TIPS (TABLE PLOT INTERACTIVE GRAPHICS SYSTEM): AN INTERACTIVE GRAPHICAL S.. (U) NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA AIRCRAFT AND CREW S.. M J CADDY

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TIGS-AN INTERACTIVE GRAPHICAL SYSTEM FOR THE CREATION
AND CORRECTION OF TABULAR DATA SETS

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TIGS - An Interactive Graphical System for the Creation and Correction of Tabular Data Sets

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Naval Air Systems Command
Department of the Navy
Washington, DC 20361

Approved for public release; distribution unlimited.

A general purpose interactive graphical computer code is described which permits interactive graphical creation and correction of tabular data sets. This code was developed for Tektronics 4015 hardware utilizing the NADC 6000/Cyber 175 computer facilities.

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Interactive Computer Graphics
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>3</td>
</tr>
<tr>
<td>DISCUSSION</td>
<td>3</td>
</tr>
<tr>
<td>CODE DEVELOPMENT</td>
<td>3</td>
</tr>
<tr>
<td>HARDWARE REQUIREMENTS</td>
<td>3</td>
</tr>
<tr>
<td>SOFTWARE OVERVIEW</td>
<td>5</td>
</tr>
<tr>
<td>USER EXPERIENCE</td>
<td>5</td>
</tr>
<tr>
<td>CONCLUSIONS</td>
<td>8</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>8</td>
</tr>
<tr>
<td>APPENDIX A - USER'S GUIDE</td>
<td>A-1</td>
</tr>
<tr>
<td>INPUT CONSIDERATIONS</td>
<td>A-2</td>
</tr>
<tr>
<td>TABLE DATA FORMAT</td>
<td>A-2</td>
</tr>
<tr>
<td>EXAMPLES</td>
<td>A-2</td>
</tr>
<tr>
<td>LIMITATIONS</td>
<td>A-2</td>
</tr>
<tr>
<td>INTERACTIVE PROMPTING</td>
<td>A-2</td>
</tr>
<tr>
<td>TABLET INITIATION PROCEDURE</td>
<td>A-10</td>
</tr>
<tr>
<td>TIGS INTERACTIVE COMMANDS</td>
<td>A-12</td>
</tr>
<tr>
<td>EXAMPLE INTERACTIVE SESSION</td>
<td>A-13</td>
</tr>
<tr>
<td>APPENDIX B - TIGS CODE FORTRAN LISTING</td>
<td>B-1</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Input and Output Axis Representation</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>TIGS Example Plot</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>TIGS Segmentation Modules</td>
<td>7</td>
</tr>
<tr>
<td>A-1</td>
<td>One Parameter Table Look-up</td>
<td>A-4</td>
</tr>
<tr>
<td>A-2</td>
<td>Two Parameter Table Look-up</td>
<td>A-6</td>
</tr>
<tr>
<td>A-3</td>
<td>Three Parameter Table Look-up</td>
<td>A-8</td>
</tr>
<tr>
<td>A-4</td>
<td>Tablet Command Menu</td>
<td>A-11</td>
</tr>
<tr>
<td>A-5</td>
<td>Example Plot</td>
<td>A-14</td>
</tr>
<tr>
<td>A-6</td>
<td>Example Plot</td>
<td>A-16</td>
</tr>
<tr>
<td>A-7</td>
<td>Example Plot</td>
<td>A-17</td>
</tr>
<tr>
<td>A-8</td>
<td>Example Plot</td>
<td>A-18</td>
</tr>
<tr>
<td>A-9</td>
<td>Example Plot</td>
<td>A-19</td>
</tr>
<tr>
<td>A-10</td>
<td>Example Plot</td>
<td>A-20</td>
</tr>
<tr>
<td>A-11</td>
<td>Example Plot</td>
<td>A-21</td>
</tr>
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<td>A-12</td>
<td>Example Plot</td>
<td>A-22</td>
</tr>
<tr>
<td>A-13</td>
<td>Example Plot</td>
<td>A-23</td>
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<td>A-14</td>
<td>Example Plot</td>
<td>A-24</td>
</tr>
<tr>
<td>A-15</td>
<td>Example Plot</td>
<td>A-26</td>
</tr>
<tr>
<td>A-16</td>
<td>Example Plot</td>
<td>A-27</td>
</tr>
<tr>
<td>A-17</td>
<td>Example Plot</td>
<td>A-28</td>
</tr>
</tbody>
</table>

# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-I</td>
<td>Data Input Instructions</td>
<td>A-3</td>
</tr>
<tr>
<td>A-II</td>
<td>One Parameter Card Inputs</td>
<td>A-5</td>
</tr>
<tr>
<td>A-III</td>
<td>Two Parameter Card Inputs</td>
<td>A-7</td>
</tr>
<tr>
<td>A-IV</td>
<td>Three Parameter Card Inputs</td>
<td>A-9</td>
</tr>
</tbody>
</table>
INTRODUCTION

The NAVAIRDEVCEN (Naval Air Development Center) is a large user of vehicle and propulsion design and performance computer codes and is constantly seeking to improve their efficiency and flexibility. A significant number of these codes are dependent on the use of input tabular data sets. Quite frequently these data sets are initially received in a format incompatible with direct use in these codes, resulting in a time consuming, error prone transformation task. To circumvent this problem, development of a rapid data transformation code was undertaken. The impetus for this effort was the need to prepare for a planned substantial increase in analyses of various aircraft and propulsion systems.

This present report describes a code based on the use of an interactive graphics system that permits direct creation of digital tabular data sets from material in graph form, utilizing a Tektronics 4015 graphics terminal, digitizer tablet and hardcopy unit. In addition the user may edit and correct these data directly from the digitizer tablet or from the graphics display screen using cursor cross hairs and tablet commands. This code, entitled TIGS (Table Plot Interactive Graphics System) was developed using the NAVAIRDEVCEN CDC 6600/Cyber 175 computer facilities. A user's guide for this code is shown in Appendix A. A Fortran listing of the TIGS code is shown in Appendix B.

CODE DEVELOPMENT

The TIGS code was developed as a general purpose computer tool to permit the user to prepare and edit tabular data sets, using interactive graphics, prior to use in other computer codes. The tabular data sets may represent a functional relationship between a dependent variable and several independent variables, an example of which is shown in Figure 1. In this figure FXYZ is the dependent variable and is a function of the independent variables X, Y, and Z. The basic output of the code is graphical plots on a Tektronics 4015 type of storage tube graphics terminal along with a computer file consisting of the digital tabular data representation of that plot. These digital tabular data are suitable for use in nearly all of the vehicle and propulsion design computer codes used within the Aircraft and Crew Systems Technology Directorate at the NAVAIRDEVCEN. Further details of the tabular data output format are discussed in the user's guide Appendix A and in reference (a). While the TIGS code is a stand-alone interactive system, the graphical data portion of the code may be used in conjunction with any other user written code. In effect this flexibility permits the user to interactively prepare and edit data which in turn is passed to the user's code. Experience in using TIGS has shown that the time required to prepare data for use in the vehicle and propulsion design codes has been reduced by a factor of 10.

HARDWARE REQUIREMENTS

The TIGS code is specialized in that it was written for a CDC 6600/Cyber 175 computer system using a 1200 baud line under the CDC telex time sharing system. Graphical implementations are provided by a Tektronics model 4015 terminal with the enhanced graphics option. A large Tektronics tablet may be employed in the digitization process along with a model 4631 hardcopy unit. The TIGS system could be modified for use with other graphics systems. Figure 2 shows a typical TIGS hardcopy plot.
FIGURE 1. INPUT AND OUTPUT AXIS REPRESENTATION
SOFTWARE OVERVIEW

The TIGS code is comprised of seven basic modules using the standard utility Tektronics release 3.2 software compiled under Fortran IV. TIGS uses the Cyber segmentation loader requiring about 40000 octal memory locations to execute. The segmentation setup consists of seven modules described below. The information flow between these modules is represented by Figure 3.

TIGS is the main executive module that controls the input and output and interplays with the graphics executive.

TABR contains the code to input and output the digital data in the required format.

TIGPPR is the graphics executive module. This module controls the graphical input and permits the user to interact with the graphical screen and digital tablet controlling data point values, plot sizes, curve options, titles and scaling.

The TIGPPR module performs these functions through connections to other segmentation modules GETVAL, LOPTIM, LABEL, and DRAWIT.

GETVAL is used to input data points either from the graphics screen or the digitizer tablet.

LOPTIM implements the axes scaling and grid options selected by the user.

LABEL uses the data values to compute the axes tic marks and other data related to fitting the plot on the graphical screen.

DRAWIT processes the scaling, axes, along with other plot data and generates the commands that draw the vectors on the graphic screen.

There are two basic operating modes in the graphics executive: creation and correction. In the creation mode a digital data file is created using the cross hair cursors either directly from the Tektronics screen or from the digitizer tablet. Commands from the screen are implemented by first positioning the cross hairs and then keying a single letter indicating the command. Commands from the digitizer tablet are implemented in two steps: first the command code letter is keyed using a tablet command menu; second, the coordinates position going with the command is keyed at the desired position. From either the screen or the tablet, the graphics executive receives the command and coordinate position. The commands received by the graphics executive are generally used in three different ways:

1) add, delete or change a coordinate point
2) change a graphics executive switch from off to on or on to off
3) control the size and view of the graphical plot.

Some commands available on the screen cannot be used on the digitizer tablet. A more detailed discussion of these commands is found in the user's guide, Appendix A.

USER EXPERIENCE

The TIGS system has proved to be a very powerful, flexible tool. Task cost reductions of 10 to 1 have been shown to date using TIGS to prepare tabular inputs for other codes.
FIGURE 2. TIGB EXAMPLE PLOT
FIGURE 3. TIGS SEGMENTATION MODULES
CONCLUSIONS

An interactive graphical code system has been developed which is capable of rapid transformation of graphical information into tabular data formats which are compatible with the input requirements for a large variety of in-house programs.

REFERENCES

(a) Caddy Michael J., "TREAD/TLOOK - Multipurpose Computer Routine for Interpolation and Extrapolation of Tabular Data" NADC Report 76366-30, 1977
A.1 INPUT CONSIDERATIONS

The TIGS code will permit a direct creation of a data file from screen and or tablet commands. In addition, existing table data, input as file TAPE1, may be edited and corrected. In either case a new table data source with corrections is produced as an output on the TAPE7 file. The format of files TAPE1 and TAPE7 is the same. In the next section this format is illustrated.

A.2 TABLE DATA FORMAT

The table data may represent a dependent (output) parameter as a function of 1, 2, or 3 independent (input) parameters. The basic method for inputting these tables is described in reference (a). However, for the sake of completeness, the user’s guide portion of reference (a) has been extracted and duplicated herein and includes those modifications introduced since its initial publication. This information is shown in Table A-1.

A.3 EXAMPLES

Card input data set-ups for three different examples are illustrated as follows:

Example 1 (Drag coefficient as a function of Mach number)
The dependent variable is drag coefficient and the independent variable is Mach number. Figure A-1 illustrates the graphical relationship. This is a one parameter table look-up so the other two parameters are dummies. Table A-1 shows the card set-up for this example. The EOT (end of table) parameter label terminates the data for this table.

Example 2 (Drag coefficient as a function of Mach number and lift coefficient)
The dependent variable is drag coefficient and the independent variables are Mach number and lift coefficient, illustrated in Figure A-2. This is a two parameter table look-up so that the third parameter is a dummy. Table A-2 shows the card set-up. In Table A-2 the last Mach parameter data repeats the previous Mach parameter data. In this situation, the last Mach parameter data card can be omitted. As a general rule, whenever the data on the X parameter axis as shown in Figure A-1, is repeated, then the X parameter data card need not be repeated.

Example 3 (Drag coefficient as a function of Mach number, lift coefficient and CG location)
The dependent variable is drag coefficient and independent variables are Mach number, lift coefficient, and CG location, illustrated in Figure A-3. Table A-3 shows the card set-up for this three parameter example. Note that the input card set-up is symmetrical in that each CL parameter data card begins data for each CG parameter.

A.4 LIMITATIONS

The TIGS system as presently written is limited to a maximum of 30 curves per plot, 150 points per curve, or a total of 300 points per plot. For example, a plot with 10 curves could be described with 5 curves using 40 points per curve, and the remaining 5 curves using 20 points per curve.

A.5 INTERACTIVE PROMPTING

The TIGS code has been designed to prompt the user in supplying information in the correct format. Selection of the baud rates compatible with available transmission lines is possible. After
### TABLE I
DATA INPUT INSTRUCTIONS

<table>
<thead>
<tr>
<th>Card No.</th>
<th>Description</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Table reference number of table look-up function; table title or descriptive information</td>
<td>1XJ4,7A10</td>
</tr>
<tr>
<td>2</td>
<td>4 character identifier (user selected) used to identify the third independent variable. If table look-up has 2 or less independent variables, use a dummy identifier; the number of values of the third independent variable (must be less than 100); values of the third independent variable arranged in ascending order.</td>
<td>A4I3,3X,7F10.0</td>
</tr>
<tr>
<td>2a, b, etc.</td>
<td>Continuation of third independent variable array, if required</td>
<td>10X,7F10.0</td>
</tr>
<tr>
<td>3 and following</td>
<td>All remaining cards have the same format as card 2, 2a, b, etc. The item which distinguishes the card types is the value of the independent variable. The 4 character identifiers of each independent variable must not be identical. The 4 characters of each independent variable card (after the title card) are user selected. The card order of each independent variable is significant. The first four cards with respective independent variables are as follows:</td>
<td></td>
</tr>
<tr>
<td>Card</td>
<td>Definition</td>
<td></td>
</tr>
<tr>
<td>2, 2a, b, etc.</td>
<td>third independent variable, identifier and values</td>
<td></td>
</tr>
<tr>
<td>3, 3a, b, etc.</td>
<td>second independent variable, identifier and values</td>
<td></td>
</tr>
<tr>
<td>4, 4a, b, etc.</td>
<td>first independent variable, identifier and values</td>
<td></td>
</tr>
<tr>
<td>5, 5a, b, etc.</td>
<td>dependent variable, identifier and values</td>
<td></td>
</tr>
</tbody>
</table>

The remaining input cards use these same identifier values as input above. On cards 4, 4a, b, etc. and 5, 5a, b, etc. are the dependent and first independent variable values along the line given by the first value of the second independent variable and in the plane of the first value of the third independent variable.

Cards with the same respective identifier value cards 4, 4a, b, etc. and 5, 5a, b, etc. are repeated for different values of second independent variable until all second independent variables have been exhausted. The next card has an identifier corresponding to the second independent variable and new values of that variable for the plane of the second value of third independent variable. The values of the first independent variable need not be repeated if they are the same along each line of constant second independent variable. In each instance where the values are changed a new card is required.

Last | Table input termination indicator, EOT | A8 |
FIGURE A-1. ONE PARAMETER TABLE LOOK-UP
**TABLE A-II. ONE PARAMETER CARD INPUTS**

<table>
<thead>
<tr>
<th>COLUMN LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>123456789012345678901234567890123456789012345678901234567890</td>
</tr>
</tbody>
</table>

| MACH 4 | 0.0  | 0.1  | 0.2  | 0.3  |
| CD    | 0.010 | 0.011 | 0.0112 | 0.0115 |
| EOT   |
Figure A-2. Two parameter table look-up.
TABLE A-III. TWO PARAMETER CARD INPUTS

<table>
<thead>
<tr>
<th>COLUMN LOCATION</th>
<th>123456789012345678901234567890123456789012345678901234567890</th>
</tr>
</thead>
<tbody>
<tr>
<td>104</td>
<td>DRAG</td>
</tr>
<tr>
<td>Z</td>
<td>1  0.00</td>
</tr>
<tr>
<td>CL</td>
<td>3  0.00</td>
</tr>
<tr>
<td>MACH</td>
<td>4  0.00</td>
</tr>
<tr>
<td>CD</td>
<td>4  0.01</td>
</tr>
<tr>
<td>MACH</td>
<td>3  0.00</td>
</tr>
<tr>
<td>CD</td>
<td>3  0.1</td>
</tr>
<tr>
<td>MACH</td>
<td>3  0.00</td>
</tr>
<tr>
<td>CD</td>
<td>3  0.02</td>
</tr>
<tr>
<td>EOT</td>
<td></td>
</tr>
</tbody>
</table>
FIGURE A-3. THREE PARAMETER TABLE LOOK-UP
TABLE A-IV. THREE PARAMETER CARD INPUTS

<table>
<thead>
<tr>
<th>COLUMN LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>123456789012345678901234567890123456789012345678901234567890</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>CD vs M, CL, AND CG</th>
</tr>
</thead>
<tbody>
<tr>
<td>226</td>
<td></td>
</tr>
<tr>
<td>CG 3</td>
<td>0.0</td>
</tr>
<tr>
<td>CL 3</td>
<td>0.0</td>
</tr>
<tr>
<td>MACH 4</td>
<td>0.0</td>
</tr>
<tr>
<td>CD 4</td>
<td>0.01</td>
</tr>
<tr>
<td>CD 4</td>
<td>0.02</td>
</tr>
<tr>
<td>MACH 3</td>
<td>0.0</td>
</tr>
<tr>
<td>CD 3</td>
<td>0.03</td>
</tr>
<tr>
<td>CL 4</td>
<td>0.0</td>
</tr>
<tr>
<td>MACH 3</td>
<td>0.0</td>
</tr>
<tr>
<td>CD 3</td>
<td>0.011</td>
</tr>
<tr>
<td>CD 3</td>
<td>0.015</td>
</tr>
<tr>
<td>CD 3</td>
<td>0.020</td>
</tr>
<tr>
<td>CD 3</td>
<td>0.025</td>
</tr>
<tr>
<td>CL 3</td>
<td>0.2</td>
</tr>
<tr>
<td>MACH 4</td>
<td>0.0</td>
</tr>
<tr>
<td>CD 4</td>
<td>0.01</td>
</tr>
<tr>
<td>MACH 3</td>
<td>0.0</td>
</tr>
<tr>
<td>CD 3</td>
<td>0.011</td>
</tr>
<tr>
<td>CD 3</td>
<td>0.021</td>
</tr>
</tbody>
</table>

EOT
logging into the host system and the baud rate has been selected, different prompts will appear depending on the user response to the initial interactive query. The response will depend on whether the user intends to correct an existing file or create a new file via the screen or tablet. After the baud rate selection the next query to appear will be:

(a) "IS THIS A CREATION RUN?"

A "Y" response indicates a TAPE1 file is to be newly created and the following prompts will appear.

(b) "ENTER TABLE TITLE CARD
   (COLUMNS 1-5 SHOULD BE TABLE REFERENCE NUMBER)"

The user should refer to the instructions in section A-2 Table A-1, card 1.

(c) "ENTER 4 CHARACTERS FOR EACH LABEL FOR Z, Y, X, FXYZ
    (separated by commas)"

The user should refer to instructions in section A.2 Table A-1, card 2.

(d) "ENTER NUMBER OF Z VALUES"

The user should refer to instructions in section A.2 Table A-1, card 2.

(e) "ENTER Z VALUES IN ASCENDING ORDER"

The user should now enter the values of the Z parameter with blanks or commas between the data pieces.

(f) "WANT TO SPECIFY DECIMAL PLACES ON TAPE2?"

An "N" response will by default, set the number of places at the maximum allowable. If the user enters a "Y", this will be prompt query (g).

(g) "ENTER NUMBER OF DECIMAL PLACES FOR Z,Y,X,FXYZ"

The user should specify the number of decimal places (up to 9) separated by blanks or commas for Z,Y,X,FXYZ parameters.

At this point, the following message will appear:

"NO DATA TO BE FOUND...ENTER COMMAND"

The user may now begin creating the tabular data set with either a "N" (new line) command or a "T" (tablet operation) command. The reader is referred to sections A.5 and A.6 for additional information.

If the response to the initial query (query (a) above) is "N" then this means that data on the TAPE1 is to be used and queries (b) thru (e) are skipped.

A.6 TABLET INITIATION PROCEDURE

Tablet commands are issued using a command menu. The command menu is a section of the tablet, 20 one inch squares (10 columns by 2 rows) in which keying the coordinates within a
square is interpreted as the indicated command. Figure A-4 shows the positions of the menu commands within the 10 by 2 inch squares.

Tablet operation begins initially by attaching the command menu at any convenient location on the tablet. The menu should be approximately parallel with the lower edge of the tablet. Upon first entering the "T" command, the user enters the position of the upper left corner of the menu. The coordinates of this position are then used to determine the commands. Next, the user attaches the graph that is to be used at a convenient tablet location. Squaring the graph is not necessary since any angular correction required is performed in TIGS. The user then may select any convenient orthogonal axes and enters the following requested information:

a) the coordinate position of the crossing point of the orthogonal axes, and the coordinate values X and FXYZ respectively at the crossing point.

b) the coordinate position of any X axis point and its value. (usually this coordinate position is the maximum axis length)

After these entries have been made the "NO DATA FOUND TO PLOT" message will appear. At this time the user may issue commands from the tablet menu.

A.7 TIGS INTERACTIVE COMMANDS

Commands from the screen involve only positioning the cross hairs and keying the appropriate command. Commands from the tablet involve first selecting the command from the menu and then indicating the coordinate position. Once a tablet command has been set it remains set until changed. The user is free to change to and from tablet and screen command modes. The following commands are available:

"A"- add point after. The user positions the cross hairs and keys the "A" command (or indicates the tablet command and position). The system will respond by drawing the symbol at the new point. (Note. See the "C" command for further discussion.)

"B"- add point before. This command is exactly like the "A" command except that the point is added before the pointer position.

"C"- position the pointer to the array location that the user wishes to add a new point. The next command following the "C" command to add a point may be an "A" to add after or a "B" to add before the pointer position. In addition an "M" command may be used to move to a new location the point indicated by the position pointer. A "V" command may also be used. It should be noted that the pointer position after each added point becomes the position of the added point. Possible valid commands would be "CAABAVVVAA" permitting the user to continuously add new points very rapidly. Any other command drops the pointer position, which must be restored by another "C" command to add new points.

"D"- delete the point closest to the cross hairs or pen position.

"E"- end or terminate this plot and return to TIGS for next plot if any.

"F"- format or change type of curve drawn for each line as follows:

A-11
FIGURE A-4. TABLET COMMAND MENU
ITIP- switch determining type of curve drawn (ITIP=2, default) ITIP can have the following values: (Note: a negative value will have the same meaning except no symbols are drawn.)

0 indicates symbols only, no curve drawn
1 indicates linear fit
2 indicates smooth spline-like fit with respect to x axis
3 same as ITIP=2 except with respect to y axis
4 indicates data is multivalued and the fit is with respect to arc length along curve
5 indicates data is multivalued and forms a closed figure; the fit is with respect to arc length and joined at the ends.

NOTE: if data is not in ascending order when ITIP = 2 or ITIP = 3, then curve fit will default to ITIP = 4; DEFAULT format is ITIP = 2.

"G"- IGRID switch- turns grid from on to off or off to on.
"H"- halt tablet and returns control to screen. This only applies to tablet modes.
"I"- initialize tablet starting with graph coordinate locations. This only applies to tablet mode.
"M"- move the point indicated by the pointer position to the new coordinates indicated by the cross hairs.
"N"- begin a new curve at point indicated. Whenever this command is issued, the user will also enter the new curve value. The pointer position becomes the new point permitting commands such as "NAAMAAAAABBVAB".

"P"- re-plot data with scale as shown. see Note
"R"- rescale data to the largest size and re-plot. see Note
"S"- show the current coordinate values at the position indicated.
"V"- values input; same as "A" or "B" command except the actual X and F coordinate values are input.
"W"- window the plot to fit within the rectangle indicated by the diagonal between two coordinate positions (two points are sent).

Note: The commands "F", "P" and "R" have a dual meaning, if the vertical cross hair is to the left of the vertical plot axis then:

"F" indicates to change the ITIP of the curve indicated by the position of the horizontal cross hairs. "P" indicates activate TIGS to plot the curve indicated by the position of the horizontal cross hairs. This action is cumulative in that one or more of many curves may be indicated in this manner. "R" is used to deactivate this special mode and thus restore all curves to plotting status.
A.8 EXAMPLE INTERACTIVE SESSION

In this example the TIGS system is used to create a plot. The figures in this example are actual copies of what the user would see on the Tektronix screen. In these figures a "?" followed by data indicates that these data were the user's response to the indicated query. In the following discussion numbers enclosed by circles refer to corresponding numbers on a figure pointing to a feature under discussion. In figure A-6 (1) is the command used to begin execution of TIGS. (2) is the user response to the query as to transmission line rate. (3) indicates that a creation is requested and results in queries (4) thru (7). (4) is the main title on the plot preceded by the table reference number. The table reference number should be a 5 digit integer number. The title can be up to 4 lines. The user may indicate a new line by leaving three consecutive blanks between words. (5) is the response to the query requesting four variable names for the respective data. Note that each variable name must be 4 characters in length; blanks count as characters. (6) is the response to the number of Z variables requested. Each Z value represents a single plane. (7) is the response to the decimal place query related to the TAPE7 file. This file is an output file containing all of the data generated during this session. Each prompt, as shown, indicates that the data on TAPE7 will contain the maximum decimal places that will fit with each space. Some caution is necessary if the user specifies the number of decimal places for each parameter; precision could be lost if a low number of decimal places is initially selected. A good technique is to examine the TAPE7 file with the maximum decimal places specified first and then re-enter TIGS, if necessary, and specify decimal places as required.

When the user responds to (8), figure A-6 will be displayed. The meaning of figure A-6 is that a plot command as implied and that data was not found to plot. This is a proper response since the user, through (3), on figure A-5, elected a creation run and there is no data as yet to plot. The user will notice for the first time that cross hairs also have appeared on the screen. (Note these are not shown in figure A-6). The cross hair is a prompt signal that an input is requested. The input is a single upper case letter. A "RETURN" is not required after typing the single letter command. The single letter command issued in this example was a "N" indicating a new line. The response to this command shown in figure A-7. The first prompt, (9), requests one set of data coordinates, X and FXYZ, for one point. The purpose of this is to scale the final plot. The response at (10) is a value assigned to this line (this one set of coordinates is the beginning of a potential curve).

After entering the number one for this query as noted by (10), the screen will appear as shown in figure A-8. The "Y" shown on the left top of this figure is the 4 character label entered in (5) figure A-5. The "A" and number under the "Y" is the symbol for the first line and the line value assigned to it as, (10) in figure 7. The "A" in the center of the plot at (0,0) is the first point (and only point) of line A. The pointer positioned message indicates that the reference point from which to add points has been identified. This occurred automatically since only one point at this time is in the plot, the first point. All of the other 4 character labels, including the main plot label, are also shown. The value of the plot plane (Z value) is zero and is shown at the top right.

In the next steps the user has moved the cross hairs and "keyed" the "A" characters indicating "add point after". The "add point after" in this context means that the data point storage of the new point is after the point indicated by pointer position. The curves are always drawn in the order towards the "after" point. After each point is added the pointer position becomes the position of the added point. Figure A-9 shows the addition of added four points as they would appear on the screen. Figure A-10 is a replot of the data resulting from the user keying a "P". This command simply plots a curve through the data points shown.

Figure A-11 is a replot resulting from an "R" command. The plot axes have been rescaled to permit the largest plot of the data points that will fit within the screen.
TIGS
ENTER BAUD RATE CODE
1=1200, 2=2400, 3=4800, 4=9600
1
TIGS VERS. 2.0 11-14-80
IF THIS IS A CREATION RUN ENTER Y
? Y
ENTER TABLE TITLE CARD
(COLUMNS 1-6 SHOULD BE THE TABLE REFERENCE NUMBER)
? G1G2G3G4G5G6 TEST EXAMPLE CREATION
ENTER 6 CHARACTERS FOR EACH LABEL FOR Z,Y,K,FXYZ
(SEPARATED BY COMMAS)
? Z Y K FXYZ
ENTER NUMBER OF Z VARIABLES --- FREE FORM
? 2
ENTER Z VALUES , ASCENDING ORDER --- FREE FORM
? 1
WHAT TO SPECIFY DECIMAL PLACES ON TAPE ??
? N

FIGURE A.5: EXAMPLE PLOT
NO DATA FOUND TO PLOT ... ENTER COMMAND

FIGURE A-9, EXAMPLE PLOT
FIGURE A-7. EXAMPLE PLOT
NADC-83030-60

TEST EXAMPLE CREATION

FIGURE A-8. EXAMPLE PLOT
TEST EXAMPLE CREATION

FIGURE A-9. EXAMPLE PLOT
NADC-83030-80

TEST EXAMPLE CREATION

FIGURE A-10: EXAMPLE PLOT
FIGURE A-11. EXAMPLE PLOT
In figure A-12 the cursor was first positioned at approximate co-ordinate locations of .15 and .16 and a "C" command issued. The "C" indicates to identify the closest point to the intersection of the cross hairs as pointer position. This command also resulted in the message stating "pointer positioned" at the top left. The four points shown on figure 12 were then added by the user moving the cursor and "Keying" the "A" command. In figure A-13 a "P" command was issued first and then the cross hairs were at the position indicated by the "B" symbol and the "N" command was keyed. This resulted in the "input line value" query shown in the top left of figure A-13. In figure A-14 the query response is shown and the user has inputted more points by just moving the cursor and using the "A" command.

In figure A-15 the user has replotted the data with a "P" command and then the cursor was positioned near the end "B" point at X=1.4 and a "C" command was keyed. The next command sent by the user was a "V", to input an exact value. This prompted the query "Input X,Y" to appear. The last query "A or B mode?" simply request that the user identify where in the data storage is the new data point stored, before the pointer or after the pointer.

Figure A-16 is a final plot of the data showing the new point. At this point the user keyed an "E" command and "ended" the execution. In figure A-17, the output file created during this example is listed using the CED text editor, showing all the data points.
FIGURE A-12. EXAMPLE PLOT
Figure A-13. Example Plot
FIGURE A-14, EXAMPLE PLOT
TEST EXAMPLE CREATION

FIGURE A-19. EXAMPLE PLOT
TEST EXAMPLE CREATION

FIGURE A-16. EXAMPLE PLOT
FIGURE A-17. EXAMPLE PLOT
CTIGS

PROGRAM TIGS (INPUT=101, OUTPUT, TAPE1=101, TAPE7=101, TAPE5=INPUT)

C ***************************************************************
C TIGS TPLOT INTERACTIVE GRAPHICS SYSTEM
C
C M CADDY JAN 30 78
C
C DIMENSION LT(7), XV(30), NPTS(30), X(300), Y(300), Z(30), A(99)
C
DATA NPLOT/O/ 
DATA NT/8/ 
DATA ITIP, IGRID/2, 1/ 
DATA NPTS, XV/30*0, 30*0./ 
DATA IEND/100E0 
10 FORMAT(A5, 7A10)
REWIND 1
REWIND 7
PRINT 20
20 FORMAT(* TIGS version 2.0 8/2/78 *)

READ 30, IC
30 FORMAT(1R1)

IC = IC - 30B 
IF (IC.EQ.1) GO TO 40

C """
C * vs C *
C FILE IS NOT BEING CREATED READ IT FROM TAPE1
C
C 31 READ (1, 10) LNO, LT
C IF (LNO.EQ.10H) GO TO 251
C
C """
C CALL IN Z VALUES
C
C CALL TABB(LZ, NZ, Z, 1)
C
C """
C READ IN Y, X, FXYZ DATA FOR NON CREATION RUN
C
C CALL TABB(LY, NY, A, 1)
C CALL TABB(LX, NX, X, 1)
C CALL TABB(LF, NY, Y, 1)
C GO TO 100
C
40 PRINT 50
50 FORMAT(* ENTER TABLE TITLE CARD /,
1 # (COLUMNS 1-5 SHOULD BE THE TABLE REFERENCE NUMBER)*)
READ 10, LNO, LT
C
C """
C READ TABLE NUMBER AND TITLE
C
C PRINT 60
C 60 FORMAT(* ENTER 4 CHARACTERS FOR EACH LABEL FOR Z, Y, X, FXYZ/
1 *(SEPARATED BY COMMAS)*

C***** READ TITLES FOR EACH VARIABLE 4 CHARACTERS LONG
C***** READ 70, LZ, LY, LX, LF
70 FORMAT(4(A4, 1X))
C***** GET NUMBER OF Z VARIABLES AND VALUES
C***** PRINT 80, LZ
80 FORMAT(* ENTER NUMBER OF *,A4,* VARIABLES--- FREE FORM*)
   CALL GETIN(1, Z)
   NZ = Z(1)
   PRINT 90, LZ
90 FORMAT(* ENTER *,A4,* VALUES ,ASCENDING ORDER---FREE FORM*)
   CALL GETIN(NZ, Z)
C***** WRITE TO TAPE7 TITLE CARD AND TABLE NUMBER
C***** WRITE(7, 10) LNO, LT
100 WRITE(7, 10) LNO, LT
   PRINT 110, LZ, LY, LX, LF
110 FORMAT(* ENTER NUMBER OF DECIMAL PLACES FOR *,4(A4, 1X)
   1 ,* FREE FORM*)
C***** GET NUMBER OF DECIMAL PLACES FOR EACH VARIABLE
C***** CALL GETIN(4, XV)
   LZDP = XV(1)
   LYDP = XV(2)
   LXDP = XV(3)
   LFDP = XV(4)
C***** WRITE TO TAPE7 THE Z VALUES ETC...
C***** CALL TFORM(1, LZ, NZ, Z, LZDP, 7)
C***** iNIALIZE TEK SOFTWARE
C***** CALL INITT(120)
   CALL TERM(3, 4096)
   CALL CHRSIZ(4)
   DO 250 IZ = 1, NZ
C***** IF CREATION MODE THEN SET DEFAULTS TO 0
C***** IF(IC.NE.1) GO TO 120
   NPTS(1) = 0
   X(1) = 0.
Y(1)=0.
GO TO 210
C****
C**** NON CREATION MODE
C****
120 CONTINUE
K=1
C****
C**** TRANSFER SECOND INDEPENDENT VARIABLE TO XV ARRAY
C****
DO 130 J=1,NY
130 XV(J)=A(J)
IF(IZ.EQ.1) GO TO 140
CALL TABR(LX,N,X,1)
CALL TABR(LF,N,Y,1)
140 LNX=N
LNY=N
NPTS(1)=N
NPTS(2)=0
C****
C**** READ NEXT SET
C****
150 CALL TABR(LW,N,A,1)
C****
C**** CHECK FOR NEXT Z GROUP
C****
IF(LW.EQ.LY) GO TO 210
C****
C**** CHECK FOR END OF TABLE
C****
IF(LW.EQ.LY) GO TO 210
C****
C**** CHECK FOR NEXT X DATA
C****
IF(LW.NE.LX) GO TO 170
C****
C**** DATA IS X DATA STORE IT
C****
LOX=LNX
DO 160 J=1,N
160 X(LNX)=A(J)
GO TO 150
C****
C**** DATA HAD BETTER BE LY
C****
170 IF(LW.NE.LF) STOP
C****
IF DATA HAS NOT BE INPUT FOR X DATA USE LAST VALUES

IF(LNX.GT.LNY) GO TO 190
   LL=LOX
   DO 180 J=1,N
   LNX=LNX+1
   LL=LL+1
180 X(LNX)=X(LL)

UPDATE COUNTERS

190 K=K+1
   NPTS(K)=N
   NPTS(K+1)=0

LOAD Y DATA

DO 200 J=1,N
   LNY=LNY+1
200 Y(LNY)=A(J)

GO BACK TO GET NEXT GROUP

GO TO 150

PLOT DATA

CALL TICPPR(NPLOT,LF,1,LX,1,LT,8,X,Y,NPTS,LY,1,XV,LYDP,ITIP, IGRID,LZ,Z(IZ))
CALL ANMODE

COUNT NUMBER OF Y VALUES

NY=0
   DO 220 I=1,30
      IF(NPTS(I).EQ.0) GO TO 230
      MY=MY+1
220 CONTINUE
   GO TO 250

WRITE TO TAPE7 Y DATA ETC....

230 CALL TFORM(1,LY,MY,XV,LYDP,7)
   LOC=1
   J=0
240 J=J+1
   NP=NPTS(J)
   IF(NP.EQ.0) GO TO 250
WRITE TO TAPE? X DATA ETC...
CALL TFORM(LOC,LX,NP,X,LXDP,7)
WRITE TO TAPE? Y DATA ETC...
CALL TFORM(LOC,LF,NP,Y,LFDP,7)
LOC=LOC+NP
GO TO 240
250 CONTINUE
WRITE (7,10) IEND
IF(IC.NE.1) GO TO 31
WRITE (7,10)
REWRITE 7
END

FUNCTION TFORM(LAB,N,X,IP,K)
DIMENSION X(1),IFORM(3)
IF(IP.LT.0) IP=0
IF(IP.GT.9) IP=9
JG=LOC-1
NP=N
IF(NP.GT.7) NP=7
FORM(1)=10H(A4,I3,3X,
FORM(2)=55555555420634335733B+IP
FORM(3)=10H)
WRITE(K,IFORM) LAB,N,(X(I+JO),I=1,NP)
RETURN
END

FUNCTION TABR(LAB,N,A,K)
DIMENSION A(1)
READ(K,10) LAB,N,(A(I),I=1,7)
10 FORMAT(A4,I3,3X,7F10.0)
IF(N.GT.7) READ(K,20) (A(I),I=8,N)
20 FORMAT(10X,7F10.0)
30 ISUB(I)=I+1

CALL BINIT
LCNT=3120
IGRID1=(3*IGRID+7)*.5
SUM UP NUMBER OF POINTS
NL=0
NPTOT=0
DO 60 I=1,30
N=NPTA(I)
IF(N.EQ.0) GO TO 70
NL=NL+1
60 NPTOT=NPTOT+N
SET STORAGE LIMIT TO NPTOT FIRST PASS
70 IF(NSTOR.EQ.0) NSTOR=NPTOT
IF(NPTOT.GT.0) GO TO 90
NSTOR=0
CALL MOVABS(0,LCNT)
CALL ANMODE
PRINT 80
80 FORMAT(* NO DATA FOUND TO PLOT .. ENTER COMMAND*)
LCNT=LCNT-LDEL
IPL0T=0
GO TO 200

SECOND INDEPENDENT VARIABLE TITLE
90 IF(NCC.LE.0) GO TO 140
CALL MOVABS(0,LCNT)
CALL ANMODE
PRINT 110,(LABVAL(J1),J1=1,NCC)
CALL MOVABS(2800,2800)
CALL ANMODE
PRINT 100,LZ,ZVAL
100 FORMAT(A4,*8,G13.5)
110 FORMAT(8A10)
LCNT=LCNT-LDEL
KL=0
KH=55B
DO 130 J1=1,NL
LCNT=LCNT-LDEL
CALL MOVABS(0,LCNT)
KL=KL+1
CALL ANMODE
PRINT 120,KH,KL,VLABEL(J1)
NADC-83030-60

RETURN
END

CTIGP
C
TEK INTERACTIVE GPPR M CADDY FEB 78
C
SUBROUTINE TIGPPR(NPLOT,LABY,N1,LABX,N2,LABTL,NT,X,Y,
1 NPTA,LABVAL,NCC,VLABL,NDECIN,ITIP,IGRID,LZ,ZVAL)
COMMON/ITRNX/ITEKC(60)
DIMENSION X(200),Y(200),LABTL(9),NPTA(30),VLABL(30),
1 LABX(5),LABY(5),VTEM(8),LABVAL(8),IQUIK(30),ISUB(300)
DIMENSION MSG1(20),MSG2(20),MSG4(10),MSG5(10),MSG6(15),IALTM(6,2)
EQUIVALENCE (BEG(1),XBEG),(BEG(2),YBEG)
EQUIVALENCE (DEL(1),DELX),(DEL(2),DELY),(ITAB,LTV(2))
EQUIVALENCE (EN(1),XEND),(EN(2),YEND)
EQUIVALENCE (IOFF,ITEKC(30)),(TXMIN,ITEKC(1))
C SET LINE SPACING
COMMON/TEKGPPR/LDEL,LCNT,MAXSR,LTV(17),EN(2),DEL(2),BEG(2),RX2,
1 RDY2,NLINE,NDRAW(30),MODE(30)
DATA MSG1/46,46,80,111,105,110,116,101,114,32,
1 80,111,115,105,116,111,110,110,100/
DATA MSG2/73,110,112,117,116,32,76,105,110,101,
1 32,86,97,108,117,101,32,32,32,32/
C*** ILLEGAL MESSAGE
DATA MSG5/73,110,112,117,116,32,88,44,89,32/
DATA MSG6/65,32,111,114,32,66,32,109,111,100,
1 101,63,32,32,32,32/
DATA ((IALTM(I,J),I=1,6),J=1,2)/65,102,116,101,114,32,
1 66,101,102,111,114,101/
DATA IQUIK/0,0,1,1,2,3,10,4,0,0,
1 0,0,0,5,0,6,0,7,8,0,
2 0,0,9,0,0,0,0,0,0,0/
A=1./KIN(1.)
LDEL=50
IF(NPLOT.GT.0) GO TO 20
DO 10 I=1,8
10 LTV(I)=0
20 IWIN=0
NPLOT=NPLOT+1
IGRID=1
DO 21 I=1,30
21 MODE(I)=ITIP
NLT=NLT
NLINE=0
NSTOR=0
C SET STORAGE POINTER TO INITIAL SEQUENCE
DO 30 I=1,299

8-7
120 FORMAT(1X,2R1,G13.5)  
130 CONTINUE

C  
PREPARE TEKTRONIX AGII COMMON

C  
140 CONTINUE

IPL0T=IPL0T+1  
CALL CHRSIZ(4)  
C  
SET SCREEN WINDOW SIZE  
CALL SLIMX(640,4000)  
CALL SLIMY(300,2700)  
C  
SET TICK SIZES  
CALL XTICS(14)  
CALL YTICS(10)  
IF(IWIN.NE.0) GO TO 170  
AXMAX=-1.E99  
AYMAX=-1.E99  
AXMIN=-1.E99  
AYMIN=-1.E99  
C  
SET MIN AND MAX DATA VALUES  
K=1  
DO 150 I=1,NPTOT  
AXMIN=AXMIN1(AXMIN,X(K))  
AYMIN=AYMIN1(AYMIN,Y(K))  
AXMAX=AXMAX1(AXMAX,X(K))  
AYMAX=AYMAX1(AYMAX,Y(K))  
KLAST=K  
C  
SET KLAST TO END STORAGE VALUE  
150 K=ISUB(K)  
IWIN=1  
IF(AXMIN.NE.AXMAX) GO TO 160  
AXMIN=AXMIN-.5  
AXMAX=AXMAX+.5  
160 IF(AYMIN.NE.AYMAX) GO TO 170  
AYMIN=AYMIN-.5  
AYMAX=AYMAX+.5  
C  
SET VIRTUAL WINDOW  
170 CALL DLIMX(AXMIN,AXMAX)  
CALL DLIMY(AYMIN,AYMAX)  
CALL XLEN(28)  
CALL YLEN(28)  
CALL XFRM(IGRID1)  
CALL YFRM(IGRID1)  
NBASE=1BASE(0)  
DO 180 I=1,2  
CALL LOPTM(NBASE)  
CALL WIDTH(NBASE)  
CALL SPREAD(NBASE)
CALL TSET(NBASE)
180 NBASE=IBASEY(0)
   EN(1)=COMGET(IBASEX(27))
   EN(2)=COMGET(IBASEY(27))
   BEG(1)=COMGET(IBASEX(26))
   BEG(2)=COMGET(IBASEY(26))
   DELX=(XEND-XBEG)/3360.
   DELY=(YEND-YBEG)/2400.
   TIGPO147
   TIGPO148
   TIGPO149
   TIGPO150
   TIGPO151
   TIGPO152
   TIGPO153
   TIGPO154
   TIGPO155
   TIGPO156
   TIGPO157
   TIGPO158
   TIGPO159
   TIGPO160
   TIGPO161
   TIGPO162
   TIGPO163
   TIGPO164
   TIGPO165
   TIGPO166
   TIGPO167
   TIGPO168
   TIGPO169
   TIGPO170
   TIGPO171
   TIGPO172
   TIGPO173
   TIGPO174
   TIGPO175
   TIGPO176
   TIGPO177
   TIGPO178
   TIGPO179
   TIGPO180
   TIGPO181
   TIGPO182
   TIGPO183
   TIGPO184
   TIGPO185
   TIGPO186
   TIGPO187
   TIGPO188
   TIGPO189
   TIGPO190
   TIGPO191

   C FIND VIRTUAL SPACE TO SCREEN SPACE SCALING PARAMETERS
   RDX2=1./DELX*DELX
   RDY2=1./DELY*DELY
   CALL SETWIN
   CALL GRID
   CALL LABEL(IBASEY(0))
   CALL LABEL(IBASEX(0))
   CALL DRAWIT(NL,NPTA,X,Y,ISJB)
   TIGPO156
   TIGPO157
   TIGPO158
   TIGPO159
   TIGPO160
   TIGPO161
   TIGPO162
   TIGPO163
   TIGPO164
   TIGPO165
   TIGPO166
   TIGPO167
   TIGPO168
   TIGPO169
   TIGPO170
   TIGPO171
   TIGPO172
   TIGPO173
   TIGPO174
   TIGPO175
   TIGPO176
   TIGPO177
   TIGPO178
   TIGPO179
   TIGPO180
   TIGPO181
   TIGPO182
   TIGPO183
   TIGPO184
   TIGPO185
   TIGPO186
   TIGPO187
   TIGPO188
   TIGPO189
   TIGPO190
   TIGPO191

   C AXIS LABELS
   CALL CHRSIZ(3)
   CALL TTITE(2320,3000,NTL,LABTL,80,0)
   CALL TTITE(2320,100,N2,LABX,80,0)
   CALL TTITE(450,1500,N1,LABY,80,1)
   TIGPO184
   TIGPO185
   TIGPO186
   TIGPO187
   TIGPO188

   C MERGE HERE FOR INTERACTIVE FUNCTIONS (BELL)
   LOCAL LCNT,MSG4,MSG
   200 IF(LCNT.LT.220) GO TO 530
       CALL CHRSIZ(4)
       IF(NPTOT.EQ.1) GO TO 240
       CALL GETVAL(ICHAR,X0,Y0)
   210 IF(ICHAR.LE.61.OR.ICHAR.GE.95) GO TO 220
       ICHAR=ICHAR-64
       ICHECK=IQUICK(ICHAR)
       IF(ICHECK.EQ.0) GO TO 220
       GO TO (300,400,440,200,460,500,540,560,590,455),ICHECK
   220 LCNT=LCNT-LDEL
       CALL NOTATE(0,LCNT,10,MSG4)
       GO TO 200
   C ADD POINT AFTER OR BEFORE SPECIFIED POINT (A OR B)
   C CHECK IF C COMMAND AND FIRST POINT.
   230 IF(NPTOT.EQ.0) GO TO 460
   240 LCNT=LCNT-LDEL
       CALL NOTATE(0,LCNT,20,MSG1)
250 CALL GETVAL(ICHAR,XO,YO)
C  CHECK FOR NEW LINE COMMAND
   IF(ICHAR.EQ.86) GO TO 580
C  CHECK FOR ADD AFTER
260 IF(ICHAR.EQ.65) GO TO 270
C  CHECK FOR MOVE
   IF(ICHAR.EQ.77) GO TO 270
   IF NOT A B OR M GO TO NEW COMMAND
   IF(ICHAR.NE.66) GO TO 210
270 CALL POINTA(XO,YO)
   CALL MOVEA(XO,YO)
   IF(IOFF.EQ.0) CALL ANCHO(IS)
   IF(ICHAR.EQ.77) GO TO 290
   NPTOT=NPTOT+1
C  INCREMENT STORAGE COUNTER
   NSTOR=NSTOR+1
   NPTA(ISAVE)=NPTA(ISAVE)+1
C  MOVE POINTER OF CLOSEST POINT TO END
   ISUB(NSTOR)=ISUB(ISAVE)
C  CHANGE CLOSEST POINTER TO ACCESS LAST POINT
   ISUB(JSAVE)=NSTOR
   IF(ICHAR.EQ.65) GO TO 280
C  MOVE OLD POINT TO LAST POINT (INSERT BEFORE)
   X(NSTOR)=X(JSAVE)
   Y(NSTOR)=Y(JSAVE)
   GO TO 290
C  NEW POINT ADD AFTER
280 IF(KLAST.EQ.JSAVE) KLAST=NSTOR
   JSAVE=NSTOR
290 X(JSAVE)=XO
   Y(JSAVE)=YO
   GO TO 250
C  DELETE POINT (D)
C
300 DSAVE=1.E40
   IF(NPTOT.EQ.0) GO TO 200
   IS=64
   NSUM=1
   K=1
   DO 340 I=1,NL
      NEND=NSUM+NPTA(I)-1
   DO 330 J=NSUM,NEND
      IF(NLINE.EQ.0) GO TO 310
      IF(NDRAW(I).EQ.0) GO TO 320
310 XDX=X(K)-XO
   YDY=Y(K)-YO
   DIST=XDX*XDX*RDXX+YDY*YDY*RDY2

S-11
IF(DIST.GE.DSAVE)GO TO 320

DSAVE=DIST
JSAVE=I
ISAVE=I

320 KLAST=K
330 K = ISUB(K)
340 NSUM=NEND+1
IS=ISAVE+64
350 IF(IS.LE.90)GO TO 360
IS = IS-90
GO TO 350
360 CALL POINTA(X(JSAVE),Y(JSAVE))
IF(IOFF.EQ.0)CALL ANCHO(IS)
IF(ICHAR.NE.4)GO TO 230
NPTOT=NPTOT-1
K = JSAVE
C IF DELETED POINT IS LAST ONE SKIP SHIFT
IF(KLAST.EQ.JSAVE)GO TO 370
C GET POINTER OF NEXT POINT
K = ISUB(JSAVE)
C TRANSFER POINTER OF NEXT POINT TO DELETED POINT
ISUB(JSAVE)=ISUB(K)
C MOVE VALUE OF NEXT POINT TO DELETED POINT
X(JSAVE)=X(K)
Y(JSAVE)=Y(K)
370 IF(NPTOT.EQ.1)NSTOR=1
C ZERO DELETED POINTER
ISUB(K)=0
NPTA(ISAVE)=NPTA(ISAVE)-1
IF(NPTA(ISAVE).GT.0)GO TO 390
NPTA(ISAVE)=0
J=0
DO 380 I=1,NL
IF(I.EQ.ISAVE)GO TO 380
J = J+1
NPTA(J)=NPTA(I)
VLABL(J)=VLABL(I)
380 CONTINUE
NPTA(NzL)=0
NL=NL-1
390 GO TO 200
C
C END (E)
C
400 CALL NEWPAGE
L=1
DO 431 I=2,NPTOT
K = ISUB(L)
IF(I.EQ.K) GO TO 431
   J=K
   JLEFT=NPTOT+1-I
   DO 420 KK=1,JLEFT
   IF(J.EQ.I) GO TO 430
   JO=J
420 J=ISUB(JO)
430 ISUB(JO)=K
   ISUB(L)=I
   IS=ISUB(I)
   ISUB(I)=ISUB(K)
   ISUB(K)=IS
   XS=X(I)
   X(I)=X(K)
   X(K)=XS
   XS=Y(I)
   Y(I)=Y(K)
   Y(K)=XS
431 L=I
   RETURN
C FORMAT (F)
C
440 LCNT=LCNT-LDEL
   CALL MOVABS(0,LCNT)
   CALL ANMODE
   IY=(YO-YBEG)/DELY+300
   II=(3045-IY)/50+1
   IF(II.LT.1) II=1
   IF(II.GT.NL) II=NL
   PRINT 450,MODE(II)
450 FORMAT(* ITIP = *,I2)
   CALL GETIN(1,VTEM)
   MODE(II)=VTEM(1)
   LCNT=LCNT-LDEL
C IF F OUTSIDE OF AXIS THE SET ALL CURVE MODES
C
451 MODE(I)=VTEM(1)
   GO TO 200
C CHANGE GRID OPTION
C
455 IGRID=-IGRID
   GO TO 200
C
C NEW LINE (N)

460 NPTOT=NPTOT+1
  NSTOR=NSTOR+1
  IF(NPTOT.NE.1) ISUB(KLAST)=NSTOR
  KLAST=NSTOR
  IF(IPLOT+ITAB.EQ.0)GO TO 580
461 X(NSTOR)=X0
  Y(NSTOR)=Y0
  NL=NL+1
  IS=NL+64

C NO DATA THEN DO[T SYMBOL IT

  IF(IPLOT.EQ.0) GO TO 490
  IF(IS.LE.90)GO TO 480
  ISZIS-90
  GO TO 470
480 CALL POINTA(XO,YO)
  IF(IOFF.EQ.0)CALL ANCHO(IS)
  NPTA(NL)=1
  NL1=NL+1
  NPTA(NL1)=0
  LCNT=LCNT-LDEL
  CALL NOTATE(O,LCNT,20,MSG2)
  LCNT=LCNT-LDEL
  CALL MOVABS(0,LCNT)
  CALL ANMODE
  CALL GETIN(1,W..ABL(NL))
  ISAVE=NL
  JSAVE=NSTOR
  IF(IPLOT.EQ.0) GO TO 530
  GO TO 240

C PLOT (P)

C CHECK FOR TABLET MODE, SKIP SPECIAL P SECTION IF TABLET

500 IF(ITAB.EQ.1) GO TO 530
  IF(XO.GT.TMIN) GO TO 530
  IF(NLINE.GT.0) GO TO 520
  DO 510 I=1,NL
510 NDRAW(I)=0
520 II=(YO-YBEG)/DELY+300
  IF(II.LT.3045-IX)/50+1
  IF(II.LT.II) II=1
  IF(II.GT.NL) II=NL

NADC-83030-60
NADC-83030-80

NDRAW(II)=1
NLINNE=1
GO TO 200
530 CALL NEWPAG
GO TO 40
C
C  RESTORE WINDOW (R)
C
540 IF(X0.GT.TXMIN.OR.NLINE.EQ.0) GO TO 550
NLINNE=0
GO TO 200
550 IWIN=0
GO TO 530
C
C  SHOW VALUE (S)
C
560 LCNT=LCNT-LDEL
CALL MOVABS(0,LCNT)
CALL ANMODE
PRINT 570,XO,YO
570 FORMAT(*X=*,G13.5,/,*Y=*,G13.5)
LCNT=LCNT-LDEL
GO TO 200
C
C  VALUE IN (V)
C
580 LCNT=LCNT-LDEL
CALL NOTATE(0,LCNT,10,MSG5)
LCNT=LCNT-LDEL
CALL MOVABS(0,LCNT)
CALL ANMODE
CALL GETIN(2,VTEM)
X0=VTEM(1)
Y0=VTEM(2)
C
C  CHECK FOR N COMMAND VALUE INPUT SECTION.
C
IF(IPLTO.EQ.0) GO TO 461
LCNT=LCNT-LDEL
CALL NOTATE(0,LCNT,13,MSG6)
CALL TINPUT(ICHAR)
GO TO 260
C
C  WINDOW (W)
C
590 CALL GETVAL(ICHAT,X1,Y1)
AXMIN=MIN1(X0,X1)
AXMAX=MAX1(X0,X1)
NADC-83030-60

AYMIN=AMIN1(YO,Y1) TIGPO402
AYMAX=AMAX1(YO,Y1) TIGP0403
WIN=1 TIGP0404
GO TO 530 TIGP0405
END TIGP0406

CGETVAL
SUBROUTINE GETVAL(ICHAR,XV,YV)
COMMON/TENGPPR/DUM(3),ICL,ITAB,ITABS,XS,YS,DUM2(20),NLINE

C
ICL=0 INITIALIZE TABLET
C
ITAB=0 NOT IN CONTINUOUS MODE

C**** GET VALUE AND CHARACTER FROM CROSS HAIR OR TABLET
C**** CHECK FOR TABLET INPUTS
C**** 10 IF(ITAB.EQ.1)GO TO 20
CALL VCURSR(ICHAR,XV,YV)
C**** CHECK TO SEE IF SCREEN COMMAND WAS TO ACTIVATE TABLET
C****
IF(ICHAR.NE.84)GO TO 30
ITAB=1
ICL=ITABS

C**** SET TABLET LAST CHARACTER (ALSO USED AS A FLAG FOR INITIALIZATION

C**** 20 ICHAR=ICL
CALL TABVU(ICHAR,XV,YV)
C**** SAVE LAST TABLET CHARACTER COMMAND
C****
ICL=ICHAR
NLINE=O

C SET FLAG TO PLOT ALL LINES IN TABLET MODE
C
C**** CHECK FOR TABLET HALT COMMAND
C****
IF(ICL.NE.72)GO TO 30
C**** TURN OFF TABLET AND SAVE LAST COMMAND
C****
ITAB=0
ITABS=ICL
RETURN
30 IF(ICHAR.EQ.69)ITABS=0
RETURN
END

CTABVU

SUBROUTINE CTABVU(ICHAR,XV,YV)
COMMON/TEI1xPPR/LDEL,LCNT,MAXSR,LTV(5)
1,LS,MX1,MY1,MX2,MY2,XB,YB,FACX,FACY,ANG,MXB,MYB
DIMENSION MSG1(54),MSG2(43),MSG3(43),MSG4(18),ICONV(2,10),
IRETN(2,10),XTEM(2)
DATA ((ICONV(I,J),J=1,10),I=1,2)/65,66,67,68,69,71,72,
105,78,80,82,83,86,87,
32,32,32,32,32,32,32,
DATA ((IRETN(I,J),J=1,10),I=1,2)/0,0,0,1,1,1,
1,1,1,1,1,1,
DATA MSG1/83,113,117,97,114,101,32,109,101,110,
117,32,119,105,116,104,32,116,97,98,
108,101,116,32,97,110,100,32,116,111,
117,99,104,32,117,112,112,101,114,32,
108,101,102,116,32,109,101,110,117,32,
100,111,116,46/
DATA MSG2/84,111,117,99,104,32,97,120,105,115,
32,111,114,105,103,105,110,32,97,110,
100,32,101,110,116,101,114,32,118,97,
108,117,101,115,32,88,32,97,110,100,
132,89,46/
DATA MSG3/84,111,117,99,104,32,32,32,97,120,
105,115,32,97,116,32,109,97,120,32,
108,101,110,103,116,104,32,97,110,100,
132,101,110,116,101,114,32,118,97,108,
117,101,46/
DATA MSG4/76,97,115,116,32,99,111,109,109,97,
110,100,32,119,97,115,32,32/
IF(ICHAR.NE.0)GO TO 30
C TABLET HAS NOT BEEN SET CHECK IT
LS=100
CALL TABINT(1,0,0)
CALL NEWPAG
LCNT=3120-LDEL
C GET MENU POSITION
CALL NOTATE(0,LCNT,54,MSG1)
CALL BELL
CALL ONEMPNT(MX1,MY1)
MX2=MX1+1000
MY2=MY1-200
GO TO 20
10 LCNT=3120
CALL NEWPAG
20 LCNT=LCNT-LDEL
C GET COORDINATE INTERSECTION
   CALL NOTATE(0,LCNT,43,MSG2)
   CALL BELL
   CALL ONEPNT(MXB,MYB)
   LCNT=LCNT-LDEL
   CALL MOVABS(0,LCNT)
   CALL ANMODE
   CALL GETIN(2,XTM)
   XB=XTEM(1)
   YB=XTEM(2)
   LCNT=LCNT-LDEL
   MSG3(7)=88
C GET X AXIS POSITION MAX
   CALL NOTATE(0,LCNT,43,MSG3)
   CALL BELL
   CALL ONEPNT(MXM,NXM)
   LCNT=LCNT-LDEL
   CALL MOVABS(0,LCNT)
   CALL ANMODE
C GET VALUE AT POSITION
   CALL GETIN(1,XM)
   DX=MXM-MXB
   DY=NXM-MYB
C COMPUTE ANGLE CORRECTION
   ANG=ATAN2(DY,DX)
   LCNT=LCNT-LDEL
   MSG3(7)=89
C GET Y AXIS POSITION MAX
   CALL NOTATE(0,LCNT,43,MSG3)
   CALL BELL
   CALL ONEPNT(MYM,NYM)
   LCNT=LCNT-LDEL
   CALL MOVABS(0,LCNT)
   CALL ANMODE
C GET VALUE AT POSITION
   CALL GETIN(1,YM)
   DY=NYM-MYB
   COSA=COS(ANG)
C SET UP COMMON FACTORS FOR ANGLE CORRECTIONS
   FACX=(XM-XB)*COSA/DX
   FACY=(YM-YB)*COSA/DY
   INIT=1
   XV=XM
   YV=YM
   ICHAR=87
C RETURN PLOT COMMAND
RETURN
C CHECK FOR TABLET INITIALIZED
30 IF(INIT.NE.1)GO TO 40
   ICHAR=87
   XV=XB
   YV=YB
   INIT=0
   RETURN
40 CALL BELL
   CALL ONEPNT(IX,IY)
C CHECK TO SEE IF POINT SENT IS A MENU COMMAND
   IF(IX.GT.MX2.OR.IX.LT.MX1)GO TO 50
   IF(IY.GT.MY1.OR.IY.LT.MY2)GO TO 50
   IC=(IX-MX1)/LS+1
   IR=(MY1-IY)/LS+1
C CONVERT ROW AND COLUMN POSITION TO COMMAND CHARACTER
   ICHAR=ICONV(IR,IC)
   IF(ICHAR.EQ.32) RETURN
   MSG4(18)=ICHAR
   LCNT=LCNT-LDEL
C LAST MESSAGE COMMAND
   CALL NOTATE(0,LCNT,18,MSG4)
   IF(ICHAR.EQ.105)GO TO 10
   IF(IRETN(IR,IC).EQ.1)RETURN
   GO TO 40
C CONVERT TABLET UNITS TO VIRTUAL UNITS WITH ANGLE CORRECTION
50 DX=IX-MXB
   DY=IY-MYB
   IF(DX.EQ.0.)DX=1.E-20
   R=SQR(T(DX*DX+DY*DY))
   ANGR=ATAN2(DY,DX)-ANG
   XV=R*FACX*COS(ANGR)+XB
   YV=R*FACY*SIN(ANGR)+YB
   RETURN
END
CDRAWIT
SUBROUTINE DRAWHIT(NL,NPTA,X,Y,ISUB)
COMMON/TXTRNX/ITEKC(60)
COMMON/TEKGFR/DUM(20),EN(2),DEL(2),BEG(2),RDX2,RYD2,MLINE,
1 NDRAM(30),MODE(30)
DIMENSION QSY(306),QSX(306),NPTA(1),X(1),Y(1),ISUB(1)
EQUIVALENCE (IOFF,ITEKC(30))
C
C 0 SYMBOLS  1 LINE  2 SPLINE WRT X  3 SPLINE WRT Y  4 ARC FIT 5 CLOSED
C
IT=64
K=1
NSUM=1
NC=0
DO 290 I=1,NL
   ISYM=MCDE(I)
   ITYP=IABS(ISYM)
   IF(ITYP.GT.1) GO TO 40
   NEND=NSUM+NPTA(I)-1
   IT=IT+1
   IF(IT.GT.90)IT=65
   DO 20 J=NSUM,NEND
   IF(NLINE.EQ.0) GO TO 10
   IF(NDRAW(I).EQ.0) GO TO 20
10 XP=X(K)
   YP=Y(K)
   IF(J.EQ.NSUN) CALL MOVEA(XP,YP)
   IF(ITYP.EQ.1) CALL DRAWA(XP,YP)
   IF(ISYM.LT.0) GO TO 20
   CALL MOVEA(XP,YP)
   IF(IOFF.EQ.0) CALL ANCHO(IT)
   CALL MOVEA(XP,YP)
20 K=ISUB(K)
30 NSUM=NEND+1
   GO TO 290
C PLOT WITH SPLINE
C
40 NS=NC
   NPT=NPTA(I)
   NC=NC+NPT
   IT=IT+1
   IF(IT.GT.90)IT=65
   IF(NLINE.EQ.0) GO TO 60
   IF(NDRAW(I).NE.0) GO TO 60
   CALL MOVEA(XP,YP)
   IF(IOFF.EQ.0) CALL ANCHO(IT)
   CALL MOVEA(XP,YP)
   DO 50 L=1,NPT
50 K=ISUB(K)
   GO TO 290
60 JFIT=2
   YO=Y(K)
   K=ISUB(K)
   IF(ITYP.GT.2) GO TO 80
   XO=X(K)
   DO 70 L=2,NPT
70 X=L*2,NPT
   K=ISUB(K)
   IF(X1.LE.XD) GO TO 110
   K=ISUB(K1)
   DO 210
   GO TO 210
80 IF(ITYP.GT.3) GO TO 100
C     CHECK Y DATA FOR ASCENDING ORDER
   DO 90 L=2,NPT
   Y1=Y(K1)
   IF(Y1.LE.Y0) GO TO 110
   K1=ISUB(K1)
   90 Y0=Y1
   GO TO 210
100 JFIT=ITYP-2
110 NCIR=0
   IF(JFIT.EQ.3) NCIR=-NPT/2-1
   MPT=NPT-2*NCIR
   QSY(1)=MPT
   QSX(1)=MPT
   S=0.
   KA=NS
   KO=KA
   KE=KO+NPT
   KSAVE=K
   KA=KA+NCIR
   DO 160 M=1,MPT
   M=M+1
   KA=KA+1
   IF(KA.GT.KO) GO TO 130
   NDO=NPT+NCIR
   DO 120 II=1,NDO
120 K=ISUB(K)
   KA=KA+NPT
   GO TO 140
130 IF(KA.EQ.(KE+1)) GO TO 140
   JSAVE=K
   K=KSAVE
   KA=KA-NPT
140 CONTINUE
   L=M1+NPT
   YYYY=X(K)
   XXXP=X(K)
   K=ISUB(K)
   IF(K.EQ.1) GO TO 150
   DS=SQRT(HDX2*(XXXP-XO)**2+RDY2*(YYYY-YO)**2)
   S=S+DS
   150 XO=XXXP
   YD=YYYY
   QSY(M1)=S
   QSX(M1)=S
   QSX(L)=XXXP
   160 QSY(L)=YYYY
   KA=KO+NPT
QSY(L+1)=0.
QSY(L+2)=0.
QSY(L+2)=1.
QSY(L+2)=1.
XO=QSY(MPT+2-NCIR)
YO=QSY(MPT+2-NCIR)
CALL MOVEA(XO,YO)
IF(IOFF.EQ.0) CALL ANCHO(IT)
CALL MOVEA(XO,YO)
SCK=QSY(3-NCIR)
S=QSY(2-NCIR)
IF(NPT.LE.1) GO TO 290
DC=40.
DS=40.
NCK=2
170 S+S+DS
XP=SPLNO1(1,QSX,S)
YP=SPLNO1(1,QSY,S)
DCK=SQRT(RDX2*(XO-XP)**2+RDY2*(YO-YP)**2)
DS=DC/DS/DCK
180 IF(S.LT.SCK) GO TO 200
NSTM=MPT+1-NCK-NCIR
XS=QSY(NSTM)
YS=QSY(NSTM)
CALL DRAWA(XS,YS)
IF(ISYM.LE.0.AND.NCK.NE.NPT) GO TO 190
CALL MOVEA(XS,YS)
IF(IOFF.EQ.0) CALL ANCHO(IT)
CALL MOVEA(XS,YS)
190 NCK=NCK+1
SCK=QSY(NCK+1-NCIR)
IF(NCK.LE.NPT+JFIT-2) GO TO 180
IF(JFIT.EQ.3) K=SAVE
GO TO 290
200 CALL DRAWA(XP,YP)
XP=XP
YP=YP
GO TO 170
210 QSY(1)=NPT
DO 240 M=1,NPT
M=M+1
K=NS+M
L=M+NPT
IF(X(K).GT.0) CALL MOVEA(XP,YP)
IF(ISYM.LE.0.AND.NST.NE.NPT.AND.ISYM.LE.0) GO TO 220
IF(IOFF.EQ.0) CALL ANCHO(IT)
220 IF(ITYP.NE.3) GO TO 230
    QSX(N)=YP
    QSX(L)=XP
    GO TO 240
230 QSX(N)=XP
    QSX(L)=YP
240 K=ISUB(K)
    QSX(L+1)=1.
    QSX(L+2)=1.
    XEN=QSX(NPT+1)
    XIN=QSX(2)
    IFITP=ITYP-1
    BCK=BEG(IFITP)
    ECK=EN(IFITP)
    DELT=DEL(IFITP)*30.
    IF(XIN.LT.BCK) XIN=BCK
    IF(XEN.GT.ECK) XEN=ECK
    KILL=0
    DO 280 M=1,200
        XI=XIN+DELT*(M-1)
    IF(XI.LT.XEN) GO TO 250
    KILL=1
    XI=XEN
    250 YI=SYMPQ1(1,QSX,XI)
        IF(ITYP.EQ.3) GO TO 260
        XP=XI
        YP=YI
        GO TO 270
260 XP=XI
    YP=XI
270 IF(M.EQ.1) CALL MOVEA(XP,YP)
    CALL DRAWA(XP,YP)
    IF(NPT.EQ.1) GO TO 290
    IF(KILL.EQ.1) GO TO 290
280 CONTINUE
290 CONTINUE
300 RETURN
END

FUNCTION SYMPQ1 (MLOC,X,XINDEP)
C** LOCAL CUBIC FIT 8/9/77 M.J. CADDY
DIMENSION X(1),QM(3)
EQUIVALENCE (QM(1),T3),(QM(2),QR),(QM(3),Q2)
XIN=XINDEP
NS=MLOC
NQPS=M(NS)
ID=M(NS)+NQPS
NSP1=NS+1

SPLN0001
SPLN0002
SPLN0003
SPLN0004
SPLN0005
SPLN0006
SPLN0007
SPLN0008
SPLN0009
NADC-83030-80

M=NS+1  
IF(NOPTS.LE.1) GO TO 130  
IF(NOPTS.GT.2) GO TO 10  
NS=ID+NOPTS  
T3=(X(N)-X(N-1))/(X(ID)-X(ID-1))  
M=ID  
NTRAP=1  
GO TO 280  
10 NS2=NOPTS*2+NSP1  
L=X(NS2)  
LSC=NS2+1  
IQMODE=X(LSC)  
K=L+NS  
NL=NSP1  
NH=ID  
NTRAP=1  
** BINARY SEARCH FOR INTERVAL  
IF(XIN-X(ID))>.30,140,20  
20 NTRAP=0  
GO TO 150  
30 IF(XIN-X(NSP1))>.40,.60,40  
40 NTRAP=1  
50 K=NSP2  
GO TO 160  
60 IF(L)<120,120,70  
70 IF(XIN-X(K))>.80,.100,100  
80 NH=K  
K=K-1  
90 IF(XIN-X(K))>.110,.100,100  
100 NL=K  
GO TO 120  
110 NH=K  
120 K=(NH-NL)/2+NL  
130 YOUT=X(NSP2)  
GO TO 320  
140 LFAST=L-NH+NS  
X(NS2)=NH-NS  
150 K=NH  
160 M=K  
N=ID+NOPTS  
Y3=X(N-1)  
X3=X(M-1)  
** CHECK FOR FAST MODE AND EXTRAPOLATION  
IF(NTRAP.GE.0) GO TO 180  
IF(IQMODE.LT.0.OR.LFAST.NE.0) GO TO 180  
DO 170 I=1,3  
170 QM(I)=X(LSC+I)
GO TO 310

180 \( Y4 = X(N) \)
\( X4 = X(M) \)
\( A3 = X4 - X3 \)
\( S3 = (Y4 - Y3)/A3 \)
IF(M.EQ.NSP2) GO TO 190
\( X2 = X(M-2) \)
\( Y2 = X(N-2) \)
\( S2 = (Y3 - Y2)/(X3 - X2) \)
IF(M.EQ.ID) GO TO 200

190 \( X5 = X(M+1) \)
\( Y5 = X(N+1) \)
\( S4 = (Y5 - Y4)/(X5 - X4) \)
IF(M.EQ.NSP2) \( S2 = S3 \)
GO TO 210

200 \( S4 = S3 - S2 \)

210 IF(M.LE.(NSP2+1)) GO TO 220
\( S1 = (Y2-X(N-3))/(X2-X(M-3)) \)
GO TO 230

220 \( S1 = S2 + S3 \)

230 IF(M.GE.(ID-1)) GO TO 240
\( S5 = (X(N+2) - Y5)/(X(M+2) - X5) \)
GO TO 250

240 \( S5 = S4 - S3 \)

250 \( W2 = \text{ABS}(S4 - S3) \)
\( W3 = \text{ABS}(S2 - S1) \)
\( S1 = W2 - W3 \)
IF(S1.NE.0.0) GO TO 260
\( W2 = 0.5 \)
\( W3 = 0.5 \)
\( S1 = 1.0 \)

260 \( T3 = (W2 * S2 + W3 * S1)/S1 \)
\( W3 = \text{ABS}(S5 - S4) \)
\( W4 = \text{ABS}(S3 - S2) \)
\( S3 = W3 + W4 \)
IF(S3.NE.0.0) GO TO 270
\( W3 = 0.5 \)
\( W4 = 0.5 \)
\( S3 = 1.0 \)

270 \( T4 = (W3 * S3 + W4 * S4)/S3 \)
IF(\text{IFTRAP}.LT.0) GO TO 290
IF(\text{IFTRAP}.EQ.0) \( T3 = T4 \)

280 \text{IFTRAP}

C**C FAST EXIT FOR 2 POINTS AND LINEAR EXTRAPOLATION
\( Y0 = X(1) + (X(N) - X(1))/A3 \)
GO TO 320

290 \( Q2 = (2.0 * (S3 - T3) + S3 - T4)/A3 \)
\( Q3 = (-S3 + S3 - 3*T4)/A3 \)
IF(IQMODE*LFAST.EQ.0) GO TO 310
DO 300 I=1,3
300 X(LSC+I)=QM(I)
310 DX=X1N-X3
YOUT=Y3+DX*(T3+DX*(Q2+DX*Q3))
320 SPLNO1=SOUT
RETURN
END

SUBROUTINE TTITE(IX, IY, NTL, LABTL, NM, IA)

DIMENSION LABTL(1), IP(136)
C NTL = NUMBER OF 10 CHARACTER WORDS
C NM = MAX CHARACTERS PER LINE
C IA SWITCH, IA=0 HORIZ, IA=1 VERTICAL
C IX SCREEN CENTER
C IY SCREEN CENTER
IF(NTL.LE.0) RETURN
NC=10*NTL
GET CHARACTER SIZE
CALL CSIZE(IHORZ, IVERT)
CONVERT LABEL TO ADE
CALL KAM2AS(NC, LABTL, IP)
IX=IX+1
IY=IY+1
ITL=0
NBLK=0
DO 70 K=1, NC
C CHECK FOR LEADING BLANKS
IF(IP(K).NE.32) GO TO 10
IF(ITL.EQ.0) GO TO 70
NBLK=NBLK+1
C CHECK FOR 3 BLANKS TO TERMINATE LINE
IF(NBLK.NE.3) GO TO 20
ITL=ITL+2
GO TO 50
10 NBLK=0
C CHECK FOR MAX LINE LENGTH EXCEEDED
20 IF(ITL.LT.NM) GO TO 30
IF(IP(K).EQ.32) GO TO 50
30 ITL=ITL+1
IP(ITL)=IP(K)
IF(K.LT.NC) GO TO 70
40 ITL=ITL-NBLK
C CHECK FOR VERTICAL OR HORIZ LABEL
50 IF(IA.NE.0) GO TO 60
IX=IX+IHORZ*ITL
CALL ROTATE(IX, IY, ITL, IP)
ITL=ITL+IVERT
ITL1=0
GO TO 70
60 IY=IY+IVERT*ITL1*.5
CALL MOVABS(IY1,IX1)
CALL VLABEL(ITL1,IP)
IX1=IX1+I_HORZ*.1
ITL1=0
70 CONTINUE
END

SUBROUTINE GETIN(NIN,Y)

DIMENSION Y(N),IC(80)

READ 20,IC
C CHECK FOR END OF FILE
IF(EQ(5).EQ.0)GO TO 30
RETURN
20 FORMAT(80R1)
30 JC=0
JD=0
JS=1
NC=0
X=0.
40 J=J+1
C ONLY ONE CARD PER INPUT READ
C MODIFIED TO READ MORE THAN ONE CARD 4/26/78 MJC
IF(J.GT.80) GO TO 10
I=IC(J)
C CHECK FOR VALID NUMERIC FIELD
IF(I.GT.32.AND.I.LT.45B) GO TO 110
C IGNORE LEAD + SIGN
IF(I.EQ.45B) GO TO 40
C SET FLAG FOR NEGATIVE VALUE
IF(I.ME.46B) GO TO 50
JS=-1
GO TO 40
C CHECK FOR DECIMAL
50 IF(I.ME.57B) GO TO 60
IF(JC.EQ.-1) GO TO 120
C IF THIS IS SECOND DECIMAL BLOW OFF TO ERROR CODE
JC=-1
GO TO 40
C CHARACTER IS BLANK TREAT AS COMMA IF NOT LEADING
60 IF(I.EQ.55B)GO TO 80
   IF(I.EQ.56B)GO TO 70
   GO TO 120
70 IF(NC.GT.0)GO TO 90
   NW=NW+1
   IF(NW.GT.NIN) RETURN
   GO TO 40
C TWO COMMAS ..IGNORE THIS DATA FIELD AND GO ON TO NEXT
80 IF(NC.EQ.0)GO TO 40
C SHIFT DECIMAL TO NUMBER
90 X=JS*10.**JD
   NW=NW+1
   Y(NW)=X
   IF(NW.GE.NIN) RETURN
   GO TO 30
110 JD=JD+JC
   NC=NC+1
C ADD DIGIT TO NUMBER ,,CAREFULLY
   X=X*10+(I-33B)
   GO TO 40
C ERROR CODE
120 DO 130 K=1,80
130 IC(K)=55B
   IC(J)=47B
   PRINT 140,IC
140 FORMAT(2X,80R1)
   PRINT 150
   FORMAT(*BAD FIELD, RE-ENTER DATA*)
150 GO TO 10
C
END
## DISTRIBUTION LIST

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- (2 for 53012D2 Terence Martin)
- (1 for A6380C James Byers)

**DDC**

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