end to accept the T2 adapter that is attached to your camera body. To assemble these parts, first attach the T2 adapter to your camera body. Next, separate the two halves of the MA150/50 camera attachment, slide the small mounting flange portion over the photo tube, and tighten the set screw. Then drop the photo eyepiece into the open top of the photo tube. Take the upper tube of the MA150/50 camera attachment and screw it into the T2 adapter mounted on your camera body. Finally, re-attach the opposite end of the MA150/50 upper tube to the MA150/50 mounting flange on the photo tube and tighten the set screw so that the entire assembly is stable.



◆ The **MA150/60** has a focusing eyepiece with a photo sizing reticle built in. This enables you to focus the image at the plane of the film more easily than if you look through the camera's viewfinder. Unlike the MA150/50, the MA150/60 is a single-piece unit, so assembly is slightly different. First attach the T2 adapter to your camera body, then screw the threaded end of the MA150/60 into the T2 adapter. Next, drop the photo eyepiece directly into the photo tube, slide the lower end of the MA150/60 over the photo eyepiece, and tighten the set screw onto the photo tube so that the entire assembly is stable.



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USING MA150/50 AND MA150/60 CAMERA ATTACHMENTS

Taking high quality photographs through a microscope takes a little practice, but the basic steps that you will need to follow are really quite simple. First of all, it is important that your microscope's interpupillary diopter, and illumination settings are properly adjusted (See pages - in this manual). When this has been done, the next step is to "parfocal" the microscope and camera.

PARFOCALIZING THE MA150/60 35mm CAMERA ASSEMBLY

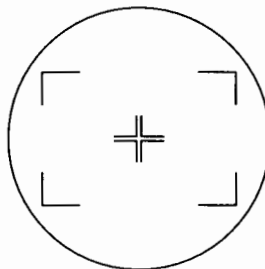
When you use the MA150/60 camera attachment there are actually three ways you can view the image of your specimen: Through the eyepieces of the microscope: through the camera viewfinder, or through the focusing eyepiece on the MA150/60.

The word "parfocal" signifies that when the image of the specimen is in focus through one of the viewing positions it is also clearly or critically focused in the other viewing positions as well.

It is only necessary to have the image focused at the plane of the film (i.e., as seen through the camera viewfinder) in order to make clear photographs, but when the microscope and attachment are properly adjusted or "parfocalized" to each other, the image should be in clear focus in all three places at once.

It is much easier to take clear pictures when the camera is parfocalized, so follow these steps to ensure that it is:

- (1) Looking through the microscope eyepieces, bring the image you wish to photograph into focus. Then pull out the beam splitter knob to redirect the image to the photo tube.
- (2) Look through the focusing or view finder eyepiece of the MA150/60 camera attachment. Rotate and adjust the outer part of the focusing eyepiece until the center set of double cross lines on the framing reticle come clearly into focus. At this point the image of the specimen is clearly in focus when viewed through the eyepieces of the microscope and the image of the crosslines are clearly in focus when viewed through the viewfinder eyepiece. The next step is to bring the image of the specimen in focus through the finder eyepiece.



Framing reticle

(3) Look through the viewfinder eyepiece on the MA150/60. If the image is not clear, you can bring it into focus by adjusting the height of the MA150/60 camera attachment on the photo tube. The photo tube is threaded where it mates to the microscope body, and its height is adjusted by screwing it farther into or out of the body. To do so, loosen both the locking ring on the photo tube and the set screw that holds the MA150/60 on the photo tube. This allows you to turn the photo tube and adjust its height without having to turn the camera as well. Look through the camera viewfinder or focusing eyepiece while adjusting the height of the photo tube. When the image is as clear as possible in both the viewfinder/focusing eyepiece and normal eyepieces, lock down the photo tube locking ring and the set screw.

The image you wish to photograph should now be focused at the eyepieces and at the plane of the film.

The procedure is identical for the MA150/50 except instead of using the focusing eyepiece to parfocalize the camera attachment you must use the viewfinder window located on your 35mm camera body. Viewing the image of the specimen using the MA150/50 camera attachment is more difficult due to the small size of the viewfinder window of your SLR camera and also due to the lack of the 10X magnification of the finder eyepiece.

35mm CAMERA SETTINGS

The most difficult part of photomicrography is figuring out the proper film, aperture, and exposure for the images you wish to capture. There are so many factors that influence the way your pictures will turn out that it would be impossible to discuss them all here. Different cameras, different types of film, different specimens, different types of lighting etc. will require different settings to achieve the desired photograph. The best advice is to experiment with your equipment to learn what settings work best. Shoot several pictures of the same specimen using different aperture and exposure settings, and keep a record of the settings for each frame so that when the film gets developed you can get a feel for how changing the settings affects the photograph. Try different brands and speeds of film. Learn how your camera works. If you become really serious about photomicrography, there are good books available from scientific supply companies that discuss these issues in more depth.

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LARGE FORMAT PHOTOMICROGRAPHY EQUIPMENT

The MEIJI TECHNO **PMX100 Large Format Photographic Camera** mounts directly to the trinocular tube of the ML2000 and allows you to take high quality photographs of your specimen. The MEIJI PMX100 features a built-in 10X magnification factor and comes equipped with a 10X focusing widefield view finder eyepiece with framing reticle. (Film holder is an option item.)

The following equipment is required for large format photography:

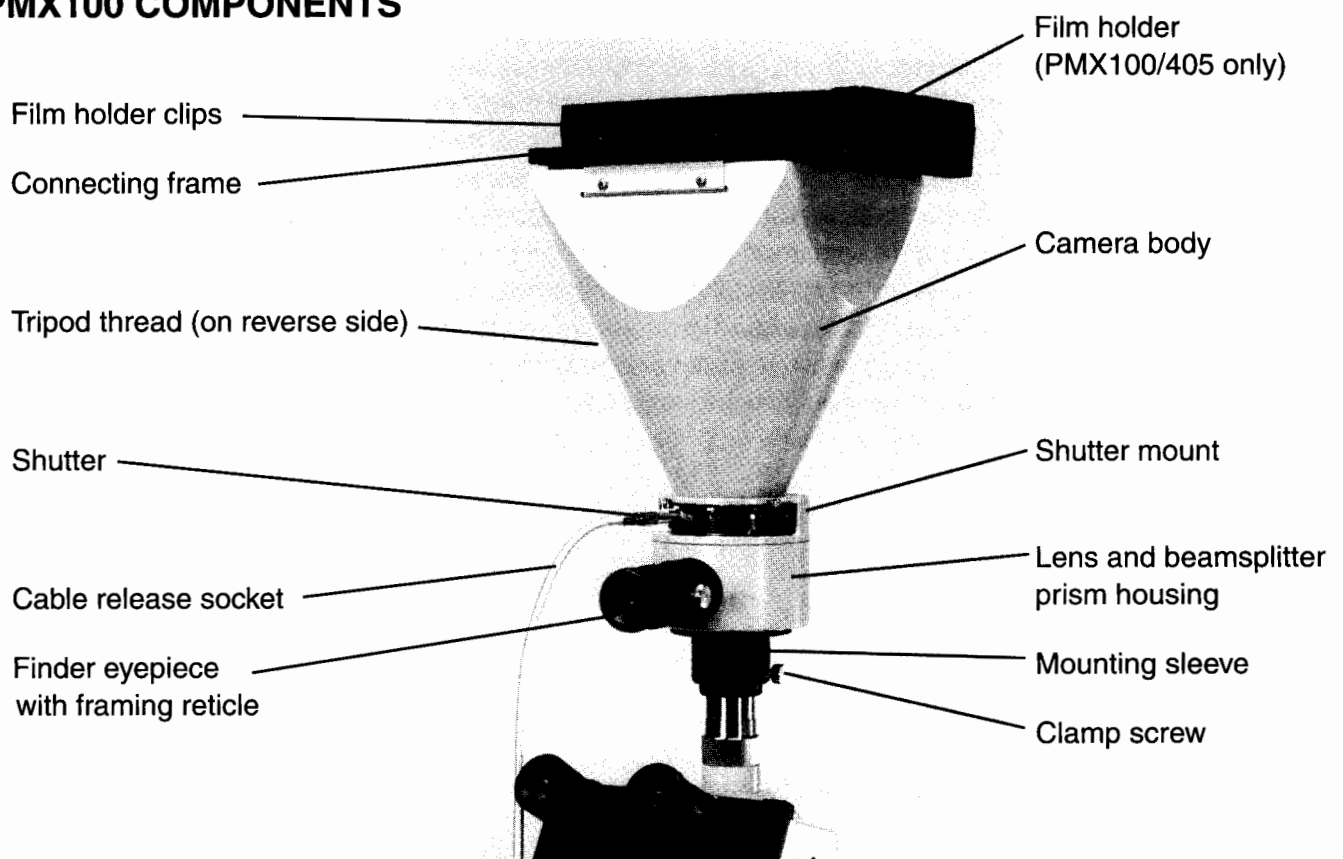
1. The MEIJI PMX100 Large Format Photomicrographic Camera
2. A Film Holder. Available from your local photography supply store in the following sizes:

#405	3-1/4" x 4-1/4" pack film holder	#451	6cm x 9cm 8EX roll film holder
#545	4" x 5" sheet film holder	#453	6cm x 9cm 16EX roll film holder
#550	4" x 5" pack film holder	#452	6cm x 7cm 10EX roll film holder

3. Film

The MEIJI PMX100/405 is equipped with #405 Polaroid 3-1/4" x 4-1/4" pack film holder.

PMX100 COMPONENTS

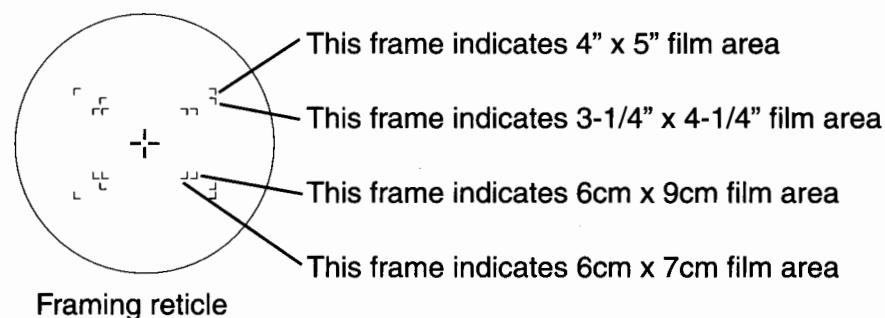


PMX100 CAMERA OPERATION

- (1) Place the PMX100 Photomicrographic camera over the photo tube of the trinocular head. The PMX100 requires no projection eyepiece as the camera comes equipped with a 10X projection lens.
- (2) Install a Large format film pack of your choice by loosening the screws on the film holder clips and positioning the film holder on top of the connecting frame. After the film holder is properly positioned tighten the film holder clip screws. Refer to the separate film holder instructions for film loading and use of the holder.
- (3) Focus the finder eyepiece on the image of the framing reticle installed in the view finder eyepiece. This is accomplished by rotating the knurled adjustment ring on the top portion of the eyepiece while simultaneously viewing the image of the framing reticle.
- (4) Focus the microscope on the specimen using the coaxial coarse and fine focus controls.
- (5) Raise and lower the PMX100 camera on the photo tube while viewing the specimen through the finder eyepiece. Lock the camera into position when the image is in sharp focus.

USING THE FRAMING RETICLE

The double crossline located in the center of the finder eyepiece is used as a reference for critical focusing. When the double crosslines are clearly separated the viewfinder is correctly focused. Three frames are visible in the field of view as illustrated below.



The area located outside of the frame is not photographed. When a larger area of the specimen is to be photographed, use a lower power microscope objective. The exposure is facilitated by adjusting the exposure control time and is dependent upon type of film used and the specimen involved.

MAGNIFICATION FACTOR

The PMX100 camera has a magnification factor of 10X. Therefore the finished print is ten times the power of the objective being used. Example: When the 10X objective is used, the actual magnification of the finished print is 100X.

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VIDEO EQUIPMENT

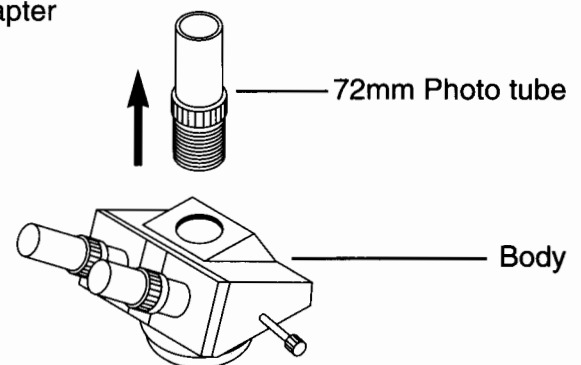
MEIJI TECHNO offers a variety of videomicrography equipment including cameras, monitors and "C" mounts in a range of magnifications. "C" mounts are used to connect the video camera either to the photo tube or directly to the trinocular body. All "C" mounts come in two parts: a silver "C" mount portion that screws into the standard 1" thread on most CCD cameras, and a lower tube containing the projection lens (Exception: The MA151/10 has no projection lens.).

1. **VIDEO CAMERAS:** **CK3800N** CCD color TV camera, 1/2" CCD, 450 lines horizontal resolution, NTSC system, 115V-DC12V adapter, BNC and Y/C cables.

CK3800P Same as above, except designed for the PAL (European) system, with DC adapter

2. **MONITORS:** Information available by request

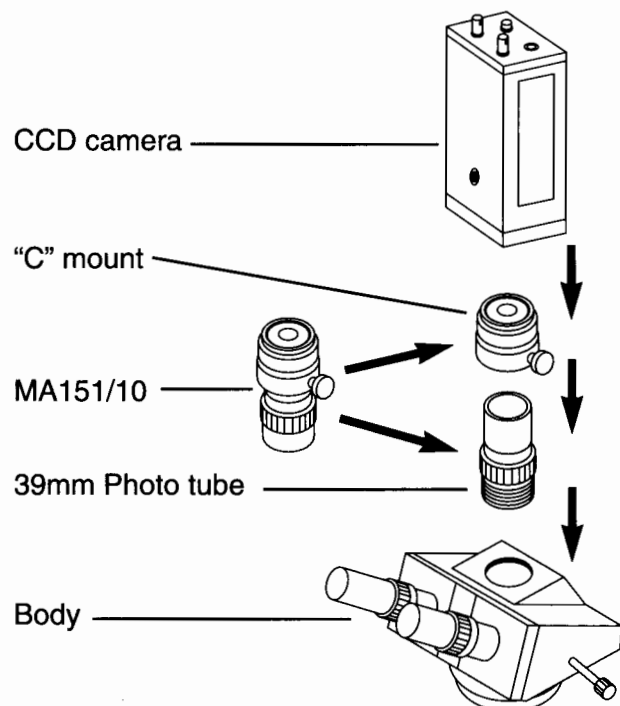
3. **"C" MOUNTS:**
MA151/10
MA151/35/04 with 0.45X lens
MA151/35/15 with 1.0X lens
MA151/35/20 with 0.7X lens
MA151/35/25 with 2.5X lens



STANDARD "C" MOUNT

MA151/10 ASSEMBLY

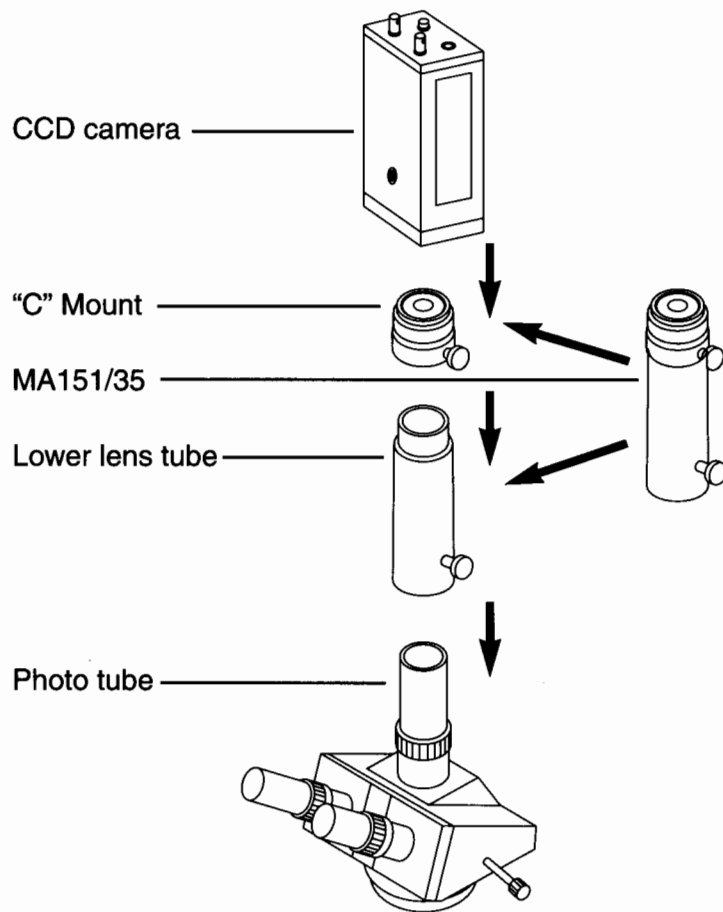
First, separate the "C" mount portion of the MA151/10 (with the set screw) from the replacement 39mm photo tube. Next, unscrew the existing 72mm Photo tube from the trinocular head and replace it with the 39mm photo tube. Remove the protective cover from the front of the CCD camera, and screw the "C" mount portion of the MA151/10 into the now exposed threads on the CCD camera. Finally, slide the "C" mount/camera assembly over the 39mm photo tube and tighten the set screw to secure the entire assembly.



“C” MOUNTS WITH PROJECTION LENSES

MA151/35/04, MA151/35/15, MA151/35/20, MA151/35/25 ASSEMBLY

First, separate the “C” mount portion of the MA151/35 from the lower lens tube by loosening the set screw on the “C” mount. Next, remove the protective cover from the front of the CCD camera, and screw the “C” mount portion of the MA151/35 into the now exposed threads on the CCD camera. Then slide the lower lens tube onto the Photo tube and tighten the set screw. Finally, slide the “C” mount/camera assembly over the top of the lower lens tube and tighten the set screw on the “C” mount to secure the entire assembly.



MIL2000 Series

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MAINTENANCE AND CARE

REPLACING THE BULB OR FUSE

Before replacing the bulb or fuse, turn off the power to the microscope and disconnect the plug from the electrical power source.

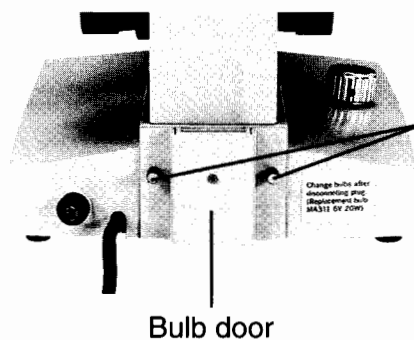
After use, the bulb and external lamp housing can become very hot! Take care not to touch the external lamp housing and do not bring flammable substances (Alcohol, cleaning solvents, gasoline, paint thinner, etc.) near the lamp housing.

Never touch a new bulb with your bare hands! Oil deposits from your fingers can shorten the life of the bulb. If you have touched the surface of the bulb, clean it with alcohol to remove residual oil.

Never handle hot bulbs! A hot bulb may explode if not handled correctly! Wait for the bulb to cool before installing a new bulb.

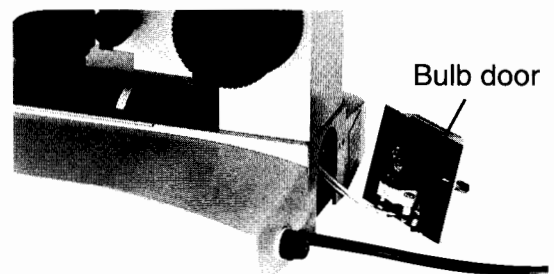
BULB REPLACEMENT

The bulb is held in a socket which is attached to the bulb door at the rear of the base of the microscope. Remove the two screws securing the bulb door and gently pull the door away from the instrument. Be sure the bulb is cool to the touch and remove it by pulling it straight out of its socket. Do not twist the bulb as the two bulb pin legs may break off and become lodged in the socket. Handle the new bulb using tissue paper or the plastic wrapper and insert the two pin legs into the socket. Replace and attach the bulb door.



Bulb door screws

Bulb door



Bulb door

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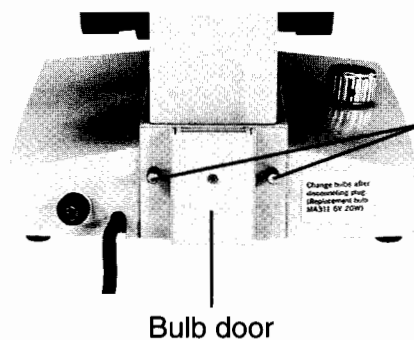
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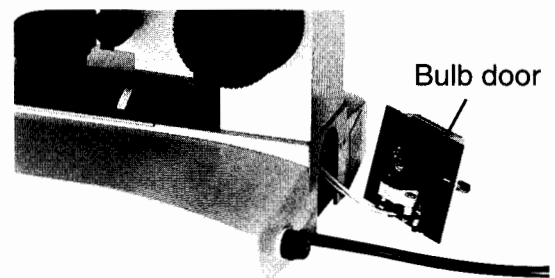
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Bulb door screws

Bulb door



Bulb door

CARE

Always cover the microscope with the plastic dust cover that came with the instrument when the microscope is not in use.

Keep eyepieces in the eyetubes at all times to prevent dust from falling on the internal optics. Store the microscope in a clean environment free from moisture, mold, fungus or dust.

CLEANING

Lens surfaces may be cleaned using a soft brush, unsoiled lint free cloth, or pressurized air canister. To remove finger prints and grease smudges moisten a lint free cleaning cloth with a small amount of absolute alcohol. For cleaning the objectives and residual immersion oil moisten a lint free cloth with a small amount of xylene. Always clean up immersion oil immediately after use. Never soak or immerse the optical components completely.

Avoid the use of any organic solvent on painted or rubber surfaces. Painted surfaces should be cleaned with a cloth moistened with water and a small amount of detergent.

DO NOT ATTEMPT TO MAKE ADJUSTMENTS TO THE INTERNAL OPTICS OR MECHANICS!

If the microscope does not seem to be functioning properly contact an authorized service or repair center.



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