MODEL 798
HYDRA
LIQUID BATH

Isotech North America
158 Brentwood Drive, Unit 4
Colchester, VT 05446

Phone: (802)-863-8050
Fax: (802)-863-8125

www.isotechna.com
sales@isotechna.com

CONTENTS

GUARANTEE

This instrument has been manufactured to exacting standards and is guaranteed for twelve months against electrical break-down or mechanical failure caused through defective material or workmanship, provided the failure is not the result of misuse. In the event of failure covered by this guarantee, the instrument must be returned, carriage paid, to the supplier for examination, and will be replaced or repaired at our option.

FRAGILE CERAMIC AND/OR GLASS PARTS ARE NOT COVERED BY THIS GUARANTEE.

INTERFERENCE WITH, OR FAILURE TO PROPERLY MAINTAIN THIS INSTRUMENT MAY INVALIDATE THIS GUARANTEE.

RECOMMENDATION

The life of your **ISOTECH** Instrument will be prolonged if regular maintenance and cleaning to remove general dust and debris is carried out.

Serial No:.....

Date:.....

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EMC INFORMATION

This product meets the requirements of the European Directive on Electromagnetic Compatibility (EMC) 89/336/EEC as amended by EC Directive 92/31/EEC and the European Low Voltage Directive 73/25/EEC, amended by 93/68/EEC. To ensure emission compliance please ensure that any serial communications connecting leads are fully screened.

The product meets the susceptibility requirements of EN 50082-1, criterion B.

Symbol Identification	Publication	Description
	ISO3864	Caution (Refer to Handbook)
	IEC 417	Caution, Hot Surface

ELECTRICAL SAFETY

This equipment must be correctly earthed.

This equipment is a Class 1 Appliance. A protective earth is used to ensure the conductive parts can not become live in the event of a failure of the insulation.

The protective conductor of the flexible mains cable which is coloured green/yellow MUST be connected to a suitable earth.

The blue conductor should be connected to Neutral and the Brown conductor to Live (Line).

Warning: Internal mains voltage hazard. Do not remove the panels.

There are no user serviceable parts inside. Contact your nearest Isotech agent for repair.

Voltage transients on the supply must not exceed 2.5kV.

Conductive pollution, eg. Carbon dust, must be excluded from the apparatus. EN61010 pollution degree 2.

ENVIRONMENTAL RATINGS

Operating Temperature	5-50°C
Relative Humidity	5-95%, non condensing

HEALTH AND SAFETY INSTRUCTIONS

1. Wear appropriate protective clothing.

2. Operators of this equipment should be adequately trained in the handling of hot and cold items and liquids.

3. Do not use the apparatus for jobs other than those for which it was designed, ie. the calibration of thermometers.

4. Do not handle the apparatus when it is hot (or cold), unless wearing the appropriate protective clothing and having the necessary training.

5. Do not drill, modify or otherwise change the shape of the apparatus.

6. Do not dismantle the apparatus without disconnecting it from the supply and leaving time for it to reach ambient temperatures.

7. Do not use the apparatus outside its recommended temperature range

8. The apparatus is protected by an over temperature circuit, ensure correct settings at all times.

SPECIFICATION

798EHT		Ambient to 300°C
798 H		Ambient to 200°C
798 M		-40 to 125°C
798 L		-80 to 125°C
Volume		150mm diameter, 300mm deep (5 litres)
Dimensions		400mm Wide 615mm Deep 800mm Height
Absolute Stability		±0.01°C
Best Comparison Accuracy		±0.002°C
Communications		RS422
Uniformity 125°C (oil)		Vertical 0.002 Horizontal 0.001 to 0.0025°C
Uniformity 200°C (oil)		Vertical 0.005 Horizontal 0.001 to 0.0035°C
Safety		Compliant to CE Regulations
Power	- 798EHT	800W 110V 50/60Hz 230V 50/60Hz
	798H	800W 110V 50/60Hz 230V 50/60Hz
	798M	1.5 KW 110V 50/60Hz 230V 50/60Hz
	798L	2.5 KW 110V 50/60Hz 230V 50/60Hz

ON ARRIVAL

Check List.

You should have the following parts,

1. Main Bath Assembly
2. One overflow and one drain pipe
3. Lid
4. This handbook
5. PC Interface Lead (yellow) and Adapter

Optional accessories are available and will only be present if specified on your order.

In the unlikely event of any items arriving damaged please retain the packing materials (which may need to be inspected later) and then contact your supplier.

ELECTRICITY SUPPLY

Before connecting to the electricity supply please familiarise yourself with the parts of the handbook relevant to your model.

Your unit's supply voltage requirement is specified on a plate on the instrument along with the Serial number.

The apparatus is provided with an approved power cord.

Take care to ensure that the old plug is disposed of safely.

The cable is colour coded as follows:

COLOUR	FUNCTION
Green/yellow	Earth (Ground)
Brown	Live (line)
Blue	Neutral

Please ensure that your unit is correctly connected to the electricity supply.

THE APPARATUS MUST BE CORRECTLY EARTHED (GROUNDED)

IMPORTANT READ THIS NOW!

CHILLERS

The M and L models include an internal mechanical refrigeration unit. During transit the internal oil can be displaced. On arrival the equipment should be left for 24 hours in an upright position to allow any displaced oil to settle.

SETTING UP

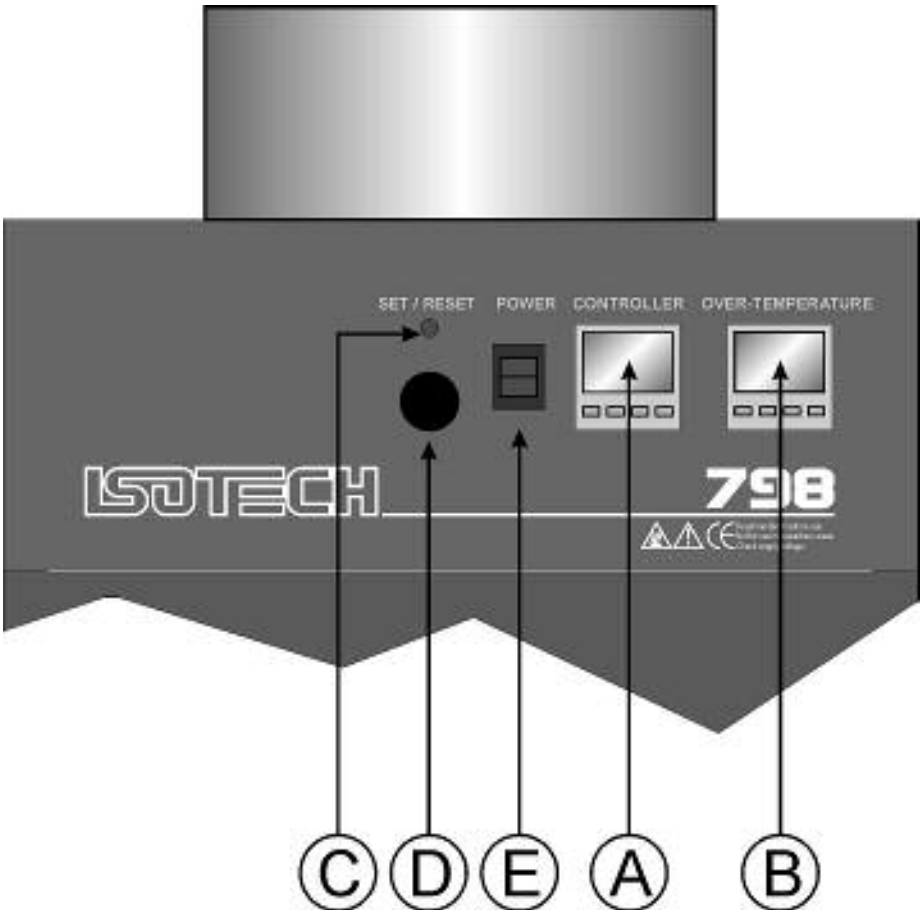
The whole manual should be carefully read before using the bath, then set the bath up as follows.

Connect the drain pipe to the drain tap and the overflow pipe to the side overflow pipe. Place a suitable container under the overflow pipe. Ensure the tap is shut, i.e. lever vertical. If the equalising block is to be used it should be placed in position now.

Fill the bath with suitable liquid, water is probably best for initial testing. Fill the bath until the level is 25 mm below the top of the round central calibration tube

ALWAYS ISOLATE THE BATH FROM THE ELECTRICAL SUPPLY WHEN CHANGING LIQUIDS

FRONT PANEL CONTROLS



A **TEMPERATURE CONTROLLER**

B **OVER-TEMPERATURE CONTROLLER (SAFETY)**

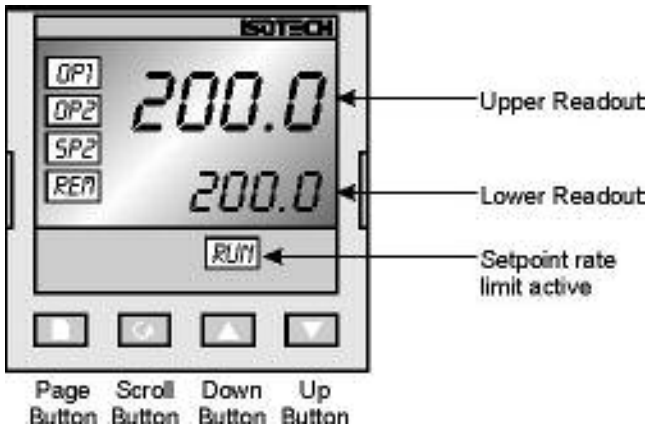
C **HEATER ENABLED**

D **SET / RESET BUTTON**

E **ON / OFF SWITCH**

USING THE CONTROLLER

FRONT PANEL LAYOUT



A. THE TEMPERATURE CONTROLLER

The controller has a dual display, the upper display indicates the nominal liquid temperature, and the lower display indicates the desired temperature or setpoint.

ALTERING THE SETPOINT

To change the setpoint of the controller simply use the UP and DOWN keys to raise and lower the setpoint to the required value. The lower display changes to indicate the new setpoint.

ADVANCED CONTROLLER FEATURES

SETPOINT RAMP RATE

By default the bath is configured to heat (and cool) as quickly as possible. There may be some calibration applications where it is advantageous to limit the heating (or cooling rate).

An example might be when testing bimetallic thermostats, by forcing the bath to heat at a controlled rate it is easier to determine the temperature at which the thermostat changes state.

The bath can have its heating rate limited with the Setpoint Ramp Rate feature. This feature is accessed from the Scroll key. Depress the key until the display shows,

SPrr

On the Upper Display, the lower display will show the current value from OFF (default) to 999.9. The desired rate is set here with the UP and DOWN keys, the units are °C/min.

When the SPrr is active the controller display will show "RUN", the lower setpoint display will now automatically update with the current value, known as the working setpoint. The setpoint can be seen by pressing either the UP and DOWN key.

The Setpoint ramp rate operates when the bath is heating and cooling.

INSTRUMENT ADDRESS

The controller has a configurable "address" which is used for PC communications. Each instrument has an address, this allows several instruments to be connected in parallel on the same communications bus. The default value is 1. This address would only need to be changed if more than one bath is connected to the same PC port.

To check the Address value press the scroll key until the top display indicates,

Addr

The lower display will show the current value that can be modified with the UP and DOWN keys.

MONITORING THE CONTROLLER STATUS

A row of beacons indicate the controllers status as follows,

OP1	Heat Output
REM	This beacon indicates activity on the PC interface

UNITS

Momentary pressing the Scroll key will show the controller units °C or °F.

DIAGNOSTIC ALARMS

These indicate that a fault exists in either the controller or the sensor.

CONTROLLER ERROR MESSAGES

The instruments include powerful diagnostics and in the unlikely event of an internal failure, or a sensor error, one of the following error messages may be displayed.

Display shows	**What it means**	**What to do about it**
EE.Er	*Electrically Erasable Memory Error:* The value of an operator or configuration parameter has been corrupted	Contact Isotech
S.br	*Sensor Break:* Input sensor is unreliable or the input signal is out of range.	Contact Isotech Check rear panel to ensure connection of both control and over-temperature sensors
HW.Er	*Hardware error* : Indication that a module is of the wrong type, missing or faulty	Contact Isotech
LLLL	*Out of Display range, low reading*	Contact Isotech
HHHH	*Out of Display range, high reading*	Contact Isotech
Err1	*Error 1: ROM self-test fail*	Consult Isotech
Err2	*Error 2: RAM self-test fail*	Consult Isotech
Err3	*Error 3: Watchdog fail*	Consult Isotech
Err4	Error 4: Keyboard failure Stuck button, or a button was pressed during power up.	Switch the power off and then on without touching any of the controller buttons.
Err5	*Error 5: Input circuit failure*	Consult Isotech
Pwr.F	*Power failure*. The line voltage is too low	Check that the supply to the controller is within the rated limits

B. OVER TEMPERATURE CONTROLLER

This device is an important safety feature. It has its own temperature sensor and will isolate the heater if the temperature exceeds the set temperature. It should be set slightly higher, perhaps 10 - 20°C higher than the working temperature or to the maximum safe temperature of the fluid in use. Which ever is the **lowest** value. IT MUST BE SET IN THIS WAY TO ENSURE SAFE USE OF THE BATH. Suitably set it will allow for protection against component failure and also operator error when setting the controller, either from the front panel or remotely from a computer.

The over temperature controller is used in conjunction with the Set / Reset Button.

The models with built in cooling have an audible alarm which will sound when the bath is switched on but the Set / Reset button has not been set. This warns that the heater has not been enabled and the bath will cool to its minimum operating temperature, this could freeze the liquid and possibly damage the bath or its contents.

C. SET / RESET BUTTON

When the bath is first switched on the heater is disabled. When this button is pressed the heater will become enabled and the light next to the button will become illuminated. If the bath temperature exceeds the value set in the over temperature controller the heater will no longer be enabled and the light will turn off.

D. HEATER ENABLED / DISABLED LIGHT AND SOUNDER

As mentioned above the light will be lit when the heater is enabled and will be off when the heater is disabled.

E. ON / OFF SWITCH

OPERATION AND INITIAL TESTING

Set the bath up as described in the earlier "Setting Up Section". For convenience it is suggested that a newly received bath should be tested at 50°C with water as the operating liquid.

Connect the bath to the supply and switch on.

DO NOT PRESS THE SET BUTTON YET!

1. Set the over temperature controller to a suitable value, see earlier.

2. Set the set point of the temperature controller to the desired value (50.0°C).

3. Press the Set / Reset Button. The bath should now reach and control at the target set point.

   The bath may now be used for calibration.

CHOICE OF LIQUIDS

The choice of liquid is important. If it is too viscous at the operating temperature then the bath may not perform correctly. Other criteria also need to be met, such as safety, operating range and fume emission for example. Isotech is able to supply a number of fluids for various temperature ranges, refer to Databook 2.

Unfortunately, there is not one fluid which can be used over the whole operating range of the bath.

Beware of oils that are claimed to work from below ambient to over 100°C. Whilst we do not supply or recommend such liquids, others do. It is our experience that such oils absorb moisture from the air when used below the dew point. Then at temperatures around 100°C this moisture boils and can lead to the oil spilling from the top of the bath. Even without the boiling risk, the oil is soon spoilt by the ingressions of moisture and the oil has to be replaced regularly, which can be an expensive task. It will be seen that when changing fluids from say water to oil that it is important that ALL the water has been removed before adding the oil.

As oils approach their upper operating limit fumes become significant and fume extraction becomes essential. Isothermal Technology manufactures a Fluidised Alumina Bath, the Ayries Bath which overcomes the limitations of oils and may be used to 700°C without fuming problems.

Below ambient we use a mixture of methanol and water. Methanol is poisonous and has a low flash point. It needs to be used very carefully by those suitably trained and aware of the dangers if handled inappropriately. As local safety requirements vary not only from country to country but also from organisation to organisation the safety aspects of these fluids should be determined with the user's safety officer.

LIQUID LEVEL

All liquids expand as they are heated and contract when they cool.

The bath has been designed to allow for varying liquid volumes and also features an overflow system which prevents the liquid from spilling from the top of the bath.

The optimum liquid level with the motor off **at the operating temperature** is for the liquid to be approximately 25mm from the top of the calibration tube.

CHANGING LIQUIDS

If possible it is best to plan so that liquids do not need to be frequently changed. This may be achieved by liquid choice, determining convenient calibration points or having more than one bath - each with a different liquid to cover the routine calibration range.

To change the liquid,

1. Disconnect from the supply.

2. Ensure the liquid is at a safe handling temperature. Neither too hot nor too cool then open the drain tap.

3. Drain the liquid into clean containers of adequate capacity, properly labelled for future use.

4. Clean the bath. Detergent and absorbent paper will assist. If the bath has been used with an oil it can be helpful to re fill with water and detergent and to allow the mixture to circulate before draining again.

5. Close the tap.

USING THE COOLING COIL (H MODEL ONLY)

This bath (H) has internal cooling coil fitted. Access for the cooling coil is via two bulkhead fittings on rear panel (labelled cooling coil).

Care must be taken using any cooling medium under pressure especially using water at temperatures exceeding 100°C.

CLEANING AND MAINTAINING THE BATH

The bath lends itself to easy cleaning and maintenance.

To clean the inside of the tank assembly simply remove the lead connections from the rear of the unit by unplugging.

Remove the four securing screws on the top panel using a 3mm hex key.

Simply lift the top panel and motor assembly clear as one. This will give access to the entire tank assembly.

This process is recommended after long periods of use or while changing liquids.

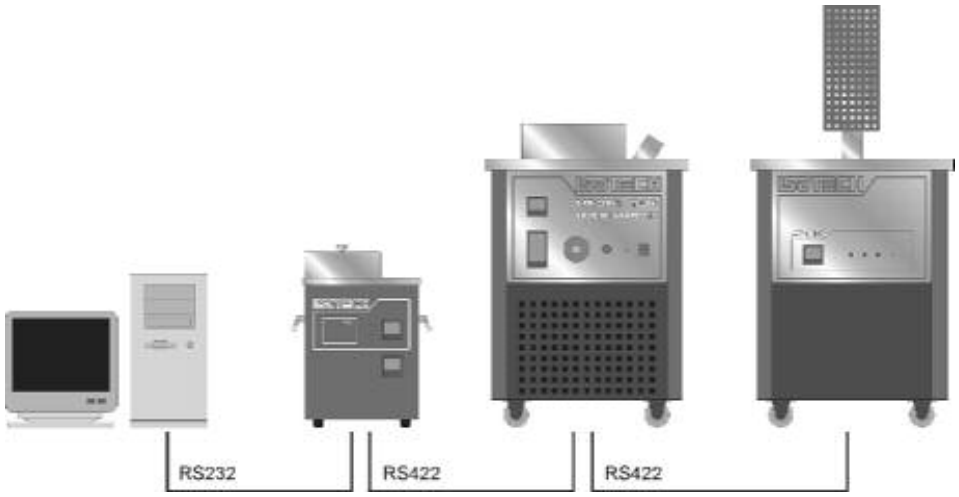
Removal of dust from the front and rear of the unit is recommended as necessary but especially after long periods of use.

All the heating and coding components of the bath are located internally and should require no maintenance. In the event of a component failure contact Isotech for assistance.

USING THE PC INTERFACE

The bath includes an RS422 PC interface and a special converter cable that allows use with the a standard RS232 port. When using the bath with an RS232 port it is essential that this converter cable is used. Replacement cables are available from Isotech, part number ISO-232-432. A further lead is available as an option, Part Number ISO-422-422 lead which permits up to 5 instruments to be daisy chained together.

The benefit of this approach is that a number of calibration baths may be connected together in a "daisy chain" configuration - and then linked to a single RS232, see diagram.



Note: The RS 422 standard specifies a maximum lead length of 1200M (4000ft). A true RS422 port will be required to realise such lead lengths. The Isotech conversion leads are suitable for maximum combined lead lengths of 10M that is adequate for most applications.

Connections

For RS232 use simply connect the Isotech cable, a 9 to 25 pin converter is included to suit PCs with a 25 pin serial converter.

RS422 Connections

Pin	Connection
4	Tx+ A
5	Tx- B
8	Rx+ A
9	Rx- B
1	Common

Using the Interface

The models are supplied with Cal Notepad as standard. This easy to use package is compatible with MS Windows 9x. A handbook for Cal NotePad can be found on the first installation disk in Adobe PDF format. If required a free Adobe PDF reader can be downloaded from, www.adobe.com.

CAL NOTEPAD

Cal Notepad can be used to log and display values from the bath and an optional temperature indicator.

Minimum System Requirements

CNP requires Windows 95 / 98, a minimum of 5Mb of free hard drive space and free serial ports for the instruments to be connected.

Development

CNP was developed by Isothermal Technology using LabVIEW from National Instruments.

License

Use of the Cal NotePad software program "CNP" is as granted in this license agreement. In using the CNP
software the user "licensee" is agreeing to the terms of the license. You must read and understand the terms of this license before using CNP.
1, This license permits licensee to use CNP software on a single computer. The user may make copies for back up and archival purposes freely as long as the software is only ever in use on a single computer at any one time. Please enquire about multi-user licenses.
2, CNP is protected by international copyright laws and treaties. CNP must not be distributed to third parties.
3, CNP must not be reversed engineered, disassembled or de-compiled. Licensee may transfer the software to a third party provided that no copies or upgrades of CNP are retained.
4, It is the responsibility of the user to ensure the validity of all stored results and printed certificates. Isothermal Technology Ltd accept no responsibility for any errors caused by inappropriate use, incorrect set up or any other cause; including defects in the software.
5, Limited Warranty. Isothermal Technology warrants that CNP will perform substantially as described in this manual for a period of 90 days from receipt. Any distribution media will under normal used be guaranteed for a period of 90 days.

NO OTHER WARRANTIES, EXCEPT AS STATED ABOVE. The software and documentation is provided "as is" without warranty of any kind and no other warranties (either expressed or implied) are made with regard to CNP. Isothermal Technology does not warrant, guarantee or make any representations regarding the use or results of the use of the software or documentation and does not warrant that the operation of CNP will be error free.

In no event will Isothermal Technology, its employees, agents or other associated people be liable for direct, indirect, incidental or consequential damages, expenses, lost profits, business interruption, lost business information or other damages arising out the use or inability to use CNP. The license fee reflects this allocation of risk.

CNP is not designed for situations where the results can threaten or cause injury to humans.

Installing Cal NotePad

1. Insert CNP DISK 1 into the disk drive
2 Click on the START button on the task bar, select RUN, type A:\SETUP (Where A: is your drive letter) then click OK
3 Follow the prompts which will install the application and necessary LabVIEW run time support files.
4 Should you ever need to uninstall the software then use the Add/Remove Programs option from the Control Panel.

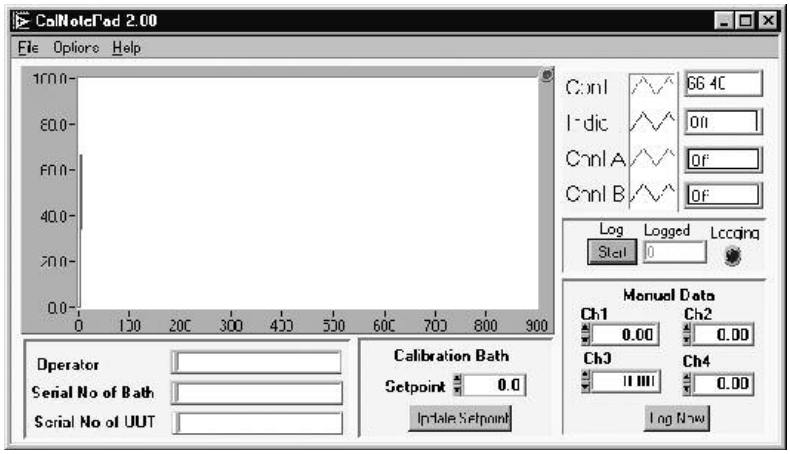
Starting Cal NotePad

From a Standard Installation:

Click the START button

Highlight PROGRAMS

Select Isotech - Select Calpad



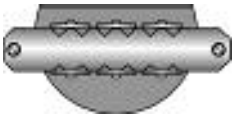
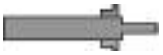
Protocol

The instruments use the "Eurotherm EI BiSynch Protocol"

If required, e.g. for writing custom software the technical details are available from our website at, www.isotech.co.uk/refer.html

ACCESSORIES

The following options are available:-

	Liquid Volume Lid	798-05-01
	Aluminium Equalising Block, 4 pockets, 8mm x 160mm deep	798-05-02A
	Copper Equalising Block, 4pockets, 8mm x 160mm deep	798-05-02B
	Standard Dual Cell Holder	798-05-03
	Standard Sensor Holder	798-05-04
	Carbon Dioxide Cell	463
	Mercury Triple Point Cell	17724
	Water Triple Point Cell	C12
	Gallium Melt Point Cell	17401
	Slim Gallium Melt Point Cell	17401M
	Indium Freeze Point Cell	17668M