SP4270/SP4290 Reference Guide

Part Number A0099-166

SP4270/4290 COMPUTING INTEGRATOR

REFERENCE GUIDE

A0099-166
290M 1/85

WARRANTY STATEMENT FOR AUTOLAB DIVISION PRODUCTS

WARRANTY COVERAGE

Spectra-Physics warrants that its products shall be free of defects in material and workmanship for a set time period from date of shipment, as specified in the warranty coverage of Table 1. Spectra-Physics will, at its option, repair or replace defective instruments or components. The necessity of an on-site visit shall be solely at the discretion of Spectra-Physics. If on-site service work is performed by SP at the Customer's request but deemed unnecessary by Spectra-Physics, labor and travel expenses will be at the Customer's expense. Parts will be covered by warranty. Products that are installed by Spectra-Physics are warranted from the installation date. All others are warranted from the ship date.

If Customer schedules or delays installation by Spectra-Physics for more than 30 days after delivery, then warranty period starts on the 31st day from date of shipment (60 and 61 days respectively for products shipped internationally).

SP warrants that its software and firmware designed by SP for use with an SP analytical instrument will execute its programming instructions when properly installed on that instrument. SP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

After expiration of the applicable warranty period, Customer has the option to purchase a Customer Service Agreement or to receive service at the then prevailing SP rates. Any obligation SP may have to provide service and/or parts for discontinued products shall cease five (5) years after the manufacture of such products has been discontinued.

Certain accessories, including some not manufactured by SP, may be warranted by SP for the specific items and periods expressed in writing on SP warranty statements, published price lists, and/or individual quotations. All such accessory warranties extended by SP are limited in accordance with all the terms, conditions, and other provisions stated in this warranty except as specifically extended by SP in writing. SP makes no warranty whatsoever concerning products or accessories not of its manufacture, except as noted above.

REPLACEMENTS AND MODIFICATIONS

In-warranty repaired or replacement parts or products are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced parts or products. Repair or replacement of products or parts under warranty does not extend the original warranty period.

Replacement parts or products used on instruments out of warranty are themselves warranted to be free of defects in materials and workmanship for 90 days.

Any product, part, or assembly returned to SP for examination or repair shall be sent prepaid via the means of transportation indicated as acceptable by SP, with all transportation at the expense of Customer.

SP reserves the right to change or modify the design of any shipped products if it determines such changes or modifications are in its own and the customer's best interests or for safety reasons.

WARRANTY LIMITATIONS

The following are expressly not covered under warranty.

a) Parts and accessories which are expendable or consumable in normal operation of the instrument, such as inlet filters, glass accessories, piston seals, piston guides, fuses, tubing fittings, lamps, cell bodies, windows, photodiodes, lenses, and rubber or polymer products.
b) Any loss, damage, and/or instrument malfunction resulting from shipping or storage, accident, abuse, alteration, misuse, neglect, or breakage or abuse of parts by Customer.
c) Operation other than in accordance with correct operating procedures, environmental and electrical specifications.
d) Modification or tampering with the system.
e) Improper or inadequate care, maintenance, adjustment and calibration by Customer.

f) Customer supplied software, hardware, interfacing or consumables.
g) Customer induced chemical action, contamination or leaks.

LIABILITY LIMITATIONS

THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING (BUT NOT LIMITED TO) WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. UNDER NO CIRCUMSTANCES WILL SPECTRA-PHYSICS BE LIABLE FOR CONSEQUENTIAL DAMAGES OR LOSS OF ANY KIND. THE LIMITS OF SPECTRA-PHYSICS' LIABILITY IN ANY DISPUTE SHALL BE THE PRICE RECEIVED FROM THE PURCHASER FOR THE SPECIFIC EQUIPMENT AT ISSUE.

RESPONSIBILITIES OF THE CUSTOMER

The Customer shall provide:

1) Access to the products during the specified periods of coverage to perform maintenance.
2) Adequate and safe working space around the products for servicing by Spectra-Physics personnel.
3) Access to and use of all information and facilities determined necessary by Spectra-Physics to service and/or maintain the products. (Insofar as these items may contain proprietary or classified information, the customer shall assume full responsibility for safeguarding and protection from wrongful use.)
4) Routine operator maintenance and cleaning as specified in the Spectra-Physics operating and service manuals.

This manual is designed with two purposes in mind: to instruct the new SP4270 or SP4290 operator on producing reports in a minimum amount of time, and to provide the experienced operator a quick reference guide to more sophisticated use of the instrument.

For additional guidance, a training kit (Part Number A2574-010) is available for the SP4270/SP4290. This kit includes a 60-minute VHS video tape and a chromatography simulator, and shows initial installation, method setup, and multilevel calibration calculations.

LIST OF FIGURES

CONTENTS

CONNECTION TO THE CHROMATOGRAPH

After unpacking the SP4270/SP4290, place it near the detector of the chromatograph. Attach the plus (+) lead of the analog signal cable (1 volt max.) to the red connector, and the minus (-) to the black connector on the back of the SP4270/SP4290 (see Fig. 1.1).

Fig. 1.1 Connecting Analog Inputs

The analog input to the second-channel option module is connected in the same manner. (See "Second Channel Installation and Setup" in Section 3 of either the SP4270 or SP4290 Operators Manual.)

PAPER INSTALLATION

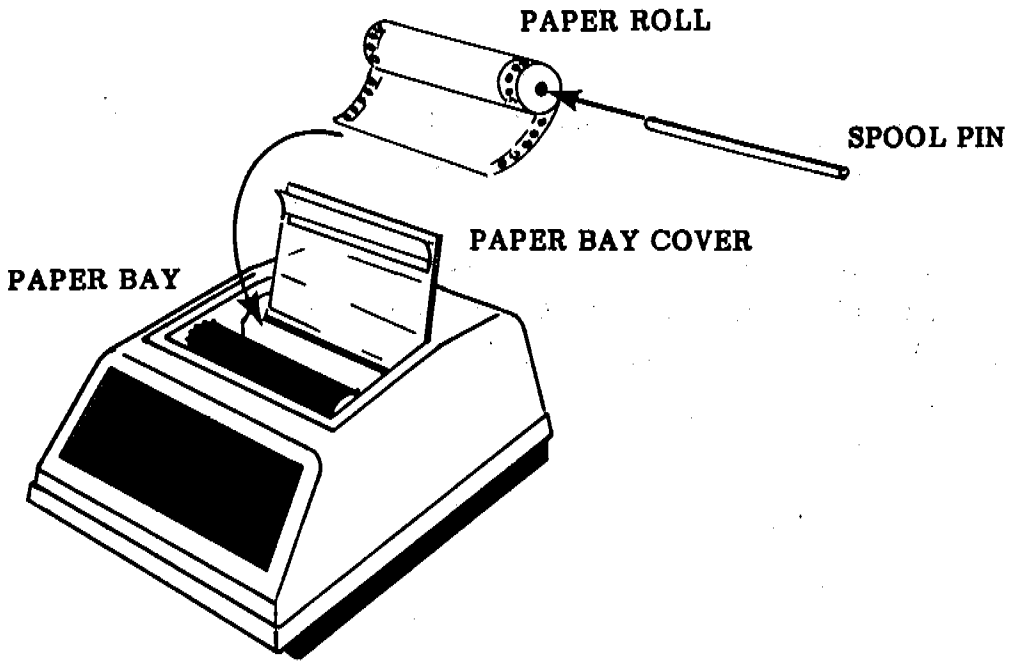


Fig. 1.2 Installing Paper into the Paper Bay

1. With the integrator turned off, open the printer/plotter paper bay cover (Fig. 1.2).
2. Insert the spool pin into the paper roll.
3. Insert the paper roll and spool pin, with the paper feeding from the bottom of the roll, into the paper bay.
4. Feed the end of the paper through the paper receiver slot (Fig. 1.3) onto the sprockets while turning the roller platen by hand.

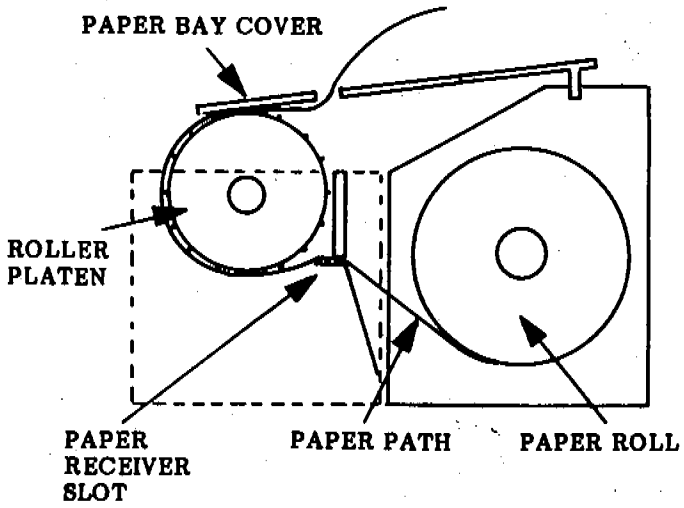


Fig. 1.3 Side View of Paper Path

5. When the paper is engaged by the sprockets, continue to turn the platen until the end of the paper can be fed into the slot in the paper bay cover (Fig. 1.3). You can then close the paper bay cover.

If the paper has not been fed squarely through the roller, adjust the paper by manually rolling the platen backward and feeding the paper into the roller again so that the paper is feeding straight through the mechanism.

After attaching the power cord to the rear of the unit and plugging the other end into a power outlet, locate the power button and push it in to switch the power on (Fig. 1.4). The LEDs on the right side of the keypad will then light up and the word READY prints on the printer/plotter.

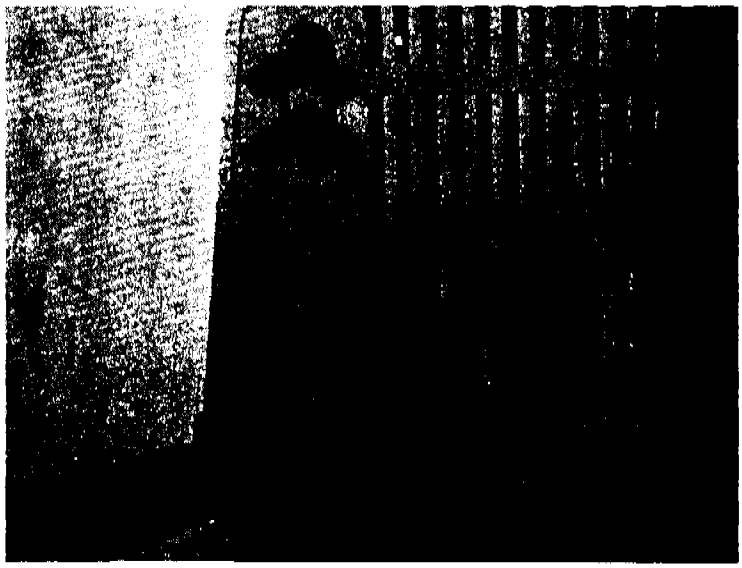


Fig. 1.4 Location of ON/OFF Button

The SP4270/SP4290 is a flexible computing integrator with many built-in features, including an advanced design that offers a "default mode" of operation. The SP4270/SP4290 can be prepared for use with the following simple keystrokes:

1. Enter the date and time (optional).
2. Adjust the input level.
3. Enter the peak width setting (optional).
4. Press the PT EVAL key.
5. Set the plotter attenuation and chart speed (optional).
6. Press the INJECT key.

Further in this section, starting with "Date and Time Entry," are instructions on performing these entries.

If your SP4270/SP4290 has a second-channel option, press the A <-> B key and repeat steps 2 through 6. Each time the A <-> B key is pressed, the connection between the keypad and channels A and B are switched, as indicated on the panel lights to the right of the keypad.

FUNCTION KEYPAD EXPLANATION

Except for SHIFT and ENTER, each of the keys on the keypad is capable of three different modes of operation:

- The **lower half** of the key indicates the system function. When the key is pressed, the system function is activated.

- To produce the character or function in the **upper left** portion of the key, first press SHIFT and then the desired key. (The EDIT LED blinks at regular intervals.)

- To produce the character shown in the **upper right** side of the key, press SHIFT **twice** and then press the key (see Fig. 1.5). (The EDIT LED blinks at irregular intervals.)

You can switch back and forth between the upper left and right characters by pressing SHIFT between each key press.

Press the ENTER key to return to the function key mode.

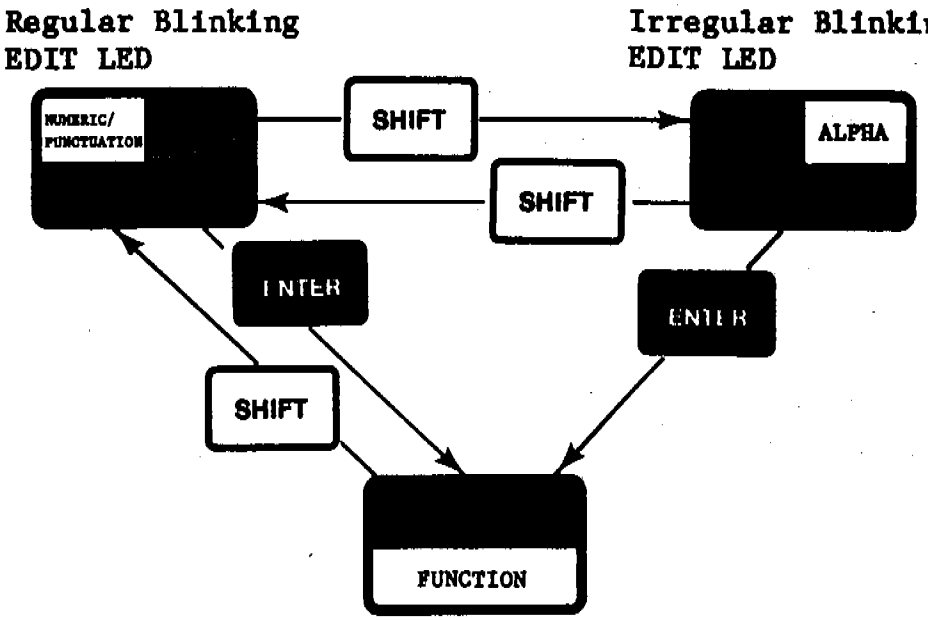


Fig. 1.5 Key-Shifting Sequences

NOTE: For more information on the three-function keypad, refer to the "KEYPAD OVERVIEW" in Section 2 of the operators manual.

DATE AND TIME ENTRY

Once the READY message is printed, the DATE prompt follows. Enter the date using the MO/DA/YR format (or the DA-MO-YR for the European format). For example:

sets the date to 7/20/85.

To reset the date without turning the power off, press:

then enter the sequence of keys given previously.

Next, the TIME prompt is printed. Enter the time using the HR:MN:SC, 24-hour format. For example:

sets the time to 5:54:04 pm.

To reset the time without turning the power off, press:

then enter the sequence of keys given previously.

If you press the wrong key during an entry, press the **CLEAR** key and an arrow pointing to the left will be printed on the entry line. This indicates that the last character entered has been eliminated and can now be replaced with the correct entry. If more than one wrong character is printed, press the **CLEAR** key the same number of times.

NOTE: Both the date and time entries are optional, and can be bypassed by pressing the **ENTER** key in response to the prompts.

INPUT LEVEL

If the detector is connected correctly and its output is zero (0) volts, the SP4270/SP4290 prints "1000" when the LEVEL key is pressed. If the level reading is not 1000 (± 2), adjust the zero control (balance adjust) on the detector until the level reading is corrected.

If the detector cannot be adjusted to produce a level of 1000 (±2), press the ZERO key on the keypad. This forces the baseline to be plotted at the left side of the printer/plotter, regardless of the input level. (For more information on the ZERO function, see the explanation of time function "AZ" in this reference guide.)

PEAK WIDTH SETTING (PW)

In packed-column situations (GC or LC), the peak width does not need to be reset from its default value (PW=6). When capillary GC or fast LC is being used these chromatographic techniques result in narrower peaks and the peak width should be set to three (PW=3) as follows:

PW=3 prints on the printer/plotter as the keys are pressed.

PEAK THRESHOLD EVALUATION (PT EVAL)

At this point, the detector of the chromatograph should be stable and the range setting placed at the position that will be used during the analysis. Press the PT EVAL key. After approximately 50 seconds (25 seconds if PW=3), the SP4270/SP4290 prints PT=n. The value of n is calculated based on the noise level of the detector being used. Typically, a PT between 12 and 200 is calculated. Very high values (>500) can be caused by:

- o Drifting baselines
- o Peaks eluting during PT evaluation
- o Working at high detector sensitivity

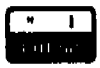
Repeat the peak threshold evaluation if the high PT value could have been caused by either of the first two items.

ATTENUATION AND CHART SPEED (AT, CS)

Before injecting the sample, note that the attenuation on the printer/plotter defaults to 1 millivolt for a full scale deflection. To change this setting, simply press the ATTEN key, enter a value in multiples of 2 (.5, 1, 2, 4, 8,...4096), and then press ENTER.

For example, to change the attenuation to 8, press the keys in the following sequence:

AT=8 prints on the printer/plotter.



The default chart speed is 1 centimeter per minute. To change this setting, press the CHT SP key and enter a value (such as .1, .25, .5, 1, 2, 4, 5, 8, 10, 16, and 20 cm/min).

To change the chart speed to .5 centimeters per minute, press the following keys:

CS=.5 prints on the printer/plotter.

SAMPLE INJECTION

While injecting the sample into the chromatograph, simultaneously press the INJ A key on the keypad. A message including the date and time is printed immediately, if the date and time entries were made when the SP4270/SP4290 was switched on (Fig. 1.6).

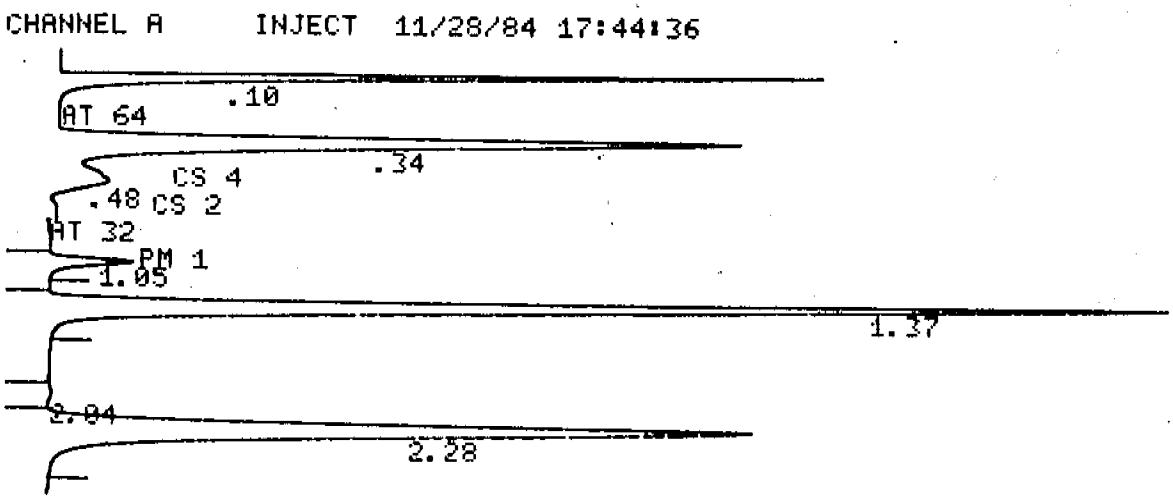


Fig. 1.6 Chromatogram Showing Inject Message

FUNCTIONS USED DURING THE RUN (CS, AT, RT, PM, II)

Chart Speed and Attenuation

During the plotting of the chromatogram, both the chart speed and attenuation are checked or changed using the function keys. To find out at what attenuation the chromatogram is being plotted, press the ATTEN key and then press ENTER. The attenuation is printed on the chromatogram as AT n (where n is the attenuation equal to the number of millivolts required to produce a full-scale deflection). Use the same procedure to find the chart speed. Refer to Fig. 1.7 at the end of this section.

Run Time

To find the run time at any point after injecting the sample, press the RUN TIME function key. The current run time from the point of injection is then printed on the chromatogram, shown in 100ths of a minute in the default time base (TB=0).

Peak Markers

Another convenient function is the peak markers. (Refer to "Time Function Value" in Section 3 of the operators manual.) When this function is activated, the printer/plotter places a tick mark on the trace where a peak starts, ends, or where fused peaks are separated.

To use this function, press the following keys:

A notation "PM 1" is printed on the printer/plotter as soon as the ENTER key is pressed (Fig. 1.7). The peak marker function stays in effect on all subsequent runs unless it is turned off (refer to "Time Functions" in Section 2).

Integrate Inhibit

The INT INH function key can be used to eliminate the reporting of interfering peaks such as solvent peaks or baseline upsets caused by unwanted detector fluctuations such as range changes or column switching. The integrate inhibit function turns off the integration and annotates the chromatogram. The message "II 1" on the chromatogram indicates the integration has been inhibited (turned off), and the message "II 0" shows the integration has been restored (turned on again), see Fig. 1.7. Refer to "Time Functions," Section 2 of this manual.

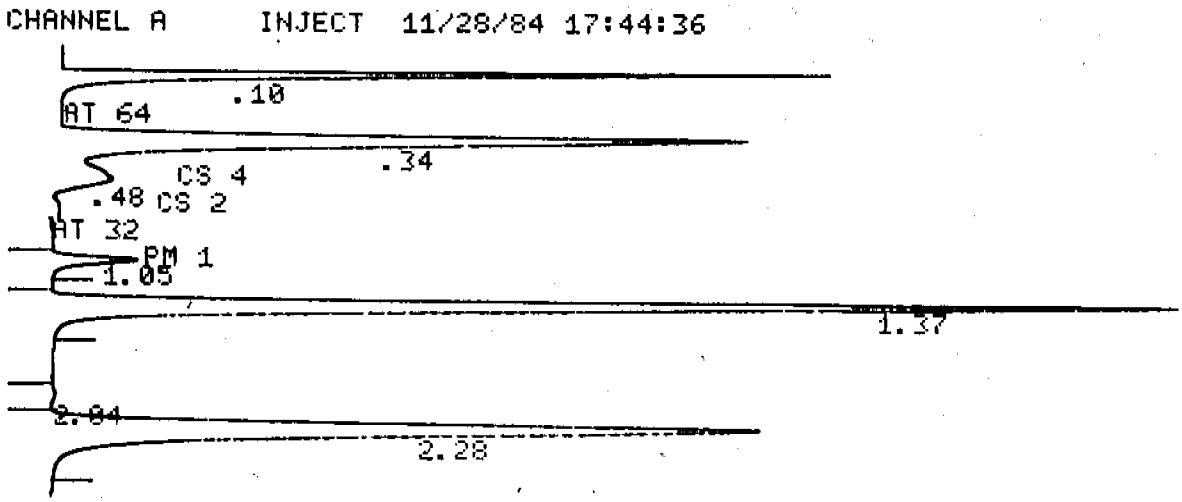


Fig. 1.7 Chromatogram Showing Time Functions

THE AREA PERCENT REPORT (MN=0, THE DEFAULT)

Press the INJ A key again and an area percent report will be printed automatically (Fig. 1.8).

SAMPLE CHROMATOGRAM 11/28/84 17:44:36 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 11' INDEX 11

PEAK#	AREA%	RT	AREA BC
1	11.537	0.1	91440 01
2	23.061	0.34	182781 02
3	3.301	0.48	26165 03
4	1.943	1.05	15401 01
5	30.967	1.37	245438 01
6	0.085	2.04	672 02
7	29.106	2.28	230687 03

Fig. 1.8 Area Percent Report

CONTENTS

GENERAL DEFINITIONS

A **method** is a set of parameters entered into a file of the SP4270/SP4290 that enables the calculation of concentrations of components based on known standards.

A **file** is an independent portion of the SP4270/SP4290 Random Access Memory (RAM) where the method and associated report parameters are stored. There are 10 of these compartments per channel. Files are made active by pressing the USE FILE key, entering a number from 0 up to 9, and then pressing ENTER. The default file is 1 (FI=1).

(sets the active file to 1)

A **component of interest** is one of the compounds in the sample mixture that is quantified using one of the three methods of analysis. A response factor (RF) is calculated for this compound during calibration, based on a known standard(s). Concentrations are then calculated for all subsequent samples using these response factors.

The **dialog** is a series of questions you answer to set up a method in the active file. Each method automatically triggers different dialogs depending on the method used and the answers to previous questions. A flowchart of the dialog is provided in the operators manual on page 3-22.

To start the dialog, press the DIALOG key. Any entry can be skipped by pressing the ENTER key. Skipping an entry either leaves the value of the variable at the default value (if there is one), or if a value has been entered previously, that value is unchanged.

NOTE: Before starting the dialog, use the PRFILE key to ensure you are starting with an empty file. If the file is not empty, press DELETE n (where n is the file number).

To exit the dialog at any time, press the ESCAPE key until the FAULT 100 message appears.

TIME FUNCTIONS

Time functions are commands that can automatically control integration, the printer/plotter, and external devices such as autosamplers or fraction collectors during or after the chromatographic run. Section 6 in the operators manual provides a detailed explanation of time functions. Time functions are entered through the dialog in the following form:

TIME	FUNCTION	VALUE
TT=	TF=	TV=
When to activate the function	What function to activate	Turn function on or off, or set to this value

TT= Enter the time at which the event is to take place in the current time base increments (default time base is in 100ths of a minute).

TF= Enter the function to be executed at time (TT) entered above.

TV= Enter the time function value. Most time functions have only two values, 1 (one) and 0 (zero). A time function value of 1 turns the function on, and a value of 0 turns the function off. Some functions, however, are not simply ON or OFF functions, but have a wider range of values (such as CS and AT). Check the range for each time function in Table 2.1.

TABLE 2.1 Time Function Range

Frequently Used Time Functions	Range
End Run (ER)	0 or 1 (on)
Integrate Inhibit (II)	0 (off) or 1 (on)
Auto Zero (AZ)	0 (off) or 1 (on)
Attenuation (AT)	.5 to 4096
Chart Speed (CS)	.1 to 20
External Data (XD)	0 (off) or 1 (on)

ER= The end run time function stops the plot and generates the report automatically.

II= The integrate inhibit time function keeps the integrator from integrating the input signal as long as the function is in effect. Use this function when there are peaks in the chromatogram that do not need to be included in the report such as solvent peaks or baseline upsets due to column switching. This function can be turned on (TV=1) and off (TV=0) as many times as necessary during the chromatogram. **NOTE:** Retention times of peaks are not printed while II is turned on.

AZ= The auto zero time function positions the plotted baseline at the offset (OF) value regardless of the input signal level. (Maximum which can be "zeroed" is 32 mv; minimum is -10 mv.) Auto zero is used to keep the plot of the chromatogram baseline on scale and is usually implemented at the start of the chromatogram. Although integration is not affected if the detector signal drifts off scale, unless it drifts below -10 mV, auto zero positions the plotter at the offset value (Fig. 2.1). The offset value is the percent of full scale at which the baseline starts to plot on the printer/plotter (default is offset, OF=5).

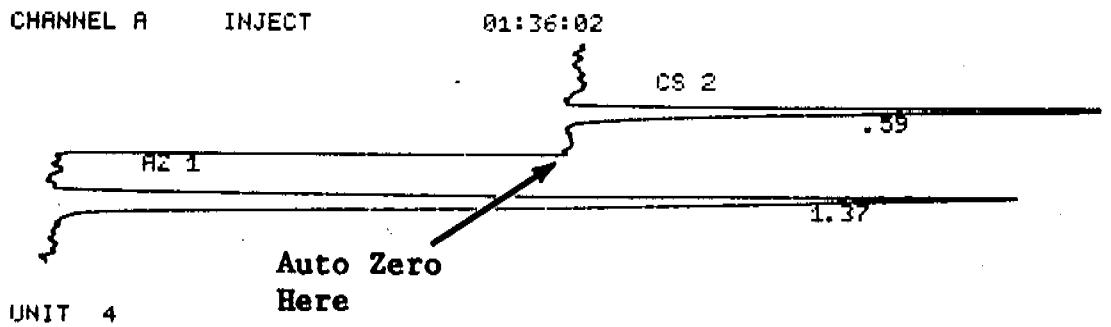


Fig. 2.1 Example of Auto Zero Time Function

AT= Attenuation can be changed automatically by the time command during a chromatographic run. The value of TV can range from .5 to 4096 millivolts full scale, incremented by multiples of 2.

CS= Chart speed can also be changed automatically by the time command during the run. The value of TV can be set to the following values: .1, .25, .5, 1, 2, 4, 5, 8, 10, 16, and 20 cm/min.

XD= External data is a time function that must be set to accept input from an autosampler. If an autosampler is connected to the SP4270/SP4290 using a Spectra-Physics interface cable, the BCD (Binary Coded Decimal) input from the autosampler can be interpreted and the vial number (or tray and vial) can be obtained and printed on the report.

To receive this information, the SP4270/SP4290 must be told to read the BCD message into memory. This is usually done by triggering the XD time function at the start of the run (e.g. TT=.02 min., TF="XD," TV=1).

XD is also a file variable that must be set for different autosamplers. Each autosampler has a slightly different output format, so the variable XD must be set before the start of the first run.

XD=0 Do not report the BCD information

XD=1 Report on Hewlett-Packard format (models 7670 and 7671)

XD=2 Report in Varian format (8000 series)

XD=3 Report in decimal format

See Appendix 1 of the SP4270 or SP4290 Operators Manual for details on the various autosamplers.

CALCULATION METHODS

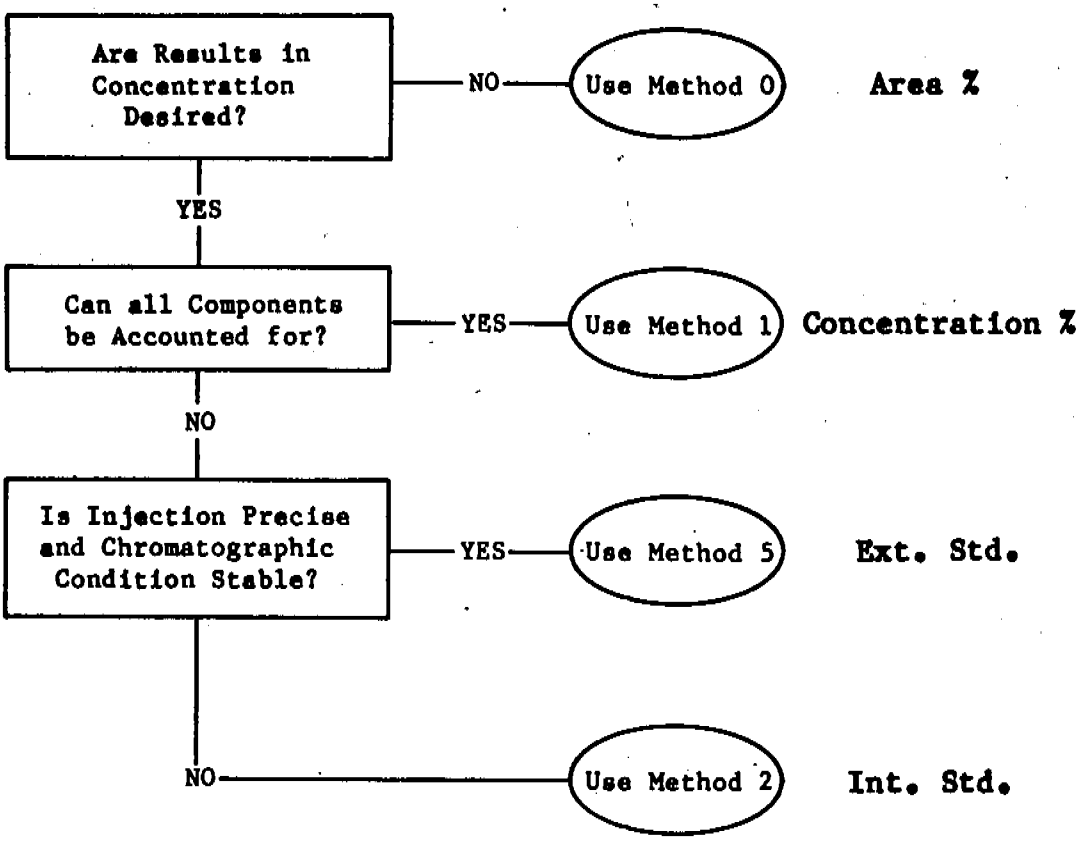


Fig. 2.2 Guidelines for Selecting Calculation Method

METHOD 0, area percent, is used when results in corrected concentration are not necessary. No response factors are used in the method, so it cannot be used for calibration. The report includes all peaks in retention time order (component names are not possible). See "Calculations for Method 0," in Section 3 of the operators manual.

METHOD 1, normalization, is used when every component is known, or can be accounted for in the sample. This method has applications in the analysis of gases and petroleum products. A response factor reference peak must be present in every sample (refer to "Calculation for Method 1," in Section 3 of the operators manual).

METHOD 2, internal standard, is useful in purity analysis of pharmaceuticals, food additives, and fine chemicals. This method is used where quantitation of one or more components (regardless of concentration) in a large matrix is required. The method is also useful when injection size is not constant (see "Calculations for Internal Standard Method 2," in Section 3 of the operators manual).

METHOD 5, external standard, is used when the use of an internal standard is inconvenient or impossible, as in gas or pesticide analysis. This method is used when the injection size can be well controlled, such as a gas sampling valve or autosampler. See "Calculations for External Standard - Method 5," in Section 3 of the operators manual.

IDENTIFICATION OF COMPONENTS

Absolute Retention Time

There are two ways in which the SP4270/SP4290 identifies the components of interest. First is the absolute retention time method. If the actual retention time of a peak as integrated is within a specified percentage of the retention time entered in the file, the component is identified properly and has applied or calculated the response factor properly.

If the actual retention time of a peak in the chromatogram matches within plus or minus 10% of the retention time entered in the method file, the peak is said to be "identified." The component window (CW) is expressed as a decimal value, for example, a CW of .1 indicates a component window of ±10%. Once a peak is identified, the appropriate calculations can be performed using the integrated area for the peak.

WINDOW	RT	WINDOW SIZE
CW = 0.1	RT(1)=1.0	.9-1.1
	RT(2)=1.5	1.35-1.65

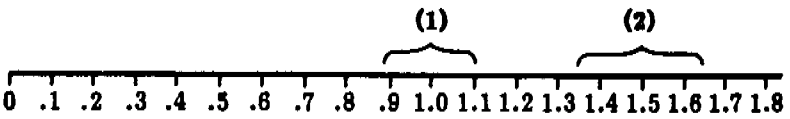


Fig. 2.3 The "Window" for a Component is a Percentage of its Retention Time

This "absolute retention time" is the default method and can be used in many chromatographic situations. See "Component Window (CW) and Absolute Retention Time (RT)" in Section 5 of the operators manual.

Relative Retention Time

The second method of identifying components of interest is called the relative retention time (RRT) method. This method is preferred when the chromatogram contains many components that may not be well resolved, or when elution times change from run to run.

This method is more accurate in these situations than the absolute retention time method because a reference peak is selected to act as a constant. Since variations in the chromatography usually affect all components, including the reference peak, peaks can be more accurately identified relative to the time of the reference peak. (Refer to "Reference Peaks and Relative Retention Time," in Section 5 of the operators manual.)

When Peak(s) Are Not Identified Properly

If a peak is not identified properly, one or two adjustments may be necessary in the method file. First check the retention time (RT) in the method file. This can be done using the PR FILE function key.

Next, compare the RT in the file to the RT of the peak in the report. The RT in the file should match the actual RT from the report within its "window." If these retention times do not match, the RT in the file must be adjusted (see "Editing Outside of Dialog," in Section 3 of this manual).

NOTE: Does not apply to the relative retention time (RRT) method, where the "window" is based on the relative retention time.

To change (edit) the RT of a peak, press:

The result is printed as RT(n)= xx.xx.

Where the "n" value is the number of the identified component in the file and the "xx.xx" value at the end of the sequence is the new RT and should more closely match the RT for that peak in the file. The new RT value then replaces the old one.

Example: RT(2)=4.51
(sets the RT, in the default time base, of component 2 to 4.51 minutes)

Another reason that components are not identified is because the component window may be too small. Normally the default window of 10% is recommended. The component window value should be reduced only for complex chromatograms containing large numbers of peaks.

To change the component window value, press:

where n is a decimal value expressed in percent.

Example: CW=.05
(sets the component window to 5%)

SAMPLE INFORMATION

The sample dialog automatically follows the component table information. Additional information, such as the analyst's name, the number of injections per sample, and information about each sample can be entered in the dialog.

Any entry can be skipped by pressing the ENTER key.

See "SAMPLE TABLE," in Section 3 of the operators manual for more information.

PRFILE FUNCTION

Once the method file has been set up, you can review the file information by pressing the PRFILE key.

```
   ①          ②              ③      ④
  MN=  2.      REM  FE=  1.      CH= "A"  PS=  1.
⑤ NM   = "NEW F"    NM(1)= "ILE  "
```

Identification

```
⑥PW   = 6.      ⑦FT   = 12.      CA   = 1.
  RN   = 1.       IX   = 1.      OD   = 1.
⑧PH   = 0.      ⑨TB   = 0.      CW   = 0.1
  CZ   = 2.       LS   = 0.      NV   = 1.
  SI   = 1.       SZ   = 1.      RC   = 1.
  IP   = 2.
```

Report Parameters

```
      ⑩              ⑪              ⑫
TT(1)=    0.01   TF(1)="PM"   TV(1)=    1.
TT(2)=    3.     TF(2)="ER"   TV(2)=    1.
```

Time Functions

```
⑬RT(1)=    0.25  ⑭CN(1)= "BIPHE"  ⑮CM(1)= "NYL  "
⑯RF(1)=    0.    ⑰CC(1)=    1.45

  RT(2)=    1.57    CN(2)= "PERYE"    CM(2)= "NE   "
  RF(2)=    0.      CC(2)=    0.98

⑱RP   = 2.       ⑲RW   = 0.1      ⑳CW   = 0.1
```

Component Table

```
㉑AN   = "NOAH "    AN(1)= "TSWET"    AN(2)= "T    "
㉒CU   = "PPM  "    CU(1)= "      "

㉓SN(1)= "LOT#1"
㉔SA(1)=  120.     ㉕IS(1)=  250.     ㉖XF(1)=  100.
```

Sample Table

Printing

The example file listing shown on the previous page is separated into five separate groups. These groups are explained as follows.

Identification

(1) Method Number. Indicates which method is currently set. This parameter is changeable either through dialog or by entering MN=n, where n is the new method number.

(2) File for Editing. The file being edited can be different than the active file.

(3) Using Channel A.

(4) Peak Storage File. Times and areas are saved in this file. This file does not need to have the same number as the parameter file.

(5) Name of file. NM, NM(1), NM(2), NM(3), NM(4) each allow storage of 5 characters, allowing a maximum of 25 characters for the file name.

Report Parameters

This group contains the values for report parameters. Some of the parameters and values in this section are from entries via dialog, some are based on -- or interpreted from -- dialog entries, and some are entered outside of dialog.

NOTE: Any of these variables can be changed using the following format:

where xx is the two-letter variable and n is the new value.

The parameters that appear in this section vary from file to file (refer to Appendix A, "CODE TABLES," in this manual for a complete list of codes). However, 4 of these codes are always present, these are:

(6) Peak Width. This value describes the peak detector setting. PW=6 (6 data samples per bunch) is the default setting.

(7) Peak Detection Threshold. This value can be automatically generated from the PT EVAL function, or by entering PT= n. The PT value determines the "sensitivity" of the integrator to changes in the baseline. ((PT=12 is the default.)

(8) Peak Height. Changing this parameter alters the manner in which the peak data are reported and saved (default value is 0). The following options are available:

PH=0 Reports areas; no heights are reported or saved.

PH=1 Reports heights; saves areas.

PH=2 Reports areas; saves heights.

(9) Time Base. This value determines the scale used by the system to measure elapsed time (default value is 0).

TB=0 Time Base in .01 minutes

TB=1 Time Base in .1 seconds

TB=2 Time Base in .1 minutes

TB=3 Time Base in seconds

NOTE: If the time base is altered, files created in the former time base cannot be used in the new time base setting.

Time Functions

Appendix A in this manual provides a complete list of time function codes.

(10) Time Function Time. This is the amount of run time elapsed before the specified function takes place (.001 is the lowest time function time allowed). To allow for easier editing of time functions, do not use multiple time functions with the same time.

(11) Time Function. The function to take place at the previously set time. This is specified in code, see Appendix A in this manual for complete list of codes.

(12) Time Function Value. Specifies the value of the time function. Whether this value turns the function ON or OFF (1 or 0) or specifies a particular function setting is dependent on the characteristic of the time function. Time function ranges are shown in Appendix A of this manual.

Component Table

Appendix A in this manual lists the Component Table Codes.

Components in the Component Table are those compounds in the sample that will have concentrations calculated for them. Each of the components in the table is indexed according to its retention time.

(13) Retention Time of the First Peak. Note these values are listed in the RT(n) format, where n is the index number used in the file to indicate the order in which the peaks are eluted.

(14) Component Name (first five characters).

(15) Component Name (last five characters).

(16) Response Factor.

NOTE: When asterisks (******) appear in a file listing in place of the response factor (RF), it indicates the calculated value is too large to be printed properly. The format to print these is preset so the RF value must be smaller than 99999.9999. This is simply a print format and does not affect the calculation or the RF value stored in memory. To get the RF value to print in the file listing, increase the value of the component concentration (CC), for example, .001 ppm is really 1 ppb. Increasing the concentration value decreases the value calculated for the RF.

(17) Concentrations for Calibrations. The measured amount of each component in the calibration sample.

(18) Relative Retention Time Reference Peak Index. This value is not entered in dialog, rather it is the Component Table index number of the peak identified in dialog as the relative retention time reference peak (RT REF PEAK). (See Section 5.1.2 in the operators manual for details.)

(19) Reference Peak Window. This value specifies the size of the reference peak time window, which is created by the system when a reference peak is designated. This window is always calculated by absolute retention time. (Refer to Section 5.1.2 in the operators manual.)

(20) Component Window. This value (set at its default in this example) specifies the range used to compare the RT value of the peaks in the chromatogram to those in the file. When an RRT is selected, this window is calculated by relative retention time.

Sample Table

Refer to Appendix A in this manual for a list of sample table codes.

(21) Analyst's Name.

(22) Concentration Units.

(23) Sample Name.

(24) Sample Amount.

(25) Internal Standard Amount (present only if method 2 was selected).

(26) Scale Factor.

REPORT AND RECALC FUNCTIONS

In order to understand the REPORT and RECALC functions, it helps to first review other important functions in the SP4270/4290.

Peak Storage (PS)

There are 10 memory "compartments" per channel where the retention times and the associated corrected areas (or peak heights) of peaks are stored. These peak areas have little meaning unless a method and report file is applied to them. To save old data, change PS before an injection to the new PS compartment. If a new PS value is not set, the old peak areas and retention times are replaced with data from the latest injection.

To choose a peak storage file, type PS=n (where n is a number from 0-9).

NOTE: The peak storage files are independent of the file value.

Method/Report File (FI)

The method/report file after a calibration contains the information needed to convert the "raw" areas (or heights) in the peak storage compartment to concentrations of the components of interest.

REPORT

The REPORT key produces a report using the currently active method file (FI) and peak storage file (PS). No statistical or sample counters are incremented. This function is useful for producing a corrected copy of a report after adjusting the method file.

RECALC

The RECALC key produces a report using the FI and PS files. All counters and index are incremented, as if another run had occurred. The most practical application of RECALC is to run a standard using MN=0, set up the method through dialog and press RECALC to get the response factors, or to "step through" calibration runs in different PS files. For example, after storing runs in several different peak storage files, pressing RECALC and then changing the PS value after each report generates a new multilevel calibration. Each new report is then generated as though it were from an actual injection.

STATUS FUNCTION

The STATUS key is used to inform you of the current operating conditions of the SP4270/4290. This report contains information on:

- o File usage
- o Plotter information
- o Memory allocations

DELETE

The DELETE key erases file from memory. Pressing this key causes the word "DELETE" to be printed and the system sets to accept a numeric value. Press DELETE, then enter the number of the file to be deleted.

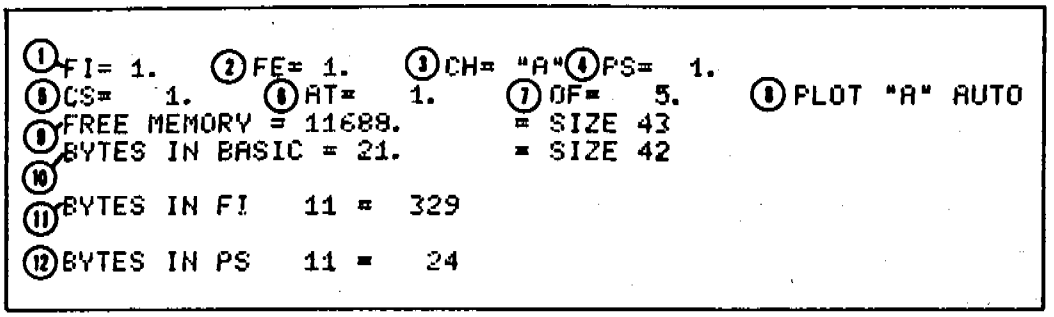


Figure 2.4 Status Listing

(1) Active File number (FI). This is the file that is currently being used. If the wrong file is active, select another by pressing the USEFILE key, enter the appropriate file number, and then ENTER.

(2) File being edited (FE). One file can be edited while the active file is used for data acquisition. Usually, FI and FE are the same. Setting FE does not change FI value; it simply allows one file to be edited while another file is being used.

(3) Indicates which channel is currently being addressed.

(4) Peak storage file number (PS). Indicates the file currently selected for storage of RT and AREA values. There are 10 (0 - 9) peak storage files per channel.

(5) Current chart speed. This sets the rate at which the paper rolls through the printer/plotter during plotting. The higher the number the faster the rate.

(6) Attenuation (AT). This parameter sets the full scale range (in millivolts) of the plotter. The higher the AT value, the smaller the peak size on the chromatogram.

(7) Offset (OF). This value specifies the printhead offset from the left side of the paper as a percent of full scale. In this listing, the printhead is offset by 5% (the default value).

(8) Channel being plotted.

(9) Bytes of free memory available. This value can be called up at any time by pressing the PRINT key and entering **SIZE 43** . When peaks are processed they require 7 bytes per peak if the baseline is resolved, and 18 if the baseline is not resolved.

(10) (Applies only to the SP4270.) Bytes currently being used for BASIC. This value can be called up at any time by pressing the PRINT key and entering **SIZE 42**. Each line of BASIC uses approximately 40-80 bytes.

(11) Number of bytes in channel A, File 1. Note that file numbers are automatically prefaced by the system with either a 1 or 2, depending on the channel being used. The 10 files in channel A are stored as 10 - 19; the 10 files in channel B are stored as 20 - 29.

(12) Number of bytes in peak storage file 1 for channel A.

CONTENTS

FINDING THE VALUE OF A VARIABLE (PRFILE OR PRINT)

The easiest way to find the value of a method or report variable is to press the PRFILE function key. This prints out all the assigned variable names and their values in the active file (FI). Yet, it can be inconvenient if you are interested in values for only one or two variables.

If the variable name is known, for example, PW, PT, or RT(2), the value can be printed using the PRINT function key. To find the current initial value for PW, press the following keys:

"PRINT PW" then echoes on the printer/plotter.

The printer/plotter prints the value of PW (6 is the default value) on the next line.

EDITING OUTSIDE OF DIALOG (DIRECT EDITING)

When a variable name, followed by an equal sign and the new value are entered, the new value replaces the old value.

To print and change the peak threshold value, first check the current value by pressing:

"PRINT PT" and a value then echoes on the printer/plotter.

Replace with the new value, 150, by pressing:

"PT=150" then echoes on the printer/plotter.

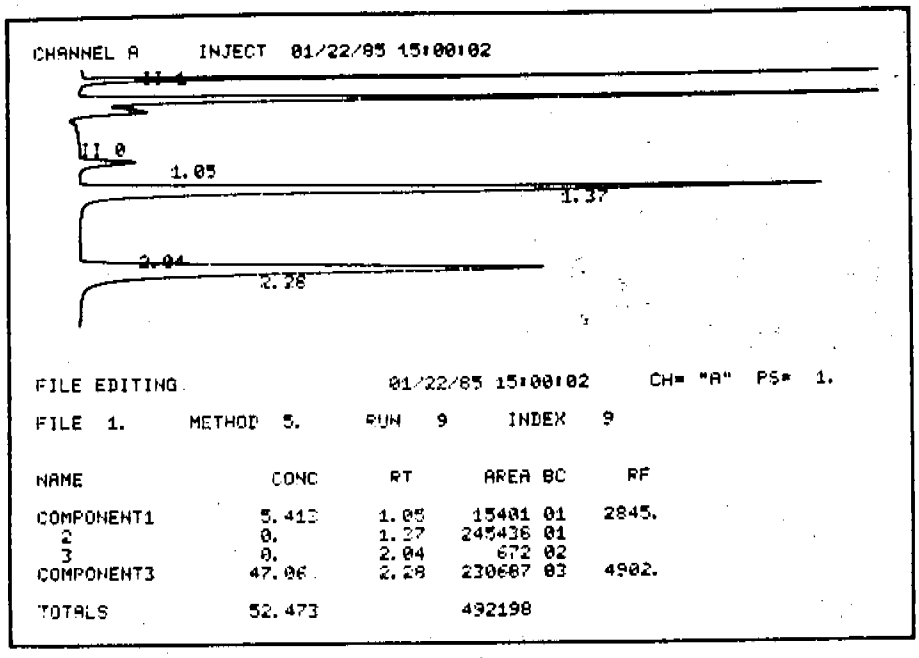
To see if the value was changed correctly, press:

"PRINT PT" and "150" should then echo on the printer/plotter.

A common use of this direct editing function is to adjust the retention time of a component. If a component has not been reported it can be a result of the peak shifting outside the component window (default is a 10% window). When this happens, the retention time must be adjusted in the active file and a new report generated by pressing the REPORT key (it is not necessary to re-inject the sample).

) D
PRFILE

First note the actual retention time printed next to the peak on the chromatogram. Next, print the file using the PRFILE key.



) D
PRFILE

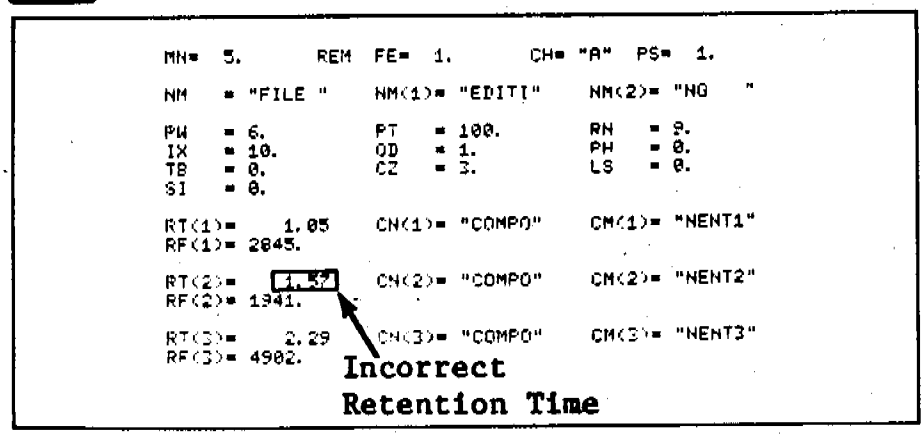


Fig. 3.1 Example of a Component Not Identified in a Report and the Corresponding File Listing

The second component in the example has not been identified properly because the actual retention time is over 10% less than the retention time, RT(2), entered in the file.

After entering the correct retention time into the file as shown (Fig. 3.2), you can generate a new file listing and report. To obtain the new report, press REPORT without re-injecting the sample. In the new report, the component is properly identified and the concentration is calculated.

RT(2)=1.37 Editing Outside of Dialog

```
NN=  5.      REM  FE=  1.      CH= "A"  PS=  1.

NM   = "FILE "    NM(1)= "EDITI"    NM(2)= "NO    "

PW   = 6.         PT   = 100.       RN   = 9.
IX   = 10.        OD   = 1.         PH   = 0.
TB   = 0.         CZ   = 3.         LS   = 0.
SI   = 0.

RT(1)=    1.05    CN(1)= "COMP0"    CM(1)= "NENT1"
RF(1)= 2045.

RT(2)=    1.37    CN(2)= "COMPO"    CM(2)= "NENT2"
RF(2)= 1941.

RT(3)=    2.29    CN(3)= "COMPO"    CM(3)= "NENT3"
RF(3)= 4982.
```

Corrected Retention Time

File

```
FILE EDITING              -    01/22/85 15:00:02     CH= "A"  PS=  1.
FILE  1.     METHOD  5.     RUN   9     INDEX   9

NAME                 CONC       RT       AREA BC     RF

COMPONENT1          5.413     1.05      15401 01   2045.
COMPONENT2         126.45     1.37     245438 01   1941.
  3                   0.       2.04        672 02
COMPONENT3          47.059     2.28     236687 03   4982.

TOTALS             178.922              492198
```

New Report

Fig. 3.2 File Listing and Report After Editing

NOTE: If INJ A is pressed instead of REPORT, the retention time and area data from the previous injection is erased.

EDITING IN DIALOG

There are certain instances where editing must be done through the dialog. Whenever a time function or an identified component is added or deleted, it must be done in dialog because a subroutine rearranges the other components according to their retention time. If a time function or component is added or removed outside of dialog, there is a chance it could leave other entries out of retention time order. In this case, some of the events are not executed.

To add a new time function or component in dialog, simply enter the new retention time as usual. To remove a component in dialog, at the "RT=" prompt, subtract the retention time by typing:

RT= -xx.xx

where xx.xx is the retention time of the component that was listed in the file.

To remove a time function entry in dialog, subtract the retention time of the event at the "TT=" prompt. Although it is not recommend, more than one time function can be activated at the same time. In addition to the time, both the name (TF) and the value (TV) of the time function must also be entered to properly identify the function to be removed. The time entry will then be eliminated and the remaining time functions or components rearranged accordingly.

CONTENTS

USING PW AND PT TO CHANGE INTEGRATION

Although the automatic parameters used in the peak detection algorithm work in most cases, in some instances the chromatographer must change the default values used by the system to improve the results of integration.

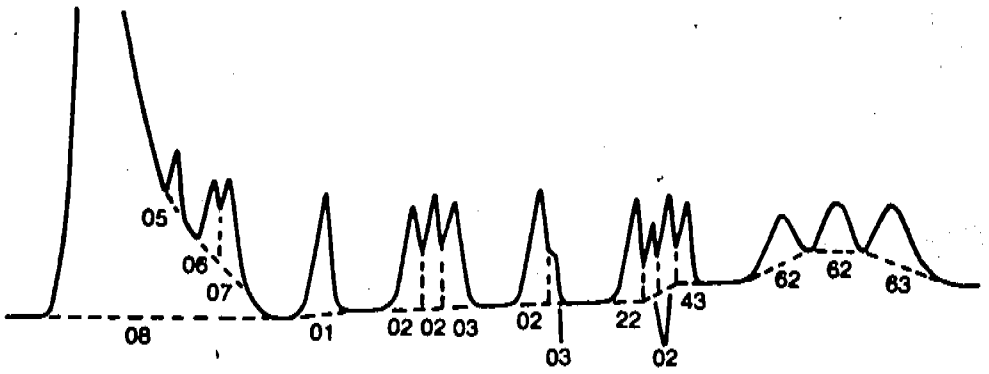
Sometimes, better integration is obtained by adjusting the initial peak width parameter (PW) closer to the actual peak width of one of the first peaks in the chromatogram. This is usually true in cases where the actual peak width (measured in seconds at peak base) differs from the default setting or when integrating very small peaks. (Refer to "Peak Onset (PO)" in Section 6 of the operators manual.)

Before making an injection, enter the new initial peak width (PW=n, where n= the measured peak width), and then press the PT EVAL key. The peak threshold evaluation can take much longer at wider peak widths. For example, at a peak width of 20 (PW=20) PT EVAL takes about 3 minutes.

After the PT value is printed, inject the sample and press the INJ A (or B) key in the usual manner.

For a complete explanation of the SP4270/SP4290 integration algorithm, refer to Section 7, "PRINCIPLES OF INTEGRATION," in the operators manual.

EXPLANATION OF BASELINE CODES (01, 02, 03, 08, 62, etc.)



01	BASELINE RESOLVED	07	LAST OF FUSED RIDER
02	FUSED	08	TAILING (SKEWED) PEAK
03	LAST OF FUSED GROUP	20	FORWARD HORIZONTAL (FH)
05	RESOLVED RIDER PEAK	40	BACKWARD HORIZONTAL (BH)
06	FUSED RIDER	60	BASELINE FORCED AT VALLEY POINT (BL)

Baseline codes are additive. For example, a BC of 62 indicates a fused peak (02) with a baseline forced at the valley point (60).

USING TIME FUNCTIONS (BL, GP, FT, NP, etc.)

NOTE: If adjusting the PW and PT parameters did not produce the desired integration, there are several time functions that you can use to alter the default integration parameters. Before using time functions to change peak integration, you should have a thorough understanding of Section 7, "PRINCIPLES OF INTEGRATION," in the operators manual. Also refer to "CONTROL OF BASELINE CORRECTION" in Section 6 of the same manual.

Forced Tangent Skimming (FT)

This function is used when fused peaks must be integrated as rider peaks on a tailing peak (Fig. 4.1). All time functions must be set before the injection is made. See "Forced Tangent Skimming (FT)" in Section 6 of the operators manual.

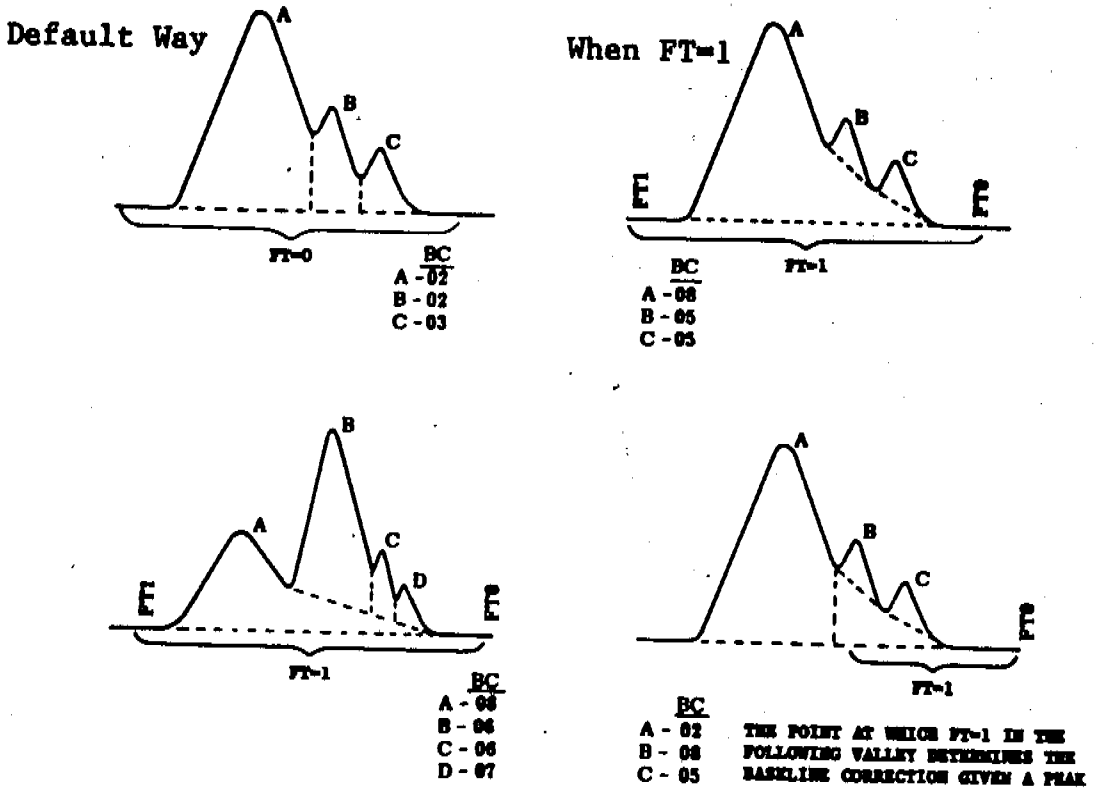


Fig. 4.1 Forcing Tangential Baseline Correction Using the FT Time Function

Tailing Peak (TP)

Setting the tailing peak function disables the tailing peak logic. Peaks normally integrated as rider peaks are integrated as fused peaks (Fig. 4.2).

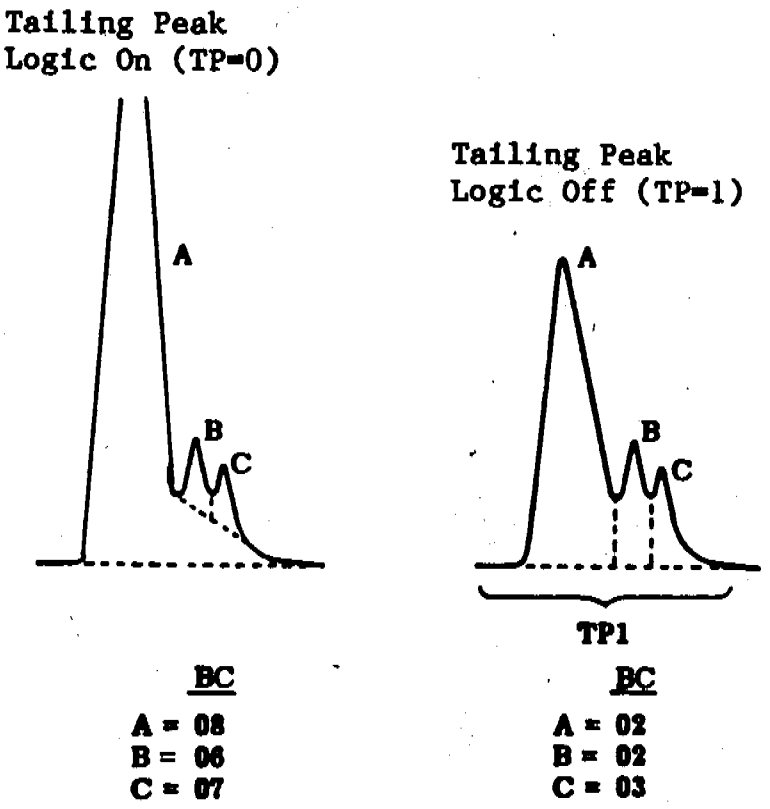


Fig. 4.2 Disabling Tailing Peak Identification with the TP Time Function

Valley-to-Valley Baselines (BL)

Setting the valley-to-valley function causes a baseline to be detected at each valley point (Fig. 4.3). This function can be used for drifting baselines or for those components that elute with sample impurities. Refer to "Valley-to-Valley Baselines," in Section 6 of the operators manual.

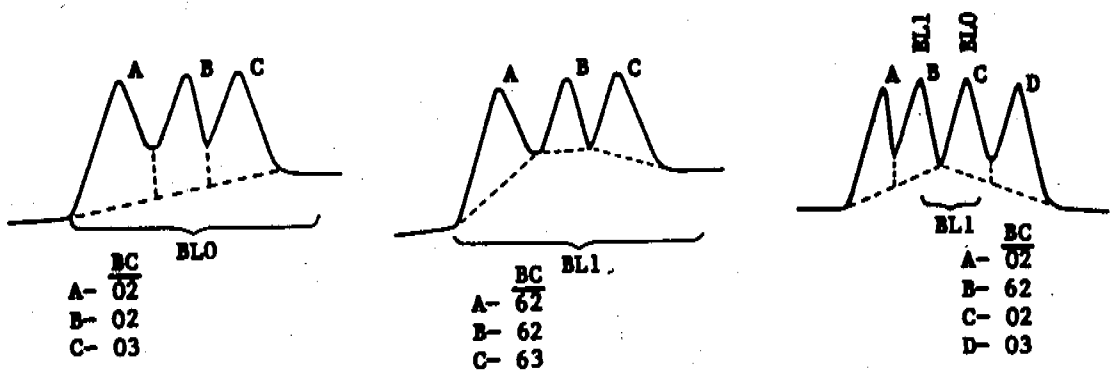


Fig. 4.3 Forced Baseline at Valley Points

Prevention of Baseline (NB)

Setting the no-baseline function inhibits the detection of baseline whenever it is activated (Fig. 4.4). See "Prevention of Baseline (NB)" in Section 6 of the operators manual.

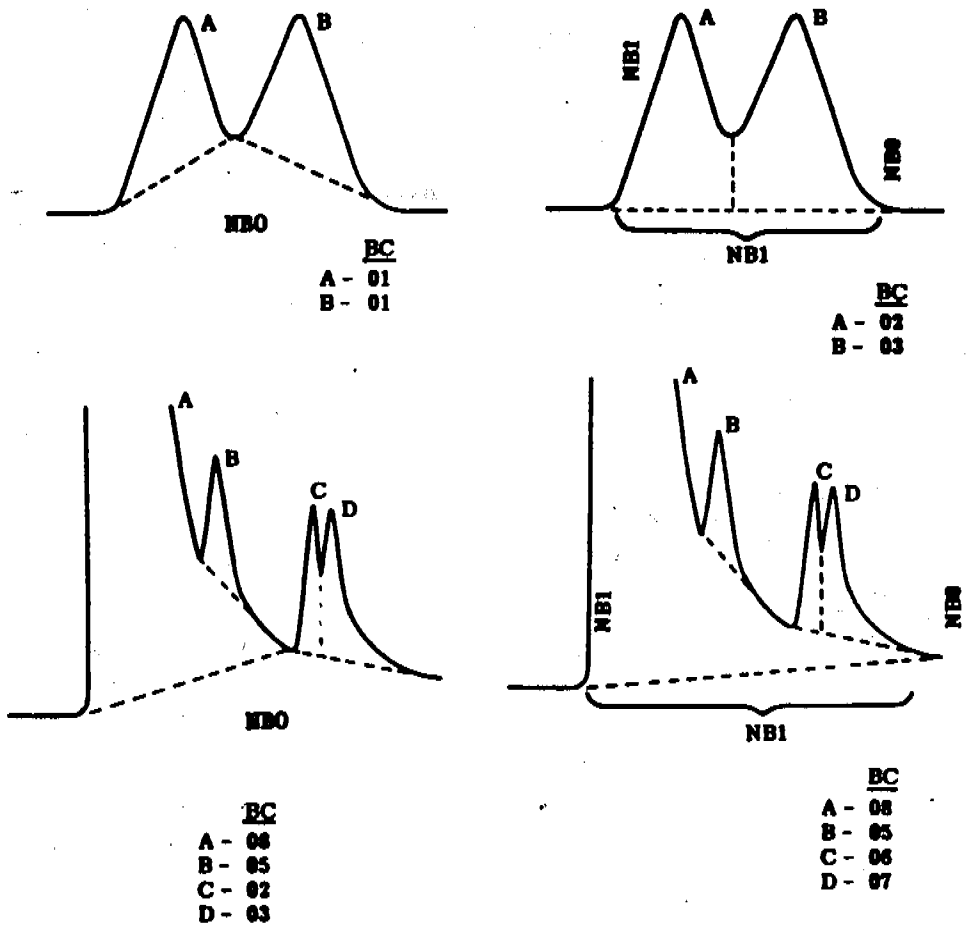
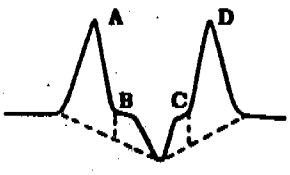


Fig. 4.4 Using the NB Time Function to Prevent Finding Baseline Between Peaks

Negative Peaks (NP)

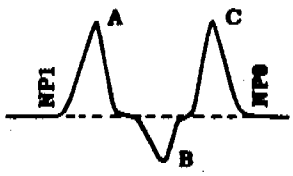
If a negative peak is a peak of interest (ie., not an unwanted baseline upset), the NP time function must be set before the peak is expected. This time function has the effect of inverting the signal while it is active, yet does not affect the plotting (Fig. 4.5). This function is most often used in liquid chromatography with refractive index detectors. See "Negative Peaks (NP)," in Section 6 of the operators manual.

1) NORMAL WAY



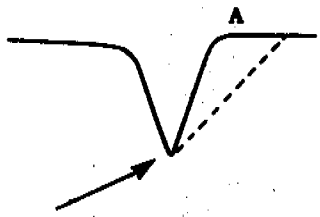
BC
A - 02
B - 03
C - 02
D - 03

a) WITH NP ACTIVE

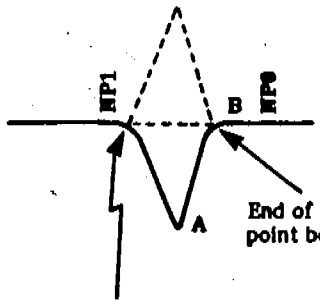


BC
A - 02
B - 22
C - 03

NP1



Peak Beginning. Should be rejected as a plateau. A is retention time.



End of negative peak. Valley point between next peak.

Peak beginning. When peak threshold is exceeded input signal is inverted. Retention Time is at apex. Baseline correction is forward horizontal from level at beginning. When the peak meets that level again, it is reverted. If the ending level is above the original, a fused peak is identified and they are split at the beginning level. If the ending baseline is below the beginning level, baseline is found in the normal manner of horizontal projections.

Area subtracted from peak B

Area subtracted from peak A

BC
A - 22
B - 43

Fig. 4.5 Examples of Ways to Deal with Negative Peaks

Group Peaks (GP)

Setting the group peaks function causes all peaks after the function is activated to be treated as one peak with a retention time matching that of the time function (Fig. 4.6). The group peaks function must be turned off to end the group. Refer to "CONTROL OF GROUPED PEAKS (GP)," in Section 6 of the operators manual.

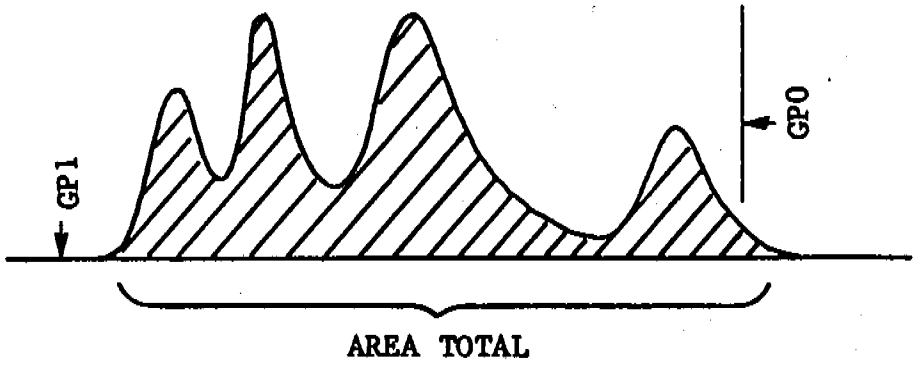


Fig. 4.6 Peak Grouping by Time Function

Only a total area will be reported for the group. The retention time for this area will be the time when GP1 was activated.

SECTION 5
USE WITH AUTOSAMPLERS

CONTENTS

AUTOSAMPLER INTERFACE

Autosamplers from manufacturers other than Spectra-Physics can communicate with the SP4270/4290 through the timed events module and the appropriate cable. Spectra-Physics autosamplers communicate through LABNET (refer to Appendix 1 in the SP4270 Operators Manual, or Appendix A in the SP4290 Operators Manual). There are cables available for the Hewlett-Packard models 7670, 7671 and 7672, and the Varian 8000, the Micromeritics Model 725, and the Waters WISP autosamplers.

AUTOMATIC CALIBRATION ANALYSIS SEQUENCE

By entering a value for "Samples Between Calibration (CI)" in the sample dialog, the SP4270/4290 automatically recalibrates after that number of sample vials. Refer to "SAMPLES BETWEEN CALIB: CI=," in Section 3 of your operators manual.

VIAL INFORMATION- XD TIME FUNCTION

Vial information is read into the SP4270/4290 via the BCD input on the timed events module. To read this vial information, the XD time function must be activated (usually at the beginning of the run). Refer to "BCD/Autosampler Vial Decoding (XD)," in Section 6 of your operators manual, the explanation for "XD" in Section 2 of this manual.

NOTES:
All section references in this appendix are directed to the operators manuals for either the SP4270 or SP4290.

Codes marked with an asterisk (*) are those items that remain at their set value at end of run; they are not automatically reset.

TIME FUNCTION CODES

CODE	RANGE	EXPLANATION
AT	.5,1,2,4,8,16, ...4096	Attenuation for chart, uV full scale.(See Section 6.2.1.)
*AZ	0,1	Auto zero. (See Section 6.2.6.) 0 = Plot at input level. 1 = Plot set to baseline.
BH	0,1	Backward horizontal baseline. (See Section 6.4.6.)

CODE	RANGE	EXPLANATION
BL	0,1	Baseline forced at next valley. (See Section 6.4.8.)
CS	.1,.25,.5,1,2,	Chart speed. (See Section 6.2.2.)
ER	1	End run. (See Section 6.3.1.)
ET	0,1	Force evaluation of peak threshold -- do not use during data acquisition.
FH	0,1	Forced horizontal, forced. (See Section 6.4.5.)
FT	0,1	Forced tangent skim of subsequent fused peaks. (See Section 6.4.3.)
GO	1 --- 32767	GOTO this statement number. (Only pertains to the SP4270, see Section 6.8.)
GP	0,1	Group peaks while ON. (See Section 6.5.)

CODE	RANGE	EXPLANATION
II	0,1	Integration inhibit. (See Section 6.4.1.)
IM	0,1	Integration inhibit mode. (See Section 6.4.2.)
NB	0,1	No baseline logic. (See Section 6.4.9.)
NE	0,1	Inhibit printing of time functions. (See Section 6.2.5.)
NP	0,1	Negative peak logic. (See Section 6.4.7.)
NT	0,1	Inhibit retention times on plot. (See Section 6.2.4.)
MB	0 —— 255	Maximum baseline allowed: Voltage * 66. (See Section 6.4.10.)
MP	1,2,4,8,16, 32,64,128	Maximum PW multiple allowed. (See Sections 6.6 and 7.3.1.)

CODE	RANGE	EXPLANATION
*PM	0,1	Peak markers. (See Section 6.2.3.)
PO	1--- 255	Peak onset parameter (default = 10; recommended range: 6 - 10). (See Section 6.7.)
PT	1 --- 32767	Peak threshold (default = 12). (See Section 7.2.1.)
PW	1 --- 32767	Peak width (default = 6). (See Section 7.10.1.)
SR	1	Start Run. (See Section 6.3.2.)
TP	0,1	Disable tailing peak logic. (See Section 6.4.4.)
*T3 - T8	0,1	External time function terminals (only usable with optional time functions card). (See Section 8.)

CODE	RANGE	EXPLANATION
XD	1	Strobe external data into variable XD(1). (See Section 6.3.3.)

COMPONENT TABLE CODES

CODE	RANGE	EXPLANATION
AC	0,1,2,3	Statistics enable, MN>0. 1 = Report when IX=RA or RC. 3 = Report when IX > 1. (See Section 5.4.)
CA	0,1	Calibrate flag. 1 = calibrate next run
CI	0 — 254	Samples between calibrations. (See Section 3.1.2, item 15.)
CM(i)	5 bytes of ASCII	Component name, second 5 characters.
CN(i)	5 bytes of ASCII	Component name, first 5 characters.

CODE	RANGE	EXPLANATION
CU	5 bytes of ASCII	Concentration units, first five characters. (See Section 3.1.2, item 15.)
CU(1)	5 bytes of ASCII	Concentration units, last five characters. (See Section 3.1.2.)
CV	Floating Point	Calibration variance, defines the range of acceptable RF values, %.
CW	0 — 1.0	Component peak window, see RW. (See Section 5.1.)
CZ	0 — 254	Number of components.
DT	0 — 655.35	Dead time, subtracted from peak times to calculate relative retention times. (See Section 5.1.4.)
DP	0 — 254	Default peak entry whose RF values will be applied to all peaks not identified by the component table.

CODE	RANGE	EXPLANATION
IP	0 — 254	Internal standard peak component array index number; method 2. If MN=1, IP is response factor reference peak.
IX	0 — 254	Index, current place in sequence. (See Section 5.4.2.)
IX(1)	0 — 254	Previous value of IX.
LC	0 — 32	Last concentration switch. (See Section 5.6.)
LK	0,1	Lock file from dialog, 1=locked. (See Section 2.2.3.)

CODE	RANGE	EXPLANATION
LS	0,1,2,5,6	Multilevel calibration switch. 0 = Not selected. 1 = Linear with external standard. 2 = Non-linear with external standard. 5 = Linear with internal standard. 6 = Non-linear with internal standard. (See Section 5.2.)
MA	-32767 — 32767	Minimum area. Peaks with areas equal to or less than this area are rejected. (See Section 5.5.3)
MC	Floating Point	Minimum concentration to report. (See Section 5.5.2.)
MN	0,1,2,5	Method number. (See Section 3.1.2.)
NM	5 bytes of ASCII	Name of file, first 5 characters. (See Section 4.2.2.)

CODE	RANGE	EXPLANATION
NM(1)	5 bytes of ASCII	Name of file, next 5 characters. (See Section 4.2.2.)
NM(2)	5 bytes of ASCII	Name of file, next 5 characters. (See Section 4.2.2.)
NM(3)	5 bytes of ASCII	Name of file, next 5 characters. (See Section 4.2.2.)
NM(4)	5 bytes of ASCII	Name of file, next 5 characters. (See Section 4.2.2.)
NO	0,1	Normalize results, MN = 2 and 5.
OD	0,1,2	Output device for end of run reports. 0 = Reports sent to printer/plotter. 1 = Same as 0. 2 = Reports sent to RS-232 port.

CODE	RANGE	EXPLANATION
NV	0 — 254	Number of multilevel calibration levels. (See Section 3.1.2.)
RA	0 — 254	Number of replicate analysis. (See Section 3.1.2, item 15.)
RC	0 — 254	Number of replicate calibrations. (See Section 5.2.3.)
RF(1)	Floating Point	Response factor for this component. (See Section 3.1.2)
RN	0 — 254	Run number, counts all injections.
RN(1)	0,1	Previous value of RN.

CODE	RANGE	EXPLANATION
RP(i)	0 — 254	Relative retention time reference peak index. The retention time is entered in dialog and converted to an array index for reference peak. (See Section 5.1.2.)
RT(n)	Floating Point	Retention time for component(n) in component table. (See Section 3.1.2)
RW(i)	Floating Point	Reference peak window, percent + or -. (See Section 5.1.2.)
SI	0 — 254	Current sample index. (See Section 3.1.2.)
SP	0 -- CI	Current pointer in recalibration sequence.
SZ	0 — 254	Number of entries in sample table.

CODE	RANGE	EXPLANATION
T1	0 — 655.35	Time before which peaks are not reported. (See Section 5.5.1.)
T2	0 — 655.35	Peak width doubling time.
WU	0,1	Weighted update option. 0 = Equal weight to all calibration runs in a series. 1 = Weight the current calibration values equally with all previous values (i.e., the longer ago a calibration was done, the less effect it will have on current calculation of response factors). (See Section 5.5.4.)

SAMPLE TABLE CODES

(See Section 3.1.2, item 15 for details.)

CODE	RANGE	EXPLANATION
AN	5 bytes of ASCII	Analyst's name, first five characters.
AN(i)	5 bytes of ASCII	Analyst's name, next five characters.(i) = 1 to 2.
CI	0 — 254	Samples between calibrations.
CU	5 bytes of ASCII	Concentration units, first five characters.
CU(1)	5 bytes of ASCII	Concentration units, last five characters.
RA	0 — 254	Number of replicate analyses.
SA(i)	0 — 32767	Sample amount.
SI	0 — 254	Current sample index.

CODE	RANGE	EXPLANATION
SM(i)	5 bytes of ASCII	Sample Name, second five characters.
SN(i)	5 bytes of ASCII	Sample Name, first five characters.
SP	0 — CI	Current Sample in recalibration sequence.
XF(i)	-32767 to 32767	Scale Factor Multiplier put in Sample Table for sample(i).

REPORT CODES

CODE	RANGE	EXPLANATION
AC	0,1,2,3	Statistics enable. (MN > 0) 0 = No statistics. 1 = Report when IX=RA or RC. 3 = Report when IX>1. (See Section 5.4.)
AN	5 bytes of ASCII	Name of analyst, first 5 characters.
AN(1)	5 bytes of ASCII	Name of analyst, next 5 characters.

CODE	RANGE	EXPLANATION
AN(2)	5 bytes of ASCII	Name of analyst, next 5 characters.
CA	0,1	Calibration flag. 1 = Next run calibrate. 0 = No calibration.
CI	0 — 254	Samples between calibrations.
CU	5 bytes of ASCII	Concentration units, first 5 characters. (See Section 3.1.2.)
CU(1)	5 bytes of ASCII	Concentration units, last 5 characters.
CV	Floating Point	Calibration variance, defines the range of acceptable RF values in %.
CW	0 — 1.0	Component peak window (See Section 5.1.1).
CZ	0 — 254	Number of components.

CODE	RANGE	EXPLANATION
DT	0 — 655.35	Dead time, subtracted from peak and file times to calculate relative retention times (RRT). (See Section 5.1.4.)
DP	0 — 254	Default peak entry whose RF values will be applied to all peaks not identified by the component table.
IP	0 — 254	Internal standard Peak component array index number; methods 1 and 2.
IX	0 — 254	Index, current place in sequence (See Section 5.4.2).
IX(1)	0 — 254	Previous value of IX.

CODE	RANGE	EXPLANATION
LC	0 — 32 0,1,2,4,8,16,24 Options may be combined by adding above numbers together.	Last concentration switch. 0 = Not selected. 1 = Store last concentration in LC (i). 2 = Report last concentrations. 3 = Store and report concentrations. 4 = Suppress main report. *8 = Long analyzer report. *16 = Short analyzer report + A/S report. *24 = Long analyzer report + A/S report. *32 = Data system report only.
LK	0,1	Lock file from dialog, 1 = locked. (See Section 2.2.3).

* LABNET analyzers only.

CODE	RANGE	EXPLANATION
LS	0,1,2,5,6	Least squares calibration switch. 0 = Not selected. 1 = Linear. 2 = Non-linear. 5 = Linear with internal standard. 6 = Non-linear with internal standard. (See Section 5.2.)
MC	Floating Point	Minimum concentration to report. (See Section 5.5.2.)
MN	0,1,2,3,4,5	Method number (See Section 3.1.2).
NM(1)	5 bytes of ASCII	Name of file, 5 characters per parameters. Up to 25 characters combined. (See Section 4.2.2.)
NO	0,1	Normalize results, MN=2,3,4,5

CODE	RANGE	EXPLANATION
OD	0,1,2	Output device for end of run reports. 0 = Same as 1. 1 = Reports sent to printer/plotter. 2 = Reports sent to RS-232.
NV	0 — 254	Number of calibration points, least squares mode. (See Section 3.1.2.)
RA	0 — 254	Replicate analysis. (See Section 3.1.2.)
RC	0 — 254	Replicate calibrations. (See Section 5.2.3)
RN	0 — 254	Run number, counts all injections.
RN(1)	0,1	Previous value of CA.

CODE	RANGE	EXPLANATION
RP(i)	0 — 254	Relative retention time reference peak index. The retention time is entered in dialog and converted to an array index for reference peak. (See Section 5.1.2)
RW(i)	Floating Point	Reference peak window, percent (±). For every RW(i) there is a CW(i) that defines the window size for other components in the zone of influence of each reference peak. (See Section 5.1.2)
SI	0 — 254	Current sample index. (See Section 3.1.2)
SP	0 — CI	Current pointer in recalibration sequence. (See Section 3.1.2)
SZ	0 — 254	Number of entries in the sample table. (See Section 3.1.2)

CODE	RANGE	EXPLANATION
T1	0 — 655.35	Time before which peaks are ignored. (See Section 5.5.1)
T2	0 — 655.35	Peak width doubling interval.
WU	0,1	Weighted update option. (See Section 5.5.4) 0 = Give equal weight to all calibration runs in a series. 1 = Weight the current calibration values equally with all previous values (i.e., the longer ago a calibration was done, the less effect it will have on current calculation of response factors).

The fault codes associated with the local data system range from 1 to 255; fault codes above 1000 are reserved for LABNET. Any fault code between 1 and 254 not shown in the list below represent a serious system level failure and is considered to be the same as FAULT 255.

NOTE: The fault codes that do not appear on the SP4290 are marked with an asterisk (*).

1	Out of Memory
3	No Program Exists
4	Ran Out of Processes (too many programs running)
*5	Illegal Variable for LET Statement
6	Illegal Argument for System Variable (such as CS)
*7	Undefined Variable in NEXT Statement
*9	Illegal IF-THEN-ELSE Construct
*10	Syntax Error (spelling error or ??)
11	Array Index too Large (>254)
*12	Statement Number too Large (>65535)
13	Overflow of Output Buffer (print >90 characters)
*14	Illegal Format Specification in PRINT Statement
*15	NEXT Without a FOR
*16	Illegal FOR-TO-STEP Construct
*17	Mismatch of Variable in NEXT Statement
*18	RETURN Without a GOSUB
*20	ON Without a GOTO

*21	Ran Out of Data for READ Statement (see RESTORE)
22	File Number Out of Range
24	Illegal Time Function
28	File or BASIC Locked From Edit
*30	Statement Was Not Found
31	Cannot SCRATCH the ROM Program
32	Statements Out of Order in SCRATCH Command
33	Already in Run or Reporting
40	Reference Made to Non-Existent Channel or File
70	Divide by Zero Attempted - Run Terminated
72	Numerical Overflow - Run Terminated
*90	Random Function Does Not Allow Negative Numbers
100	STOP or ESCAPE Key was Recognized
101	Mismatch of Parentheses
195	Illegal Clock Interrupt
201	Illegal Call to ALLOC
*202	Corrupted BASIC Program*
203	Corrupted Pointer in Process Work Area
222	Function Not Allowed
255	Illegal Z80 Address Was Executed

LABNET FAULT CODES

1000	Unsupported Device (device not present)
1020	Device Busy
1021	Illegal Output Device
1022	Address Fault
1023	Transmit Confirmation Fault
1025	Terminal Time Out