Chapter 3.7

Ultratech Mask Copier
(maskcopy - 382A)

1.0 Title
Ultratech Mask Copier

2.0 Purpose
The Ultratech mask copier is a contact printer, which is used to duplicate both chrome and emulsion masks.

3.0 Scope
This document describes the general operation of the Ultratech mask copier. It is a contact printer primarily used for duplicating chrome and emulsion masks. The mask copier copies 5” square plates only. The copy will be a mirror image of the original mask. The original mask is called the master plate.

4.0 Applicable Documents
Revision History

5.0 Definitions & Process Terminology
5.1 Master plate: The original mask.
5.2 Copy plate: The duplicate mask.

6.0 Safety
Follow general safety guidelines in the lab as well as the specific safety rules as per follows:

6.1 Take care of the vacuum seal rubber. Do not cut the rubber ring with the edges of the plates during loading and unloading; this will cause a vacuum leak.

7.0 Statistical/Process Data
Pertinent information can be found in the following locations:

7.1 Problem and comments section under equipment section of the wand.
7.2 Enable message for maskcopy.

8.0 Available Processes, Gases, Process Notes
8.1 Available Processes

<table>
<thead>
<tr>
<th>Plate Type</th>
<th>Emulsion Intensity Setting</th>
<th>Chrome Intensity Setting</th>
<th>Exposure Time (sec.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.R. on Chrome</td>
<td>0</td>
<td>3.5</td>
<td>60.0</td>
</tr>
<tr>
<td>Emulsion</td>
<td>3.0</td>
<td>0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Note: Only ~ 4.5” of the exposing field is guaranteed to be uniform.
9.0 Operating Procedure

The following is a detailed outline of the general procedure to follow in using the maskcopy.

9.1 Check Controller Settings

9.1.1 Check the status of the controls on top of the machine. It should be in the following condition.

<table>
<thead>
<tr>
<th>Controls</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamp Servo Mode</td>
<td>Normal</td>
</tr>
<tr>
<td>N2 Purge Time</td>
<td>0</td>
</tr>
<tr>
<td>Vacuum Pump Down Time</td>
<td>2.0 on Black Knob</td>
</tr>
<tr>
<td>Vacuum Pump Down Time</td>
<td>2.5 on Red Knob</td>
</tr>
<tr>
<td>Plate Separation Time</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Note: Do not adjust the settings on the top panel of the copier. They have been calibrated for optimum results. Check these settings against those posted on the front panel of the copier.

9.2 Copy 5” Masks

9.2.1 Check whether the door fixture is securely sealed.

9.2.2 Push MAIN POWER button.

9.2.3 Set exposure time and intensity knobs as the above chart (Section 8.1.1)

9.2.4 Open the vacuum chamber door.

9.2.5 Use the nitrogen gun to blow any dust off the master plate.

9.2.6 Load the master plate with the emulsion or chrome side facing out on the master anvil.

9.2.7 Push MASTER VACUUM button. Vacuum gauge should read 25” or higher.

9.2.8 Push FAST PUMP button. For 5” mask, push the MASTER HOLD button also.

9.2.9 Push EMULSION button in for exposing emulsion plates or the EMULSION button out for exposing chrome plates.

9.2.10 Load the copy plate against the three metal pads with the emulsion or photoresist side up.

9.2.11 Use the nitrogen gun to blow off any dust particles on the master and copy plates.

9.2.12 Close the vacuum chamber door. The automatic cycle light will come on and the automatic cycle will start the vacuum. The COPY vacuum gauge, MASTER vacuum gauge and the MAIN CHAMBER gauge should read 25” or higher. When the vacuum is good, press the AUTOSTART button twice to start the exposure.

Option: The NEWTON RINGS button allows you to check the contact between the master plate and the copy plate. Before making an exposure, push the NEWTON RINGS button in, open the NEWTON RINGS door, and then close the vacuum chamber door. When the vacuum is completed, the Newton rings should stop moving.

9.2.13 When the exposure is finish, the output light on the OMRON gauge will go off. Press LATCH RELEASE button and the CYCLE ON light will go off. Wait a minute, and then open the chamber door slowly. If the copy plate sticks to the master plate, use a N2 gun and generally blow between the two plates. Remove the copy plate.
9.2.14 Turn off the MASTER VACUUM, FAST PUMP and MASTER HOLD buttons. Remove the master plate and close the chamber door.

9.2.15 Turn off the MAIN POWER.

10.0 Troubleshooting Guidelines

If you suspect that the copier is not operating properly, push the MAIN POWER button out to turn off the power on the whole system.

If you need to change plates or exposure in the middle of a cycle, the LATCH RELEASE button may be used. It will stop the cycle and release the latch holding the door.

11.0 Figures & Schematics

N/A

12.0 Appendix

Mask Polarities

12.1 Emulsion mask with a clear field (black boxes) when copied over to another emulsion plate gives a dark field emulsion mask (with windows).

12.2 A clear field emulsion mask copied over to chrome will give a clear field chrome mask; when (the chrome copy) copied back over emulsion, it will give a dark field emulsion copy.

12.3 A clear field emulsion mask copied over to chrome will give a clear field chrome copy. (Copied over to chrome once more will give another clear field copy.)

12.4 A clear field emulsion mask copied over to chrome will give a clear field chrome copy.

12.5 A dark field chrome mask copied to emulsion gives a clear field emulsion mask with boxes. The emulsion copy copied back over to chrome will then give a clear field chrome mask.

12.6 A clear field chrome mask copied over to emulsion will give a dark field emulsion mask.

12.7 A dark field chrome mask copied over to chrome gives a mirror image dark field chrome mask. The mirror image dark field chrome mask copied back over to emulsion will give a clear field emulsion mask with the same orientation as the original.

12.8 A dark field mirror image emulsion mask copy copied over to emulsion again will give a clear field emulsion. The Clear field mask copy copied to another emulsion plate gives a dark field mirror image.

12.9 A dark field chrome mask copied over to iron oxide will give a dark field iron oxide copy.

Note: Whenever a mask is copied, the copy (mask) will always be a mirror image of the original mask pattern.

M. Kushner - April 1995