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The PRISM III System
Model 590 Continuous Working Level Monitor
Data System Software Program for Windows
Operators Manual

Version 1.0

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PRISM III System

The PRISM III Continuous Working Level Monitoring (CWLM) in combination with the Data System Software Program for Windows, is a versatile instrumentation and software System for the measurement and reporting of Radon and Thoron levels in mining, industrial, and other confined work/living areas.

The Model 590 CWLM

The Model 590 CWLM is intended for operation as a station monitor, its physical design allows for operation in extremely hostile environments. The instrument features four alpha energy-counting windows. These windows are internally set to count the activity on the filter from RaA (6 MeV), RaC' (7.7 MeV), ThC' (8.8 MeV) and gross count (>2 MeV).

Instrument Description

- Rugged aluminum structure with stainless steel handle
- Instrument weight: 2.25 kg (4.95 lb)
- Internal Electronics: Pulse amplifier
 - Four channel Analyzer
 - Real time clock and calendar
 - Non-volatile data memory
 - Microcontroller with serial number identification
- Data collected in 10 minute intervals for up to 22 days
- Operational set-up and data acquisition through a serial communications link with a PC.
- An internal rechargeable battery can support up to 30 hours of autonomous operation. An AC adapter / battery charger is supplied for longer periods.

The Model 590 stores the four channels of alpha count data in a non-volatile memory. Each channels count data is integrated in 10 minute intervals, therefore, each 24 hour sampling period results in 144 x 4 (576) readings stored, the data is referenced to date and time by the systems real time clock and calendar. Following the predetermined sampling period, whatever the duration, and additional 21 readings per channel are stored during a 3.5 hour post-sample period. This extra data is required by the alphaNUCLEAR WL method for calculation of average thoron WL.

The data memory system has sufficient capacity to store up to 22 days of data before the earliest data is overwritten.

The Model 590 has two operating modes, it can be programmed (set-up) by a PC running the Data System Software Program to start sampling at a future date and time, then to stop at a later (up to 22 days later) date and time. The other operating mode does not require any set-up programming; instead, an automatic 24-hour sample period is initiated when the AC adapter/charger is plugged in with no programmed run registered. This mode of operation is called a “default run”. With either mode the sampling period is followed by the 3.5 hour decay counting period.

Communications between the Model 590 and a PC is established on the basis of each instrument's unique serial number. This feature can allow many instruments to be connected in parallel to the serial port of a PC, and has application for remote multiple site monitoring.

Specifications

- Filter: Model 501-2. Acrylic copolymer membrane, 0.8 micron
Gelman Versapor 800, custom cut.
- Pump: Positive displacement rotary vane.
- Flow Rate: 250 cc/minute standard (150 to 350 on request).
- Flow Regulation: Continuous, active constant flow (+/- 2%).
- Detector: Diffused junction silicon, 400 square mm area.
Sensitive to alpha particle radiation only.
Operating temperature range, -10 to +40 C.
- Power ON/OFF: Electric Key Plug. Momentary insertion in serial data connector
to switch internal power ON or OFF, prevents tempering.
- Status Indicator: LED flashing (2 modes), and static illumination.
Indicating the standby, pump running, and decay counting states.
- Serial Communications: 1200 baud, 8 data bits, no parity, one stop bit.

Minimum Operational System

- a) Model 590 Continuous Working Level monitor (CWLM)
- b) Model 552 AC Power Adapter/Battery Charger
- c) Model 534 Special serial communications cable.
- d) Model 505-2 Power ON/OFF Key
- e) Model 501-2 Pack of filters
- f) PC Software CD ROM
- g) Operators Manual

Optional Accessory:

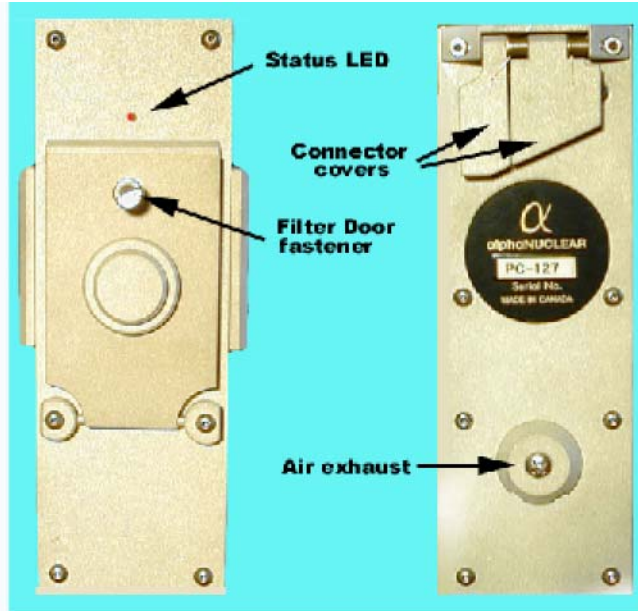
Model 507-2 Air Flow Measuring Adapter



Serial Data Port



AC Adapter/Charger jack



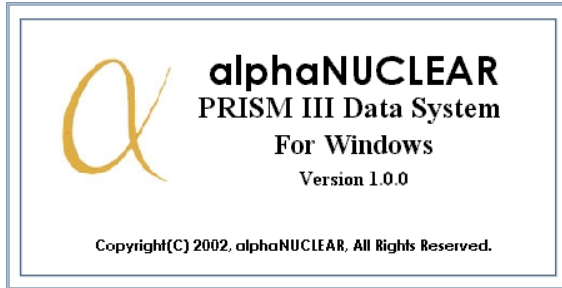
Front Panel

Rear Panel



Filter Door Open

PC Software Program



The program includes all the necessary functions for operation of the model 590 CWLM and for processing and reporting its data.

Software functions include

- a) Model 590 Characteristics database.
- b) Serial communications with CWLM.
- c) Automatic data acquisition and storage.
- d) Model 590 Job Set-up (programming CWLM).
- e) Data processing with Tokonami radon algorithm.
- f) Data processing with alphaNUCLEAR radon/thoron algorithm.
- g) Report generation and printing.
- h) Terminal mode for manual communications with CWL monitors.
- i) Manual data recovery.

User's PC Minimum Requirements

- a) iNTEL Pentium or equivalent, 200 MHz or faster.
- b) 16 MB of memory (RAM).
- c) Windows 98 or later.
- d) CD-ROM drive.
- e) Windows 98 compatible Mouse.
- f) RS-232 Serial port.
- g) SVGA Video Card and monitor (800 x 600 pixels minimum).
- h) At least 4 MB of free hard disk space.
- i) The PC clock set to the date and time format used by the series 590 WL monitors. Time, 24-hour format. Date, *year - month - day* (yyyy-mm-dd).

Software Installation

If the program is supplied on a CD-ROM disk, insert the disk into the CD-ROM drive of your PC. From the desk top Select **Windows Explorer**, select (click on) the CD-ROM drive, find the file *Set-up.exe* on the CD-ROM, and click on it.

The Windows installation wizard will guide you through the rest of the installation, and will request a name and location for a destination folder. For example C:\Program Files\Win590\.

If your copy of the program is a zipped e-mail attachment, click on the attachment then right click and select **Save As** and specify a destination folder (C:\Program Files\590Temp).

Use **Windows Explorer** to locate the **590Temp** folder and then unzip it within this folder, select *Set-up.exe* from the list of unzipped files and click on it.

The Windows installation wizard will guide you through the rest of the installation, and will request a destination folder name and location. e.g., C:\ProgramFiles\Win590\.

Use **Windows Explorer** to locate the new **Win590** folder. Open it and select the application file **Pb590** (the file with an alpha symbol identifier), right click on it, and then from the drop down menu select and click on **Create Shortcut**. Now the shortcut file (also with an alpha symbol identifier) **Shortcut to Pb590** will reside in the **Win590** folder. Right click on it, and then from the drop down menu select **Send to**, and then from the menu extension click on **Desktop**. An 'alpha' icon shortcut will now exist on your desktop screen.

IMPORTANT

To complete the installation, it is necessary to perform the following one time process.

From the desk top, click on the '**alpha**' icon to invoke the program.

Next click on **File** (left side of top **Main Menu** bar).

Now, click on **Exit** in the drop down menu to close the program.

Finally, reboot the computer (shut down and restart).

The program is now ready for normal operation.

The program installation Wizard created a folder named **Data**. This is the default folder for job data storage, and includes a folder named **Samples**.

The program includes a real raw data file (*EML26.590*) acquired from a model 590 CWL monitor. This file, located in the **Samples** folder, is included to demonstrate the report generation and printing functions of the program.

Software Operation

From the Desk Top, click the 'alpha' icon to invoke the program.
The Main Menu Screen will open.



The top **Main Menu Bar** includes the following choices, with their drop down functions:

- File...** *Open Job File* Select a job data set for processing.
- Page Set-up* Printer selection and set-up.
- Exit* Close program.

- Edit...** *590 Characteristics Record...* Add or edit 590's specific characteristics.
- Operator Record...* Enter or edit user data, this data will appear on printed reports.
- Site Record...* Enter or edit test site data, this data will appear on printed reports.

Model 590... *Set-up New Job*... Program 590 to perform a specific job.
***Get Data*...** Automatic acquisition data from 590 on conclusion of a job.
***Manual Data Recovery*...** Manual acquisition of data from 590.
***Terminal Mode*...** Manual (key board) communications with 590.
***Disconnect*...** Sever serial port RS232 connection with 590.

View...*Toolbar*... Show or hide toolbar.
***Status bar*...** Show or hide status bar.
***Refresh*...** Clears the Terminal Mode screen.
***Options...Report*...** Select method, Tokonami and report RaA as Bq/m³ or pCi/L, or alphaNUCLEAR and set options Binomial filter, Thoron calculation.
***Options...Serial Ports*...** Select serial communications on Serial Port 1, or Serial Port 2 (COM1 or COM2).

The **Toolbar** (second menu bar) has icons with the following functions (when active).

Icon: **Blank Page...*Set-up New Job*...** Program 590 to perform a specific job.
Icon: **Open Folder...*Open Job File*...** Select a job data set for processing.
Icon: **Floppy Disk...*Export and close Job file*...** Data/report in ASCII format is sent to a folder of choice, job file is closed.
Icon: **Printer...*Print report*...** Print current view of report.
Icon: **CRT Monitor...*Terminal Mode*...** For manual communications with 590.
Icon: **Wall Phone...*Disconnect*...** Sever serial link with 590.

The **Status Bar** (bottom of program screen) includes the following.

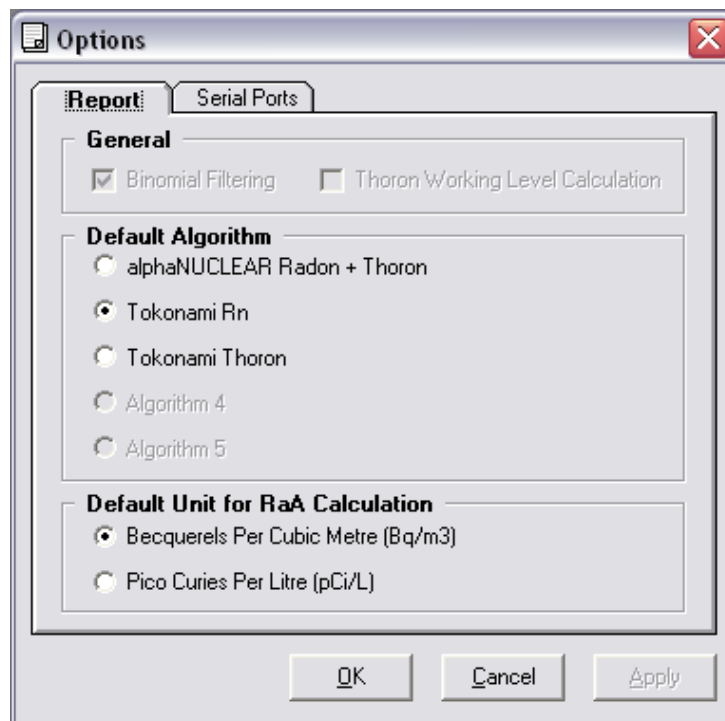
The left hand side describes the current activity.
The right hand side shows current date and time. Also there are three word processing aids that become active with certain entry screens (job descriptions).

REPORT GENERATION

First it is necessary to select the desired data processing and reporting method. There are three choices, the Tokonami Rn, Tokonami Thoron, or the original alphaNUCLEAR gross count radon method with or without average thoron calculation.

Note the top **Main Menu** bar across the top of the screen. Click on **View**, then on **Options** from the drop down menu.

The following screen overlay will open.



Select the desired calculation method.

If the **alphaNUCLEAR** method is selected, then two additional options become available under **General**. These options enable or disable a binomial data smoothing filter, and thoron WL calculation.

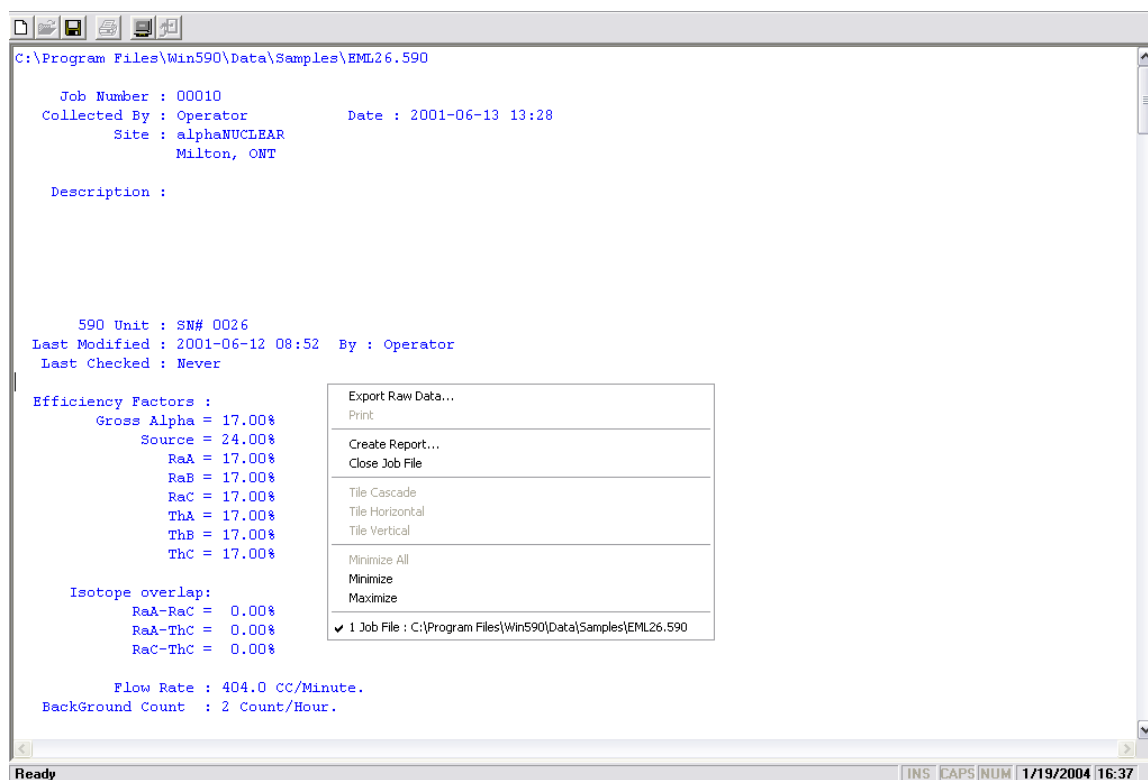
If the Tokonami radon method is selected, then under heading **Default Unit for RaA Calculation**, choose to have the RaA results reported as **Pico Curies Per Litre (pCi/L)** or **Becquerels Per Cubic Metre (Bq/m3)**.

Once these choices have been made, click **OK**. The selected options will remain in effect until intentionally changed.

Now select a data file for processing. On the **Toolbar** click the open folder icon in the left side, or click on **File** in the top **Main Menu** bar, and then click **Open Job File**. Next select and open the **Data** folder, then the **Samples** folder, and then click on the demonstration job file *EML26.590*.

The **Job File** screen will open, and will include a summary of conditions associated with this job, and the raw count data will list on screen.

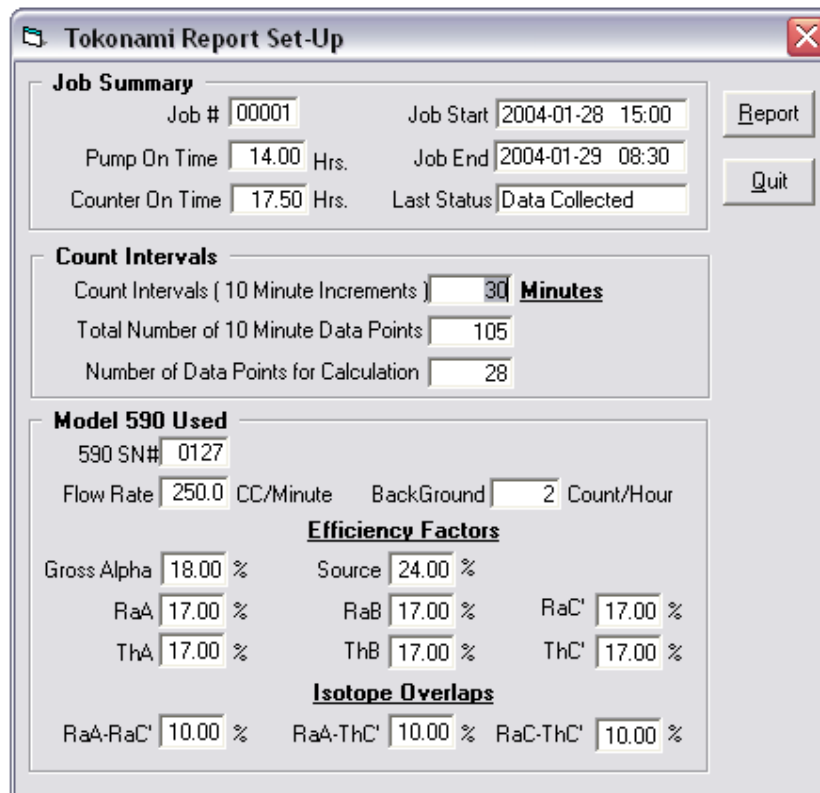
Click anywhere on this **Job File** screen to open the pop-up data processing menu overlay.



The pop-up data processing menu overlay contains three important choices for action related to the **Job File** screen, these are; *Export Raw Data*, *Create Report*, and *Close Job File*.

Click **Create Report**.

The **Report Set-up** window will open.
In this case, the Tokonami method had been selected.



Tokonami Report Set-Up

Job Summary

Job # Job Start

Pump On Time Hrs. Job End

Counter On Time Hrs. Last Status

Count Intervals

Count Intervals (10 Minute Increments) **Minutes**

Total Number of 10 Minute Data Points

Number of Data Points for Calculation

Model 590 Used

590 SN#

Flow Rate CC/Minute BackGround Count/Hour

Efficiency Factors

Gross Alpha % Source %

RaA % RaB % RaC' %

ThA % ThB % ThC' %

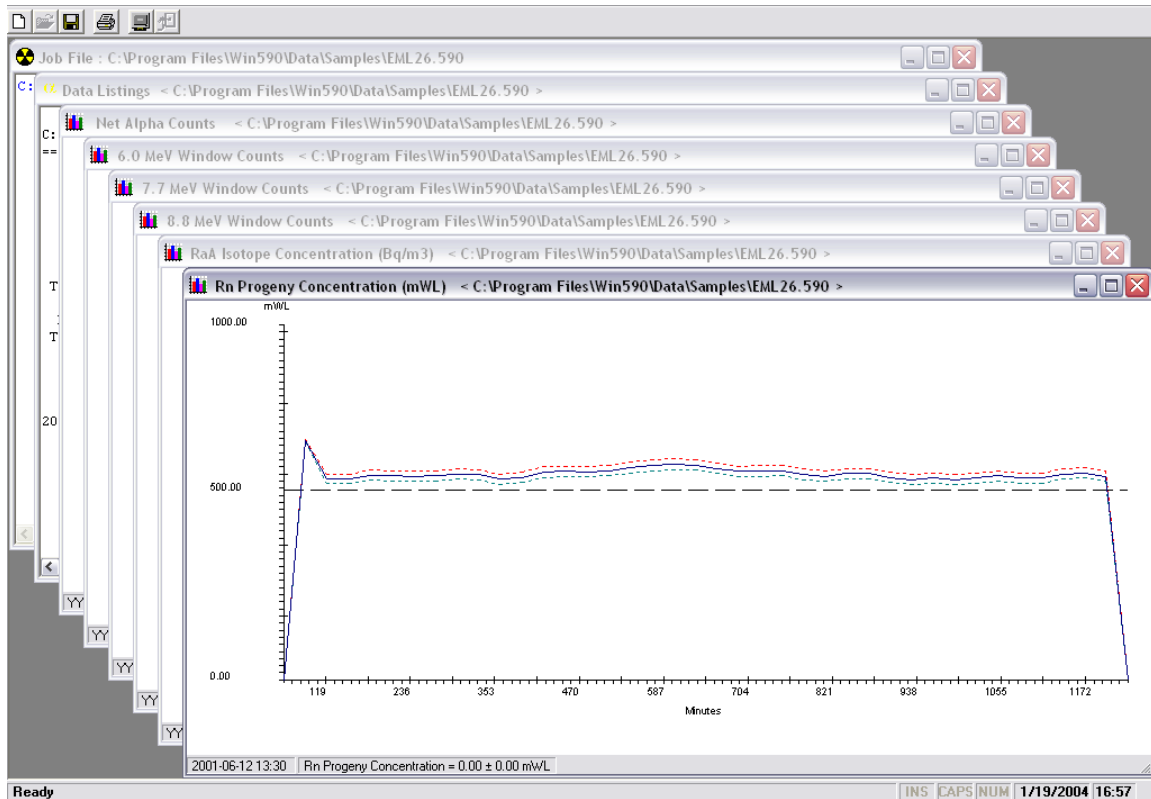
Isotope Overlaps

RaA-RaC' % RaA-ThC' % RaC-ThC' %

For the purpose of this demonstration, simply click on **Report** in the top right corner of this window.

By default, the **Tile Cascade** format will display with eight overlapping pages of processed data with the WL plot on top.

You may view any one of the report pages by either clicking on their title margin, or by clicking anywhere on the top report to again view the pop-up data processing menu and select the report title you wish to see.



Two alternative report-viewing formats are offered in the data processing menu, these are ***Tile Horizontal*** and ***Tile Vertical***. Initial view of data with these formats show the plots are not a correct fit in their screen areas, to fix, click anywhere on the report screen for the data processing menu, then select ***New Report Settings*** to invoke the **Report Set-up** window. Then without necessarily making changes, again click on **Report** (top right corner). This will cause the graphs to be repainted to fit their screen areas.

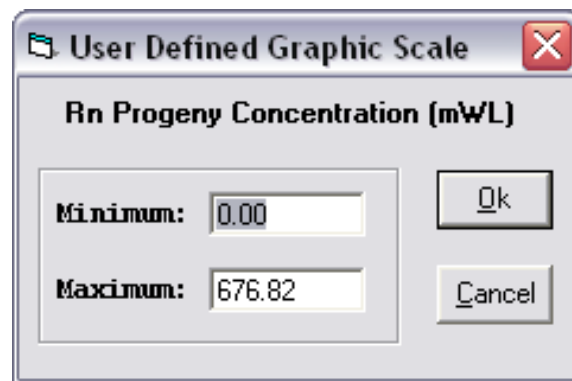
While viewing the various pages of a **Tile Cascade** report, the pages can become disorganized; the foregoing action will realign the pages in their current order.

The data processing menu now includes four additional functions.

- 1) **Adjust Vertical Scale**
- 2) **Default Graphic Scale**
- 3) **New Report Settings**
- 4) **Export Job File**

1 and 2) By default, the vertical scale of each plot is set from zero to the value of the highest reading. In some applications it may be desirable to fix the upper and lower values of the vertical scale, this report standardization can simplify visual interpretation of reports.

Assume the **Tile Cascade** report is displayed with the **Rn Progeny** plot on top, click on the top report. The data processing menu will open, click **Adjust Vertical Scale**. The pop-up overlay **User Defined Graphic Scale** will open.



This window includes two entry boxes **Minimum** and **Maximum**. Assume the **Rn Progeny** plot shows the full scale (maximum reading) as 676.82 mWL. Leaving the **Minimum** box set at zero, replace the value (676.82) in the **Maximum** box with 1000, click **OK**. The vertical scale of the plot will change from 0 to 676.82 to 0 - 1000; this will cause the plot peak to drop down from full scale to 67% of full scale.

To set the report back to the default (auto ranging) bring up the data processing menu and click **Default Graphic Scale**, the peak of the plot will revert back to full scale (676.82). The most recent settings will remain in effect until intentionally changed.

3) Any data set (job) can produce any number of reports, each with different results and/or appearances. The **New Report Settings** selection from the data processing menu allows adjustments to the Characteristics data of the CWL monitor and the report count interval duration.

The **Count Intervals** defaults to 30 (minutes), but can be set to as little as 10 minutes and to as much as the entire length of a job, e.g., a 24 hour job (1440 minutes). Adjustments to this value will not affect the average WL, but peak WL values and plot appearance will change.

Changes to the CWL monitor's characteristics, such as air **Flow Rate**, **Back Ground**, or any of the **Efficiency Factors** or **Isotope Overlap** data, will affect the calculated results.

4) The Job File (unprocessed ASCII data) can be exported to a folder of choice by selecting the option **Export Raw Data** and choosing a destination folder or drive.

Print Report

With the desired report page in view, click on the printer icon in the **Main Menu** bar, or click on the top report for the pop-up data processing menu, and click **Print**. Each page can be printed in turn by selecting to top, and **Print**.

To conclude, click anywhere on the top report for the pop-up data processing menu, and choose **Close Job File**.

590 Characteristics Record

The unique characteristics of each model 590 must be entered in the database of this program before any 590 functional operations can be performed. This data is supplied with each instrument in the form of a 'Calibration Document' included in the initial delivery, and then from subsequent calibration service.

To enter this data into the program, select **Edit** from the **Main Menu** bar, then click on **590 Characteristics Record**.

Model 590 Characteristics

General

Serial Number

Last Updated 2004-01-26 15:20 By gd

Last Checked Never By System

Flow Rate 250.0 CC/Minute Back Ground 2 Count/Hour

Efficiency Factor in Percent

Gross Alpha 17.00 % Source 24.00 %

RaA 17.00 % RaB 17.00 % RaC 17.00 %

ThA 17.00 % ThB 17.00 % ThC 17.00 %

Isotope Overlap in Percent

RaA-RaC 0.00 % RaA-Th 0.00 % RaC-Th 0.00 %

Status

Last Job No Never Last Job Start 1980-01-01 00:00

Last Job End 1980-01-01 00:00

Last Known Status New Unit

Ok Add Delete Cancel Apply

The cursor will be in the **Serial Number** entry box, type in the number of your 590 (e.g. 127), then press the Tab key on your key board, the cursor will move to the **Flow Rate** entry box, enter the flow rate (e.g. 250) from the most recent Calibration Document and press the Tab key. The cursor will now be in the **Back Ground** entry box, enter the current back ground count (e.g. 2) data and press the Tab key, the cursor will move to the **Efficiency Factor – Gross Alpha** entry box, enter this data (e.g. 18.5) from the most recent Calibration Document.

Proceed to step through (Tab key) each entry box entering the appropriate data from the Calibration Document for this particular 590.

After the final entry box, continue pressing the Tab key until the **Add** button is activated, and then press Enter. The Operator ID pop-up screen will appear, enter your name or initials (or pass) and click **OK**, then **OK** again on the top of the record entry screen. Editing the characteristics data of a unit already on file is a similar process, except that the **OK** key is active instead of the **Add** key (or click **Apply** to edit additional units).

590 Sampling Modes

The 590 series CWL monitors can be deployed in either of two “run” modes. The fixed duration (24 hour) default run mode, or the programmed run mode. The programmed mode facilitates setting a run start time and run duration of choice (up to 22 days maximum). Regardless of the operating mode, the sampling period (pump and counters active) is always followed by a fixed 3.5 hour decay-counting period (counters only active). The count data from the decay count period is required by the alphaNUCLEAR method for calculation of average thoron WL.

Default Run Mode

This is a very simply operation requiring only the 590, its AC power adapter/battery charger, and the power ON/OFF key. The test site must have AC power available.

At the test site, insert the “ON” end of the special power ON/OFF key into the serial port connector on the rear of the 590; this will switch ON the 590’s battery power. The key should only be plugged in momentarily (2 or 3 seconds). Now observe that the 590’s status indicator (located near the top of the front panel) it should be flashing with a short duty cycle (short illumination, long off time), this indicates the 590 is in the stand-by state.

Plug in the AC power adapter into a live AC power source, and into the 590. The default run mode will start, and the status indicator will be fully illuminated.

Return after 24 hours to retrieve the system, note the status indicator will be flashing with the long duty cycle (long illumination, short off time), indicating it is in the decay count state. It can be removed from the test site, but cannot be read by the PC until after the decay count period has expired (27.5 hours after initial start). When the decay count period expires, the status indicator will revert back to flashing in the short duty cycle standby state.

Programmed Run Mode

Assuming the 590's battery is fully charged, and its unique characteristics have been registered in the Characteristics database.

The 590 can be programmed at the test site with a portable (laptop) PC, or it can be programmed at base office hours prior to arrival at the test site. However, it must arrive before the programmed starting time.

Insert the "ON" end of the special power ON/OFF key into the serial port connector on the rear of the 590; this will switch ON the 590's battery power. The key should only be plugged in momentarily (3 or 4 seconds). Now observe that the 590's status indicator (located near the top of the front panel) it should be flashing with a short duty cycle (short illumination, long off time), this indicates the 590 is in the stand-by state.

Do **not** connect the AC power adapter/battery charger at this time.

Plug the black plastic connector of the special serial communications cable into connector receptacle on the rear panel of the 590. **It is very important that only the black plastic connector is ever plugged into the 590.**

Then plug the other end of the cable into the COM-1 serial communications connector of the PC.

If necessary the COM-2 serial port can be used instead of COM-1. To enable the COM-2 port select **View** from the **Main Menu**, then **Options**, then from the top of the **Options** window select **Serial Ports**, then click the **Serial Port 2** (COM-2) button..

Next Click on the **Blank Page** icon in the left corner of the **Toolbar**, or click on **Model 590** in the **Main Menu** bar, and in this case then click on **Setup New Job**. Either way, the **Setup New Job** data entry dialog box will appear with the cursor in the **Serial Number** box.

Setup New Job

Model 590

Serial Number Last Updated 2004-01-26 15:20 By gd

Last Checked Never By

Current Status New Unit

Unit Details

Flow Rate 250.0 CC/Minute Back Ground 2 Count/Hour

Gross alpha 17.00 % Source 24.00 %

RaA 17.00 % RaB 17.00 % RaC 17.00 %

ThA 17.00 % ThB 17.00 % ThC 17.00 %

RaA-RaC 0.00 % RaA-Th 0.00 % RaC-Th 0.00 %

Programmed Run Parameters

Job Start 2004-01-26 16:00 Pump Stop 2004-01-27 16:00

Sampling Time 24.00 **Hours** Total Analysis Time 27.50 **Hours**

Ready

Ok Cancel

Type in the serial number of the connected 590, or press the arrow on the side of this entry box and select the serial number from the drop down list, or pass this box (press Tab) and let the system find the serial number of the connected 590.

The cursor will now be in **Job Start** date entry box of the **Programmed Run Parameters** data entry area. The date entry box will be showing the current days date as the job start date, edit this date in accordance with your job requirements, or press Tab, the cursor will move to the **Job Start** time entry box, enter the desired start time (at least 10 minutes hence) and press Tab. Time entries are automatically rounded up to the next even 10 minute increment in time.

The cursor will now be in the **Pump Stop** date entry box, edit as desired and press Tab, the cursor will now be in the **Pump Stop** time entry box, enter the desire time and press the Tab key.

The cursor will be in the **Sampling Time** hours entry box, in this case pass (press Tab), the cursor will be in the **Total Analysis Time** hours entry box, again pass (press Tab).

The OK button will now be active, if all entries are acceptable press the Enter key of your keyboard. If the data is not as desired press the TAB key again to high light the Cancel button and press Enter.

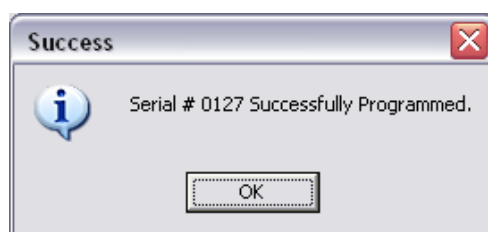
An alternative procedure for job setup is as follows. Set the start date and time as previously, then Tab past the next entry boxes and go directly to the **Sampling Time** hours entry box, enter the desired hours of sampling (pumping), and press Tab to get to the **OK** button. In this case the **Pump Stop** date and time will change to conform to the selected number of the **Sampling Time** hours.

Alternatively the **Total Analysis Time** hours can be set as the job run time factor.

You will be prompted to ensure the correct 590 is connected and powered ON, you will also be asked for your initials for the job record, enter (or pass) and press **OK**.

The following message will appear to confirm that the 590 has been successfully programmed with the parameters entered in the **Set up New Job** dialog box.

This programming function also sets the 590's date and time to that of the PC.



The serial communications cable should now be disconnected from the 590, and the 590 deployed to the test site. The 590's battery has sufficient capacity for at least a 24-hour sample run time. For longer run times, or when AC power is available at the test site, the battery charger/AC power adapter should be attached.

Data Acquisition

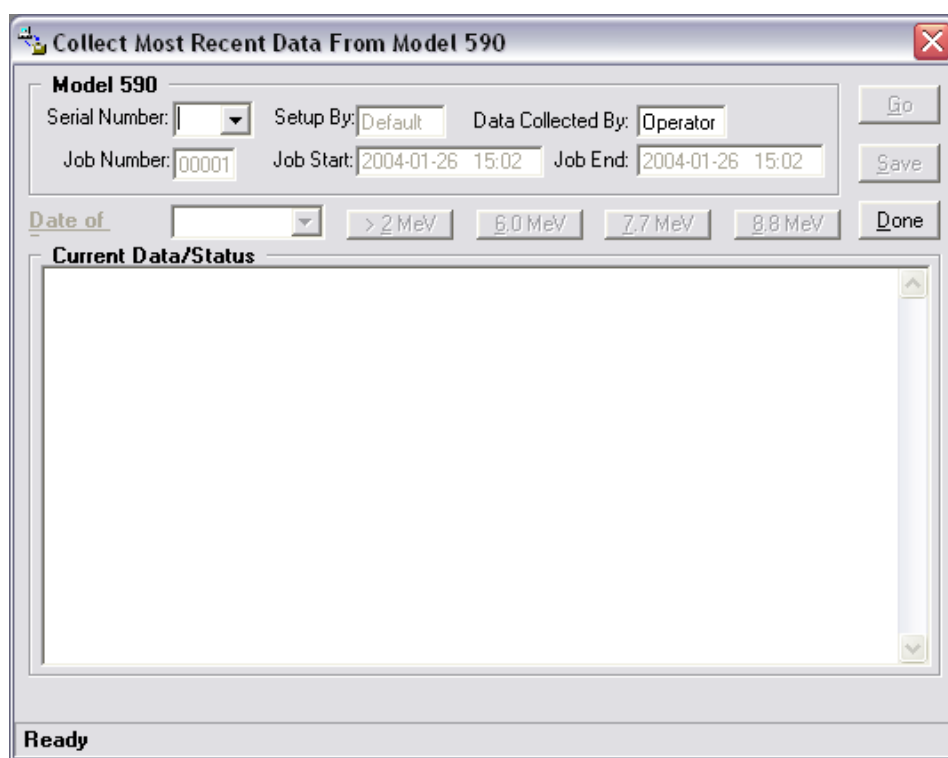
If there is a completed, error free job data set present in the 590 memory, the data can be automatically downloaded and stored in the PC.

A completed job means that the post sampling decay count period has been completed successfully. Error free means there were no 590 system failures such as battery or pump fail, and the 590 status data match the 590 job interval data (see terminal mode for RS and RI details).

Assuming the foregoing, and that the PC date and time format is correct. See User PC Requirements, page 5.

Plug the black plastic connector of the special serial communications cable into connector receptacle on the rear panel of the 590. **It is very important that only the black plastic connector is ever plugged into the 590.** The other end of the cable is plugged into the COM-1 serial communications connector of the PC.

On the **Main Menu** bar click **Model 590**, and then on the drop down menu click **Get Data**. The following screen will open.



The screenshot shows a software window titled "Collect Most Recent Data From Model 590". The window contains several input fields and buttons. At the top, there is a "Model 590" section with a "Serial Number:" dropdown menu, a "Setup By:" field set to "Default", and a "Data Collected By:" field set to "Operator". Below these are "Job Number:" (00001), "Job Start:" (2004-01-26 15:02), and "Job End:" (2004-01-26 15:02). There are "Go" and "Save" buttons to the right. Below the input fields is a "Date of" dropdown menu, followed by buttons for energy levels: "> 2 MeV", "6.0 MeV", "7.7 MeV", and "8.8 MeV", and a "Done" button. A large empty area labeled "Current Data/Status" is in the center. At the bottom left, the status "Ready" is displayed.

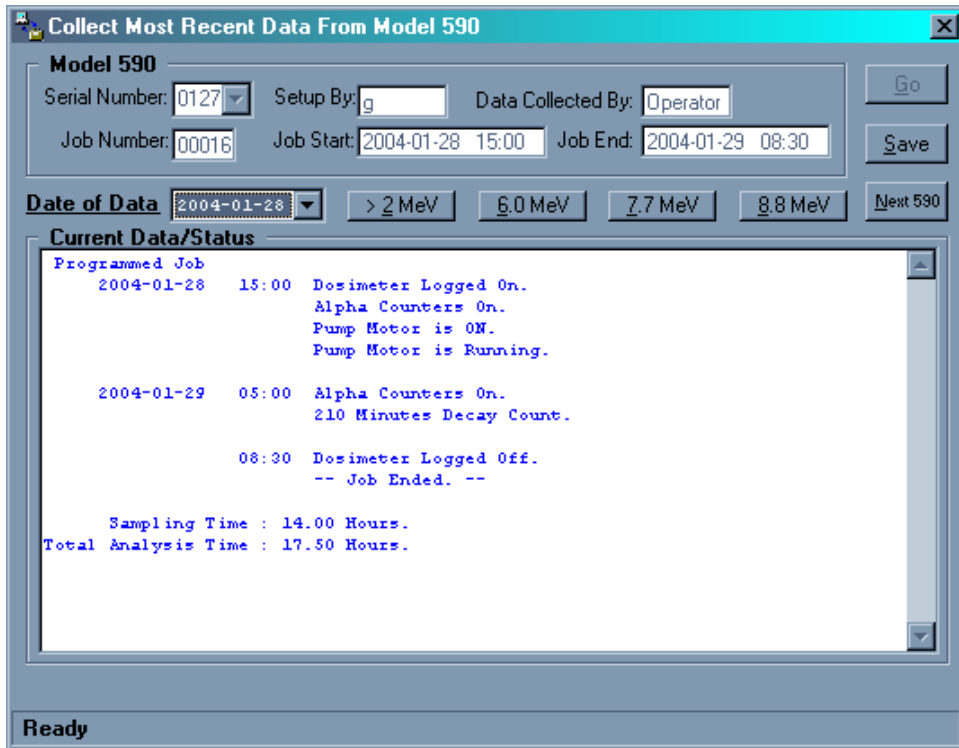
The cursor will be flashing in the **Serial Number** entry box.

Type in the serial number of the connected 590, or press the arrow on the side of this entry box and select the serial number from the drop down list.

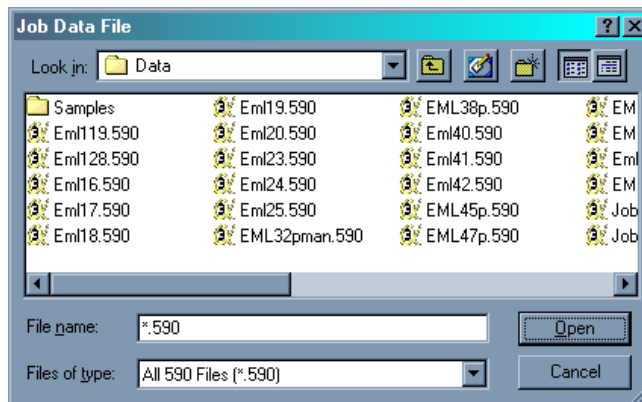
Press the Tab key, the cursor will move to the **Data Collected By** entry box, enter your initials or pass (Tab) to the **Go** button and press Enter. An overlay message will open prompting you to verify that the 590 is powered up, and connected to the PC.

Press Enter (OK)

After 2 or 3 seconds the status data from the 590 will appear as follows (next page).



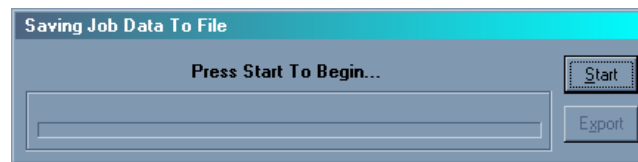
Preceding the Status data is the operating mode, *Programmed Job* in this case. The Status data includes the Job Start date and time along with the 590's operational parameters (status), followed by the date and time sampling ended, with status, then the final Job completion time. Following the Status data is the duration of the sampling period (14 hours in this case), and finally the total Job time (17.5 hours). Click the **Save** button. The **Job Data File** screen will open.



This screen provides a means to assign a file name and select a folder for the job. Select the folder **Data**; this folder was generated during the original software installation. If the software installation example was followed, the **Data** folder can be found under C:\Program Files\Win590\Data.

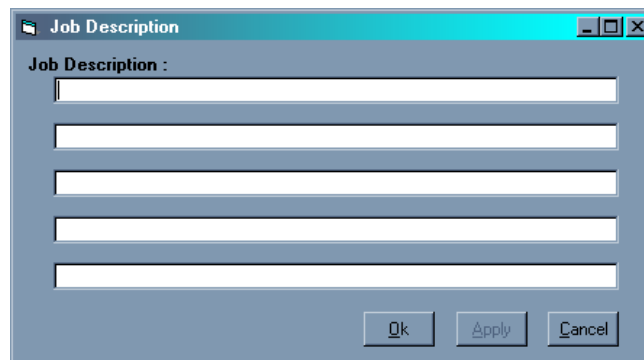
Find these folders with the **Look in** box, and then type in a name for the file in the **File name** box. The file name must include the extension **.590** (e.g., Myjob.590). After a folder name has been entered, click **Open**.

The following overlay screen will replace the **Job Data File** overlay.



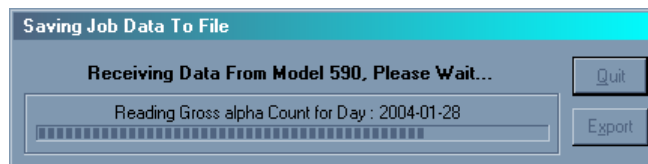
As prompted by this overlay, click **Start** or press Enter.

The following **Job Description** entry screen opens.

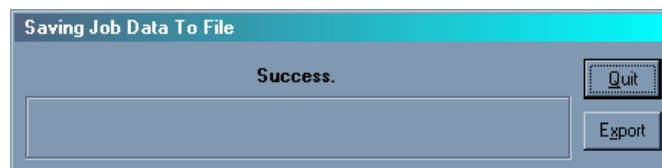


The cursor is in the left hand corner of the top text entry line. There are five text entry lines. Text entered in this facility will become part of the job file and final printed report. Click **Ok** when done.

The **Saving Job Data to File** overlay will open, and the system will proceed to download the data. This can take some time; each of the four channels issues 144 two byte numbers per day of sampling. The current activity is displayed as the download progresses.



On conclusion of the data acquisition process, the following overlay will open.



This overlay confirms that the data acquisition was successful. Click **Quit** or press Enter to return to the second screen of this Data Acquisition routine. From there click **Next 590** and start over with another instrument, or Close (click **X**).

The final **Saving Job Data to File** screen overlay has one other function choice, **Export**. This option provides a means of saving the raw data file as an ASCII (.Txt) file. A screen will open to facilitate naming the file, and specifying a destination folder. Other programs can easily access the text file.

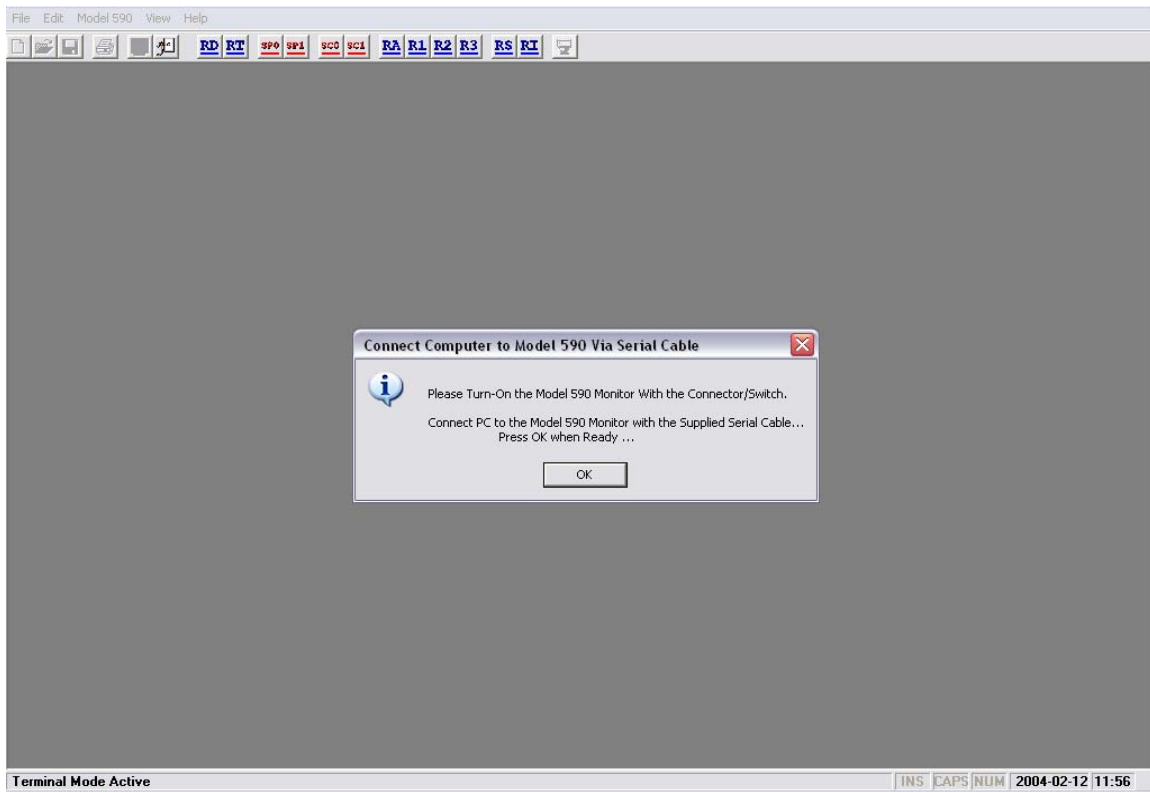
Terminal Mode

The Terminal Mode is a software emulation of a dumb terminal. This feature allows manual communication with a 590 for the purpose of hardware tests, diagnostics, and service needs. Communications can be entirely by keyboard entries, or with aid of a mouse click on a choice of several instant command buttons.

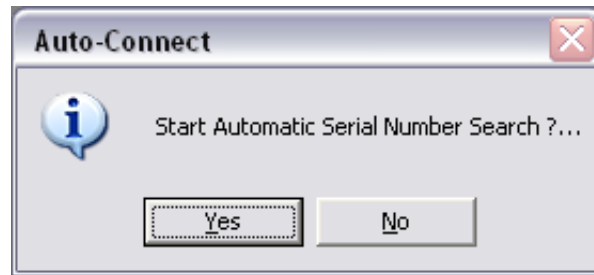
Switch ON the power of a 590 and connect it to the serial communications cable. To avoid starting a Default Job run, do not attach the AC Adapter/Charger.

On the **Toolbar** click the CRT Terminal Icon, or from the **Main Menu** click on **Model 590**, then from its drop down sub menu, click **Terminal Mode**.

Either way, the following full screen Terminal window will open. A message overlay on this screen is requesting verification that the 590 is powered up, and connected to the PC. Click the **OK** button on the message.



Now the following overlay will open. This **Auto-Connect** check box provides a choice of how a communications link with the 590 is to be established, by automatic search with serial numbers on file, or by keyboard entry of the appropriate serial number.



Choosing (click) **Yes** will cause the system to scan the serial communications port with each serial number registered in the Characteristics data base, the scanning will terminate when the connected 590 is found. The serial numbers are sequentially displayed in the left hand side of the **Status bar** as they are being transmitted. When the connected 590 is found, its serial number is displayed in the top left corner of the active screen area. e.g., PC 0127, note the serial number is returned as a four-digit number.

If **No** is selected, a cursor will be flashing in the top left hand corner of the active screen. To establish a communications link with the connected 590, type in its serial number, for example PC127 (no space or hyphen) then press Enter. The 590 will respond by echoing back its serial number, in this case PC 0127 will be written in the top left corner of the active screen, the cursor will move down one line.

Either way, a serial communications link now exists between the PC and the 590. This link will remain active as long as there is communications activity, the 590 will automatically go off line after one minute of inactivity on the link. Enter the serial number (PC127 and press Enter) again to restore the link.

Model 590 commands.

The **Tool bar** includes the instant command buttons; these and their functions are as follows.

- RD** Read Date from the 590.
- RT** Read Time from the 590.
- SP1** Start Pump.
- SP0** Stop Pump.
- SC1** Start Counters.
- SC0** Stop Counters.

- RA** Read the current days gross alpha count data (if existing).
- R1** Read the current days RaA alpha count data (if existing).
- R2** Read the current days RaC'alpha count data (if existing).
- R3** Read the current days ThC'alpha count data (if existing).
If data does not exist, the message "data not found" is returned.

- RS** Read the 590 Status data related to the most recent job.
- RI** Read the 590 latest job Interval data.

The RS and RI data return from a successfully completed job will look as follows. Note the RS dates and times match those of the RI.

```

alphaNUCLEAR PRISM III Data System v1.0.0 - [Terminal Mode]
File Edit Model 590 View Help
RD RT SP0 SP1 SC0 SC1 RA R1 R2 R3 RS RI
PC 0127
RS
RS 04-01-28 15:00:01 01010011
RS 04-01-29 05:00:02 00000011
RS 04-01-29 08:30:02 00000000
RI
RI 04-01-28 15:00:00 04-01-29 08:30:00

```

Note two additional icons on the tool bar.

The sixth from the left, an antique telephone. Click on this icon to exit (hang up) the Terminal mode.

The first from the right, a toilet. Click on this icon to clear (flush) the terminal screen.

Manual Commands

All the instant commands can also be entered manually on the keyboard. e.g., Type in RD (then press Enter) to acquire the current date from the 590's clock/calendar system. Type in RT to get 590's current time.

There are additional commands that can only be entered manually, these include the following.

To read the gross count data of a specific date. Type in RA followed by the date of a known job. e.g., RA4 02 14 (February 14, 2004), press Enter.

Substitute R1, R2, or R3 for RA to read count data from other channels.

To set the 590 time. Type in ST14 33 10 (33 minutes and 10 seconds after 2 pm), press Enter.

To set the 590 date. Type in SD4 02 14 (February 14, 2004), press Enter.

To manually set-up a job (set start and stop dates and times, job duration up to 22 days). Type in SI4 02 14 15 30 00, press Enter. This sets job start on February 14, 2004 at 30 minutes after 5 pm.

Type in SO4 02 15 09 00 00, press Enter. This sets job stop on February 15, 2004 at 9 am To read-out (confirm) this data, type in RI, press Enter.

To clear the Status buffer. Type in SB, press Enter.

Filter Replacement

The filter is a disposable item that must be replaced periodically.

The frequency of change is dependent on operational site conditions and the airflow rate setting of the vacuum pump. Assuming a flow rate of 250 cc/minute, and use in a clean dry work site/office type environment, the filter should be changed each 500 hours of sampling time. While use in underground mining operations will require the filter be replaced each 150 hours.

Only the Model 501-2 filter element should be used.

Filter removal

Set the instrument a firm surface with the front panel facing you. The main front panel incorporates the filter cover door, this hinged stainless steel panel opens out and down to expose the filter and the front air inlet. The filter cover door, this is retained in the closed position by a finger tight captive screw fastener. The only tool required for the filter change process is a small brush (tooth brush or small paint brush).

To open the cover, unscrew the fastener in a counter clockwise direction until it is loose in its retainer. Pull on the screw to swing the cover outward and down to the fully open horizontal position. The pointed tip of the filter is now visible in its slot directly below the front air inlet slot. Below the filter is the filter release lever protruding from its vertical slot.

Use a small brush to clear the area above and below the filter of dust and dirt. With your fingertip, push the filter release lever down as far as possible and hold it down. Take the tip of the filter between thumb and forefinger and pull it out of its slot. If the release lever is sufficiently depressed the filter can be withdrawn without resistance.

Filter installation

Again depress the filter release lever to maximum, hold a new filter by the pointed end, and insert it into its slot as far as it will go, the filter should slide in without resistance. When properly installed only about 5 mm of its tip will remain protruding from its slot. The filter release lever can now be allowed to return to its natural position applying pressure to the internal filter sealing mechanism.

Return the filter cover door to its full closed position with no space visible between the cover door and the main panel structure. With closing pressure applied to the cover door, tighten the retaining fastener to finger tight pressure only. Use of tools to tighten the fastener could stress or destroy the screw thread.

Never operate the 590 vacuum pump for more than a few minutes with the filter cover door open. Such operation can allow some air to by-pass the filter, and dust particles drawn in could block the airflow sensing system and pump. Only when the filter cover is fully closed and retained is maximum pressure applied to the filter by the sealing mechanism. A proper seal on the filter is necessary to protect the pump and flow sensing system from contamination and eventual failure.

Air Flow Rate Calibration

This procedure should be performed periodically to ensure the airflow rate value that is stored in the Characteristics file for this 590 is valid. The precision of this value is an important contributor to the accuracy of the final WL results.

The flow rate servo control system of the 590 is sensitive to the mass of the local atmosphere (altitude sensitive). As a result, the flow should be checked if the 590 is moved to a site of considerably different altitude.

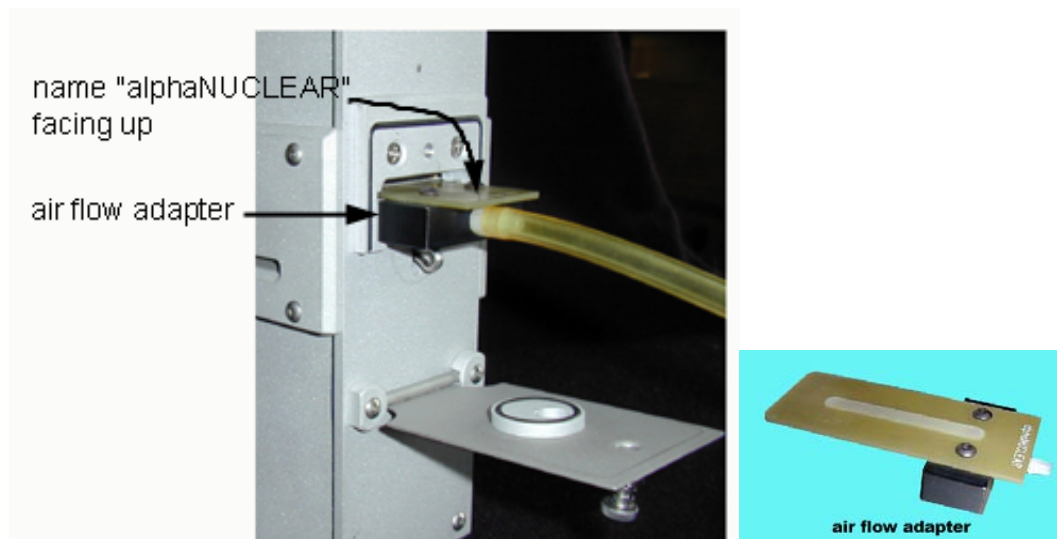
This procedure requires the use of an alphaNUCLEAR accessory part, the Model 507-2 airflow-measuring adapter. Also an airflow measurement device is required, preferably a bubble tube, either manual or electronic. Bubble tube based measurement devices are recommended; this technique has minimal air flow restriction.

See the Filter Replacement section of this manual for details concerning filter release, removal, and replacement.

Insure that the 590s battery is well charged.

The following procedure is based on use of a simple 100 cc glass bubble tube, a stopwatch, and some liquid soap.

Connect the plastic hose of the bubble tube to the hose barb on the Model 507-2 flow adapter. Remove the filter from the 590, then holding the filter release lever down as far as it will go, insert the adapter (with the name “alphaNUCLEAR” facing up) into the filter slot until it stops with the hose barb block against the main front panel structure. The flow adapter must slide in with minimal resistance, major damage to the rubber filter seal “O” ring will result if the filter release lever is not fully depressed and force is applied.



Switch ON the 590, connect the serial communications cable from the computer, but do not connect the AC adapter/charger. Invoke the PRISM III program and select **Terminal Mode** from the **Tool bar**, establish a communications link, click the instant command icon **SP1** (start pump), and allow the pump to run for 2 or 3 minutes before attempting a flow measurement.

Mix some liquid soap with water, 4 parts water to 1 part soap. Pour some of the soap mixture into a shallow open dish to a depth of about one cm. Clear any bubbles or foam off the surface of the soap mixture.

Hold the bubble tube in a vertical position with the hose connection end up, now dip the open end into the soap solution and immediately lift it out of the soap solution. A flat film (bubble) of soap solution should now be moving up the tube, drawn by the suction of the 590 pump. However, because the inside surface of the tube is dry, the soap film will break well before reaching the top of the tube. Repeat this process numerous times until the inner surface is sufficiently wet that the film travels past the 100 cc mark near the top of the tube.

Caution. Insure that no soap solution is drawn into the hose and toward the 590.

Now use the stopwatch to measure the elapsed time between the instant the soap film crosses the bottom 0 cc mark on the bubble tube, and when it reaches the top 100 cc mark. Repeat this process 3 or 4 times, calculate the average transition time (in seconds) of the soap film.

If the flow rate were 250cc/minute, the transition time of the soap film would be 24 seconds. To determine the actual flow rate, calculated as follows.

$$\begin{aligned} \text{flow} &= \frac{100(\text{cc}) \times 60 (\text{sec}/\text{min})}{t \text{ (seconds, bubble transition time)}} \\ &= \frac{6000}{t} \\ \text{example} & \quad \frac{6000}{24} = 250 (\text{cc}/\text{min}) \end{aligned}$$

The calculated flow rate should now be entered into the Characteristics data base file for this particular 590.

Manual Data Recovery

This function of the program is provided to facilitate recovery of data that does not meet the criteria of the automatic data acquisition function of the program (see page 18, Data Acquisition). For this to work you need to know the job start date and time, and the job end date and time. The job end data is the final date and time following the 3.5 hour decay count period. For a default run this would be 27.5 hours after start (24 hours sample period plus 3.5 hours decay count).

Click **Model 590** on the **Main Menu** bar, then from the drop down menu select **Manual Data Recovery**.

The following screen will open.

Manual Data Recovery From Model 590

Model 590

Serial Number Setup By Default Data Collected By Operator

Job Number 00001 Job Start 2004-02-15 14:40 Job End 2004-02-16 18:10

Sampling Time 24.00 Hours Analysis Time 27.50 Hours

Date of Data

Manual Recovery Data/Status

Ready

The cursor is flashing in the **Serial Number** entry box.

Type in the serial number of the connected 590, or press the arrow on the side of this entry box and select the serial number from the drop down list.

Press the Tab key, the cursor will move to the **Setup By** entry box, enter your initial or pass (Tab), the cursor will move to the **Data Collected By** entry box, enter your initials or pass (Tab).

The cursor will jump to the **Job Start** date entry box, edit the existing date as necessary (use the key board arrow keys to place the cursor over the parts of the date to edit, delete an incorrect part, enter the desired number, arrow key to the next incorrect part, delete, enter desired number, move cursor, and so on until the desired date is present).

Tab to the **Job Start** time box, edit accordingly (same method as date).

Tab to the **Job End** date entry box, change as desired.

Tab to the **Job End** time entry box, edit as necessary.

Press Tab, **Go** button becomes active, press Enter. An overlay message will open prompting you to verify that the 590 is powered up, and connected to the PC.
Press Enter (OK)

In the **Status bar** of the active screen there will be the message “Checking Data Availability, Please Wait”

After 3 or 4 seconds the status data from the 590 will appear on the screen as follows.

Manual Data Recovery From Model 590

Model 590

Serial Number: 127 Setup By: Operator Data Collected By: Operator Go

Job Number: 00002 Job Start: 2004-01-28 15:00 Job End: 2004-01-29 08:30 Save

Sampling Time: 14.00 Hours Analysis Time: 17.50 Hours

Date of Data: 2004-01-28 > 2 MeV 6.0 MeV 7.7 MeV 8.8 MeV Next 590

Manual Recovery Data/Status

```

Programmed Job
2004-01-28 15:00 Dosimeter Logged On.
                Alpha Counters On.
                Pump Motor is ON.
                Pump Motor is Running.

2004-01-29 05:00 Alpha Counters On.
                210 Minutes Decay Count.

                08:30 Dosimeter Logged Off.
                -- Job Ended. --

Sampling Time : 14.00 Hours.
Total Analysis Time : 17.50 Hours.

```

Ready

If there is no data in the 590 for the dates entered, the following screen overlay will open.



If the dates entered are correct but the times entered are incorrect, a job will be recovered, but the final report could be missing data (job duration less than actual), or include data outside the true times (job duration longer than actual, or offset). Data recovered from outside the true times will likely be null (zero) data, either way the report results will be invalid. If true times are unknown, enter times that would be outside true times (earlier start and later end). Then by studying reports, and trial and error time entries, a true job can be recovered.

Once the dates and times are entered, the procedures (naming and saving the job file) become the same as those of the **Data Acquisition** section (see pages 20 through 22).