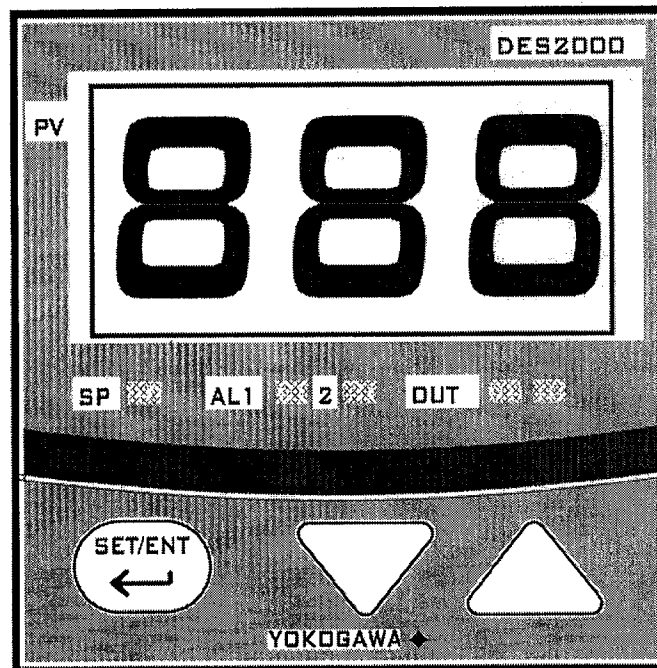


C-191  
P.N. 208712  
REVISION A  
3/2000

# DES2000 CONTROL INSTRUCTION MANUAL



Prepared by:  
Despatch Industries  
P.O. Box 1320  
Minneapolis, MN 55420-1320  
Customer Service 800-473-7373

## 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

# Despatch

## Benchtop and Laboratory Oven

### Product Warranty

#### Products Covered by this Warranty

This warranty (the "Warranty") applies to the following Despatch products if scheduled for shipment on or after July 1, 2000: LEB, LDB, LBB, LAC, LCC, LAD, LFD, LND, RTFO.

#### 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.

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#### Service

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

# Despatch Industries

## Advantage Service Assurance Program (ASAP)

PLEASE CONTACT: STEVE EUL, Service Agreements Specialist at 800-473-7373 or e-mail: [sgeul@despatch.com](mailto:sgeul@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 e-mail Steve Eul at [sgeul@despatch.com](mailto:sgeul@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

→PLEASE CONTACT: STEVE EUL, SERVICE AGREEMENTS SPECIALIST, 800-473-7373 or [SGEUL@DESPATCH.COM](mailto:SGEUL@DESPATCH.COM)←

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# INTRODUCTION

The features of the DES2000 controller include:

- PID Tuning
- Display can show process variable or setpoint during normal operation
- Solid state output to operate a solid state relay

The DES2000 controller is a microprocessor-based digital control instrument. The instrument can be configured as a proportional controller. Initially the CONTROL will allow the heater to operate at full power. However, as the actual oven temperature reaches the setpoint, the Proportional Control will cycle the heater on and off, minimizing process temperature fluctuations.

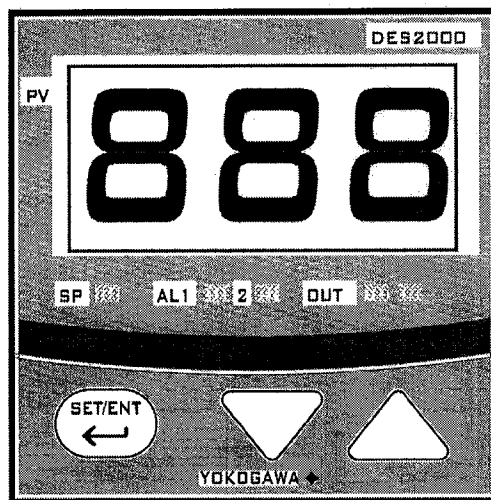
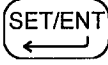


Figure 1. DES2000 CONTROL Instrument

Table 1 CONTROL Instrument Features

Features	Description
Main Display	Displays the actual oven temperature or displays the setpoint when the set key is pressed. Displays parameter code and value.
 Key	Switches between PV and SP displays. Enters the data changed by the ▲ or ▼ keys. Switches through parameter displays.
Down Key ▼	Decreases a setpoint or mode parameter.
Up Key ▲	Increases a setpoint or mode parameter.
LED SP Indicator	Lights when the setpoint value is displayed.
LED OUT Indicator	Lights when the control is calling for heat.
LED AL1-2 Indicator	N/A
LED PV Indicator	Lights when process variable is displayed.

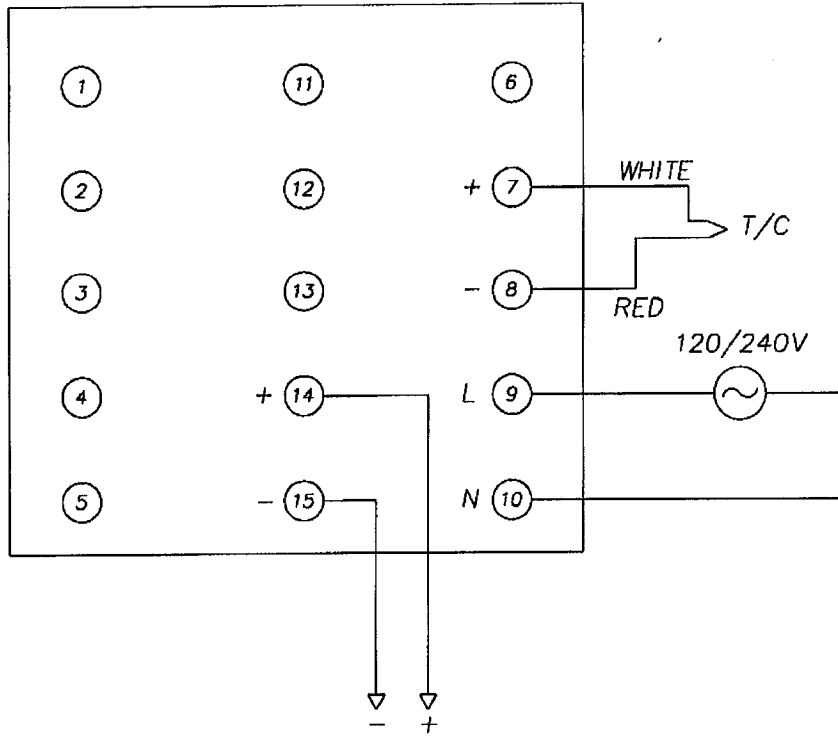


Figure 2. DES2000 CONTROL Instrument Connections

# OPERATION

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

1. Start oven.
  - a. Turn **POWER** switch to on.

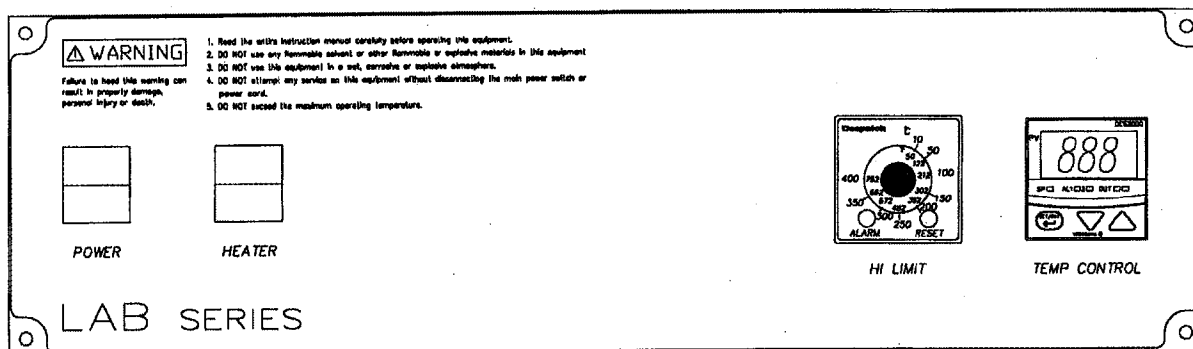
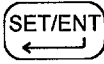
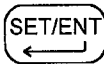
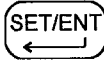


Figure 3. Typical Control Panel

2. Enter setpoint on the CONTROL instrument.
  - a. Press  key until the SP LED is lit.
  - b. Use ▲ key and ▼ key to set operating temperature.
  - c. Press  key to enter setpoint.
  - d. Press  key again to display process temperature.

Set HI-LIMIT instrument to a temperature 10°C to 14°C higher than the setpoint or to a temperature that should not be exceeded in the process.

**NOTE:**  
If the HI-LIMIT instrument is exceeded the heater will shut down. Reset the HI-LIMIT by pushing the reset button on the HI-LIMIT instrument.

# Parameter Programming Mode


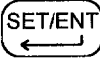
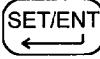

The control parameters are set through the Operating and Set-up modes. In most applications, it is not necessary to alter the oven settings. The following instructions describe how to access, view and, if desired, change the parameters.

**WARNING:** Make sure you understand what you are changing before doing so. Changing the program parameters will alter the functions of the CONTROL.

Once the Operating and Set-up modes are accessed, the SP LED will start blinking on and off. The CONTROL will not allow the display to be altered improperly.

The CONTROL will automatically exit the Parameter Programming mode if no keys are pressed for about two minutes.

## Operating Parameters

1. Press  key for three (3) seconds.
2. Press the  key until the desired parameter is displayed. See Operating and Setup Parameter Tables on the following pages.
3. Press the ▲ or ▼ once to display value.
4. Use the ▲ or ▼ to the desired setting.
5. Press the  key to enter the value.
6. Press and hold the  key for three (3) seconds to return to the display mode.

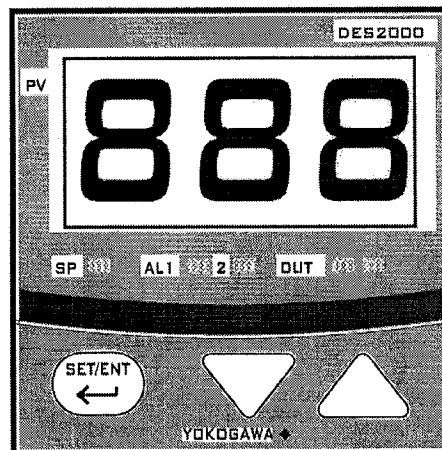


Figure 4. DES2000

On the next page are the parameter codes, listed in order as they appear.

*Table 2 Operating Parameter Outline*

Code	Name	Settings
CtL	Control Mode	PID
At	Auto-tuning	OFF
P *	Proportional Band	5 **
I	Integral Time	120
d	Derivative Time	0
Ct	Cycle Time	1
FL	Input Filter	2
bS	PV Bias (Offset)	0
LoC	Key Lock	0

\* If P is not displayed the Control Mode (CtL) must be first set to Pid.

\*\*For F change to value 13.

**Definitions for Table 2:**

- CtL Control Mode - This parameter determines whether controller functions as a time proportional or an on/off control.
- At Auto-tuning – Off for PID tuning, ON for controller to tune process.
- P Proportional Band - Expressed in degrees. This value determines the band width on both sides of the setpoint within which the control provides proportional control.
- I Integral Time - Expressed in seconds. This parameter corrects for errors in actual temperature versus the setpoint.
- D Derivative Time - Expressed in seconds. This effect of the derivative time is in direct proportion to the time setting.
- Ct Cycle Time - Expressed in seconds. This is the total time for one ON/OFF cycle of the controller output during the proportional action.
- FL Input Filter – Expressed in seconds. This function should be used when the PV may fluctuate greatly (i.e. input signal contains noise).
- bS PV Bias - Expressed in percent of span. From –100 to 100% of span, this parameter used to set the actual oven temperature to the controller display.
- LoC Key Lock - This provides levels of access to the controller.  
 0 = No key lock, full access to controller.  
 1 = Prevents changing of all parameters except setpoint.  
 2 = Prevents all parameters from being changed including the setpoint.  
 -1 = Set to enter the Setup parameter setting display.

When LoC = -1, the parameters are displayed in the order shown in the Set-Up Parameters section, below.

# Set-Up Parameters

1. Go into the operating parameters and change the LOC parameter to -1 and press the SET/ENT key to access the Setup Parameters.

*Table 3 Set-Up Parameters for Degrees Centigrade*

Code	Parameter Name	Setting
In	Input Type	5
SPH	Maximum Setpoint Limit	Use value from Table 5 (below)
SPL	Minimum Setpoint Limit	Use value from Table 5 (below)
SC	Super Function	OFF
dr	Direct/Reverse Action	0
DSP	Display Priority	0

*Table 4 Set-Up Parameters for Degrees Fahrenheit*

Code	Parameter Name	Setting
In	Input Type	35
SPH	Maximum Setpoint Limit	Use value from Table 5 (below)
SPL	Minimum Setpoint Limit	Use value from Table 5 (below)
SC	Super Function	OFF
dr	Direct/Reverse Action	0
DSP	Display Priority	0

*Table 5 Oven Models and Temperatures*

Oven Model	Degrees F		Degrees C	
	Maximum	Minimum	Maximum	Minimum
LAC	500	95	260	35
LAD/LFD/LND/LXD	650	95	343	35
LBB	400	86	204	30

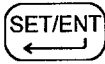
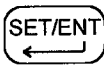
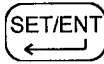
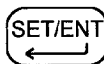
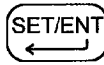
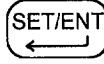
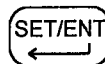
NOTE: If the "In" code is changed, the "P" code in the operating parameters may have to be reset.

2. Press and hold the  key for three seconds to return to normal operation.



# Changing Display From °C To °F


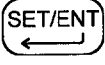
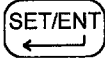
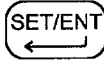
The control can be configured for either °C or °F. Use the following steps to change control from displaying °C to °F.

1. Press and hold the  for three (3) seconds.
2. The display will read **CtL**. The SP LED will flash indicating that Operating Parameter mode has been entered.
3. Press the  until **LoC** appears on the display.
4. Press the ▲ or ▼ once to enter the parameter.
5. Press the ▼ to set the value to **-1**. The SP LED will flash rapidly, indicating that the Set-Up Parameter mode has been entered.
6. Press the  to enter the value. The display will read **In**.
7. Press the ▲ or ▼ once to enter the parameter.
8. Press the ▲ to set the value to **35**. The right decimal point LED will flash indicating that the setting is being changed. This will stop flashing when the new value has been entered.
9. Press the  to enter the value.
10. Press the  until **SPH** is displayed.
11. Press the ▲ to set the value to **400**.
12. Enter a value of **400**.
13. Press the  to enter the value.
14. Repeat steps 12 –14 for **SPL**; the value is **32**.
15. Press and hold the  for three (3) seconds to return to the operation mode.

**WARNING:** Make sure you understand what you are changing before doing so. Changing the program parameters will alter the functions of the CONTROL.

**NOTE:** To change from °F to °C repeat the above steps. The following are the values to be entered:

**In = 5**  
**SPH = 204**  
**SPL = 0**  
**P = 5**

16. Press and hold the  for three (3) seconds.
17. The display will read **CtL**. The SP LED will flash indicating that Operating Parameter mode has been entered.
18. Press the  until P appears on the display.
19. Press the ▲ or ▼ once to enter the parameter.
20. Press the ▼ to set the value to 5. The SP LED will flash indicating that the setting is being changed.
21. Press the  to enter the value.
22. Press and hold the  for three (3) seconds to return to the operation mode.
23. The control now reads °F. Enter the desired setpoint.

# Oven Zone Calibration

The CONTROL instrument has been tested and calibrated at the factory. Under normal operating conditions, recalibration should not be necessary. However, if the instrument does not comply with known standards, OR if the user would like to recalibrate the CONTROL for a specific operating condition, then recalibration is easily accomplished.

## Calibration Instructions

(Equipment needed: Temperature Measuring Device with a Compatible Temperature Sensor)

1. Verify that the bS (PV Bias) operating parameter in the control is programmed to 0. Refer to Instructions on viewing the parameter in the OPERATING mode in the Appendix of this manual.
2. Locate the temperature sensor of the temperature measuring device at the center of the chamber.
3. Operate the oven until it reaches the desired operating temperature and the CONTROL is cycling the heater on and off. The user may wish to have a loaded chamber with a standard amount of product to simulate a specific operating condition. It will take several minutes for the unit to stabilize at the controlled temperature. Allow at least 30 minutes of operation at the stabilized temperature before proceeding.
4. Subtract the average controlled temperature (number appearing on the CONTROL display) from the actual oven temperature (number appearing on the temperature measuring device display). The CONTROL and the device must be in the same scale (°C or °F).

Actual Oven Temperature - Controlled Temperature = calculated value

5. Enter the calculated value from Step 4 as the new bS (PV Bias) value in the instrument.

# APPENDIX

## Troubleshooting

Equipment that operates for long periods may develop problems. The DES2000 was designed to have minimal problems; however, if there are problems please do the following:

1. Have a qualified maintenance person verify wiring is correct.
2. Check the tuning and configuration parameters.
3. Verify that the thermocouple is working properly.
4. If everything is set up correctly, contact the Despatch Help Line at 800-473-7373 for assistance.

*Table 7 Error Displays and Content*

Display	Error Content
Unknown (at power-on)	CPU failure
"Err" (at power-on)	Calibration abnormal
Flashing "Err" (at power-on)	RAM or ROM failure
Flashing "Err" (during operation)	A/D converter failure, RJC failure, or EEPROM failure
000 or b.o	Open thermocouple

*Table 8 Difficulties, Probable Causes, and Remedies*

Difficulty	Probable cause	Suggested Remedy
Failure to heat	CONTROL instrument malfunction	Check parameter in controller or replace controller if OUT LED on controller does not turn on.
Erratic temperature	CONTROL instrument malfunction	Check control parameters before replacing the CONTROL instrument.
Inaccurate temperature	CONTROL instrument miscalibration	Recalibrate CONTROL instrument.
Oven will not control at setpoint	HI-LIMIT instrument set too low	Set the HI-LIMIT higher.
	CONTROL instrument malfunction	Check control parameters before replacing CONTROL instrument.
	Air friction of recirculation fan	Open exhaust air vent. Unit will not control at minimum operating temperature with vent(s) closed.
Heater does not shutdown until temp. reaches the HI-LIMIT setting	CONTROL instrument malfunction	Verify control parameters. Replace relay if no output exists. Replace CONTROL instrument if 5VDC output exists.
	SSR Relay malfunction	Replace relay if no CONTROL output exists.

# Technical Specifications

UL, cUL listed:	UL file E136675
CE compliance to:	<ul style="list-style-type: none"><li>• EN55011: Class A, Group 1 for EMI (emission)</li><li>• EN55082-2: 1995 for EMS (immunity)</li></ul>
Power supply: Temperature:	100 to 240 VAC + 10% -15%, 50-60 Hz 8VA Maximum <ul style="list-style-type: none"><li>• Storage -25° to 60° C</li><li>• Operating 0° to 50° C</li></ul>
Humidity:	5% to 90% RH (no condensation allowed)
Sensor inputs:	<ul style="list-style-type: none"><li>• Universal</li><li>• Input: 1 point</li><li>• Sampling period 500 ms</li><li>• Applicable standards Thermocouple and resistance temperature detector JIS/IEC/DIN ITS90</li></ul>
Temperature display:	<ul style="list-style-type: none"><li>• 1° resolution (C or F)</li><li>• Accuracy after calibration of +/- 1° C, or +/- 0.2° of sensed temperature (whichever is greater) @25° C</li><li>• Three digit seven segment LED, 0.75 inches high</li></ul>
Heat control output:	SSR Drive 24VDC nominal @ 40 ma
Front panel:	NEMA 4X (with gasket)
Dimensions:	1.87H x 1.87W x 3.25D inches
Panel opening:	1.77H x 1.77W inches