

OPERATING MANUAL

NIMBUS PL

DIGITAL THERMOMETER

SENSOR INSTRUMENTS CO., INC. (JULY 2000)

<u>INTRODUCING THE NIMBUS PL</u>	3
<u>INSTALLATION</u>	4
LOCATING THE BASE UNIT:	4
INSTALLING THE BATTERY:	4
USING THE TRANSFORMER POWER:	4
CONNECTING THE PROBE:	5
<u>OPERATION</u>	5
SETTING THE INTERNAL CLOCK:	5
READING THE PRESENT TEMPERATURE:	6
MAXIMUM AND MINIMUM READINGS:	6
DAILY MAXIMUM AND MINIMUM TEMPERATURES:	7
HOURLY READINGS:	8
<u>USING A COMPUTER OR MODEM</u>	11
CONNECTING TO A COMPUTER OR MODEM:	11
USING A TERMINAL PROGRAM:	12
COMMAND REFERENCE:	16
<u>MAINTENANCE</u>	17
BATTERIES:	17
CLEANING:	17
<u>TROUBLESHOOTING</u>	17
AT POWER-UP:	17
• <i>Display is blank</i>	17
• <i>Display reads number much too small</i>	17
TEMPERATURE INDICATION:	18
• <i>Readings don't change</i>	18
• <i>Readings are always -99.9</i>	18
• <i>Readings are always 255.5</i>	18
• <i>Readings don't agree with NWS</i>	18
• <i>Temperature readings erratic</i>	18
• <i>Batteries run down quickly</i>	18
<u>APPENDICES</u>	19
SPECIFICATIONS:	19
• <i>Accuracy, °F</i>	19
• <i>General</i>	19
• <i>Electrical Specifications</i>	20
• <i>RS232 Pin Configuration</i>	20
MESSAGES ON THE DISPLAY	20

Introducing the Nimbus PL

The Nimbus PL Digital Thermometer offers the Nimbus features and accuracy at a lower price.

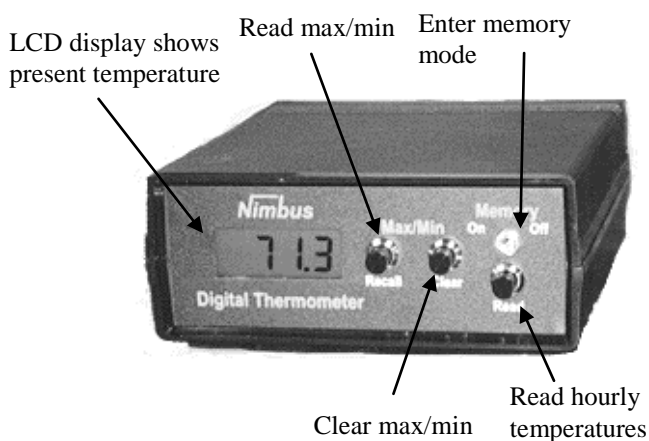
- **0.3°F accuracy**
- **Daily max and min for 35 days**
- **Hourly memory for 35 days**
- **Improved computer interface**
- **Ideal for networked applications**
- **Improved manual data retrieval**

Temperature products from Sensor Instruments:

- Nimbus Classic: Handsome wooden case.
- Nimbus Ultra: The same handsome appearance as the classic with improved features and the highest accuracy.
- Nimbus PL: economical Nimbus instrument with improved features
- TempTrax: computer based temperature measuring and alarms
- TempTrax2000: computer based temperature measurements with memory.

For additional information visit our web site at:

www.seninsco.com.



Installation

Locating the Base Unit:

The Nimbus base unit should be placed in a location convenient for viewing the display and for operating the controls. To maintain the highest accuracy do not place the unit near sources of heat or cold. In extreme climates do not place the base unit in unheated or uncooled spaces such as garages or sheds.

Installing the Battery:

The rear of the base unit contains a battery compartment. Open the compartment by pressing the tab of the battery compartment cover in the direction of the arrow, pulling the cover gently out, and removing the cover. Clip the battery terminal connector onto the 9v alkaline battery (it goes on only one way), insert the battery into the compartment, and close the cover. The unit is now on. This battery is for backup in case of loss of commercial power. It will last about five days. When the battery becomes low an indication is given on the display by a flashing “L” in the leftmost character.

Using the transformer power:

Plug the wall transformer into an outlet (115v, 60Hz) and then plug the connector on the wall transformer wire into the rear of the base unit. The jack is located on the lower right of the panel looking at the unit from the rear. Be sure that a light switch will not inadvertently remove power to the transformer.

**Use only the transformer
supplied with the unit.**

Connecting the Probe:

There is a circular connector on the rear panel of the instrument. Insert the plug into the connector. The plug and connect are keyed so that it can be inserted in one orientation only.

Operation

- **Setting the Internal Clock**
- **Reading Present Temperature**
- **Reading Maximum and Minimum Temperatures**
- **Reading Daily Maximum/Minimum Temperatures**
- **Reading Hourly Temperatures**

Setting the Internal Clock:

- Buttons control setting hour, 10's of minutes, unit minutes.

Hold down the [**Max/Min Recall**] button for about 2 seconds and simultaneously flip the [**Memory**] toggle switch to [**On**] – the screen will momentarily blank and **E3E.3** will be displayed, signaling successful entering of the “Time Mode.” Release the [**Max/Min Recall**] button and the current time (as known by the instrument) will be displayed. The presence of the colon on the display indicates time mode. Setting the clock involves pushing various push-button switches. The buttons change the unit's time in the following ways:

1. [**Max/Min Recall**] – increments the hours in steps of one
2. [**Max/Min Clear**] – increments the minutes in steps of ten
3. [**Memory Read**] – increments the minutes in steps of one.

After the clock has been set to the desired time, flip the [**Memory**] switch back to off and the new time will take effect.

Note: When the time is reset the times of the daily max/min are not changed. For example, when changing to Daylight Saving Time, the previous times of highs and lows which were taken

at Standard Time remain the same. However, the hourly readings are adjusted to reflect the new times, lest the same time have two readings when setting the clock back an hour.

Reading the Present Temperature:

- LCD display shows the present temperature

The Nimbus digital thermometer normally indicates the present temperature. The reading is updated every 16 seconds. The **[Memory]** switch on the right should be in the **[Off]** position.

Maximum and Minimum Readings:

The Nimbus produces two maximum/minimum data sets, Global and Daily. The Global maximum/minimum allows the user to define the time period over which the maximum/minimum is recorded. The user “resets” the Nimbus at the beginning of a new time period and recalls the data at the desired end time. The Global maximum/minimum data set is independent of the internal clock. The Daily maximum/minimum is dependent on the internal clock using midnight to midnight at the standard time period. The Daily maximum/minimum is recorded with the actual time of occurrence within the Nimbus memory.

Global Maximum and Minimum

- **[Max/Min Recall]** shows max/min temperatures
- **[Max/Min Clear]** resets
- **[Memory] switch [Off]**

The Nimbus thermometer remembers the highest and lowest temperatures occurring in the period of time since it was last reset. To determine the maximum and minimum values, push in the button labeled **[Max/Min Recall]** and hold it in. The display will alternate between the two as long as the button is depressed. To clear the max/min depress the **[Max/Min Clear]** button for about 4 seconds until "**E2E.2**" is displayed, signaling reset complete (the display will momentarily go blank). If you were to then press the **[Max/Min Recall]**

button immediately after clearing, both the maximum and minimum reading would be the same (until a new max or min is measured).

Daily maximum and minimum temperatures:

- Memory switch and **[Max/Min Recall]** button give daily highs and lows and their times

The Nimbus thermometer remembers the highs and lows for the last 35 days and also records the times they occurred. This information is retrieved sequentially day by day. The reading of the 35 daily max/min values and the times of occurrence (as opposed to the "global" max/min) are initiated by moving the **[Memory]** switch to the left **[On]**.

Perform the following steps:

1. Push the **[Memory]** toggle switch to **[On]** (left). The display will go blank.

2. Press the **[Max/Min Recall]** button and the display will read the number of days back, beginning with the present day (00). For each day there are four pieces of information: the high temperature and the time, and the low temperature and its time. Press the button again and the display will read the high temperature for the day. Another push gives the time of the high. Pushing again gives the low, and once more gives the time of the low. When the button is pushed again the day backs up to 01, meaning one day prior to the present. Four more pushes give the highs and lows and their times for this day.

You can also press and hold **[Recall]** in to cycle through data faster.

Example: these are sample readings obtained by repeatedly pressing the **[Recall]** button:

0.0	zero days back; i.e., today
63.5	maximum temperature was 63.5
14:46	happened at 14:46 (2:46PM)
48.9	minimum temperature was 48.9
6:34	at 6:34
0.1	one day back (yesterday)
71.4	maximum temperature was 71.4
15:12	at 15:12
55.2	minimum temperature was 55.2
7:55	at 7:55
0.2	
	etc.

3. After day 34 (Note that 35 days of max/min includes today through day 35) the cycle repeats itself.
4. If you happen to accidentally skip past a reading and wish to go back to see what was missed flip **[Memory]** switch to **[Off]** and start over.
5. After retrieving the max/min data, flip **[Memory]** switch back to **[Off]** to display the current temperature.

Hourly Readings:

- **[Memory]** function shows hourly temperatures.
- **[Read]** button steps back by hour.
- **[Max/Min Recall]** button steps back by day.
- **[Max/Min Clear]** steps forward by day.

The Nimbus PL Thermometer records the present temperature in electronic memory at the beginning of every hour. At every subsequent hour, it records another reading. The readings stored are instantaneous values, not averages. When the 35

days have elapsed, the oldest reading is discarded and the new entered.

Move the **[Memory]** toggle switch at the right of the unit to the **[On]** position to enter the memory mode. The display will go blank (except for the decimal point). At this point you can begin using the buttons to control the day and time of the values you want to see. The buttons are used as follows:

1. **[Memory Read]** – moves time back one hour
2. **[Max/Min Recall]** -- moves time back one day
3. **[Max/Min Clear]** -- moves time forward one day

After you have entered memory mode momentarily push the **[Read]** button and the display will read the time of the last hourly reading followed by the temperature at that time. Pressing the **[Read]** button again, will display the time and temperature of the previous hour. Every time the button is pressed the instrument steps backward in time and displays the temperature at that time. Midnight is 00:00 hours and the clock is a 24 hour clock, i.e., 15:00 is 3:00PM. When you read past midnight the instrument automatically moves to the prior day.

Note: if you hold the button in, the time and reading will go by rather quickly. It takes about 24 seconds to scroll back 24 hours.

If the memory is read back to a time when the instrument was off, the corresponding memory locations will be empty. Their contents are the “zero” of the instrument and will appear as -99.9

At any point during memory read-back you can move forward or backward in time by one day. Depressing the **[Max/Min Recall]** button moves back in time one day a time while pressing the **[Max/Min Clear]** moves forward in time by one day.

Example: if the present time is 08:46

Button Pushed	Display	Meaning
[Memory On]	Blank	Now in Memory mode
[Read]	08:00	Time 08:00 hours. Last recorded reading.
	24.7	Temperature at 08:00 was 24.7
[Read]	07:00	07:00 hours
	23.8	Temperature at 07:00 was 23.8
[Recall]	01	One day previous
	31.1	Temperature was 31.1 at 07:00
[Read]	06:00	06:00 hours
	30.7	Temperature was 30.7 at 06:00
[Recall]	02	Two days back
	37.8	Temperature was 35.7 at 06:00
[Recall]	03	Three days back
	34.7	Temperature was 34.7 at 06:00
[Clear]	02	Back up to two days back
	37.8	temperature was 37.8
		Etc.

You can forward or backwards through the last day (34) and continue with day 00 or 33, respectively.

Hint: The features example above illustrates a useful capability. You can step back to a particular hour, and then step back day by day to read the temperature at that same hour every day.

Important: When you have finished retrieving the data remember to throw the **[Memory]** toggle switch **[Off]** so that the instrument will read the current temperature.

Using a Computer or Modem

Connecting to a computer or modem:

The Nimbus PL Digital Thermometer is designed to connect directly to a computer for data display and retrieval or to a modem for remote data retrieval in networked applications. It has a nine pin male connector on the rear of the base unit for that purpose.

To connect to a modem, use a cable that connects to the Nimbus with a nine pin female connector on one end and has a 25 pin male connector on the other to plug into the modem. This is a standard RS232 serial cable (**NOT null-modem**) that is widely available (Radio Shack part #26-269).

To connect to a computer, use a cable that connects to the Nimbus unit with a nine pin female connector and has the appropriate connector on the other end that is compatible with your xcomputer's serial port connector. This is also standard RS-232 serial cable; however this connection must be wired as a **null modem**.

DO NOT CONNECT THE UNIT INTO THE PRINTER PORT OF THE COMPUTER

Please note: Computers have different RS232 serial port connectors. Some use nine pin connectors, others use 25 pin connectors. If you are unsure of the configuration of your computer consult your computer manufacturer's users manual or contact the supplier of the computer. Sensor Instruments has no way of determining how your computer is configured, so our customer support cannot help with this.

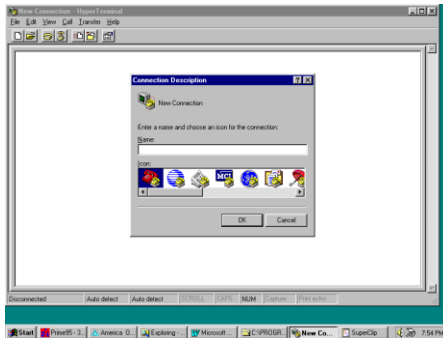
Using a Terminal Program:

To use a terminal program to communicate with the Nimbus PL thermometer, set up the program to communicate directly out of the external Com Port that is attached to the thermometer. You can communicate at 300,1200,2400,9600, or 19200 baud. Use eight data bits, no parity and one stop bit.

Example: Hyperterminal is widely used with Win95 and Win98. If this program is on your computer, start the program by clicking:

Start|Programs|Accessories|Hyperterminal

Sometimes “Accessories” is “Communications”. Alternatively, you can look for Hyperterminal in Windows Explorer by using Tools|Find.

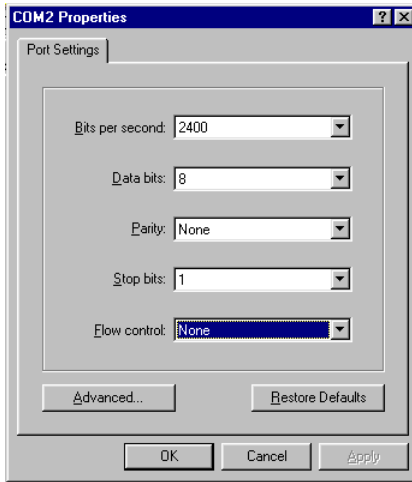


Type a name in the box and click on OK. The window shown below will appear.



Choose “Connect Using” whatever comport is connected to your external serial port. Here we have chosen Com2. Click [OK] and then click on the settings tab.

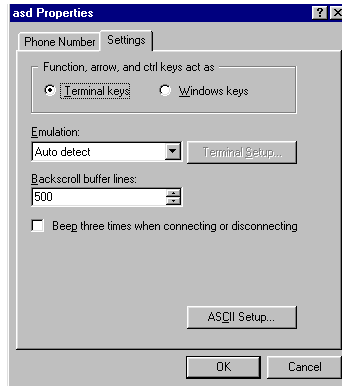
The window below then appears.



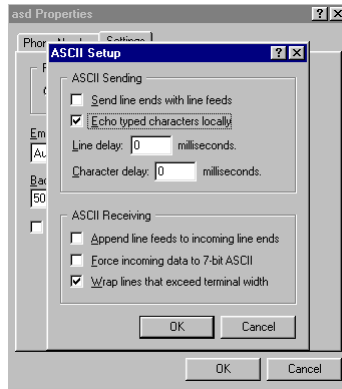
Click on Configure and choose port settings at the desired baud rate (300,1200,2400,9600, or 19200). Then select eight data bits, no parity, one stop bit, and no flow control. Then click OK. At this point the window will vanish, but with additional setup required click on File|Properties:



Select the Settings tab at the top of the window

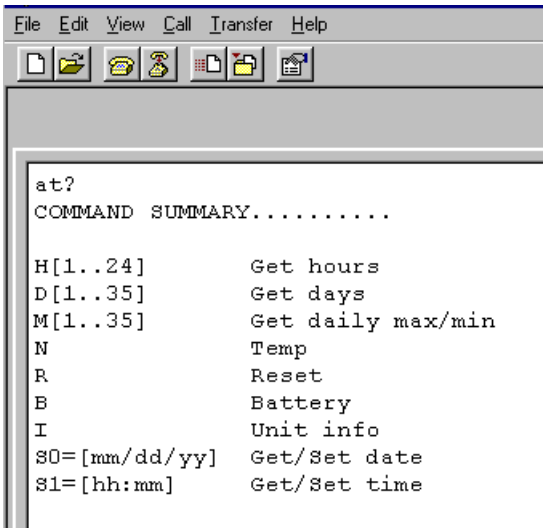


and then click on ASCII Settings



Select Echo typed characters and click the OK button to close the windows. The program is now set up to communicate with the Nimbus PL Thermometer.

The command set may be retrieved using command *at?*



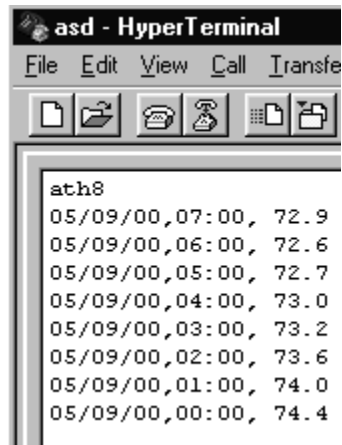
```
File Edit View Call Transfer Help
[Icons]
at?
COMMAND SUMMARY.....

H[1..24]          Get hours
D[1..35]          Get days
M[1..35]          Get daily max/min
N                Temp
R                Reset
B                Battery
I                Unit info
S0=[mm/dd/yy]    Get/Set date
S1=[hh:mm]       Get/Set time
```

Commands are preceded with “AT” and are case insensitive.

If you type, for example, **ats0**, the Nimbus will return the date. If you type **Ats1=14:26** the time will be set to 14:26 (2:26PM).

In the example we have typed **ath8** to retrieve eight hourly readings. Note that the date and time are given along with the data separated by commas. You can capture this data for other applications such as Excel using the Edit Command in Hyperterminal.



```
asd - HyperTerminal
File Edit View Call Transfe
[Icons]
ath8
05/09/00,07:00, 72.9
05/09/00,06:00, 72.6
05/09/00,05:00, 72.7
05/09/00,04:00, 73.0
05/09/00,03:00, 73.2
05/09/00,02:00, 73.6
05/09/00,01:00, 74.0
05/09/00,00:00, 74.4
```

Command Reference:

Commands are insensitive to case. Illegal commands or data result in a response of *error!*. The instrument times out in 10 seconds if a command is not completed. Commands are terminated by <Enter>.

Command	Response	Example/Comment
at?	Returns command summary	
ath[1...24]	Returns 1,2,...,24 hourly readings	ath1, ath2,...,ath24
atd[1...35]	Returns hourly readings for 1,2,...,35 days	atd1, atd2,...,atd35 35 days = 840 hourly readings
atm[1...35]	Returns daily max/mins and times for 1,2,...,35 days	
atn	Returns present temperature	
atr	Resets instrument	clears memory and daily data, rests calendar and clock
atb	Returns battery OK or Low	
ati	Gives unit identification	
ats0	Returns date	
ats0=mm/dd/yy	Sets date to mm/dd/yy	ats0=05/18/00 Note date set only via RS232
ats1	Returns time	
ats1=hh:mm	Sets time to hh:mm	ats1=15:56 sets to 3:56PM

MAINTENANCE

Batteries:

The instrument uses a nine-volt battery, which will normally last at least a year as backup and at least five days as primary power. When the battery needs changing, the leftmost digit on the display will flash **L**. The battery is located behind in the battery compartment in the rear of the unit. Use alkaline batteries only.

Cleaning:

The case of the base unit may be cleaned occasionally with a clean damp cloth.

TROUBLESHOOTING

At Power-Up:

- **Display is blank**
 1. No power. If the decimal point is missing check to be sure that power is supplied to the wall transformer and that the transformer is plugged into the unit. Be sure that the battery is fresh.
 2. **[Memory]** switch is in **[On]** position. Flip to the right **[Off]**.
- **Display reads number much too small**

Instrument left in **[Memory]** mode and is displaying a temperature from some previous time.

Temperature Indication:

- **Readings don't change**

Instrument left in [**Memory**] mode and is displaying a temperature from some previous time.

- **Readings are always -99.9**

Probe is disconnected or open. Check to be sure probe is plugged in and that cable has not been damaged.

- **Readings are always 255.5**

Temperature much too high or short in probe or cable.

- **Readings don't agree with NWS**

Temperatures vary widely even over short distances, therefore the values given by the Nimbus PL thermometer are not expected to concur with the local report. Each Nimbus is calibrated at the factory to exceed the specifications. Gross differences should be investigated.

- **Temperature readings erratic**

A common cause is from radio frequency energy coupling to the probe. Check to be sure that the cable isn't in the vicinity of computer or radio equipment.

- **Batteries run down quickly**

Be sure that the wall transformer is being supplied with power and that it is plugged into the base unit. Verify this by removing the 9 volt battery. If power is present the unit should continue to operate and the low battery indication "L" should appear.

**Use only the transformer
supplied with the unit.**

Appendices

Specifications:

- **Accuracy, °F**

Note: Accuracy specifications are given for the base unit only for the Nimbus PL since the unit is connected to existing MMTS sensors. Calibrations are performed using at least eight points with precision resistors.

Range	Ambient Conditions	Accuracy, °F
-40 to 120	55-85	0.3
-75 to 150	55-85	0.5
-40 to 120	32-100	0.5
-75 to 150	32-100	1.0

- **General**

Resolution	0.1°F
Measurement Interval	16 sec
Units	°F (°C factory option)
Memory	35 day hourly
Max/Min	Until reset
Daily max/min	35 days with times
Internal clock	Hr and min (24 hr clock)
Clock accuracy	30 sec/mo
Display	4 digit LCD ½" char ht.
Power	12v dc wall transformer
Battery	9v alkaline transistor
Battery life	5 days active, 1 yr standby
Size	6"W, 2.4"H 7.5"D
Shipping weight	Approx 4 lbs
Storage conditions	32°F - 140°F non condensing

RS232 Specifications

The Nimbus PL Digital Thermometer is configured as a DTE (Data Terminal Equipment) so that it communicates directly with modems (DCE's). To communicate directly with a computer requires a null modem connection.

- **Electrical Specifications**

Parameter	Min	Max	Units	Conditions
Input				
Range	-30	+30	volts	
Threshold low	0.8		volts	
Threshold high		2.4	volts	
Hysteresis	0.2	1.0		
Resistance	3	7	Kohms	
Output				
Voltage swing	+/- 5		volts	3Kohm to gnd
Output resistance	300		ohms	
Short circuit current	Appr	18	MA	Infinite duration
Slew rate	Typ	30	V/us	C=10pf, RL = 3-7K

- **RS232 Pin Configuration**

Pin	Function
2	Received data
3	Transmitted data
5	Signal ground

Messages on the Display

E1E.1	Power up initialization indicator
E2E.2	Max/Min has been cleared
E3E.3	Entering time set mode.
Lxx.x	Battery is low (x= any numeric)
255.5	Out of range high temperature (>150°F) or the probe or cable is shorted.
-99.9	No valid reading or probe open.

Temperature Facts

The record high temperature in North Dakota (121°F in July of 1936) is surpassed in only four other states (AZ,CA,NV,NM)

The record low temperature in Utah (-69°F in 1985) is surpassed only in AK (-80 in 1971) and Montana (-70 in 1954)

In Rapid City, SD the temperature dropped 62 degrees in two hours on January 12, 1911.

In Spearfish, SD the temperature rose 49 degrees in two hours, from -4°F at 7:30 to 45°F at 7:32 on Jan 22, 1943.

Concord, NH has over three weeks shorter growing season than Minneapolis, MN (142 vs 166 days).

Duluth, MN has over 10,000 heating degree days in a year, and it normally has about 100 in July.

In the “lower 48” Rhode Island has the lowest high temperature record, 104°F set in 1975.

Temperatures of Reference Points, International Practical Temperature Scale of 1968

Reference Point	Temperature Kelvins
Standard	
Triple point of water	273.16
Primary	
Triple point of hydrogen	13.81
Boiling point of hydrogen at 25/76 atm pressure	17.042
Boiling point of hydrogen at 1 pessure	20.28
Boiling point of neon at 1 atm pressure	27.102
Triple point of oxygen	54.361
Boiling point of oxygen at 1 atm pressure	90.188
Boiling point of water at 1 atm pressure	373.15
Melting point of zinc at 1 atm pressure	692.73
Melting point of silver at 1 atm pressure	1235.08
Melting point of gold at 1 atm pressure	1337.58

