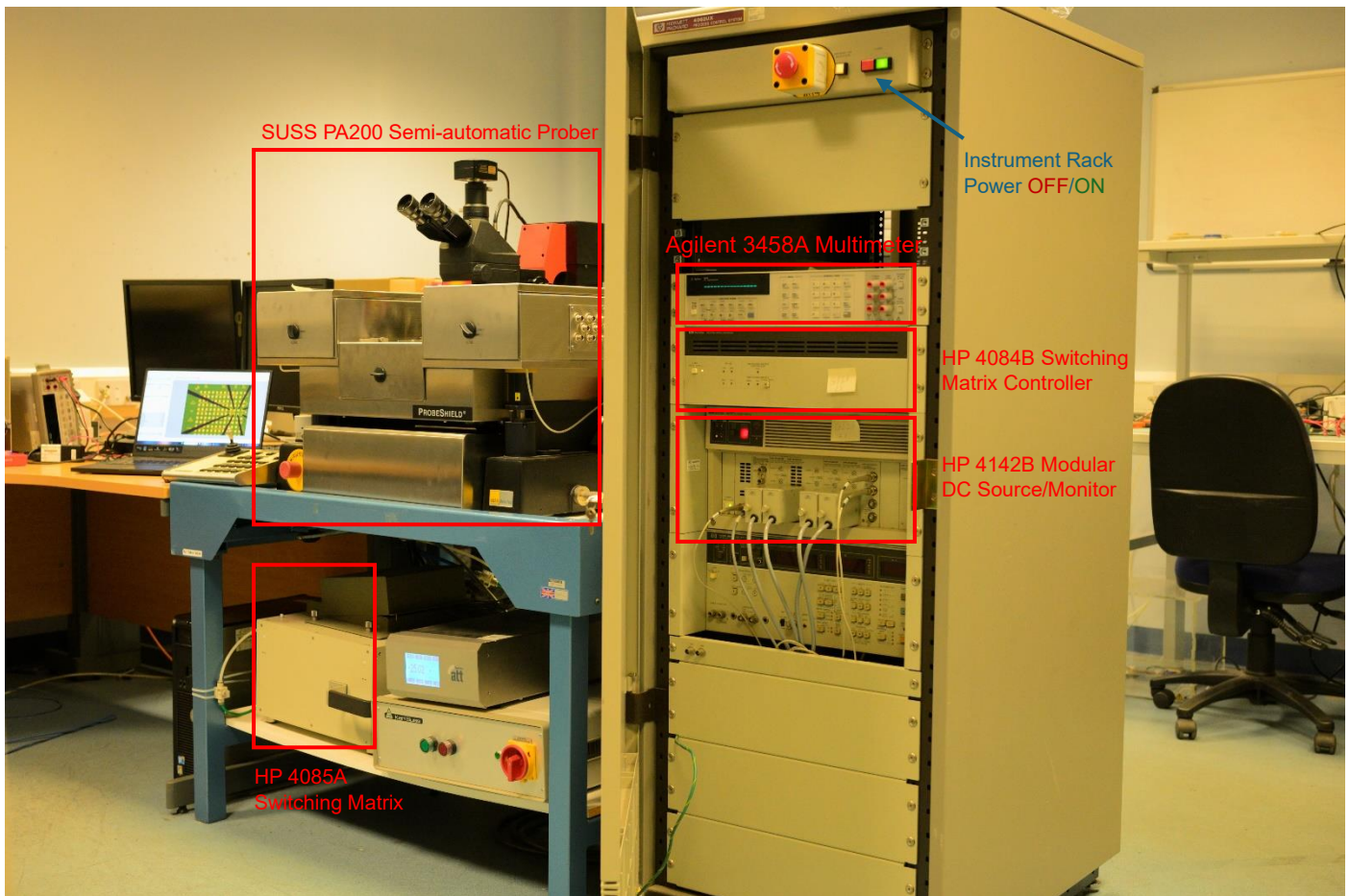


## Test Equipment Overview



The automated on-wafer parametric system consists of 4 Automated Test Equipment (ATE):

- **HP 4142B Modular DC Source/Monitor (SMU)** [On Rack]
- **Agilent 3458A Digital Multimeter (DMM)** [On Rack]
- **HP 4085M Switching Matrix (SWM)** [On Rack], consists of:
  - HP 4084B Switching Matrix Controller
  - HP 4085A Switching Matrix
- **SUSS PA200 Semi-automatic Prober (PB)** [Individual Powered]

The 4 equipment is connected to each other through GPIB connections and can be connected to the control computer's USB port through an **82357B USB/GPIB Interface**



# Manual Wafer Loading & Prober Set Up

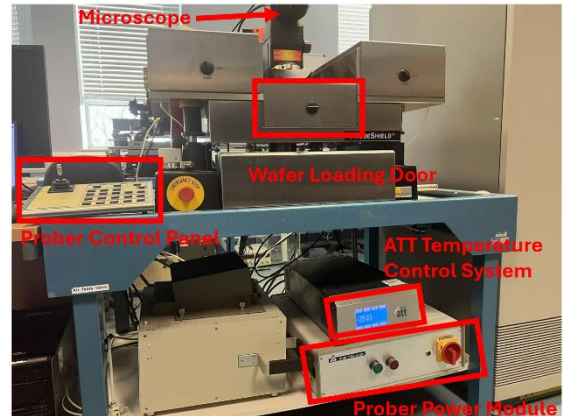
**Before deploying a parametric test, following steps must be completed to properly set up the prober:**

1. Power up the prober by:
  - a. Firstly, turn the Main Switch to **ON** Position.
  - b. Then press the **Power On** button.

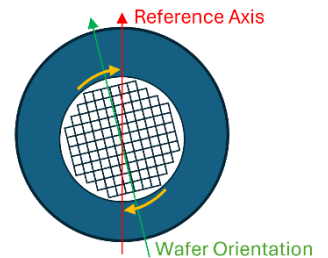


Main Switch

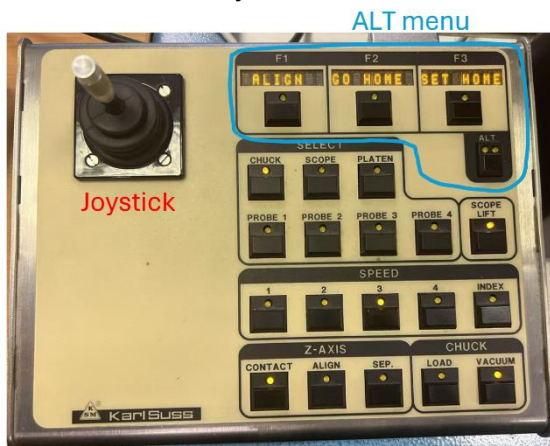
2. Turn on the microscope's light source using the black knob located on the desk at the rear left-hand side of the prober.
3. Open the wafer loading door in the centre of the shield, then carefully place the wafer in the middle of the chuck (a metal plate). If the chuck is not positioned near the wafer loading door, press the **LOAD** key on the Control Panel.



4. Adjust the wafer orientation to achieve optimal alignment with the reference axis. Note that the chuck can only rotate within a very limited range on the XY-plane. This step may require multiple adjustments if the wafer cannot be correctly aligned using the chuck's rotation alone.

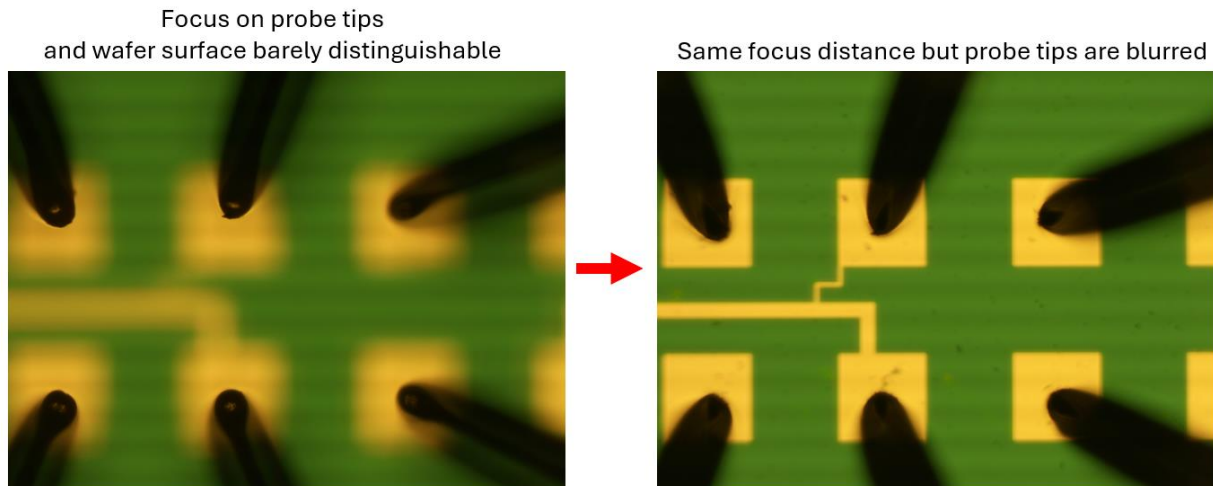


5. Press the **VACUUM** key on the Control Panel to securely fix the wafer on the chuck.
6. Observe the chuck directly and use the joystick on the Control Panel to position the wafer beneath the probe. Press the **ALT** key once to access the ALT01 menu (the two LEDs on the ALT key indicate the current menu; a lit LED represents 1, while an unlit LED represents 0). Use the **Z UP** key to lift the wafer closer to the probes, ensuring the distance between the probe and the wafer remains visible to the naked eye.



ALT	F1	F2	F3
00	ALIGN	GO HOME	SET HOME
01	SET CONT	Z UP	Z DOWN
10	REMOTE	THETA	INDEX
11	IDX POS	REAL POS	QUIET

7. Reduce the chuck's movement speed by pressing the **3** key in the SPEED section of the Control Panel. For finer adjustments, use the **1** or **2** keys as needed.
8. Look through the microscope and adjust its focus until the probe tips are clearly visible. Then, use the **Z UP** key to move the wafer closer to the probes until the wafer surface becomes barely distinguishable.
9. Use the joystick to navigate to a DUT on the wafer and align the probes with the DUT contact pads. Then, use the **Z UP** key to slowly move the wafer towards the probes until all probe tips appear slightly blurred, indicating they are in contact.

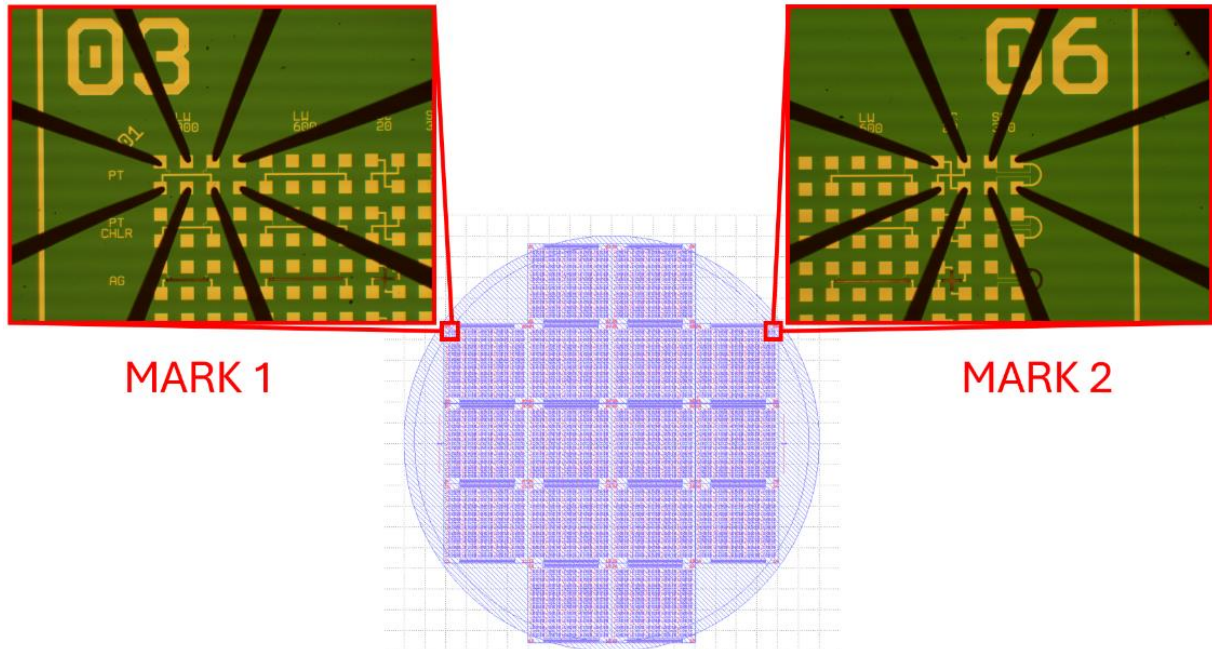


10. Press the **ALT** key several times to navigate to the ALT00 menu, then press the **SET CONT** key to set the contact height for the chuck. In the Z-AXIS section, the LED on the **CONTACT** key should light up, indicating that the chuck has reached the contact height.
11. Press the **SEP.** key near the **CONTACT** key to separate the contact. **\*\*DO NOT** use the **ALIGN** key in the Z-AXIS section of the panel to set the align height. Since manually setting the contact height is not always precise and the probes may not be perfectly level, the align height might not adequately separate all probes from the wafer.

(Continued On Next Page ... )



12. Navigate the chuck to align the leftmost DUT on the wafer with the probes. Then press the **ALIGN** key in the ALT00 menu to enter alignment mode. In this mode, the **F1**, **F2**, and **F3** keys on the panel are redefined as **CANCEL**, **MARK1**, and **MARK2**, respectively. Press **MARK1** to mark the current position. Next, navigate to and align the rightmost DUT in the same row as the previously marked leftmost DUT, and press **MARK2** to mark it. Once both positions are marked, the chuck should rotate slightly, and the ALT00 menu will be restored on the panel. This process can be repeated for the best alignment results.



- a. If no rotation is observed, it means the wafer is either perfectly aligned or the alignment exceeds the chuck's rotational range. In the latter case:
  - i. Press the **SET HOME** key to set the current location as home for faster restoration.
  - ii. Press the **LOAD** key to move the chuck to the **LOAD** position, then use the **VACUUM** key to release the chuck vacuum.
  - iii. Manually adjust the wafer orientation slightly, turn the vacuum back on, and press the **GO HOME** key to return the chuck to the home position.
  - iv. Use the **SEP.** key to restore the chuck to the separation height
  - v. Retry Step 12
13. Navigate the wafer to align with the desired home DUT. Note that the home DUT can only be the top-left DUT in any block. Once aligned, press the **SET HOME** key in the ALT00 menu to set the home position.
14. Press the **CONTACT** and **SEP** keys alternately to verify that a reliable contact is established between the probe and the contact pad of the home DUT.
15. (Recommended) Navigate to the ALT10 menu on the Control Panel and press the **REMOTE** key to disable control from the Control Panel. The Control Panel should then display **LOCAL** in its F1 section, indicating that it can be re-enabled if necessary.
16. (Recommended) Turn on the ATT temperature control system using the switch located at its rear side. Once switched on, it maintains the chuck temperature at 25 degrees Celsius by default. The temperature setting can be adjusted via the controls on its front panel.

# Software Set Up

## Pre-Installation Requirements

Before proceeding, ensure that the following software is installed on the computer:

- [Keysight IO Libraries Suite](#)
- [Python 3.10 , 3.11, or 3.12](#)

## Application Startup

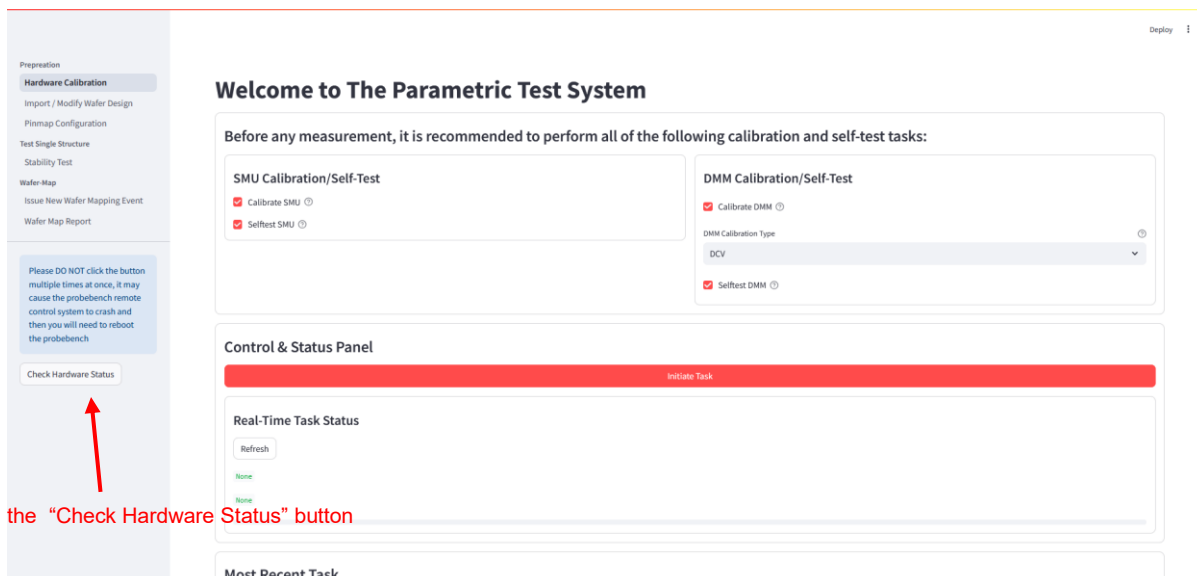
Once these are installed, open the system command window, activate the desired Python environment, navigate to the project folder, and run the following command:

```
> pip install -r requirements.txt
```

If all required Python libraries are successfully installed, **Automated On-Wafer Parametric Test** application can be launched by running:

```
> streamlit run app.py
```

This should open the default web browser and display the application's starting page:



## Initial Setup and Connection

1. Connect the computer to the powered ATE.
2. Wait a few moments, then click the **"Check Hardware Status"** button once.
3. After approximately 1–2 seconds, the connection status will be displayed.

If the **"passed"** entry for each instrument shows the value **"True"**, congratulations—you have successfully configured the system and started the application!

If a failure occurs and the error message is:

**"VI\_ERROR\_RSRC\_NFOUND"**

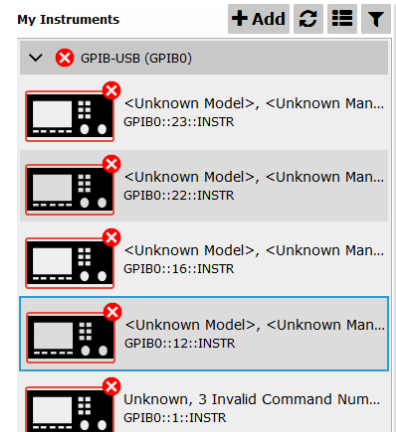
- Check the connections.
- Ensure all instruments are powered on.
- Try rebooting the system.

Else, if the error message is:

### “VI\_ERROR\_INTF\_NUM\_NCONFIG”

it indicates that the interface type is correct but the designated interface cannot be found. Follow these steps to troubleshoot:

1. Verify the Keysight IO Libraries Suite:
  - a. Ensure that the [Keysight IO Libraries Suite](#) is installed.
  - b. Open **Connection Expert** to check:
    - i. If the **GPIO-USB interface** is correctly displayed under the **My Instrument** section.
    - ii. If the connected instruments are listed under the interface's tab.
2. If the interface tab exists but the error persists:
  - a. Try **reinstalling** the [Keysight IO Libraries Suite](#).
3. If no interface tab is present:
  - a. Restart the [Keysight IO Libraries Suite](#) and the operating system.
  - b. Reinstall the [Keysight IO Libraries Suite](#).
  - c. Check if the operating system is blocking the functionality of the [Keysight IO Libraries Suite](#).
  - d. Disable antivirus software or any game anti-cheat software running on the computer.



**For other failure reasons or persistent connection or interface issues, please:**

- Contact the system administrator for assistance.
- Or raise a new issue in the [GitHub Repository](#).

### Prober Camera Access

A camera is mounted on top of the microscope on the Prober. It connects to the computer via a USB cable, enabling real-time monitoring. However, specific software must be downloaded to activate the camera's functionality.

Click either to download:

- [ToupView](#)
- [ToupLite](#)

After downloading and installing the software, launch it and select the camera (identified by a series of letters and numbers) under the **Camera List** tab.