**CM10 Basic Operating Instructions**
1/6/93, updated 5/27/15 J.C.

This assumes the CM10 microscope is operational -- Check the computer screen: vacuum status ready, filament comes on and the beam is aligned.

1. Push microscope **ON**. Turn **DATA DIM** (the same button) clockwise to illuminate the screen. Find TEM Bright Field page (press READY button at lower right of the screen). Check the following: **HT = 60KV, spot size = 2**, and XY ctrl is calibrated (shows coordinates in microns).

2. **To remove the specimen arm:** pull out the specimen arm until it stops, turn it clockwise until it stops, pull the arm out completely. Place the arm on the brown holder and remove or load your grid using the lift needle. **IMPORTANT!** Check the sapphire crystal on the end of the specimen arm using a magnifier. Wipe off any dirt with a clean lens tissue. **Do not ever put a dirty specimen arm into the column.** Check that the specimen arm o-ring is free of dust and lint. Wipe the o-ring with a lens tissue if you see any lint.

3. **To Insert the specimen:** put the arm into the column with the indicating rod at 4 o'clock. Wait for the red light to extinguish. Turn the arm counterclockwise with a firm grip. The arm will be drawn into the column with some force. Gently rest the specimen arm into the column so that the groove sits firmly around the post.

4. Push **HIGH TENSION**, turn **FILAMENT** up to saturation (until a beep is heard).

5. Check that condenser and objective apertures are in (handle faces left). Center the beam using **SHIFT X** and **Y** (below the screen) and **INTENSITY** knobs (left hand control panel). Release or engage **FINE** button to control the intensity sweep. Fine tune the objective aperture if necessary- use the inner knob and its side knob to center the aperture. Choose a working magnification using the **MAGNIFICATION** knob.

## XY CONTROL

Go to **XY CTRL** page (press the screen softkey next to XY CTRL), highlight 1, hit store to save up to 99 coordinates consecutively as you scan your tissue. The recall softkey brings the highlighted coordinate into view. Recall + and - selects the next adjacent stored coordinate into view.

6. Choose a magnification. Use **FOCUS** (outer ring) and **STEP SIZE** (inner knob) to focus your image. The inner step size control gives you fine (steps 1-3), medium (steps 4-6) and coarse (steps 7-9) focus. The outer knob changes the focus. Your focus step is indicated on the screen.

## PHOTOGRAPHY

7. Using AMT imaging software, bring the beam to center with SHIFT X and Y knobs, adjust **INTENSITY** to center the AMT camera histogram. Make sure image is not moving, and capture the image. If you cannot center the histogram, then the filament

needs to be re-aligned. See filament saturation.

**Starting up CM10 microscope from shut off condition.**

## VACUUM

1. Go to MICROSCOPE buttons and press **ON** (white button). STANDBY (yellow) and OFF (red) will be illuminated. The computer program will test various functions.
2. Push VACUUM SYSTEM **ON** (OFF will be illuminated). Wait for 20-30 minutes until the microscope pumps down completely (VACUUM STATUS: READY). You can monitor this process on Vacuum Status page. Press **VACUUM** softkey.

## EMISSION AND HIGH TENSION

3. Press **READY** to return to CM10 page. Press **MODES** softkey to go to Modes Selection page. Press **TEM** softkey to go to TEM Bright Field page. Press **PARAMETERS** softkey. To go to Parameters page:
4. Increase emissions to **3** by pressing the right hand softkey.
5. Set High Tension KV to **60KV** using the right hand softkey.

Default DF (Darkfield) channel is 0, Automatic contrast is Low, and Lens Program is Zoom.

## FILAMENT SATURATION

6. Press **READY** to get back to TM Bright Field page. Press **MODES** softkey to go to Modes Selection page. Press **CONFIGURATION** softkey. Highlight **TUNGSTEN**. Un-highlight **FIL LIMIT**.
7. Press **HIGH TENSION** and turn **FILAMENT** knob up to heat the filament to saturation.

Center the undersaturated filament image using the shift X Y knobs. Press the align button if the image is not symmetrical. Use the direct alignments to adjust the gun tilt to get a symmetric filament image (multifunction XY knobs). Bring the filament to saturation when the filament image disappears and the brightness is stable.

When saturated, highlight **FIL LIMIT** to lock in the number. This prevents over-saturation and prolongs filament life.
Default objective lens is H-Contrast, Condenser 2 apertures are: 1: 300 2: 200 3: 150 4:100; Objective apertures are: 1: 100 2: 70 3: 30 4: 15

## SPECIMEN RELOCATION CALIBRATION

8. Press **READY** to return to Modes Selection. Press **TEM** softkey. Press **XY CTRL** softkey. Press **CALIBRATE** softkey twice, follow instruction on the bottom of the screen. Wait for the specimen relocation software to calibrate x and y.

## CM10 ALIGNMENT

After new filament or after microscope shutdown (1 hour)

1. Press ALGN button. The right hand page is for quick touch up alignments. Instructions are in the manual under direct alignments (section 2-56 to 2-57). Insert a holey carbon film into the specimen arm to do alignment work.

2. For full alignment, press left hand page softkeys and follow instructions on the screen. Do this if direct alignments are not sufficient to get EM imaging. Usually GUN procedures are enough to align the microscope. You may follow down the page and do all the alignments if necessary.

3. When you have finished all the steps, the page returns to Alignment Selection. Un-highlight the ALGN button to return to TEM Bright Field operating mode.

## CM10 STIGMATORS

1. Stigmators sometimes gets knocked out of alignment- often when the microscope is shut down. You will not be able to focus at higher magnification if this happens. To align the stigmators, press STIG button.

2. Defaults to objective stigmators. Saturate the filament and insert a holey carbon film. Make sure your objective and condenser apertures are in and aligned. Go to a magnification approximately 2 clicks above your highest working range. (34,000x)

3. Get an image of a hole. Work with step size on the softkeys and multifunction X and Y to "focus" fresnal fringes.

4. Press condenser softkey. This brings the condenser stigmators into adjustment. Under-saturate the filament. Adjust and center filament image with multifunction X and Y.

5. Un-highlight the STIG button.

**IF ALL ELSE FAILS:**
CALL (800) 432-1734 for Philips Service Technician : Joseph Manascalco.
CM10 serial # D814

## CM 10 ADVANCED USERS:

### FOCUSING WITH WOBBLER:

Press WBL button on the left hand control panel. The screen will show that the wobbler function is turned on. Focus as you would normally, minimizing image movement. Release wobbler button by pressing WBL again. Now under focus until the image looks crisp. (This is useful for quick focus of low mag shots.)

### TILTING SPECIMEN:

1.Unlock the specimen tilt locking arm by flipping the black handle out. Manually turn the tilting cylinder to the desired angle- indicated by degrees on the cylinder scale.

2. Tilt your specimen slowly, noting which direction it appears to have moved away from the center. Use the thumbwheel located on the tilting cylinder to bring the area back into the center of view.

3. Focus the image to see if tilting in this direction gives you more useful information. Tilt the grid in the opposite direction also. The results can vary with the tilt direction.

4. Lock the tilt mechanism before you photograph your tilted specimen.

5. Remember to bring the tilt plane back to zero before proceeding. If you cannot obtain a tilted image, you may be near the grid bars, or at the edge of your grid.

#### SPECIAL CAUTIONS WITH TILT MECHANISM:

The sapphire crystal at the end of the specimen arm must be extremely clean to get a smooth tilt. Any dirt on the crystal will contaminate the inner portion of the tilt mechanism. This part is irreplaceable and cannot be accessed by service technicians. You must clean the crystal each time you put in a specimen.

6. Always return the tilt angle to zero to remove or insert a specimen.

### LOW MAGNIFICATION:

Magnification steps below 620x are LOW MAG and are indicated on the screen as LM. You must remove the objective aperture by flipping the handle so it faces right.. Remember to return the objective aperture to the left and aligned position to proceed to higher magnifications.

### SELECTING LENS PROGRAMS:

The CM10 has a magnification range of 620x to 450K in 37 increments. These are divided into two separate lens programs (ZOOM and STEREO). The default is set to ZOOM. To select a lens program, go to the TEM Bright Field page (press READY). Press PARAMETERS softkey, at the bottom of the page are the two lens programs. Highlight the one you want to use, press READY to return to TEM Bright Field page.

CHANGING HT AND EMISSION:

The CM10 is capable of the examination of semi-thick (.5um) sections by increasing the HIGH TENSION settings (80-100KV) and lowering the EMISSION (2-1). Press PARAMETERS softkey from the TEM Bright Field page.

Do not use this adjustment to make the beam brighter. You will only blow the filament. Align the filament and set the spot size to 2. Check that the emission is set to 3 at 60KV. This setting is used for normal ultrathin sections.

USING INT ZOOM AND INT LIMIT:

These softkeys on the TEM Bright Field page control the intensity of the illumination while you are working. INT ZOOM if highlighted will keep the intensity of the beam constant regardless of changes in magnification. INT LIMIT if highlighted will keep the intensity below the current setting to avoid burning your tissue. You will get a beep if you try to make the beam more intense with the setting on.

APERTURES:

The condenser should be 300um (the biggest) for most thin sections. The innermost knob is turned all the way in clockwise. Similarly, the objective aperture is set to 200um (the biggest), the inner knob turned fully clockwise.

USING MCID:

An image at 19,000x magnification is approx 5,800 square microns
25,000x screen is approx 7,900 square microns.