

C O N T H E R M

INSTRUCTION MANUAL

CAT 150MC

G.P.M. COOLED INCUBATOR

(WP:150MC)

1994:9:94

CONTHERM SCIENTIFIC LIMITED  
P O BOX 30-605 LOWER HUTT  
TEL: (0064-4) 568 8034  
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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 only free of charge of components parts found to be defective 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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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) TEMPERATURE VARIATION:  
The difference at any moment between the temperature at the centre of the working space and at any other point in the working space.
- d) TEMPERATURE FLUCTUATION:  
The short term changes in temperature at any point in the working space.
- 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.

N.B.: All the above apply with an empty Chamber.

## SECTION: 2: INTRODUCTION

The CONTHERM Series Five range of cabinets have 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.

### SPECIFICATIONS

All specifications are quoted for  
Cabinet Temperature ..... 20°C  
with Ambient Temperature ..... 20°C

#### MECHANICAL:

Construction: ..... High quality stainless steel interior, full fibreglass insulation, with non-jar magnetic 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: ..... Micro-Controller mechanical Convection.

#### **a) Temperature -**

Nominal Range: ..... +5°C - 100°C  
Temperature Fluctuation: ..... (30 minutes)± 0.2°C  
Temperature Variation: ..... ± 1.5°C  
Initial Overshoot: ..... + 2.0°C  
Temperature Reproducibility: .. ± 0.4°C  
Cold junction compensation: ... . . . . .  
. < 0.05°C/°C Dial settability: . . . . .  
0.1°C Operating Ambient: ..... 10°C -  
35°C Mains Voltage Range: . . . . . 210-270 AC  
50Hz

**NB:** Maximum Ambient for +5°C operation is 20°C.

#### **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.

### SECTION: 3: OPERATING INSTRUCTIONS

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 control console and motor area.

#### TO OPERATE CONTROLLER

- 4) Plug cabinet into 230V Mains outlet.
- 5) Turn on Main switch - The LCD should show all 8888's then display current temperature in the cabinet.
- 6) Press and HOLD the temperature button (top) UNTIL the LCD display goes BLANK then RELEASE, the `SET' led above the LCD should now be ON!
- 7) While the `SET' led is ON use the `UP' & `DOWN' buttons to adjust the SET POINT to the desired temperature.
- 8) WAIT for the display to return to normal, the `SET' led will go off.
- 9) 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: the symbol `[:]' means run CONTINUOUSLY.
- 10) The cabinet will now attempt to obtain the SET POINT and control until the TIMER runs out of time.

- 11) 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.

- 12) To CANCEL any Alarm (ie 1---) PRESS the TEMP button.

NB: To Set the Mechanical Hi-Limit:

Allow the cabinet to stabilise at the required operating temperature, then turn the Hi-Limit control anticlockwise until the cabinet shuts off, advance the Hi-limit clockwise 2-3 degrees of rotation. This will set the Hi-Limit trip point 3-4°C above the cabinet temperature.



## ALARMS

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

To **CANCEL** any Alarm (ie 1---) PRESS the TEMP button.

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.
3---	Preset alarm: The cabinet has lost its control settings due to an internal memory failure. Reset all control settings as desired.
4---	Temperature Sensor Failure: The thermocouple (Type 'K') temperature sensing probe has failed (The displayed temperature will usually read 110.0°C) - Replace or repair the probe.
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 20.0°C with the Thermometer in the centre of the working chamber with the chamber empty.

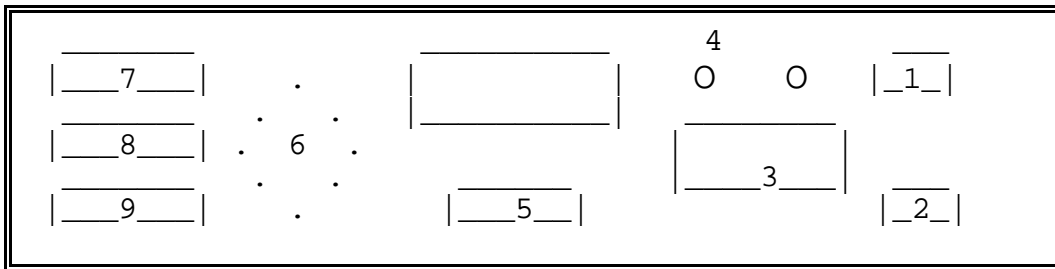
- 13) Place the Calibration Thermometer probe in the workspace centre, close the door and set the controller for 20.0°C, allow at least 1 hour to stabilise.
- 14) Read the temperature on the Calibration Thermometer.
- 15) To calibrate the cabinet -
  - a) Press and HOLD the TEMP button until the display BLANKS.
  - b) Press BOTH 'UP' & 'DOWN' buttons TOGETHER - a beep will be heard and the word 'CAL' will appear briefly on the LCD display. Adjust the reading on the LCD display using the 'UP' & 'DOWN' buttons until it agrees with the Calibration Thermometer.
  - c) WAIT for a further beep to occur, the LCD will briefly show '----' 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.

### **: CAUTION:**

- 1) If operating above 60°C be aware of possible glass door damage due to sudden application of cold temperatures when door is opened.
- 2) If prolonged use is expected above 60°C then a special Hi-Temperature glass door should be ordered.

## CONTROL LAYOUT



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

- 16 Temperature adjustment button.  
(Also used to adjust set points)
- 17 Time adjustment button.  
(Also used to adjust set points)
- 18 Liquid crystal Display - Gives readout of temperature in degrees centigrade OR elapsed time in hours and minutes.
- 19 Monitor Indicators - Left led indicates when the element is ON Right indicator indicates when controller is in SET mode.
- 20 Refer "Caution" Instructions Page 9.
- 21 Mechanical Hi-limit set Adjustment Knob (No Scale).
- 22 Mains Switch and Illuminator combined - indicates power to controller board.
- 23 Hi-Limit Monitor Neon- will come on if power is being applied to heater element while mechanical Hi-Limit is tripped.
- 24 Fuse - contains a 8amp normal blow fuse.

## SECTION: 4: THEORY OF OPERATION

This CONTHERM General Purpose Incubator uses a new electronic PID controller with a type 'K' thermocouple as the temperature sensing element. The LCD gives a direct readout of SET POINT or Cabinet temperature in degrees centigrade.

The operation of the ZP19 controller is based on the thermocouple emf produced by the junction of dissimilar metals, ie, CHROMEL/ALUMAL or a type 'K' thermocouple.

The thermocouple output is amplified 270 times by a chopper stabilised amplifier (IC1) to provide an input into the summing amplifier (IC2a) of about  $-10\text{mV} / ^\circ\text{C}$ , this output is smoothed by capacitor C16 and passed through the summing amp to give a linear output of  $+ 5\text{mV} / ^\circ\text{C}$ .

This signal is sent to a dual slope integrating A/D converter and the digitised result is adjusted by the Microprocessor to give a reading directly in degrees centigrade.

Cold junction compensation for the thermocouple is provided by a temperature sensor IC (LM335). The final output of the Microprocessor is used to switch a zero crossing triac driver (contains an led and a small triac internally), which in turn drives the heater triac. The zero-crossing driver ensures that radiated interference is kept to a minimum.

Incoming AC mains power is conditioned by a varistor to prevent mains 'spikes' from causing damage, then goes through a double wound transformer to reduce the AC to 8 volts and provide isolation.

Finally all voltages are stabilised by 3 terminal regulators and a precision IC reference(LM336).

The type of cabinet and range ( $0-100^\circ\text{C}$  OR  $0-300^\circ\text{C}$ ) is selected by the EPROM version fitted.

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

## REFRIGERATION

There is a safety override built-in to the cabinet that limits the operation of the refrigeration system to temperatures below 40°C. This prevents the refrigeration system from operating at temperatures above the units normal operating range.

### Refrigeration Maintenance

If the unit is going to be stored for some period after the refrigeration has been used for some length, a drying out period is necessary to remove moisture from the element well. This could be done by setting a temperature of approximately 35°C and have the unit operating with the door slightly ajar to allow for the drying out of the moisture in the interior.

Once the unit is suitably dried it can be closed up and stored without further problems.

#### REFRIGERATION DATA:

COMPRESSOR:	Matsushita SB51C10WA
CONDENSER:	FP 35/22
COOLING COIL:	G8/22/HG
DEFROST VALVE:	Alco 100RB2S2
REFRIGERANT:	R134a
REFRIGERANT CONTROL:	Capillary Type 5/044
DRYER:	Sweat Type 245/XH9

The Refrigeration System is designed to maintain the internal Cabinet Temperature of 5°C - 40°C with ambients up to 20°C.

Components of the System are shown on the Schematic Diagram.

The Compressor is of the Low Starting Torque type and may not restart immediately if the power supply is disconnected. After approximately 3-5 minutes the internal Refrigeration Pressures will have equalised, the Compressor will start up as normal.

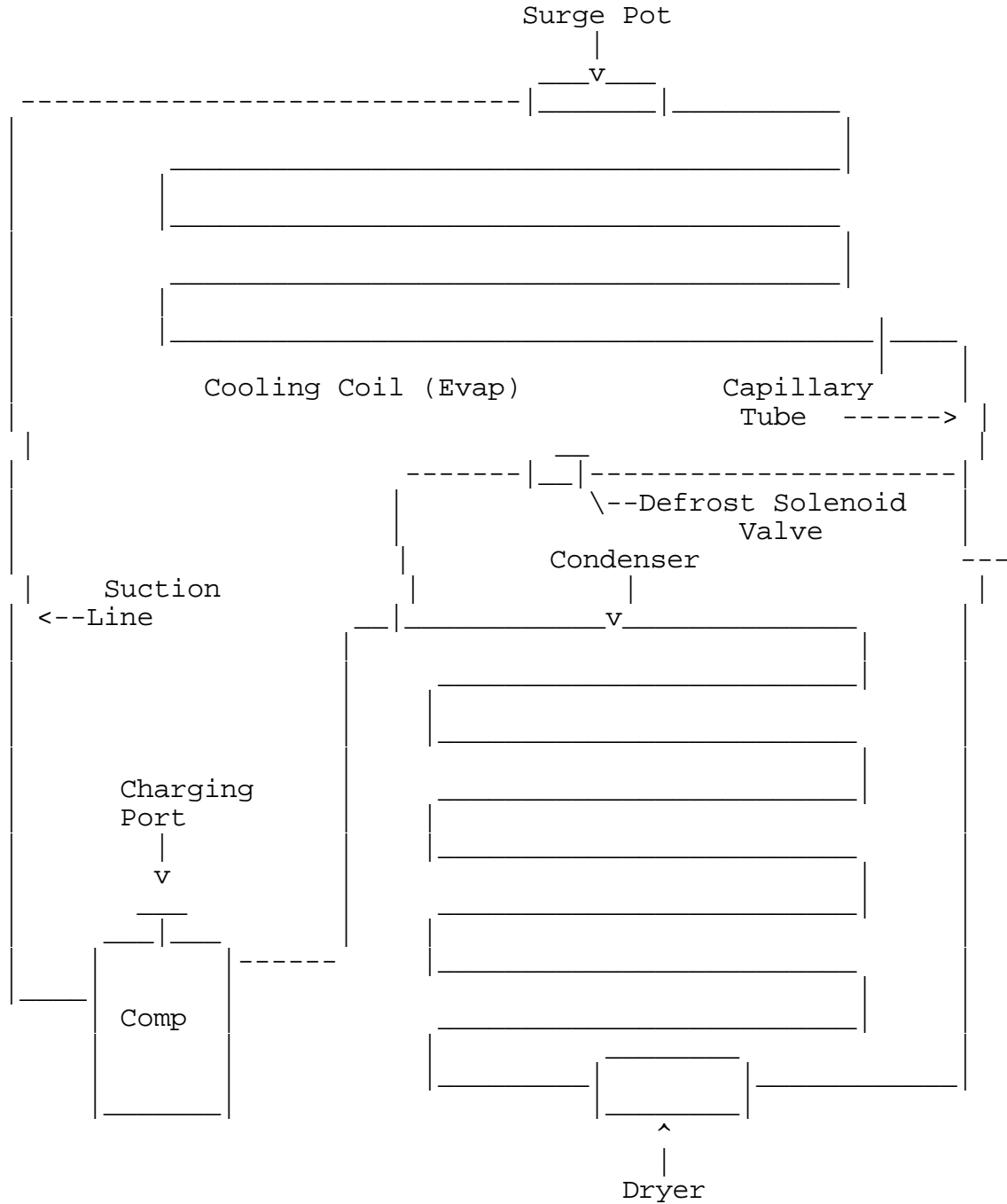
The Cooling Coil under normal operating conditions does not build up frost. This is due to the ZP19 Controller, switching a Defrost Solenoid Valve periodically.

The Condensate Water from the Cooling Coil is evaporated by the Compressor Heat Dissipation Tray. If moisture collects inside Cabinet check that the Collection Trough outlet located inside cabinet is not blocked.

The Refrigeration System Condenser located on the External Rear of the Cabinet is cooled by natural convection, therefore, it is important to ensure no obstructions are placed to prevent normal ventilation around the Cabinet. The Condenser will slowly collect a layer of dust, therefore, it is recommended that once a year it is brushed clean with a small broom.

The Refrigeration System does not operate at temperatures above 40°C due to the **factory adjusted** safety override located in the electrical wiring area.

REFRIGERATION SCHEMATIC DIAGRAM



COMPONENT LOCATION

Inside Cabinet Behind False Back  
     Cooling Coil  
     Surge Pot  
 External Back of Cabinet  
     Compressor  
     Condenser  
     Dryer  
     Defrost Solenoid Valve

## 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, but their service life will be reduced at high temperatures.

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.

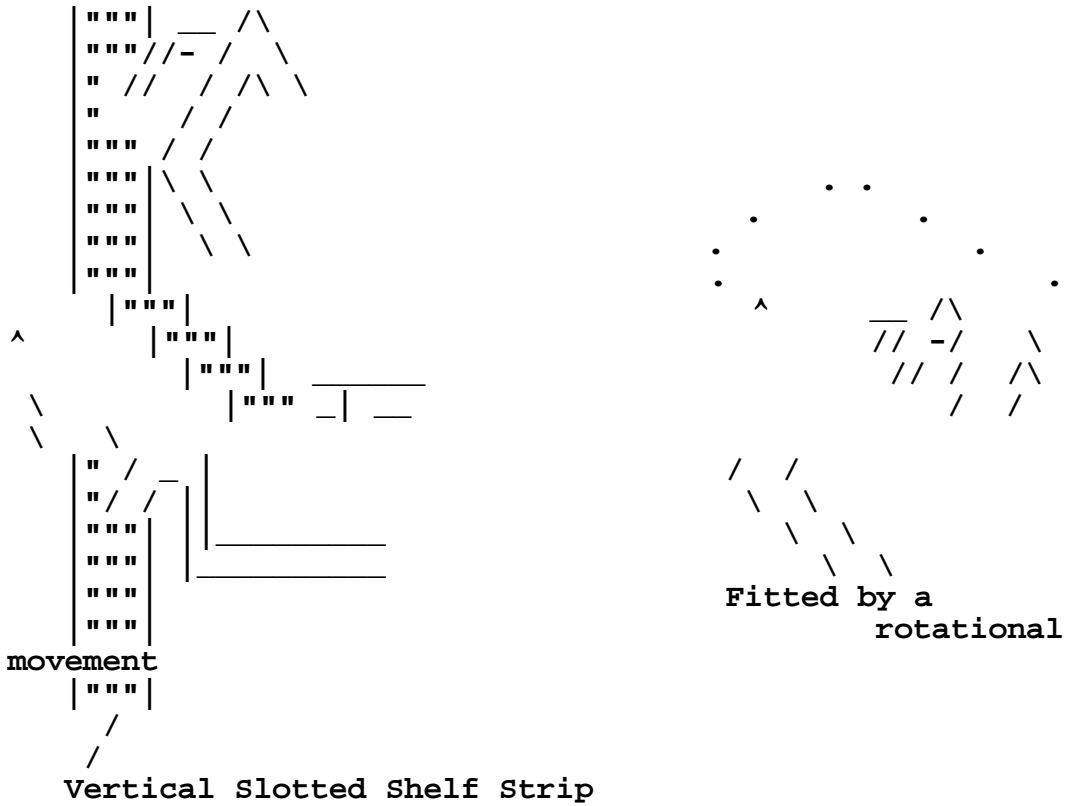
Any spillages or breakages within the cabinet should be cleaned up immediately with the cabinet switched off and unplugged at the mains.

### TROUBLESHOOTING

- A) CABINET COMPLETELY DEAD. NO MAINS LIGHT
  - NO POWER TO CABINET, CHECK WALL SOCKET AND WALL SOCKET FUSES
  
- B) CABINET DEAD, BUT MAINS LIGHT ON
  - FUSE BLOWN
  
- 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



25) Remove vinyl protective film, if necessary, from runners.

Note: Lug may need easing further away from the runner with a screwdriver if insertion is difficult.

26) Check height of runners are parallel.

27) 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.

28) Remove power cord from wall socket and feed in through rear to base of cabinet, including plug.

29) Open door of cabinet and remove the glass doors by undoing PK screws securing hinges to wall. Remove shelves and shelf runners then false floor/back (being careful not to bend main sensor), as follows:

Undo three PK screws across front, then grasping the top edge of the back with one hand and supporting the front edge with the other, lift upwards (approximately 50mm) and pull forward.

Gently lift out, keeping vertical and square to ease removal.

This exposes Safety Hi-Limit Probe. This is removed by undoing the one

Phillips head self-tapping screw clamping Probe to base (silver coloured, lying on base). This Probe can now be carefully straightened to a vertical position and pushed partially back through hole in base.

30) Undo screw securing main sensor to cabinet.

31) Fully withdraw Safety Hi-Limit Probe.

32) Remove "push-on" connectors at Element.

33) Remove controller end caps and withdraw controller.

34) Unscrew motor wires, if applicable, from terminal strip on PC Board.

Controller should now be free to be carefully removed, lifting upwards, trailing leads, etc out onto bench.

To Remove PC Board

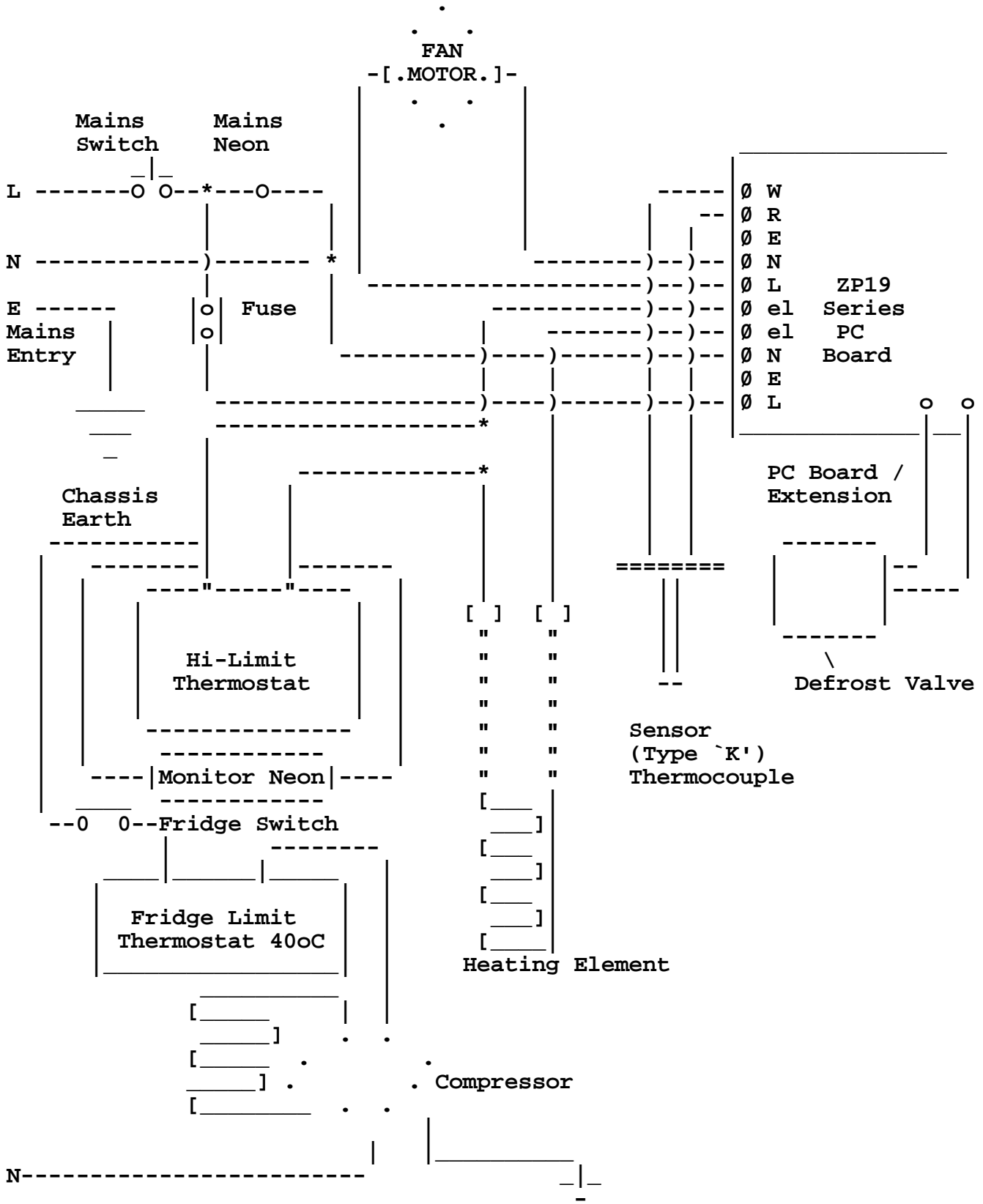
- a) Unplug socket from Controller PC Board.
- b) Using 4mm socket undo four securing nuts.
- c) Remove PC Board.

List fault details, carefully pack, return to Agents for repair.

The refitting of the controller should be done in the reverse order as above, taking care when refitting the main sensor back through the hole in the false floor/back that it is not damaged in the process.

N.B. Check for loose wires (before fitting bottom cover) that may have been missed, particularly the green earth wires.

ELECTRICAL GP LAYOUT ZP19

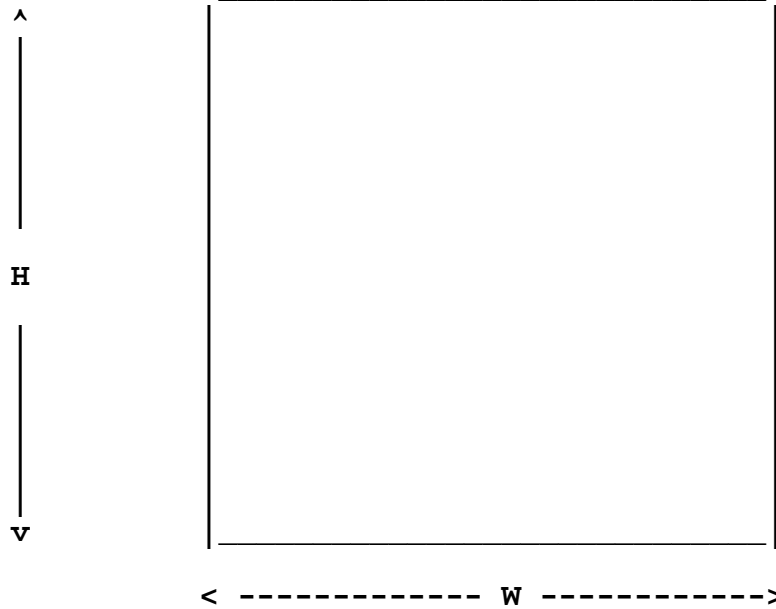


SECTION: 6: PARTS LISTS AND SPARES

Shelves:		GP.062
Shelf Support Brackets:		
State Model when ordering		GP.064
Hinges:		GP.006
Fan Motors:		GP.007
Fan - Rotors:		GP.009
Elements:	870 W	GP.013
Temperature Sensor:	Type `K' Thermocouple	GP.067
Hi-Limit Thermostat:	Incubator	GP.021
Mains Switch (Illuminated):		GP.033
Complete Control Panel:	All Incubators	
(State Model)		GPM.035
Control Knob:		GP.324
Control Circuit Board:	ZP19	GPM.070/I
Control Panel End Caps		GP.044
Fuse Holder		GPM.071
Fuse	8 Amp	GPM.072
Monitor Neon		GPM.073

GLASS DOOR SIZES

(If purchasing independently)



6.0mm Drawn Sheet - All edges arased.

**NB:** This cabinet has **TWO** of the above glass doors.

Cat.150            2off            442mm H x 665mm W

If fitting of new glass door necessary, be aware hinges require RTV Dow Corning silicone adhesive to attach hinges to glass. This should be allowed to fully cure (at least 24 hours) before fitting door to cabinet.

C O N T H E R M

CABINET TEST REPORT

CAT. NO.: .....

DATE: .....

APPLIANCE NO.: .....

Test Temperature: .....

Probe Position: .....

Duration of Test - Started: .....

Completed: .....

Actual Recorded Temperature: .....

Fluctuation: .....

COMMENTS:

Signature of Test Personnel:

.....

CONTHERM SCIENTIFIC LIMITED,  
NEW ZEALAND.

Please leave this form with the Final Product

C O N T H E R M

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.: .....  
Appliance No.: .....  
Date Installed: .....

Customer: .....  
.....

Your co-operation in filling in this report is greatly appreciated so that CONTHERM products can be continually manufactured to suit your requirements.



C O N T H E R M

PACKING INSTRUCTIONS  
(Leave with Cabinet)

CAT.NO.: GPM.150MC Date: .../.../...  
(General Purpose Incubator)

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) Four pair shelf runners (ie total of eight) [ ]
- c) Four shelves [ ]
- d) Fit Lexan control cover (c/w non throw/away label [
- ] e) Other .....

PACKED BY .....

**IMPORTANT** --DO NOT THROW AWAY!-- **IMPORTANT**

THIS IS YOUR PERSPEX CONTROL PANEL COVER FOR YOUR CONTHERM CABINET.

**IMPORTANT** --DO NOT THROW AWAY!-- **IMPORTANT**

CONTHERM SCIENTIFIC \*CABINET TRACK\*

CAT No : 150MC

DATE : / /

APP No :

=====  
=

CUSTOMER :

CONTROLLER TYPE :

SERIAL No :

EPROM VERSION :  
150MC.002

MANUAL:

PRESETS :

PROGRAMMABLE [ ] LIGHTING [ ] HUMIDITY [ ]

SPECIAL FEATURES :

TESTED BY :

SERVICE NOTES

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