IBM Instruments Inc.

Enzyme Analysis (Kinetics) Program User's Manual

GC22-9309

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First Edition (July 1984)

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PREFACE

The purpose of this Manual is to enable the user to install and operate the IBM Instruments Enzyme Analysis (Kinetics) Program.

This program extends the capability of the IBM Instruments 9420 & 9430 UV-Visible Spectrophotometers.

The new capability enables the instrument to perform measurements and calculations pertaining to enzyme analysis and reaction kinetics work.

RELATED PUBLICATIONS

9400 Series Product Description, GC22-9216

9420/9430 UV-Visible Spectrophotometer User's Manual, GC22-9223

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LIST OF FIGURES

1.0 GENERAL DESCRIPTION

The IBM Instruments Enzyme Analysis (Kinetics) Program is an optional feature of the 9420/9430 UV-Visible Spectrophotometers. The program resides on a special board, which plugs into one of the option slots provided in the back of the Operator Unit of the spectrophotometer.

The Enzyme Analysis (Kinetics) Program can be used to measure and store optical density changes versus time in a sample and to perform mathematical operations on the stored data. The results are printed out in a form which is useful to those engaged in enzyme work or in kinetics studies of chemical reactions.

The program performs these functions by adding two new methods, 103 and 111, to the menu of the 9420/9430 spectrophotometers.

Method 103 acquires, plots and stores the photometric data as a function of time. Method 111 displays the data on the CRT, sets the conditions for data analysis and processing, and prints out the final results on the printer/plotter.

2.0 INSTALLATION

2.1 HARDWARE CONSIDERATIONS

Before installing the Enzyme Analysis (Kinetics) Program board, verify that the switches SW1 and SW2 (see Figure 2-1) are set as shown in Figure 2-2.

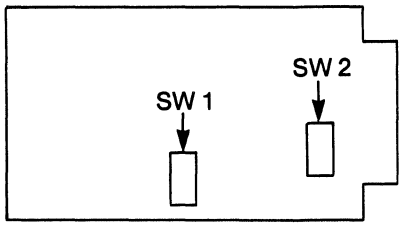

Figure 2-1 Switch Positions on the Enzyme Analysis (Kinetics) Board

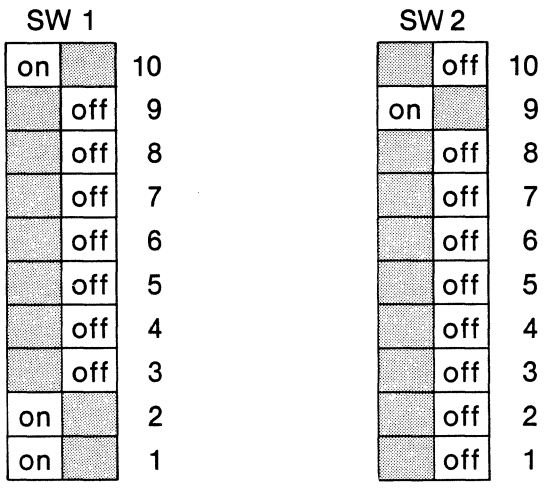

Figure 2-2 Correct Switch Configurations

2.2 INSTALLATION

The Enzyme Analysis (Kinetics) Program board can be easily installed on the 9420/9430 spectrophotometers by the procedure described below.

1. Turn the POWER switch on the 9420/9430 Optical Unit to the "Off" position.

2. Remove two adjacent option slot covers from the rear panel of the Operator Unit. Save all screws and washers.

   Note: Removing two slot covers instead of only one facilitates the insertion of the Program board.

3. Open the shipping carton and carefully remove the Enzyme Analysis (Kinetics) Program board from its protective envelope. Handle the board only by the edges to minimize the risk of damage to its components from electrostatic discharges.

4. Insert the Program board in one of the slot guides with the component side facing right as you face the back of the Operator Unit, as shown in Figure 2-3. Carefully push the board all the way in until solidly engaged in the bus connector on the mother board.

   Note: Due to the stiffness of the connector, proper board insertion may not be achieved on the first try. In this case, pull the board out and reseat it gently in the slot guide. Carefully realign the board with the bus connector and push it in firmly until fully inserted. The board is properly seated when the top of the slot cover is flush with the frame to which it mounts.

5. Reinstall the two slot covers and refasten them with the screws and washers set aside earlier.

6. Label the back of the slot cover for future reference.

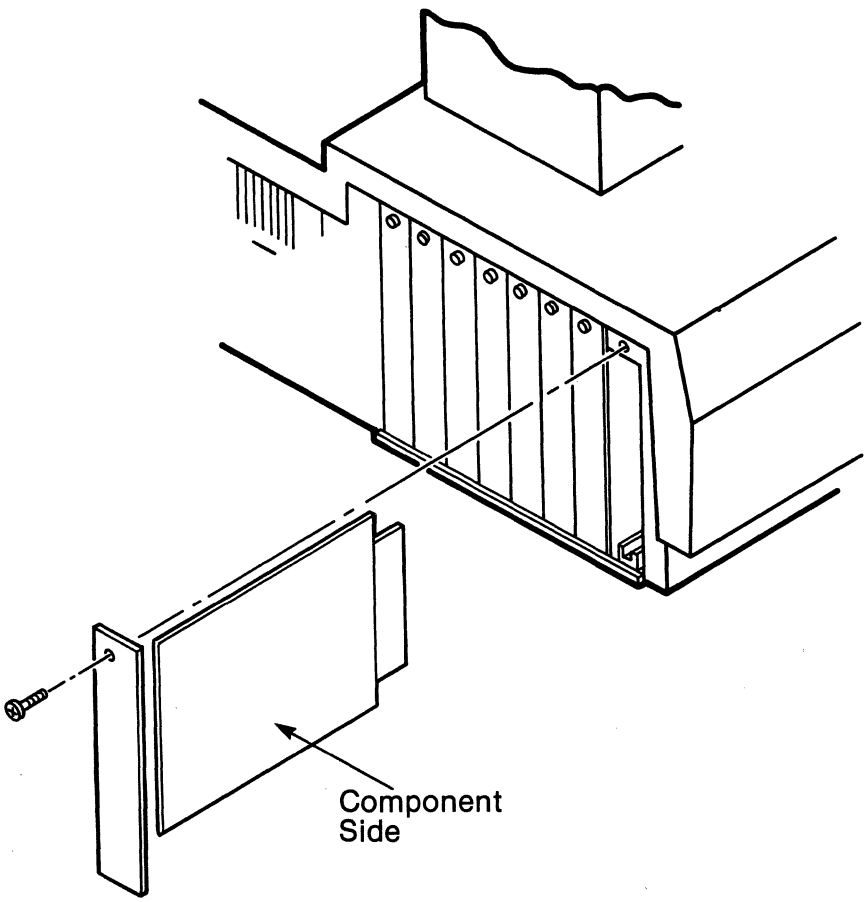

Figure 2-3. Installation of Enzyme Analysis (Kinetics) Program Board

3.0 OPERATING PROCEDURE

The Enzyme Analysis (Kinetics) program board enables the IBM Instruments 9420 & 9430 Spectrophotometers to perform two additional methods. These are Methods 103 and 111.

The operating procedure for these methods is described in the following sections of this Manual.

4.0 METHOD 103: MEASUREMENT AND PLOTTING AT FIXED WAVELENGTH VERSUS TIME

4.1 DESCRIPTION

This method, which is similar to Method 3, measures either absorbance or transmittance at a fixed wavelength as a function of time and plots the results on the printer/plotter. Method 103 differs from Method 3 in that it stores the plotted data in the spectrophotometer memory (memory 1).

The following keys are applicable to this method:

%T/ABS	%T/ABS Scale
Bandwidth	Chart Set
Time Const	Plot Mode
Auto Set	Cycle Number
Go to λ	Cycle Time
Chart Speed	Scaling
Time Set	

The parameter values and ranges are the same as in Method 3. For a summary of parameter settings, see Appendix A.

4.2 PROCEDURE

1. Press the [Method], [1], [0], [3], and Enter keys to enter the method. The CRT will display the measurement axis as shown in Figure 4-1.

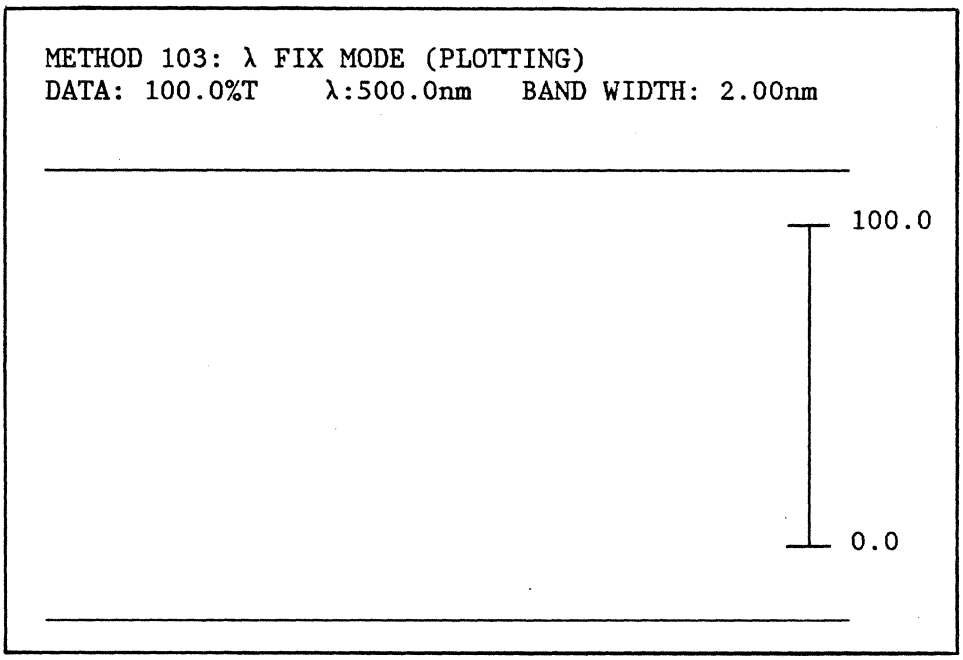

Figure 4-1. Method 103 Display

2. If a check of the operating conditions is desired, press the [Display List] key. The parameters used to set the operating conditions will be displayed as shown in Figure 4-2.

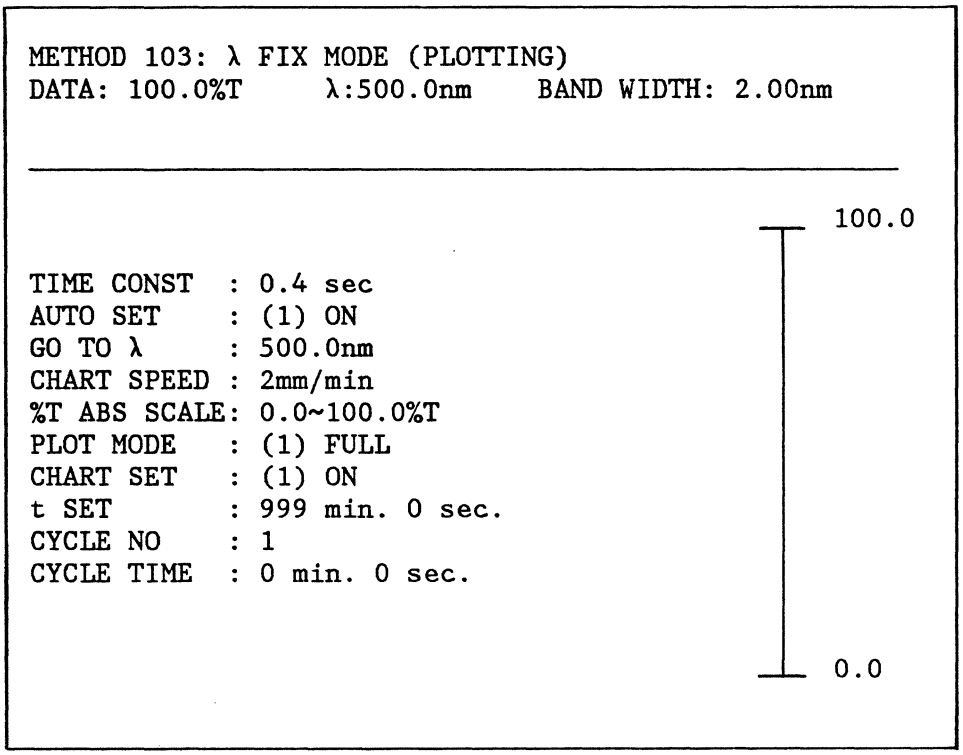

Figure 4-2. Method 103 Operating Conditions (Preset Values).

3. Set the instrument parameters as required by the experiment to be performed. For details on parameter setting, refer to the 9420/9430 User's Manual.

4. Select the measurement wavelength with the [Go to λ] key. If necessary, the [Auto Set] key can be used to set the baseline to 100.0%T or 0.000 ABS at the selected wavelength.

5. Place the sample in the cell compartment.

   Note: If sample temperature control is required, set the appropriate thermostatic controls and allow time for the sample to equilibrate.

6. Set the measurement time with the [Time Set] key. The measurement time can be set from 1 minute to 999 minutes in 1 minute steps.

   Note: The numerical entry for Time Set must be in minutes, followed by a hyphen and two zeros. For example, to set a measurement time of 5 minutes, press the following keys:

   [Time Set] [5] [-] [0] [0] [ENTER]

7. For a printout of the experimental parameters, press the [Print List] key. An example of such a list is shown in Figure 4-3.

```
DATE:___,___,___  OPERATOR:_____________________  SAMPLE:_____________
CELL:_____________ TEMPERATURE:_____________________ SOLVENT:_____________
                  HUMIDITY:_____________________  CONC:_____________

      DATA MODE    :        (2) ABS
      BAND WIDTH   :        2.00 nm
      TIME CONST   :        0.4 sec.
      GO TO λ      :      288.4nm
      t SET        :        5' 0"
      CHART SPEED  :      20 mm/min
      %T ABS SCALE:       0.000~2.500ABS
      CYCLE NO     :        1
```

Figure 4-3. Method 103 Parameter Printout

8. Press the [Scaling] key to draw the photometric axis on the printer/plotter.

9. Press the [Measure] key to begin the experiment. The chart paper will begin to advance at the rate determined by the "Chart Speed" setting and a recording of the absorbance or transmittance of the sample will be drawn by the printer/plotter.

10. The measurement will stop automatically at the end of the set time or of the last cycle of measurement. The experiment can be terminated at any time by pressing the [Stop] key. The data recorded up to that time are still available in memory. The data in memory beyond the time at which the measurement was stopped will still be those collected during the previous experiment.

    An example of the printer/plotter output for this method is shown in Figure 4-4.

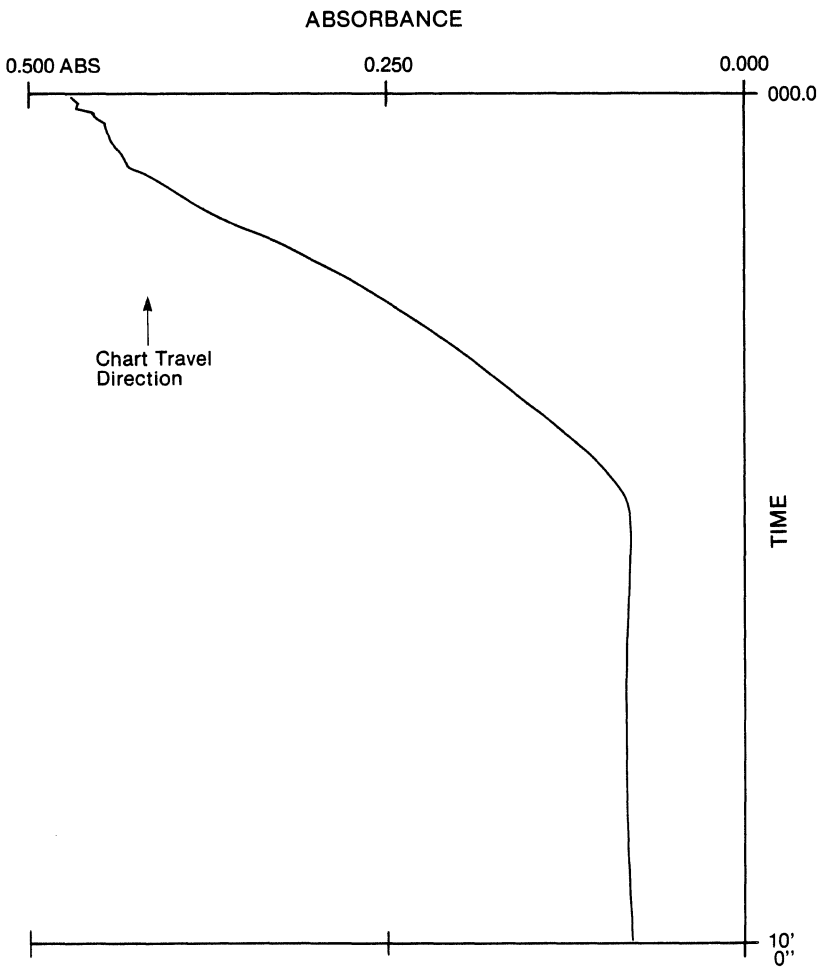

Figure 4-4. Method 103 Printer/Plotter Output

11. Note on Data Interval:

    When selecting the measurement time (Time Set) for an experiment, it is important to keep in mind that the time between data points stored in memory (Data Interval) is variable. This is due to the fact that a fixed number (2000) of data points is always stored in memory during the measurement. For example, if the Time Set is 1 minute, the Data Interval will be 30 milliseconds. If the Time Set is 60 minutes, the Data Interval will be 1.8 seconds.

12. If it is desired to save the data of a measurement, transfer the contents of memory 1 to another memory before the next experiment. Either Method 11 or Method 111 (see Section 5.0) can be used for transferring data between memories.

5.0 METHOD 111 : DATA PROCESSING AND CALCULATIONS

5.1 DESCRIPTION

A plot of either absorbance or transmittance versus time obtained using Method 103 is automatically stored in memory 1 in the 9420 or 9430 spectrophotometer. Method 111 is used to perform the following functions on the stored data:

1. Display the plot and the data on the CRT.

2. Select the time parameters for the kinetic calculations.

3. Select the output parameters for the printer/plotter.

4. Perform data processing, such as smoothing, differentiation, arithmetic operations and transfer of data between memory locations.

5. Print out the results of enzyme activity or kinetics calculations.

Each of these functions is described in the sections below.

5.2 STORING PLOTS IN MEMORY

5.2.1 DESCRIPTION

Four memory locations (memory 1-4) are used to store plots in the 9420 or 9430. When a plot is obtained in Method 103, the data are always stored in memory 1. Each time a plot is collected, the previous contents of memory 1 are erased. Therefore, to save a plot, the data must be transferred to another memory location before the next plot is obtained.

5.2.2 PROCEDURE

1. Press the [Method] [1] [1] [1] and [Enter] keys to enter the method. The CRT will appear as shown in Figure 5-1.

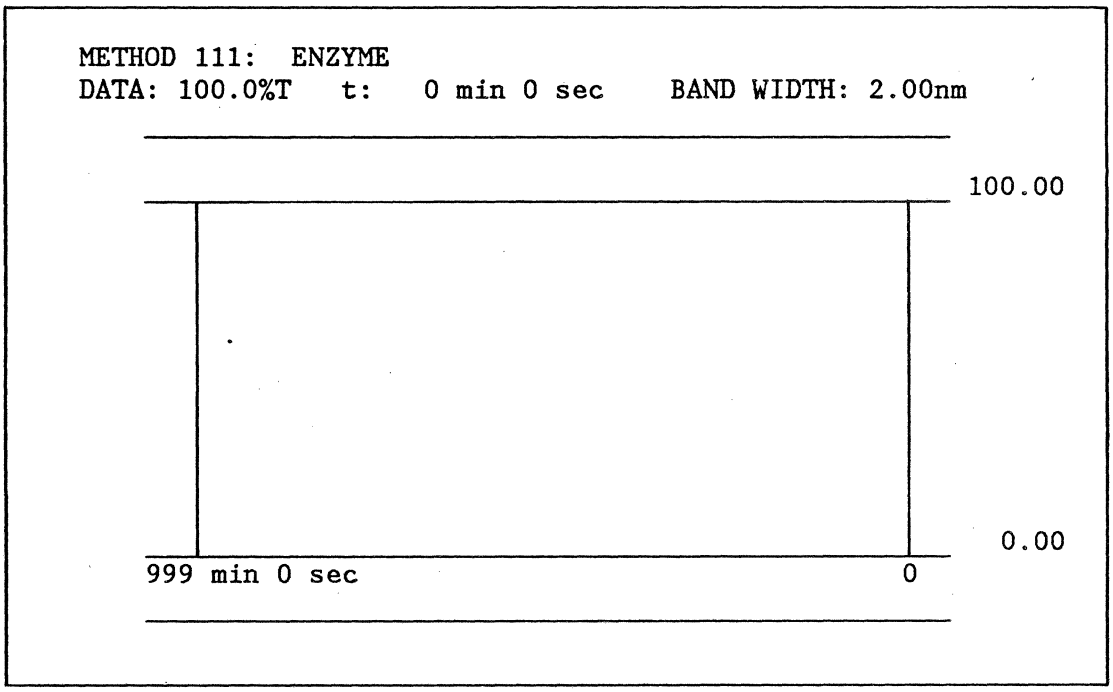

Figure 5-1. Method 111 Display.

2. To transfer the data from memory 1 to another memory, e.g. memory 2, press the following key sequence:

[Memory] [1] [Transfer] [Memory] [2] [Enter]

The same data are now present in both memories and whatever data existed in memory 2 will have been erased. A new plot could now be acquired in method 103. The new plot data will be written in memory 1. This leaves the old plot in memory 2 and the new plot in memory 1, as desired.

5.3 DISPLAYING THE PLOT ON THE CRT

5.3.1 DESCRIPTION

Any stored plot can be recalled from memory and displayed on the CRT, as shown in figure 5-2.

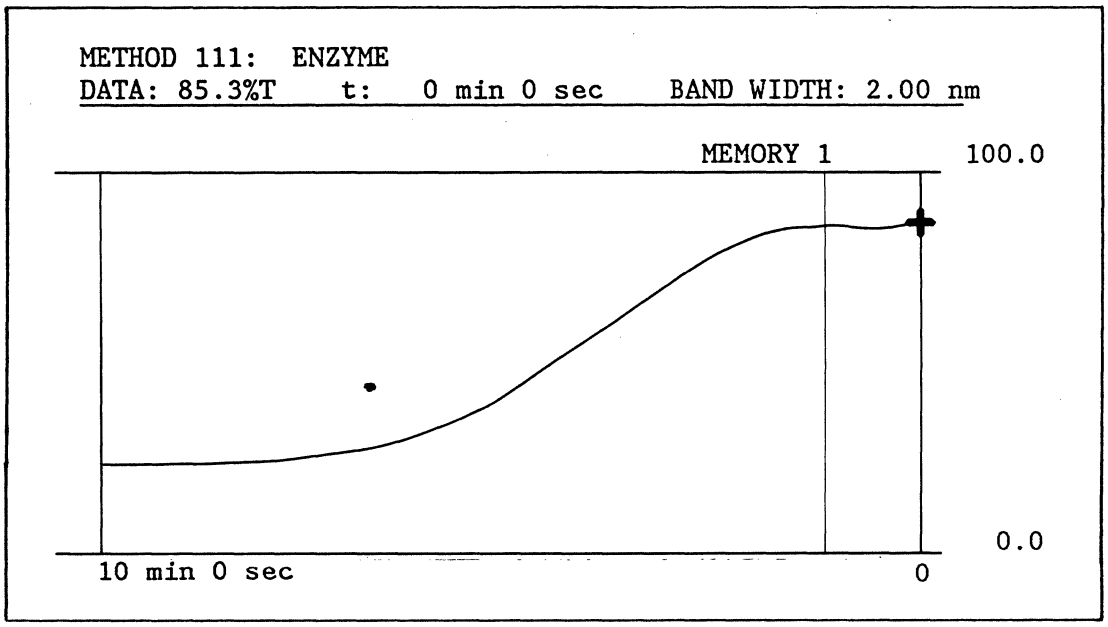

Figure 5-2. Method 111 Display of Stored Plot.

A second ordinate may appear to the left of the Y-axis on the CRT. It is related to the preset values of "Lag Time" and "Measure Time", and its position along the X-axis can be varied, as explained in the next Section.

Note: This ordinate is displayed only if a Time Set > 2 min was previously selected in Method 103.

In addition, a cursor appears on the Y-axis. It can be positioned at any point along the plotted curve by using the cursor keys. As the cursor is moved, the corresponding time along the X-axis is displayed, in minutes and seconds, in the top center portion of the CRT, while the DATA window displays the transmittance or absorbance value measured at that point in the reaction. The "Time Set" selected for the measurement in Method 103 is displayed in the lower left corner of the CRT. A list of parameters is associated with each plot stored in memory. These parameters can be displayed on the CRT, as shown in Figure 5-3, by pressing the Display List key.

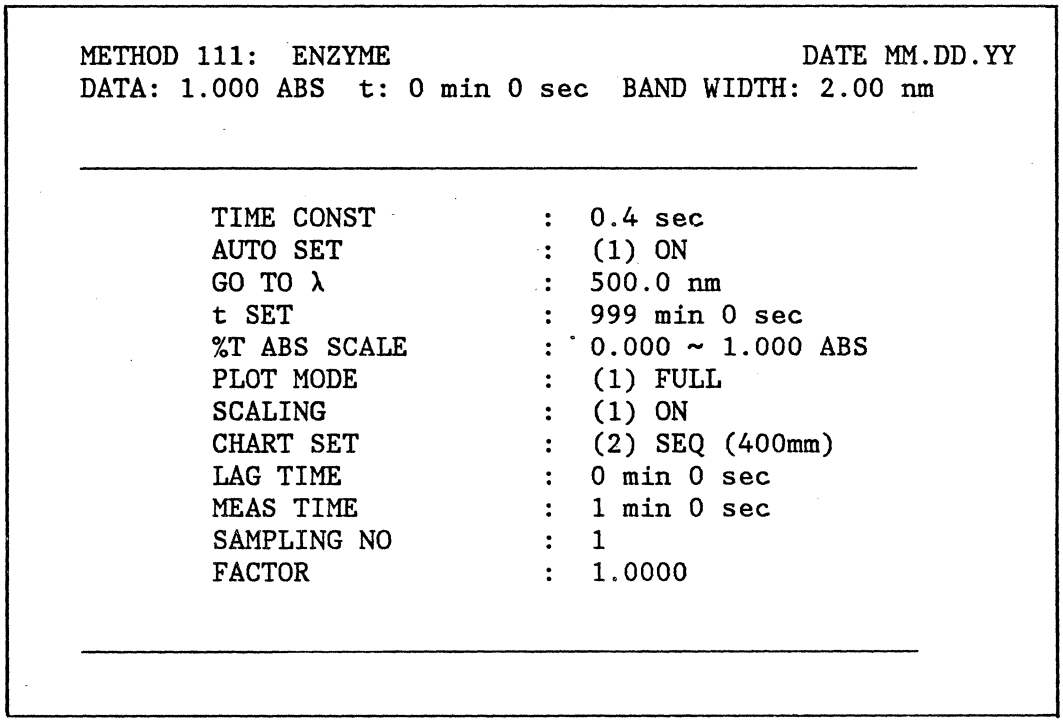

Figure 5-3. Method 111 Parameter Display.

Note: The preset conditions are shown in Figure 5-3. The date on the upper right corner is displayed only if entered using Method 53 (See 9420/9430 User's Manual).

5.3.2 PROCEDURE

1. To display a plot on the CRT, press the following keys:

   [Memory] [N] [Enter]

   where N is the memory where the plot is stored. N must be an integer from 1 to 4. The data will appear as shown in Figure 5-2.

2. Move the cursor left from its original position on the Y-axis by pressing the following key:

   [Cursor ←]

   The cursor can be moved one data point at a time by pressing the cursor key momentarily, then releasing it. For continuous movement, hold the key down. The cursor can be moved back (to the right) by pressing the other cursor key:

   [Cursor →]

3. The transmittance or absorbance value and the time corresponding to the cursor position are continuously displayed on the upper portion of the CRT. To print these values on the printer/plotter, press the [Print] key.

4. The parameters associated with the plot shown on the CRT can be displayed at any time by pressing the [Display List] key.

   If no parameter values are changed, pressing the [Display List] key again restores the plot on the CRT.

5. To display the plot after one or more parameters have been changed, press the [Memory] [N] [Enter] keys as in step 1 above.

6. Notes:

   a) The bandwidth displayed in the upper right corner of the CRT is fixed at the value last selected in Method 103 or other method and is unrelated to the storage of data in memory.

   b) If an "empty" memory, i.e., one without photometric data, is displayed, the "t Set" parameter in Method 103 is set to zero.

5.4 SELECTING THE TIME PARAMETERS

5.4.1 DESCRIPTION

The time parameters associated with a reaction plot displayed on the CRT can be measured by moving the cursor, as described in the previous section. The following parameters can be set by reading the corresponding time display on the upper portion of the CRT:

a) LAG TIME - This is the time from the start of the measurement to the onset of an appreciable reaction rate. It can be set from 1 second to 999 minutes 59 seconds in 1 second steps. The preset value (0 seconds) will be used in the calculations if no entry is selected.

b) MEASURE TIME - This is the time interval over which the reaction rate will be calculated. It can be set from 1 second to 999 minutes 59 seconds in 1 second steps. Its preset value of 1 minute 0 seconds will be used if no entry is made.

c) SAMPLING NUMBER - This is the number of Measure Time increments over which the reaction rate calculation is desired. It can be from 1 to 100, in integers, and has a preset value of 1.

Note: The Measure Time value selected will affect the Sampling Number selection. The smaller the Measure Time, the larger the Sampling Number that can be used over the total measurement time of the plot.

d) PARAMETER INTERRELATION - Mathematically, the interrelation of the time parameters can be described with the following equation:

(t Set) = (Lag Time) + (Sampling Number) x (Measure Time) + K.

The CRT will display one vertical line to the immediate left of the Y-axis corresponding to the Lag Time. If Lag Time = 0, this line coincides with the time zero ordinate. Moving further to the left, three situations can obtain, as follows:

1) K > 0: A number of ordinates are displayed equal to the Sampling Number selected. The CRT display looks like the example shown in Figure 5-4.

2) K = 0: The ordinates displayed are an exact multiple of the Measure Time, as illustrated in Figure 5-5.

3) K < 0: The Sampling Number selected is too large. The program ignores the excess and displays as many ordinates as there is available space, as shown in Figure 5-6.

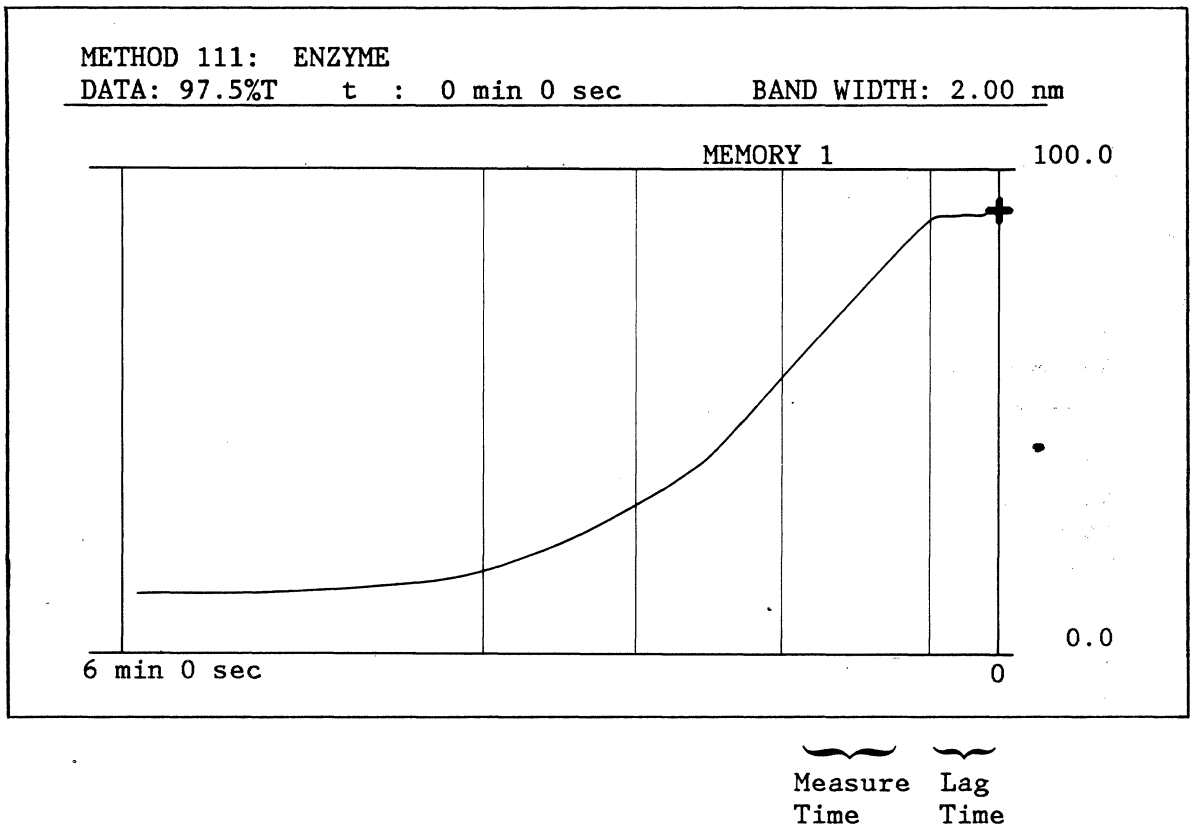

Figure 5-4. Display of Plot Recalled from Memory:

t Set	= 6 min
Lag Time	= 30 sec
Meas Time	= 1.0 min
Sampling No.	= 3

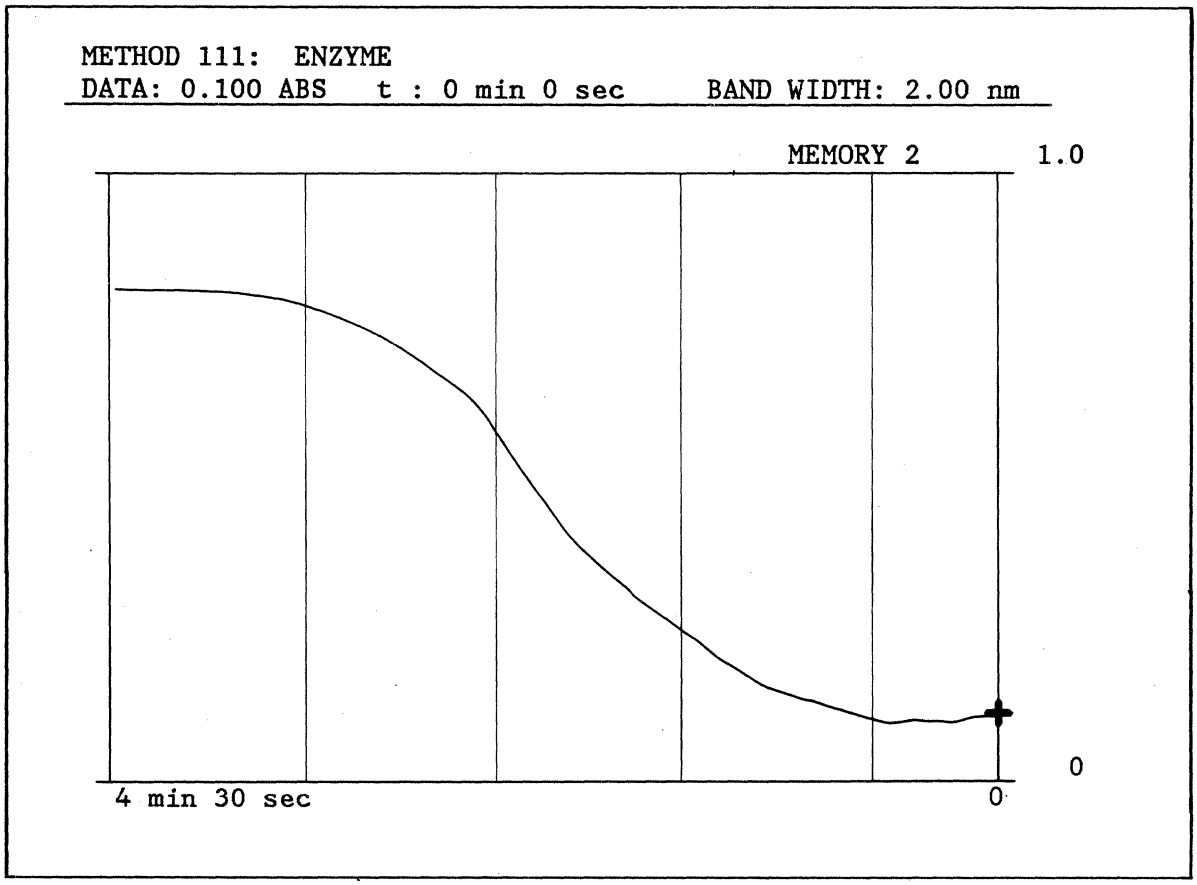

Figure 5-5. Method 111 Display of Stored Data.
(t Set = 4 min 30 sec; Lag Time = 30 sec; Meas Time = 1 min 0 sec; Sampling No = 4)

Note: "t Set" (Method 103 Time Set) is stored in memory at the time of selection in Method 103, together with the other data. The parameter list of Method 103 will retain the "t Set" value associated with the last memory data set displayed on the CRT. When returning to Method 103, always check the parameter values by pressing Display List before starting a new measurement.

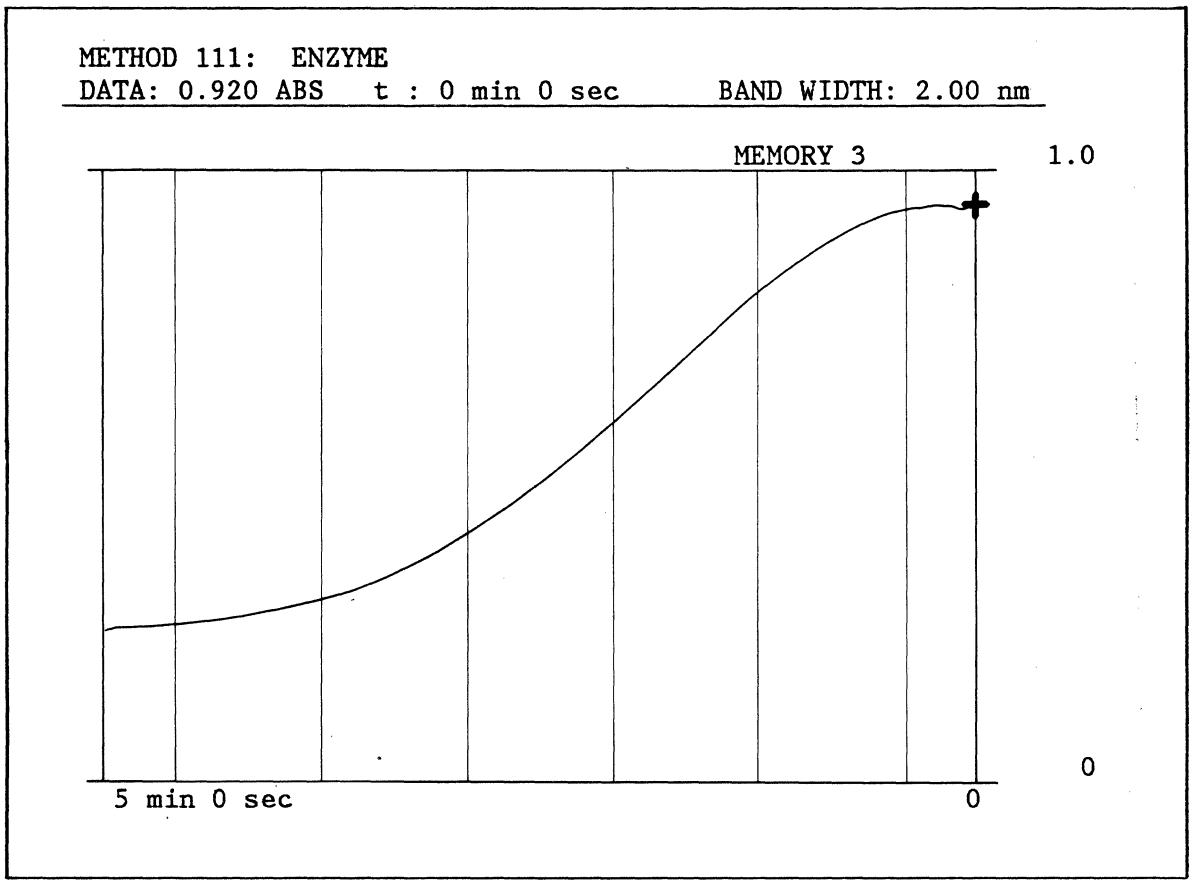

Figure 5-6. Method 111 Display of Stored Plot.
(t Set = 5 min; Lag Time = 30 sec; Meas Time = 1 min; Sampling No.= 10)

5.4.2 PROCEDURE

To select the time parameters for the calculation of the reaction rate, perform the following steps:

1. To determine the Lag Time, press the following key in steps:

   [Cursor ←]

   or hold the key pressed down for faster cursor speed, until the cursor reaches the desired position on the plot.

2. Read the time displayed at top center on the CRT: this is the Lag Time.

3. Enter the Lag Time determined above by pressing the following keys in sequence:

   [Time Set] [Minutes – Seconds] [Enter]

   Note: a) Time entries must always have the XXX.XX or XXX-XX format, including all zeros in the seconds.

   b) Skip steps 1-3 above, if the preset Lag Time value of 0 min 0 sec is desired.

4. To determine the Measure Time, continue to move the cursor to the left by pressing the [←] key as in step 1.

5. Stop the cursor at any desired point along the curve and read the time displayed on the CRT.

6. To enter the Measure Time, subtract the Lag Time determined in step 2 above from the time reading taken in step 5 and enter the time difference by pressing the following keys in sequence:

   [Cycle Time] [Minutes – Seconds] [Enter]

   Note: The preset time of 1 min 0 sec is automatically used, if no Measure Time entry is made.

7. To enter the Sampling Number, press the following keys:

   [Cycle Number] [N] [Enter]

   Note: The preset value of 1 is automatically used, if no Sampling Number entry is made.

5.5 SELECTING THE PRINTER/PLOTTER PARAMETERS

5.5.1 DESCRIPTION

The stored data from the photometric measurement versus time can be plotted on the printer/plotter as shown in Figure 5-7.

The following parameters are available for plotting:

1. Chart Set - for sequential or overlay plots
2. Scaling - for drawing the plot scale
3. %T/ABS Scale - for scale expansion or compression
4. Plot Mode - for selection of line type

5.5.2 PROCEDURE

Perform the following steps:

1. Display the plot as described in section 5.3. This will aid in the selection of the appropriate scale and will specify the memory to be used for parameter listing.

DATE:___,___,___ OPERATOR:_____ SAMPLE:_____
CELL:_____ TEMPERATURE:_____ SOLVENT:_____
HUMIDITY:_____ CONC:_____

BAND WIDTH	:	2.00 nm
TIME CONST	:	0.4 sec.
GO TO λ	:	500.0nm
t SET	:	10' 0"
%T ABS SCALE	:	0.000 ~ 3.500 ABS
LAG TIME	:	0 min 0 sec
MEAS TIME	:	2 min 0 sec
SAMPLING NO	:	5
FACTOR	:	-1.0009

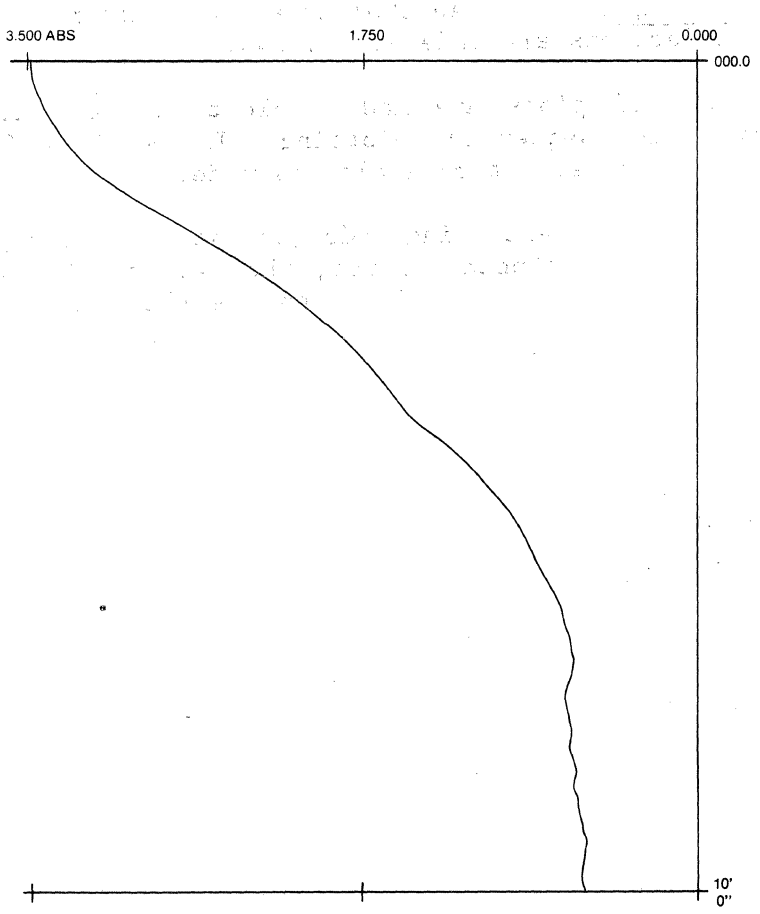

Figure 5-7. Chart Plot of Stored Data with Parameter List.

2. Press the [Chart Set] key. Five choices are displayed on the CRT: (1) SEQ (200mm), (2) SEQ (400mm), (3) OVERLAY (200mm), (4) OVERLAY (400mm), (5) OFF. The numbers in mm represent the length of the chart paper over which the X-axis (time scale) is drawn. The selections are made as follows:

   a. To plot the reaction curves sequentially, press either the [1] or the [2] key and [Enter].

   b. To overlay two or more plots on a single set of axes, as shown in Figure 5-8, press either [3] or [4] and [Enter].

   c. If no selection is made, the preset value (2) SEQ (400 mm) will be used.

3. Press the [Scaling] key. Three choices are displayed: (1) ON, (2) OFF and (3) DRAW. Selections are made as follows:

   a. If sequential plots are made, select (1) ON. This is the preset condition for sequential plotting. The 9420 or 9430 automatically draws the axes each time a plot is made.

   b. If overlay plots are being made (see step 2. above), select (3) DRAW. Two things will happen. First, the 9420 or 9430 will draw the axes on the printer/plotter and rewind the chart paper to the beginning of the X-axis. Second, the Scaling status will automatically be set at (2) OFF, so that the axes will not be redrawn each time a plot is made.

4. To select a new Y-axis scale, press the [%T/ABS Scale] key and enter the new value. This allows expansion or compression of the data along the photometric axis.

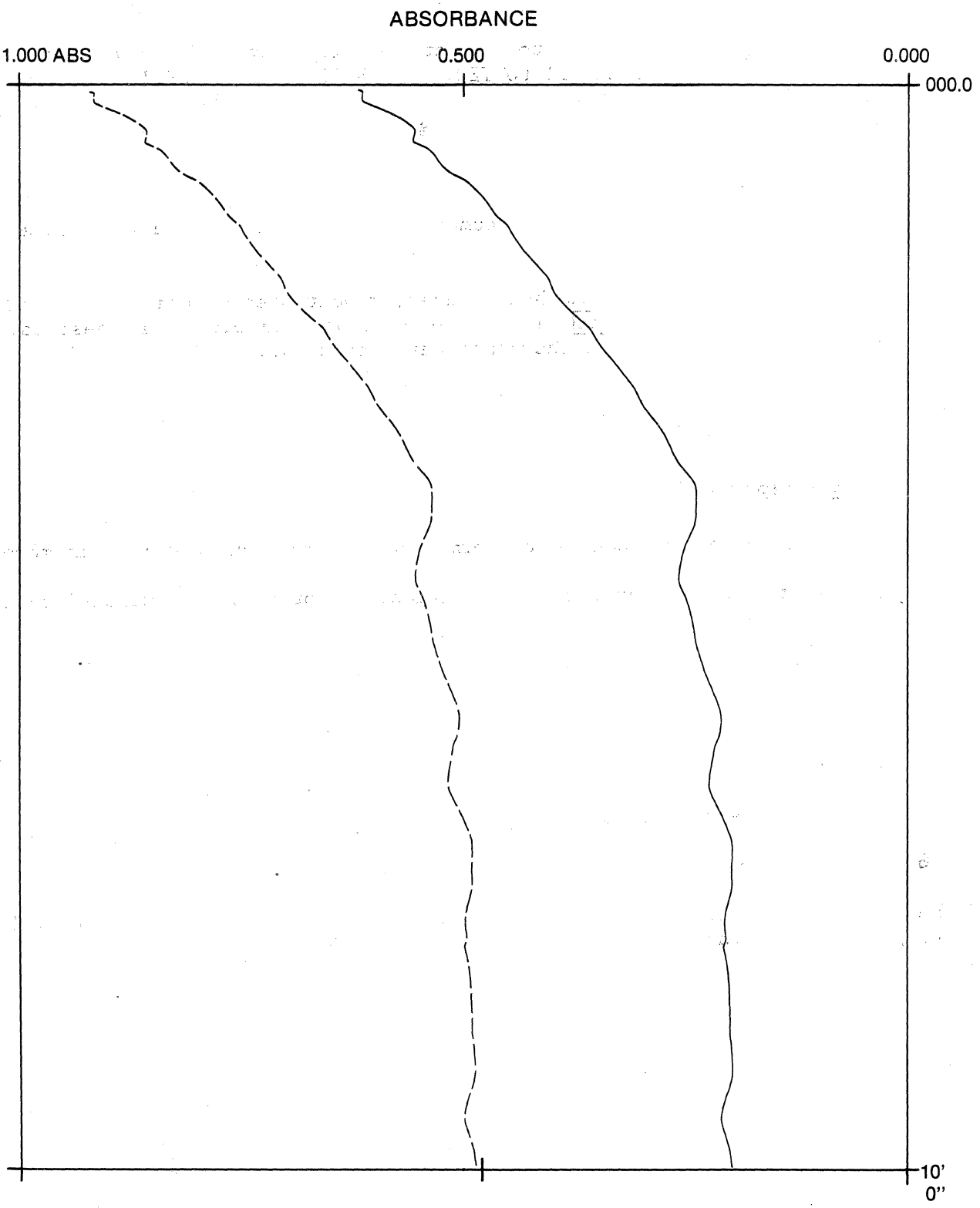

Figure 5-8. Overlay Plotting of Reaction Curves.

5. Press the [Plot Mode] key to select the line type for the plot. The choices are: (1) FULL, (2) DOTTED, (3) BROKEN and (4) CHAIN.

6. To plot the data, press the following keys:

   [Memory] [N] [Measure]

   where N = 1-4 is an integer number indicating the memory in which the data are stored.

7. If the overlay plotting method is used, repeat Step 6 until all the plots are made. The [Plot Mode] key can be used between plots, if desired, to change the line type for increased curve contrast.

5.6 DATA PROCESSING

5.6.1 DESCRIPTION

The following operations can be performed on the plot data stored in memory:

1. Arithmetic operations (addition, subtraction, multiplication, division).

2. Data smoothing.

3. Differentiation.

4. Transfer of data to another memory.

5. Exchange of data between memories.

5.6.2 PROCEDURE

The procedure to use for data processing is the same as in Method 11 (see 9420/9430 User's Manual).

5.7 PRINTOUT OF CALCULATION RESULTS

5.7.1 DESCRIPTION

Method 111, in addition to graphic data presentation and processing, provides a printout of sample results including reaction rates or enzyme activity values. The following items are listed in tabular form:

1. Factor - used to express enzyme activity in international units.

2. Sampling No. - the number of "Measure Time" increments used in the rate calculations (see section 5.4.1).

3. Time - the time corresponding to the photometric readout printed in the next column in the table (see item 4 below).

4. I/ABS - absorbance (or transmittance) value at the time specified in the time column (see item 3 above).

5. Delta OD - optical density difference between one sampling point (Sampling No. column) and the next.

6. Rate/min - reaction rate result, converted in OD change per minute or enzyme unit change per minute.

An example of a printout of calculation results is shown in Figure 5-9, together with a listing of parameters used in the calculation. In this example, the Factor converts the rate result to enzyme "unit" change per minute and the rate calculation is repeated 12 times in correspondence to the Sampling Number selected.

Note: If the Sampling Number selected is greater than necessary (see section 5.4.1, step d-3), the excess samples are not printed out.

DATE:___,___,___ OPERATOR:_____ SAMPLE:_____
CELL:_____ TEMPERATURE:_____ SOLVENT:_____
HUMIDITY:_____ CONC:_____

BAND WIDTH	2.00 nm
TIME CONST	0.4 sec.
GO TO λ	500.0nm
t SET	10' 0"
%T ABS SCALE	0.000 ~ 3.500 ABS
LAG TIME	0 min 0 sec
MEAS TIME	0 min 30 sec
SAMPLING NO	12
FACTOR	-7020.0

FACTOR = -7020.0

SAMPLING NO.	TIME	I/ABS	DELTA OD	RATE/min
	0'00"	2.943		
1	0'00"	2.943	-0.198	2779.9
2	0'30"	2.745	-0.375	5276.2
3	1'00"	2.369	-0.356	5002.4
4	1'30"	2.013	-0.276	3886.2
5	2'00"	1.736	-0.186	2615.6
6	2'30"	1.550	-0.167	2344.6
7	3'00"	1.383	-0.260	3654.6
8	3'30"	1.123	-0.196	2754.6
9	4'00"	0.926	-0.072	1013.6
10	4'30"	0.854	-0.019	268.16
11	5'00"	0.835	-0.010	151.63
12	5'30"	0.824	-0.029	416.98
13	6'00"	0.795		

Figure 5-9. Method 111 Parameters and Calculation Results.

5.7.2 PROCEDURE

To obtain a printout of calculation results, proceed as follows:

1. Display the plot of interest on the CRT by pressing the [Memory] [N] and [Enter] keys (N is an integer from 1 to 4).

2. If desired, display the list of parameters by pressing the [Display List] key. To return to the plot display, press the Display List key again.

3. Select Lag Time, Measure Time and Sampling Number as described in section 5.4.

   Note: A change of parameter values will affect the rate calculation for data stored in all memories. Parameters can be changed at any time as desired.

4. Enter the desired Factor by pressing the following keys:

   [X] (multiplication sign), [N] and [Enter],

   where N is any number from ± 0.1 to ± 9999.9.
   If no entry is made, the preset value of +1.0 will be used.

5. If a copy of the Method 111 parameters is desired, simply press the [Print List] key. The parameter list need not be displayed for printing.

6. When satisfied with the choice of parameters, press the [Memory] [N] and [Print] keys to obtain the final printout, as shown in Figure 5-10.

7. The values of Lag Time, Measure Time, Sampling Number and Factor can be changed and new results can be printed on the printer/plotter an indefinite number of times.

FACTOR = -1.0009

SAMPLING NO.	TIME	I/ABS	DELTA OD	RATE/min
	0'00"	3.498		
1	0'00"	3.498	-0.799	0.4002
2	2'00"	2.698	-1.062	0.5318
3	4'00"	1.636	-0.736	0.3687
4	6'00"	0.899	-0.173	0.0868
5	8'00"	0.725	-0.068	0.0343
6	10'00"	0.657		

Figure 5-10. Method 111 Printout of Sample Results.

6.0 APPENDIX A

6.1 CONDENSED OPERATING INSTRUCTIONS

Method	Function
103	Transmittance or absorbance measurements are made at a fixed wavelength as a function of time. The data are plotted on-line on the printer/plotter and also recorded in Memory 1.
111	Enzyme activity and reaction kinetics are calculated and the results are printed on the printer/plotter. The data from memory can be plotted on an expanded time scale on the printer/plotter. Cursor control for timing of reaction plots with graphic identification of selected reaction times. Expansion or compression of data along the photometric axis (Y). Unit conversion factor for enzyme activity value. Transfer of memory contents. Exchange between memories. Curve smoothing and differentiation. Arithmetic operations between a plot and a constant or between plots.

6.2 CONDENSED PARAMETER SETTINGS

6.2.1 METHOD 103 PARAMETERS

1. MEASUREMENT TIME

   Key Used: [Time Set]
   Range: 1 to 999 min, in 1 min steps
   Preset Value: 999 min.

2. CHART SPEED

   Key Used: [Chart Speed]
   Range: 2,5,10,20,50,100, 200 mm/min.
   Preset Value: 2 mm/min.

3. OTHER PARAMETERS

   The parameters summarized above and all other parameters available in Method 103 are the same as in Method 3. See the 9420/9430 User's Manual for additional details.

6.2.2 METHOD 111 PARAMETERS

1. LAG TIME

   Key Used: [Time Set]
   Range: 1 sec to 999 min 59 sec, in 1 sec steps.
   Preset Value: 0

2. MEASURE TIME

   Key Used: [Cycle Time]
   Range: 1 sec to 999 min 59 sec, in 1 sec steps.
   Preset Value: 1 min 0 sec.

3. SAMPLING NUMBER

   Key Used: [Cycle Number]
   Range: 1 to 100, in integer steps.
   Preset Value: 1.

4. FACTOR

Key Used: [×] (multiplication sign)
Range: ± 0.1 to ± 9999.9
Preset Value: 1.

5. CHART SET

Key Used: [Chart Set]
Range: SEQ (200 mm), SEQ (400 mm), OVERLAY (200 mm), OVERLAY (400 mm), OFF.
Preset Value: SEQ (400 mm)

6. OTHER PARAMETERS

All other parameters available in Method 111 are the same as in Method 11. For additional details, see the 9420/9430 User's Manual.

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