

CON THERM

INSTRUCTION MANUAL

CAT 2050 - 2400 N2

SPECIAL NITROGEN OVEN

CON THERM SCIENTIFIC LIMITED

P O BOX 30-605 LOWER HUTT

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WARRANTY STATEMENT

* * * * *

CONTHERM Scientific Company will guarantee CONTHERM equipment for a period of twelve months from the date of installation against faulty workmanship and fabricated materials. This guarantee covers the replacement of component parts found to be defective and authorised labour charges during this period.

Should a malfunction occur or condition develop beyond reasonable acceptance the company will accept responsibility for returning the unit to its factory specification at no cost to the Purchaser providing that the operating instructions have been observed and the defect is due solely to faulty design, material and workmanship. That the defective part be returned, freight paid to the nearest sales service office, the Company shall service the affected component and despatch, freight prepaid, within ten working days of receipt. Units outside the warranty period will be accepted and repairs will be covered under an extension of the above for 90 days.

In remote installations where it is not possible for the company's or agents' engineers to attend, authority may be given to allow the Purchaser to arrange such service.

The Purchaser is required to remit the purchase price of the unit to the supplier within the terms of that supplier's condition of sale. CONTHERM Scientific Company will accept no liability or shall its agents for consequent damage of any kind due to a malfunction or component failure.

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STATEMENT of CONFORMITY

This **CONTHERM** cabinet conforms to the following standards:

- **Electrical Safety:** Designed to AS/NZS3350:1:1994
- **EMC:** Complies with EN 61326-1:1997

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IMPORTANT

All electrical servicing **must** be carried out by suitably qualified personnel only.

SECTION 1 DEFINITION OF TERMS

For the purpose of our standard specifications the following definitions shall apply:

- a) **WORKING SPACE**
That portion of the internal space which is above the lowest shelf and not less than 3cm from any wall (including roof).
- b) **CABINET TEMPERATURE**
That temperature at the centre of the working space.
- c) **SPATIAL VARIATION**
The difference between the midrange of all measured temperatures obtained at one site and that at another site for those sites which give the greatest difference.
- d) **TEMPORAL VARIATION**
The maximum value of the temperature range obtained for the standard site with the greatest range throughout the test interval.
- e) **TEMPERATURE DRIFT**
Any long term changes in cabinet temperature during continuous operation of the closed cabinet.
- f) **TEMPERATURE OVERSHOOT**
Any excess of actual over desired cabinet temperature during a heating up period.
- g) **TEMPERATURE REPRODUCIBILITY**
Temperature regained without alteration to controls.
- h) **TEST INTERVAL**
Interval of time to which the steady state characteristics apply (Max 1 hour).

NB: All the above apply with an empty chamber.
For definitions and test methods refer: **AS2853 : 1986** (and Appendices)

SECTION 2 INTRODUCTION AND SPECIFICATIONS

The CONTHERM 2000 series range of ovens has been expressly designed to give the widest choice of operating conditions consistent with high reliability and low cost, the addition of microprocessor control gives additional versatility and resolution while improving the degree of temperature control. This is a SPECIAL version of the standard cabinet to allow PURGING of nitrogen into the chamber.

All specifications are quoted for a cabinet temperature of 105°C with an ambient temperature of 20°C. With any air vents CLOSED and NO nitrogen flow.

- **Construction** - High quality stainless steel interior, full fibreglass insulation, with latching door catch and corrosive resistant epoxy powder coated exterior.
- **Safety** - Fitted with an independent user adjustable Hi-Limit completely separate from normal controls.
- **Convection** - All units come with mechanical convection fan systems.
- **Electrical** - All quoted at 105°C - ZP21 Micro-Controller mechanical Convection.
 - Designed to AS/NZS 3350.1.1994 220-250V AC M.E.N
- **EMC** - Complies with EN 61326-1:1997

PERFORMANCE:

a) Temperature:

Nominal Range	Amb +5°C	-	300.0°C
Temporal Variation			± 0.3°C
Spatial Variation			± 2.5°C
Initial Overshoot			+2.0°C
Reproducibility			±0.5°C
Cold junction compensation			<0.05°C/°C
Dial resolution			1.0°C
Operating Ambient			10°C - 35°C
Mains Voltage Range			210-270 AC 50Hz

b) Timer:

Timing range	1 minute - 99 hours 59 minutes
Timing Resolution	1 minute

NB: Timer does not start timing down **UNTIL** within 2.5°C of the temperature **SET POINT**.

c) Nitrogen PURGE Timer:

Adjustable nitrogen PURGE time (0.0 - 9.9 minutes)

NB: 0.0 setting means NO PURGE

SECTION 3 OPERATING INSTRUCTIONS

This appliance is NOT intended for use by young children or infirm persons without supervision.

To set up unit for operation after unpacking and checking for damage proceed as follows:

- 1) Fit shelf runners, then shelves.
- 2) Select a location handy to a 10amp electrical outlet.
- 3) Bench Units - Place on solid top with clearance underneath to allow ventilation around entire cabinet. – Any shelf or ceiling must be **AT LEAST** 200mm from the top of the oven.
- 4) Assemble Flow Gauges to Cabinet RHS. Check for leaks. Maximum allowable Nitrogen Gas inlet pressure is 200kpa. Adjust Flow rates and PURGE timer to desired settings.

OPERATING CONTROLLER:

- 1) Plug cabinet into 230-240VAC Mains outlet.
- 2) Turn on main switch - The LED display should show all 8888s then display the current temperature in the cabinet.
- 3) Press and HOLD the temperature button (top) UNTIL the 'SET' LED comes ON then RELEASE. The 'SET' LED above the LED display should now be ON!
- 4) While the 'SET' LED is ON use the 'UP' & 'DOWN' buttons to adjust the SET POINT to the desired temperature.
- 5) WAIT for the display to return to normal; the 'SET' LED will then go off.
- 6) The TIMER must now be set to run the cabinet - use the SAME method as for the temperature EXCEPT press the 'TIME' button instead.
NB: 1) The symbol '[.]' means run **CONTINUOUSLY**.
2) Setting the TIMER to **0.00** turns the cabinet **OFF**.
If the cabinet has **TURNED OFF** after the completion of a TIMED operating period it is only necessary to PRESS and HOLD the TIMER button until the 'SET' LED comes on to **REPEAT** the TIMED run.
- 7) The cabinet will now attempt to obtain the SET POINT and control until the TIMER runs out of time.

- 8) To look at the current TIME press the 'TIME' button for 2 seconds - the amount of time left will now be displayed continuously.
To display the TEMPERATURE continuously - press the 'TEMP' button for 2 seconds.
- 9) To CANCEL any Alarm (ie. 1- - -) PRESS and HOLD the 'TEMP' button until the 'SET' LED comes ON.
- 10) Set P TIME for the length of time (0.0 - 9.9 minutes) it is desired to operate the nitrogen PURGE solenoid after the door has been closed.

MECHANICAL HI-LIMIT MONITOR

The mechanical hi-limit is provided as a secondary safety device to protect the cabinet from over temperature in the event of electronic controller failure.

To set the Mechanical Hi-Limit

Turn the Hi-Limit control FULLY CLOCKWISE.

Allow the cabinet to stabilise at the required operating temperature, then turn the Hi-Limit control anti-clockwise until the **MONITOR** neon comes on (or a slight 'click' is felt). Now turn the Hi-Limit control **SLOWLY CLOCKWISE** until the **MONITOR** neon goes off, then advance the Hi-limit clockwise 1-2 scale markings. This will set the Hi-Limit trip point about 3 - 4°C above the current cabinet temperature.

NB: If the power to the cabinet is **REMOVED** for **LONG** periods when the internal cabinet temperature is above 190°C the operating life of the fan motor will be greatly reduced. It is **ALWAYS** recommended that the cabinet be allowed to cool to ambient temperatures **BEFORE** being switched **OFF** or **UNPLUGGED**, this allows the fan motor to continue operating while the cabinet is cooling down and thus prolongs fan motor life.

P TIME

The centre button (P TIME) on the Oven Control Panel is used to set the length of time that the NITROGEN PURGE solenoid is energised for AFTER the door has just been closed.

- 1) Press the 'P TIME' button, a 'beep' will be heard, release the button and the display will blank for a short period, a two digit number between 0.0 and 9.9 will appear on the LCD display and the 'SET' led will come on. The two digit number is the current PURGE TIME setting (in minutes).
- 2) To adjust the PURGE TIME use the 'UP' & 'DOWN' buttons, when the desired time has been set just WAIT until the 'SET' led goes out and the controller will resume normal operation.

WARNING: To prevent FIRE or SHOCK hazard, DO NOT expose this product to rain or any type of moisture.

FOR YOUR SAFETY

To ensure safe operation the three-pin plug supplied must be inserted **ONLY** into a standard three-pin power outlet which is effectively earthed through the normal building wiring.

Extension cords are **NOT** recommended.

The fact that the equipment operates satisfactorily does **NOT** imply that the power outlet is earthed and that the installation is completely safe. For your safety, if in any doubt about the effective earthing of the power outlet, consult a qualified electrician.

PERIODIC ELECTRICAL SAFETY CHECKS

This appliance should be regularly tested (at intervals not exceeding 12 months) according to the procedures prescribed in **AS/NZS 3760**. The basic safety checks and tests on electrical appliances required by **AS/NZS 3760** are:

- a) A visual check to ensure that there is no mechanical damage, that controls etc. are in good working order and that no parts are missing.
- b) An earth continuity test. (Maximum allowed resistance is 1 Ω)
- c) An insulation resistance test. (Minimum insulation resistance is 1 M Ω)

ALARMS

All alarms are indicated by a number and three dashes on the LED display and are accompanied by an audible alarm.

To **CANCEL** any Alarm (ie 1---) PRESS and HOLD the `TEMP' button until the 'SET' LED comes ON.

ALARM MEANING

- 1--- This means the cabinet is OVER or UNDER temperature. If UNDER temperature it could be due to the door being opened, otherwise check the cabinet to determine if the Internal fan is still operating and that the MECHANICAL Hi-Limit control is not interfering with normal operation.
- 3--- Preset alarm - The cabinet has lost its control settings due to an internal memory failure. Reset all control settings as desired.
- 4--- This means that the TEMPERATURE sensing probe has failed / overranged. (Type 1000 Ω RTD).
- 5--- The cabinet has lost its CALIBRATION setting. A calibration will have to be performed - See Calibration Section.
- 9--- This is a WATCHDOG alarm - The Electronic PCB has failed - Replace the controller.

CALIBRATION

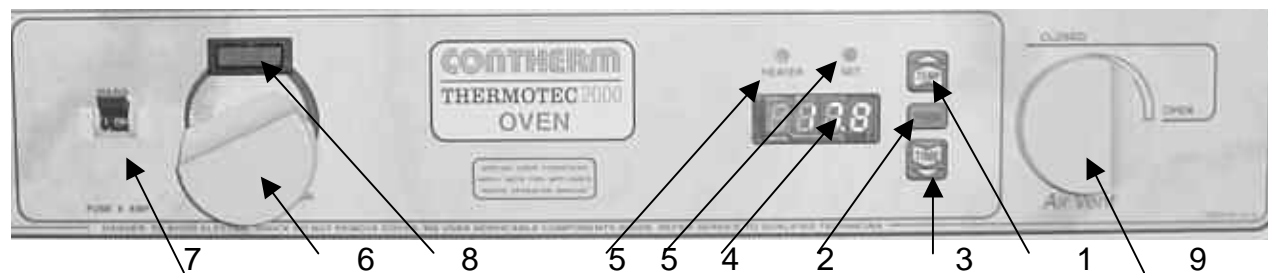
Calibration should be carried out at 150°C with the thermometer in the centre of the working chamber with the chamber empty.

- 1) Place the Calibration Thermometer probe in the workspace centre, close the door and set the controller for 150°C, allow at least 1 hour to stabilise.
- 2) Read the temperature on the Calibration Thermometer.
- 3) To calibrate the cabinet -
 - a) Press and HOLD the `TEMP' button until the 'SET' LED comes ON then release. The 'SET' led should now be ON.
 - b) WHILE the 'SET' led is ON: Press BOTH `UP' & `DOWN' buttons **TOGETHER** - a beep will be heard and the word `CAL' will appear briefly on the LED display. Adjust the reading on the LED display using the `UP' & `DOWN' buttons until it agrees with the Calibration Thermometer.

NB: If when attempting to press BOTH buttons together, the temperature SET POINT adjusts either up or down - it means you are NOT pressing BOTH buttons at the SAME TIME! - if the 'SET' led is still on you should attempt 3(b) again, if the 'SET' led is OFF you should repeat from 3 (a).
 - c) WAIT for a further beep to occur, the LED display will briefly show '----' before displaying the **CALIBRATION CONSTANT**, this will be a number in the range 0.0 to 19.9. This figure SHOULD BE NOTED as it may be used to return to this calibration setting. The LED display will then briefly show another '---' and the controller will resume its role of normal operation.
- 4) Allow to stabilise again - the temperature should now be correct. If NOT repeat the procedure.

NB: The calibration can only be performed within limits, if the calibration cannot be achieved a further fault exists.

CONTROL LAYOUT



The following controls are fitted on the Micro-controller Console:

- 1 Temperature adjustment button.
(Also used to adjust set points)
- 2 P Time – Sets the PURGE time (in minutes) 0.0-9.9.
- 3 Time adjustment button.
(Also used to adjust set points)
- 4 LED Display - Gives readout of temperature in degrees centigrade OR elapsed time in hours and minutes.
- 5 LED Indicators - Left LED indicates when the element is ON. Right LED indicates when controller is in SET mode.
- 6 Mechanical Hi-limit set Adjustment Knob (No Scale).
- 7 Mains Switch and Circuit Breaker combined - applies power to cabinet.
- 8 Hi-Limit Monitor Neon- will come on if power is being applied to heater element while mechanical Hi-Limit is tripped.
- 9 Oven Air Vent – Not Fitted on this cabinet.

SECTION 4 THEORY OF OPERATION

This CONTHERM General Purpose Oven uses a new single chip microprocessor electronic PID controller with a 1000 Ω resistance RTD probe as the temperature sensing element. The LED display gives a direct readout of SET POINT or Cabinet temperature in degrees centigrade.

The operation of the ZP21 controller is based on the change of resistance with temperature.

The RTD probe is fed from a 1.05mA constant current source and the output is amplified to provide a final output of 10mV/ $^{\circ}$ C. This output is sent to a hi-resolution A/D converter.

The outputs of the Microprocessor are used to switch zero crossing triac drivers (containing an led and a small triac internally), which in turn drive the heater triac and other devices. The zero-crossing driver ensures that radiated interference is kept to a minimum. An internal WATCHDOG monitors program execution and RESETs the microprocessor in the event of program failure.

Incoming AC mains power is conditioned by a varistor and inductor filter to prevent mains `spikes' from causing damage, then goes through a double wound transformer to reduce the AC to 10 volts and provide isolation.

The +5 Volt supply is stabilised by a standard 3 terminal regulator.

The type of cabinet (OVEN,INCUBATOR,MC or ,MCP) is selected by special button sequences during the power on period and retained by the EEROM IC.

Calibration of the temperature is performed via the adjustment buttons and is retained in a EEROM IC, settings will typically be retained for up to 100 years even in the absence of power.

SECTION 5 TROUBLESHOOTING AND MAINTENANCE

MAINTENANCE

The epoxy powder coated mild steel exterior is resistant to corrosion and spillages and should be wiped with a damp cloth occasionally to maintain its appearance.

The fan motor bearings do not require lubrication under normal conditions however prolonged operation above 200°C will result in a reduced motor life.

The stainless steel interior and shelves should be kept clean with a damp cloth. Take care that the temperature probe is not damaged during cleaning of the interior base. Any spillage's or breakages within the cabinet should be cleaned up immediately with the cabinet switched off and unplugged at the mains.

ELECTRICAL SAFETY

This appliance should be tested for insulation resistance and earth continuity at regular intervals according to **AS/NZS 3760**.

TROUBLESHOOTING:

- A) **CABINET COMPLETELY DEAD. NO LED DISPLAY :**
 - NO POWER TO CABINET, CHECK WALL SOCKET AND WALL SOCKET FUSES

- B) **CABINET DEAD, BUT MAINS POWER AT WALL SOCKET :**
 - CHECK CABINET MAIN SWITCH/CIRCUIT BREAKER.

- C) **LARGE TEMPERATURE VARIATION IN CABINET, CONTROLLER `HEATER' LED PULSING :**
 - INTERNAL FAN NOT GOING (CHECK FOR AIR MOVEMENT INSIDE CABINET)
 - CABINET OVERLOADED WITH SAMPLES, REMOVE SOME SAMPLES TO ALLOW BETTER AIR FLOW.
 - LOOK FOR HI-LIMIT MONITOR NEON COMING ON, INDICATES MECHANICAL HI-LIMIT SET TOO LOW

ASSEMBLY OF ANTI-TILT SHELF RUNNERS

- 1) Remove vinyl protective film, if necessary, from runners.
- 2) Fit lug into selected slot at rear of cabinet sidewall and clip down into front slot to lock into place.
- 3) Check heights of runners are parallel.
- 4) Fit Shelves.

Remove by the opposite action.

REMOVAL AND REPLACEMENT OF GP CONTROLLERS

The following should only be carried out by suitably qualified electrical personnel.

ENSURE that power cord has been **REMOVED** from the wall socket **BEFORE** attempting to remove the PCB.

To Remove PC Board:

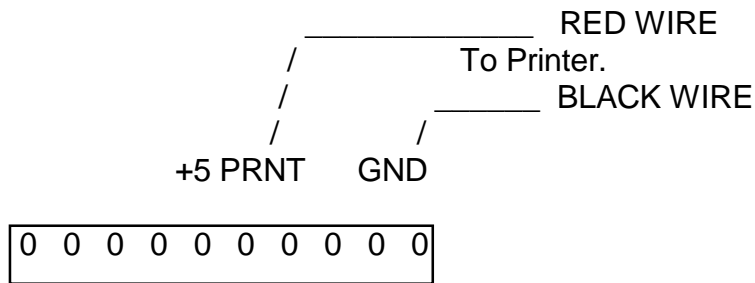
- a) **ENSURE POWER CORD is REMOVED** from wall socket then unplug socket from Controller PC Board. NOTE connections from side 10way socket to sensor probe etc so that they can be correctly reinstalled, then disconnect probe etc from socket.
- b) Using suitable socket spanner undo four 4mm securing nuts. Carefully NOTE position and size of SPACERS
- c) Remove PC Board.
List FULLY all fault details, carefully pack, return to Agent for repair.
The refitting of the controller should be done in the reverse order as above, taking care when reconnecting the sensor etc that they are connected to the correct socket holes.
- d) Carry out an Insulation (use 500V insulation tester) and earth continuity test **BEFORE** applying power to cabinet. (as per **AS/NZS 3760** – In-service safety inspection and testing of electrical equipment).
The basic safety checks and tests on electrical appliances required by **AS/NZS 3760** are:
 - 1) A visual check to ensure that there is no mechanical damage, that controls etc. are in good working order and that no parts are missing.
 - 2) An earth continuity test.
 - 3) An insulation resistance test.

In order to provide evidence of compliance, a label (signed and dated by the person testing the equipment) may be placed on the tested appliance.

ELECTRICAL GP LAYOUT ZP21

PRINTER OPTION

The ZP21 PCB comes complete with provision for driving the CONTHERM thermal printer. The RED and BLACK wires connect from the small expansion block on the ZP21 PCB to the printer socket.



ZP21 EXPANSION BLOCK

ALL MODELS

The PHASE wire to the heating element should be connected to the "ELEMENT" connection on the main PCB connector.

FAN MOTOR

The fan motor on ALL models is permanently wired so that it is energised whenever power is applied to the cabinet.

The ZP21 PCB is equipped with a green "HEARTBEAT" LED adjacent to the large buzzer. When the cabinet is operating this LED should be PULSING about once per second. There are also TWO small glass fuses to protect the PCB. **REMOVE ALL POWER** from the unit (By removing the mains plug) **BEFORE** attempting to check these fuses.

SECTION 6 PARTS LISTS AND SPARES

Shelves	Cat 2050		GP2051
	Cat 2100		GP2052
	Cat 2150		GP2053
	Cat 2200/2300/2400		GP2054
Shelf Support Brackets			
(State Model when ordering)			GP2064
Fan Motors			GP2010
Elements	Cat 2050 (FINNED)	600W	GP2015
	Cat 2100 (FINNED)	800W	GP2016
	Cat 2150/2200 (FINNED)	1250W	GP2017
	Cat 2300 (FINNED)	1500W	GP2018
	Cat 2400 (FINNED)	1750W	GP2019
Special Element (FINNED)		2000W	GP2020
Temperature Sensor: 1000Ω RTD			GP2307
Hi-Limit Thermostat: Oven			GP2022
Mains Switch (Illuminated)			GP2033
Fuse Holder			GP2071
Fuse		10Amp	GP2072
Control Knob			GP2324
Control Circuit Board: ZP21			GP2306
Monitor Neon			GP2073
Solid State Relay 'OPTO 22' 240A10 AC Control			GP1188
(CAT 2300, 2400 ONLY)			
Seal			GP1190
Flow Gauge Weldwell SteadFlo 0-40 LPM			
Flow Gauge Weldwell SteadFlo 0-14 LPM			
Herion Solenoid for Nitrogen - 230V			

CONTHERM SCIENTIFIC LTD
CERTIFICATE OF CONFORMANCE (PQ)

This certifies that the CONTHERM equipment specified below has passed quality and performance tests according to our standard methods and procedures and has been approved for despatch to our customers. Contherm calibration equipment is traceable to a YSI Model 60 gallium melting point temperature standard.

CAT. No:

APPLIANCE No:

DATE:.....

TEST RESULTS

CALIBRATION FACTORS

Test Temperature:	Temperature []
Probe Position:	
Date of Test:	
Actual Recorded Temperature	
Temporal Variation	Passed []

ELECTRICAL TESTS

Earthing: [] Ω	Insulation: [] $M\Omega$
Flash: []	Leakage: [] Ma

The electrical tests are satisfactory: []

Signature of Test Personnel

CONTHERM SCIENTIFIC LIMITED
NEW ZEALAND

CONTHERM SCIENTIFIC
CUSTOMER INSTALLATION REPORT

Please fill in and return to:

CONTHERM SCIENTIFIC LIMITED
DEVELOPMENT SECTION
P.O. BOX 30605
LOWER HUTT
NEW ZEALAND

1) Did your cabinet arrive in good condition? **YES / NO**

2) Any difficulties experienced in setting up? **YES / NO**
Comments:

3) Is this your first CONTHERM purchase? **YES / NO**

4) Any previous problems of a specific nature with CONTHERM products? **YES / NO**
Comments:

5) Any suggestions for improvements or special features you would like to see -
Comments:

6) **Cabinet Details** **Catalogue No:** **CAT**

Appliance No:

Date Installed:

Company:

.....

.....

COUNTRY:

Contact Name:

PHONE: **FAX:**

PACKING INSTRUCTIONS
(Leave with Cabinet)

CAT.No. GPM.
(Nitrogen Oven)

Date:/...../.....

- 1) Ensure cabinet has been fully tested and approved for packing . []
- 2) Ensure rear data plate is fitted. []
- 3) Clean interior and exterior. []
- 4) Parts to be packed with cabinet:
 - a) Manual []
 - b) Shelf runners []
 - c) Shelves []

PACKED BY