

WATSON PCR

4 Well Portable Thermocycler

Instruction Manual



Introduction

This manual describes the operating instructions for WATSON and includes installation, operation, and maintenance.

Description

The WATSON is a cost-effective solution for PCR (polymerase chain reaction), a DNA amplification technique in which few copies of DNA can be replicated to create trillion of copies in less than 90 minutes. In PCR, the starting DNA is repeatedly heated and cooled about 40 times in the presence of an enzyme and buffers to synthesize new DNA.

The instrument consists of a 4 well heating block and a heated lid. The temperature is programmable between 30 and 105 °C with $\pm 0.1^\circ\text{C}$ precision. The resistive heating and air forced cooling systems are controlled by a PID algorithm for cyclical heating/cooling of the heating block. The WATSON's heating ramp rate is rated at 4 ± 0.5 degrees/sec. The heating block is cooled by a 5 CFM (cubic feet per minute) capacity cooling fan producing 2 ± 0.5 degrees/sec cooling ramp time. The heated lid prevents water condensation during sample heating step.

Power is delivered to WATSON by a USB type C port. Either USB AC wall adapter or USB power bank can power the device. The 10Ah power bank that comes with the device will enable the user to run 4 full PCR assays without charging.


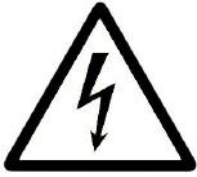

WATSON is operated by a 4-positioned DIP switch. It does not require a computer or a mobile phone for operation. It can store up to 16 different PCR programs in its flash memory. Users will need to alter DIP switch patterns to select the recommended PCR program for each individual assay specified in the manual. The machine comes with 16 default programs preloaded that can cover almost all assays that can be run on WATSON. Nevertheless, users can alter all programs using a desktop based software.

WATSON can operate in a harsh environment. Its plastic housing and mechanical components are manufactured with material that can resist high temperature, chemicals and high impact.

Safety and Regulatory Compliance

Safety Warning Labels

Warning labels on the instrument and in this manual warn you about sources of harm. The warning labels are:

Icon	Meaning
	CAUTION: Risk of danger!
	CAUTION: Risk of electrical shock!
	CAUTION: Hot surface! This symbol identifies components that pose a risk of personal injury due to excessive heat if improperly handled.

Safety Compliance

This instrument complies with applicable clauses of the requirement for the following safety standards:

- Applicable clauses of IEC 61010-1:2001 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements.
- Applicable clauses of IEC 61010-2-020: 2003 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 2: Particular Requirements for Laboratory Equipment for the Heating of Materials.

Instrument setup

- The WATSON package includes one WATSON (Figure 1), one 5V 3A ACE power adaptor, one USB power bank, One Micro USB to USB Cable for data.
- Remove all packaging materials and place WATSON on a dry, flat surface with sufficient air flow for cooling.

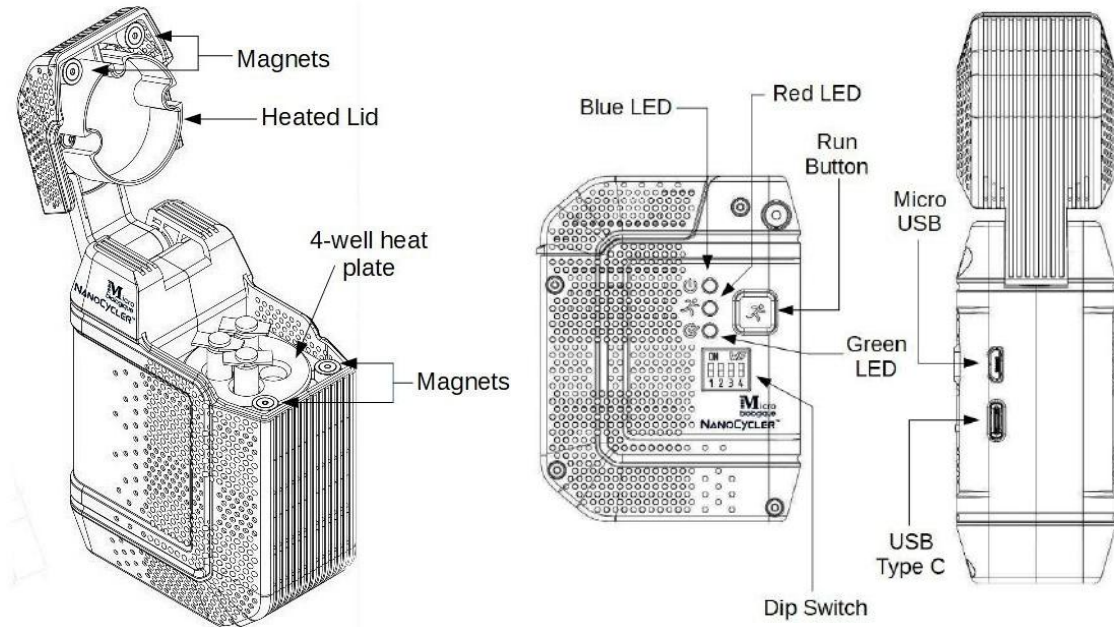


Figure 1: WATSON external and internal parts

Operation

- Plug the USB power bank or the USB-C AC power adaptor into the USB type C port on WATSON. Both green and the blue lights should turn ON which place the machine into the STANDBY mode for accepting samples. The blue LED is for power and the green LED is for the STANDBY mode.
- Setup the reagent system for amplifying a particular nucleic acid target by following the manual that came with the kit for target detection.
- Open the lid of WATSON. Place small PCR test tubes vertically into the wells.
- Close the lid.
- Alter the position of dip switches to choose the program to use. 16 different programs that are stored in the instrument has a unique combination of switch position. Please consult the manual that comes with WATSON Reagent Kit to choose the correct dip switch pattern.

- Press the RUN button next to the LEDs on WATSON to start the program. The red LED will start flashing to indicate that the machine is running.
 - When WATSON is running **DO NOT OPEN** the lid as it will be hot and would interfere with the run. It is also a burn hazard.
- After the program is completed, the LEDs will switch back to solid blue and green. Solid blue and green indicates that the program is completed and is in the STANDBY mode.

Editing Programs.

NanoCycler Updater SWv: 2.6 / FWv: 4.0

Estimated Run Time: 0 hours, 40 minutes. Plate Temp 30.6 Lid Temp 28.0

The graph shows a temperature profile with a red line for Plate Temp and a blue line for Lid Temp. The Plate Temp starts at 30°C, rises to 95°C, and remains constant. The Lid Temp starts at 30°C, rises to 95°C, then drops to 60°C, rises to 70°C, and finally drops to 40°C and 35°C. A red arrow points down to the Run Stage table.

Prep Stage							
	1A	Temp (C)	95	Time (s)	10	Lid T. (C)	95
x	1B	Temp (C)	95	Time (s)	5	Lid T. (C)	95

Run Stage							
	2A	Temp (C)	95	Time (s)	10	Lid T. (C)	95
	2B	Temp (C)	60	Time (s)	10		
x	2C	Temp (C)	70	Time (s)	10		

Hold Stage							
x	3A	Temp (C)	40	Time (s)	10		
	3B	Temp (C)	35	Time (s)	∞		

Program # 0

ON [LEDs]

RUN [COPY ALL] [PASTE ALL]

Connected [STORE] [READ] [PRINT]

Note that WATSON comes preloaded with almost all the programs necessary for running any tests. Nevertheless, in case that you need to change stored programs, follow these steps.

- Download the WATSON software into your computer from the WATSON website (www.WATSONPCR.com).
- Connect WATSON to power supply via USB-C.
- Connect WATSON to a computer via a Micro USB-B cable using the micro USB port. The LEDs should be solid blue and green.
- Open the WATSON software and **verify on the bottom left of the Main interface** window that the device is connected.
- Choose which program to alter by changing the **Program Number** or by altering the dip switch patterns on WATSON or on the dip switch icon on the main program interface.
- Alter temperature and duration of each step by selecting the desired box and changing the numbers. Programmable temperature for the plate range from 30°C to 100°C.
- The planned program will be shown on the graph on the main interface and the plot will update when alterations are made to time and temperature parameters. The.
- **Prep Stage: Step 1 and 2: Mostly needed for denaturing DNA templates or converting RNA into DNA.** For converting RNA to DNA, this stage will require two steps, one for the enzyme reaction and the other for destroying the enzyme by heat. Otherwise, only one step is required during the prep stage.
- **Run Stage: Step 3, 4, and 5: This stage** is the main cycling program to amplify samples. The run stage can be either two steps or three steps PCR. **“x” symbol** delete steps and **“+” symbol** adds steps. Most PCR can be completed by a two stage reaction.
- **Hold Stage: Step 6 and 7:** This stage is to ensure that the device cools off to room temperature or remains at a set desired temperature.
- **Number of Cycles** sets the amount of cycles WATSON will undergo of during the Run Stage. Typical cycle numbers are 35-40.
- **Lid Temperature** sets the temperature that will be maintained by heated lid plate throughout the duration of the program. Temperature range is between 30°C and 105°C. A heated lid will prevent water condensation into the lid of the test tube which is undesirable.
- After all steps have their temperature and time parameters set, select **STORE button** to upload the program to WATSON. This process will also will

overwrite any previously stored programs in the selected dip switch pattern.

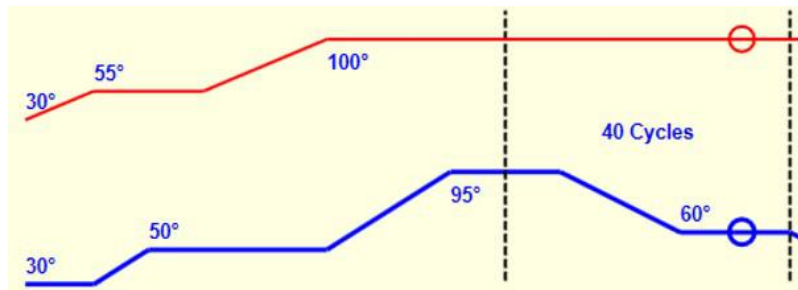
- Choose a new program number and repeat these steps.
 - Merely switching program numbers will not update the program to what is currently stored on the new number. It will maintain the most recently stored program until changes are made and STORE button is pressed.
- Selecting **READ (for current settings)** will display what program is currently stored for a particular dip switch pattern in WATSON.
 - All programs that are stored in WATSON can be accessed by selecting the program number of a dip switch pattern and pressing the **READ** button.
 - If no program is stored for the dip switch combination the program will say that the current program is empty
- Close the application and disconnect WATSON from the computer once the programming is completed.

Real Time Temperature Tracking

- Connect WATSON to the computer by using the micro USB cable.
- Plug a power supply to WATSON.
- Flip the dip switches in WATSON to the desired patten.
- Load the WATSON with assay tubes and press RUN.



- The top right corner of the interface shows the lid and plate temperature.
- The top left corner shows the estimated run time for the PCR program.



- The red and blue circles on the graph tracks lid and heating block parameters during the PCR run.



- The **PRINT** button prints or saves PDF of all stored PCR programs.

LED Message

Color	Meaning
Solid Blue and Green	Device is powered and ready to run- STANDBY mode
Solid Blue and Blinking Red	Device is currently running; surface of the device may be hot!
Solid Blue and Red	Device has encountered a problem, please contact technical support
Solid Blue and Blinking Green and Red	A run was attempted to start on a dip switch position with no stored program
Solid Blue and Green and Blinking Red	Device is cooling down after PCR has completed.
Blinking Green and Red	Device has encountered a temperature problem, please contact technical support

Dip Switch Settings

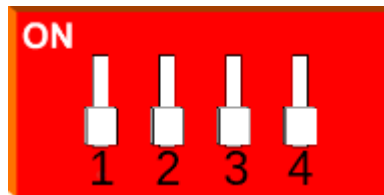


Figure 4: Dip Switch with all switches down indicating it is in Program 0.

The WATSON has the ability to store 16 different PCR programs. The different programs are represented by dip switch positioning. Each unique position of the switches represents a different program that has been uploaded on WATSON.

Following dipswitch patterns are factory defaults. Users can change these patterns to desired program number.

Program Number	Dip Switch Description (Numbers refer to switches in dip switch, Figure ?)	Dip Switch
0	Up: None Down: All	
1	Up: 1 Down: 2,3,4	
2	Up: 2 Down: 1,3,4	
3	Up: 1,2 Down: 3,4	
4	Up: 3 Down: 1,2,4	
5	Up: 1,3 Down: 2,4	
6	Up: 2,3 Down: 1,4	
7	Up: 1,2,3 Down: 4	
8	Up: 4 Down: 1,2,3	
9	Up: 1,4 Down: 2,3	
10	Up: 2,4 Down: 1,3	
11	Up: 1,2,4 Down: 3	
12	Up: 3,4 Down: 1,2	
13	Up: 1,3,4 Down: 2	
14	Up: 2,3,4 Down: 1	
15	Up: All Down: None	

Issue	How to fix/Reason
Error pop-up appears when trying to READ current settings	Ensure all Dip switches are fully up or down and try again. Most likely the program is actually empty so store a new program onto the setting and read again to verify upload.
Error LEDs when trying to start a run	Check to make sure the selected program is not empty, and if so upload desired program and run once ready.
Device does not show up as connected on WATSON software	Totally disconnect WATSON from power and connection to the computer. Quit the software and reconnect WATSON to power and to the computer and reopen the software.

Maintenance

Prior to doing any maintenance, please unplug power supply from WATSON.

Cleaning is recommended before every run. Wear gloves and apply 1% Bleach to a microfiber cloth and gently wipe the surface to destroy any DNA left on the machine.

Safe maintenance and inspection is permitted such as cleaning dust on the hardware. Do not attempt to change any software, firmware, or any mechanical piece of the device. If any hardware or function is broken or malfunctions, please contact customer support for replacement information.

Product Specification

Model	WATSON 4-well
Dimensions (W x D x H)	39mm x 68 mm x 88 mm
Weight	80 g
Supply Voltage	5V
Supply Current	3A
Rated Load	15W
Insulation	Class I (Earth)
Pollution Degree	II
Degree of Protection	IP30
Reaction Volumes	10-50 μ l
Runtime	45-60 min for 3-step s 30-40 cycles PCR
Sample Format	4 wells plate; PCR tubes 200 ul capacity
Thermocycling System	Resistive Heating, Forced-Air Cooling
Programmable Plate Temperature range	30-105 °C
Programmable Lid Temperature range	30-105 °C
Temperature Accuracy	± 0.1 °C of programmed target temperature
Maximum Ramp Rate Heating	4°C/s
Maximum Ramp Rate Cooling	2 °C/s
Ports	USB type-C, Micro-USB
Housing Material	Polycarbonate
Operational Interface	4-positioned DIP switch Store up to 16 different programs

Contact Information

For technical support, please contact: Microbiologique

Telephone: (206) 364-1335 and (206) 556-3157

Technical support: Watson@Nanocycler.com

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