Chapter [4.23]

SVG 8800 6" Developer Track

(svgdev6) ***(Bay 384)***

1.0 Equipment Purpose

1.1 SVGDEV6 is the developer track (back track) on the SVG 8800 series machine in the Nanolab. This tool is uses OCG 934 to develop OCG 825-35 (Fujifilm), and MF-26A to develop the MiR (AZ), OiR 906-12 (Fujifilm), UV210 (Dow), and UV26 (Dow) resists. This tool can develop 6" wafers.

2.0 Material Controls & Compatibility

2.1 Refer to Chapter 4 of the Process Manual for more information about the resists used on this track.

2.2 Large runs (15+ wafers) must be discussed with staff before running on the tool. This allows staff to plan for photoresist consumption and ensure there is an adequate supply for all members.

2.3 Bonded wafers are generally NOT allowed on any of the Nanolab coat/develop tracks. Members who wish to run bonded wafers must discuss with staff to see if their process would qualify for an exception.

2.4 Do not run wafers with PR or dicing tape on the backsides on the track. They WILL stick to the hotplates. If you need to protect the backsides of wafers, BARC may be used.

2.5 Transparent wafers are NOT allowed on svgdev6.

3.0 Training Procedure & Applicable Documents

3.1 Training Procedure
- **3.1.1** Schedule a training session with a qualified member
- **3.1.2** Pass the online test in the Nanolab office (open 8A - 12P, 1P - 5P).
- **3.1.3** Arrange a qualification session with Process Engineer 1 or 2 to show competency on the tool.

3.2 Members who were qualified before November 2017 should review the manual and consider re-training with a qualified member before requesting oral requalification - the tool's software was upgraded and so the tool operation procedure is very different.

3.3 Members can access C&D provided documentation by pressing HELP in the tool software.

3.4 Special recipes not yet available on the track can be requested through this form

4.0 Definitions & Process Terminology

4.1 **Coat Track:** The front track, as the operator faces the tool, is the coating track. Please refer to chapter 4.12 for more information about the coater track (SVGCOAT6).

4.2 **Develop Track:** The back track, as the operator faces the tool, is the development track.

4.3 **Module:** Each individual station (oven, developer, chill plate) is called a module.

4.4 **PEB:** Post-exposure bake.

4.5 **HPO1:** Hot Plate Oven (1); There are two hot plate modules available on the developer side. This hot plate can be at 110 °C for MiR process, 120°C for OiR and OCG processes, or at

130℃ for DUV processes. The oven should be left at 110℃ before disabling, since it takes much longer to cool the hot plate than to heat it.

4.6 **HPO2:** Hot Plate Oven (2); There are two hot plate modules available on the developer side. This plate is kept at 120℃ but can be used as a “set your own temperature” hot plate - see staff for instructions.

4.7 **CP**: Chill Plate; This is the module that wafers go to after the post-exposure bake (HPO1 or HPO2) step.

4.8 **MDTD:** Moving Dispense Triple Developer; This is the developer module and can dispense two developers, MF-26A and OCG 934

4.9 **Puddle:** In the process of developing when developer sits on top of the wafer for a given amount of time it is called a puddle

4.10 **DUV:** Deep-UV process with resists sensitive to 193 nm and/or 248 nm wavelength light.

4.11 **GUI:** Graphical User Interface. Shorthand notation for the software program that operates the tool.

5.0 Safety

5.1 Do not operate the develop module with the protective cover off.

5.2 Do not operate the hot plates with the covers off.

5.3 Do not place your hand in the path of the track’s moving parts.

5.4 Do not access the electronic and high power supplies inside the machine.

5.5 Do not touch or manipulate any of the robotic systems, especially the transfer arm on the tool.

5.6 Do not abort the develop process if developer has begun dispensed.

5.7 Do not fill the developer tanks

5.8 Do not handle any of the developer chemicals or touch residues without proper protective equipment

5.9 Do not abort the develop process if the module has begun dispensing

6.0 Process Data

6.1 Process monitor data is available in the process specification chapter on the website.

7.0 Available Processes, Gases, Process Notes

7.1 **Recipe Names:** Standard recipes have a series of number codes. Below is a summary of the codes and list of the standard recipes

01 - Standard recipe flow

02 - Bake only recipes

03 - Developer only recipes

Photoresist	Thickness	Developer Flow/Recipe
UV210-0.6	0.42um	01_PEB130C90s_MF26A45s
	0.90um	
MiR 701	1.0um	01_PEB110C90s_MF26A60s

	2.0um	
MiR 900	3.5um	01_Prox110C60s_MF26A2x30s_XtraSpray
	5.0um	

7.2 **Developer Processes:** There are 6 lines running to the developer arm. Those lines are as follows:

Line Name	Developer
STREAM 1	MF-26A
SPRAY 1	MF-26A
STREAM 2	OCG 934
SPRAY 2	OCG 934
STREAM 3	Not in use
SPRAY 3	Not in use

7.3 **PEB Processes:** The HPO1 on the developer side is set to 110℃ or 130℃ according to the recipe and depending on the type of photoresist being developed.

7.4 **Non-Standard Processes:** Members are not permitted to modify recipes on the track. Special recipes must be set up with staff -- see Process Engineer 1 or 2 to discuss your process. To request a special recipe, please fill out this Form

7.5 **Tip Cleaning and Dummy Wafers:** The developer nozzles should not require cleaning at any point. Members are not permitted to remove the developer cover to clean the nozzles. Removal of the developer cover will result in disqualification. Dummy wafers also do not need to be run to prime the lines -- members should run 0-1 dummies before their real wafers.

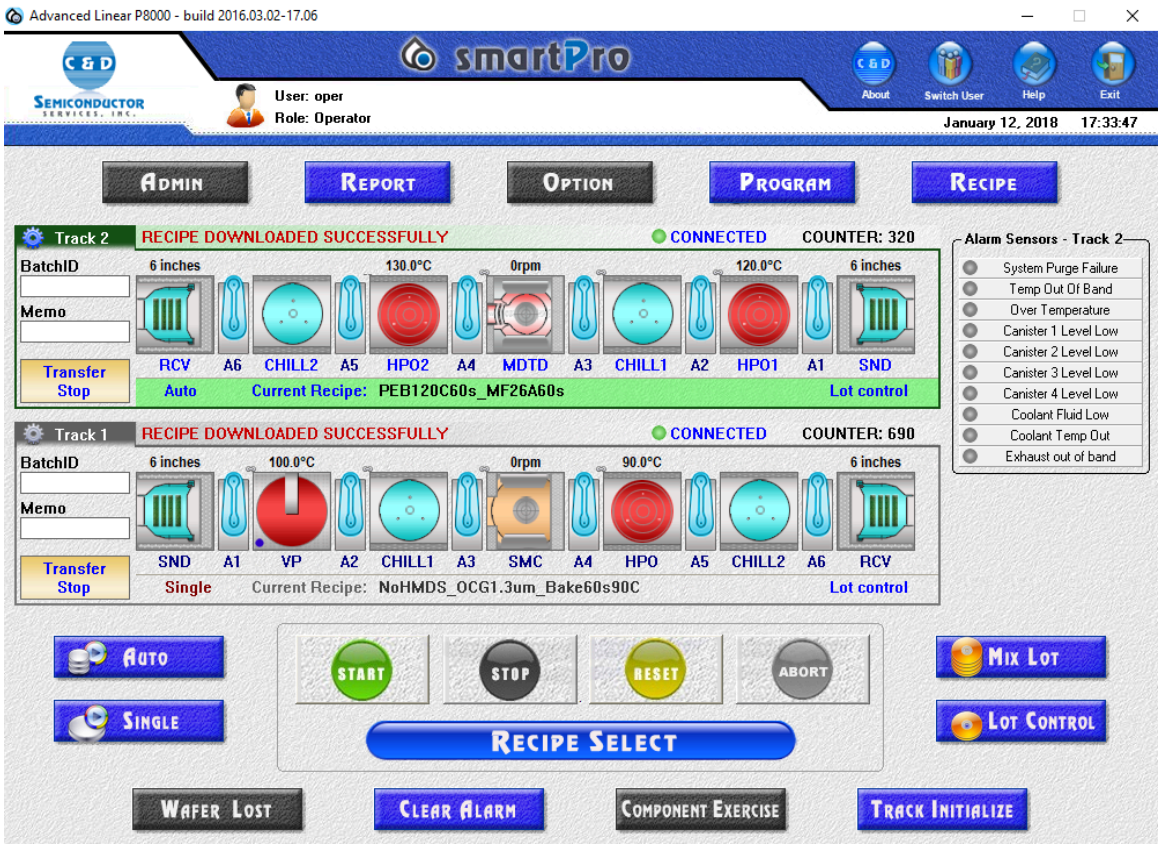
7.6 **PICOTRACK Backup:** Members are encouraged to be qualified on both PICOTRACK and SVG tools. Recipes have been developed so that either tool may be used with the same exposure parameters in the event of either heavy usage or tool maintenance.

8.0 Equipment Operation

8.1 The tool is operated using the Advanced Linear P8000 software program by C & D Semiconductor Services Inc. The software has 5 separate tabs: ADMIN, REPORT, OPTION, PROGRAM, and RECIPE. Nanolab members will have access to view, but not edit, the tabs with “all” permission level. A table with the different tabs is listed below.

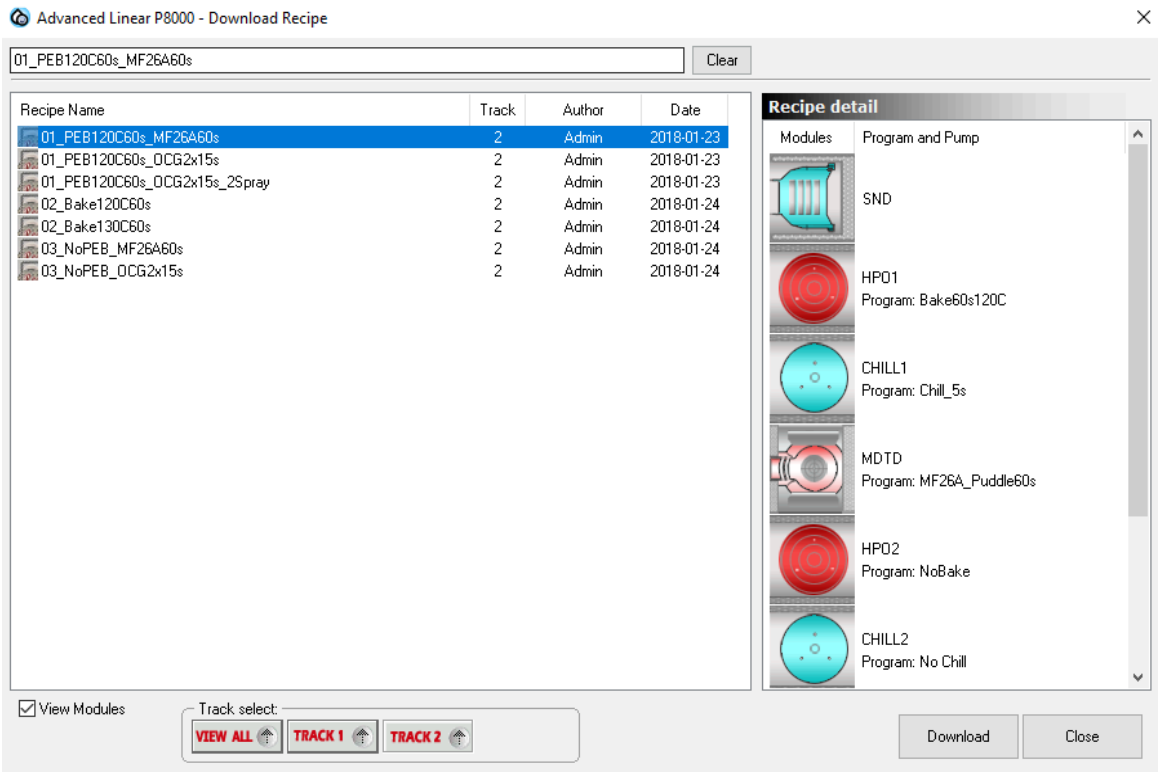
Tab Name	Description	Permissions
ADMIN	Software configurations and user manager	Staff only
REPORT	Search reports such as alarms, wafer lost, and sessions	All users

OPTION	Control module settings	Staff only
PROGRAM	View individual module programs	All users
RECIPE	View track recipes	All users



8.2 Before you begin, review the recipe you want to use. Make sure the developer track, “Track 2”, is selected so the schematic is highlighted in green.

8.3 Click [Recipe Select], select the recipe you would like to use. Verify the steps are correct by viewing the program names next to the module icons on the right side of the screen.



8.4 Press [Download] to download your recipe. If your recipe has a different temperature set point than the previous recipe, the tool will alarm. Press [Clear Alarm] and wait for the HPO1 to reach the correct temperature. Verify the temperature by checking the hotplate controller or the software readout.

8.5 Verify the recipe downloaded, the recipe name should appear next to “Current Recipe” beneath the developer track schematic.

8.6 The developer track is the back track. Load wafers into the send cassette (right). The send cassette can hold up to 25 wafers.

8.7 If this is the first run and the receive cassette (left) is at the top, verify the cassette is empty then lift and place it back on the indexer.

8.8 In the software, verify both the send (SND) and receive (RCV) cassettes appear blue, not gold. If it appears gold, tilt the cassette up and place it back down to reset it. .

8.9 Select either [Single] or [Auto] on the lower-left side of the screen. [Single] runs one wafer at a time, [Auto] runs all the wafers in the cassette.

1.1 Select either [Mixed Lot] or [Lot Control] on the right side of the screen. [Lot Control] raises the receive cassette when the last wafer from the send cassette has finished being processed. [Mixed Lot] allows you to run multiple send cassettes without resetting the receive cassette, but it will reset once it is full. For both cases, when you start your run with the recieve cassette at the top, it must be empty.

8.10 Press start to begin the process.

1.1 After the process is finished and you are ready to disable the tool, make sure to download the standby recipe: “00_DeveloperStandby_HPO1-110C”. It takes much longer for the hot plate to cool than to heat up, so the default temperature is 110℃.

9.0 Troubleshooting Guidelines

9.1 Software temperature readout is different than the hotplate controller

9.1.1 HPO2 uses an older controller that is not compatible with the new software. The software temperature readout of HPO2 is entirely inaccurate. The hot plate controller displays the correct temperature.

9.1.2 If the software readout for HPO or HPO1 is off by more than 1°C, out in a yellow fault.

9.1.3 DO NOT use the hot plate controllers to change the temperature. Selecting the correct recipe will automatically change the set point.

9.2 Cross slotting

9.2.1 If the transfer arm begins to pick up your wafer and the alarm sounds, your wafer may be cross-slotted. Verify by visually inspecting the cassette.

9.2.2 Clear the alarm in the software.

9.2.3 Gently tilt the cassette without lifting it off the platform.

9.2.4 Carefully pull your wafer out of the cassette, keeping it as horizontal as possible. Remove the wafers in the next two slots if present.

9.2.5 Switch to “Single” mode if not already selected.

9.2.6 Select the “Wafer Lost” button in the software then hit “yes” to confirm your selection.

9.2.7 Make sure the rest of your wafers are slotted correctly, then hit “Start”.

9.3 If you started the wrong recipe

9.3.1 If you realize you are running the wrong process, follow these steps. DO NOT select “Stop” or “Abort” without consulting staff.

9.3.2 Select the SND module in the software and press “Reset”.

9.3.3 Allow the wafers already in the tool to finish processing.

9.3.4 Superusers may, with staff instruction, abort certain modules on the tool. Please see staff if you would like to gain permission to do this.

9.4 Low Developer Alarm:

9.4.1 Silence the alarm by pressing the “Acknowledge” button (see section 11.3).

9.4.2 Observe which developer or other chemical is low.

9.4.3 Report the problem on Mercury, including the chemical name, as a warning under the “chemical” symptom. Staff will promptly refill the tank.

9.4.4 The alarm indicates there is ~1 gallon of developer left in the tank. The track can still be used to develop wafers. Members are advised to proceed with caution and not to run large batches (15+ wafers).

9.5 Receive cassette does not go down

9.5.1 Make sure the RCV cassette appears blue in the software. If it is yellow, lift the cassette off the platform and place it back down.

9.5.2 If there are wafers in the cassette, you must run your process on Mixed Lot mode.

9.5.3 Press “Start”

9.6 Wafer falls off chill plate pins or vacuum arm

9.6.1 Select [Transfer Stop]

9.6.2 Retrieve your wafer using wafer tweezers and remove it from the track

9.6.3 Hit [Start]

9.6.4 When the tool alarms with a vacuum error, press [Wafer Lost] and confirm missing wafer

9.7 Error message: “MDTD: CENTERING DEVICE OUT?”

9.7.1 Make sure the tool is enabled

9.7.2 Once the tool is enabled press “Start”

9.7.3 If the tool was enabled before the problem occured, report the problem on mercury

9.8 Error message: “MDTD: SPINDLE NOT SPIN”

9.8.1 Take the deionized water bottle (squeeze bottle with white markings) from the bottle in the “SVG 6 cleaning supplies” cubby next to the tool.

9.8.2 Pour water slowly onto the wafer to dilute the developer and halt the develop process.

9.8.3 Clear the alarm in the software and report a problem in mercury or call PE 1 if available.

9.8.4 DO NOT press “Start” or “Abort”, as this will cause developer to spill outside the developer bowl and contaminate the remaining modules (HPO 2, CP, RCV). Wait for staff to properly fix the problem.

9.9 Vacuum error

9.9.1 On a transfer arm

9.9.1.1 Make sure the wafer is positioned correctly - i.e. not cross slotted. Follow steps listed above for a cross slotted wafer

9.9.1.2 If the wafer fall off completely, remove the wafer and press [Wafer Lost]

9.9.2 On a chill plate or hot plate

9.9.2.1 Make sure the wafer is positioned correctly

9.9.2.2 Press start

9.9.3 On the coater station

9.9.3.1 Check the vacuum gauge on the front of the tool - if the numbers are Red you may press start, if the numbers are Green wait and call staff or file a problem report

10.0 <u>Study Guide</u>

10.1 The SVGCOAT6 test qualifies on both SVGCOAT6 and SVGDEV6. Be sure to review both manuals before taking the test.

10.2 Are lab members allowed to fill the developer tanks in chase 383?

10.3 What is the correct flow order for the modules on svgcoat6?

10.4 What is the correct flow order for the modules on svgdev6?

10.5 How do you adjust the HPO temperature?

10.6 What resists are available on the tool?

10.7 How many dummies do you run before your wafers?

10.8 Why is Backside Bead Removal (BEBR) recommended for ALL wafers?

10.9 What do you do if you hear the low developer alarm?

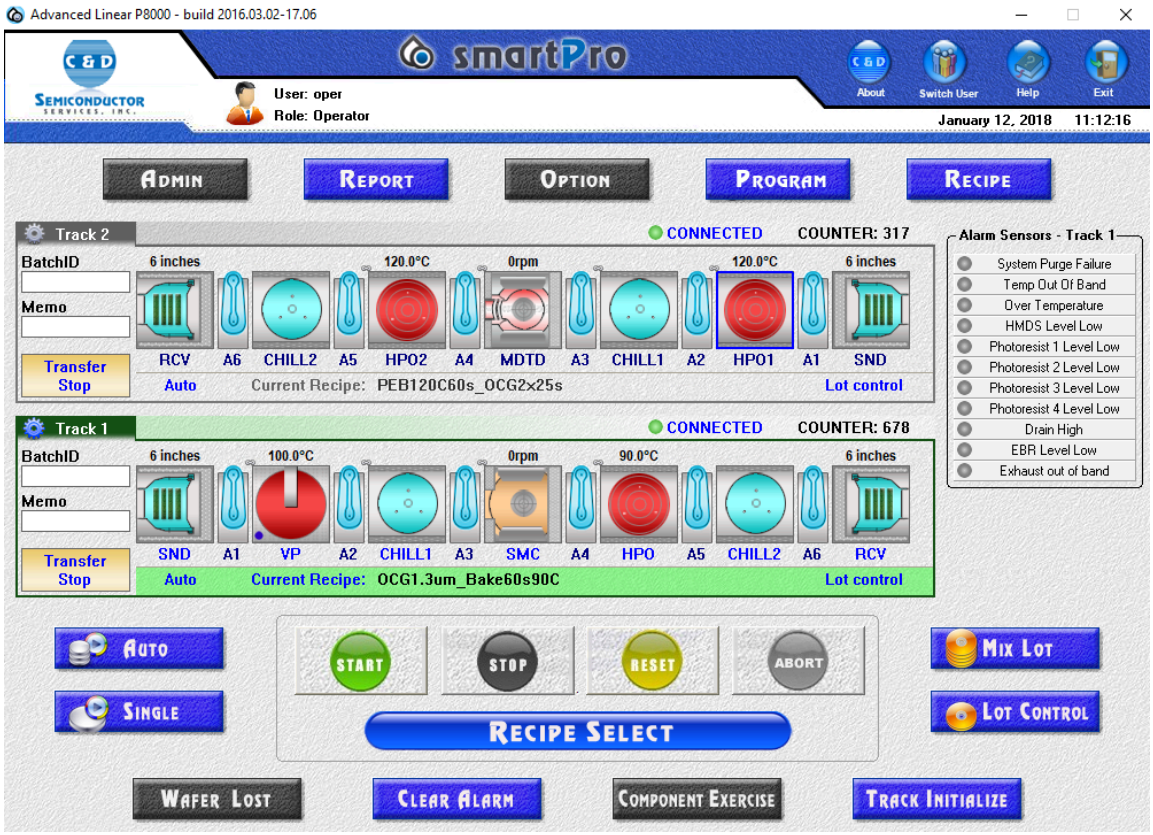
10.10 What should you do after you are finished coating or developing your wafers and before you disable the tool?

10.11 What should you do if the receive cassette does not lower?

10.12 Can both PICOTRACK and SVG be used to coat and develop deep UV resists?

11.0 Appendices

11.1 Explanation of buttons



Button Name	Description
About	Information about the software and license
Switch User	Page to log into a different user account
Help	Brings up the C & D manual for the tool
Exit	Closes the software

Transfer stop	Stops all transfer arms (not modules)
Auto/Single	Auto - runs all wafers in a cassette Single - runs one wafer for every time you press “Start”
Start	Starts processes wafers according to the downloaded recipe
Stop	Stops an active module
Reset	Resets a module
Abort	Aborts an active module
Recipe Select	Brings up the list of recipes for the selected track. Choose your recipe and download it from this page
Mix Lot/Lot Control	Mix Lot - run multiple send cassettes without needing to reset or unload the receive cassette Lot Control - When the last wafer from the send cassette is finished, the receive cassette will rise
Wafer Lost	Can be pressed if a vacuum leak is detected. Only press if you have removed your wafer from the track
Clear Alarm	Can be pressed to turn off an audible alarm on the tool. Further steps must then be taken to correct the alarm
Component Exercise	Not available to members. Can be accessed to control specific components of the tool
Track Initialize	If the tool has been powered off, the track must be initialized before processing. Do not press “Track Initialize” unless instructed by staff

11.2 Explanation of develop steps

Example program: MF26A_Puddle60s

Event	**Time (s)**	**Speed (rpm)**	**Arm Position**	**Description**
SPIN	2	300		Allow spindle to reach desired speed
SPRAY1	5	300	Center	Spray developer to wet the photoresist surface
SPIN	2	105	Home	Reset arm position. Allow spindle to reach desired speed.
STREAM1	6	105	Center	Dispense from tank 1 (MF-26A) while spinning
STREAM1	4	0	Center	Dispense from tank 1 to form a puddle
SPIN	60	0	Home	Allow wafer to develop for 60 seconds

SPIN	2	500		Spin off developer
RINSE1	30	500		Rinse off developer for 30 seconds
SPIN	20	2000		Spin-dry wafer

11.3 Figure of Low Level Indicators

