

EBPG CHEAT SHEET

1. Load the substrate in a holder. Check that the substrate and/or piece holder are pressing against the three points. Use the alignment microscope to measure the vector from the Faraday cup to a focus point (e.g. silver balls).

2. Start pumping the load lock and then

```
subl n
```

where n=1 for the mask holder, n=3 for the 3 inch wafer holder, n=6 for the six-inch wafer holder, n=4 for the four-inch wafer holder.

3. Select holder with

```
pg sel hol n
```

 (where n=1, 3, 4, or 6)

4. Load the column conditions

Show the list of beam files for different currents, then restore those conditions

```
pg info arc beam
```

```
pg arc restore beam <file>
```

Note that the system switches and aligns the apertures automatically. On systems with a manual aperture changer, you should use “pg adj ap”

5. Find the calibration mark

`mvm`

then **IF** the mark is found successfully...

`atc`

adjust table coordinates (reset origin)

6. Measure the current with

`mcur`

If the current is not within 10% of the desired value, then something is wrong and you should ask for help.

7. Choose your pattern

`pg sel pattern <file>`

Hopefully you have already used “cd” to set the default directory under /home/pg/users/

8. *Optionally*, set the resist sensitivity

`pg set resist <lowest-dose>`

This will avoid warning messages about the clock rate. It's not really important.

10. Calibrate the field size, focus, etc with

`pg adj ebpq`

or “aeb”

This sequence ends at the Faraday cup.

11. Move to your focus blob

```
mvr1 <dx>,<dy>
```

for example, **mvr1 45mm,32.87mm**

Move to a good looking blob and check the focus with

```
afl d
```

You might want to save the location with

```
sp foo
```

or any name you like, other than "foo"

Move back to this location with

```
mvsp foo
```

12. Move to where you want the center of your layout then save that location

```
sp start
```

Or you can type the stage coordinates directly into the wrapper script (see next step). It would be smart to turn off the SEM view so that you will not expose the resist.

13. Create a wrapper script for running your job. You could copy an example:

```
cp /home/pg/users/wrapper.sh whatever_name_you_like.sh
```

Edit this file with emacs, kate or gedit
(or with vi if you are a freak)

If you copied an example then you **do not**
have to make the script executable with

```
chmod a+x whatever
```

If you are using the symbol “start” in the
wrapper script, be sure to move to where you
want the center of the layout, then save the
location

```
sp start
```

14. Start the exposure with

```
./whatever_name_you_used.sh
```

15. Unload the substrate

subu n

16. Leave the holder in the loadlock and leave it pumping.

IF YOU LOAD ANOTHER WAFER then you can skip nearly all of this procedure. Just load the wafer with "subl" and run your wrapper script again.

MOST of this procedure is for checking that the tool is running properly before you start the exposure. If the EBPG is not working, it's best to know this *before* wasting a lot of time.

UNIX COMMANDS YOU SHOULD KNOW

<code>cp from_file to_file</code>	copy the file "from_file" to the file "to_file"
<code>mv from_file to_file</code>	move, that is, rename a file
<code>mkdir <name></code>	make a new directory (folder)
<code>cd <name></code>	change directory (change the default folder)
<code>pwd</code>	print working directory
<code>ls</code>	list files (directory), minimal information
<code>ll</code>	list files, with lots of information
<code>emacs <name></code>	text editor (or use kate, gedit)
<code>which <command></code>	show where this command comes from
<code>man <command></code>	show the manual page for this unix command

Unix tips:

- . means "here"
- .. means "up one directory level"

- & after a command causes the command to run in the background
freeing the terminal for other commands

Do not use spaces in file names.

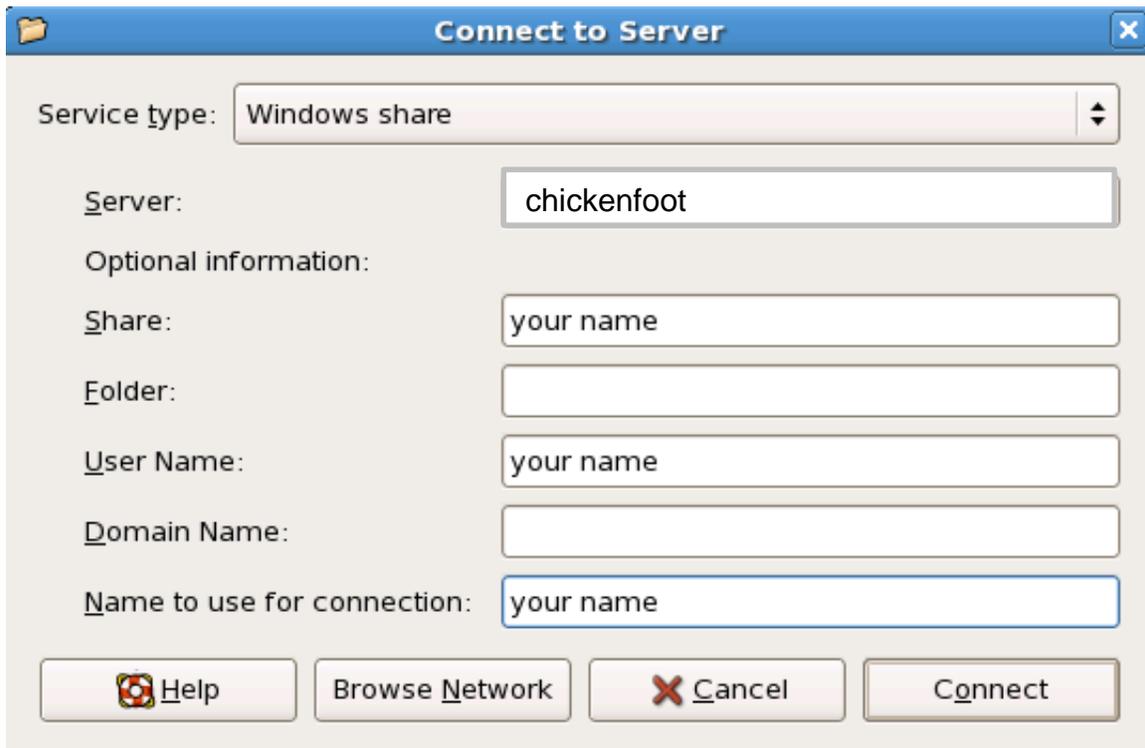
For file names, UseOnlyLetters_numbr5_underscore-dash.and.dot,
but be sure to begin and end the name with either a letter or a number.

Create a new directory (with "mkdir") for each project.

You **MUST** put the pattern file in the same directory as the cjob file.

MOUNTING YOUR CHICKENFOOT ACCOUNT FROM THE EBPG

Places → Connect To Server



If you leave the resulting icon on the screen, then your connection to sizzlorr will time out. Later, you can click on the icon and then simply enter your password.

If you unmount the connection explicitly (by right-clicking on the icon) then you'll have to go through this connection dialog all over again.

Alternatively, to transfer files you can use a command like

```
scp yourname@chickenfoot:foo/bar/something.job .
```

OTHER HANDY EBPB COMMANDS

pg move pos <x>,<y>

move somewhere

joy

adjust focus & stig manually

pg adj freq

calculate exposure clock

pg measure height subs --size=5mm,5mm

height map

pg marker calib <x>,<y>

use alternate mark for calib.

mvm 0,0 --rel marktype

align to mark right here

pg deselect map subs

discard current alignment map

pg info sel map

show current alignment map

pg set stagelock 0

unlock stage

pg marker create rec pos 8,8 foo

define new mark type

\$pg save

must follow marker create

pg marker set p10 contra 99

*require the least contrast for
marker type "p10"*

pg get htval

display high voltage value



pgreset

*reset system after crash
or freeze*

restore_symbols

*restore stage coordinate
symbols after losing the
terminal window*

pg table /del "*"

delete all position symbols

TROUBLE VENTING?

Sometimes we run out of nitrogen.

First, open the *liquid* valve on the nitrogen tank, allowing air to go *into* the tank.

Walk around the e-beam column and look for the switch labeled “vent forever” on the plinth. This switch is on the southwest corner. Flip it to “vent forever”.

It will take a few minutes more to vent the load lock with air. Pull out on the door so you can tell when it reaches atmosphere.

If you want to be nice, you could switch the regulator to the other liquid nitrogen tank, then switch back to “timed vent”.

Please send a note to michael.rooks@yale.edu to tell him that we ran out.
Thanks.

WAFER CENTERS

4 inch and 6 inch wafers: 74.5mm,77.3mm

3 inch wafers: 71.0mm,77.5mm