

THRIVING ON INNOVATION

Despatch
INDUSTRIES

RBC1-50 INSTRUCTION MANUAL

C-200
PN 163189
REVISION B
1/2003

SERVICE AND TECHNICAL SUPPORT

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Despatch
INDUSTRIES

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Notice

Users of this equipment must comply with operating procedures and training of operation personnel as required by the Occupational Safety and Health Act (OSHA) of 1970, Section 6 and relevant safety standards, as well as other safety rules and regulations of state and local governments. Refer to the relevant safety standards in OSHA and National Fire Protection Association (NFPA), section 86 of 1990.

Caution

Setup and maintenance of the equipment should be performed by qualified personnel who are experienced in handling all facets of this type of system. Improper setup and operation of this equipment could cause an explosion that may result in equipment damage, personal injury or possible death.

Dear Customer,

Thank you for choosing Despatch Industries. We appreciate the opportunity to work with you and to meet your heat processing needs. We believe that you have selected the finest equipment available in the heat processing industry.

At Despatch, our service does not end after the purchase and delivery of our equipment. For this reason we have created the Service Products Division within Despatch. The Service Products Division features our Response Center for customer service. The Response Center will direct and track your service call to ensure satisfaction.

Whenever you need service or replacement parts, contact the Response Center at 1-800-473-7373: FAX 612-781-5353.

Thank you for choosing Despatch.

Sincerely,
Despatch Industries

Standard Products Product Warranty

Products Covered by this Warranty

This warranty (the "Warranty") applies to the following Despatch products: LEB, LBB, LAC, LCC, LLC, LLD, RAD, RFD, LND, RTFO, TAD, TFD, PR, PN, PW, PTC and the following Ransco products: RTH, RTS, 900 Series.

Parts and Materials

Despatch warrants all parts and materials to be free from defects in material and workmanship for a period of:

1. five (5) years from date of shipment for laboratory oven electric heaters;
2. three (3) years from date of shipment for Protocol Plus and DES 2000 temperature controllers; and
3. one (1) year from the date of shipment, or 2,000 hours of operation, whichever occurs first, for all other components of products covered by this Warranty.

During the applicable Warranty period, Despatch will repair or replace, at Despatch's option, parts and materials covered by this Warranty

Labor

During the first 90 days of the Warranty period, Despatch will pay labor costs incurred to remove defective parts and materials, and to reinstall repaired or replacement parts or materials; provided, however, that Despatch's obligation to pay such labor costs shall be subject to the limitation that the removal and/or reinstallation service must be performed by a Despatch-authorized technician from Despatch's worldwide network of factory-trained professionals at a location within the contiguous United States.

Transportation Costs

All transportation costs to transport defective parts or materials to Despatch, and to transport repaired or replacement parts or materials to Customer, shall be the responsibility of the Customer.

Terms and Conditions

This Warranty shall be deemed valid and binding upon Despatch if and only if the Customer:

1. installs, loads, operates, and maintains the covered product supplied hereunder in accordance with the instruction manual provided upon delivery and product labeling affixed to the subject equipment;
2. if applicable, follows the Emergency Procedure set forth in this Warranty; and
3. contacts Despatch's Helpline at 1-800-473-7373 for assistance in diagnosing and troubleshooting the problem immediately upon discovering any damage or malfunction.

Despatch's reasonable determination as to whether a repair, replacement, or service is covered by this Warranty shall be final and binding.

Exclusions

This Warranty DOES NOT cover:

1. damage or malfunctions, or expenses incurred in the process of diagnosing and/or repairing damage or malfunctions, resulting from any of the following: operator error, misuse, abuse,

inadequate preventive maintenance, normal wear and tear, service or modifications by other than Despatch authorized technicians, use of the covered product that is inconsistent with the operation manual or labeling, acts of nature (including, without limitation, floods, fire, earthquake, or acts of war or civil emergency), internal or external corrosion, or non-conforming utilities (including, without limitation, electrical, fuel supply, environmental and intake/exhaust installations);

2. repair or replacement of parts or materials designed and intended to be expendable or consumable;
3. routine maintenance; or
4. labor costs incurred for troubleshooting, diagnostics, or testing (except for testing required to verify that a covered defective part or material has been repaired).

Limitations of Liability

Despatch shall not, in any event, be liable for indirect, special, consequential, incidental, or punitive damages or penalties of any kind, including, without limitation loss of revenue, profits or business opportunities resulting from interruption of process or production. In no event shall Despatch be liable for damages in excess of the amounts paid by Customer to Despatch with respect to the applicable product(s). This Warranty does not cover, and Despatch shall not be liable for any losses, costs, damages or expenses resulting from delays in diagnosing or repairing the products, supplying or obtaining replacement parts or materials, strikes, labor stoppages or shortages, fires, accidents, government acts or regulations, or any other causes beyond the control of Despatch.

Non-Compliance By Customer

Despatch reserves the right to suspend and withhold service under this Warranty in the event of non-compliance by the Customer to any terms and conditions of this Warranty or the applicable purchase order or invoice. Further, Despatch shall not be liable for any loss of production, expenses, and inconveniences incurred due to such suspension.

Customer Furnished Equipment Warranty Limitation

This Warranty does not cover diagnosis or repairs of defects in or caused by, lack of performance of, or fitness for purpose of customer-supplied parts or equipment unless specifically noted in the Despatch written order acceptance confirmation.

Performance Commitment

Despatch provides no guarantee of process performance or fitness for purpose, unless specifically noted otherwise in Despatch written order acceptance confirmation. Despatch is providing equipment with design parameters specific only to its equipment.

Procedure Upon Discovery of Defects and Emergencies

In the event Customer becomes aware of any defect in the applicable products, Customer must immediately: (a) shut off fuel or energy supply (gas and electricity), (b) call for emergency assistance, if needed, and (c) notify Despatch Service.

THE REPRESENTATION AND WARRANTIES SET FORTH HEREIN ARE EXCLUSIVE AND IN LIEU OF, AND CUSTOMER HEREBY WAIVES AND DISCLAIMS RELIANCE UPON, ALL OTHER REPRESENTATIONS AND WARRANTIES OF EVERY KIND WHATSOEVER, WHETHER EXPRESS OR IMPLIED, OR ARISING BY OPERATION OF LAW OR IN EQUITY, OR BY COURSE OF PERFORMANCE OR DEALING OR USAGE OF TRADE, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

THIS WARRANTY IS PERSONAL TO THE CUSTOMER AND MAY NOT BE TRANSFERRED OR ASSIGNED. ALL LIMITATIONS HEREUNDER, HOWEVER, SHALL BE BINDING ON ALL SUCCESSORS AND ASSIGNS OF CUSTOMER.

Service

Worldwide Phone 612-781-5356; Worldwide Fax 612-781-5485; North American Phone 800-473-7373
e-mail service@despatch.com; www.despatch.com

Despatch Industries

Advantage Service Assurance Program (ASAP)

CONTACT: DESPATCH SERVICE AGREEMENTS SPECIALIST at 800-473-7373 or 612-781-5356
or e-mail: service@despatch.com

Despatch continues to deliver exceptional products backed by a strong sense of responsibility and drive for long term customer satisfaction. Your partnership with Despatch can offer even higher value through your subscription to one of Despatch's Advantage Service Assurance Program(ASAP).

Warranty

Despatch's exclusive, comprehensive service programs start with the 1 year parts only warranty which is described on the other side of this document. This warranty can be expanded immediately to meet your most stringent service needs. Despatch Service Products Group will be able to answer your service questions and provide a quotation for the immediate expansion of your product warranty. Call 800-473-7373 or 612-781-5356; or e-mail service@despatch.com.

Immediate Service Response

The key to an effective service program is response. Wherever your location, Despatch is only a phone call away. Our U.S. and Canadian customers can reach Despatch at 1-800-473-7373. Worldwide customers can call 1-612-781-5356 or FAX 1-612-781-5485. Our Customer Service Technicians have over 150 years combined experience and access to detailed design and manufacturing documentation specific to your Despatch unit(s). This exacting level of service is a benefit only Despatch can provide and means that you can expect speedy, accurate and the most cost effective response.

Field Service Network

A worldwide network of factory trained Service Professionals is available to support your Despatch equipment. From routine repair to certified instrument calibration, the Despatch service network is positioned to respond to your needs. As a manufacturer of custom equipment, our service programs are customized to meet your specific needs regarding:

1. Service scope
2. Response time
3. Preventive maintenance frequency and content
4. Payment method

Sustained Service Support

At Despatch, long term customer satisfaction means more than just responding quickly and effectively to our customers' service needs. It means offering comprehensive customer support well beyond the scope and duration of our initial warranty. Despatch offers two basic service packages which are customized to each individual customer's need. These service packages are titled Full Service and Preventive Maintenance Plus+ service agreement products. Each is unique in the industry and offer the following benefits:

1. Priority response for minimum production interruption
2. Preventive maintenance for longer product life
3. Discounts on parts and services
4. Various payment plans to ease budgeting and recording expenses
5. Reduce purchase ordering costs

Service

Worldwide Phone 612-781-5356; Worldwide Fax 612-781-5485; North American Phone 800-473-7373
e-mail service@despatch.com; www.despatch.com

PREFACE

This manual is your guide to the Despatch oven. It is organized to give you the information you need quickly and easily.

The INTRODUCTION section provides an overview of the Despatch oven.

The THEORY OF OPERATION section details the function and operation of assemblies and subassemblies on the Despatch oven.

The INSTRUCTIONS section provides directions on unpacking, installing, operating and maintaining the Despatch oven.

The APPENDIX section contains special instructions on air atmosphere and nitrogen atmosphere Burn-In ovens, a Troubleshooting Table, a list of Accessories and a Warranty.

Refer to the manufacturer's manual for instructions on the use of the controls.

The parts are listed in the corner of the prints, the electrical items on the electrical print and the mechanical items on the mechanical prints.

An efficient way to learn about the oven would be to read the manual while working with the corresponding oven control system. This will give you practical hands-on experience with information in the manual and the oven.

Before operating the equipment, be sure you understand all of the technical information contained in this manual. Information skipped, not understood or misunderstood could create the possibility of operating the equipment in an unsafe manner. This can cause damage to the oven or personnel or reduce the efficiency of the equipment.

NOTE:
Read the entire INTRODUCTION and THEORY OF OPERATION before installing the oven.

WARNING:
Failure to heed warnings in this instruction manual and on the oven could result in personal injury, property damage or death.

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INTRODUCTION

This instruction manual covers the operation and maintenance of the Despatch RBC1-50 Burn-In oven.

NOTE:
Read the entire
INTRODUCTION and THEORY
OF OPERATION before
installing the oven.

Special Features

The sturdy construction and three-inch insulation top and bottom and four-inches of insulation on the sides of the Despatch RBC1-50 Burn-In ovens contribute to excellent temperature uniformity.

Other special features include the following:

- Unique Despatch design to combine higher fan volume of forced recirculated air with a system of perforated stainless steel walls for the ultimate in temperature uniformity.
- Welded double wall construction and fiberglass insulation to reduce heat loss. Silicone rubber gaskets further minimize heat leakage.
- Rapid response heater.
- Scratch-resistant baked enamel exterior and stainless steel interior for easy cleaning.

Specifications

Dimensions

Model	Chamber Size in (cm)			Capacity feet ³ (liters)	Overall Size in (cm)		
	W	D	H		W	D	H
RBC1-50	18 (46)	25 (64)	18 (46)	4.7 (133)	46 (117)	36 (91)	31.50 (80)

Capacities

	MODEL	
	RBC1-50 Air Atmosphere	RBC1-50 Nitrogen Atmosphere
Maximum Load	150 Lbs	
Fresh Air/ Exhaust Capacity at 125 °C (255 °F)	51 CFM	N/A
Recirculating Fan	600 CFM 1 HP	
Fresh Air Inlet	2.5" Diameter	N/A
Exhaust outlet	2.18" Diameter	N/A
# of Doors	1	
Approximate Weight	470 Lbs. (213 KG)	

Temperature

		RBC1-50 Air Atmosphere	RBC1-50 Nitrogen Atmosphere
Time to Temperature (approximate minutes with no live load) (1)	25°C - 80°C	4	4
	25°C - 125°C	10	10
	25°C - 150°C	14	14
	25°C - 260°C	34	30
Recovery Time to 125°C with door open 1 Min.		>1 Min.	>1 Min.
Temperature Uniformity at (2)	125°C*	<±1°C	<±1°C
	260°C*	±1°C	±1°C
Operating Temperature Range (Based on 25°C ambient, and dampers fully open)		50° - 260°C	15° - 260°C
Control Stability (3)		±0.5°C per 5°C Δ	
Repeatability		±0.5°C	
Cooldown Time 125° - 60 °C		40 Min.	11 Min.
Dissipation/Mean Temperature Rise (4)	80°C	800 Watts/4°C	
	125°C	1,300 Watts/6°C	
	150°C	1,400 Watts/6°C	

- (1) Time to temperature will be slightly longer for lower voltages due to heater kW derating (empty oven).
 (2) Figures are based on a nine-point survey in an empty oven. Uniformity can vary slightly depending on unit and operating conditions.
 (3) Δ In control stability figures represent the change in ambient temperature.
 (4) Dissipation is reduced by 17% on 50-Hertz operation. Temperature gradient/mean temperature rise is with an evenly distributed live load.

Note: Testing performed on 240V-1PH-60HZ.

Power

Line voltages may vary in some geographical locations. If your line voltage is much lower than the oven voltage rating, warm up time will be longer and motors may overload or run hot. If your line voltage is higher than nameplate rating, the motor may run hot and draw excessive amps.

If the line voltage varies more than 10% from the oven voltage rating, some electrical components such as relays, temperature controls, etc. may operate erratically.

WARNING:

Failure to read this warning can result in death, serious bodily injury or property damage. All conductors must be copper unless the specific terminal is marked for use with aluminum conductors.

WARNING:

All grounding and safety equipment must be in compliance with applicable codes, ordinances and accepted safe practices.

Power Requirements

Volts	Amps	Hertz	Phase	Heater KW
208	23	60	1	3
220	24	50	1	3.4
240	24	60	1	4

THEORY OF OPERATION

Despatch RBC1-50 Burn-In ovens are made for the accelerated life testing of microcircuit electronic devices to identify early mortality. The Despatch RBC1-50 ovens are ideally suited for:

- high-dissipation forward-bias burn-in,
- high temperature reverse-bias burn-in,
- stabilization baking of integrated circuits and other semiconductor devices.

Air atmosphere ovens recirculate air through the chamber. They can add heat and remove dissipated heat. Air is taken from the burn-in room and circulated through the oven. Heat is added by electric resistance elements, or removed through automatically controlled exhaust.

Temperature Control

A modular microprocessor based digital temperature controller regulates the process. The control utilizes a time-proportioning voltage signal to control heating, and a milliamp signal to control cooling with minimal temperature fluctuations.

The controller temperature-sensing element, located in the air return plenum area, senses the median air temperature of the oven. The controller automatically controls heat dissipated by sending a signal to the automatic damper modulator. This automatic damper controls the amount of fresh air drawn into the chamber, preventing excessive cooling and conserving energy.

The high limit control protects the product and/or the oven from overheating. If the product being processed has a critical high temperature limit, the high limit setpoint should be set to a temperature somewhat below the temperature at which the product could be damaged. If the product does not have a critical high temperature limit, the high limit setpoint should be set 5 to 15 degrees higher than the maximum-programmed setpoint at which the oven will operate. When the high limit trips, the alarm horn will sound.

Please refer to the manufacturer's manual on the control and high limit.

Power Switch

The POWER switch controls power to the control circuit, chamber recirculating fan motor relay, control cabinet fan, and any options that were included at the time of purchase.

Air Circulation

A Despatch centrifugal fan draws air through the heater section, moves it evenly across the chamber, past the temperature sensors and back to the heater. The fresh air is controlled manually and a modulating damper controls the exhaust.

Chamber Design

The chamber (in which the load is processed) has air supply and exhaust ducts on opposite sides. The ducts and perforated panels provide uniform airflow and temperature distribution throughout the chamber.

Airflow Switch

The airflow switch senses the differential pressure between the inlet and outlet side of the recirculating fan. If there is no air pressure, the switch disconnects power to the heater, and the alarm horn will signal. An On/Off indicator is visible through a window on the switch. The switch is located in the upper equipment compartment, behind the equipment panel and next to the recirculating motor.

Alarm

When there is a high limit condition, or when there is no air pressure sensed by the airflow switch, an alarm will sound and a red pilot light will be lit. To silence the alarm, depress the momentary ALARM SILENCE switch. The red light will remain on until the alarm condition is cleared.

Chamber Door Handle

The door handle positively engages a cam with a catch in one-quarter turn. The silicone rubber gasket provides a seal around the door as the handle is moved to the latched position.

Damper Control

The oven is equipped with a manually adjustable fresh air damper. The damper blade located on the rear of the oven. The damper adjustment controls the flow of fresh air into the chamber. If the damper is in the full open position, the maximum amount of fresh air is distributed into the chamber.

WARNING: This oven is not designed for use with flammable material. If your process involves flammable material, contact Despatch Industries.

The exhaust has a modulating damper motor, which is done automatically by the controller. No adjustments are necessary.

Determining Damper Settings

The optimum setting for the amount of fresh air that should be distributed into the chamber depends on several factors. These factors include ambient environment temperature, load conditions, load distribution, heat up and cool down rates, desired temperature uniformity and most importantly the desired operating temperature. To consider all of these variables at any one point in time is not practical and there are engineering tradeoffs that should be considered. Therefore guidelines should be used to determine the fresh air damper setting.

In general, the damper should be set so that the amount of fresh air flowing into the chamber agrees with the desired operating temperature conditions. The following outline shows the considerations involved with various damper position settings.

Full Closed Position

When the fresh air damper is in the full closed position, the chamber will be able to achieve the maximum attainable heat up rates for the chamber. In addition, the chamber will use the minimum amount of power to operate at the desired temperature. In almost all cases, the fresh air damper should be in the full closed position in order to efficiently operate at the maximum operating temperature for the chamber.

Full Open Position

When the fresh air damper is in the full open position, the chamber will operate at its minimum operating temperature.

Friction heat from the air recirculation system builds up in the chamber. This causes chamber temperature to rise slightly even though the heating system is not turned on. After the recirculation motor has been on for an extended period of time, the chamber will reach a thermal equilibrium temperature.

When the damper is not set to the full open position, the chamber has no way to readily dissipate the heat generated by the friction. With the fresh air damper fully open, the thermal equilibrium temperature is the minimum operating temperature of the chamber.

Minimum Opening for Dissipation of Live Load

To determine the minimum setting for the fresh air damper, only open the damper so that the fresh air dissipates the heat from live load. To conserve energy, the cooling output should be trying to control the setpoint temperature with minimal fluctuations. Close the damper if the heater continues to be cycled on and off. If the cooling is full on and the chamber temperature is over the setpoint, open the damper.

Other Damper Settings

The damper can be set to several other distinct operating positions. In most cases, the damper setting is influenced by specific performance factors. Some of these performance factors are uniformity; cool down rates and required dissipation.

The uniformity of the chamber is influenced by the inside chamber pressure of the system. The pressure inside the chamber is dependant on the amount of fresh air flowing into the chamber. When a large volume of fresh air is flowing into the chamber, the chamber becomes slightly pressurized and the overall temperature uniformity improves. The slightly pressurized chamber produces the effect of "pushing" the air to the corners of the chamber. Typically the corners of the chamber will improve with respect to temperature distribution while the core of the chamber will maintain excellent uniformity characteristics regardless of the damper position. Therefore, the pressurization of the chamber typically is a factor when the chamber is loaded heavily. The best uniformity results, with respect to the product, are achieved when the chamber is loaded uniformly.

NOTE: Overpressurizing the chamber can cause hot air to blow out around the door seal and cause the area around the door to be hot to the touch. To stop this hot air from entering the room, close the damper slightly until the air stops blowing.

OVEN INSTRUCTIONS

Failure to heed warnings in this instruction manual and on the oven could result in death, personal injury or property damage.

WARNING:

Do not use oven in wet, corrosive or explosive atmospheres.

Unpacking and Inspection

Remove all packing materials and thoroughly inspect the oven for damage of any kind that could have occurred during shipment.

- See whether the carton and plastic cover sheet inside carton are still in good condition.
- Look at all outside surfaces and corners of the oven for scratches and dents.
- Check the oven controls and indicators for normal movement, bent shafts, cracks, chips or missing parts such as knobs and lenses.
- Check the door and latch for smooth operation.

If there is damage that may have occurred during shipment, follow these instructions.

1. Contact the shipper immediately and file a written damage claim.
2. Contact Despatch Industries to report your findings and to order replacement parts for those that were damaged or missing.
3. Send a copy of your filed damage claims to Despatch.
4. Next, check to make sure you have received all the required materials. Your shipment should include:
 - One (1) Despatch oven
 - One (1) Instruction manual
 - Any special options that were ordered at time of purchase

Warning Signs Missing

If it appears that any warning, danger, caution or information label or sign has been damaged or lost, contact Despatch Industries for replacements. Call or write:

Service Products Division
Despatch Industries
P.O. Box 1320
Minneapolis, MN 55440
Call Toll Free 800-473-7373

Set-up

1. Select the location for installing your oven.
2. Install an exhaust stack from the exhaust discharge stack to the outside of the building, if required.

WARNING:

Do not use the oven in wet, corrosive or explosive atmospheres.

- If a round exhaust stack is used, a minimum area greater than the area of the exhaust stack is required.
- The flashing through the roof or wall must be capable of handling an exhaust stack temperature up to 260°C (500°F).
- All stacks must comply with state and local building codes to insure that surrounding combustible surfaces are below 71°C (160°F).
- Design the exhaust stack to limit the amount of restrictions to insure proper airflow. If more than two (2) elbows are used in the stack, over all airflow will be reduced.

- a. The exhaust could be vented into a burn-in room atmosphere or other exhaust system capable of handling the total rated heat dissipation in:

$$KW \times 3,412 \left(\frac{BTUH}{KW} \right) + 2,500 \left(\frac{BTUH}{KW} \right) \times \text{Recirculation Fan HP}$$

- b. We recommend that the ovens be vented to the outside or to an area that could use the heat. The maximum exhaust temperature could reach the maximum operating temperature of the oven.

3. Place oven on a bench top or directly on the floor. The oven must have a minimum 2-inch clearance in the rear to provide proper ventilation. When placed next to another cabinet, or next to another oven, a 3-inch clearance is required. The doors will still open.
4. Make sure oven is level and plumb; this will assure proper heat distribution and operation of all mechanical components.
5. The atmosphere where the oven is used should be clean, free of solvent vapors. Good results depend on a clean workspace.

Power Connection

Be sure the oven is connected to the power source shown on the nameplate. Connect the oven directly to your electric supply, with all grounding and safety equipment, according to applicable codes, ordinances and accepted safe practices.

Line voltages may vary in some geographical locations. If your line voltage is much lower than the oven voltage rating, the warm up time will be longer and the motors may overload or run hot. If the line voltage varies more than $\pm 10\%$ from the oven voltage rating, the temperature control may operate erratically.

WARNING:

Failure to read this warning can result in death, serious bodily injury or property damage. All conductors must be copper unless the specific terminal is marked for use with aluminum conductors.

WARNING:

All grounding and safety equipment must be in compliance with applicable codes, ordinances and accepted safe practices.

Operating

Users and operators of this oven must comply with operating procedures and training of operating personnel as required by the Occupational Safety and Health Act (OSHA) of 1970, Section 5 and relevant safety standards, and other safety rules and regulations of state and local governments. Refer to the relevant safety standards in OSHA and National Fire Protection Association (NFPA), Section 86 of 1990.

WARNING:

Do not use oven in wet, corrosive or explosive atmospheres.

Loading the Oven

Despatch Industries cannot be responsible for either the process or process temperature used, or for the quality of the product being processed. It is the responsibility of the purchaser and operator to see that the product undergoing processing in a Despatch oven is adequately protected from damage.

Carefully following the instructions in this manual will help the purchaser and operator in fulfilling that responsibility.

Distribute the workload evenly so that airflow is not restricted. Do not overfill your oven. The workload should not take up more than two-thirds of the cross-sectional air-delivery area.

WARNING:

Do not heat any closed containers, flammable solvents or other flammable material in this oven. (Examples: spray can, sealed jar of water, alcohol, kerosene, oil, paper, etc.)

Oven Temperature Limit

Do not attempt to exceed the maximum or minimum operating temperature of this oven.

Product Temperature Limit

If the product has a critical high temperature limit, the HIGH-LIMIT control should be used as a process HIGH-LIMIT. When used as a process HIGH-LIMIT, the control should be set to a temperature somewhat below the temperature at which the product would be damaged. A pyrometer could be used to determine the process HIGH-LIMIT setting. If the destructive temperature of the product is already known, this could be used as a point below which the process HIGH-LIMIT could be set.

NOTE:

Despatch Industries cannot be responsible for either the process or process temperature used, or for the quality of the product being processed. It is the responsibility of the purchaser and operator to see that the product undergoing processing in a Despatch Industries burn-In oven is adequately protected from damage. Carefully following the instructions in this manual will assist the purchaser and operator in fulfilling that responsibility.

Operator Training Requirements

All users must be thoroughly trained under the supervision of experienced personnel. The operator must be aware of the possible dangers of:

- Suffocation from nitrogen,
- Frostbite from nitrogen as a liquid or as a frozen gas,
- Fire.

Users must demonstrate an understanding of the equipment and its operation to assure knowledge of and practice of safe and proper operating procedures. Users should receive regular retraining and testing as required to maintain a high level of proficiency and effectiveness.

Training should include the:

- function of controls and safety devices,
- handling of special atmospheres (on units with LN2 or GN2).

Pre-Startup Checklist

- Know the system. Read this manual carefully. Make use of its instructions and explanations. Safe, continuous, satisfactory, trouble-free operation depends primarily on the degree of your understanding of the system and your willingness to keep all parts in proper operating condition.
- Check line voltage. Voltage must correspond to nameplate requirements of motors and controls. Refer to the section on power connections in the INTRODUCTION of this manual.
- Fresh air and exhaust. Do not be careless about restrictions in and around the fresh air and exhaust openings and stacks. Under no condition permit them to become so filled with dirt that they appreciably reduce the air quantity. The proper ventilation clearances should be fulfilled at all times. Refer to the Set-up instructions in this manual.

Startup

For fastest oven heat-up time, close the fresh-air vent. After the desired temperature is reached, the vent may be adjusted as needed.

1. Start Fan.

- Open oven door.
- Press Power switch to the ON position. You will hear the recirculating fan start.
- Shut oven door.
- Check that the control and high limit display turns on.

WARNING:

Do not heat any closed containers, flammable solvents or other flammable material in this oven. (Examples: spray can, sealed jar of water, alcohol, kerosene, oil, paper, etc.)

2. Operate the temperature control as desired. Refer to the manufacturer's instruction manual on the operation of the control.

3. When the oven nears temperature set on the control, the heater will start cycling on and off.

WARNING:

Hot surfaces may exist around door, inside cabinet, product, and fixtures. Handle with care.

4. When the chamber temperature is above setpoint on control, the cooling output of the control will start driving the damper open, which will exhaust air from the chamber.

5. If temperature of the chamber exceeds the high-limit setting on the control, the heater will shut down and the Alarm Horn and red pilot light will energize. The heater will shut off. To silence the alarm:
 - Depress the Alarm Silence switch, this is a momentary switch, it will return to its normal position when released.
 - The alarm horn will be silenced, but the red alarm pilot light will remain lit.
 - When the overtemperature condition clears, press RESET on the control.
 - The heater should be back on and the control should be functioning correctly.
 - If the high-limit trips repeatedly, verify the cause of overtemperature and correct problem.
6. If the fan stops running during process, the Airflow switch will trip and the Alarm Horn and pilot light will energize. The heater will shut off.
 - Shut down the chamber and correct the problem.
7. Shut down chamber by lowering the setpoint on the control, usually to ambient, 20°C (70°F).
8. Turn the power switch to OFF.

WARNING:

On all manual and on all auto processes, the fans should remain in operation until oven temperature is below 150°C (300°F).

Maintenance

Do not attempt any service on this oven before opening the main power disconnect switch.

WARNING:

Disconnect the main power switch or power cord before attempting any repair or adjustment.

Checklist

- Keep equipment clean. Gradual dirt accumulation retards airflow. A dirty oven can result in unsatisfactory operation such as unbalanced temperature in the work chamber, reduced heating capacity, reduced production, overheated components, etc. Keep the walls, floor and ceiling of the oven work chamber free of dirt and dust. Floating dust or accumulated dirt may produce unsatisfactory work results. Keep all equipment accessible. Do not permit other materials to be stored or piled against it.
- Protect controls against excessive heat. This is particularly true of controls, motors or other equipment containing electronic components. Temperatures greater than 51.5°C (125°F) should be avoided.
- Establish maintenance & checkup schedules. Do this promptly and follow the schedules faithfully. Careful operation and maintenance will be more than paid for in continuous, safe and economical operation.
- Maintain equipment in good repair. Make repairs immediately. Delays may be costly in added expense for labor and materials and in prolonged shut down.
- Practice safety. Make it a prime policy to know what you are doing before you do it. Make CAUTION, PATIENCE, and GOOD JUDGMENT the safety watchwords for the operation of your oven.
- Lubrication. Fan motor bearings are permanently lubricated. All door latches, hinges, door operating mechanisms, bearing or wear surfaces should be lubricated to ensure easy operation.

Inspection and Cleaning

The purpose of inspection is to determine cleanliness, proper operation and condition of the oven, including its controls indicators and moving parts.

Vents

Make sure intake and exhaust openings are clean and free of blockages. Any dirt accumulation in the air circuit can unbalance temperatures and airflow patterns.

Chamber

Keep perforated panels and other surfaces of the chamber clean. Use a vacuum cleaner to clean perforated panels.

Control Cabinet and Fan

Keep the control cabinet fan and the intake grill clean. Make sure there is a 2-inch clearance behind the oven to provide adequate ventilation.

Remove dust and cobwebs from heat sinks.

Control cabinet temperature should not exceed 52°C (125°F).

WARNING:
High voltage is present on terminals inside control cabinet. Turn off main power disconnect before cleaning inside of control cabinet. Do not use any cleaning equipment that may pull wires.

Chamber Door Gasket

Check the gasket on the chamber door as follows.

1. Open the door.
2. Visually inspect the gasket-sealing surface.
3. Squeeze the gasket between your fingers to check for damage and tears.
4. Close the door on a piece of paper at many points around the gasket. The gasket should seal tight enough to require a slight pull to remove the paper.

Recirculation Motor

Fans, motors and shaft should be clean and free of dust and oil or grease. The recirculation motor is permanently lubricated and does not require any lubrication.

Oven Exterior

Clean oven exterior with Dupont No. 7 polish or equal, or with soap and water. Do not clean while the oven is hot. Do not use abrasives or chemicals.

Oven Chamber Interior

Clean the oven interior with soap and water or stainless steel cleaner. Under normal conditions, a major cleaning should be done once a year.

Door Hinges and Latches

Check operation of the chamber door to see whether it opens easily and closes securely, without jerking or slamming.

Automatic Damper

1. Put the oven in operation (without a load in the chamber) and wait until the temperature is stabilized.
2. Set the controller to about 10°C lower.
3. While looking at the damper control motor and linkage, when the setpoint is first turned down, the dampers should move to the wide-open position.
4. Then, as the chamber temperature drops, the dampers should start to close when the difference between the chamber temperature and the setpoint is less than 4°C.
5. When the chamber temperature has dropped between 1°C and 2°C above the setpoint, the damper should be fully closed.
6. At lower chamber temperatures (compared to the setpoint), the damper remains closed and the heater is turned on.
7. Reset the temperature controller.

Controls and Indicators

Check all controls for proper operation. Switches should move easily, indicators should light or give a correct signal, and controls should perform intended function.

Loose Screws, Bolts and Fasteners

Check tightness of all screws, bolts and fasteners. Notice whether the oven vibrates or makes unusual noises while starting, running or stopping. Make sure switches and control knobs and indicators are securely fastened.

Lubrication

Fan motor bearings are permanently lubricated. All door latches, hinges, door operating mechanisms, bearing or wear surfaces should be lubricated to ensure easy operation.

Tests

Tests should be performed carefully and regularly. The safety of personnel as well as the condition of equipment may depend upon the proper operation of any one of the functions of the temperature control. Test the control every 40 hours. Check that the heater LED is cycling on and off, indicating that the heater is working. Also at this time, check the high limit function to make sure it is working properly. Refer to manufacturer's instruction manual on the controls, if necessary.

To test the high limit:

1. Set the HIGH LIMIT instrument to its highest temperature.
2. Set the CONTROL instrument to your normal process temperature and let chamber stabilize at that temperature.
3. Adjust the HIGH LIMIT slowly downward toward the temperature of the oven until the heater is shut off.
4. The HIGH LIMIT alarm indicator should flash and a high limit alarm message should be displayed. The alarm horn should sound.
5. Verify that the heater relay has been disabled by checking that 2LED on the control panel circuit board is not lit.
6. Return the HIGH LIMIT setpoint value to their original value.
7. Press the Reset key.

OPTIONAL ACCESSORIES

This section provides operating instructions on the standard options for the RBC1-50 Burn-In oven.

Door Switch

The door switch is wired to shut off the fan and heater. In addition, when the N₂ and LN₂ options are installed the door switch will shut these down. The door switch may be defeated manually by pulling out the actuator.

WARNING:

Disconnect the main power switch or power cord before attempting any repair or adjustment.

WARNING:

Do not use oven in wet, corrosive or explosive atmospheres.

Recorder

The circular chart recorder, mounted on top of the oven, is used to record the user's process. This is done by an independent thermocouple, located next to the control thermocouple. The charts used are 24hr/7day. This option is available in a single pen for stand-alone units or a two pen for units using the stacking option. See the manufacturer's manual on the recorder instrument attached to this manual.

WARNING:

Failure to heed warnings in this instruction manual and on the oven could result in personal injury, property damage or death.

Redundant High-Limit

The redundant high-limit is located on the equipment panel behind the control panel door. The temperature is sensed by an independent thermocouple, located next to the control thermocouple. To operate the redundant high-limit, set the dial to the desired temperature, this is usually set at a temperature just below the safe maximum temperature of the product, but not too low to interfere with the process. If temperature of the chamber exceeds the high-limit setting on the redundant high-limit, the heater will shut down and the Alarm Horn and red pilot light will energize. The heater will shut off. To silence the alarm:

- Depress the Alarm Silence switch, this is a momentary switch, it will return to its normal position when released.
- The alarm horn will be silenced, but the red alarm pilot light will remain lit.
- When the overtemperature condition clears, press RESET on the redundant high-limit.

- The heater should be back on and the chamber should be functioning correctly.

If the high-limit trips repeatedly, verify the cause of overtemperature and correct problem. See the manufactures manual on the redundant high-limit instrument attached to this manual.

Disconnect Switch

The disconnect switch is located on the upper front of the control panel, above the controller. The OFF position is when the handle turned to the left, and ON is when it turned to the right. To access the equipment behind the control panel, the disconnect switch must be in the OFF position. This prevents access to the equipment panel while power is on the oven.

Stacking Option

When ordered, this option lets the user to stack two ovens; one on top of the other using specially designed stacking hardware. Using this option still requires that each oven have its own power supplied to it

Replacement

WARNING:

Disconnect the main power switch or power cord before attempting any repair or adjustment.

Parts

To order or return parts, contact the Service Products Division at Despatch. The Service Products Division features our Response Center for customer service. When returning parts, a Despatch representative will provide you with an MRA (Material Return Authorization) number. The MRA number must be attached to the returned part for identification. When you are ordering parts, be sure to give the model number, serial number and the part number. This will expedite the process of obtaining a replacement part.

When you have a **service** need, contact the **Response Center** at **1-800-473-7373**: FAX 612-781-5353.

Nitrogen and Liquid Nitrogen

The standard air-atmosphere oven can be converted to a nitrogen-atmosphere with a factory installable kit. The following are instructions on the operation of the nitrogen (N₂) and liquid nitrogen (LN₂) cooling option for the RBC1-50 Burn-In oven.

Theory of Operation

The nitrogen atmosphere option uses nitrogen (N₂) to displace oxygen from the chamber, thus eliminating oxidation of components. The heat is dissipated from the oven by liquid nitrogen (LN₂). Nitrogen enters the chamber and reduces the oxygen level to the desired level. The flowmeter keeps the desired N₂ entering into the chamber, maintaining a low concentration of oxygen while a burn-in cycle is in progress.

Operator Training Requirements

Users and operators of this oven must comply with operating procedures and training of operating personnel as required by the Occupational Safety and Health Act (OSHA) of 1970, Section 5 and relevant safety standards, and other safety rules and regulations of state and local governments. Refer to the relevant safety standards in OSHA and National Fire Protection Association (NFPA), Section 86 of 1990.

WARNING:

Suffocation can occur in a nitrogen atmosphere oven chamber if it is not thoroughly purged with room air before a person goes inside it. Before entering an oven chamber, run the oven for at least five minutes with the nitrogen (or any other inert) gas turned off, doors open and recirculating fan running. Only then should a person work inside the oven chamber with the doors closed.

Operation

1. Connect the nitrogen (N₂) supply line to the inlet located in the rear of the oven.
2. Set the pressure regulator to 40PSIG.
3. Connect the liquid nitrogen (LN₂) supply to the inlet located on the box in the rear of the oven.
4. Adjust the regulator to 35PSIG max.
5. Check nitrogen plumbing for leaks, using soapy water solution.
6. As gas nitrogen is odorless, all leaks should be stopped to prevent the possibility of suffocation in a small work area in which a nitrogen leak might displace much of the oxygen in the atmosphere.
7. Start chamber, and turn the Nitrogen (N₂) switch ON.
8. The pilot light on the switch indicates that the solenoid valve is open and nitrogen (N₂) is entering the chamber.
9. Adjust the flowmeter, which is located in the front control panel, and set to desired flow rate. The flow rate should set so that it creates a slightly positive pressure in the chamber, which counteracts leaks and keeps the oxygen content at a safe, low level of concentration.
10. When the oven nears temperature set on the control, the heater will start cycling on and off.

WARNING:

Do not use oven in wet, corrosive or explosive atmospheres.

CAUTION:

Nitrogen & carbon dioxide gases can cause asphyxiation if used in confined or poorly ventilated areas.

11. When the chamber temperature is above setpoint on control, the cooling output of the control will start cycling the liquid nitrogen (LN₂) solenoid valve, which will cool the chamber.

WARNING:

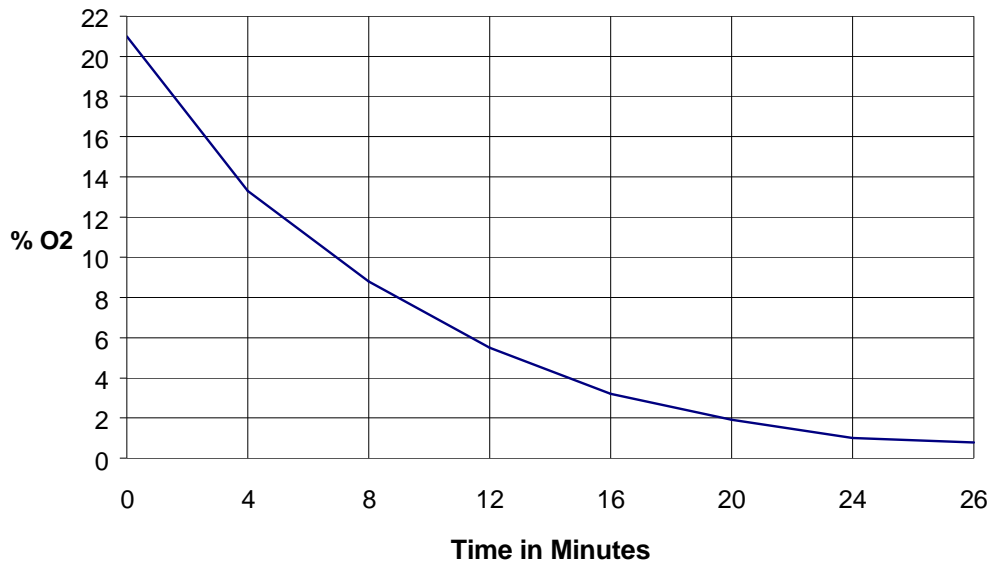
Failure to heed this warning can result in severe frostbite to eyes or skin. Do not touch frosted pipes or valves.

Nitrogen Atmosphere

Purge Rate

The chart below shows the time required to reduce the oxygen content to different percentages of concentration. At a flow rate of 100 SCFH in the RBC1-50 Burn-In oven, oxygen concentration from 21% in room air down to 6% in the closed oven takes approximately 11 minutes.

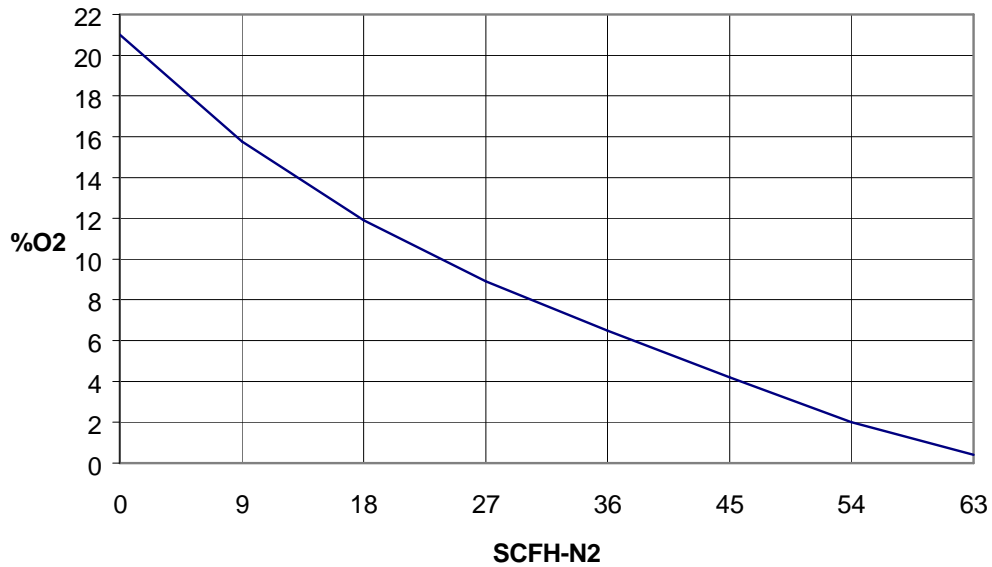
Flow Rate Time Versus Oxygen Content



Maintain Rate

The chart below shows typical flow rate required to maintain the oxygen content at different percentages of concentration in the RBC1-50 Burn-In oven with nitrogen atmosphere option installed. For example, it requires 36SCFH to keep the oxygen concentration down to 6½ percent in the closed oven chamber. The preliminary settings can be determined from this graph. If the oxygen concentration must be determined more accurately, use an oxygen monitor.

Oxygen Stabilization vs. Flow of N2



Troubleshooting

Equipment, which operates for extended lengths of time, may develop problems. Below are possible problems and suggested solutions. If you have a problem not listed and do not know what to do, contact Despatch Industries at our toll free Help Line 800-473-7373.

WARNING:
Disconnect the main power switch or power cord before attempting any repair or adjustment.

Difficulty	Probable Cause	Suggested Remedy
Failure to heat	No power	Check power source and/or oven and wall fuses.
	Burned out heater	Replace heater (see warranty.)
	Control malfunction	Replace control.
	Loose wire connections	Disconnect power and check connections behind control panel.
	Heater relay failure	Replace circuit board.
	No power to the heater	Reset High limit(s). Make sure control is calling for heat. Check controller. Check SSR.
	Airflow switch open	Check airflow switch.
	Door switch failure (if installed)	Replace door switch.
Slow heat up	Improperly loaded	Reduce load or redistribute load in chamber.
	Low line voltage	Supply sufficient power and proper connections. Check for circuit overload.
	Heating element(s) are burned out	Replace heater (see warranty statement.)
	Fan motor failure	Replace fan motor.
Frequent heater element burnout	Harmful fumes generated by load	Increase vent opening or discontinue process.
	Spillage or splattering of material on heater elements	Disconnect power and clean oven chamber and elements.
	Overheating oven	Check the High limit. Do not operate oven over 260°C (500°F).
Erratic temp. or inaccurate temp.	Control malfunction	Replace control.
	Improper tuning parameters	Check tuning parameters.
	High limit setting	High limit should be 10-25°C higher than setpoint.
	Improper offset	Check zone calibration.
Excess surface or door temp.	Door seal deterioration	Replace door seal.

Difficulty	Probable Cause	Suggested Remedy
Improper airflow	Fan motor failure	Replace fan motor.
	Fan wheel seated too low on fan shaft	Adjust fan wheel for 3/16" clearance between wheel and inlet ring.
	Unbalanced fan wheel	Replace fan wheel.
Excessive vibration	Dirty fan wheel	Clean fan.
	Unbalanced fan wheel	Replace fan wheel.
Oven will not control at setpoint	High limit set too low	Set the high limit higher
	Control malfunction	Replace control.
	SSR malfunction	Replace SSR and/or check control output voltage.
	Air friction of recirculation fan	Open fresh air vent. Unit will not control below minimum operating temperature with vent closed.
Damper motor (exhaust) not responding	Damper motor (exhaust) not responding	Check tuning parameters.
	Linkage binding	Observe and correct linkage.
	Motor not working	Check supply and signal voltage.
Liquid nitrogen (LN ₂) not cooling	Improper tuning parameters	Check tuning parameters.
	Tank empty or valve is to the OFF position	Check liquid nitrogen (LN ₂) supply and valve position.
	Pressure regulator set too low	Adjust regulator to 35PSIG maximum.
	Solenoid valve not responding	Check supply voltage and control output. Replace valve.
Heater does not shut down until temp. reaches the High limit setting	Control malfunction	Replace control
	SSR malfunction	Replace SSR
Nitrogen (N ₂) not flowing correctly	Tank empty or valve is to the OFF position	Check nitrogen supply and valve position.
	Pressure regulator set too low	Adjust regulator within the acceptable range of the flowmeter.
	Flowmeter incorrectly set	Adjust flowmeter to the desired flow rate.

Circuit Board Check

The circuit board mounted on the control panel has three status LED indicators to help troubleshoot if the oven is not heating.

- If LED 1 is not lit, check 2F and 3F (control fuses), or power switch.
- If LED 1 and LED 3 are lit but not LED 2, check high limit (and optional door switch, if installed).

If all three LEDs are lit, check 1F and 4F (heater relay fuses), SSR, heater, heater fuses, and heater relay.