

Product Introduction

PCR thermal cyclers provide a system for performing a variety of PCR applications. Polymerase Chain Reaction (PCR) is a technique for amplifying nucleic acids *in vitro*, emulating the natural DNA replication process.

Amplification is achieved by subjecting samples through cycles of different temperatures allowing the reaction mixture to proceed with the replication process. The reaction volume is in microliters and minute variations in temperature uniformity and accuracy could potentially affect the results of the analysis.

Application

Polymerase Chain Reaction (PCR) enables the detection of genetic material from a small amount of sources. Typical workflow involves extraction, PCR mastermix preparation, PCR amplification, and detection.

- Diagnostic Testing
- Molecular Biology Research
- Immunological Assays
- Forensics
- GMO Testing
- Oncology Research



Maintenance

Proper and routine maintenance of thermal cyclers are important to ensure the reproducibility and reliability of PCR results.

To get reliable PCR results, it is important that the following are ensured in thermal cyclers:

- Temperature accuracy
- Uniform temperature across the block
- Minimal overshoot
- Accurate hold time

A. Preventive Maintenance

Regular check-up of your thermal cycler ensures that the thermal cycler can perform the variety of PCR protocols as designed (see Table 1 for schedule).

- **Cleaning Sample Well and Hot Lid**
- **Cleaning of Exterior Surfaces**
- **General Inspection**
Check electrical supply, safety, fuse and any PC Interface.
- **Check Controls and Display**
Check control buttons, HMI screen, casing, and LCD display for any cracks, loss of functionality and responsiveness.



Figure 1. Check screen and buttons of the thermal cycler

- **Check Hot Lid Knob**
Check the hot lid knob if it can be tightened.
- **Decontamination**
Decontamination should be performed as needed.

Table 1. Frequency of cleaning and preventive maintenance

No.	Description of Task to Perform	Maintenance to be carried out		
		Weekly	Yearly	As Needed
1	Cleaning of Sample Well and Hot Lid	✓		
2	Cleaning of Exterior Surfaces	✓		
3	General Inspection		✓	
4	Check Controls and Display		✓	
5	Check Hot Lid Knob		✓	
6	Decontamination			✓

B. Temperature Validation and Certification

To ensure that PCR programs you set up on the instrument can be reliably performed, thermal cycler should have validation of temperature accuracy, uniformity, and hold time. Temperature mapping is performed to check if the set temperature is within the acceptance criteria.



Figure 2. Testing temperature uniformity of the thermal cycler

Cleaning Procedure

False-positive results arise from carryover contamination of products from previous PCR runs, hence, the need for cleaning of wells and lids are advised with frequency shown in Table 1.

- **Cleaning Sample Wells**

1. Turn off the instrument and let it cool for 10-15 minutes.
2. Thoroughly clean wells with a cotton swab soaked in 100% isopropanol.
3. If wells are contaminated, clean thoroughly with a cotton swab soaked in a 70% ethanol solution.
4. Rinse wells with de-ionized or distilled water.
5. Wells should be completely dry before using the instrument.

- **Cleaning of Hot Lid**

1. Turn off the instrument and let the instrument cool for 20-30 minutes.
2. Gently wipe the bottom of the hot lid with a cloth soaked in 100% isopropanol.
3. If the hot lid is contaminated, wipe the bottom of the lid with a cloth soaked in a 70% ethanol solution.
4. Rinse wells with de-ionized or distilled water.
5. Wait for the lid to dry before returning the lid to its normal position.

- **Cleaning Exterior Surfaces**

If necessary, the body of the thermal cycler can be cleaned with a soft, damp cloth.

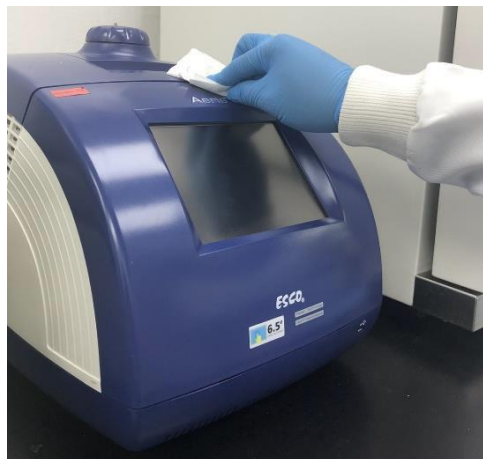


Figure 3. Cleaning external surfaces

Working Safely with PCR Thermal Cyclers

PCR experiments and testing may involve biohazardous materials as well as equipment-related risks that should be taken caution by lab analysts and operators.

- **Wear the appropriate Personal Protective Equipment (PPE)**
Wear the appropriate PPE properly depending on the risk group classification of the organisms being handled.
- **Ensure the PCR tube caps are properly closed and plates completely sealed**
The protocols include high temperatures causing evaporation on the samples. Tubes and plates should be completely closed and sealed to prevent the escape of any reagents.
- **Avoid touching the hot lid upon completion**
The hot lid is kept at $\sim 100^{\circ}\text{C}$ to prevent build-up of droplets on top of the tubes.

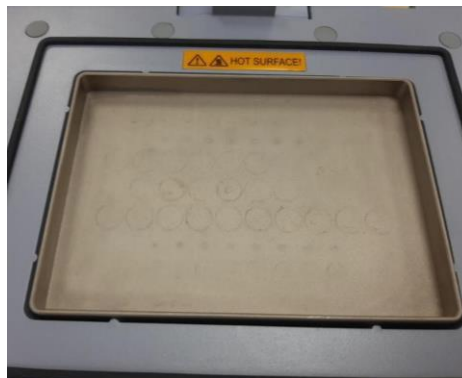


Figure 4. Hot surface caution on the hot lid

- **Cool down tubes and plates upon completion**
An additional step of holding the temperature at 4°C at the end of the run may be added to cool down the tubes and plates. Forceps can be also used to remove tubes if still hot.