



Block Dry Bath

DBD-001N
DBD-002N

Operation Manual



Safety Information

Alert Signals



Warning The warning message requires extremely careful operation of a certain step. Failure to observe the instruction may result in serious personal injury.

Caution Important information is contained in any item and should be carefully read. Failure to observe the instruction would result in damage or abnormal function of the instrument.

Note Notes alert you to pertinent facts and conditions.



Warning If the MRC Digital Dry bath is used in a manner not specified by the manufacturer, the protection provided by the unit may be impaired.

Your MRC Digital Dry bath has been designed with functionality, reliability, and safety in mind. It is your responsibility to use this instrument in conformance with local electrical codes. It is very important that the user follows installation instructions exactly as written. Do not attempt operation without this information.

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Section 1 Introduction

The product is dry bath with advanced microprocessor control, which can be widely applied to sample reservation, enzyme reservation and reaction, DNA amplification, electrophoresis degeneration and serum coagulation, etc. Useful for variety of applications in molecular biology and histology as well as clinical, environmental & industrial settings, including restriction digests, denaturing DNA, BUN, melting agar, coagulation studies, hybridization and Hot Start thermo-cycled reaction. The dry baths feature a broad temperature range, up to 150°C, and excellent uniformity. A microprocessor regulates the high wattage heater to provide precise, accurate control and rapid heating. The Aluminum block chamber ensures an even transfer of heat from the heating element to the block. Temperature is easily set using arrow keys while the value is shown on the large display. The user calibration function allows for easy calibration to in-house standards when required. Interchangeable blocks are available to accommodate a wide variety of tubes, plates and slides. Solid blocks are also available for custom machining. Each dry bath is supplied with a block lifter that enables the user to exchange blocks easily, even when the block is hot.

The characteristics of the product are as follows:

- Large block 96x96x49mm
 - Precise microprocessor control
 - Broad temp. range, to 150°C (Optional: up to 250°C)
 - Large digital controller with dual display
 - User friendly calibration
 - Rapid temperature increasing rate
 - Optional: RS-232 communication.
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Section 2 Safety

During operation, maintenance and repair of this instrument, the following basic safety notes should be observed. In case of failure to follow these instructions, the warnings or notes indicated herein, the basic protection provided by the instrument, its safety criteria of design and manufacture, and its predicted use range would be impaired. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. *MRC is not responsible for any injury as a result of the user's failure to observe the following requirements.*

Caution This instrument is for indoor use.

a) The ground connection

To avoid the electric shock, the input power line must be reliably grounded. The instrument is equipped with the three-pin plug that has the third pin (the pin connects the ground), therefore, the plug should be used with the grounded power socket only. This is a kind of safety device. If the plug cannot be plugged into the power socket.

b) Servicing and Replacement of Parts

The operator should not take apart the instrument without permission. Only qualified professionals are allowed to replace elements or adjust components inside the instrument. Replacement of components while unit is connected to power and/or turned on is prohibited.

c) Observe voltage/power requirements

Before the instrument is connected with the AC power source, the voltage of the power source should be the same with the required voltage of the instrument (a deviation of 10% is allowed). The rated load of the power socket should not be lower than the requirements of the instrument.

d) The power cord

The instrument should use the power line cord attached to it. If the power line is destroyed, it must be replaced but not be repaired. The replacement should be carried out with the power line of the same type and same specification. No items should be put on the power cord when the instrument is in operation.

e) Connecting and disconnecting from to power source

The user should hold the plug to remove from power source. When connecting the plug, user should make sure it has been fully plugged in; when removing the plug, do not pull the power line forcefully.

f) Placement of the instrument

This instrument should be fixed in a low RH and low dust place away from water source (e.g. sink or water pipeline) and the room should be well ventilated, and free of corrosive gas or interference of strong magnetic field. The instrument should not be placed in a wet or dusty location. the openings on this instrument are for ventilation circulation and in order to avoid over-heat of the instrument body they should not be blocked or covered. When a single set of instrument is used, the interval between ventilation opening before and after the instrument and its nearest object should not be less than 25cm. Also, don't use the instrument on loose or soft surface, or the air inlet of instrument bottom might be blocked.

Excessive temperature will impair performance or result in failure of instrument. This instrument should not be used in location subjected to direct sun light. The instrument should be kept away from hot gas, oven and all other heat sources. If the instrument is to be stored for a long time, the power plug should be withdrawn and the instrument covered with soft cloth or plastic film to avoid entrance of dust. The product is powered by connecting the mains plug to a standard socket-outlet. Always place the product in such a way that it is easy for the operator to disconnect the product from the mains supply.

g) Explanation of symbols



Attention, read user manual before use.

Warning! There is a yellow sign of “CAUTION: HOT SURFACE! ATTENTION: SURFACE HOT” on the instrument. The block should not be touched with any part of the body when the instrument is operating in a high temperature state or just finished operation to avoid burns!

Caution In any of the following cases, immediately turn off the power supply, withdraw the power plug from the power socket, contact the supplier for service:

- Liquid drops into the inside of the instrument.
- The instrument is rained on or water is spilled on it.
- The instrument works abnormally, especially if generating an abnormal sound or odor.
- The instrument is dropped or its casing is damaged.
- The function of instrument obviously changes.

Section 3 Features

Basic parameters

Parameters / Type	DBD-001N	DBD-002N
Display	LED Display	
Heating power	400W	800W
Unit dimension (WxLxH)	195x305x112 mm	290x305x112 mm
Controller	PID Digital Microprocessor Controller	
Heating chamber	Molded aluminum alloy chamber	
Temp. control range	5°C Above ambient to 150°C	
Temperature increment	0.1°C	
Temp. uniformity in working area at 37°C	±0.2°C	
Temp. accuracy in working area at 37°C	±0.2°C	
Temperature calibration	Yes	
Operating temperature	Ambient to 40°C	
Block material	Aluminum alloy	
Block type	Standard & customized type are available	
Data log (option)	RS232	
Weight	approx. 2.85kg	approx. 3.95kg
Rated voltage	110VAC	

Section 4 Unpacking and Installation





Upon receiving the instrument, check to ensure that no damage has occurred during shipment. It is important that any damage that occurred during shipment must be detected before unpacking. If such damage is found, notify the carrier immediately.

After unpacking, check to ensure that all the following parts and accessories are included in the package. If not, contact your dealer or MRC immediately.

Item	Quantity
Main Body	1
Operation Manual	1
Blocks (option)	1 or 2
RS-232 Communication (option)	1

Installation Environment

It should be installed in suitable environment as described below.

	Avoid direct sunlight.
	Room temperature ~ 40°C
	Relative Humidity (RH%) should be less 80%.
	Altitude should be less than 2,000m.

Location Conditions

- Never install or use this equipment in explosive atmospheres.
 - Never install or use this equipment with or near to hazardous or flammable substances.
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- Never expose this equipment to any heat sources including direct sunlight.
- Never install this equipment closer than 20 cm (8 inches) to a wall of combustible material.
- Never install this equipment near any device that generates high frequency noises.
- Set up this equipment on a flat, stable, clean, non-slip, dry, and fireproof surface inside a lab with proper safety measures.
- Observe the minimum distances (in general, 30 cm or 12 inches) from other devices. In addition, any device which can be affected by the motor vibrations should not be placed near this equipment.

Connecting to Power Supply

When connecting power, use only the power cord that came with your instrument. The power connection procedures are as follows:

- (1) Before connecting the power cord, make sure that the main power switch is turned off.
- (2) Plug the other end into a properly grounded and dedicated power outlet nearby.

Connecting to Main Power

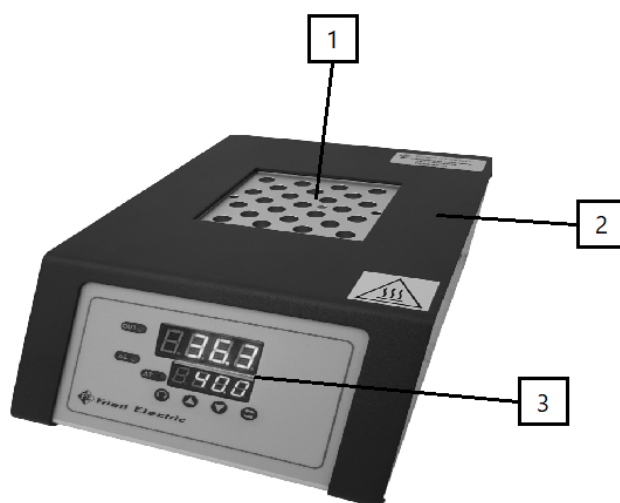
- Check electrical requirements in the operation manual or on the ID plate attached to the back of this equipment before use.
 - Make sure to connect this equipment only to properly grounded as well as dedicated power outlets to protect you and your equipment.
 - In order to prevent fire or power cord damage due to overloading, do not use power strips or improper extension cords.
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Section 5 Preparation Work

This chapter introduces the structure of the instrument, user interface and functions of all buttons and preparation before startup. Read the content in the section carefully before startup when using the instrument for the first time.

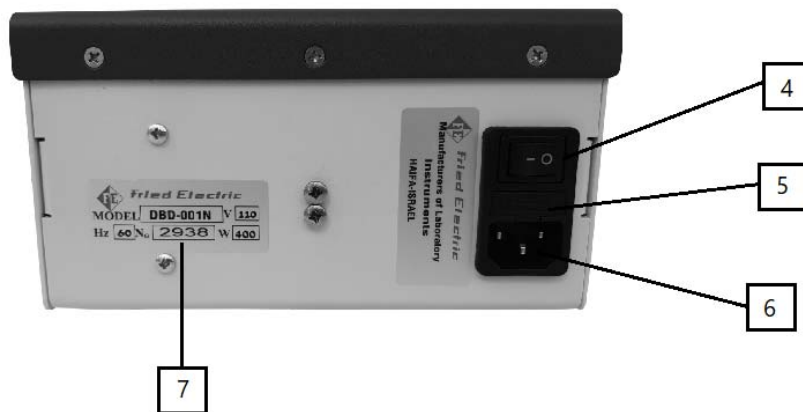
1. Structure Diagram

Unit Front



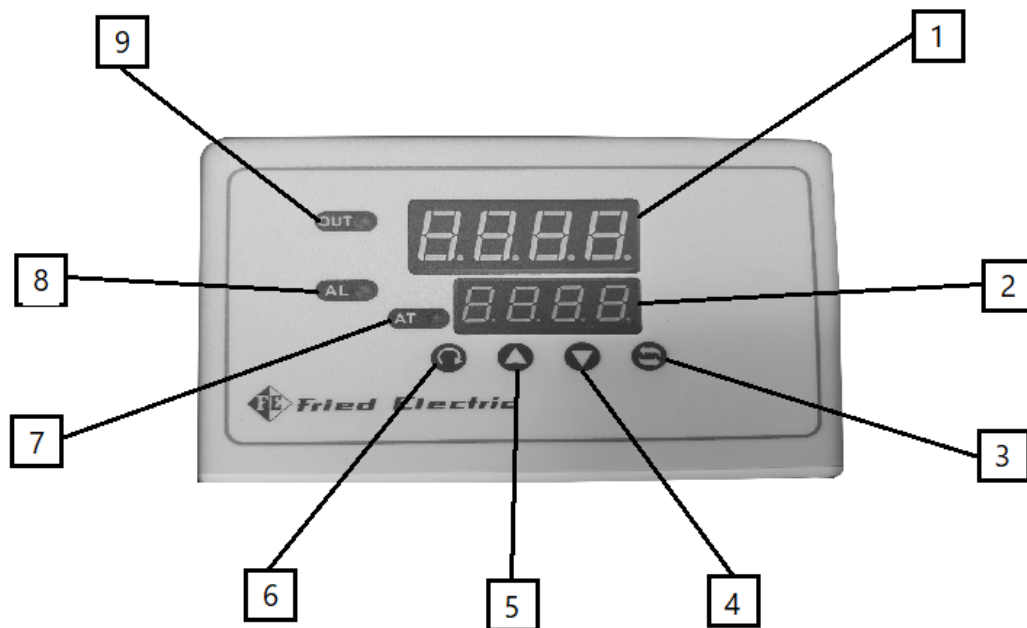
- (1) Aluminum Alloy Block
- (2) Housing
- (3) PID Digital Controller

Unit back



- (4) Power Switch
- (5) Fuse (5A)
- (6) Power Socket
- (7) Identification Label

2. Display Panel Diagram



- (1) Upper Display: Present Value (PV)
 - (2) Lower Display: Set Value (SV)
 - (3) Escape Button (Esc)
 - (4) Down Button
 - (5) Up Button
 - (6) Scroll Button
 - (7) Auto-tuning Indicator
 - (8) Alarm Indicator
 - (9) Heating Indicator (Out)
-

Section 6 Operation

The chapter introduces the display window and the operation of buttons of the dry bath with constant temperature.

Examination Before Start-Up

Confirm the following before inserting the plug into the power socket.

1. Ensure the power source is in accordance with the voltage requirement of the instrument (refer to Features section for voltage requirements).
2. Make sure the plug has been fully plugged into the power socket.
3. Ensure the power line has been reliably grounded.

Caution If the display of the instrument is abnormal after startup, turn off the power source immediately and contact the supplier.

Start-Up

Press the power switch and the instrument will power on. All indicator lights will be turned on. About 3~5 seconds later, temperature display window will show the real-time temperature. All indicator lights will be turned off.

Set the Temperature Value

The setting temperature range is: 5°C Above ambient to 150°C. Press "▲" or "▼" to increase or decrease the temperature value, the "OUT" indicator will be turned on or flashing, when the instrument temperature is stabilized, the "OUT" indicator will flash Intermittently

Caution DO NOT change any parameters in the controller apart from the temperature setpoint (SV)

Autotuning (AT)

Temperature control using digital PID controllers have automatic auto-tune functions. During the auto-tune period the PID controller controls the power to the process and measures the rate of change, overshoot and response time of the plant. This is often based on the Zeigler-Nichols method of calculating controller term values. Once the auto-tune period is completed the P, I, D values are stored and used by the PID controller.

Use AT function to automatically calculate and set the optimize PID value for your system

- **DO NOT touch the block or the temperature controller during autotuning process.**

Temperature Offsetting (OFFSET)

The temperature shown on the Actual Temperature Display is measured by a temperature sensor inside the unit. However, this temperature can be different from the temperature of your own thermometer which you may use as a standard for your specific applications. If needed, you can offset such temperature differences at 0.1°C interval

NOTICE

If, for example, the actual temperature in the block is 100°C but the displayed temperature is 98°C, you can match the displayed temperature with the actual temperature of the unit by selecting the offset value of +2°C

Section 7 Troubleshooting

This chapter details possible failures of this instrument, an explanation and troubleshooting.

Power troubles	Cause	Corrective action
Digital controller is not turned on after switching on	Power supply fails to be connected	Check power supply and connect it
	Fuse burned out	Replace fuse
	Damage of the switch	Replace the switch
	Others	Contact MRC for service.
Repetitive tripping of circuit breaker	Electrical overload	Disconnect all the appliances connected to the breaker first and reconnect them one by one to find the reason for the overload.
	Damages in heating element	Contact MRC for service.
	Controller failure	Contact MRC for service.
Temperature display does not conform to actual temperature	Sensor is damaged or in poor contact	Contact MRC for service.
	Offset parameter is wrong	Check offset parameter
	Damages in controller	Contact MRC for service.
No heat	Too low setting of the temperature controller	Increase the temperature setpoint
	Heating element failure	Contact MRC for service.
	Internal circuit failure	Contact MRC for service.
Power switch malfunction	Damaged switch	Replace the switch
Controller display malfunction	Wrong internal parameters	Contact MRC for service.
	Damage due to chemical spill or overheating or technical problem	Contact MRC for service.
Temperature display window shows error codes	See error codes list	Contact MRC for service.

Error Codes and Corrective Actions

Error Code	Display Symbol	Error Description	Corrective Action
4	<i>Er04</i>	Illegal setup values been used: Before COOL is used for OUT2, DIRT (cooling action) has already been used for OUT1, or PID mode is not used for OUT1 (that is PB = 0, and / or TI = 0)	Check and correct setup values of OUT2, PB, TI and OUT1. IF OUT2 is required for cooling control, the control should use PID mode (PB ≠ 0, TI ≠ 0) and OUT1 should use reverse mode (heating action) , otherwise, don't use OUT2 for cooling control.
10	<i>Er 10</i>	Communication error: bad function code	Correct the communication software to meet the protocol requirements.
11	<i>Er 11</i>	Communication error: register address out of range	Don't issue an over-range register address to the slave.
14	<i>Er 14</i>	Communication error: attempt to write a read-only data or a protected data	Don't write a read-only data or a protected data to the slave.
15	<i>Er 15</i>	Communication error: write a value which is out of range to a register	Don't write an over-range data to the slave register.
26	<i>RtEr</i>	Fail to perform auto-tuning function	<ol style="list-style-type: none"> 1.The PID values obtained after auto-tuning procedure are out of range. Retry auto-tuning. 2.Don't change set point value during auto-tuning procedure. 3.Use manual tuning instead of auto-tuning. 4. Don't set a zero value for PB. 5. Don't set a zero value for TI. 6. Touch RESET key
29	<i>EEPE</i>	EEPROM can't be written correctly	Return to factory for repair.
30	<i>CJEr</i>	Cold junction compensation for thermocouple malfunction	Return to factory for repair.
39	<i>SbEr</i>	Input sensor break, or input current below 1 mA if 4-20 mA is selected, or input voltage below 0.25V if 1 - 5V is selected	Replace input sensor.
40	<i>AdEr</i>	A to D converter or related component(s) malfunction	Return to factory for repair.

Section 8 Modular Block Accessories



Model	Type	Description
301-01081-01	BK01	49 X Ø6mm
301-01081-02	BK02	49 X Ø7mm
301-01081-03	BK03	25 X Ø10mm
301-01081-04	BK04	25 X Ø12mm
301-01081-05	BK05	25 X Ø13mm
301-01081-06	BK06	12 X Ø15mm
301-01081-07	BK07	16 X Ø15mm
301-01081-08	BK08	12 X Ø16mm
301-01081-09	BK09	16 X Ø16mm
301-01081-10	BK10	12 X Ø19mm
301-01081-11	BK11	16 X Ø19mm
301-01081-12	BK12	9 X Ø20mm
301-01081-13	BK13	9 X Ø26mm
301-01081-14	BK14	4 X Ø28mm
301-01081-15	BK15	4 X Ø40mm
301-01081-16	BK16	49 X 0.5ml tubes
301-01081-17	BK17	25 X 1.5ml tubes
301-01081-18	BK18	25 X 2.0ml tubes

Section 9 Maintenance

The holes of the blocks should be regularly cleaned with the damp cloth to ensure the test tube be well contacted with the wall of the holes so as to have good heat conduction. If the surface of the instrument is polluted, it can be cleaned with a slightly damp soft cloth.

Warning When cleaning the instrument, the power supply should be shut off and unplugged. The instrument surface should be cleaned with a noncorrosive cleaning agent.

Item	Inspection Interval	
	Daily	Weekly
Connection status of power cord or plug	•	
Damages in power cord or plug	•	
Cleanliness of block		•
Cleanliness of main body and accessories		•
Damages in Block, Switch, Controller, Power socket	•	
Heating capability check (up to 150°C)		•

Cleaning Product

WARNING

- Never immerse this unit in water or any other liquid.
- Do not allow any liquid or wet material to get inside the unit when cleaning.
- Do not reconnect this unit to power outlets until all cleaned surfaces have dried.

CAUTION

- DO NOT use of caustic soda in cleaning reagent

Cleaning Product (continued)

Always make sure to keep block, main body, and accessories clean. Dirt and other foreign substances can cause fire or electric shock. Before attempting cleaning,

- (1) Disconnect the power cord from the power outlet and ensure that the equipment is cool enough,
- (2) Wipe with a soft dry cloth first to remove any foreign matter and, if not enough,
- (3) Wipe with a soft damp cloth or a sponge soaked in water or diluted neutral detergent when necessary.

Relocation

If you need to move the equipment to another place,

- (1) Disconnect the power cord from the power outlet,
- (2) Pack the equipment and its accessories into the original packaging or any other suitable container before moving.

CAUTION

- Pay attention to avoid mechanical shock or vibration while moving the instrument. Damages caused by mechanical shock or vibration may result in injury or fire.

Keeping Product

If you know you will not use this equipment for an extended period of time,

- (1) Disconnect the power cord from the power outlet and clean the equipment with soft cloth.
 - (2) Pack the equipment properly and make sure to store it in dry place.
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