THE JITTERBUG

MICROPLATE INCUBATOR/SHAKER

Operator's Manual



BOEKEL INDUSTRIES

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1.0 INTRODUCTION

1.1 Summary and Explanation of the Instrument

The ***Jitterbug Microplate Incubator / Shaker*** is an economical combination incubator, timer, and shaker that accommodates two standard microplates or strip trays. This microprocessor controlled instrument offers variable temperatures, times, and mixing speeds via the keyboard. Incubation, timing, and mixing may also be used independently. A pulse mode is available. Temperatures may be set from room temperature to 40 degrees C with a resolution of 0.1 degree. The instrument is designed to provide long-life and trouble-free performance. A smoke tint plexi-glass cover protects the plates, shields them from light, and insulates them during incubation. The enclosed system also reduces the risk of biohazard from the dispersement of aerosols. Like all Boekel products, the ***Jitterbug Microplate Incubator / Shaker*** offers quality and versatility and is backed with a one year warranty.

1.2 Installation

- Carefully unpack the instrument, removing it from its plastic bag, and report any obvious damage to your freight carrier at once.

  NOTE: Retain the original packing material for future use in the event that the instrument is shipped to another location or returned for service.

- Place the instrument on a flat working surface capable of safely supporting the weight of the instrument (approximately 7 pounds). A clearance of at least three inches around the instrument is required to assure optional ventilation.

1.3 Power Requirements

Either of the following adaptors may be used:

- 120 VAC input, 12 VAC 2 amp output
- 220 VAC input, 12 VAC 19.2 watt output



CAUTION: **For use inside the United States, use only a UL listed Class 2 transformer/adaptor with 12 VAC 2A rated output.**

Instruments will be supplied with an adaptor. Plug the adaptor into the instrument jack on the rear panel, and into the wall outlet. The ON/OFF switch is located on the back of the instrument. When you turn the instrument ON, "rdY" will display indicating READY.

1.4 Getting to Know Your Instrument

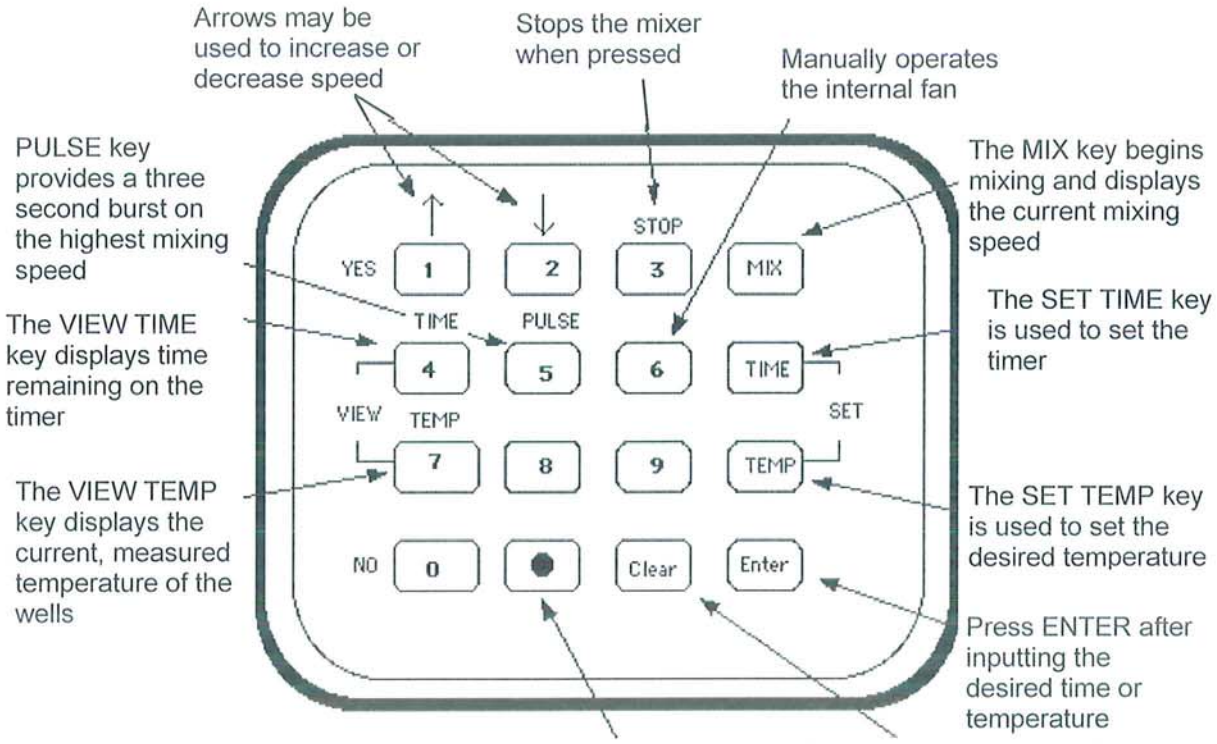
The following labeled sketch will help you to locate the control switches for the ***Jitterbug Microplate Incubator / Shaker***. More details on the operation of each feature are provided in ***Section 2.0 Operating Procedures***.

1.4.1 Principles of Operation

Six heating resistors connected to the base plate warm the inner compartment. The temperature of the air in the compartment is constantly monitored at the height of the wells by a thermistor located between the two trays. A circulating fan serves to remove any condensation from the inner lid. The double lid system insulates the plates from changes in ambient temperature.

The base plate is supported by four flexible legs. With the use of an orbiting counterweight mechanism the tray can be shaken at speeds ranging from 575 rpm to 1500 rpm. A microprocessor controls the speed in eight increments.

KEYBOARD FUNCTIONS



NOTE: Many of the keys serve more than one function. The numbers are used only while setting the timer, temperature, and numerical speed. Otherwise, the function which appears above the key defines the purpose of the key. (YES and NO keys are for possible future options but have no current use.)

1.5 Specifications

Incubator

Temperature range	Ambient to 40 degrees C
Resolution	0.1 degree C
Uniformity with cover	Better than +/-.4 degrees C
Mechanism	Warmed aluminum bed
Warm up time	15 minutes typical, display temperature to check
Temperature detector	Thermistor, feedback, heuristic software

Mixer

Speeds	Gradual steps, from gentle agitation to vigorous mixing, eight speeds
Options	Continuous or pulse (three second interval)
Mechanism	Orbital mixing achieved by rotating counterweight

Timer

Modes	Set time, view time remaining, audible signal
Resolution	One second
Range	One second to 99 minutes and 59 seconds

Electronic

Display	Red, 7-segment, four digit LED
Keyboard	16-key, enunciating membrane switch, 4x4
Power requirements	12V AC, 2 amp, adaptor provided
Microprocessor	Z80A

Other

Vessel	Holds two standard microtiter plates
Enclosure	ABS plastic casing, metal base
Aerosol guard	Smoke-tint plexi-glass cover
Dimensions	Approximately 10 x 10 x 4" with cover, 10 pounds (26 x 26 x 10 cm, 4.5 kg)

Design and instrument specifications are subject to change without notice.

1.6 Warning Markings

1.6.1 Safety Symbols

Safety symbols which may appear on the product:



WARNING

Risk of Shock



CAUTION

Refer to Manual

1.6.2 Safety Terms

These terms may appear on the product:	
DANGER	indicates an injury immediately accessible as you read this marking
WARNING	indicates an injury hazard not immediately accessible as you read this marking
CAUTION	indicates a hazard to property, including the product

These terms may appear in this manual:	
WARNING	WARNING statements identify conditions or practices that could result in injury or loss of life. WARNING indicates an injury hazard not immediately accessible as you read this marking.
CAUTION	CAUTION statements identify conditions or practices that could result in damage to this product or other property.

1.7 Safety Precautions

To assure operator safety and prolong the life of the instrument, carefully follow all instructions outlined below.

Read Instructions	Review the following safety precautions to avoid injury and prevent damage to this instrument or any products connected to it. To avoid potential hazards, use this instrument only as specified. For best results, become familiar with the instrument before use. Refer any questions to your instrument service provider.
Servicing	There are no user-serviceable parts inside the instrument. Refer servicing to your dealer.
Follow Operating Instructions	Do not use the instrument in a manner not specified by the manual or the protection provided by the instrument may be impaired.
Use Proper Power Cord	Use only the power cord specified for this product and certified for the country of use.
Observe All Terminal Ratings	To avoid fire or shock hazard, observe all ratings and markings on the instrument. Consult this manual for ratings information.
Install as Directed	Install the ***Jitterbug Microplate Incubator / Shaker*** on a stationary flat working surface capable of safely supporting the weight of the instrument (approximately 7 pounds).
Do Not Operate Without Cover	Do not operate this instrument with cover removed.
Do Not Operate With Suspected Failures	If damage is suspected to this instrument contact your dealer.
Do Not Operate in Wet/Damp Conditions	For safety reasons such as shock hazard/injury, do not operate the ***Jitterbug Microplate Incubator / Shaker*** under wet/damp conditions.
Keep Instrument Surfaces Clean and Dry	Refer to the Maintenance section of this manual.

2.0 OPERATING PROCEDURES

2.1 Getting Started

- The ON/OFF switch is located on the back of the instrument.
- Lift off the smoked plexi-glass cover. Open the internal cover by pulling back on the clip while lifting the front of the clear plastic lid. These covers serve as aerosol guards as well as insulators and should be used at all times.
- The instrument is designed to hold two standard 96-well microplates or strip trays, round or flat bottom wells. Even if only one plate is needed, two plates should be used, as the system works using counterbalance. The second plate may be empty but should be installed to assure optimal instrument performance.
- To properly seat a microplate in the ***Jitterbug Microplate Incubator / Shaker***:
    - Slide the rear edge of the microplate into the silicon bumpers located in the back two corners of the plate holder.
    - Apply pressure to the bumpers with the plate; the front edge of the plate should click into place.
    - Press BOTH plates into the bumpers located at the rear corners of the metal frames in the incubation platform.
    - Close the internal cover and replace the outer cover.

2.2 Incubating

To set the incubator temperature on the ***Jitterbug Microplate Incubator / Shaker***:

- Press the SET TEMP key and the previously set temperature will display. If this is the desired temperature, press ENTER, otherwise, type the desired temperature in Celsius, using the numeric keys, with no more than one place after the decimal point. Press the ENTER key.

  The instrument will pause to measure and then display the current temperature. The displayed temperature is corrected to reflect the equilibrated temperature inside a micro-well containing 200µL of water.

  Next, heating will begin or heating will stop depending on the set temperature, until the desired temperature is reached.

  The display will continue to show the incubator temperature, unless another function is selected.

  NOTE: For faster cooling, open both lids and press the "6" key to turn on the fan.

The display will continue to show the incubator temperature, unless another function is selected. A decimal point indicator under the degree symbol reflects the state of the heater. When it is lit the heater is on. When first set, the instrument may over and undershoot the desired temperature but will quickly adjust and hold the temperature constant.

- When the desired temperature is achieved, the heat will pulse on and off to maintain the temperature within +/-0.5 degrees C. The fan may run periodically during heating to prevent water condensation on the internal lid.
- To check the temperature when it is not being displayed, press the VIEW TEMP key. The temperature will then be continuously displayed until another function is selected.
- If no temperature is entered the unit automatically controls the temperature to 25 degrees Celsius or ambient, whichever is greater.

2.3 Mixing

To set the mixer on the ***Jitterbug Microplate Incubator / Shaker***:

- Press the MIX key. The first time the mixer is run after being plugged in, it will display "0-7". Type the number of the desired mixing speed.
- Use the up and down arrows to increase or decrease the speed respectively. Pressing the STOP key will stop the mixer. To view the current speed while mixing, press the MIX key.

The actual RPM's of the speed settings 0-7 are as follows:

Setting	RPM (approximate)
0	575
1	625
2	675
3	750
4	875
5	1000
6	1200
7	1500

The orbital diameter varies slightly with speed, being about 2mm at setting 0, 1.5mm at setting 2, and 1mm at settings 4 through 7.

2.4 Timing

To set the timer on the ***Jitterbug Microplate Incubator / Shaker***:

- Press the SET TIME key. The previously set time will be displayed unless the instrument has just been plugged in. If this is the desired time, press ENTER, otherwise type one or two digits for the minutes and then a decimal point followed by two digits for the seconds. The maximum time the timer can be set for is 99 minutes and 59 seconds. Press the ENTER key to begin timing. A countdown of the time remaining will be displayed.
- When the time has elapsed, the mixing will stop and a beeper will sound. Press the CLEAR key to silence the beeper. Temperature will continue to be maintained after the timing cycle ends.
- To turn off the timer while it is running, press the SET TIME key, and push CLEAR twice. The display will prompt "OFF" and the timer will be disabled.
- To check the time remaining when it is not being displayed, press the VIEW TIME key. The countdown will be displayed.

2.5 Other Functions

2.5.1 The Clear Key

To correct mistakes or clear the display, use the CLEAR key. Pressing CLEAR twice will exit without changing the settings.

2.5.2 The Pulse Mode

Using the PULSE key, the contents can be mixed in short three second bursts at the highest speed each time the key is pressed.

2.5.3 Condensation

As the plates are heated, you may observe condensation forming on the inner lid. The ***Jitterbug Microplate Incubator / Shaker*** automatically cycles the fan to clear this. In addition, you may press the "6" key to manually turn on the fan for thirty seconds.

3.0 OPERATING PRECAUTIONS

3.1 Precautions

To assure operator safety and prolong the life of the instrument:



WARNING!

- Read the instruction manual before operating the instrument
- Use only the prescribed voltages
- NEVER operate the instrument without the casing in place
- Do not attempt to make repairs or adjustments to the circuitry.
- Do not install any non-specified replacement parts. Boekel Industries will supply all service and accessories. Consult your dealer to make arrangements.
- Do not continue to use a malfunctioning instrument.

3.2 Maintenance

The ***Jitterbug Microplate Incubator / Shaker*** is essentially a maintenance free instrument. To ensure maximum trouble free operation, the instrument needs only to be kept dry.

- Wipe up any spills immediately.
    - If caustic reagents are spilled, clean up the spill, then wipe the instrument with a soft cloth dampened with water.
    - Be sure to dry the instrument thoroughly.
- Using the instrument in an air conditioned room is recommended for humid climates (greater than 85% humidity).
    - The ***Jitterbug Microplate Incubator / Shaker*** is designed for use at 20 degrees Celsius and performs according to specifications in the range of 18 to 35 degrees Celsius.
- Cleaning should be done only when necessary.
    - Use a dry cloth or duster to remove dry dust and dirt. Use only a slightly damp, soft cloth to clean the incubation chamber and outer enclosure.
    - Water or 70% isopropanol may be used to dampen the cloth. Most disinfectants are also safe to use. Use of other chemicals or abrasive scrubbing may damage the cover.
    - Be careful not to soak liquids up under the keyboard overlay. If this does happen, simply allow the keyboard to dry before resuming operation. Such a spill does not present a hazard, but may cause temporary keyboard dysfunction.