



Scientific Ltd

INSTRUCTION MANUAL

**CAT 360 – 380
DIGITAL WATERBATHS**

**CONTHERM SCIENTIFIC LIMITED
P O BOX 30-605 LOWER HUTT 5040**

TEL: (0064-4) 568 8034

FAX: (0064-4) 568 8095

EMAIL: contherm@xtra.co.nz



WARRANTY STATEMENT

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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.

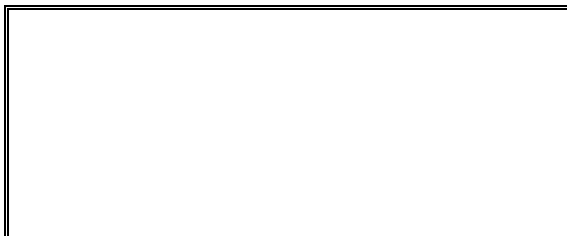
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STATEMENT of CONFORMITY

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 volume of the bath which is at least 15mm from the sides and above the baffle and below the liquid level.
- b) **BATH 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 OVERSHOOT**
Any excess of actual over desired bath temperature during a heating up period.
- f) **TEMPERATURE REPRODUCIBILITY**
Temperature regained without alteration to controls.
- g) **TEST INTERVAL**
Interval of time to which the steady state characteristics apply (Max 1 hour).

NB: All the above apply with an **unloaded** bath with the LID ON.

SECTION 2 INTRODUCTION AND SPECIFICATIONS

The new CONTHERM 350-380 Series of High Temperature Digital Water Baths come in four sizes from 15 to 50 litres and feature a precision PID controller to give excellent temperature control. These baths are **NOT** to be used for BOILING water!

Mechanical:

TANKS:

Exterior - A heavy gauge zinc coated mild steel outer body finished in an attractive epoxy powder coating contains the high density polystyrene insulation and stands on four plastic feet.

INTERIOR:

The interior tank is constructed from satin finish non-corrosive stainless steel, seamless welded. The top tank edges extend over the outer wrapper to prevent water entering the insulation. A 'High/Low' mark is provided to assist with water level checking.

FALSE FLOORS:

Constructed of high gloss stainless steel the false floor provides direction for the water flow giving good uniformity when loaded.

RAISED SHELVES:

Constructed of high gloss stainless designed to raise the floor of the bath.

LIDS:

a) Lift Off (LL) Stainless - Constructed of stainless steel, epoxy coated, gabled as above with lifting handle, designed for maximum durability. Really only suitable for temperature up to 60°C. Must be used with caution at temperatures above 60°C due to danger from HOT SURFACE and steam contact.

b) Hinged (HL) Insulated - Designed for increased insulation where a positive seal is required, mild steel outer casing, polystyrene insulation and stainless steel liner fitted with sealing gasket and lifting handle. Must be used with caution at temperatures above 60°C due to danger from steam contact. For use at temperatures above 85°C the lid must be opened with caution using the sided mounted handle.

CONSTANT LEVEL: Only available factory fitted.

CIRCULATING PUMP: Only available factory fitted (Option 'N').

CONTROL UNITS:

Constructed entirely of non-corrosive materials, this series of controllers feature a silent long life stirrer motor, stainless steel element, resettable Hi-Limit cutout and stainless steel probe, Contherm custom microprocessor control system with high resolution digital L.E.D display, P.I.D control and an accurate RTD sensor.

Finished in a durable epoxy powder coating, giving a professional appearance.

- **Electrical** - All quoted at 37°C - ZP21WB Micro-Controller forced circulation.
 - 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 (Lid ON)	Amb+5°C	-	100.0°C
(NOT to be used for BOILING water)			
Temporal Variation			± 0.2°C
Spatial Variation			± 0.2°C
Initial Overshoot			+2.0°C
Reproducibility			±0.4°C
Dial resolution			0.1°C
Operating Ambient			10°C - 35°C
Mains Voltage Range			220-250 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**.

NB: When operating at temperatures above 60°C a HAZARD exists from escaping STEAM when the waterbath lid is opened or removed. The use of protective gloves/clothing and special care is advised. When using a lift off lid above 60°C please be aware that the lid will attain nearly the same temperature as the water in the bath – it could be VERY HOT!

NB: When fitted with option 'N' (circulating pump) care must be taken not to exceed the heating/cooling capacity of the controller or larger temperature variations will occur.

SECTION 3 OPERATING INSTRUCTIONS

This appliance is NOT intended for use by young children or infirm persons without supervision. Young children should be supervised to ensure that they do not play with the appliance.

Liquids

We recommend the following liquids for use in Contherm Waterbaths:

5°C to 99.9°C: Water*

NB: (*Bath is **NOT** to be used for boiling water).

Use spheres or a lid to reduce evaporation and heat loss at temperatures above 60°C.

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

- 1) Select a location handy to a 10amp electrical outlet.
- 2) Place on solid top, bearing in mind the weight of the filled bath if placed on a bench. **Do not** have unit plugged in during installation or removal. If a HINGED LID (HL) is fitted attach the supplied lifting handle to the RHS of the lid by screwing the handle securely into the thread provided. ALWAYS open the hinged lid using this handle.
- 3) Ensure a space of at least 150mm is allowed at the rear of the bath for air circulation.
- 4) Fit adjustable shelf in position on top of the false floor, ensuring gap is left opposite control console end to allow circulation.
- 5) If the Control unit has not been attached to the bath, attach it now by removing the two outside plastic end caps and using the captive set screws to firmly fasten the controller to the bath. Replace the two end caps. Be aware that the balance of the Control unit is inward to the bath and incorrect or loose clamping could result in the unit falling into the liquid with resulting danger from electric shock.
- 6) To ensure optimum performance fill bath to 50mm from controller chassis - always maintain level within marks on bath ends. The bath **MUST** be filled before attempting operation. **NB:** At temperatures above 60°C either a lid or polystyrene spheres should be used to reduce evaporation and heat loss from the bath, also be aware that any lid used will become HOT.

- 7) If constant level device is fitted, fill to the level determined by the device.
- 8) If option 'N' (circulating pump) is fitted, tubing should be carefully attached to the circulating pump output and connected so that water can flow freely from the pump to the external device and return back to the water tank. The amount of external heating / cooling capacity will depend on the controller element/fridge and water tank size. To allow the controller to achieve good control characteristics the external heat load should be as small as possible.

OPERATING CONTROLLER:

- 1) Plug controller into an earthed 220-250V Mains outlet.
- 2) The LED should show all 8888s then display the current temperature in the bath. Do NOT press any buttons until after the 8888's have gone from the display.
- 3) Press and HOLD the temperature button (top RHS) UNTIL the 'SET' LED comes ON then RELEASE. The 'SET' LED to the left of the 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 bath - use the SAME method as for the temperature EXCEPT press the 'TIME' button instead. To obtain the special '[.]' symbol for continuous operation, first adjust the timer down until '0.00' is reached, then press the down button once more to get '99:59' then the 'up' button to go 1 step above '99:59' the special '[.]' symbol should now be shown.
NB: The symbol '[.]' means run **CONTINUOUSLY**.
Setting the TIMER to **0:00** turns the bath **OFF**.
If the controller 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 controller will now attempt to obtain the SET POINT and control until the TIMER runs out of time. The waterbath heater **WILL NOT OPERATE** if the **TIMER** has been set to **0.00**.
- 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) When transferring items to and from the bath, or when removing or replacing a lift off lid, take care to ensure that water does **NOT** drip onto the temperature controller.

WARNING!

If operating the bath at temperatures above 60°C, the lid may be **HOT!** Use extra care when opening the hinged lid or removing any lift off lid as **STEAM** may be released! It is recommended that the operator use heat resistant gloves when introducing or removing samples from the bath.

WARNING!

FOR YOUR SAFETY

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

WARNING: To prevent FIRE or SHOCK hazard, DO NOT expose the controller to rain and also ensure that it is correctly fastened to the bath.

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.

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)

HAZARDS

The following **HAZARDS** have been identified when using this appliance:

- Danger from electric shock – please follow all installation and maintenance instructions and carry out periodic electrical safety checks as per **AS/NZS 3760**.
- Danger from burns - when operating at temperatures above 60°C allow for the fact that lid surface temperatures may be HOT and that there may be steam released when opening/removing any lid or cover.
- If circulating water to an external device ensure there is no possibility of the connecting hose discharging hot water onto personnel or equipment.

ALWAYS remove the appliance from the mains socket outlet **BEFORE** carrying out any preventative maintenance.

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 bath is OVER or UNDER temperature..

- 3--- Preset alarm - The controller 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 (1000 Ω RTD). The connections to the probe and the probe condition should be investigated.

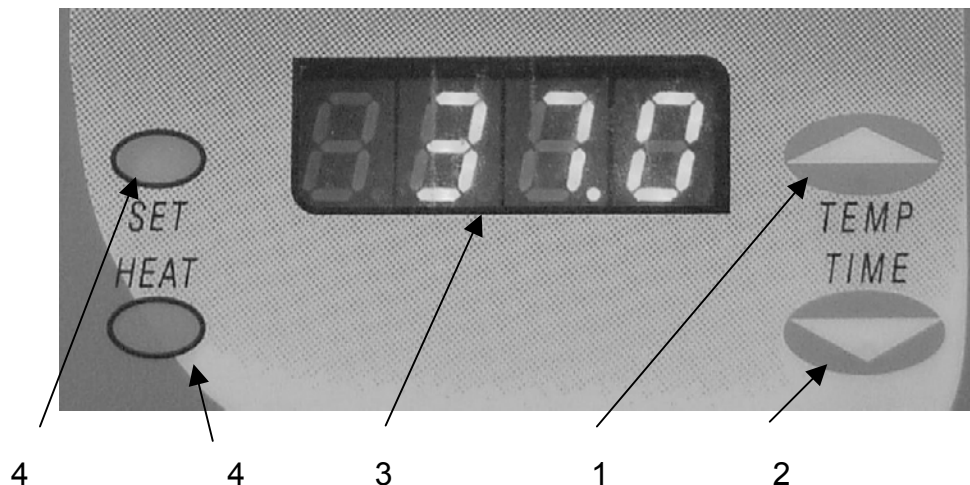
- 9--- This is a WATCHDOG alarm - The Electronic PCB has failed - Replace the controller.

CALIBRATION

Calibration should be carried out at 37.0°C or at the temperature of interest, with a reference thermometer probe in a suitable position and with the bath correctly filled with water and UNLOADED. Any polystyrene spheres or lid used during normal operation should be fitted. The calibration temperature must be within the achievable operating range of the bath. (**NB:** factory calibration is at 37°C).

- 1) Place the Calibration Thermometer probe so that the measured temperature is representative of the bath temperature, close the bath LID and set the controller for 37.0°C or the temperature of interest, allow at least 2 hours to stabilise **after** reaching the set point.
- 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 and 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 `----` and then 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 will then briefly show another `---` and the controller will resume its role of normal operation.
NB: If a `[[[[` sign appears on the display the cabinet is OUTSIDE its calibration display range and calibration should be performed at a slightly higher temperature.
- 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



- 1 Temperature adjustment button.
(Also used to adjust set points)
- 2 Time adjustment button.
(Also used to adjust set points)
- 3 LED Display - Gives readout of temperature in degrees centigrade OR elapsed time in hours and minutes.
- 4 LED Indicators - Lower LED indicates when the element is ON. Top LED indicates when controller is in SET mode.

SIDE VIEW CONTROLLER - wording

BASIC INFORMATION: READ OPERATING AND SERVICE INSTRUCTIONS BEFORE USE.

For optimum performance ensure water level is maintained 5cm below controller chassis. Safety cutout will operate on low water level or an overtemperature condition above the controllers maximum temperature of 100°C.

No routine maintenance required. Refer Service to Qualified Service Technician.

DANGER: To avoid electric shock do not remove ends. No User serviceable components inside.

Qualified Service Technician: To reset safety Hi-Limit - isolate controller from mains, remove front end cap, push red plunger, replace end cap.
To remove controller - isolate from mains, remove end caps, undo front & rear captive screws, lift controller free of bath.

SECTION 4 THEORY OF OPERATION

This CONTHERM Digital Waterbath Controller uses a new single chip microprocessor electronic PID controller with a 1000Ω Resistance RTD probe as the temperature sensing element. The LED display gives a direct readout of SET POINT or bath temperature in degrees centigrade.

The operation of the ZP21WB 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 $10\text{mV}/^{\circ}\text{C}$. 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.

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

SECTION 5 TROUBLESHOOTING AND MAINTENANCE

MAINTENANCE

Occasional wiping with a damp cloth considerably enhances the external appearance. Similarly occasionally drain the bath and remove the adjustable tray and false floor, then wipe out the interior.

It is important to realize that while the stainless steel used in the construction of CONTHERM baths is of the highest quality, particles of ferric material, by rusting, will react and cause corrosion.

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

The circulating motor is fitted with long life pre-lubricated ball races, should it become noisy, service the unit immediately.

The stainless steel bath interior and shelves should be kept clean with a damp cloth.

Hi-Limit - The bath has a resettable Hi-Limit which is factory preset to 100°C dependant on the controller configuration. Should the Hi-Limit operate check the water level and if correct check the main control operation.

Operation of the Hi-Limit will cause ALL display indicators to go off.

To reset the Hi-Limit. Consult instructions on Controller side.

ELECTRICAL SAFETY

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

TROUBLESHOOTING:

- 1) **No Controller L.E.D's on**
 - Check power at electrical outlet
 - Check I.E.C inlet socket 5A fuse (unplug from wall socket FIRST)
 - Check Hi-Limit, reset if operated
 - Call Service Engineer

- 2) **Not Heating**
 - Check control temperature set above present temperature
 - Check that timer is NOT set to 0:00
 - Call Service Engineer

- 3) **Temperature Unstable**
 - Check liquid level
 - Check stirrer operating
 - Check operating conditions (ie: ambient temperature and mains voltage)
 - Call Service Engineer

- 4) **Temperature Variation Too Great (within bath)**
 - Check stirrer operating
 - Check that the bath is not overloaded with samples
 - Call Service Engineer

- 5) **Hi-Limit Control Activated**
 - Check liquid level
 - Check temperature not above allowable maximum of 100°C
 - If okay reset high limit (consult side of controller)
 - Call Service Engineer.

WARNING

Danger from electric shock exists within the Controller **always** remove lead from outlet before opening the Controller or touching any electrical parts. This unit should **ONLY** be serviced by a **suitably qualified technician**.

If operating the bath at temperatures **above 60°C**, the lid may be **HOT!** Use extra care when opening the hinged lid or removing any lift off lid as **STEAM** may be released! It is recommended that the operator use heat resistant gloves when introducing or removing samples from the bath.

For further service please contact the Authorized **Agent** or **CONTHERM Scientific Limited**.

SECTION 6 PARTS LISTS AND SPARES

End Caps: plastic, complete with screws	WB324
Element: 870W Model 350D/360D/370D	WB342
Element: 1100W Model 380D	WB343
Hi-Limit Preset	WB344
Motor, complete with shaft and propeller	WB320
P.C. Board, ZP21WB/LC	WB340
Pump Assembly	WB327
Sensor `1000 Ω RTD' type, ZP21WB Sealed	WB341

PACKING INSTRUCTIONS
 Installation Quality Check List (IQ)
 (Leave with Cabinet)



CONTHERM CAT.No
 (Digital Waterbath)

App No:

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

<u>Accessories Supplied</u>	<u>Qty</u>	<u>(IQ)Checked</u>
Operating Manual	[]	[]
IEC Mains Lead	[]	[]
Other.....	[]	[]
Waterbath Undamaged when Packed	[]	When Received []
Certificate of Compliance Completed	[]	[]
Ensure waterbath has been fully tested and approved for packing .	[]	[]
Ensure data plates are fitted.	[]	[]
Interior and exterior clean.	[]	[]
Waterbath Installed as per installation Instructions: <i>(See SECTION 3 of the operating manual)</i>		[]

PACKED BY

(IQ)CHECKED BY

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

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

OPERATION VERIFICATION INSTRUCTIONS
 Operational Quality Check List (OQ)
 (Leave with Cabinet)



CONTHERM CAT.No
 (Digital Waterbath)

App No:

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

<u>Operation</u>	<u>(OQChecked)</u>	<u>Comments</u>
LED Display working <i>(Manual SECTION 3 – 8888's during powerup)</i>	[]	
Able to adjust SET POINTS <i>(Manual SECTION 3 – set for 37.0°C)</i>	[]	
Temperature stable @ 37°C <i>(Allow cabinet to stabilise at temperature for 1 hour)</i>	[]	
Check Alarm Operation <i>(Add HOT water to raise temperature above Hi-Limit)</i>	[]	
Check Alarm Cancellation <i>(Manual SECTION 3 – Press 'temp' button until 'set' led on)</i>	[]	
Calibrate at temperature at 37°C <i>(Manual SECTION 3 – Calibration @ 37 or temperature of interest)</i>	[]	

Operational Performance (OQ) Satisfactory: [Y][N]

(OQ)CHECKED BY

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

PERFORMANCE VERIFICATION INSTRUCTIONS

Performance Quality Check List (PQ)
(Leave with Cabinet)



CONTHERM CAT.No
(Digital Waterbath)

App No:

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

<u>Operation</u>	<u>(PQChecked)</u>	<u>Comments</u>
Check Temporal Variation @ 37°C <i>(Refer manual for specification, cabinet empty, center only.)</i>	[]	

Performance Verification (PQ) Satisfactory: [Y][N]

(PQ)CHECKED BY

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

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) **Waterbath Details** **Catalogue No: CAT** **(ZP21WB)**

Appliance No:

Date Installed:

Company:

.....

.....

COUNTRY:

Contact Name:

PHONE: **Email:**