GDDM-PGF

Programming Reference

Version 2 Release 1.3

SC33-0333-01

GDDM-PGF

Programming Reference

Version 2 Release 1.3

SC33-0333-01

Note!

Before using this information and the product it supports, be sure to read the general information under “Notices” on page xiii.

Second Edition (December 1996)

This edition applies to Version 2 Release 1 Modification 3 of the IBM licensed program GDDM-PGF, program number 5668-812, to GDDM-PGF as an optional feature of OS/390 (program number 5645-001), and to all subsequent versions, releases, and modifications until otherwise indicated in new editions. Consult the latest edition of the applicable IBM system bibliography for current information on this product.

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Programming interface information

This book is intended to help you to write and run GDDM application programs that use the GDDM-PGF program product.

This manual also documents General-use Programming Interface and Associated Guidance Information provided by GDDM-PGF Version 2 Release 1 Modification 3.

General-use programming interfaces allow the customer to write programs that obtain the services of GDDM.

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Preface

What this book is about

This manual provides information needed to use the **Graphical Data Display Manager Presentation Graphics Facility (GDDM-PGF)** licensed program.

Who this book is for

The material is intended primarily for application programmers, although some of the information is also applicable to system programmers.

What you need to know

Before using this manual, you are recommended to read the *GDDM Base Application Programming Guide*, which describes concepts and techniques for general graphics and alphanumerics programming. For information on presentation graphics programming, see the *GDDM-PGF Application Programming Guide*. Both manuals give examples of complete application programs.

How to use this book

You will need to use only **part** of this manual, depending on the task you have to do.

Application programmers will need to understand the concepts introduced in Chapters 2 and 3, and will use Chapters 1, 4, and 5 for reference.

System programmers will need to read Chapters 1 and 3 to get an overview of GDDM-PGF and how it operates.

Book structure

The manual consists of five chapters and four appendixes:

- **Chapter 1** on page 1 provides a general description of GDDM-PGF and its relation to the GDDM family of licensed programs.
- **Chapter 2** on page 9 introduces the Interactive Chart Utility (ICU) and describes the two programming interfaces to it: the new CSxxxx calls and the old CHART call.
- **Chapter 3** on page 21 introduces the basic concepts of the GDDM Presentation Graphics routines (GDDM-PG routines).
- **Chapter 4** on page 25 lists the GDDM-PGF function calls (both CHxxxx and CSxxxx), with their syntax and parameters.
- **Chapter 5** on page 173 describes how GDDM-PGF application programs are run on various operating systems.
- **Appendix A** on page 175 provides information on sample programs.
- **Appendix B** on page 201 describes the Chart Utility sample module.
- **Appendix C** on page 209 shows tables of colors, line types, markers, and shading patterns.
- **Appendix D** on page 211 shows the ICU panels with their Version 2 Release 1 defaults.

Special note for online users

The pictures in this book may differ from those in the online version because of the characteristics of your graphics display. In the online version, the pictures show the colors described in the text. The representations of line types, shading patterns, and symbols vary depending on your graphic display, but they are usually more accurate in the online version than in this book.

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Latest GDDM information

For up-to-date information on GDDM products, check our Home Page on the Internet at the following URL:

`http://www.hursley.ibm.com/gddm/`

You might also like to look at the IBM Software Home Page at:

`http://www.software.ibm.com`

GDDM publications

GDDM Base
GDDM Base Application Programming Guide, SC33-0867
GDDM Base Application Programming Reference, SC33-0868
GDDM Diagnosis, SC33-0870
GDDM General Information, GC33-0866
GDDM/MVS Program Directory, GC33-1801
GDDM/VM Program Directory, GC33-1802
GDDM/VSE Program Directory, GC33-1803
GDDM Messages, SC33-0869
GDDM Series Licensed Program Specifications, GC33-0876
GDDM System Customization and Administration, SC33-0871
GDDM User's Guide, SC33-0875
GDDM Using the Image Symbol Editor, SC33-0920

GDDM-GKS
GDDM-GKS Programming Guide and Reference, SC33-0334

GDDM-IMD
GDDM Interactive Map Definition, SC33-0338

GDDM-IVU
GDDM Image View Utility, SC33-0479

GDDM-PGF
GDDM-PGF Application Programming Guide, SC33-0913
GDDM-PGF Programming Reference, SC33-0333
GDDM-PGF Interactive Chart Utility, SC33-0328
GDDM-PGF Vector Symbol Editor, SC33-0330
GDDM-PGF OPS User's Guide, SC33-1776

GDDM/MVS is an element of OS/390. GDDM-REXX/MVS and GDDM-PGF are optional features of OS/390. For a complete list of the publications associated with OS/390, see the *OS/390 Information Roadmap*, GC28-1727.

Summary of Changes

Changes for Version 2 Release 1 Modification 3

There are no changes to the functions nor how you use them in Version 2 Release 1 Modification 3. Editorial changes have been made to remove some redundant material.

Summary of amendments for GDDM-PGF Version 2 Release 1 Modification 2

Changes to GDDM Series for Version 3 Release 1

A complete list of the changes to the GDDM Base programs is given in the *GDDM General Information* book. The main changes are:

- GDDM-OS/2 Link, GDDM-PCLK, and GDDM-REXX have been combined with GDDM Base to provide a single package, so that GDDM is easier to install and maintain.
- Changes have been made to GDDM's screen-redrawing functions to improve application-response time.
- Several enhancements have been made to GDDM's printing and plotting support, including support for more devices, the ability to store plotter output in IBM-GL files, and support for plots up to 11.862 m (38.91 ft.) in length.
- A number of usability enhancements have been made to the GDDM-OS/2 Link and GDDM-PCLK components of GDDM Base, and to the printing interfaces of User Control and the GDDM-PGF ICU.
- The User Control interface now allows both image and graphics to be panned and zoomed.
- C/370 is supported, and GDDM-REXX can be used in the MVS/TSO environment.
- A new, Mincho double-byte character set is provided, and multiple double-byte character sets can be installed and used.
- The GDDM library has been restructured, is smaller, and the GDDM Base library is available in soft-copy format.

Changes to GDDM-PGF

- GDDM-PGF calls can be issued from applications written in C/370.
- A new book (the *GDDM-PGF Application Programming Guide*) has been added to the GDDM-PGF library. This was previously published as volume 2 of the *GDDM Application Programming Guide*.
- Enhancements have been made to the printing interface of GDDM-PGF ICU. In particular, the user is no longer required to know the name of a printer or plotter in order to be able to print or plot a chart. Instead, the user can enter a "?" in the printer field and be presented with a list of devices. Also, output can be directed to family-4 devices (advanced-function printers) from the ICU if appropriate nickname statements are coded.

Summary of amendments for GDDM-PGF Version 2 Release 1 Modification 1

Changes to GDDM Series for Version 2 Releases 2 and 3

A complete list of changes to the base GDDM programs is given in the *GDDM Release Guide*. The main additions are:

- New GDDM Series licensed programs:
  - GDDM-PCLK, which lets you use GDDM application programs on IBM PCs using PC DOS.
  - GDDM-OS/2 Link, which lets you access GDDM application programs from IBM workstations, including PS/2s using OS/2 Extended Edition.
  - GDDM/VMXA, which extends Base support to XA environments under VM.

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  - GDDM-CSPF (Central Slide and Plot Facility), which lets you run plotters in an unattended service rôle, and to improve charts and similar pictures for business presentations.
  - GDDM-REXX, which lets you include GDDM calls in REXX EXECs under VM.
  - GDDM-IVU (Image View Utility), which lets you create, edit, and print images.
  - GDDM-GKS, which is an application programming interface for the Graphical Kernel System standard.
- Support for new devices, including some ASCII graphics devices, and more IBM displays, printers, and plotters.

Changes to PGF

There are no functional changes to GDDM-PGF since Version 2 Release 1 Modification 0. The changes for Version 2 Release 1 Modification 1 incorporate service updates and a repackaging of the modules so that no GDDM Base modules are shipped with GDDM-PGF.

Changes to this manual

The only changes to this manual affect the definition of programming interfaces.

Chapter 1. Introduction

The **Presentation Graphics Facility (PGF)** of the IBM licensed program. **Graphical Data Display Manager (GDDM)** helps you to draw business charts in a simple way, for displaying on a screen or for printing. An introduction to GDDM, including PGF, is given in the *GDDM General Information* book.

PGF has three levels of function:

- The Interactive Chart Utility (ICU) that can be used interactively by anyone to create charts at the terminal. It can be started from:
  - The terminal. When the ICU is called from the terminal, it runs as a stand-alone utility; there is usually no need for DP specialists to be involved. Stand-alone use is described in the *GDDM-PGF Interactive Chart Utility* book.
  - An application program. When the ICU is called from an application program using the CSxxxx calls, all the functions are available to the programmer.
- The Presentation Graphics (PG) routines; these must be called from an application program. The PG routines (CHxxxx calls) are more flexible than the ICU, and allow you to create more complex charts, but they do not have any interactive facilities.
- The Vector Symbol Editor, which can be started from a terminal or from an application program.

This manual gives a comprehensive description of the calls you can make from an application program to the ICU and the PG routines.

Only the call to the Vector Symbol Editor will be discussed in this manual. For full details see the *GDDM-PGF Vector Symbol Editor* book. GDDM also provides an Image Symbol Editor, which is described in the *GDDM Using the Image Symbol Editor* book. You can use these editors to produce or modify symbols for annotating PGF charts.

This manual is intended as a reference document rather than as an introduction or guide to PGF. If you are unfamiliar with programming using GDDM, you may prefer to read the *GDDM Base Application Programming Guide*, which introduces the facilities of GDDM, and the *GDDM-PGF Application Programming Guide*, which describes how the GDDM-PGF API calls are used, first.

GDDM supports a variety of terminals and printers, and runs under several different software subsystems; these are summarized in the *GDDM General Information* book.

Relation to GDDM base calls

The GDDM Base product provides a call interface to an extensive set of graphics and alphanumeric functions. You can use these calls in application programs together with the ICU and PG routines. For example, GDDM Base calls might handle ordinary alphanumeric fields on one part of the page, while calls to the ICU or PG routines draw charts on another. If the page is a mapped one, charts can be drawn in the graphic area. The GDDM Base calls are described in the *GDDM Base Application Programming Reference* book. The compatibility with GDDM Base calls means that the ICU and the PG routines can be used together with BMS under CICS.

Types of chart and their uses

This section gives a brief description of the various types of chart produced by the ICU and the PG routines. The basic types available by both methods are shown in figures 1 to 10.

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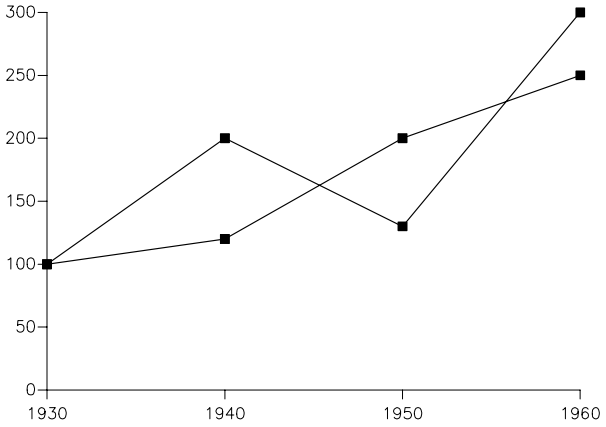

Figure 1. Line graph

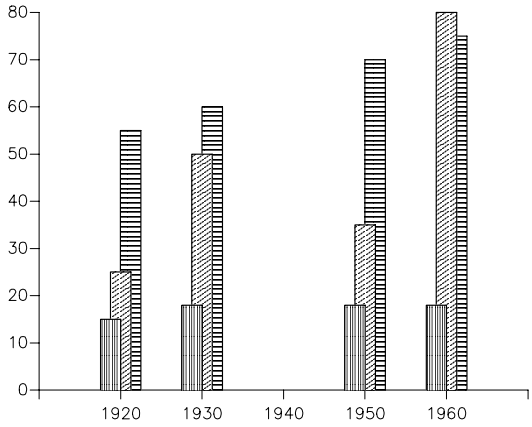

Figure 4. Bar chart

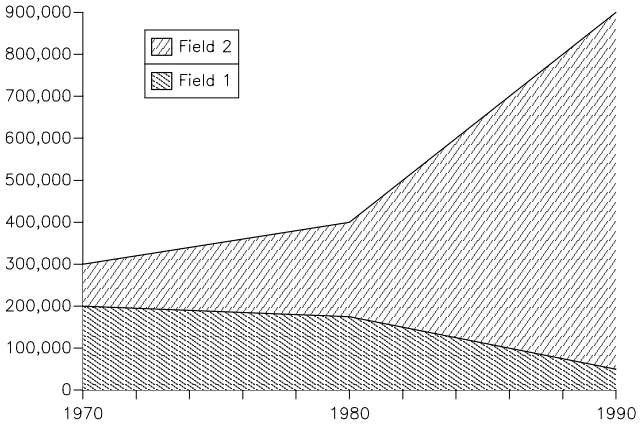

Figure 2. Surface chart

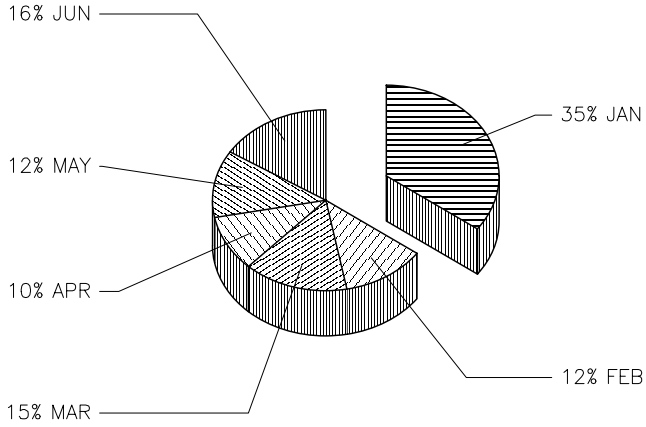

Figure 5. Pie chart

Figure 3. Histogram

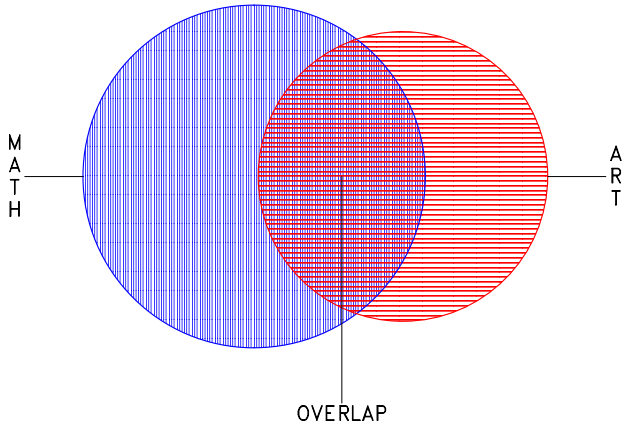

Figure 6. Venn diagram

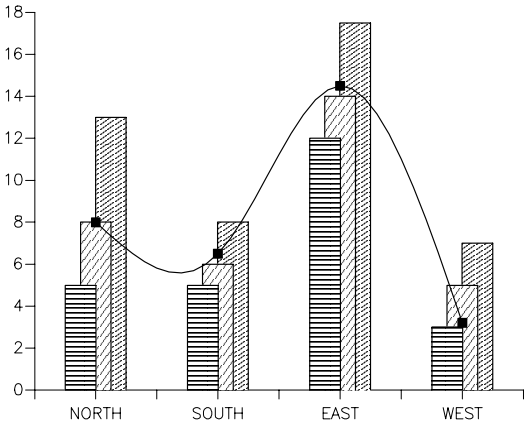

Figure 7. Mixed chart

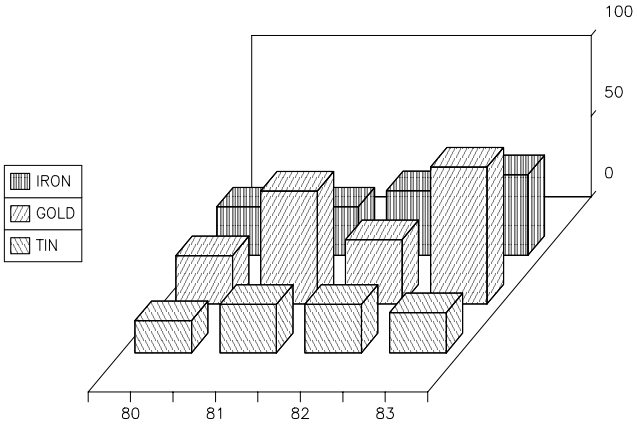

Figure 9. Tower chart

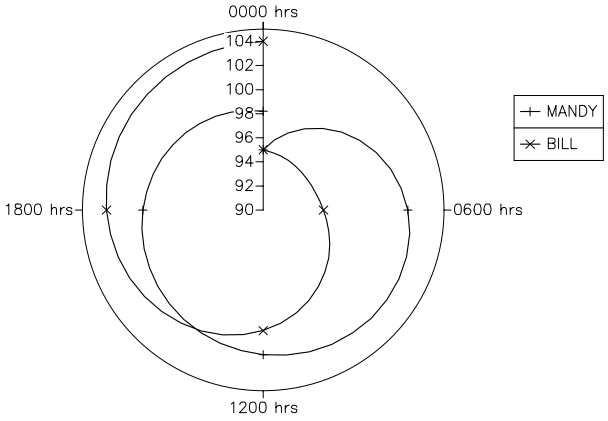

Figure 8. Polar chart

	1982	1983	1984	1985	1986	1987
North	5,000	5,230	6,010	6,050	6,000	6,120
South	4,300	4,600	4,520	4,670	4,630	4,540
East	3,670	3,290	4,100	4,320	4,130	4,100
West	2,560	1,900	2,190	2,210	2,340	2,290

Trees Planted

Figure 10. Table chart

Line graphs and scatter plots

Line graphs represent values as lines joining a series of points. By showing the points without the lines, scatter plots can be produced. On ordinary line graphs, the points can be joined by curves or straight lines, and the points themselves can be shown or omitted.

Line graphs are the most useful general purpose charts produced by the ICU. They are good for comparing accurately a number of sets of data. However, they do not give the same immediate visual impression of the sizes and trends of data as surface charts, bar charts, and pie charts.

Line graph totals can be absolute or relative. With **absolute** data, the y values are plotted as their absolute values. With **relative** data, the y values are relative to the y values of the previous data group.

Surface charts

Surface charts are similar to line graphs, but the areas under the lines are shaded. They emphasize the relative proportions of the sets of data. They show the value of each particular set of data and the total value of all the sets of data together.

Surface chart totals can be absolute or relative. With **absolute** data, the y values are plotted as their absolute values. With **relative** data, the y values are relative to the y values of the previous data group.

Histograms

A histogram represents y values across a **range** of x values. The width of a histogram bar is relevant, whereas that of a bar chart is not.

The general form of histogram requires two sets of x data: the “range-starts” and “range-ends.” These denote the left and right edges of each bar and therefore its width. The bars do not have to be contiguous along the x axis.

Histogram totals can be absolute or relative. With **absolute** data, the y values are plotted as their absolute values. With **relative** data, the y values are relative to the y values of the previous data group.

Types of histogram

A histogram produced by the ICU can have the y values represented by the areas of the bars or by bar height alone. The area option should be used if the x ranges are different for different steps. This normalizes the y values.

Histograms produced by the PG routines may have y values represented by bar height only.

Bar charts (column charts)

Bar charts show y values as a number of bars at specified points along the x axis.

Bar charts provide a powerful visual way of showing frequent changes in y values over a period or range. The use of multiple bars can show comparisons between different sets of data. When the bars are stacked, they can be used to show proportions of sets of data within a whole, and the changes both in the value of the sets of data and in the value of the whole over the x-axis range.

For the difference between bar charts and histograms, see the description of histograms.

Types of bar chart

When a bar chart has more than one component, the bars of the various components may be placed side by side or stacked on top of one another. In the latter case, relative data is normally used, as it is for all stacked chart types.

You also have options to control the horizontal space between bars (removing it completely if you wish), to request bar values to be displayed on top of each bar, and to control methods of shading. If you want a horizontal set of bars, you must reverse the orientation of the axes.

Pie charts

A pie chart is one or more circles (or pies) that are cut or sliced to represent the proportions of a whole that are made up by various sets of data.

Pie charts give an immediate visual impression of the proportions of various sets of data within a whole. The use of more than one pie chart enables changes in the makeup of a whole to be compared.

To increase the visual impression, PGF lets you create three-dimensional pie charts, where the complete pie can be shown to have width and thickness. In addition, individual slices can be exploded (that is, moved out from the rest of the pie).

The size of each slice, expressed as a percentage, may be attached to the slice.

Generally, the maximum number of pie charts that can be shown at one time depends on the display device being used. The usual number is four or five. If more than one pie chart is being shown, you may prefer to have labels in a legend and not attached to the slices.

Types of pie chart

PGF allows you to specify your data either as absolute values or as percentages. If absolute values are used, PGF treats the total number entered in a data group as making up 100%. Every pie is therefore complete.

For percentages, if the total is less than 100, part of the pie is not drawn. If the total is more than 100, the pie is not drawn and an error message is given.

If you are showing more than one pie on the chart, the pies can be displayed vertically by changing the x-axis orientation to vertical. This option is preferable when there is more than one pie to display.

Venn diagrams

Venn diagrams represent two populations and an overlap. They give an immediate impression of the relative sizes of the two populations, and the proportion that the overlap represents in each population. The actual number in any population can be shown only by annotation.

When produced using the ICU, a Venn diagram represents the first three y values of the first data group.

Polar charts (radar or star charts)

Polar charts are like circular line graphs. They are sometimes called star or radar charts. They are most useful for displaying cyclical data, if the x axis represents a single continuous variable. A patient's temperature taken at intervals over a day would be a typical example.

Another important use is for comparing two or more entities, such as companies, on several different parameters, such as revenue, profit, capital invested, and so on.

Polar chart totals can be absolute or relative. With **absolute** data, the y values are plotted as their absolute values. With **relative** data, the y values are relative to the y values of the previous data group.

Tower charts (skyscraper or Manhattan charts)

Tower charts are similar to bar charts, but have a three-dimensional appearance and a third axis, the z axis. They are sometimes known as skyscraper or Manhattan charts.

They usually have several data groups, each being drawn at a different specified z-axis value, like the example in Figure 1 on page 2. Bars can be stacked, but towers cannot; otherwise, the choice between bar and tower charts depends mainly on appearance.

Table charts

Table charts allow you to present the actual figures of your data in rows and columns with suitable headings. A table chart is particularly useful as one of a series of charts showing different interpretations of the same data.

Getting data for a chart

There are several ways in which you can obtain the data to use for a chart. You can:

- Type it in when you create a chart
- Use some that already exists in a chart data file
- Use some that exists in a sequential file, perhaps as part of a data base.

The first two methods were available in Version 1; the third method is new for this Version.

Using data from existing sequential files:

Often, the data that you need to create a chart already exists in a sequential file somewhere. You can only select the fields that you need from the file by using the ICU interactively. A description of the selected fields is stored in a **data definition file**. Once you have created a data definition file, you can use the CSLOAD call (see "CSLOAD – Restore saved chart information" on page 150) to access the data.

The data definition file you create this way is sometimes referred to as a flat file. For full details on creating and using flat files, see the *GDDM-PGF Interactive Chart Utility* book.

Calling the ICU from an application program

You can call the ICU from an application program with the new CSxxxx calls. Using these calls, you can:

- Query format options in a specified chart format object.
- Override format options in a specified chart format object.
- Override default operating options.
- Have more than one instance of a called chart.
- Add data to a chart data object.
- Access a directory of GDDM objects.
- Pass data that is to be made available to the terminal operator as the initial contents of appropriate ICU menu panels. The application could obtain it from a data base.
- Display a chart using a saved chart format and saved chart data.
- Print a chart on a specified printer.
- Cause the ICU to construct a chart, then let your program modify it before it is displayed.
- Make the ICU into an interactive GDDM library manager, giving the terminal operator access to the Directory panel and its associated Help panel only.

In Version 1, you could call the ICU from an application program using the CHART call. Although you can still invoke the ICU from an application program using the CHART call with the appropriate arguments, in most cases you will find it better to use the new CSxxxx calls. The new calls are more flexible than the old CHART call. They allow you to control more options, increase the certainty of producing the result you expect and avoid incompatibility between releases.

Note: Under IMS, the ICU can be used interactively only in stand-alone mode. When called from a program, the ICU displays charts, but does not allow operator interaction through the menu panels.

Drawing a chart with the PG routines

Drawing a chart using the PG routines is done in two successive states:

1. Tailoring the default layout assumptions (termed chart definition)
2. Passing the data and plotting the chart (termed chart construction).

These two states must be preceded by initialization calls to GDDM, and followed by GDDM input/output calls to display or print the chart. There must also be a GDDM call (FSTERM) to terminate PGF and GDDM.

Plotting the chart is done by passing the data to the plotting routine for the relevant type of chart.

The two states differ. Calls in state-1 merely set up information that is used when the chart is constructed in state-2. Consequently they can be made in any sequence. Calls in state-2 actually result in the construction of parts of the graph and are therefore irreversible (except by starting again from scratch).

Further information on states 1 and 2 is given in “States 1 and 2 and moving between them” on page 22.

The PG routines allow you to create more complex charts than the CSxxxx calls do, but they cannot be used interactively.

Calling the Vector Symbol Editor from an application program

You can invoke the Vector Symbol Editor from an application program using the Vector Symbol Set Editor call with a symbol set name as the parameter. The symbol set can be a new or existing one, or it can be blank (in which case the name has to be entered by the operator once the Vector Symbol Editor has started).

For details of the call, see “VSSE – Vector Symbol Editor” on page 170.

Calling the ISE from an application program

You can invoke the ISE from an application program using the ISSE call with a symbol set name as the parameter. The symbol set can be a new or existing one, or it can be blank (in which case the name will have to be entered by the operator once the ISE has started).

For details of the call, see the *GDDM Base Application Programming Reference* book.

Chapter 2. Invoking the Interactive Chart Utility (ICU)

General-Use Programming Interface

The Interactive Chart Utility (ICU) can be invoked in two ways:

- As a stand-alone program
- Called from an application program.

The stand-alone ICU is described in the *GDDM-PGF Interactive Chart Utility* book.

This chapter describes how to call the ICU from an application program.

When you call the ICU from an application program using the CSxxxx calls, you can do everything that the stand-alone program can plus some extra functions that are not available with the stand-alone program. These functions are described first.

This section is followed by an introduction to the CSxxxx calls. The calls are described in detail in the section "Alphabetic list of chart calls" on page 118. The CHART call is then introduced. The call is described in detail, in the section "CHART – Invoke Interactive Chart Utility" on page 118.

Next, there is a section that covers general points you need to know for whichever method of calling you use. It also explains when to use the CSxxxx calls and when to use the CHART call. Normally, however, you should use the CSxxxx calls in preference to the CHART call.

Finally, there are some example programs that demonstrate calling the ICU with the CHART call. Further examples of invoking the ICU by this method is given in Appendix A, "Sample programs" on page 175.

Summary of additional function

When the ICU is called from an application program, parameters may be specified to exploit more function than is available in stand-alone mode. The main additional functions are summarized briefly below:

1. Additional functions supporting operator interaction (that is, access by the operator to some or all of the ICU menu and help panels):
   - Interactive use in which initial data or chart format information is supplied by the application program.
   - Interactive use in which initial data or chart format information is supplied from a named Chart files created during a previous ICU invocation.
   - Interactive use in which a chart is displayed initially (instead of the Home Panel), and can then be modified by normal access to the menu panels.
   - Interactive use in which a chart is displayed initially, but normal access to the menu panels is replaced by (at most) access to the Save and Print functions only.
   - Interactive use in which the calling program supplies a specific print-destination name. All printing initiated by the operator takes place using this supplied print-destination name.
   - Interactive use, restricted so that Chart Format and Chart Data files can be neither restored nor saved.
   - Interactive use in which only the Directory panel and its associated Help panel can be displayed, making the ICU into a library manager.

   Note: The interactive invocation of the ICU from an application program is not available under IMS.
2. Additional functions in which operator interaction in the above sense is **not** supported:
   - Creating a Chart Data or Format file from information supplied by the application program.
   - Creating a Graphics Data Format (GDF) file from data and format information supplied by the application program or from existing Chart Format and Chart Data files.

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- Printing a chart on a specified printer or plotter.
- Constructing a chart in the current GDDM page of the calling program. The chart can be created from data and format information supplied by the application program or from existing Chart Format and Chart Data files. The calling program is responsible for the further use of the GDDM page containing the constructed chart (for example it may define alphanumeric fields, and display, print, or save the page).
- Outputting a chart using the GDDM ASREAD function. Control is returned to the calling program upon completion of the ASREAD.

Creating charts from a program: the CSxxxx calls

The ICU can be accessed from an application using the CSxxxx calls. This means that ICU graphics can be obtained by non-graphics programs. The application program remains in control while allowing the use of all the ICU facilities. The CSxxxx calls can offer the full interactive ICU or just create and display a chart.

The CSxxxx calls provide a very flexible method of invoking the ICU. Everything that can be done with the stand-alone ICU can be done with these calls. Most CSxxxx calls correspond to ICU panel settings and options.

There are a number of calls which, together with their parameters, control an ICU session. These calls can be divided into four groups according to their function:

Managing an ICU session

Setting chart fields

Querying chart fields

Using the directory.

Managing an ICU session

There are four calls that you need to manage an ICU session:

CSCCRT Initialize a new chart session

CSCDEL Terminate the ICU session

CSSICU Invoke the ICU

CSQUID Discover the next unused chart number.

Setting chart fields

To create a new chart, you need to give the ICU information about the chart. This group of calls passes the information to the ICU.

CSCHA Pass character string information

CSDEL Delete a chart item

CSFLT Set floating point chart options

CSINT Set integer chart options

CSNUM Set control values

CSXDT Pass x values

CSXSL Set x selection information

CSYDT Pass y values

CSZDT Pass data group values

CSZSL Set data group selection information.

Querying chart fields

This is the largest group of calls. You use them to find out the current state of your chart.

CSQCHA Discover what is in the character strings

CSQCHL Discover the number of character strings and their lengths

CSQCS Discover the number of arrays in use

CSQFLT Discover the floating point chart options

CSQINT Discover the integer chart options

CSQNUM Discover the control values

CSQXDT Discover the x values

CSQXSL Discover which x values have been selected and which excluded

CSQYDT Discover the y values

CSQZDT Discover the data group values

CSQZSL Discover which data group values have been selected and which excluded.

Using the directory

This group of calls allows you to load, save, and delete charts. You can also create and examine a list of GDDM objects. The calls in this group are:

CSCDEL Delete an existing chart or directory list

CSDIR Create a list of GDDM objects

CSLOAD Restore an existing chart

CSQDIR Query the list of GDDM objects that you created

CSSAVE Save a chart.

An outline series of calls

To construct, display, and save a simple chart, this sequence could be used:

CSQUID Find the next available chart number

CSCCRT Initialize the chart

CSNUM Specify how many x and y values

CSXDT Pass the x data

CSYDT Pass the y data

CSCHA Pass the titles

CSSICU Start the ICU to display the chart

CSSAVE Save the chart

CSCDEL Terminate the ICU session.

Relating calls to ICU panels

There are four main calls that you need to create a chart: CSCHA, CSFLT, CSINT, and CSNUM. These calls have lots of options (called **types**), most of which are equivalent to making a selection or entering data on an ICU panel. Table 1 shows you what each call and type does and the corresponding ICU panel. If you are not sure of the effect of a particular call and type, try setting the equivalent ICU panel interactively in the same way and look at the resulting chart. Appendix D, “Interactive Chart Utility panels” on page 211 shows all the ICU panels with their default values and the *GDDM-PGF Interactive Chart Utility* book gives help on what panels to use.

Table 1 (Page 1 of 2). Cross reference for the main CSxxxx calls

	CSCHA type	**CSFLT type**	**CSINT type**	**CSNUM type**	**ICU PANEL**
Axis label options	7,10–12,33	11–14	27–30		4.4,2.4,2.8
Axis line options			23,24		4.2
Axis scale, range and position		9,10	25,26,39		4.3,5.2
Axis title options	13–16	29,30	21,22,46,47		4.1
Bar chart options	18	2,8	5,6		1.4
Chart heading	8,9	17	38,39		5.1,5.2
Chart note options	19,20	20,26	42,48	1,2	3
Chart pro-portions and dimensions		19,28	41		5.4
Chart type options			1,16		1,2.6
Data attributes		4,5	11–17	7	2.6
Data group options	6, 17	7	20	5,6,12,13	2.7, 2.3
Data import options	25,26,31,32		44		2.9
Data interpret-ation and indexing		6	19		2.5
Datum-line options		24, 25	36, 37		4.8
Directory options	4, 5		18	8	M
Histogram options			4		1.3
Legend options		18	40		5.3

Table 1 (Page 2 of 2). Cross reference for the main CSxxxx calls					
	CSCHA type	**CSFLT type**	**CSINT type**	**CSNUM type**	**ICU PANEL**
Line graph options			2		1.1
Menu control options			18		M
Pie chart options			7, 17		1.5
Polar chart options			9		1.7
Printer and plotter options	3	1	45		PF4
Reference-line options		22, 23	35, 51		4.7
Save/load options	1,2,27–32				S or PF2
Scale marks and grids		15, 16	31 –34		4.3, 4.6
Subchart options	21, 22	21	43	3,4,10,11	6
Surface chart options			3		1.2
Table chart options	23, 24	27, 31	49, 50		1.9
Tower chart options		3	10		1.8
User defined labels	10, 33				4.4
Venn diagram options			8		1.6

The CHART call

In Version 1, the only way to access the ICU was to use the CHART call. This call is still available, but it is not such a flexible method of invoking the ICU as the CSxxxx calls are. It cannot exploit the new features of the ICU. In particular, you CANNOT use it to:

1. Construct multiple charts
2. Replace data
3. Set or override chart format items
4. Interrogate the data or format of an existing chart
5. Interrogate the data or format of a chart during an interactive session
6. Access sequential data files
7. Interrogate a directory of GDDM objects.

Additionally, you cannot pass z-axis data in the CHART call. This limits your scope for drawing tower charts.

A detailed description of the CHART call can be found later in this book under “CHART – Invoke Interactive Chart Utility” on page 118.

Which call to use

You should use the CSxxxx calls for all your new programs. The CHART call is still supported and you will be able to maintain any programs that use it. Programs that already use the CHART call can be mixed with new programs using the CSxxxx calls in the same suite.

Things to consider when calling the ICU

There are three special points you need to be aware of when invoking the ICU from an application program. They are:

1. The differences between free and tied data.
2. Using missing values.
3. Using GDDM symbol sets in the ICU; this section describes, among other things, how to make available nonstandard shading patterns and marker symbol sets for use by the ICU.

These points apply whether you use the CSxxxx calls or the CHART call.

Free (paired) and tied (non-paired) data

Free data is so named because each data group is free of association with any other data group, because it contains, as well as a set of y values, its own set of x values. Tied data, by contrast, has a single set of x values for all data groups. Free data was formerly known as **paired** data, and tied data as **non-paired** data.

All data groups with free data are completely independent of one another. Each data group can contain a different number of points from other data groups, and the individual point x and Y values in one data group can be different from those in other data groups.

Note: Although you can still use free data, there is no need to because tied data and missing values achieve the same effect.

All data groups with tied data are constrained to contain the same number of points, and all data groups share a common set of x values.

Saved Chart Data files contain data either in free mode or in tied mode. When a Chart Data file is restored, the free or tied mode of the data is restored also. Thus, during an interactive session, the ICU operator can switch the mode of operation between free and tied data by restoring a Chart Data file with data of the appropriate mode. In particular, a null chart data file may be restored in either free or tied mode by using the reserved names *FREE or *TIED.

You can convert free data into tied data by using the ICU's CONVERT command in the Data Manipulation panel. (You **cannot** convert tied data in this way.)

Missing data values

When you collect the data that you want to display in a chart, you might find that you have not been given all the data values you require. To display the chart without these values, you would have had to invent some values, which might give a false impression to your chart.

PGF allows you to omit the values that you do not have; your chart is still drawn, but the missing values are ignored.

PGF provides the following methods for the ICU and non-ICU user:

1. In the ICU Data Entry panels, specify a period (.) in place of a data value.
2. Using the CSxxxx calls in an application program, specify a missing data value as 10 raised to the power 72 (X'7C90E410').

You can specify missing values for all types of charts except Venn diagrams. The effect of missing values on the other types of charts is as described below:

- Histograms – the step is not drawn and there is no gap left between the adjacent steps.
- Bar and tower charts:
  - On a multiple-bar chart, a gap is shown where the missing value would have appeared.
  - On a composite (stacked) or floating bar chart, the bar for the missing value is not drawn; there is no gap left between the bars.
- Pie charts:
  - On a pie chart with percentage values supplied, the slice that corresponds to the missing value is not drawn; there is no gap left between the slices.
  - On a pie chart with absolute values supplied, the missing value is not used in calculating the percentages, and the slice for the missing value is not drawn (again, no gap is left between the slices).
- Line, surface, and polar charts:

  The effect depends on where the missing value occurs:
  - If the missing value is the first or last element in a component, the component is drawn without that element. This means that, for a line graph or polar chart without shading, the line that represents the component is shortened; for a surface chart or polar chart with shading, the shaded area extends only to the values that are present.

– If a sequence of one or more missing values lies between two elements that have values, the two elements with values are connected by a continuous line.

Symbol set usage with the ICU

The discussion of symbol set usage with the ICU is covered in the following sections:

- Image and vector symbol sets
- Shading-pattern symbol sets
- Marker symbol sets.

Image symbol sets and vector symbol sets are referred to directly as text attributes.

Shading pattern and marker symbol sets are referred to using pattern and marker data attribute values.

There are device-dependent restrictions on the use of symbol sets.

More information about symbol set usage is given in the *GDDM System Customization and Administration* book.

Image and vector symbol sets: An image symbol set (ISS) or a vector symbol set (VSS) can be referred to by name in the chart definition as a text attribute of any text appearing on the chart (for example, axis labels, keys, or chart notes). During chart construction, each symbol set is loaded as it is needed, if it is not already loaded, using GSLSS. When the chart has been constructed, loaded symbol sets that are not needed are unloaded using GSRSS. In this way, symbol set loading, and the use of storage, are optimized during an interactive session while successive charts are constructed and displayed.

Note: GSLSS replaces a symbol set name that ends with the substitution character "." with another name in which the "." is replaced by an appropriate alphabetic character, as described for the GSLSS call in the *GDDM Base Application Programming Reference* book. This is particularly relevant to image symbol sets, because, in general, different image symbol sets are required for different device types. For example, to print a chart containing a reference to an ISS, using an ISS name that ends in "." causes the Print Utility to attempt to load an ISS whose name ends in a suffix character appropriate to the print device.

Any ISS or VSS already loaded by the application program (by a GSLSS or GSDSS call) at the time the CSSICU or CHART call is issued, is noted by the ICU as a preloaded symbol set. Such preloaded symbol sets are treated specially in that they are never loaded or released by the ICU. Preloaded symbol sets may be used, in general, to prevent the dynamic loading and releasing of a symbol set that occurs in the normal case (as described above), depending on whether or not the symbol set is required for each chart constructed.

The only exception to this rule is a preloaded symbol set whose name ends with ".". In this case, the name of the symbol set treated as preloaded by the ICU is the name after substitution of an alphabetic character for the ".". If the chart definition includes a reference to the symbol set name ending with ".", the symbol set is loaded and released as normal (that is, it is not treated as a preloaded symbol set).

Before control is returned to the calling program, all symbol sets loaded by the ICU are released. In all cases the symbol sets loaded (and the symbol-set identifiers in use) are the same on return from the CSSICU or CHART call as they were immediately before that call.

Shading-pattern symbol sets: The chart definition may refer to shading-pattern values in the range 65 through 254 (for example, shading pattern 65 can be specified for a selected data group). In such cases, the ICU ensures that a user-defined shading-pattern symbol set is loaded.

Shading-pattern symbol sets are merely special uses of image symbol sets, so that any image symbol set can be referred to as a pattern set.

The ICU loads, using a GSLSS call, a user-defined pattern set with the name **ADMICUP.**. The final "." character ensures that the GSLSS call loads a symbol set appropriate to the primary device type (for example, **ADMICUP.** is replaced by **ADMICUPD** or, if a symbol set with this name cannot be found, by **ADMICUPC**, on a 3279 device).

Table 2. Chart definition marker types

Marker type	Marker scale	Symbol set type	Symbol set name	Comments
0–62	numeric	vector	ADMDHIMJ	ICU markers (types 1-8 are scalable versions of the image system markers 1-8)
65–254	numeric	vector	ADMICUM	User-defined markers (if ADMICUM cannot be found, image markers in ADMICUM. are used)
1–8	*	image	none	Image system markers (these cannot be scaled; their size depends on the particular device in use)

Thus, in order to set up installation-defined extended pattern sets available to ICU users, all that is required is for pattern sets with names **ADMICUPx** to be created (where **x** is a suffix character appropriate to the device type in use). For example, the sample 64-color shading pattern set supplied on the distribution tape under the name **ADMCOLSD** need only be copied under the name **ADMICUPD** to become available to the ICU user with pattern values 65 through 128. The copying can be done with the Copy command of the ICU Directory panel.

Like image symbol sets and vector symbol sets referred to through text attributes (discussed above), pattern symbol sets are loaded and released by the ICU as required for each chart constructed. Also, pattern sets of any name may be preloaded by the application program. In this case, no dynamic loading of pattern sets takes place. Use of preloading is recommended if an installation-defined standard extended pattern set (such as the 64-color shade set mentioned above) needs to be replaced for a particular session by a different pattern set.

Marker symbol sets: A chart definition may use marker types in the ranges 0 through 62 or 65 through 254, as shown in Table 2.

A chart may use only one marker symbol set. This means that, in general, marker types 0 through 62 should not be mixed with marker types 65 through 254. There is one exception to this: the image system markers (types 1 through 8 with a scale of *) do not require a symbol set to be loaded, and so can be mixed with ICU markers or with user-defined markers.

When the chart is drawn, the ICU decides which marker symbol set to use on the basis of the markers required by the data **actually plotted**. If contradictory marker types have been specified, the highest priority marker set of those requested is used. In order of decreasing priority, these are:

- preloaded markers
- ICU markers
- user-defined markers.

If a preloaded marker set is used, it should be a vector symbol set, otherwise marker scaling cannot be supported.

If user-defined markers are requested, but **ADMICUM** cannot be found, the ICU tries to load the image marker set **ADMICUM.** . The "." character ensures that a symbol set appropriate to the device is used. These markers cannot be scaled.

└ End of General-Use Programming Interface ┘

Example programs

This section contains example programs that demonstrate calling the ICU from an application program with the CHART call.

See the *GDDM-PGF Application Programming Guide* for examples of programs using the CSxxxx calls.

The first CHART call program, shown in Figure 11 on page 17, calls the ICU to display program-supplied data. It creates a line graph with three lines and five points on each line. It shows how to use the **chart_control** structure, the data value parameters, and the CHART call.

Figure 12 on page 18 shows how to send a chart to a page printer. The name of the chart is specified as a parameter to the program. The type of printer must be specified in a DSOPEN statement. In this case, it is an IBM 4250 printer (a family-4 printer in GDDM terms).

For more information about the DSOPEN and DSUSE calls, see the *GDDM Base Application Programming Reference* book.

```
LGRAPH: PROC OPTIONS(MAIN);

%INCLUDE ADMUPINC;                /* 'C..' ENTRY POINTS           */
%INCLUDE ADMUPINF;                /* 'F..' ENTRY POINTS           */


DCL 1 CHART_CONTROL,              /* CHART CONTROL PARAMETER      */
2 LEVEL    FIXED BIN(31) INIT(1), /* FULL STRUCTURE FORMAT        */
2 DISPLAY  FIXED BIN(31) INIT(1), /* ALL MENU PANELS ACCESSIBLE   */
2 HELP     FIXED BIN(31) INIT(1), /* PF KEYS SHOWN ON DISPLAY     */
2 ISOLATE  FIXED BIN(31) INIT(0), /* SAVE/RESTORE/DIRECTORY OK    */
2 FORMNAME CHAR(8) INIT('*'),     /* DEFAULT CHART FORMAT         */
2 DATANAME CHAR(8) INIT('*'),     /* DATA IS PASSED IN ARRAY x    */
2 BINDING  FIXED BIN(31) INIT(0), /* DATA IS NORMAL IE. TIED      */
2 NG       FIXED BIN(31) INIT(3), /* 3 DATA GROUPS                */
2 NE       FIXED BIN(31) INIT(5), /* 5 ELEMENTS IN EACH GROUP     */
2 KEYL     FIXED BIN(31) INIT(0), /* NO KEYS                      */
2 LABELL   FIXED BIN(31) INIT(0), /* NO LABELS                    */
2 HEADINGL FIXED BIN(31) INIT(14),/* 14 CHARACTER HEADING         */
2 DESTNAME CHAR(8) INIT('*'),     /* PRINT DESTINATION UNKNOWN    */
2 PRTDEP   FLOAT DEC(6)  INIT(0), /* DEFAULT PRINT DEPTH          */
2 PRTWID   FLOAT DEC(6)  INIT(0), /* DEFAULT PRINT WIDTH          */
2 PRTCOPY  FIXED BIN(31) INIT(1), /* JUST 1 PRINT COPY            */
2 PRTHEAD  FIXED BIN(31) INIT(0), /* NO PRINT HEADER PAGE         */
2 PRTVOFF  FLOAT DEC(6)  INIT(-1),/* DEFAULT PRINT VERTICAL OFFSET */
2 PRTHOFF  FLOAT DEC(6)  INIT(-1),/* DEFAULT PRINT HORIZTAL OFFSET */
2 PRTUNIT  FIXED BIN(31) INIT(0), /* DEFAULT PRINT UNITS (%AGES)  */
2 RESERVED FIXED BIN(31) INIT(0), /* ICU RESERVED                 */
2 DRYNAME  CHAR(8) INIT(' '),     /* NO INITIAL DIRECTORY NAME    */
2 DRYTYPE  FIXED BIN(31) INIT(0), /* DEFAULT DIRECTORY TYPE       */
2 DRYTYPEQ FIXED BIN(31) INIT(0), /* DEFAULT DIRECTORY SUBTYPE    */
2 DRYLIB   CHAR(8) INIT(' '),     /* DEFAULT DIRECTORY LIBRARY    */
2 EXPLVL   FIXED BIN(31) INIT(0); /* STANDARD EXPERIENCE LEVEL    */

DCL DATA_CONTROL(1) FIXED BIN(31); /* ONLY USED FOR FREE DATA     */
DCL X(5)            FLOAT DEC(6)   /* x VALUES DATA ARRAY         */
    INIT(1,2,3,4,5);
DCL Y(15)           FLOAT DEC(6)   /* y VALUES DATA ARRAY:        */
    INIT(100,122,172,200,217,      /*   1ST DATA GROUP            */
         100,105,118,127,153,      /*   2ND DATA GROUP            */
         100,110,129,144,177);     /*   3RD DATA GROUP            */
DCL KEYS(1)         CHAR(1);       /* DUMMY KEYS ARRAY            */
DCL LABELS(1)       CHAR(1);       /* DUMMY LABELS ARRAY          */
DCL HEADING         CHAR(14)       /* HEADING TEXT                */
    INIT('ICU LINE GRAPH');


CALL FSINIT;                       /* INITIALIZE GDDM             */


CALL CHART                         /* CALL CHART UTILITY          */
     (CHART_CONTROL,DATA_CONTROL,X,Y,KEYS,LABELS,HEADING);

CALL FSTERM;                       /* TERMINATE GDDM PROCESSING   */

END LGRAPH;
```

Figure 11. Program to display line graphs using the ICU

```
PRTCHART: PROC(NAME) OPTIONS(MAIN);

%INCLUDE ADMUPINC;                /* 'C..' ENTRY POINTS           */
%INCLUDE ADMUPIND;                /* 'D..' ENTRY POINTS           */
%INCLUDE ADMUPINF;                /* 'F..' ENTRY POINTS           */


DCL 1 CHART_CONTROL,              /* CHART CONTROL PARAMETER      */
2 LEVEL    FIXED BIN(31) INIT(1), /* FULL STRUCTURE FORMAT        */
2 DISPLAY  FIXED BIN(31) INIT(6), /* BUILD CHART IN USER'S PAGE;  */
                                  /* DO NOT TERMINATE PG ROUTINES */
2 HELP     FIXED BIN(31) INIT(1), /* PF KEYS SHOWN ON DISPLAY     */
2 ISOLATE  FIXED BIN(31) INIT(0), /* SAVE/RESTORE/DIRECTORY OK    */
2 FORMNAME CHAR(8),               /* FORMAT NAME SET LATER        */
2 DATANAME CHAR(8),               /* DATA   NAME SET LATER        */
2 BINDING  FIXED BIN(31) INIT(0), /* DATA IS NORMAL IE. TIED      */
2 NG       FIXED BIN(31),         /* NOT USED                     */
2 NE       FIXED BIN(31),         /* NOT USED                     */
2 KEYL     FIXED BIN(31),         /* NOT USED                     */
2 LABELL   FIXED BIN(31),         /* NOT USED                     */
2 HEADINGL FIXED BIN(31),         /* NOT USED                     */
2 DESTNAME CHAR(8) INIT(' '),     /* PRINT DESTINATION UNKNOWN    */
2 PRTDEP   FLOAT DEC(6)  INIT(60),/* DEFAULT PRINT DEPTH          */
2 PRTWID   FLOAT DEC(6)  INIT(90),/* DEFAULT PRINT WIDTH          */
2 PRTCOPY  FIXED BIN(31) INIT(1), /* JUST 1 PRINT COPY            */
2 PRTHEAD  FIXED BIN(31) INIT(0), /* NO PRINT HEADER PAGE         */
2 PRTVOFF  FLOAT DEC(6)  INIT(-1),/* DEFAULT PRINT VERTICAL OFFSET*/
2 PRTHOFF  FLOAT DEC(6)  INIT(-1),/* DEFAULT PRINT HORIZTAL OFFSET*/
2 PRTUNIT  FIXED BIN(31) INIT(4), /* ROW & COLUMN PRINT UNITS     */
2 RESERVED FIXED BIN(31) INIT(0), /* ICU RESERVED                 */
2 DRYNAME  CHAR(8) INIT(' '),     /* NO INITIAL DIRECTORY NAME    */
2 DRYTYPE  FIXED BIN(31) INIT(0), /* DEFAULT DIRECTORY TYPE       */
2 DRYTYPEQ FIXED BIN(31) INIT(0), /* DEFAULT DIRECTORY SUBTYPE    */
2 DRYLIB   CHAR(8) INIT(' '),     /* DEFAULT DIRECTORY LIBRARY    */
2 EXPLVL   FIXED BIN(31) INIT(0); /* STANDARD EXPERIENCE LEVEL    */

DCL NAME   CHAR(8) VARYING;       /* CHART NAME (PARAMETER)       */

FORMNAME = NAME;                  /* SET CHART FORMAT AND CHART   */
DATANAME = NAME;                  /* DATA NAMES TO PARAMETER.     */

DCL                               /* DUMMY DECLARES FOR CHART CALL*/
DATA_CONTROL(1) FIXED BIN(31),    /* NOT USED                     */
X(1)       FLOAT DEC(6),          /* NOT USED                     */
Y(1)       FLOAT DEC(6),          /* NOT USED                     */
KEYS(1)    CHAR(1),               /* NOT USED                     */
LABELS(1)  CHAR(1),               /* NOT USED                     */
HEADING    CHAR(1);               /* NOT USED                     */
```

Figure 12 (Part 1 of 2). Program to send a chart to a page printer

```
DCL                              /* DECLARES FOR THE DSOPEN       */
PROCNT      FIXED BIN(31) INIT(12),/* PROCESSING OPTION COUNT      */
PROLIST(12) FIXED BIN(31),       /* PROCESSING OPTION LIST        */
NAMCNT      FIXED BIN(31) INIT(1), /* NAME COUNT                  */
NAMLIST(1)  CHAR(8);             /* NAME LIST                     */
PROLIST(1) = 5;                  /* OPT GROUP: PRIMARY/SECONDARY  */
PROLIST(2) = 0;                  /*            PRIMARY            */
PROLIST(3) = 6;                  /* OPT GROUP: SPILL/NO-SPILL     */
PROLIST(4) = 0;                  /*            SPILL              */
PROLIST(5) = 7;                  /* OPT GROUP: SWATHES            */
PROLIST(6) = 10;                 /*            10 SWATHES         */
PROLIST(7) = 8;                  /* OPT GROUP: PAGE SIZE          */
PROLIST(8) = 50;                 /*            WIDTH 5 INCHES     */
PROLIST(9) = 50;                 /*            DEPTH 5 INCHES     */
PROLIST(10)= 0;                  /*            1/10 INCHES        */
PROLIST(11)= 9;                  /* OPT GROUP: UN/FORMATTED       */
PROLIST(12)= 1;                  /*            FORMATTED          */
NAMLIST(1) = NAME;               /* USE CHART NAME AS PRINT-FILE  */
                                 /* NAME                          */
CALL FSINIT;                     /* INITIALIZE GDDM               */

CALL DSOPEN                      /* OPEN A FAMILY-4 PRINTER       */
     (88,4,'IMG600X',PROCNT,PROLIST,NAMCNT,NAMLIST);
CALL DSUSE(1,88);                /* MAKE IMG600X PRIMARY DEVICE   */

CALL CHART                       /* CALL CHART UTILITY            */
     (CHART_CONTROL,DATA_CONTROL,X,Y,KEYS,LABELS,HEADING);

CALL FSFRCE;                     /* TRANSMIT PAGE TO PRINT FILE   */

CALL FSTERM;                     /* TERMINATE GDDM PROCESSING     */

END PRTCHART;
```

Figure 12 (Part 2 of 2). Program to send a chart to a page printer

Chapter 3. Using the Presentation Graphics routines

General-Use Programming Interface

The Presentation Graphics routines (PG routines) provide a high-level interface to GDDM that is specially tailored for producing business and other charts. The types of chart that can be produced are line graphs, scatter plots, surface charts, histograms, bar charts, pie charts, Venn diagrams, tower charts, table charts, and polar charts.

The purpose of the routines is to give you the maximum control of the chart layout, while at the same time minimizing the work necessary to get an acceptable chart. To achieve this, an extensive set of defaults is used. (Defaults are values that the PG routines assume when there are no explicitly specified values in the program. They cover, for example, the type of line that is used for axes, and the position of the heading.)

GDDM base functions are used for initialization, outputting the chart, and controlling the graphics field. (The graphics field is that part of a screen or printed page that is used for drawing the chart or charts.)

If you are about to use the PG routines for the first time, you may prefer to read the *GDDM-PGF Application Programming Guide*, which introduces the PG routines and gives guidance, with examples, on using them. After you have drawn one or two simple charts, you will find it easier to understand the PG routines. The remainder of this chapter is arranged as follows:

- Meaning of PG routine names
- How to draw a chart with the PG routines (a "cookbook" list to follow for creating charts)
- States 1 and 2, and moving between them.

Meaning of PG routine names

A mnemonic naming scheme is used in the PG routines. It is shown in Figure 13. As with most such schemes, there are some anomalies (the initial letters CHN, for example, are used for both notes and numbers). Even so, understanding it will help you to remember the names of the calls you need.

Letters	Usual Meaning	Example
CH....	PG routine	CHPLOT - Plot line graph
CHD...	Datum line	CHDATT - Datum line attributes
CHG...	Grid line	CHGATT - Grid line attributes
CHH...	Heading	CHHEAD - Heading text
CHK...	Legend (key)	CHKEYP - Legend position
CHM...	Markers	CHMKSC - Marker scale values
CHN...	Notes	CHNOTE - Note text
CHX...	x axis	CHXSCL - x-axis scale
CHY...	y axis	CHYSCL - y-axis scale
CHZ...	z axis	CHZRNG - z-axis range
CH.ATT	Attributes	CHNATT - Attributes of note

Figure 13. Naming system used for PG routines

Special conventions in PG routines

Many routines let you use a zero value to reset the defaults.

How to draw a chart with the PG routines

Drawing a chart with the PG routines normally consists of arranging your data in a format that suits the routines, deciding on which defaults you will need to change to get the results you require, and writing the necessary call statements to initialize GDDM, construct the chart, and transmit the chart to the terminal or printer. Here is a cookbook type of list that you can follow:

1. Decisions before you start:
   a. Decide on the type of chart you are going to create.
   b. Decide on whether you want the chart to take up the whole of the screen or printed page. If you do not use the CHAREA, CHHMAR, and CHVMAR calls
   c. Decide on your data and divide it up to suit the PG routines, as follows:
      1) Heading – the title of your chart, if any.
      2) Data group names – the names to explain the data you are plotting. These are placed in a legend for most types of chart.
      3) Axis titles.

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4) Axis labels. Decide whether you want the automatically generated numeric labels, labels that you provide, or the day and month labels provided by the PG routines.

5) Values for plotting.

6) Additional annotation (chart notes).

d. Decide which of the defaults for the chart type you want to change.

2. Coding the PG routine and GDDM calls:

a. Place an FSINIT call at the start of your program before any PG routine calls. This is the start of **state-1**.

b. Use the CHHEAD call to specify the heading.

Change the default heading appearance, if you want to, using CHHEAD, CHHATT, and CHSET. It makes programming easier when you keep related calls together, so place them immediately after the call to CHHEAD.

c. Specify the names of your data groups using the CHKEY call.

These data groups are used in the legend, unless you are drawing a pie chart, Venn diagram, or table chart.

Change the legend appearance, if you want to, using CHKEYP, CHKATT, and CHSET. It makes programming easier when you keep related calls together, so place them immediately after the call to CHKEY.

d. If you decided you needed to specify axis labels, enter the text of the labels using the CHXLAB and CHYLAB calls.

Change any aspects of label appearance, if you want to, using CHXLAT, CHXDLB, CHXDAY, CHXMTH, CHXSCL, and CHXSET (or the y-axis equivalents), plus CHLATT, CHSET, and CHZSET. Place them immediately after CHXLAB or CHYLAB if you used either of the calls.

e. Specify the wording for your axis titles in CHXTTL and CHYTTL calls.

Change any aspects of axis title appearance, if you want to, using CHXSET, and CHXTATT (or the y-axis equivalents), plus CHTATT. Place them immediately after the call to CHXTTL or CHYTTL.

f. Enter any other PG routines if you need to change other layout defaults.

g. Plot your data with one of the plotting calls:

CHPLOT Line graphs and scatter plots

CHSURF Surface charts

CHHIST Histograms

CHPIE Pie charts

CHBAR, CHBARX Bar charts

CHVENN Venn diagrams

CHPOLR Polar charts

CHTOWR Tower charts

CHDTAB Table charts

h. Add any additional annotation by means of CHNOTE calls, controlling the positioning and any nondefault positioning of the note by calls to CHNOFF and CHNATT.

i. Add a call to CHTERM to free PG-routine storage.

j. Transmit the constructed chart to the terminal or printer by means of an FSFRCE or ASREAD call.

k. Finish with a call to FSTERM to terminate GDDM.

States 1 and 2 and moving between them

Creating the chart using PG routines is a two-state process. This means that your program must define the chart in the following order:

1. Change the PG routine defaults as necessary to determine the appearance of your chart.
2. Plot the data.

If you do not do this, you may try to do something that can only be done in state-1 when you have already entered state-2. This causes an error and may result in the chart not being produced.

The next section describes the restrictions in general terms so that you can foresee actions that may cause problems.

What you can do in state-1

Generally, you can do anything in state-1 except specify chart notes. However, if you issue a plotting routine call (CHPLOT, CHSURF, CHHIST, CHBAR, CHBARX, CHPIE, CHVENN, CHPOLR, CHTOWR, CHDTAB), the state changes to state-2.

What you can do in state-1 only: State 1 is used to set up the items that define the chart. These can be conveniently classified as follows:

Chart layout
Legend
Chart heading
Axes
Grid and datum lines.

Each of these items is defined by defaults that may be changed by parameters or options of the PG routine calls.

With the proviso that the latest invocation of a call statement supersedes the previous one, the order in which the routines are used in state-1 is immaterial.

What you can do in state-2

Generally, in state-2 you can plot data and use the calls that affect the appearance of the plotted data and of notes. You can also specify datum lines but not datum reference lines (see “CHXDTM – X-axis datum line” on page 89 for an explanation of the difference).

Resetting the processing state

After constructing an interim or final version of the chart, you may want to change some items of the chart definition and replot, plot new data with the same or a different format, or create a new chart in another area on the screen. To do this, it is possible to return from state-2 to state-1 using either:

- A call to CHSTRT, which resets all options and parameters to their most recent values set in state-1. This can be used, for example, to modify some of the options or parameters before making a new plotting routine call.
- A call to CHRNIT, which reinitializes all options, parameters, and attributes to their **default** values.

Chapter 4. Presentation graphics and chart routines

This chapter contains the definitive description of the GDDM-PGF call interface. The CHART call is superseded by the calls starting with the letters "CS," and the control block parameter is subject to change from release to release or as a result of maintenance. The "principal errors" lists are neither exhaustive nor guaranteed. Although part of the interface, the messages and their texts are subject to change from release to release or as a result of maintenance.

The section "PL/I declarations" on page 36 lists the sets of PL/I `DECLARE` statements that support the call interface to GDDM-PGF. These files are subject to change and rearrangement as they are dependent on interfaces with other IBM products.

This chapter contains the syntax of all PG routine calls (CHxxxx calls), the CHART call, the CSxxxx calls, and the call to the Vector Symbol Editor, in alphabetic order. The alphabetic listing is preceded by information about invocation and syntax.

Note: In the alphabetic listing, the CHART call should come between CHAREA and CHBAR. But as its logical place is with the CSxxxx calls, you will find it immediately before CSCCRT.

Invocation of PG and chart routines

The PG routines are invoked by using call statements from the application program. The routines exist in two forms, a reentrant form and a nonreentrant form.

The reentrant form differs from the nonreentrant one in that an additional parameter must be supplied. The additional parameter (the first) must be supplied on each call. This parameter is the anchor used to identify all resources (particularly storage) associated with that instance of GDDM.

A third type of interface, intended for system programming uses, is also available.

This chapter describes the nonreentrant interface to the PG routines. The other two forms are similar to the reentrant and system programmer forms of the GDDM Base calls. Both are described fully in the *GDDM Base Application Programming Reference* book.

Syntax conventions

The syntax of the calls shown is for the nonreentrant PL/I or FORTRAN interface, omitting the CALL verb.

Lowercase words in the argument positions in the descriptions of the call statements in this chapter should be replaced by identifiers or expressions that are valid as subroutine arguments in the language being used. All numeric parameters must be fullword items. All counts and length parameters must be binary integers, whereas most other numeric values are single-precision floating-point. Text should be stored as strings of EBCDIC characters.

To assist APL users, the syntax box for each PGF call contains the APL code for that call. A complete list of APL codes in numerical order is provided on page 171. In addition, for users of the system programming interface, each call also contains the PGF request control parameter (RCP) code in hexadecimal and decimal format.

In the parameter descriptions that follow the syntax of a call, the parameters for which you must provide a value are indicated by **(specified by user)**, followed by the type of value. Parameters that receive information from GDDM-PGF are indicated by **(returned by GDDM)**, followed by the type of value.

The single-parameter calls CHSET, CHXSET, CHYSET, and CHZSET can be used to set various PG routine options. For each use, the parameter must consist of either:

- A variable name, that refers to a specific string of **at least** four alphabetic characters.
- A literal string of at least four alphabetic characters. This form is not applicable in COBOL.

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Additional characters may be added to enhance application program readability, but only the first four defining the option are recognized by the PG routines.

In all cases, the **default** option is in uppercase bold.

Data types required for parameters

The parameters used in the calls have the following data types:

Numeric Parameters
All numeric parameters must be fullword integers or single precision (short) floating point numbers.

Integer parameters
Fullword integer parameters should be declared as follows:

```
Assembler  F-constant
COBOL      PICTURE S9(8) COMPUTATIONAL
                         or equivalent
C/370      INT
FORTRAN    INTEGER*4
PL/I       FIXED BINARY(31)
```

Single-precision (short) floating-point parameters
Floating-point parameters should be declared as follows:

```
Assembler  E-constant
COBOL      COMPUTATIONAL-1
C/370      FLOAT
FORTRAN    REAL*4
PL/I       FLOAT DECIMAL(6)
```

Character strings
These must be supplied as the appropriate EBCDIC codes. They should be declared as follows:

```
Assembler  C-constant
COBOL      PICTURE X (n)
C/370      char[n]
FORTRAN    CHARACTER*n    (VS/FORTRAN only),
             string literals, or a numeric
             data array initialized with
             string literals
PL/I       CHARACTER(n)
           /*Note: Must not be VARYING*/
```

Language considerations

This section contains a number of points that apply to some of the languages supported by GDDM.

COBOL format

The call format for COBOL is as follows:

CALL Cxxxxx [USING Parameter-1 [Parameter-2] ...]

Assembler language linkage

In assembler language, linkage is accomplished according to normal OS conventions:

1. Register 1 points to an address list containing the addresses of the parameters. The high-order bit must be **on** in the last address word. If there are no parameters to be passed, Register 1 should contain the value 0, or should point to a fullword of value 0 with the high-order bit **on**.
2. Register 13 points to a register save area of at least 72 bytes (18 fullwords) in size.
3. Register 14 points to the return address in the application program.
4. On entry, Register 15 points to the entry point of module Cxxxxx. On return from a call to PGF, the top half of Register 15 contains the error severity code; the bottom half contains the error number.
5. A branch to Cxxxxx is performed.

PL/I and C/370 declarations

In application programs using PL/I or C/370, it is necessary to declare as an external entry each GDDM and PGF function that is used. This can be done either explicitly or by including one of the sets of predefined declarations that is supplied with the program.

For a call using the nonreentrant interface, the PL/I declarations take the form:

```
DECLARE CHNUM EXTERNAL ENTRY(FIXED BINARY(31))
              OPTIONS(ASM,INTER);
```

A number of sets of PL/I and C/370 entry declarations for GDDM and PGF functions are provided on the installation tapes. Each set is a library member that contains declarations for all the entry points beginning with a particular letter, in either the nonreentrant or reentrant form. The member names have the form ADMUPIxy (for PL/I) and ADMUCIxy (for C/370). The letter **y** is the first letter of all the entry points in the member. The letter **x** has the value **N** for the nonreentrant entry declarations, and **R** for the reentrant declarations.

The PGF entry points begin with the letter **C** or **V**, so all the nonreentrant PGF entry declarations are contained in members ADMUPINC and ADMUPINV (for PL/I) and ADMUCINC and ADMUCINV (for C/370). In addition to the PGF entry points, your programs also use some GDDM Base calls, such as FSINIT, ASREAD, and FSTERM. A typical set of inclusions for PL/I would therefore be:

```
%INCLUDE SYSLIB(ADMUPINC);
%INCLUDE SYSLIB(ADMUPINF);
%INCLUDE SYSLIB(ADMUPINA);
```

These members contain **sample** declarations for the GDDM and PGF functions. They have parameter descriptions that match exactly the parameter specifications in the descriptions of the call statements. These declarations allow the PL/I compiler to check that the parameters have been correctly declared and, if necessary, permit automatic conversion by way of dummy parameters.

You can modify the parameter descriptors in the sample declarations to permit more flexibility, but you must be aware that checking or conversion may not occur if this is done.

For compatibility with GDDM Version 1, Release 2, two further PL/I members are provided. Each contains entry declarations for all the GDDM Base and PGF functions available in Version 1, Release 2. They do not contain declarations for the functions introduced subsequently. The member names are ADMUPLNO, for the nonreentrant declarations, and ADMUPLRO for the reentrant ones.

Possible rounding errors: The PG routines use short floating-point numbers to hold all values associated with the chart data. If the data has an unusually high number of significant figures, rounding errors may occur in the rightmost digit position. This is most likely to show itself in the total values specified on stacked bar charts. When repeated operations on numbers with a high number of significant digits occur, cumulative rounding errors are possible.

VS/FORTRAN character strings

Versions of the VS/FORTRAN compiler prior to Release 1.3 cause extra parameters to be generated for character items in CALL statements when the **LANGLVL(77)** compiler option is in effect. GDDM and PGF do not accept these extra parameters. To prevent the extra parameters being generated, the **SC** compiler option must be specified. The current release does not generate the extra parameters, and so the SC compiler option is not required.

APL

GDDM-PGF supports VS APL under CICS, TSO, and VM/CMS. Refer to the appropriate VS APL Terminal User's Guide for the subsystem being used for details of the VS APL interface to GDDM.

In addition, APL2 is supported under TSO and VM/CMS. The *APL2 Programming: System Services Reference* manual, SH20-9218 describes AP 126 (the GDDM Auxiliary Processor).

IBM BASIC

A call interface to GDDM-PGF is provided by IBM BASIC under TSO and VM/CMS. See the *IBM BASIC Application Programming Language Reference* manual, GC26-4026.

For IBM BASIC, the first argument to the CALL GDDM command is the RCP code; for example:

```
100  CHXTIC=269092357
110  CALL GDDM (CHXTIC,27.8,38.2)
```

The second and subsequent arguments are as described for each GDDM and PGF call.

Alphabetic list of presentation graphics routines

This section starts on the next page. It lists and describes the Presentation Graphics Routines in alphabetic order.

CHAATT

Function: To establish axis line attributes.

CHAATT (count, array)

APL code	735
PGF RCP code	X'10020701' (268568321)

Parameters

count *(specified by user) (fullword integer)*
Fullword integer specifying the number of elements in **array**. If more than 15 elements are specified, the excess elements are ignored. If less than 15, the remainder are unchanged from their previous setting. If zero is specified, all defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of fullword integers specifying the attributes for the axes. The first set of three attributes is for the primary x axis, the second set is for the primary y axis, the third set is for the secondary x axis, and the fourth set is for the secondary y axis. In the case of a tower chart, the fifth set is for the z axis.

For valid values of color and line type, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

Valid values for line width are:

-1 leave unchanged
0 default (normal)
1 normal
2 double

Description

Overrides or reestablishes the default attributes to be used for each axis line and the associated major and minor scale marks.

The **defaults** are:

color	green (displays), black (printers)
line type	solid
line width	normal

Valid only in State 1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0518 E INVALID LINE TYPE VALUE
ADM0519 E INVALID LINE WIDTH VALUE
```

CHAREA

Function: To define the chart area.

CHAREA (x1, x2, y1, y2)

APL code	721
PGF RCP code	X'10020A02' (268569090)

Parameters

x1 *(specified by user) (short floating point)*
A short floating-point number that specifies the left-hand bounds of the chart area in picture-space units.

x2 *(specified by user) (short floating point)*
A short floating-point number that specifies the right-hand bounds of the chart area in picture-space units.

y1 *(specified by user) (short floating point)*
A short floating-point number that specifies the lower bounds of the chart area in picture-space units.

y2 *(specified by user) (short floating point)*
A short floating-point number that specifies the upper bounds of the chart area in picture-space units.

Description

Overrides the default area to be used for the chart. You might want to override the default area because:

- You want to draw two charts in different areas of the screen
- You want the chart area to have specific fixed proportions, regardless of the screen or printed page size.

By default, the whole of the screen (or printed page) is used to display the chart. If this is not your intention, you can specify a graphics field and optionally a picture space within the graphics field (see GSFLD and GSPS described in the *GDDM Base Application Programming Reference* book).

Whether the graphics field and picture space have been explicitly defined or not, the chart area is specified in terms of the picture space. A call to the GDDM function GSQPS must be used to obtain the defined or defaulted picture-space dimensions. The parameters to CHAREA are then given as fractions of these values.

CHSET('CBOX') can be used to draw a frame round the chart area. CHSET('CBACK') can be used to shade in the background.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0507 E CONFLICTING PARAMETERS
```

CHBAR

Function: To plot a bar chart.

CHBAR	**(components, count, y-values)**
APL code	795
PGF RCP code	X'100D0A01' (269289985)

Parameters

components *(specified by user) (fullword integer)*
An integer specifying the number of data groups (types of bar) to be created. The bar for each data group has new attributes as indicated by the appropriate chart-attribute tables.

count *(specified by user) (fullword integer)*
An integer specifying the number of points on the x axis at which bars are placed. This is the number of bars in each component (data group). All components must have the same number of bars.

y-values *(specified by user) (array of short floating-point numbers)*
An array of short floating-point numbers specifying the y values, which govern the lengths of the bars. For multiple components, the values must be stored sequentially by component; that is, all values for the first component, followed by all values for the second component (and so on, for as many components as are specified). No array of x values is necessary.

Description

Plots one or more bar-chart components on the currently selected axes. The type of bar chart constructed is that specified by the current chart-type setting of CHSET ('MBAR'|'CBAR'|'FBAR'). The possible choices are multiple, composite (stacked), or floating bar charts. The shading is determined by the CHSET shading option.

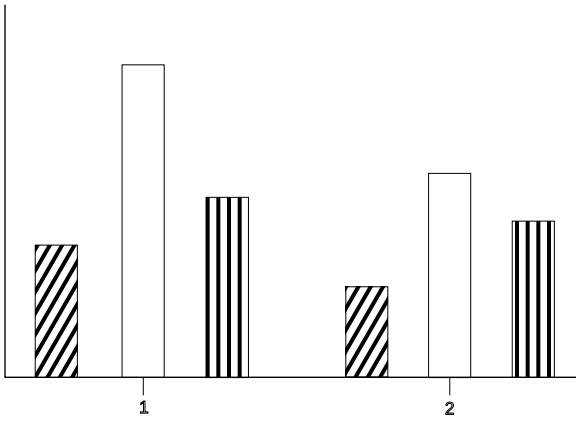
The bars or bar groups are centered on the values 1, 2, 3 (and so on). If autoranging applies, the x-axis range is constructed to run from 0.5 to (count + 0.5).

A CHSET('CVALUES') call can be issued to control whether bar values are to be placed inside or at the end of each bar. In addition (for compatibility with previous releases), a CHSET('VALUES') call may be specified to show the data value at the end of each bar (in a multiple bar chart), or to annotate the last component plotted (in composite (stacked) and floating bar charts).

Refer to “CHSET – Specify chart options” on page 68 for the full details of these options.

Valid in state-1 or state-2. If entered in state-1, the program enters state-2.

Example



This bar chart has three components (differently shaded bar types) each with two bars (two positions on the x axis, labeled 1 and 2). The call to plot this would therefore be: `CALL CHBAR(3,2,array);`

The MBAR option of CHSET was in use for the example.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0510 W LEGEND FORMAT MAY BE INCORRECT
ADM0511 W NOT ENOUGH ROOM TO DRAW ALL KEYS.
          ONE OR MORE WERE OMITTED
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0526 S LOGARITHMIC X OR Y AXIS RANGE
          CONTAINS A NON-POSITIVE VALUE
ADM0527 E NON-POSITIVE INTERCEPT ON
          LOGARITHMIC X OR Y AXIS
ADM0528 E X, Y, OR Z AXIS TICK INTERVAL TOO
          SMALL
ADM0529 W MAXIMUM OVERLAP EXCEEDED FOR A BAR
          CHART
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0533 E CHART COMPONENT COUNT EXCEEDED
ADM0534 W DATA LIES OUTSIDE THE X, Y, OR Z
          AXIS RANGE AND HAS NOT BEEN PLOTTED
ADM0536 W THE X AXIS CANNOT BE LOGARITHMIC
          FOR A BAR CHART CREATED WITH CHBAR
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0545 E THE X, Y, OR Z AXIS HAS AN INVALID
          POWER OF 10 FOR TICK DEFINITION
ADM0546 E THE X, Y, OR Z AXIS RANGE EXCEEDS
          NUMERIC BOUNDS
ADM0547 E BARS ARE TOO NARROW FOR HARDWARE
          CHARACTER MODE VALUES
ADM0557 W AXIS TITLE TRUNCATED ON RIGHT OF
          CHART
ADM0558 W AXIS TITLE TRUNCATED AT TOP OR
          BOTTOM OF CHART
ADM0560 E LOGARITHMIC X, Y, OR Z AXIS RANGE
          IS TOO SMALL
```

CHBARX

Function: To plot a bar chart with numeric x-axis values.

CHBARX	**(components, count, x-values, y-values)**
APL code	782
PGF RCP code	X'100D0A07' (269289991)

Parameters

components *(specified by user) (fullword integer)*
A fullword integer specifying the number of components to be drawn, that is, the number of individual bars. Each component has a new set of attributes.

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of data values in each bar group.

x-values *(specified by user) (array of short floating-point numbers)*
An array of short floating-point numbers specifying the x values. Each chart uses the same set of values. For example, if **count**=5, five values must be supplied.

y-values *(specified by user) (array of short floating-point numbers)*
An array of short floating-point numbers specifying the y values. One value must be supplied for each bar to be drawn. For multiple components, the values must be stored sequentially by component; that is, all values for the first component, followed by all values for the second component, and so on for as many components as are specified. Each component must contain **count** values.

Description

Plots one or more bar-chart components on the currently selected axes, using a numeric x axis. Each successive group of bars is centered on successive x values (which are defined in the x-values parameter), rather than on arbitrary 1, 2, 3, ... values. (Note that the CHBAR call (see "CHBAR – Plot a bar chart" on page 29) produces a logical, rather than numeric, x axis, and so gives these arbitrary x values.)

The width of each bar depends on the minimum interval between any two successive x values (as specified in the x-values parameter). If autoscaling is in effect, the x axis is extended to include all bars.

You can make multiple CHBARX calls in the same way as for the CHBAR call. Each one of these calls uses the x values supplied with the CHBARX calls. Therefore, the layout of the chart is changed if you change x values between successive calls.

Valid in state-1 or state-2.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0510 W LEGEND FORMAT MAY BE INCORRECT
ADM0511 W NOT ENOUGH ROOM TO DRAW ALL KEYS.
          ONE OR MORE WERE OMITTED
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0526 S LOGARITHMIC X OR Y AXIS RANGE
          CONTAINS A NON-POSITIVE VALUE
ADM0527 E NON-POSITIVE INTERCEPT ON
          LOGARITHMIC X OR Y AXIS
ADM0528 E X, Y, OR Z AXIS TICK INTERVAL TOO
          SMALL
ADM0529 W MAXIMUM OVERLAP EXCEEDED FOR A BAR
          CHART
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0534 W DATA LIES OUTSIDE THE X, Y, OR Z
          AXIS RANGE AND HAS NOT BEEN PLOTTED
ADM0535 E ZERO OR NEGATIVE DATA IS INVALID ON
          A LOGARITHMIC AXIS
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0545 E THE X, Y, OR Z AXIS HAS AN INVALID
          POWER OF 10 FOR TICK DEFINITION
ADM0546 E THE X, Y, OR Z AXIS RANGE EXCEEDS
          NUMERIC BOUNDS
ADM0557 W AXIS TITLE TRUNCATED ON RIGHT OF
          CHART
```

```
ADM0558 W AXIS TITLE TRUNCATED AT TOP OR
          BOTTOM OF CHART
ADM0560 E LOGARITHMIC X, Y, OR Z AXIS RANGE
          IS TOO SMALL
```

CHBATT

Function: To set framing box attributes.

CHBATT (count, array)	
APL code	722
PGF RCP code	X'100B0A03' (269158915)

Parameters

count *(specified by user) (fullword integer)*
Fullword integer specifying the number of elements in **array**. If more than three elements are supplied, the excess elements are ignored. If fewer than three are supplied, the remainder are unchanged from their previous setting. If count is set to zero, the defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of fullword integers giving the attributes:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Line type

   For valid values of line type, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

3. Line width

   Valid values are:

   0 normal (default)
   1 normal
   2 double width

Description

Overrides or resets the default attributes for the chart area background or the chart area frame box, if these are used. The chart area background is only produced if CHSET('CBACK') is used. A chart area framing box is only produced if CHSET('CBOX') is used. By default, neither a background nor a box is produced.

The **defaults** are:

color	7	neutral
line type	0	solid
line width	0	normal

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0518 E INVALID LINE TYPE VALUE
ADM0519 E INVALID LINE WIDTH VALUE
```

CHCGRD

Function: To set the basic character spacing/size.

CHCGRD (n, m)	
APL code	723
PGF RCP code	X'10020615' (268568085)

Parameters

n *(specified by user) (fullword integer)*
A fullword integer, giving the number of character columns across the width of the chart, which determines the basic character width and the size of the vertical margins. If zero is specified, the default basic character width is used (see below).

m *(specified by user) (fullword integer)*
A fullword integer, giving the number of character rows in the height of the chart, which determines the basic character height and the size of the horizontal margins. If zero is specified, the default basic character height is used (see below).

Description

Specifies the basic character size of all text constructed by the PG routines (for example, axis labels, keys, chart heading, chart notes). The basic character size is the fundamental measurement in chart layout. To obtain the actual text character size, the basic character size is multiplied by the character multiplier specified in the text attributes associated with each type of text.

The default basic character size is that of the current hardware characters of the primary device at the time of transition from state-1 to state-2, reduced if the chart area does not fill the picture space (see below).

If CHCGRD is used, it should be used with care. Normally, the defaults should be used. CHCGRD governs:

- Horizontal and vertical spacing of mode 2 characters.
- Horizontal and vertical size of mode 3 (vector) characters. That is the basic size upon which any multipliers will work.
- The size of the horizontal and vertical margins, and therefore the size of the plotting area.

The basic character size is specified in terms of a character grid. The parameters specify the number of characters (**n**) to be accommodated across the width, and (**m**) the number of character rows to be accommodated within the height of the chart area.

The default values correspond to the current hardware character size of the primary device at the time of transition from state-1 to state-2 (for example, n=80, m=32). If a CHAREA call is issued, this default value is reduced in proportion to the ratio of the chart-area dimensions to the picture-space dimensions (horizontal and vertical).

The physical width and height of the chart margins are affected when **n**, **m**, or both, differ from the default values. For example, if the default value of **n** is 80 but **n** is set to 60, the 10-character default width of the vertical margins is physically 4/3 as wide as the default value, and the physical width of the plotting area is correspondingly reduced.

When mode 2 characters are used, their size must be considered when specifying **n** and **m**. Character overlap occurs if the character size is too large to fit the specified character into the space available.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

CHCOL

Function: To set the component basic color table.

CHCOL (count, colors)	
APL code	761
PGF RCP code	X'10020303' (268567299)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of attribute values to be taken from the **colors** array and used as the basic color-attribute table. If zero, the default table is used. The maximum number of values that can be specified is 32.

colors *(specified by user) (an array of fullword integers)*
An array of fullword integers indicating the color codes that are used consecutively for components.

For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

Note: If a multicolored shading pattern or marker symbol is to be used (see "CHPAT – Component shading pattern table" on page 60 and "CHMARK – Component marker table" on page 53), the corresponding color must be set to neutral.

Description

Overrides the default table of basic color-attribute values used for shading patterns and marker symbols used in representing data. Colors are taken from this table in sequence to construct each data component, pie slice, or Venn diagram circle. The colors in this table may also be used for lines and outlines, depending on the use of the CHLC call (see "CHLC – Component line color table" on page 51).

The **default** basic color-attribute table is as follows:

Valid only in State 1.

Example

If the first two data components (for example, the bars in a bar chart) are to be green and the third is to be red, enter the following:

```
DCL COLARRAY FIXED BIN(31) INIT(4,4,2);
CALL CHCOL (3,COLARRAY);
```

In this example, 3 is the number of attribute values, 4 means green, and 2 means red.

The color of the outlines of the data components are controlled by the CHLC call.

Note: The table is used cyclically and therefore, in this case, the fourth component (if any) would be green.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
```

CHCONV

Function: To convert coordinate values.

CHCONV (h-type, h-old, h-new, v-type, v-old, v-new, pos-flag)	
APL code	719
PGF RCP code	X'10170100' (269943040)

Parameters

h-type *(specified by user) (fullword integer)*
Identifies the type of conversion required. The values that can be specified are:

- **0** Do not perform any conversion.
- **1** Convert from axis units to character-grid units.
- **2** Convert from character-grid units to axis units.

Specifying 0 performs no action; 0 can be specified when the caller has only one coordinate to be converted (for example, because a note has one coordinate in axis units and one in character-grid units). The **h-type** and **v-type** parameters cannot both be 0; neither of them can be 0 for polar charts.

h-old *(specified by user) (short floating point)*
Specifies the values to be converted. The units in which this and the **v-old** parameter are expressed are indicated by the **h-type** and **v-type** parameters. The point whose coordinates are given by (**h-old,v-old**) need not correspond to a point that is inside the plotting area or on the display; the coordinate system (whether character-grid units or axis units) extends as far as is necessary beyond the edges of the display.

h-new *(returned by GDDM) (short floating point)*
Returns the converted value. The units in which this and the **v-new** parameter are expressed are indicated by the **h-type** and **v-type** parameters.

v-type *(specified by user) (fullword integer)*
See the description of the **h-type** parameter.

v-old *(specified by user) (short floating point)*
See the description of the **h-old** parameter.

v-new *(returned by GDDM) (short floating point)*
See the description of the **h-new** parameter.

pos-flag *(returned by GDDM) (fullword integer)*
Indicates whether the coordinates that have been converted correspond to a point that is inside or outside the plotting area. The values that can be returned are:

0 The point is inside the plotting area.
1 The point is outside the plotting area.

If either **h-type** or **v-type** is 0, the entity indicated by the **pos-flag** parameter is a line rather than a point.

Description

Converts coordinates from axis units to character-grid units, or from character-grid units to axis units. The coordinates refer to the currently selected horizontal and vertical axes, and not to the x and y axes (which the user might have changed). CHCONV cannot be used for pie charts, tower charts, or Venn diagrams.

Valid in state-2 only.

Principal errors

```
ADM0503 E THIS FUNCTION CAN ONLY BE INVOKED
          IN THE CHART-DRAWING STATE
```

CHDATT

Function: To set datum line attributes.

CHDATT (count, array)	
APL code	757
PGF RCP code	X'100B0A01' (269158913)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of elements in **array**. If more than three elements are supplied, the excess elements are ignored. If fewer than three, the remainder are unchanged from their previous setting. If **count** is set to zero, all defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of fullword integers giving the attributes:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Line type

   For valid values of line type, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

3. Line width

   Valid values are:

   0 normal (default)
   1 normal width
   2 double width

Description

Overrides the default attributes used in drawing datum lines.

The **defaults** are:

color	0	green (displays), black (printers)
line type	0	solid
line width	0	normal

Valid in state-1 or state-2.

Principal errors

```
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0518 E INVALID LINE TYPE VALUE
ADM0519 E INVALID LINE WIDTH VALUE
```

CHDCTL

Function: To control the format of values, and the overall size of table charts.

CHDCTL (count, list)	
APL code	805
PGF RCP code	X'10150201' (269812225)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of items in the **list** array. The value must be in the range 0 through 5. If 0 is specified, default values are used for all the options.

list *(specified by user) (an array of fullword integers)*
Controls the options for the table chart. If the list does not contain a value, the corresponding option is not changed. The options are:

x spacing control: Defines the number of x slices between successive spaces or grids on the table chart. The choice between a grid line and a space is given by CHXSET.

A value of 0 indicates that no special spacing is to occur, the x slices will be adjacent. A value of 1 indicates that there is a space after each x slice. A value of 2 gives a space after every other x slice.

Default value is 0, no special spacing.

z spacing control: Defines the number of components (data groups) between successive spaces or grids on the table chart. The choice between a grid line and a space is given by CHZSET.

A value of 0 indicates that no special spacing is to occur, the components will be adjacent. A value of 1 indicates that there is a space after each component. A value of 2 gives a space after every other component.

Default value is 1, space after each component.

x space multiplier: Defines a percentage multiplier that is applied to the gap between x items.

Default value is 100, half a character margin around the text.

The value supplied must be between 0 and 9999.

z space multiplier: Defines a percentage multiplier that is applied to the gap between z items.

Default value is 100, half a character margin around the text.

The value supplied must be between 0 and 9999.

Overall size multiplier: Defines a percentage multiplier that is applied to the size of the table.

Default value is 100, no special scale factor is applied to the table.

The value supplied must be between 0 and 9999.

Description

Controls the format of values on a table chart. It also controls the overall size of the chart.

Valid only in state-1.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHDRAX

Function: To specify control of axis drawing.

CHDRAX	
APL Code	790
PGF RCP code	X'10140100' (269746432)

Parameters

None

Description

Specifies that the axis lines, scale marks, labels, and associated grid and/or datum reference lines are to be constructed immediately, as described below. The call does not apply to axis titles. Note that CHSET ('NDRAW') should normally be used together with CHDRAX.

A CHTOWR call (to plot a tower chart) must not be followed by a CHDRAX call.

Valid **only** when in **state-2**, after the currently selected axes have been defined by a previous call to a plotting routine.

Principal errors

```
ADM0503 E THIS FUNCTION CAN ONLY BE INVOKED
          IN THE CHART-DRAWING STATE
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0530 E A SELECTED AXIS HAS NOT BEEN
          GENERATED
ADM0566 E CHDRAX NOT ALLOWED WITH CURRENT
          CHART TYPE
```

CHDTAB

Function: To construct a table chart.

CHDTAB (z-count, x-count, z-list, x-list, data-array)	
APL code	806
PGF RCP code	X'100D0A0B' (269289995)

Parameters

z-count *(specified by user) (fullword integer)*
Specifies the number of data groups (components) to be shown along the z axis.

x-count *(specified by user) (fullword integer)*
Specifies the number of data values to be shown along the x axis (that is, the number of values in each data group). All the data groups must have the same number of values.

z-list *(specified by user) (array of short floating-point numbers)*
The list of z values to be used along the z axis.

x-list *(specified by user) (array of short floating-point numbers)*
The list of x values to be used along the x axis.

data-array *(specified by user) (array of short floating-point numbers)*
An array that contains the data values to be shown in the table. The number of values to be displayed corresponds to the number specified in the **z-count** parameter multiplied by the number in the **x-count** parameter. For example, if the **data-array** contained 20 values, **x-count** was 5, and **z-count** was 3, then only 15 values would be displayed.

Description

Constructs a table chart. The horizontal dimension of the standard table chart is considered to be a z axis, and the vertical dimension an x axis. The data shown in the cells of the table is the y data.

The x and z axes of the standard table chart are treated similarly. They both have the option (controlled by CHXSET and CHZSET) to put a set of labels around the edge of the table. The x labels go down the left edge of the table and the z labels go across the top of the table. The labels can be:

Numeric values supplied on the CHDTAB call.

The data labels supplied by the CHXDLB and CHZDLB calls.

For the x axis only they may also be:

Labels supplied by the CHXLAB call.
Month or day labels as specified by the CHXDAY or CHXMTH calls.

The outer edges of the chart are at the current margins. No legends are allowed with this chart as it already shows all the information that a legend would contain.

Valid only in state-1.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0534 W DATA LIES OUTSIDE THE X, Y, OR Z
          AXIS RANGE AND HAS NOT BEEN PLOTTED
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0546 E THE X, Y, OR Z AXIS RANGE EXCEEDS
          NUMERIC BOUNDS
ADM0566 E CHDRAX NOT ALLOWED WITH CURRENT
          CHART TYPE
ADM0587 W CHART IS TOO WIDE. n COLUMN(S)
          MISSING
ADM0588 W CHART IS TOO LONG. n ROW(S) MISSING
```

CHFINE

Function: To specify curve fitting smoothness.

CHFINE (smoothness)	
APL code	799
PGF RCP code	X'1002061A' (268568090)

Parameters

smoothness *(specified by user) (fullword integer)*
A fullword binary integer in the range 0 through 1000 specifying the number of straight lines to be constructed between each consecutive pair of data points to form the appearance of a smooth curve.

The default value, which applies if no CHFINE call is issued or if CHFINE(0) is issued, is 10.

Description

Overrides or resets the default smoothness of the curves used to connect consecutive data points in each component of a line graph or surface chart.

CHFINE has no effect unless CHSET('CURVE') is explicitly specified and CHPLOT, CHPOLR, or CHSURF is issued. It also has no effect on a CHPLOT or CHPOLR call for which CHSET('NOLINES') is specified (that is, a scatter plot).

The smooth curve joining consecutive pairs of data points is constructed by interpolating a number of straight lines between each pair of data points. As the number of such interpolated lines increases so the resulting curve appears smoother. On higher-resolution devices, a larger number of interpolated lines are required to give a smooth appearance. CHFINE may be used to control the apparent smoothness by specifying the number of interpolated lines. The **default** number of interpolated lines is 10. A large number of interpolated lines can significantly increase plotting time.

Valid in state-1 or state-2.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHGAP

Function: To specify spacing between bars.

CHGAP (gap-to-bar-ratio)	
APL code	765
PGF RCP code	X'10020610' (268568080)

Parameters

gap-to-bar-ratio *(specified by user) (short floating point)*
A positive or zero short floating-point value that specifies the ratio of the gap between bars to the bar width. If **gap-to-bar-ratio** is set to zero, bars have common lines that may appear in unexpected colors because of color mixing.

If **gap-to-bar-ratio** is a negative number and CHGAP is used before CHBAR or CHBARX calls, the bars in the chart are positioned so that they partially overlap; that is, a bar is partially hidden behind the previous one. Values close to –1 are not recommended.

If a negative value is used before a CHTOWR call (for a tower chart), a value of zero is used. (The user-defined value remains unchanged.) The CHZGAP call allows you to specify the gap in the z-axis direction. Refer to “CHZGAP – Spacing between towers” on page 112 for details of this call.

The total length of the axis must accommodate all bars and gaps. As this parameter is increased, the actual bar width decreases. It is therefore possible to produce bars that appear as single lines.

Description

Overrides the default ratio of the gap between adjacent bars to the bar width (in bar charts) or adjacent towers to the tower width (in tower charts). See Figure 14 on page 41 and compare CHGGAP.

The **default** ratio is half the bar width (0.5).

Valid in state-1 or state-2.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

CHGATT

Function: To set grid line attributes.

CHGATT (count, array)	
APL code	754
PGF RCP code	X'10020702' (268568322)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of elements in **array**. If more than 15 elements are specified, the excess elements are ignored. If less than 15, the remainder are unchanged from their previous setting. If zero is specified, all defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of fullword integers specifying the attributes for the grid lines.

The first set of three attributes applies to the primary x-axis grid lines, the second set applies to the primary x-axis grid lines, and the third and fourth sets apply to the secondary x-axis and y-axis grid lines. For tower charts and table charts, the fifth set applies to the z axis.

The three elements of each set are:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Line type

   For valid values of line type, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

3. Line width

   Valid values are:

   -1 leave unchanged
   0 normal (default)
   1 normal width
   2 double width

Description

Overrides or reestablishes the default attributes used in drawing grid lines.

The **defaults** are:

color	0	green (displays), black (printers)
line type	0	solid
line width	0	normal

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0518 E INVALID LINE TYPE VALUE
ADM0519 E INVALID LINE WIDTH VALUE
```

CHGGAP

Function: To specify spacing between bar groups.

CHGGAP (group-gap-to-bar-ratio)

APL code	766
PGF RCP code	X'10020611' (268568081)

Parameters

group-gap-to-bar-ratio *(specified by user) (short floating point)*
A positive or zero short floating-point value that specifies the ratio of the gap between bar groups to the width of a single bar.

The total length of the axis must accommodate all bars and gaps. As this parameter is increased, the actual bar width decreases. It is therefore possible to produce bars that appear as single lines.

Description

For **multiple** bar charts with more than one component, CHGGAP overrides the default ratio of the gap between bar groups to the width of a single bar.

The **default** ratio is twice the bar width (2.0).

Valid in state-1 or state-2.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

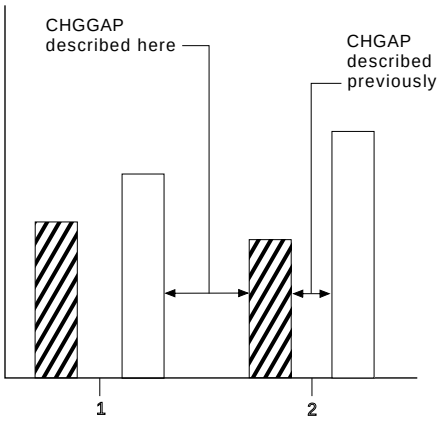


Figure 14. Specify gaps between bars with CHGAP and CHGGAP

CHHATT

Function: To set heading text attributes.

CHHATT (count, array)	
APL code	729
PGF RCP code	X'10020901' (268568833)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of elements in **array**. If more than five elements are specified, the excess elements are ignored. If fewer than five, the remainder are unchanged from their previous setting. If zero is specified, all five defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of, at most, five fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set
   n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the basic size, which is that of the hardware characters unless overridden by CHCGRD. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

Description

Overrides or reestablishes the default character-appearance attributes used in displaying the chart heading.

The **defaults** are:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHHEAD

Function: To specify heading text.

CHHEAD (length, text)

APL code	730
PGF RCP code	X'10020202' (268567042)

Parameters

length *(specified by user) (fullword integer)*
A fullword integer giving the length in bytes of the EBCDIC character string supplied. The heading length cannot exceed 132 characters. Specifying **length** as zero suppresses the heading.

text *(specified by user) (character)*
A character string, of the length given in **length**, containing the text string to be used as a heading.

The text string may be formatted as a number of separate physical lines of heading on the chart by the use of the semicolon character (;) as a control character, indicating new line. The text string is scanned from left to right and, whenever a semicolon control character is found, a new line of heading is started. The control character itself is not displayed. The lines of heading are constructed in sequence, each line immediately under the preceding line. Each line is subject to separate justification.

If a semicolon character is required in the heading, two consecutive semicolons should be entered. In this case, no new line action is taken, and the two consecutive semicolons cause a single semicolon character to appear in the heading.

Description

Specifies the chart-heading text. CHSET options are available to control its occurrence, position, and justification. Its attributes are controlled by CHHATT.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
```

CHHIST

Function: To plot histograms.

CHHIST	**(components, count, range1, range2, y-values)**
APL code	793
PGF RCP code	X'100D0A02' (269289986)

Parameters

components *(specified by user) (fullword integer)*
Specifies the number of sets of histogram bars to be drawn on the current axes.

count *(specified by user) (fullword integer)*
Specifies the number of ranges (bars) for each component. For example, if you want to plot the distribution of test scores (from 0–100) in increments of five, you would specify a count of 20.

range1 *(specified by user) (array of short floating-point numbers)*
Contains the number of elements specified in the **count** parameter. Each value represents the start of a range. Using the previous example, **range1** contains the following twenty elements: 0, 5, 10, 15, 20, . . . , 90, 95.

range2 *(specified by user) (array of short floating-point numbers)*
Each value in this array gives the end of the range whose start is given by the corresponding element of the **range1** parameter. If **range2** contains the same values as **range1** or is the same array) the bars appear as vertical lines. Based on the previous example, the array contains the following values: 5, 10, 15, 20, 25, . . . , 95, 100. Note that, in the general case, the successive ranges do not have to be all equal.

y-values *(specified by user) (array of short floating-point numbers)*
Specifies the y values. For multiple components, the values must be stored sequentially by component; that is, all values for the first component, followed by all values for the second component (and so on), for as many components as are specified.

Description

Plots one or more histograms on the currently selected axes.

The histogram is drawn as a set of bars parallel to the x axis. Each bar extends over a range defined by a start value and an end value. The ends of the bars may be connected to the x axis (or datum reference line) by **risers** parallel to the y axis (see the CHSET option RISERS). The shading method is determined by the CHSET shading option. A multicomponent histogram is plotted in a manner similar to a composite (stacked) bar chart.

The color of the bars is controlled by the color table, which can be specified by a call to CHCOL. See Appendix C, “Colors, line types, markers, and shading patterns” on page 209 for further details.

Valid in state-1 or state-2. If entered in state-1, the program enters state-2.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0510 W LEGEND FORMAT MAY BE INCORRECT
ADM0511 W NOT ENOUGH ROOM TO DRAW ALL KEYS.
          ONE OR MORE WERE OMITTED
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0526 S LOGARITHMIC X OR Y AXIS RANGE
          CONTAINS A NON-POSITIVE VALUE
ADM0527 E NON-POSITIVE INTERCEPT ON
          LOGARITHMIC X OR Y AXIS
ADM0528 E X, Y, OR Z AXIS TICK INTERVAL TOO
          SMALL
```

```
ADM0529 W MAXIMUM OVERLAP EXCEEDED FOR A BAR
          CHART
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0534 W DATA LIES OUTSIDE THE X, Y, OR Z
          AXIS RANGE AND HAS NOT BEEN PLOTTED
ADM0535 E ZERO OR NEGATIVE DATA IS INVALID ON
          A LOGARITHMIC AXIS
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0545 E THE X, Y, OR Z AXIS HAS AN INVALID
          POWER OF 10 FOR TICK DEFINITION
ADM0546 E THE X, Y, OR Z AXIS RANGE EXCEEDS
          NUMERIC BOUNDS
ADM0557 W AXIS TITLE TRUNCATED ON RIGHT OF
          CHART
ADM0558 W AXIS TITLE TRUNCATED AT TOP OR
          BOTTOM OF CHART
ADM0560 E LOGARITHMIC X, Y, OR Z AXIS RANGE
          IS TOO SMALL
```

CHHMAR

Function: To set horizontal margins.

CHHMAR (botmar, topmar)

APL code	724
PGF RCP code	X'10020612' (268568082)

Parameters

botmar *(specified by user) (fullword integer)*
A fullword integer specifying the number of character rows at the bottom of the plotting area.

topmar *(specified by user) (fullword integer)*
A fullword integer specifying the number of character rows at the top of the plotting area.

Description

Overrides the default margin sizes of the chart, and therefore changes the size of the plotting area also. The margin sizes are specified in terms of character grid rows, where the character grid is that of the device unless explicitly overridden by a call to CHCGRD.

By **default**, the horizontal margins are five character rows above and below the plotting area.

CHHMAR can enlarge the margins to prevent the legend encroaching on the chart-plotting area, or reduce the margins to increase the size of the chart-plotting area.

See also “CHVMAR – Vertical margins” on page 88 for details on vertical margins.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

CHKATT

Function: To set legend text attributes.

CHKATT (count, array)	
APL code	727
PGF RCP code	X'10020905' (268568837)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of elements in **array**. If more than five elements are specified, the excess elements are ignored. If fewer than five, the remainder are unchanged from their previous setting. If zero is specified, all five defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of at most five fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set
   n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the basic size set by CHCGRD. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

Description

Overrides or reestablishes the default character appearance attributes used in displaying legend key labels, spider labels on pie charts, and Venn diagram labels. See CHSET('SPISLICE') for a description of the applicability of CHKATT to spider labels in pie charts.

The **defaults** are:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in text size as defined by CHCGRD (by default, the size of the hardware characters)

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHKEY

Function: To set legend key labels.

CHKEY (count, length, labels)	
APL code	726
PGF RCP code	X'10020201' (268567041)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of labels supplied in **labels**. Count = 0 deletes labels defined by a previous CHKEY call.

length *(specified by user) (fullword integer)*
A fullword integer specifying the number of characters in each label supplied in **labels**. All labels supplied have the same length. The effect of varying length labels may be produced by padding each label with null (X'00') characters. All such trailing nulls are ignored when the legend is constructed.

If a label consists entirely of null characters, the associated legend key label or Venn diagram label is not constructed. For pie slice labels, the slice label and associated spider line connecting it to the pie slice are not constructed unless CHSET('VALUES') is specified when the value and associated connecting line are constructed.

labels *(specified by user) (character)*
A string of EBCDIC text, interpreted as a list of labels each of which is **length** characters long. The total length, L, of the text string that is accessed is given, in bytes, by: `L = count*length`

The maximum value of L permitted is approximately 32000.

Semicolon (";") and underscore ("_") characters in each label are interpreted specially when the labels appear in legends. Each semicolon is interpreted as a line break control character, causing a new line to be started, left-justified. Each underscore is interpreted as a request to construct the key symbol at this point (taking up three key label character positions).

If a semicolon character is required to appear as part of the legend key label text, ";;" achieves this effect, with no control-character line-break action. Similarly, if an underscore character is required to appear in the legend key label text, "__" achieves this effect, with no control-character key-symbol-substitution action.

If a legend key label contains **no** underscore control characters, a key symbol followed by a blank character (the whole occupying four character positions) is constructed at the start of the first line of the key label. Any further lines of the key label are indented four character positions to align with the text of the first line. If a legend key label contains one or more underscore control characters, key symbols (each occupying three character positions) are constructed where underscore control characters appear. No indenting of lines occurs.

In slice labels on pie charts, single semicolon characters are interpreted as line-break control characters as described above, and single underscore characters are interpreted as blanks. In Venn diagram labels, both semicolon and underscore single characters are interpreted as blanks. In both pie slice labels and Venn diagram labels, ";; " and "__" appear as ";" and "_" respectively.

The following character codes have a special interpretation:

- X'15' is interpreted as a line-break control character.
- X'1A' is interpreted as a key-symbol-substitution control character.

Description

Specifies legend key labels for data components (on a line graph, surface chart, bar chart, histogram) or for pie chart slices. Also has other interpretations for pie charts and Venn diagrams, as follows:

- For pie charts, the labels specified by CHKEY appear as slice labels around each pie if CHSET('SPIDER') is specified; they appear instead as key labels in a legend only if CHSET('PIEKEY') is specified.
- For Venn diagrams, the labels specified by CHKEY appear as labels connected to the Venn circles and their overlap. Only the first three labels are used. No legend can be specified for a Venn diagram.

In all cases (legend key labels, pie slice labels, and Venn diagram labels), the labels are constructed with the attributes specified by CHKATT, or with the CHKATT default attribute values.

What follows refers to keys in a legend.

On each plotting-routine call, a key is created for each component or pie slice plotted using the supplied labels in sequence. Thus, if more labels are provided than are needed for the number of components or slices plotted, the remaining labels are ignored. If fewer labels are provided than are needed, the number of keys constructed is equal to the number of labels supplied. In all cases, legend base-position justification (see CHKEYP) is based on the assumption that all labels provided are generated. Thus, if all labels are not used, the legend may not be where you expect it.

If a CHKEY call is not issued; a legend is not constructed. Even if a CHKEY call is issued, a legend is constructed only if CHSET('LEGEND') applies. (For pie charts, both CHSET('LEGEND') and CHSET('PIEKEY') must apply.)

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
```

CHKEYP

Function: To set legend base position.

CHKEYP (orientation, margin, justification)	
APL code	728
PGF RCP code	X'10020801' (268568577)

Parameters

orientation *(specified by user) (character)*
A character string of length 1 containing 'V' or 'H'.

'V' specifies a vertical legend (base position in the left- or right-hand margin, adjacent to the left- or right-hand chart-area boundary).

'H' specifies a horizontal legend (base position in the top or bottom margin, adjacent to the top or bottom chart-area boundary).

margin *(specified by user) (character)*
A character string of length 1 containing 'R', 'L', 'T', or 'B'.

'R' and 'L' specify a base position in the right- and left-hand margins, respectively, and are valid only for vertical legends.

'T' and 'B'. specify a base position in the top and bottom margins, respectively, and are valid only for horizontal legends.

justification *(specified by user) (character)*
A character string of length 1 containing 'C', 'R', 'L', 'T', or 'B'.

'C' specifies a base position centered in the margin and is valid for both horizontal and vertical legends.

'R' and 'L' specify right and left justification respectively, and are valid only for horizontal legends. For example 'L' specifies a base position in which each row of the legend is justified to the left-hand boundary of the chart area (within the top or bottom margin).

'T' and 'B' specify top and bottom justification respectively, and are valid only for vertical legends. For example 'T' specifies a base position in which each column of the legend is justified to the top boundary of the chart area (within the left- or right-hand margin).

Description

Overrides the default base position of the legend. The legend offsets (0 by default, see "CHKOFF – Legend offsets" on page 49) are applied to the base position, to obtain the legend final position. The legend base position also affects many aspects of the legend format.

The default base position, that applies when CHKEYP is not called, specifies a vertical legend centered in the right margin.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0554 E INVALID KEY POSITION CODE: c1
ADM0555 E CONFLICTING KEY POSITION CODE: c1
```

CHKMAX

Function: To set maximum legend width/height.

CHKMAX (hmax, vmax)	
APL code	770
PGF RCP code	X'100A0619' (269092377)

Parameters

hmax *(specified by user) (fullword integer)*
Specifies the maximum width of a horizontal legend. The maximum possible number of key entries is constructed in each row of the legend within the maximum width specified (except that the first key entry in each row is always constructed, even if it is wider than the maximum width specified).

When the maximum width would be exceeded by a new entry, a new line is started.

A zero value specifies that the full chart-area width is to be used.

If the value specified results in a maximum legend width greater than the chart-area width, the chart-area width is used as the maximum.

Each line of a key entry begins and ends with a blank character (for spacing). Therefore, the width of a key entry is:

`(2 + number of character positions in longest line of key entry)`

The maximum legend width specified applies to the actual width, and includes these two extra spacing characters for each key entry.

vmax *(specified by user) (fullword integer)*
Specifies the maximum height of a vertical legend. The maximum possible number of key entries is constructed in each column of the legend within the maximum height specified (except that the first key entry in each column is always constructed, even if it is taller than the maximum height specified). When the maximum height would be exceeded by a new entry, a new column is started.

A zero value specifies that the full chart-area height is to be used.

If the value specified results in a maximum legend height greater than the chart-area height, the chart-area height is used as the maximum.

The top line of text in a key entry begins a half-character height below the top of the space occupied by the key entry. Similarly, there is a half-character height between the bottom line of a key entry and the bottom of the space occupied by the key entry. Therefore, the height of a key entry is:

`(1 + number of lines in key entry)`

The maximum legend height specified applies to the actual height, and includes this extra spacing character for each key entry.

Description

Specifies the maximum width of a horizontal legend, or the maximum height of a vertical legend, or both.

Both parameters are fullword binary integers. Their values must be non-negative. The units are the character width and height, which default to the hardware character size unless the defaults are explicitly overridden by CHCGRD (see "CHCGRD – Basic character spacing/size" on page 32).

Zero specifies that the legend height or width is limited by the height or width of the chart area.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

CHKOFF

Function: To set legend offsets.

CHKOFF (hoffset, voffset)	
APL code	771
PGF RCP code	X'100A0618' (269092376)

Parameters

hoffset *(specified by user) (short floating point)*
A short floating-point number specifying the horizontal offset, in character-grid units (which default to the character size of the device unless explicitly overridden by a call to CHCGRD), that is applied to the legend base position. A positive value specifies translation to the right, and a negative value translation to the left.

voffset *(specified by user) (short floating point)*
A short floating-point number specifying the vertical offset, in character-grid units (which default to the character size of the device unless explicitly overridden by a call to CHCGRD), that is applied to the legend base position. A positive value specifies translation upward, and a negative value translation downward.

Description

Specifies the horizontal and vertical offsets, interpreted in character-grid units, which are used to obtain the final legend position from the legend base position.

If no CHKOFF call is issued, no offsets are applied.

When the legend is constructed, it is formatted in the legend base position, then translated across the chart area by the specified horizontal and vertical offsets. If, as a result, any part of the legend lies outside the chart area, the legend is further translated horizontally, or vertically, or both as necessary until it lies just within the nearest chart-area boundaries.

Both parameters are short (fullword) signed floating-point numbers.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
```

CHLATT

Function: To specify axis label text attributes.

CHLATT (count, array)	
APL code	747
PGF RCP code	X'10020903' (268568835)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of elements in **array**. If more than six elements are specified, the excess elements are ignored. If fewer than six, the remainder are unchanged from their previous setting. If zero is specified, all six defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of, at most, six fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set
   n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. For example, if character-size multiplier is 200 and mode 3 characters are being used, they are drawn twice as large as the basic size set by CHCGRD. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

6. Axis-label rotation

   When axis-label rotation is requested, each label is written at the specified angle to the horizontal. Label rotation is indicated by specifying a nonzero value in this element. The value must be between –9000 and +9000. This number is divided by 100 to give a value between –90 and +90, which is the angle, in degrees, to the horizontal at which the labels will be drawn. The default is zero. When positive, the angle is in a counterclockwise direction. When negative, it is in a clockwise direction.

Description

Overrides or reestablishes the default character-appearance attributes used in displaying **all** axis labels, and pie titles (on pie charts) on all the axes. You can use the CHXLAT, CHYLAT, and CHZLAT calls to change the axis-label attributes for the currently selected x, y, or z axis.

By **default**, the attributes are as follows:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters) unless overridden by CHXLAT, CHYLAT, or CHZLAT
Label rotation	0	

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHLC

Function: To specify component line color table.

CHLC	**(count, colors)**
APL code	800
GDDM RCP code	X'10020307' (268567303)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of attribute values to be taken from the **colors** array and used as the line color attribute table. If zero, the default colors are used.

The maximum number of values that can be specified is 32.

colors *(specified by user) (an array of fullword integers)*
An array of fullword integers indicating the color codes used consecutively for components.

For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

Example

If the line in the first two data components (for example, lines on a line graph) is to be green and the third red, enter the following:

```
DCL LCARRAY FIXED BIN(31) INIT(4,4,2);
CALL CHLC (3,LCARRAY);
```

In this example, 3 is the number of attribute values, 4 means green, and 2 means red.

Marker and shading colors are controlled by the CHCOL call.

Note: The table is used cyclically and therefore, in this case, the fourth component (if any) would be green.

Description

Overrides the default table of line color attributes used for data representation lines on, for example, line graphs; for outlines on, for example, bar charts; and for x slices on table charts. Colors are taken from the line color table in sequence to construct each data component, pie slice, or Venn diagram circle.

The default line color attribute table is the basic color attribute table, whether this is specified explicitly in CHCOL or allowed to default.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
```

CHLT

Function: To specify component line type table.

CHLT	**(count, line-types)**
APL code	762
PGF RCP code	X'10020302' (268567298)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of attribute values to be taken from **line** and used as the line type attribute table. If zero, the default table is used. A maximum of 32 values may be specified.

line-types *(specified by user) (an array of fullword integers)*
An array of fullword integers indicating the line types used consecutively for components.

For valid values of line type, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

Description

Overrides or reestablishes the default table of line type attributes. Line type attributes are taken in sequence from the table and are used for each data component, pie slice, or Venn diagram circle.

The **default** table has only one entry:

Index	**Line type**
1	**solid**

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0518 E INVALID LINE TYPE VALUE
```

CHLW

Function: To specify component line width table.

CHLW	**(count, line-widths)**
APL code	772
PGF RCP code	X'10020305' (268567301)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of attribute values to be taken from **line** and used as the line-width attribute table. If zero, the default table is used. A maximum of 32 values can be specified.

line-widths *(specified by user) (array of short floating-point numbers)*
An array of short floating-point numbers indicating the line widths used consecutively for components. Valid values are 0 through 100.

The specified value is a multiplication factor to be applied to the standard line width, shown below. The standard width is multiplied by the specified factor, and then rounded down to an integral number of pels. If the result is less than one pel, a width of one pel is used. If the result is more than the maximum shown below, the maximum is used.

	Line Width in Pels		
	Minimum	**Standard**	**Maximum**
IBM 3270 terminals and printers	1	1	2
IBM 3800 printer	1	3	300
IBM 4250 printer	1	6	600

Description

Overrides or reestablishes the default table of line width attributes. Line width attributes are taken in sequence from the table and used for each data component, pie slice, or Venn diagram circle.

The **default** table has only one entry:

Index	Line width
1	**1.0**

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM1047 E LINE WIDTH MUST BE A NUMBER IN THE
          RANGE n1 THROUGH n2
```

CHMARK

Function: To specify component marker table.

CHMARK (count, markers)

APL code	763
PGF RCP code	X'10020301' (268567297)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of attribute values to be taken from **markers** and used as the marker-attribute table. If zero, the default table is used. A maximum of 32 values may be specified.

markers *(specified by user) (an array of fullword integers)*
An array of fullword integers indicating the marker values used consecutively for components. See Appendix C. Colors, line types, markers, and shading patterns on page 209 for valid values.

Description

Overrides or reestablishes the default table of marker values. Markers from this table are used in sequence to construct each data component.

A **default** attribute table, containing eight markers, is available.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0513 E INVALID PATTERN OR MARKER VALUE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
```

CHMISS

Function: To specify missing values on a table chart.

CHMISS (length, text)

APL code	804
PGF RCP code	X'10150301' (269812481)

Parameters

length *(specified by user) (fullword integer)*
Specifies the number of characters in the **text** string. The value must be in the range 0 through 20. If 0 is specified, default values are used for all the options.

text *(specified by user) (character)*
A character string that will be used for each missing y value. The default string is a null string, which shows a blank space on the resulting chart.

Description

Sets a character string, up to 20 characters long, that is used to show missing values on a table chart.

Any y data element that has the special value corresponding to “missing” will be shown on the table chart using this character string.

Valid only in state-1.

Principal errors

```
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
```

CHMKSC

Function: To set marker scale values.

CHMKSC (count, marker_scales)	
APL code	781
PGF RCP code	X'10030C01' (268635137)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of elements in the **marker_scales** parameter.

marker_scales *(specified by user) (array of short floating-point numbers)*
Specifies the scale factors that are applied to the markers used in the GSMARK call.

Description

Defines the scale factors that are applied to the markers used in the CHMARK call (see “CHMARK – Component marker table” on page 53). The scale factors can be reset by specifying 0 in the **count** parameter.

CHMKSC is used together with the CHMARK call in the following way. If the third element of the scale factor array in CHMKSC is 2.3, the third marker number that is passed in a CHMARK call is scaled by 2.3 times its original size.

Markers can be scaled like other characters on a chart. See CHSET ('MSCALE') for details.

Valid only in state-1.

Principal errors

```
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
```

CHNATT

Function: To specify attributes for notes.

CHNATT (count, array)	
APL code	760
PGF RCP code	X'100B0904' (269158660)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of elements in **array**. If more than six elements are specified, the excess elements are ignored. If fewer than six, the remainder are unchanged from their previous setting. If zero is specified, all six defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of, at most, six fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 the alternative hardware set (valid only on terminals that have this facility)

n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

For mode 2 or mode 3, the identifier denotes:

0 the default character set
n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. (CHCGRD defaults are the size of characters for the device.) For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the hardware characters unless CHCGRD has been used to override the default. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

6. Note rotation

   Note rotation is indicated by specifying a nonzero value in this element. When note rotation is requested, each note is written at the specified angle to the horizontal. The value must be between –36000 and +36000. This number is divided by 100 to give a value between –360 and +360, which is the angle, in degrees, to the horizontal at which the notes are drawn. The default is zero. When positive, the angle is in a counterclockwise direction. When negative, it is in a clockwise direction.

   The rotation occurs when the note is drawn (that is, when CHNOTE is called). The rotation is performed so that the part of the imaginary rectangle surrounding the note (as specified in CHNOTE) remains at the offset specified in CHNOFF.

   When mode-1 characters are specified, any nonzero angle is treated as zero. No error or warning message is issued.

   When mode-2 characters are used, the area that is blanked (if blanking is specified) or the surrounding box (if boxing is specified) may not surround the note but might cut through some of the characters. This is because of the inherent characteristics of mode-2 text.

Description

Overrides or reestablishes the default character attributes used for notes.

The defaults are:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Note rotation	0	

Valid in state-1 or state-2.

Principal errors

```
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
ADM0569 E INVALID ANGLE OF ROTATION
```

CHNOFF

Function: To specify offsets for CHNOTE.

CHNOFF (hoffset, voffset)	
APL code	759
PGF RCP code	X'100B0617' (269157911)

Parameters

hoffset *(specified by user) (short floating point)*
A signed, short floating-point number specifying the horizontal offset applied to the note. Depending on the CHNOTE position code, the offset may be interpreted in two ways:

- As an offset in character-grid units. A positive number specifies movement to the right, and a negative number movement to the left.

  The size of character-grid units defaults to the character size of the device, but can be changed by a CHCGRD call.

- As an offset in scale units of the currently selected horizontal axis. The (positive or negative) number specifies movement from the base position (the axis origin (0)) to the axis position given by the number. (The offset must be positive for a logarithmic axis.)

The **default** value is zero.

voffset *(specified by user) (short floating point)*
A signed, short floating-point number specifying the vertical offset applied to the note base position. Depending on the CHNOTE position code, the offset may be interpreted in two ways:

- As an offset in character grid units. A positive number specifies movement upward, and a negative number movement downward.

  The size of character-grid units defaults to the character size of the device, but can be changed by a CHCGRD call.

- As an offset in scale units of the currently selected vertical axis. The (positive or negative) number specifies movement from the base position (the axis origin (0)) to the axis position given by the number. (The offset must be positive for a logarithmic axis.)

The **default** value is zero.

Description

Specifies the offsets applied to the base position of the note to obtain the note position (see “CHNOTE – Construct a character string at a designated position” on page 56). Applies to all subsequent calls to CHNOTE (until superseded by another CHNOFF call). If CHNOFF is not called, no offset is applied to the note.

Valid in state-1 or state-2.

Principal errors

None

CHNOTE

Function: To construct a character string at a designated position.

CHNOTE (position-code, length, string)	
APL code	758
PGF RCP code	X'10130100' (269680896)

Parameters

position-code *(specified by user) (2-byte character string)*
A two-character code indicating the manner in which the final position of the note is determined in terms of a base position, note position, and relocation relative to the note position. As stated below, position codes may be divided into two classes:

- Class 1 position codes

  This class contains the following 36 position codes: C1, C2, C3, C4, C5, C6, C7, C8, C9, H1, H2, H3, H4, H5, H6, H7, H8, H9, V1, V2, V3, V4, V5, V6, V7, V8, V9, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9.

The first character of each code is interpreted as follows:

C (character) The base position is the bottom left-hand corner of the chart area. Both horizontal and vertical CHNOFF note offsets are interpreted in character grid units from the base position to obtain the note position.

H (character) The horizontal CHNOFF note offset is interpreted in units of the scale of the currently selected horizontal axis from the base position given by the origin (0) on that axis (even when the origin is outside the range of that axis). The vertical CHNOFF note offset is interpreted in character grid units from the base position given by the bottom of the chart area.

V (character) The vertical CHNOFF note offset is interpreted in units of the scale of the currently selected vertical axis from the base position given by the origin (0) on that axis (even when the origin is outside the range of that axis). The horizontal CHNOFF note offset is interpreted in character grid units from the base position given by the left of the chart area.

Z (character) The horizontal CHNOFF note offset is interpreted as for **H** above, and the vertical CHNOFF note offset is interpreted as for **V** above.

The second character of each class 1 position code specifies the relocation that takes place from the note position to obtain the final position of the note. It is a number in the range 1 to 9, which may be thought of as a compass key defining the point of the note that is to be fixed at the note position. The numbers correspond to the corners and mid-points of an imaginary rectangle just surrounding all the characters of the note (the note rectangle), as follows:

```
1       2       3
4       5       6
7       8       9
```

For example, number 1 relocates the note to place its top left corner at the note position, number 7 places the bottom left corner of the note at the note position, number 6 places the mid-point of the right side of the note at the note position, and so on.

Position codes beginning with H, V, or Z are only valid for notes on charts with axes (that is, for all chart types except pie charts and Venn diagrams). Further, for these position codes, any axis used for interpretation of note offsets must be defined when the CHNOTE call is issued. Finally, for these position codes, if an axis offset determines a note position outside the range of the corresponding axis, the note is not constructed (no diagnostic is issued in this case).

For position codes beginning with H, V, or Z and with the second compass-key character any value except 5, the final position of the note is adjusted by a slight amount in the direction of each axis used for interpretation of note offsets. This is found to provide acceptable positioning in typical cases where the note is used to annotate a particular point on a chart (such as a marker), using as axis offsets the x or y values of the marker.

For all class 1 position codes, semicolon (;) characters within the note text are interpreted as line-break control characters. This facility allows multiline notes to be constructed easily. For example the following note text:

```
This;note; is a;multiline;note.
```

is constructed so as to appear on the chart as follows:

```
This
note
 is a
multiline
note.
```

If a semicolon is needed in the text on the chart, two contiguous semicolon characters must be supplied in the note text. These do not cause line breaks, and each such contiguous pair found during a start-to-end scan of the note text is replaced by a single semicolon character in the constructed note.

For all class 1 position codes, if the CHSET call option 'NBOX' is specified, the note is surrounded by a rectangular framing box, constructed of lines with default line type (solid), default line thickness (normal thickness), and line color the same as the color of the note text (specified by CHNATT).

For all class 1 position codes, any trailing nulls in the note text string are ignored, and do not contribute to the constructed note or its position.

If any part of the note rectangle (including any framing box) lies outside the chart area, the entire note rectangle is moved horizontally, or vertically, or both until it lies within the chart area. An error diagnostic is produced only if the note rectangle, after this translation, is too wide or too high to be contained entirely within the chart area.

- Class 2 position codes

  This class contains 9 position codes. They are defined below with a base position associated with each code.

  TL the top-left point of the string will be at the top-left point of the chart area.

  TC the top-center point of the string will be at the top-center point of the chart area.

  TR the top-right point of the string will be at the top-right point of the chart area.

  BL the bottom-left point of the string will be at the bottom-left point of the chart area.

  BC the bottom-center point of the string will be at the bottom-center point of the chart area.

  BR the bottom-right point of the string will be at the bottom-right point of the chart area.

  DL the bottom-left point of the string will be at the left end of a horizontal datum line, or at the bottom end of a vertical datum line.

  DC the bottom-center point of the string will be at the mid-point of a horizontal datum line, or the left-center point of the string will be at the mid-point of a vertical datum line.

  DR the bottom-right point of the string will be at the right end of a horizontal datum line, or the top left-point of the string will be at the top of a vertical datum line.

  Position codes beginning with D refer to datum or datum-reference lines associated with the **currently selected** axes when CHNOTE is called. The particular datum line to be annotated is determined as follows:

  – If calls have been made to CHXDTM or CHYDTM in State 2 before CHNOTE is called, the most recent of such calls is used to identify the relevant datum line.

  – If there have been no calls to CHXDTM or CHYDTM in State 2 preceding CHNOTE, the most recent **y datum reference line** specified by a State 1 call to CHYDTM (if any) is used. An x datum reference line specified in State 1 cannot be implicitly referred to in this manner.

  For all class 2 position codes, the note position is obtained from the base position by applying CHNOFF note offsets interpreted in character grid units.

  For class 2 position codes, semicolons are never interpreted as line break control characters, and a note framing box is never constructed. Explicit use of X'15' as a line break control character can lead to the note extending beyond the chart area.

If the note position is not related to a datum line, and the position after adjusting for offsets lies outside the chart area, the note is drawn justified to the chart area boundary. No error or warning message is issued unless the note is too large to fit into the chart area.

length *(specified by user) (fullword integer)*
The number of characters in **string**.

string *(specified by user) (character)*
The character string constructed on the chart. (Depending on the position code, semicolon characters in the string may be interpreted as line-break control characters.)

Description

This call is valid only in state-2. It constructs a character string (a note) at a designated location on the chart.

The position of the note is adjusted by the offsets specified by the most recent CHNOFF call. The note text attributes are those specified by the most recent CHNATT call. If no CHNOFF or CHNATT call has been issued, defaults apply for offsets and text attributes, as described under CHNOFF and CHNATT.

The final position of the note on the chart is determined from the position code in the following way. The position code specifies a base position within the chart area. Horizontal and vertical note offsets are then added algebraically to the base position to obtain the note position. Finally, depending on the position code, the note may be relocated relative to the note position to obtain its final position, where it is constructed.

Position codes fall into two mutually exclusive classes. Class 1 codes support multiline notes, rectangular boxing around the note, and relocation relative to the note position. Class 2 supports none of these, and is provided mainly for compatibility with an earlier release of GDDM-PGF.

The CHSET call option 'BNOT' may be used with position codes of both classes to blank the rectangular area occupied by the characters of the note, before note construction.

Some examples of the use of CHNOTE are:

- To annotate individual plotted points, lines, or areas on a chart.
- To provide a subheading in a different font from the main heading.
- To provide a footnote on a chart.
- To extend the basic axis annotation functions (labels and titles) where required. For example, multiline axis titles or labels may be constructed as notes.

Principal errors

```
ADM0503 E THIS FUNCTION CAN ONLY BE INVOKED
          IN THE CHART-DRAWING STATE
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
ADM0551 E INVALID POSITION CODE
ADM0552 E NO DATUM VALUE TO RESOLVE POSITION
          CODE
ADM0553 E AXIS NOT AVAILABLE FOR NOTE
          POSITIONED BY DATUM VALUE
ADM0556 W NOTE TEXT EXCEEDS AVAILABLE SPACE
          AND HAS BEEN TRUNCATED
ADM0563 E NOTE TEXT OR BAR VALUE WILL NOT FIT
          WITHIN THE CHART AREA
ADM0564 E AXIS OFFSET FOR NOTE NOT SUITABLE
ADM0565 E NON-POSITIVE LOGARITHMIC AXIS
          OFFSET SPECIFIED FOR A NOTE
ADM0567 E INVALID NOTE POSITION FOR A POLAR
          CHART
```

CHNUM

Function: To set number of components.

CHNUM (n)	
APL code	794
PGF RCP code	X'1002060F' (268568079)

Parameters

n *(specified by user) (fullword integer)*
A fullword binary integer that specifies the total number of pies or bars to be drawn. If set to zero, or if no call is made, the number of pies or bars is determined from the **first**

subsequent call to CHPIE, CHBAR, or CHBARX.

Description

Sets the total number of pie charts or multiple bar charts to be constructed on the currently selected x axis by subsequent CHPIE, CHBAR, or CHBARX calls. For pie charts, the CHNUM value for the primary axis is used.

CHNUM controls the spacing and size of the pies (and bars) so that the complete chart fits within the plotting area. The call is used for multiple pie charts and multiple bar charts whenever they are to be constructed by more than one plotting call.

Valid in state-1 and state-2.

Principal errors

```
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
```

CHPAT

Function: To specify component shading pattern table.

CHPAT (count, patterns)	
APL code	764
PGF RCP code	X'10020304' (268567300)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of attribute values to be taken from **patterns** and used as the shading-pattern attribute table. If zero, the default table is used. A maximum of 32 values may be specified.

patterns *(specified by user) (an array of fullword integers)*
An array of fullword integers indicating the pattern codes used consecutively for components.

Valid values are:

0-16 system-defined patterns
65-254 user-defined patterns

If values 65 through 254 are used, the pattern set must be loaded by the application program before the chart is constructed. (See the description of the GSLSS call in the *GDDM Base Application Programming Reference* book.)

Description

Overrides or reestablishes the default table of shading pattern values to be used. Patterns from the table are used in turn to construct each data component, pie slice, or Venn diagram circle.

If the patterns are multicolored (for example, the GDDM 64-color set), CHCOL must be used to set to neutral each color that corresponds to a multicolor pattern. If this is not done, the pattern takes on the color specified in the color table controlled by CHCOL.

The **default** pattern table contains eight patterns. These are the first eight shown in Figure 19 on page 210. The default patterns for other types of terminal may be different.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0513 E INVALID PATTERN OR MARKER VALUE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
```

CHPCTL

Function: To control pie chart slices.

CHPCTL (count, list)	
APL code	710
PGF RCP code	X'10150101' (269811969)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of items in the **list** array. The value must be in the range 0 through 3. If 0 is specified, default values are used for all the options.

list *(specified by user) (array of short floating-point numbers)*
Controls the options for the slices of a pie chart. If the list does not contain a value, the corresponding option is not changed. The options are:

Explode Defines the amount, in terms of a multiple of the horizontal radius, by which exploded slices are moved out. For example, if a value of 0.5 is specified, the tip of each exploded slice is moved out to halfway between the center of the pie and its circumference. The horizontal radius of the pie is reduced as necessary to ensure that the entire pie remains within the plotting area. Values greater than 1 make the slices of the pie small and difficult to see. The default is 0.2.

Tilt Controls the apparent tilt of all subsequent pies. The value can be in the range 0 through 0.99. The default, 0, means that a pie is not tilted; 0.99 tilts the pie away from the viewer by the maximum amount (thus reducing the top surface of the pie to a single horizontal line). For best results, the value should not be greater than 0.8.

Thickness Defines the thickness of the pie in terms of a multiplier of the horizontal radius. Any value less than 100 can be specified. The default is 0. The horizontal radius of the pie is reduced as necessary to ensure that the entire pie remains within the plotting area. Values greater than 10 make the slices of the pie small and difficult to see.

Description

Controls how the slices of a pie chart are displayed. The call operates on exploded slices (those that have been moved out from the rest of the pie) and non-exploded slices.

Valid only in state-1.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHPEXP

Function: To specify exploded slices in pie charts.

CHPEXP (count, list)	
APL code	775
PGF RCP code	X'10020306' (268567302)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of items contained in the **list** array. The value must be in the range 0 through 32. If 0 is specified, a default explosion array is restored.

list *(specified by user) (an array of fullword integers)*
Elements in this array correspond to slices of the pie. If there is more than one pie, then the elements correspond to the equivalent slice of each pie. An element that contains the value 1 indicates that the corresponding slice of the pie is moved out in isolation from the other slices. An element that contains the value 2 indicates that the corresponding slice of the pie is moved out with any neighboring slices that have the value 2; this creates a group of moved slices. An element with the

value 2 that does not have a neighboring slice with the value 2 is treated as if it had the value 1. The first and last slices of a pie chart cannot be grouped together. An element that contains the value 0 indicates that the corresponding slice of the pie is not moved. Only 0, 1, and 2 can be specified in this parameter.

If the length of the list does not match the number of slices in the pie, the list is truncated (if it is too long) or resumes from the start (if it is too short).

The default **list** array contains all zero values, which causes none of the slices to be moved out.

Note: Support for exploded slices in groups is by means of an APAR. Consult your local support center for details of the PTF.

Description

Specifies which slices of a pie chart are to be exploded (moved out from the other slices of the pie). The CHPCTL call (see “CHPCTL – Control pie chart slices” on page 61) controls the amount by which the slice is to be moved.

Valid only in state-1.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHPIE

Function: To draw pie charts.

CHPIE	**(components, count, y-values)**
APL code	796
PGF RCP code	X'100D0A06' (269289990)

Parameters

components *(specified by user) (fullword integer)*
Specifies the number of pie charts to be drawn.

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of slices in each pie. All pies in a multicomponent chart must have the same number of slices.

y-values *(specified by user) (array of short floating-point numbers)*
Controls the sizes of the pie slices in each pie. The data may be given in percentages (the default) or in absolute values. Positive numbers must be specified. CHSET('PERPIE' or 'ABPIE') may be set to indicate which data type is being used.

For **absolute pie charts**, the total for each component is assumed to correspond to 360 degrees, and a complete pie is always drawn. The total for each component in this case must be positive. For **percentage pie charts**, the total for each component must not exceed 100. If the total is less than 100, an incomplete circle is drawn. Slices are drawn in a clockwise direction, with the first slice beginning at the 12 o’clock position.

Description

Draws one or more pie charts. When more than one pie is drawn, horizontal and vertical alignment of the pies is controlled by the CHSET YVERTICAL and XVERTICAL options. YVERTICAL specifies pies each beside the other (default) and XVERTICAL specifies pies one above the other.

The positioning and size of pies for a multiple pie chart is based on the number of pies specified on

the first call to CHPIE, or on the value of CHNUM, if CHNUM was used. The CHNUM value takes precedence.

Unless CHSET('NOFILL') has been specified, each slice of a pie is colored and shaded on the basis of the current settings of the attribute tables and the CHSET shading option. Corresponding slices in each pie have the same attributes.

All axis definition and datum line specifications are ignored, except that any labels specified by CHXLAB are used as titles for the pies.

Valid in state-1 or state-2. If entered in state-1, the program changes to state-2.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0510 W LEGEND FORMAT MAY BE INCORRECT
ADM0511 W NOT ENOUGH ROOM TO DRAW ALL KEYS.
          ONE OR MORE WERE OMITTED
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0533 E CHART COMPONENT COUNT EXCEEDED
ADM0537 E TOTAL OF ABSOLUTE PIE VALUES IS
          ZERO
ADM0538 E TOTAL OF PERCENTAGE PIE CHART
          SLICES EXCEEDS 100 PERCENT
ADM0539 E A NEGATIVE PIE SLICE VALUE WAS
          ENCOUNTERED
ADM0540 E PIE CHART CANNOT BE DRAWN IN THE
          AVAILABLE CHART AREA
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0561 W PIE SPIDER TEXT OMITTED
ADM0571 W PIE RADIUS HAS BEEN INCREASED TO
          ALLOW CHART TO BE DRAWN
ADM0572 W ALL DATA HAS THE VALUE 'MISSING'
```

CHPIER

Function: To reduce pie chart size.

CHPIER (reduction)	
APL code	768
PGF RCP code	X'10020614' (268568084)

Parameters

reduction *(specified by user) (fullword integer)*
Specifies the percentage reduction of the area of each pie constructed. The value must be positive; 99 is the largest reduction.

Description

Allows the size of each pie in a pie chart to be reduced. This can be useful if the automatic sizing and spacing prevents a multiple pie chart being displayed (giving message ADM0540), or produces a congested chart.

Valid only in State 1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHPLOT

Function: To construct line graphs and scatter plots.

CHPLOT	**(components, count, x-values, y-values)**
APL code	791
PGF RCP code	X'100D0A03' (269289987)

Parameters

components *(specified by user) (fullword integer)*
Specifies the number of components drawn; that is, the number of individual graph lines or groups of scatter plot data. Each component has a new set of attributes.

count *(specified by user) (fullword integer)*
Specifies the number of data points in each graph line or scatter plot group.

x-values *(specified by user) (array of short floating-point numbers)*
Specifies the x values. Each graph uses the same set of values. For example, if **count**=5, five values must be supplied.

y-values *(specified by user) (array of short floating-point numbers)*
Specifies the y values. One value must be supplied for each point to be plotted. For multiple components, the values must be stored sequentially by component; that is, all values for the first component, followed by all values for the second component, and so on for as many components as are specified. Each component must contain the number of values given in the **count** parameter. The y values specified for each component are associated in sequence with the x values supplied in the **x-values** parameter to give the (x,y) coordinate pairs to be plotted.

Description

Constructs one or more components consisting of line graphs or scatter plots on the currently selected axes. By default, markers are drawn at each data point, and solid straight lines connect them. The CHSET options ('LINES' | 'NOLINES') and ('MARKERS' | 'NOMARKERS') can be used to suppress the markers, or to produce a scatter plot by suppressing the lines.

The color of the lines and markers, and the line types, line widths, and markers used are determined by the current attribute table settings.

Valid in state-1 or state-2. If entered in state-1, the program changes to state-2.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0510 W LEGEND FORMAT MAY BE INCORRECT
ADM0511 W NOT ENOUGH ROOM TO DRAW ALL KEYS.
          ONE OR MORE WERE OMITTED
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0526 S LOGARITHMIC X OR Y AXIS RANGE
          CONTAINS A NON-POSITIVE VALUE
ADM0527 E NON-POSITIVE INTERCEPT ON
          LOGARITHMIC X OR Y AXIS
ADM0528 E X, Y, OR Z AXIS TICK INTERVAL TOO
          SMALL
ADM0529 W MAXIMUM OVERLAP EXCEEDED FOR A BAR
          CHART
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0534 W DATA LIES OUTSIDE THE X, Y, OR Z
          AXIS RANGE AND HAS NOT BEEN PLOTTED
ADM0535 E ZERO OR NEGATIVE DATA IS INVALID ON
          A LOGARITHMIC AXIS
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0545 E THE X, Y, OR Z AXIS HAS AN INVALID
          POWER OF 10 FOR TICK DEFINITION
ADM0546 E THE X, Y, OR Z AXIS RANGE EXCEEDS
          NUMERIC BOUNDS
ADM0557 W AXIS TITLE TRUNCATED ON RIGHT OF
          CHART
ADM0558 W AXIS TITLE TRUNCATED AT TOP OR
          BOTTOM OF CHART
ADM0560 E LOGARITHMIC X, Y, OR Z AXIS RANGE
          IS TOO SMALL
```

CHPOLR

Function: To plot a polar chart.

CHPOLR (components, count, X-values, Y-values)	
APL code	783
PGF RCP code	X'100D0A08' (269289992)

Parameters

components *(specified by user) (fullword integer)*
A fullword integer specifying the number of components drawn; that is, the number of individual polar charts. Each component has a new set of attributes.

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of data points in each polar chart.

X-values *(specified by user) (array of short floating-point numbers)*
Specifies the x-axis values. Each polar chart uses the same set of x-axis values. For example, if **count**=5, five values must be supplied.

Y-values *(specified by user) (array of short floating-point numbers)*
Specifies the y-axis values. One value must be supplied for each point to be plotted.

For multiple components, the values must be stored sequentially by component; that is, all values for the first component, followed by all values for the second component, and so on for as many components as are specified. Each component must contain the number of values specified in the **count** parameter. The y values specified for each component are associated in sequence with the x values supplied in the **x-values** parameter to give the (x,y) coordinate pairs to be plotted.

Description

Constructs one or more components in a polar chart.

By default, markers are drawn at each data point, and solid straight lines connect them.

The CHSET options ('LINES' | 'NOLINES') and ('MARKERS' | 'NOMARKERS') can be used to suppress the markers, or to produce a scatter plot by suppressing the lines.

The ranges of the axes are set by the first call. Any data that lies outside the axis ranges is clipped at the boundary of the plotting area.

The color of the lines and markers, and the line types, line widths, and markers used are determined by the current attribute table settings.

The CHSET options 'NOFILL', 'INFILL', and 'FILL' (the default) specify whether the polar chart is to be shaded. The method of shading can be set by the CHSET calls 'MOUNTAIN' or 'NOMOUNTAIN' (the default).

If notes are produced, their offsets must be given either in axis offsets or in character grid offsets. They cannot be mixed.

It is not possible to have secondary axes. Only primary axis information is used. Therefore, any alterations made to secondary axis information as a result of issuing a CHXSEL or CHYSEL call are not seen on the chart.

The CHSET options 'LOWAXIS', 'MIDDLE', 'HIGHAXIS', 'XVERTICAL', and 'YVERTICAL' are ignored for polar charts. The CHXSET and CHYSET option 'ATABOVE' is interpreted as 'ATEND'.

Valid in state-1 or state-2. If entered in state-1, the program changes to state-2.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0510 W LEGEND FORMAT MAY BE INCORRECT
ADM0511 W NOT ENOUGH ROOM TO DRAW ALL KEYS.
          ONE OR MORE WERE OMITTED
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0526 S LOGARITHMIC X OR Y AXIS RANGE
          CONTAINS A NON-POSITIVE VALUE
```

```
ADM0527 E NON-POSITIVE INTERCEPT ON
          LOGARITHMIC X OR Y AXIS
ADM0528 E X, Y, OR Z AXIS TICK INTERVAL TOO
          SMALL
ADM0529 W MAXIMUM OVERLAP EXCEEDED FOR A BAR
          CHART
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0534 W DATA LIES OUTSIDE THE X, Y, OR Z
          AXIS RANGE AND HAS NOT BEEN PLOTTED
ADM0535 E ZERO OR NEGATIVE DATA IS INVALID ON
          A LOGARITHMIC AXIS
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0545 E THE X, Y, OR Z AXIS HAS AN INVALID
          POWER OF 10 FOR TICK DEFINITION
ADM0546 E THE X, Y, OR Z AXIS RANGE EXCEEDS
          NUMERIC BOUNDS
ADM0557 W AXIS TITLE TRUNCATED ON RIGHT OF
          CHART
ADM0558 W AXIS TITLE TRUNCATED AT TOP OR
          BOTTOM OF CHART
ADM0560 E LOGARITHMIC X, Y, OR Z AXIS RANGE
          IS TOO SMALL
ADM0566 E CHDRAX NOT ALLOWED WITH CURRENT
          CHART TYPE
```

CHQARE

Function: To query chart area.

CHQARE (xlow, xhigh, ylow, yhigh)	
APL code	802
PGF RCP code	X'10180100' (270008576)

Parameters

xlow *(returned by GDDM) (short floating point)*
Returns the left-hand bounds of the chart area in picture-space units. In state-1, this is zero when no CHAREA call has been issued.

xhigh *(returned by GDDM) (short floating point)*
Returns the right-hand bounds of the chart area in picture-space units. In state-1, this is zero when no CHAREA call has been issued.

ylow *(returned by GDDM) (short floating point)*
Returns the lower bounds of the chart area in picture-space units. In state-1, this is zero when no CHAREA call has been issued.

yhigh *(returned by GDDM) (short floating point)*
Returns the upper bounds of the chart area in picture-space units. In state-1, this is zero when no CHAREA call has been issued.

Description

Returns the extents of the chart area.

Valid in state-1 or state-2

Principal errors

None

CHQPOS

Function: To query positional information.

CHQPOS (entity-type, count, h-array, v-array)	
APL code	718
PGF RCP code	X'10170200' (269943296)

Parameters

entity-type *(specified by user) (fullword integer)*
Specifies that positional information for a chart note is to be returned. The only value that can be specified is 1.

count *(specified by user) (fullword integer)*
Specifies the number of elements in **h-array** and **v-array**.

h-array *(returned by GDDM) (array of short floating-point numbers)*

v-array *(returned by GDDM) (array of short floating-point numbers)*
Contain the positional information that is returned. The coordinates are returned in character-grid units, and correspond to the actual position of the note in the chart (that is, after PG routines has performed any positional adjustment).

For interactive chart notes, the returned coordinates correspond to the position

originally specified by the user. For non-interactive notes, the returned coordinates might correspond to a position that is different from that originally specified by the user (because the chart note was partially or completely off the display, and has been adjusted by PG routines).

The coordinates of the following points are returned in consecutive elements:

The top left-hand corner
The bottom left-hand corner
The top right-hand corner
The bottom right-hand corner
The reference point.

Description

Queries the positional information associated with the specified type of chart entity (a chart note). The positional information is returned for the last chart note drawn; the chart note must have a class 2 position code specified in the CHNOTE call (see “CHNOTE – Construct a character string at a designated position” on page 56). If there is no such preceding note, an error message is issued.

Valid in state-2 only.

Principal errors

```
ADM0503 E THIS FUNCTION CAN ONLY BE INVOKED
          IN THE CHART-DRAWING STATE
ADM0575 E NO PRECEDING VALID NOTE CALL
```

CHQRNG

Function: To query axis ranges.

CHQRNG (count, xlow, xhigh, ylow, yhigh)	
APL code	801
PGF RCP code	X'10170300' (269943552)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of parameters returned. This may be from 0 through 4. If the count is greater than 4, 4 is assumed. If the count is less than zero, zero is assumed.

xlow *(returned by GDDM) (short floating point)*
Returns the left-most (or low) value on the currently selected x axis.

xhigh *(returned by GDDM) (short floating point)*
Returns the right-most (or high) value on the currently selected x axis. If this is the same as **xlow**, the axis has not been generated.

ylow *(returned by GDDM) (short floating point)*
Returns the bottom (or low) value on the currently selected y axis.

yhigh *(returned by GDDM) (short floating point)*
Returns the top (or high) value on the currently selected y axis. If this is the same as **ylow**, the axis has not been generated.

Description

Returns the bounds of the currently defined x and y axes.

Valid in state-2 only.

Principal errors

None

CHRNIT

Function: To reinitialize PG routines.

CHRNIT	
APL Code	704
PGF RCP code	X'10010100' (268501248)

Parameters

None

Description

Resets all chart-definition options and parameters to their default values. If issued in state-2 it also returns the application program to state-1. (See "CHSTRT – Reset the processing state to state-1" on page 78 for returning to state-1 without reinitialization.)

CHRNIT may be used, for example, to reinitialize the PG routines before using CHAREA to construct a second chart in another area of the display screen. (See also "CHTERM – Terminate the PG routines" on page 81.)

CHRNIT does not clear charts from the page. Any further charts are added to the existing ones. Charts can be cleared by the GSCLR call, described in the *GDDM Base Application Programming Reference* book.

Valid in state-1 or state-2. If entered in state-2, the application program reenters state-1.

Principal errors

None

CHSET

Function: To specify chart options.

CHSET (option)	
APL code	798
PGF RCP code	X'10020101' (268566785)

Parameters

option *(specified by user) (4-byte character string)*
The option string must be at least four characters long, and must be enclosed in single quotes. If more than four characters are specified, they are ignored. However, they may be used to increase the readability of the program.

The options are as follows, in alphabetic order by function; the defaults are shown **LIKE THIS**.

Function	Option
Axis, autoranging	**RANGE** **NORANGE**
Axis, orientation	**YVERTICAL** **XVERTICAL** **ZVERTICAL**
Axis, time of drawing	**IDRAW** **DRAW** **NDRAW**
Axis, title line break	**TLBREAK** **NTLBREAK**
Bar chart, controlled values	**CVALUES** **VALUES** **NOVALUES**
Bar chart, type	**MBAR** **CBAR** **FBAR**
Bar values, blanking behind	**BVALUES** **NBVALUES**
Bar values, notation	**VFIXED** **VSCIENTIFIC**
Bar values, placement	**VINSIDE** **VONTOP**
Chart area, boxed or shaded	**CBOX** **CBACK** **NCBOX**
Curve fitting or not	**CURVE** **NOCURVE**

Function	Option
Data, absolute or relative	**RELATIVE** **ABSOLUTE**
Date label abbreviations	**ABREV** **FULL** **LETTER**
Heading justification	**HCENTER** **HLEFT** **HRIGHT**
Heading or not	**HEADING** **NOHEADING**
Heading position	**HTOP** **HBOTTOM**
Histogram risers	**RISERS** **NORISERS**
Label areas blanked	**BLABEL** **NBLABEL**
Legend areas blanked	**NBKEY** **BKEY**
Legend, box around	**KBOX** **NKBOX**
Legend or not	**LEGEND** **NOLEGEND**
Legend, order of elements	**KNORMAL** **KREVERSED**
Line graphs and polar charts, lines	**LINES** **NOLINES**
Line graphs and polar charts, markers	**MARKERS** **NOMARKERS**
Marker scaling	**MSCALE** **NOMSCALE**
Note area blanked	**BNOTE** **NBNOTE**
Notes, box around	**NBOX** **NONBOX**
Notes, repositioned	**NNOTES** **INOTES**
Numbers punctuation	**PGFS** **NPGFS**
Pie charts, labeling appearance	**SPISLICE** **SPILABEL**
Pie charts, labeling type	**PIEKEY** **SPIDER**
Pie charts, relative size	**PROPIE** **NOPROPIE**
Pie data, type of	**PERPIE** **ABPIE**
Screen position occupied by SO/SI characters	**POSITION** **NOPOSITION**
Shading method	**FILL** **INFILL** **NOFILL**
Shading, mountain range	**MOUNTAIN** **NOMOUNTAIN**
Tower charts, backplane drawn	**BACK** **NOBACK**
Tower charts, color face	**BGBASE** **TCBASE**
Tower charts, pick axis	**ZPICK** **XPICK**
Tower charts, scale tower	**SCALETOWER** **NOSCALETOWER**
Tower charts, side plane drawn	**SIDE** **NOSIDE**
Tower charts, y-axis ticks	**TOWERTICK** **NOTOWERTICK**
X axis, secondary specification	**XDUP** **XNOD**
Y axis, secondary specification	**YDUP** **YNOD**

Description

Overrides defaults on all chart attributes that are not related to axes. In general, any attribute that does not need a value and does not refer to an axis is an option of CHSET.

Only one option may be set by each CHSET call. For example, to request a left-justified heading in the bottom margin, two calls are needed:

```
CHSET ('HBOT')
CHSET ('HLEFT')
```

Unless otherwise stated, CHSET calls are valid only in state-1.

Principal errors

```
ADM0505 E INVALID PARAMETER: a
ADM0549 E OPTION a IS INVALID IN THE
          CHART-DRAWING STATE
```

CHSET Options

The groups of CHSET options are listed in alphabetic order by option.

- CHSET '**ABREV**' | '**FULL**' | '**LETTER**'

  Specifies the form of axis labels supplied by CHXMTH, CHYMTH, CHXDAY, and CHYDAY. It applies to all charts except pie charts and Venn diagrams.

  ABREV specifies three-character abbreviations.

  FULL specifies complete words.

  LETTER specifies first letters only.

  The following tables list the month/day sequence numbers and the display variations.

Number	ABREV	FULL	LETTER
Month			
1	JAN	JANUARY	J
2	FEB	FEBRUARY	F
3	MAR	MARCH	M
4	APR	APRIL	A
5	MAY	MAY	M
6	JUN	JUNE	J
7	JUL	JULY	J
8	AUG	AUGUST	A
9	SEP	SEPTEMBER	S
10	OCT	OCTOBER	O
11	NOV	NOVEMBER	N
12	DEC	DECEMBER	D
Day			
1	MON	MONDAY	M
2	TUE	TUESDAY	T
3	WED	WEDNESDAY	W
4	THU	THURSDAY	T
5	FRI	FRIDAY	F
6	SAT	SATURDAY	S
7	SUN	SUNDAY	S

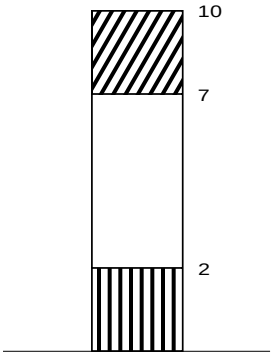
- CHSET '**ABSOLUTE**' | '**RELATIVE**'

  ABSOLUTE specifies that absolute data values are supplied.

  RELATIVE specifies that the dependent data values, for all data groups except the first, are relative to the previous component. Relative data is the natural and recommended form of data for all chart types that involve stacking of components. The depth of each bar (or layer in a surface chart) then gives the absolute data value. The following example illustrates this point:

Component	Value Supplied	Value Plotted
1	2	2
2	5	7
3	3	10

  The resultant bar chart is:



- CHSET '**BACK**' | '**NOBACK**'

  BACK specifies that the back plane is to be drawn on a tower chart. If this plane is present, an edge is always drawn round it, corresponding to the extremes of the axis. A grid can be drawn on this plane by using the GRID option of CHZSET.

  NOBACK specifies that the back plane is not to be drawn on a tower chart.

- CHSET '**BGBASE**' | '**TCBASE**'

  BGBASE specifies that the face of the tower on a tower chart at the reference plane is to be shown in the background color. This allows any negative towers to be identified easily.

  TCBASE specifies that the face of the tower at the reference plane is to be shown in the same color as the tower.

- CHSET '**BKEY**' | '**NBKEY**'

BKEY specifies that the rectangular area to be occupied by the legend is blanked before the legend is constructed. On terminals not in the IBM 3270 family, this option may have no effect, because some types of hardware do not permit blanking.

NBKEY specifies that the legend area is not blanked.

- CHSET '**BLABEL**' | '**NBLABEL**'

  Controls blanking of the areas to be occupied by axis labels, before the labels are constructed. It can be used with CHSET('**CBACK**'), CHSET('**DRAW**'), or CHDRAX, to ensure that the axis labels are not obscured by background shading or some aspect of the plot.

  Valid in state-1 or state-2.

  NBLABEL does not blank label areas (except for mode 1 text, for which blanking is performed by hardware action).

  BLABEL blanks the label areas before the labels are written. On terminals not in the 3270 family, this option may have no effect, because some types of hardware do not permit blanking.

- CHSET '**BNOTE**' | '**NBNOTE**'

  Controls the blanking of areas to be occupied by notes, before the notes are written (see CHNOTE).

  BNOTE blanks note areas before the notes are written. On terminals not in the 3270 family, this option may have no effect, because some types of hardware do not permit blanking.

  NBNOTE does not blank note areas (except for mode 1 text, for which blanking is performed by hardware action).

  Valid in state-1 or state-2.

- CHSET '**BVALUES**' | '**NBVALUES**'

  Controls blanking of the areas to be occupied by data values on bar charts if CHSET('**VALUES**') is set.

  Valid in state-1 or state-2.

  NBVALUES does not blank the value areas (except for mode 1 text, for which blanking is performed by hardware action).

  BVALUES blanks the value areas before the values are written. On terminals not in the IBM 3270 family, this option may have no effect, because some types of hardware do not permit blanking.

- CHSET '**CBOX**' | '**NCBOX**' | '**CBACK**'

  Permits the drawing of a framing box about the perimeter of the chart area or the shading of the background. Defaults for the attributes of the lines defining the box can be overridden by CHBATT.

  CBOX specifies that the box is to be drawn.

  NCBOX suppresses the framing box.

  CBACK specifies that the entire chart area is to be shaded with a solid pattern as a background, in addition to drawing the framing box. The background color will be the same as the lines defining the box, as set by CHBATT.

  CBACK should *not* be used for Venn diagrams, for monochrome devices, or when the chart is to be printed. Furthermore, remember that the data streams generated by this option may be very long, because many more cell definitions are generated with multicolor contents. PS stores may be quickly exhausted with other than simple charts. Note that to cancel a **CBACK** request, **CBOX** or **NCBOX** must be specified.

- CHSET '**CURVE**' | '**NOCURVE**'

  Controls the manner in which the supplied data points in a line graph, surface chart, or polar chart are connected. Each consecutive pair of points may be connected by a straight line, or by a smooth curve. For a line graph or polar chart, it is effective only if CHSET('**LINES**') is also specified (or defaulted).

  If a smooth curve is specified, the smoothness of the curve may be controlled by the CHFINE call. Note that the smooth curve constructed by use of this option is not intended to provide an interpretation of the supplied data values. Rather, the option is provided purely for its cosmetic effect on the resulting graph.

  Valid in state-1 or state-2.

  CURVE specifies that consecutive data points within each data group of a line graph, polar chart, or surface chart are to be connected by

a smooth curve constructed using the current data-group attributes.

NOCURVE specifies that consecutive data points within each data group of a line graph, polar chart, or surface chart are to be connected by straight lines constructed using the current data-group attributes.

- CHSET '**CVALUES**' | '**VALUES**' | '**NOVALUES**'

  Specifies how values are to be displayed for bar charts and table charts (or, in the case of the '**VALUES**' option, for bar and pie charts).

  Valid in state-1 or state-2.

  CVALUES specifies that controlled bar-chart values are to be provided. Related calls are CHVDIG, CHTHRS, CHSET('**VINSIDE**' | '**VONTOP**'), CHSET('**VFIXED**' | '**VSCIENTIFIC**'), and CHVATT with the bar-value rotation option. Values and bars might overlap on composite (stacked) or floating bar charts. See "CHVCHR – Number of characters in bar values" on page 86 for a further discussion. Text attributes for the value representations are set by CHVATT. The area to be occupied by each bar value may be blanked, before the value is constructed, with the **BVALUES** option.

  VALUES controls the appearance of dependent data values at the ends of bars on bar charts, or percentage values on pie charts.

  For bar charts, **VALUES** constructs character representations of the dependent data values at the end of each bar, on each CHBAR or CHBARX call. Overlap of values and bars may occur on composite (stacked) or floating bar charts. See the description of CHVCHR for further discussion. Text attributes for the value representations are set by CHVATT. The area to be occupied by each bar value may be blanked, before the value is constructed, with the **BVALUES** option.

  For pie charts, **VALUES** has two possible meanings:

  – If the option CHSET('**PIEKEY**') (the default) is in effect, integer percentage data values are constructed as spider labels around the pie, connected to their corresponding slices by lines. Each consists of the character representation of the integer closest to the percentage slice value, followed by a % sign.

  – If CHSET('**SPIDER**') is in effect, spider labels are constructed, each consisting of a percentage representation as above, followed by a label text string as specified by CHKEY.

    In both cases, the data values are always in percentage form, regardless of the pie chart data type. See CHSET('**SPISLICE**') for a description of text attributes.

  NOVALUES indicates that no values are given on bar charts or pie charts.

- CHSET '**FILL**' | '**INFILL**' | '**NOFILL**'

  Specifies the method of shading. Applies to all charts except line graphs, scatter plots, and table charts. Note that shading, when specified, always shades the *interior* of a defined boundary. If the defined boundary crosses itself, the effects of shading may be unexpected.

  Valid in state-1 or state-2.

  Shading patterns are taken from the pattern-attribute table. The default table may be overridden by a call to CHPAT.

  – Surface charts, bar charts, polar charts, tower charts, and histograms

    FILL specifies that all data groups are shaded with patterns taken from the pattern-attribute table. The first data group specified in a plotting routine call is shaded to the x axis (or y datum reference line if specified). Subsequent data groups in the same call are shaded to the previous data group.

    INFILL is equivalent to FILL for multiple bar charts and tower charts. It suppresses the shading of the first data group for polar charts, surface charts,

histograms, and composite (stacked) bar charts.

NOFILL suppresses all shading for all charts except surface charts, for which it is equivalent to **INFILL**.

– Pie charts

FILL specifies that all pie slices are shaded with patterns taken from the pattern-attribute table. Corresponding slices in different pies are shaded with the same pattern.

INFILL is equivalent to **FILL**.

NOFILL suppresses shading for all pie slices.

– Venn diagrams

FILL specifies that the two population circles are shaded with patterns from the pattern attribute table.

INFILL is equivalent to **FILL**.

NOFILL suppresses shading of the two population circles.

- CHSET '**HCENTER**' | '**HLEFT**' | '**HRIGHT**'

  Controls the justification of the chart heading.

  HCENTER specifies that each line of the heading is centered between the left and right edges of the chart area.

  HLEFT specifies that each line of the heading is left-justified to the edge of the chart area.

  HRIGHT specifies that each line of the heading is right-justified to the edge of the chart area.

- CHSET '**HEADING**' | '**NOHEADING**'

  This option controls whether or not the chart heading is displayed.

  HEADING specifies that the heading is displayed.

  NOHEADING specifies that the heading is suppressed.

- CHSET '**HTOP**' | '**HBOTTOM**'

  Controls the location of the chart heading.

  HTOP specifies that the heading is placed in the top margin.

  HBOTTOM specifies that the heading is placed in the bottom margin.

- CHSET '**IDRAW**' | '**DRAW**' | '**NDRAW**'

  This option governs the time of construction of the axes, together with their scale marks, labels, and associated grid/datum lines.

  Valid in state-1 or state-2.

  IDRAW specifies that each axis is constructed automatically at the time of its *definition*, that is, when the first plotting routine call is issued with the axis selected. In this case each axis is constructed once and once only, *before* the data supplied on the plotting routine call is plotted. Data thus overwrites the axis where they cross.

  DRAW specifies that each axis is constructed automatically on *each* plotting routine call for which the axis is selected, *after* the data is plotted. In this case each axis is constructed as many times as there are plotting routine calls for which the axis is selected. The axis thus overwrites the data. **DRAW** may result in unnecessary processing if several plotting routines calls are made. In such a situation, data can be overwritten using the CHDRAX call and possibly the **NDRAW** option.

  DRAW is ignored for tower charts.

  NDRAW suppresses the automatic construction of axes on plotting routine calls. Axis drawing can be explicitly requested by means of a CHDRAX call.

  In all cases, axis construction may be forced at any time in state-2 by execution of CHDRAX.

- CHSET '**KBOX**' | '**NKBOX**'

  Controls the construction of a box around each key in the legend. **NKBOX** specifies that no key box is to be constructed.

  KBOX specifies that each key in the legend is surrounded by a box whose attributes are the same as those for the primary x-axis line (see CHAATT).

- CHSET '**KNORMAL**' | '**KREVERSED**'

  Controls the order of items in a legend (K stands for Key).

  KNORMAL specifies that the first key is on the left or bottom.

  In a horizontal legend, each row of key entries is constructed from left to right (using the keys

in the order in which they are defined by a CHKEY call). Similarly, in a vertical legend, each column of key entries is constructed from bottom to top.

KREVERSED specifies that the first key is on the right or top.

In a horizontal legend, each row of key entries is constructed from right to left (using the keys in the order in which they are defined by a CHKEY call). Similarly, in a vertical legend, each column of key entries is constructed from top to bottom.

- CHSET '**LEGEND**' | '**NOLEGEND**'

  Specifies whether a legend is to be constructed. Legends are not produced for Venn diagrams irrespective of the setting of this option. See the **PIEKEY** option for information about construction of legends for pie charts.

  LEGEND specifies that a legend is to be constructed after any subsequent plotting calls (for example, CHPLOT, CHTOWR, CHBAR, and CHBARX).

  Valid in state-1 or state-2.

  NOLEGEND specifies that a legend is not to be constructed.

  Valid in state-1 only.

- CHSET '**LINES**' | '**NOLINES**'

  Controls whether CHPLOT and CHPOLR produce a line graph (**LINES**) or a scatter plot (**NOLINES**).

  Valid in state-1 or state-2.

  LINES specifies that consecutive points on each data group are joined by a line, or curve (see CHSET('**CURVE**')).

  NOLINES specifies that only the markers are drawn, giving the effect of a scatter plot. If the CHSET('**NOMARKERS**') option is specified, nothing is drawn for CHPLOT; for CHPOLR, only shaded areas are drawn.

- CHSET '**MARKERS**' | '**NOMARKERS**'

  Indicates whether markers are shown.

  Valid in state-1 or state-2.

  MARKERS specifies that markers on line graphs, scatter plots, or polar charts appear at the data points specified on a CHPLOT or CHPOLR call. Markers are obtained from the marker-attribute table. The default marker table can be overridden by a CHMARK call.

  NOMARKERS suppresses the construction of markers.

- CHSET '**MBAR**' | '**CBAR**' | '**FBAR**'

  Specifies the type of bar chart to be constructed.

  Valid in state-1 or state-2.

  MBAR specifies a multiple bar chart (groups of bars, side-by-side).

  CBAR specifies a composite (stacked) bar chart (colinear bars).

  FBAR specifies a floating bar chart (like a stacked bar chart but with first data group bars omitted).

- CHSET '**MOUNTAIN**' | '**NOMOUNTAIN**'

  MOUNTAIN specifies that, for surface charts and polar charts, the successive data groups appear behind the previous data group(s) so that the shading does not overlap. This effect is called mountain-range shading. Chart details (for example, grid lines and datum lines) that are behind a mountain range are not shown. The first component is shaded if the CHSET option '**FILL**' has been specified; otherwise, shading is suppressed.

  NOMOUNTAIN suppresses mountain-range shading and restores the standard method of shading.

  Valid in state-1 only.

- CHSET '**MSCALE**' | '**NOMSCALE**'

  Indicates whether markers are scaled to the size of the chart.

  NOMSCALE, the default, specifies that markers on line graphs, scatter plots, or polar charts have an absolute size independent of the overall size of the chart. Markers are scaled relative to the device's default markers. This option has been kept for compatibility with other releases.

  MSCALE specifies that scaling of markers is to occur relative to the size of the chart. This means that if the overall size of the chart is changed, then the markers will be scaled accordingly.

- CHSET '**NBOX**' | '**NONBOX**'

  Controls the construction of a framing box round all subsequent chart notes, until the option is changed. Refer to the CHNOTE call description for the parameters affecting framing-box construction.

  Valid in state-1 or state-2.

  NBOX specifies construction of a framing box round subsequent chart notes.

  NONBOX suppresses construction of a framing box round subsequent chart notes.

- CHSET '**NNOTES**' | '**INOTES**'

  Controls whether notes that do not fully appear on a display are repositioned.

  Valid in state-1 or state-2.

  NNOTES indicates that notes drawn after this call are repositioned by PGF to ensure that all of the note is visible on the display.

  INOTES indicates that notes drawn after this call are *not* repositioned by PGF; this means that not all of the note is visible on the display.

- CHSET '**PERPIE**' | '**ABPIE**'

  Specifies the data type for pie charts.

  Valid in state-1 or state-2.

  PERPIE specifies that the data supplied in any subsequent calls to CHPIE is a percentage. Each slice subtends an angle of V*360/100 degrees, where V is the data value for the slice.

  If the total for all slices is less than 100, the complete circle is not drawn. If it is greater than 100, an error message is issued.

  ABPIE specifies that the data is absolute. All values of a pie are added together and the slice angle determined as a proportion of the total. Each slice subtends an angle of V*360/T degrees, where V is the data value and T is the total of all data values for the pie.

- CHSET '**PGFS**' | '**NPGFS**'

  Specifies the method used to punctuate numbers of 1000 and over. The convention is used for the display of numeric data values in fixed-point format. Applies to all numeric axis labels, to bar values on bar charts, and to table chart values. These options are used in CHXSET and CHYSET calls to specify punctuation for numeric labels on the x or y axis.

  Valid in state-1 or state-2.

  PGFS suppresses all punctuation except the decimal point. This minimizes the space required for numeric values, for example: `1234567.999`

  NPGFS selects the default national convention that may be specified when GDDM is installed. Widely used conventions are:

  – The period decimal convention. Example: 1,234,567.999

  – The comma decimal convention. Example: 1.234.567,999

  – The French convention. Example: 1 234 567,999

- CHSET '**PIEKEY**' | '**SPIDER**'

  Specifies the configuration of pie chart labels.

  PIEKEY specifies that a legend will be constructed in the chart margin.

  SPIDER suppresses the generation of a legend, and specifies the construction of spider labels consisting of the labels specified by CHKEY written around the circumference of each pie. The labels are connected to their corresponding slices by lines. See CHSET('**SPISLICE**') for further discussion.

  Note: Any labels supplied by CHXLAB are written as pie titles adjacent to the pies, independently of labels supplied by CHKEY.

- CHSET '**POSITION**' | '**NOPOSITION**'

  Controls whether the shift out (SO) and shift in (SI) characters occupy a screen position or not.

  NOPOSITION indicates that the SO/SI characters are removed.

  POSITION indicates that the SO/SI characters are replaced by blanks.

  Valid in state-1 only.

- CHSET '**PROPIE**' | '**NOPROPIE**'

  Applies only to multiple pie charts using absolute (not percentage) data, generated by a single call to CHPIE.

  NOPROPIE specifies that all pies generated are the same size.

PROPIE specifies that the area of each pie will be proportional to the sum of its slice values. The pies generated from a single call to CHPIE will be in proportion. The largest pie in each such group of pies has the same size as if **NOPROPIE** had been specified, and the remaining pies are reduced in proportion.

- CHSET '**RANGE**' | '**NORANGE**'

  Controls whether plotting is to be done or whether just the range of the currently selected axes is to be calculated.

  Valid in state-1 only.

  RANGE indicates that a subsequent CHPLOT, CHSURF, CHHIST, CHBAR, or CHBARX call will enter state-2, calculate the axis range, define the axes (if they have not already been defined), and return without plotting any data. (Note that the first plotting call always defines the axes, whether **RANGE** has been specified or not.)

  NORANGE indicates that a subsequent plotting call will plot the data, as normal.

- CHSET '**RISERS**' | '**NORISERS**'

  Controls whether steps of a histogram are delimited by riser lines.

  Valid in state-1 or state-2.

  RISERS specifies that lines perpendicular to the x axis are drawn at the ends of each histogram range. **NORISERS** suppresses the generation of intermediate histogram risers. The two outermost risers remain, joining the ends of the step to the x axis or datum reference line.

- CHSET '**SCALETOWER**' | '**NOSCALETOWER**'

  SCALETOWER specifies that a tower, whose height corresponds to the y axis, is to be constructed on the left-hand side of the x axis if the z axis slopes to the right, or on the right-hand side if it slopes to the left. The tower will be placed so that it appears to be constructed on the x-z plane.

  NOSCALETOWER specifies that a tower is not to be constructed.

- CHSET '**SIDE**' | '**NOSIDE**'

  SIDE specifies that the side plane is to be drawn on a tower chart. If this plane is present, an edge is always drawn round it, corresponding to the extremes of the axis. A grid can be drawn on this plane by using the GRID option of CHZSET.

  NOSIDE specifies that the side plane is not to be drawn.

- CHSET '**SPISLICE**' | '**SPILABEL**'

  Specifies the appearance of pie-chart labels. It determines whether the pie labels and spider lines are the same colors as the slice to which they are attached, or are controlled by CHKATT or CHVATT. **SPISLICE** and **SPILABEL** are effective only if slice values, or slice labels, or both are specified. Slice values are specified by CHSET('VALUES'), and slice labels are specified by CHKEY and CHSET('**SPIDER**').

  Valid in state-1 or state-2.

  SPISLICE draws the spider line and associated text (slice value, or label, or both) in the color of the corresponding slice. The character mode, symbol-set identifier, and character multiplier for the text are determined by CHKATT if CHSET('**SPIDER**') is in effect, by CHVATT otherwise.

  Note: The **SPISLICE** option was previously called **SPISECTOR**. Both names are valid; the abbreviation (**SPIS**) is the same for both names.

  SPILABEL draws the spider lines in the default color. The associated text attributes are those specified by CHKATT if CHSET('**SPIDER**') is in effect, by CHVATT otherwise.

- CHSET '**TLBREAK**' | '**NTLBREAK**'

  TLBREAK specifies that a semicolon in an axis title will cause a line break.

  NTLBREAK specifies that a semicolon in an axis title will not cause a line break.

- CHSET '**TOWERTICK**' | '**NOTOWERTICK**'

  TOWERTICK specifies that a tower is to have the major scale (tick) marks from the y axis copied on to it. This option allows the heights of the towers to be compared more easily. The scale marks are drawn in the background color. A solid shading pattern should be specified in the CHPAT call (see “CHPAT – Component shading pattern table” on

page 60) when this option is used so that the scale marks are clearly visible.

NOTOWERTICK specifies that scale marks are not to be copied.

- CHSET '**VINSIDE**' | '**VONTOP**'

  Controls the placement of values for bar charts. The values can appear either on top of or inside the bars. A CHSET('**CVALUES**') call is required if you specify one of these options.

  VINSIDE specifies that bar values are to be centered within each bar.

  VONTOP specifies that bar values are to be placed on top of the bars.

  Valid in state-1 or state-2.

- CHSET '**VSCIENTIFIC**' | '**VFIXED**'

  Controls the format of the values for bar charts and table charts. The values can appear either in scientific format or in fixed-point format. A CHSET('**CVALUES**') call is required if you specify one of these options.

  VSCIENTIFIC specifies that values are to appear in scientific format (for example, 1.3E+01).

  VFIXED specifies that values are to appear in fixed-point format (for example, 13).

  Valid in state-1 or state-2.

- CHSET '**XDUP**' | '**XNODUP**'
- CHSET '**YDUP**' | '**YNODUP**'

  These options specify that a duplicate of the primary axis is used as a secondary axis. By default this will give axes at both sides or ends of the graph.

  XDUP specifies that the primary x axis is duplicated.

  YDUP specifies that the primary y axis is duplicated.

  XNODUP specifies that the x axis is not duplicated.

  YNODUP specifies that the y axis is not duplicated.

  For pie charts and Venn diagrams, a duplicate axis specification is ignored.

  When a duplicate axis is specified, the secondary axis is used to support it. For this reason, certain items are copied into the secondary axis fields on entry to state-2 if the duplicate axis option is set. The following items are copied: axis range, scale mark positions, scale type (linear or logarithmic), scaling factor, and axis attributes (line type, width, and color). These supersede any corresponding items that may have been explicitly specified for the secondary axis. Also, the secondary axis grid lines option is suppressed to avoid redrawing grid lines.

- CHSET '**YVERTICAL**' | '**XVERTICAL**' | '**ZVERTICAL**'

  Specifies the orientation of *all* axes; also controls the orientation of multiple pie charts, and Venn diagrams. It is ignored for tower charts.

  YVERTICAL specifies that the y axis should be vertical and the x axis horizontal. **YVERTICAL** is the default and creates horizontal line graphs, and bar charts and histograms with vertical bars. Venn diagrams are arranged horizontally and pie charts in a horizontal line if there are more than one. Table charts have components (data groups) in columns vertically.

  XVERTICAL specifies that the x axis is to be vertical and the y axis horizontal. **XVERTICAL** creates vertical line graphs, and bar charts and histograms with horizontal bars. Venn diagrams are vertically aligned. Pie charts are arranged above one another if there are more than one. Table charts have components (data groups) in columns vertically.

  ZVERTICAL specifies that table charts have components (data groups) in rows horizontally. **All** other chart types are arranged as for **YVERTICAL**.

- CHSET '**ZPICK**' | '**XPICK**'

  ZPICK specifies that the color, pattern, and line types for each tower in a tower chart or each component (data group) on a table chart are to be picked from the attribute list, according to their positions on the z axis.

  XPICK specifies that the color, pattern, and line types for each tower in a tower chart or each x slice on a table chart are to be picked

from the attribute list, according to their positions on the x axis.

CHSSEG

Function: To set segment number.

CHSSEG (entity-type, id)	
APL code	717
PGF RCP code	X'100B0703' (269158147)

Parameters

entity-type *(specified by user) (fullword integer)*
The only value you can specify is 1, which means that a chart note is created in a separate segment with the specified identifier.

id *(specified by user) (fullword integer)*
Specifies the segment identifier to be used for the next chart note. After it has been used, the segment identifier is reset to zero. A value of zero resets any current nonzero value.

Description

Defines the segment identifier to be used by the Presentation Graphics routines (PGR) for the next chart entity (a chart note) that is drawn. The chart note is created in a separate segment with the specified identifier.

Valid in state-2 only.

Principal errors

```
ADM0503 E THIS FUNCTION CAN ONLY BE INVOKED
          IN THE CHART-DRAWING STATE
```

CHSTRT

Function: To reset the processing state to state-1.

CHSTRT	
APL Code	703
PGF RCP code	X'10110100' (269549824)

Parameters

None

Description

If issued in state-1, CHSTRT has the same effect as CHRNIT. It resets all chart-definition options and parameters to their default values.

If issued in state-2 (as is normally the case), CHSTRT resets the processing state to state-1, and resets the chart-definition options and parameters to their values just before the most recent transition from state-1 to state-2. Also causes the primary axes to become selected. Note that, because very few options can be set in state-2, CHSTRT usually leaves the settings as they stand.

CHSTRT may be used to plot a series of charts using the same (or similar) formats, without the overhead of respecifying the common format for each chart.

Principal errors

None

CHSURF

Function: To draw surface charts.

CHSURF	**(components, count, x-values, y-values)**
APL code	792
PGF RCP code	X'100D0A04' (269289988)

Parameters

components *(specified by user) (fullword integer)*
Specifies the number of data groups to be drawn; that is, the number of individual graph lines. Each data group has a new set of attributes.

count *(specified by user) (fullword integer)*
Specifies the number of data points in each data group.

x-values *(specified by user) (array of short floating-point numbers)*
Specifies the x values. Each data group uses the same set of x values. For example, if **count**=5, five values must be supplied.

y-values *(specified by user) (array of short floating-point numbers)*
Specifies the y values. One value must be supplied for each point to be plotted. For multiple data groups, the values must be stored sequentially by data group; that is, all values for the first data group, all values for the second (and subsequent) data group, for as many data groups as specified. Each data group must contain the number of values specified in the **count** parameter. The y values specified for each data group are associated in sequence with the x values supplied in the **x-values** parameter to give the (x,y) coordinate pairs to be plotted.

Description

Produces a surface chart on the currently selected axes.

A surface chart is, essentially, a shaded line graph without marker symbols. As in a line graph, each data group is drawn as a series of lines connecting the data points. Data group colors, shading patterns, line types, and line widths are determined by the current attribute tables. Surface charts are, in general, drawn with relative data and are often improved by curved lines. CHSET('RELATIVE') and CHSET('CURVE') control these aspects. Shading of the first component can be suppressed by calling CHSET('INFILL').

Valid in state-1 or state-2. If entered in state-1, the program changes to state-2.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0510 W LEGEND FORMAT MAY BE INCORRECT
ADM0511 W NOT ENOUGH ROOM TO DRAW ALL KEYS.
          ONE OR MORE WERE OMITTED
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0526 S LOGARITHMIC X OR Y AXIS RANGE
          CONTAINS A NON-POSITIVE VALUE
ADM0527 E NON-POSITIVE INTERCEPT ON
          LOGARITHMIC X OR Y AXIS
ADM0528 E X, Y, OR Z AXIS TICK INTERVAL TOO
          SMALL
ADM0529 W MAXIMUM OVERLAP EXCEEDED FOR A BAR
          CHART
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0534 W DATA LIES OUTSIDE THE X, Y, OR Z
          AXIS RANGE AND HAS NOT BEEN PLOTTED
ADM0535 E ZERO OR NEGATIVE DATA IS INVALID ON
          A LOGARITHMIC AXIS
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
```

```
ADM0545 E THE X, Y, OR Z AXIS HAS AN INVALID
          POWER OF 10 FOR TICK DEFINITION
ADM0546 E THE X, Y, OR Z AXIS RANGE EXCEEDS
          NUMERIC BOUNDS
ADM0557 W AXIS TITLE TRUNCATED ON RIGHT OF
          CHART
ADM0558 W AXIS TITLE TRUNCATED AT TOP OR
          BOTTOM OF CHART
ADM0560 E LOGARITHMIC X, Y, OR Z AXIS RANGE
          IS TOO SMALL
```

CHTATT

Function: To specify axis title text attributes.

CHTATT (count, array)	
APL code	736
PGF RCP code	X'10020902' (268568834)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of elements in **array**. If more than five elements are specified, the excess elements are ignored. If fewer than five, the remainder are unchanged from their previous setting. If zero is specified, all five defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of, at most, five fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set
   n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. (The default character size is the size of hardware characters for the device on which the chart will be displayed.) For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the basic. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width; 200 causes the height to be multiplied by twice the amount of the width.

Description

Overrides or reestablishes the default character appearance attributes used in displaying all axis titles on all the axes. You can use the CHXTAT and CHYTAT calls to change the axis-title attributes for the currently selected x or y axis.

The **defaults** are:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters) unless overridden by CHXTAT or CHYTAT.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHTERM

Function: To terminate the PG routines.

CHTERM

APL Code	705
PGF RCP code	X'10000100' (268435712)

Parameters

None

Description

Terminates the PG routines. The main action taken is to free any storage obtained on previous calls to the PG routines. CHTERM should be issued when the application program has no further requirement for PG routine services.

It is recommended, in addition, that CHTERM should normally be issued as soon as the final form of the chart has been constructed, and before ASREAD or FSFRCE is called to cause output to the device. This practice provides the most efficient use of storage. The next call to the PG routines (after return from ASREAD or FSFRCE) is treated as if it were the first call to the PG routines. CHTERM thus provides the same function as CHRNIT, except that it also releases all storage used by the PG routines.

Neither CHTERM nor CHRNIT clears charts from the page. Any further charts are added to the existing ones. Charts can be cleared by the GSCLR call, which is described in the *GDDM Base Application Programming Reference* book.

Valid in state-1 or state-2.

Principal errors

None

CHTHRS

Function: To set bar value threshold limit.

CHTHRS (n, array)

APL code	776
PGF RCP code	X'100B0A05' (269158917)

Parameters

n *(specified by user) (fullword integer)*
Must be 0 or 1. A 0 resets the parameter to the default of 0.

array *(specified by user) (array of short floating-point numbers)*
This parameter is an array of dimension **n**. If **n** is 1, it is a single-element array that

specifies the threshold limit; if **n** is 0 it is ignored. The value is a percentage of the y-axis range. For example, if the y-axis range is 0 through 20 and the number in **array** is a threshold limit of 50 (percent), any bar value that is 10 or less (50% of 20) is not drawn.

Description

Specifies the minimum bar size for which a bar value will be displayed. If the data value of a bar is less than this limit, the bar value is not drawn. The CHSET('CVALUES') and CHSET('VINSIDE') options have to be specified if this call is to take effect.

Valid only in state-1.

Principal errors

```
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHTOWR

Function: To plot a tower chart.

CHTOWR (n, z-count, x-count, z-list, x-list, data-array)	
APL code	785
PGF RCP code	X'100D0A09' (269289993)

Parameters

n *(specified by user) (fullword integer)*
Reserved; must be 1.

z-count *(specified by user) (fullword integer)*
The number of data groups (components) to be shown along the z axis. The tower for each data group will have new attributes as indicated by the appropriate chart-attributes tables.

x-count *(specified by user) (fullword integer)*
The number of data values to be shown along the x axis (that is, the number of towers in each data group). All the data groups must have the same number of towers.

z-list *(specified by user) (array of short floating-point numbers)*
The list of z values to be used along the z axis. Each group of towers is constructed at the positions indicated by these values.

x-list *(specified by user) (array of short floating-point numbers)*
The list of x values to be used along the x axis. Each group of towers is constructed at the positions indicated by these values.

data-array *(specified by user) (array of short floating-point numbers)*
An array that contains the values for the heights of the towers. The values to be used correspond to the number specified in the **z-count** parameter multiplied by the number in the **x-count** parameter. For example, if **data-array** contained 16 values, **x-count** was 5, and **z-count** was 3, the number of towers displayed would be 15.

Description

Draws a tower chart, which is, in effect, a three-dimensional bar chart with a numeric x axis. In addition to the x and y axes, tower charts have a z axis.

The towers are arranged on a regular horizontal grid that is represented by x and z axes; the vertical axis is the y axis. The chart is constructed using an oblique projection; the x axis remains horizontal, the y axis remains vertical, and the z axis is drawn “into” the display screen at a user-defined angle that is specified in the CHTPRJ call (see “CHTPRJ – Tower chart projection” on page 83).

When text is placed on the chart, it is by default aligned so that it appears either vertically or horizontally, and not parallel to the related axis. You can rotate text from this position by using CHNATT, CHXLAT, CHYLAT, or CHZLAT calls.

Several options from the CHSET call can be used with the CHTOWR call. The SCALETOWER option draws a dummy tower at the side of the

chart to enable the scale of the y axis to be assessed. The TOWERTICK option draws lines around the towers at the major y-axis tick marks values. The XPICK and ZPICK options select the colors, shading patterns, and types of outline for the towers from the three attribute lists, according to their order along either the x axis (XPICK) or the z axis (ZPICK). Refer to "CHSET – Specify chart options" on page 68 for the full details of this call.

By default, the CHTOWR call constructs a back and side wall on which can be drawn grid lines for the x, y, and z axes (by using the GRID option of the CHXSET, CHYSET, and CHZSET calls, respectively). The NOBACK and NOSIDE options of the CHSET call suppress the back and side walls. The CHZSET call (see "CHZSET – Z-axis options" on page 115) enables options to be specified applicable only to the z axis.

The CHZDLB call (see "CHZDLB – Z-axis data labels" on page 112) allows the z axis to be labeled; the CHXDLB call (see "CHXDLB – X-axis data labels" on page 89) does the same for the x axis.

The CHXRNG, CHYRNG, and CHZRNG calls allow the ranges of axes to be specified, overriding the default scheme. Similarly, the CHXTIC, CHYTIC, and CHZTIC calls allows the user's own tick marks to be specified.

The CHGAP call (see "CHGAP – Spacing between bars" on page 39) allows the user to specify how the towers are spaced along the x axis; the CHZGAP call (see "CHZGAP – Spacing between towers" on page 112) controls the spacing in the direction of the z axis.

Valid in state-1 only.

Principal errors

```
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0510 W LEGEND FORMAT MAY BE INCORRECT
ADM0511 W NOT ENOUGH ROOM TO DRAW ALL KEYS.
          ONE OR MORE WERE OMITTED
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0514 W LABEL(S) OMITTED ON X, Y, OR Z AXIS
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0526 S LOGARITHMIC X OR Y AXIS RANGE
          CONTAINS A NON-POSITIVE VALUE
ADM0527 E NON-POSITIVE INTERCEPT ON
          LOGARITHMIC X OR Y AXIS
ADM0528 E X, Y, OR Z AXIS TICK INTERVAL TOO
          SMALL
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
ADM0532 E COMPONENT PARAMETER LESS THAN ZERO
          OR COUNT PARAMETER LESS THAN ONE
ADM0534 W DATA LIES OUTSIDE THE X, Y, OR Z
          AXIS RANGE AND HAS NOT BEEN PLOTTED
ADM0535 E ZERO OR NEGATIVE DATA IS INVALID ON
          A LOGARITHMIC AXIS
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0545 E THE X, Y, OR Z AXIS HAS AN INVALID
          POWER OF 10 FOR TICK DEFINITION
ADM0546 E THE X, Y, OR Z AXIS RANGE EXCEEDS
          NUMERIC BOUNDS
ADM0557 W AXIS TITLE TRUNCATED ON RIGHT OF
          CHART
ADM0558 W AXIS TITLE TRUNCATED AT TOP OR
          BOTTOM OF CHART
ADM0560 E LOGARITHMIC X, Y, OR Z AXIS RANGE
          IS TOO SMALL
ADM0566 E CHDRAX NOT ALLOWED WITH CURRENT
          CHART TYPE
ADM0573 W SMALLEST GAP RATIO IS 0 FOR TOWER
          CHARTS
```

CHTPRJ

Function: To specify tower chart projection.

CHTPRJ	**(projection, option-count, option-start, options)**
APL code	720
PGF RCP code	X'10160100' (269877504)

Parameters

projection *(specified by user) (fullword integer)*
The type of projection to be used. Must be 1, indicating an oblique projection.

option-count *(specified by user) (fullword integer)*
Specifies the length of the array given in the **options** parameter. The maximum is 2.

option-start *(specified by user) (fullword integer)*
Specifies the starting point in the array given in the **options** parameter. Options before this point in the array remain unchanged; options after this point in the array are affected by the meaning of the value specified in the **options** parameter.

options *(specified by user) (array of short floating-point numbers)*
Specifies the angle of projection and the scale value to be used. Defaults are applied if the number of options specified is greater than that specified in the **option-count** parameter. The default angle is 45 degrees and the default scale is 1. The options are:

Angle Specifies the angle (in degrees, moving counterclockwise) between the x and z axes. The value must be from 0 through 180. Values from 5 through 85 or 95 through 175 are recommended. Other values are permitted but do not produce such acceptable results.

Scale Specifies the length of the z axis in relation to the length of the x axis. A value of 2 (for example) means that the z axis is to be twice as long as the x axis.

Description

Overrides the default or current projection angle and scale of the z axis for the next tower chart that is plotted. The default is that the z axis is drawn at 45 degrees to the x axis, and that one z-axis unit is the same as one unit on the x axis.

Valid only in state-1.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
ADM0570 E INVALID PROJECTION NUMBER GIVEN
```

CHVATT

Function: To specify attributes of values text in bar and pie charts.

CHVATT (count, array)	
APL code	769
PGF RCP code	X'10020906' (268568838)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of elements in **array**. If more than six elements are specified, the excess elements are ignored. If fewer than six, the remainder are unchanged from their previous setting. If zero is specified, all six defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of, at most, six fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or 3, the identifier denotes:

   0 the default character set

n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical character sizes are multiplied by this factor before the characters are drawn. The default character size is the size of the hardware character for the device. For example, if the character-size multiplier is 200 and mode 3 characters are being used, they are drawn twice as large as normal. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width; 200 causes the height to be multiplied by twice the amount of the width.

   CHSET('CVALUES') must be specified for this option to take effect.

6. Bar-value rotation

   Bar values can be inclined away from the horizontal. This element must have a value from –9000 through +9000. This number is divided by 100 to give a value from –90 through +90, which is the angle, in degrees, to the horizontal at which bar values will be drawn. The default is zero. When positive, the angle is in a counterclockwise direction. When negative, it is in a clockwise direction.

   CHSET('CVALUES') must be specified for this option to take effect.

Description

Overrides or reestablishes the default character-appearance attributes used for data values on bar charts, or percentage values on pie charts, or values (but not labels) on table charts. These values are only shown if CHSET('CVALUES') or CHSET('VALUES') has been specified.

See CHSET('SPISLICE') for a description of how CHVATT applies to pie chart spider labels.

By **default**, the attributes are as follows:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Bar-value rotation	0	

Valid in state-1 only.

Principal errors

```
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
ADM0569 E INVALID ANGLE OF ROTATION
```

CHVCHR

Function: To specify number of characters in bar values.

CHVCHR (number)	
APL code	767
PGF RCP code	X'10020616' (268568086)

Parameters

number *(specified by user) (fullword integer)*
The maximum number of value characters that are displayed at the end of each bar of a bar chart. This **includes** the minus sign, decimal point character, and separator characters for 10**3 and 10**6 positions, if present. If a value cannot be displayed in this number of characters, asterisks will replace it.

The default value is 9, and the maximum is 15. Because the 15-character maximum includes the sign, decimal point, and possibly a signed exponent, the maximum number of digits displayed will be eight.

If the number of characters specified does not fit across the bar, and character mode 3 is specified for the value text, the character box width or height is adjusted to force a fit. Note that this may produce very small mode 3 characters.

In general, the PG routines involved use the minimum number of characters needed to distinguish between different bar values. The format used is similar to those of the matching y-axis labels.

Description

Overrides the default maximum number of characters used for displaying the value on each bar of a bar chart and the values in a table chart if CHSET('VALUES') is specified. Value text attributes are controlled by CHVATT.

The default maximum is 9.

Valid in either state-1 or state-2.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHVDIG

Function: To set decimal digits for bars and tables.

CHVDIG (n)	
APL code	774
PGF RCP code	X'100B0A04' (269158916)

Parameters

n *(specified by user) (fullword integer)*
The number of decimal digits that are to be shown. The default is 2.

Description

Indicates the number of decimal digits that are to be shown after the decimal point in each value on bar charts and table charts. The CHSET('CVAL') option must be specified for this call to take effect.

Valid in state-1 or state-2.

Principal errors

```
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHVENN

Function: To draw a Venn diagram.

CHVENN (population1, population2, overlap)	
APL code	797
PGF RCP code	X'100D0A05' (269289989)

Parameters

population1 *(specified by user) (short floating point)*
A short floating-point number specifying the size of the set represented by the area of the first circle. May not be negative.

population2 *(specified by user) (short floating point)*
A short floating-point number specifying the size of the set represented by the area of the second circle. May not be negative.

overlap *(specified by user) (short floating point)*
A short floating-point number specifying the size of the intersection of the two population sets, represented by the area of overlap of the two circles. Must be less than or equal to the **smaller** of **population1** or **population2**. May not be negative.

Description

Draws a Venn diagram.

Two circles are drawn within the plotting area, proportional in area to the **population1** and **population2** data values supplied, and positioned in such a way that the area of their overlap is proportional to the **overlap** parameter supplied.

The centers of the circles may be aligned horizontally or vertically with the first circle to the left or at the top respectively. Alignment specifications are controlled by the CHSET option YVERTICAL (default horizontal alignment) or XVERTICAL (vertical alignment).

Three labels corresponding to the three populations can be specified by CHKEY; their attributes are controlled by CHKATT. The labels are constructed in the chart margins. If fewer than three labels are specified, only those specified appear. If more than three are specified, only the first three are used.

When the circles are arranged horizontally, the label for the first area is to the left, the label for the second area is to the right, and the label for the area of overlap is below the overlapping area. The labels are joined to the areas by straight lines. If no overlap exists, the third label does not appear.

When the circles are arranged vertically, the first label is above, the second label is below, and the third label is to the left of the circles.

Each circle is shaded and colored, based on current settings of the attribute tables and the CHSET shading-option setting. The intersection merges the two shading patterns and mixes the two color settings. Because color mixing is used for Venn diagrams (and only Venn diagrams), CHSET('CBACK') should not be specified for a Venn diagram. Color- and shading-attribute tables can be changed by CHCOL and CHPAT.

Only one Venn diagram may be produced at a time. Subsequent invocations of this call in state-2 produces an error message.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0502 E PICTURE SPACE AND CHAREA ARE
          INCOMPATIBLE
ADM0504 E MARGINS EXCEED AVAILABLE CHART AREA
ADM0512 W HEADING TEXT EXCEEDS AVAILABLE
          SPACE AND HAS BEEN TRUNCATED
ADM0525 W CHARACTER SIZE IS TOO LARGE FOR THE
          CHART
ADM0541 E VENN DIAGRAM POPULATION OR OVERLAP
          IS TOO SMALL
ADM0542 E VENN DIAGRAM OVERLAP EXCEEDS ONE OF
          THE POPULATIONS
ADM0543 S INCOMPATIBLE MIXTURE OF CHART TYPES
ADM0544 S STORAGE LIMIT EXCEEDED
ADM0559 W INSUFFICIENT SPACE FOR VENN LABEL
          IN MARGIN
```

CHVMAR

Function: To specify vertical margins.

CHVMAR (leftmar, rightmar)	
APL code	725
PGF RCP code	X'10020613' (268568083)

Parameters

leftmar *(specified by user) (fullword integer)*
Fullword integer specifying the number of character columns at the left-hand side of the plotting area.

rightmar *(specified by user) (fullword integer)*
Fullword integers specifying the number of character columns at the right-hand side of the plotting area.

Description

Overrides the default size of the chart margins, and therefore the size of the plotting area also. The margin control sizes are specified in terms of character grid columns, where the character grid is defined by CHCGRD, or is defaulted (the default is the hardware character size of the device on which the chart is displayed or printed).

By **default**, the vertical margins are ten character columns on each side of the plotting area.

CHVMAR can be used to enlarge the margins to give more room for the legend, or to reduce them to give more room to the chart.

See “CHHMAR – Horizontal margins” on page 44 for details on horizontal margins.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

CHXDAY

Function: To specify x-axis day labels.

CHXDAY (day)	
APL code	752
PGF RCP code	X'1002060B' (268568075)

Parameters

day *(specified by user) (fullword integer)*
A fullword integer that identifies the day to be associated with the first major scale mark. Valid values are 1 through 7. Monday is day 1.

Description

Specifies uppercase day labels for the x axis. The specified day is associated with the first major scale mark position. Each successive day is assigned to the next major mark. The labels are normally 3-letter abbreviations, but a CHSET option is available to change this; see CHSET('ABREV').

This call implicitly sets the corresponding label type to 'DATE'.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0505 E INVALID PARAMETER: a
```

CHXDLB

Function: To specify x-axis data labels.

CHXDLB (n1, n2, x-array, lab-array)	
APL code	773
PGF RCP code	X'10020505' (268567813)

Parameters

n1 *(specified by user) (fullword integer)*
Specifies the number of values in **x-array** and the number of labels in **lab-array**.

n2 *(specified by user) (fullword integer)*
Specifies the length of each x-axis label in the **lab-array** parameter.

x-array *(specified by user) (array of short floating-point numbers)*
Specifies the x-axis value that corresponds to a scale-mark value.

lab-array *(specified by user) (character)*
Specifies an array of labels in the form of character strings.

Description

Specifies user-provided data labels for the x axis.

When a label is to be associated with a major scale mark on the x axis, the **x-array** parameter of CHXDLB is searched for a value that corresponds to the scale-mark value. If such a value is found, the corresponding label from the **lab-array** parameter is drawn at the scale mark. An **x-array** value is considered to correspond to a scale-mark value if it is the nearest value (either greater than or less than) to the scale-mark value, and if it lies within 10% of the scale-mark interval of the scale-mark value. If two **x-array** values are the same distance from the scale-mark value, the first **x-array** value is used.

Valid only in state-1.

Principal errors

```
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
ADM0550 E INSUFFICIENT STORAGE AVAILABLE
```

CHXDTM

Function: To specify x-axis datum line.

CHXDTM (xvalue)	
APL code	755
PGF RCP code	X'100E060D' (269354509)

Parameters

xvalue *(specified by user) (short floating point)*
Short floating-point number giving the x-axis value through which the datum line passes.

Description

Specifies an x datum line relative to the currently selected x axis. The **xvalue** must lie within the axis range.

The x datum lines are drawn parallel to the y axis with **xvalue** specifying the point of intersection with the x axis.

The color, line type, and line width are controlled by the current datum-line attribute values, which may be specified by CHDATT.

In **state-1**, the call results in the specification of a datum line to be constructed when the axis is constructed. **If a y datum line is specified (see "CHYDTM – Y-axis datum line" on page 101), it is also the line used in place of the axis for all shaded charts. It also acts as a baseline for bars of bar charts or risers of histograms**.

If more than one call is made in state-1, the most recent is used.

In **state-2**, the call results in the immediate construction of a datum line. More than one datum line can be added in state-2. Such lines have no effect on the shading of charts.

In the ICU, a datum line created in state-1 is called a reference line.

Principal errors

```
ADM0530 E A SELECTED AXIS HAS NOT BEEN
          GENERATED
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
```

CHXINT

Function: To specify x-axis interception point.

CHXINT (x)	
APL code	741
PGF RCP code	X'100A0603' (269092355)

Parameters

x *(specified by user) (short floating point)*
Short floating-point number specifying the x-axis interception point.

Description

Specifies the interception point for the currently selected x axis. (Primary axes are selected by default.)

CHXINT positions the y axis by giving the position on the x axis at which the y axis should cross it. (CHYINT positions the x axis by giving the position on the y axis where the x axis should cross.) CHXINT is only brought into effect if CHYSET('INTERCEPT') is also specified. CHXINT is ignored for pie charts, tower charts, and Venn diagrams.

If the interception value is outside the range when the axis is to be constructed, the range is extended to include it. Note that interception values for logarithmic axes must be positive, and nonzero.

If CHXSET('INTERCEPT') is specified and CHXINT is not used, a default interception value of 0 is assumed.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
```

CHXLAB

Function: To set x-axis label text.

CHXLAB (count, length, text)	
APL code	748
PGF RCP code	X'10020503' (268567811)

Parameters

count *(specified by user) (fullword integer)*
Fullword binary integer specifying the number of labels supplied. A specification of zero suppresses the labels.

length *(specified by user) (fullword integer)*
Fullword binary integer specifying the number of characters associated with each label. All labels must be the same length. Each label is centered on the corresponding axis position (scale-mark position, or point mid-way between scale-mark positions). Centering occurs after any trailing null (X'00') characters have been deleted. Therefore, the effect of varying-length labels can be obtained by using nulls as padding characters to extend each label to the standard length.

text *(specified by user) (character)*
An EBCDIC character string that contains all of the labels, in order of use. The total length of the string must not exceed 32000 characters.

Description

Specifies alphanumeric labels as a sequence of EBCDIC text strings. The labels are placed, in sequence, at major scale marks on the currently selected x axis, starting with the scale mark with the algebraically lowest value. If the number of labels specified is less than the number of major scale marks on the axis, the sequence of labels is reused as necessary until each scale mark is associated with a label.

CHXLAB may also be used for assigning a title to each pie of a pie chart.

Semicolons can be used to cause line breaks in the labels.

This call implicitly causes a call to CHXSET('ALPHANUMERIC') and causes a logarithmic-axis type specification to be ignored.

CHSET('BLABEL') can be used to clear the areas to be occupied by labels, before labels are written.

The label text attributes can be set by CHLATT.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
```

CHXLAT

Function: To set x-axis label attributes.

CHXLAT (count, array)	
APL code	711
PGF RCP code	X'10020907' (268568839)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of elements in **array**. If more than six elements are specified, the excess elements are ignored. If fewer than six, the remainder are unchanged from their previous setting. If zero is specified, all six defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of, at most, six fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set
   n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the basic size set by CHCGRD. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

6. Axis-label rotation

When axis-label rotation is requested, each label is written at the specified angle to the horizontal. Label rotation is indicated by specifying a non-zero value in this element. The value must be from –9000 through +9000. This number is divided by 100 to give a value from –90 through +90, which is the angle, in degrees, to the horizontal at which the labels will be drawn. The default is zero. When positive, the angle is in a counterclockwise direction. When negative, it is in a clockwise direction.

Description

Establishes the default character-appearance attributes to be used in displaying labels for the currently selected x axis.

By **default**, the attributes are as follows:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Label rotation	0	

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHXMTH

Function: To specify x-axis month labels.

CHXMTH (month)	
APL code	750
PGF RCP code	X'10020609' (268568073)

Parameters

month *(specified by user) (fullword integer)*
A fullword integer that identifies the month to be associated with the first scale mark. Valid values are 1 through 12. January is month 1.

Description

Specifies English language, uppercase month labels for the currently selected x axis. The specified month is associated with the first major scale-mark position. Each successive month is assigned to the next major mark. The labels are normally 3-letter abbreviations, but a CHSET option is available to change this; see CHSET('ABREV').

This call implicitly sets the corresponding label type to 'DATE'.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0505 E INVALID PARAMETER: a
```

CHXRNG

Function: To specify x-axis explicit range.

CHXRNG (x1, x2)	
APL code	739
PGF RCP code	X'100A0601' (269092353)

Parameters

x1 *(specified by user) (short floating point)*
Short floating-point number specifying the data value at the start point of the x axis. For a horizontal x axis, the start-point data value is at the left. For a vertical x axis, the start-point data value is at the top.

x2 *(specified by user) (short floating point)*
Short floating-point number specifying the data value at the end point of the x axis. For a vertical x axis, the end-point data value is at the bottom. For a horizontal x axis, the end-point data value is at the right.

Description

Specifies explicitly the range of the currently selected x axis. If the range is not specified or is specified as (n,n) (with lower- and upper-limit values identical), autoranging applies to the axis. In general, the second parameter is greater than the first, but you may switch the direction of the axis by reversing the order of the parameters. Note that logarithmic axis ranges must have positive, nonzero values.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
```

CHXSCL

Function: To specify x-axis scale factor.

CHXSCL (scale-factor)	
APL code	745
PGF RCP code	X'10020607' (268568071)

Parameters

scale-factor *(specified by user) (short floating point)*
A short floating-point number acting as a scaling factor for each label to be generated. The value associated with each major scale mark is first multiplied by **scale-factor**. For example, if the value is 7000 and the factor is 0.001, the resulting label is 7. The value must be greater than zero.

Description

Specifies a scale factor for numeric labels on the currently selected x axis. The call specifies that, when labels are generated from numeric values, the values should be multiplied by the scale factor before the labels are generated. This enables superfluous zeros to be suppressed. Scale factors are ignored for alphanumeric and date labeling.

If a scaling factor is specified, it may be useful to include a notation in the axis title describing its use. For example, if the scaling factor is 0.001 and the data is in dollars, the axis title might be “Thousands of Dollars.”

Valid only in state 1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

CHXSEL

Function: To specify x-axis selection.

CHXSEL (axis-number)	
APL code	731
PGF RCP code	X'100F0801' (269420545)

Parameters

axis-number *(specified by user) (fullword integer)*
A fullword integer specifying the axis number to be selected. The integer must be 1 for the primary axis, or 2 for the secondary axis. The default is 1.

Description

Overrides the default axis selection to select the primary or secondary x axis. By default, the primary axis is selected.

The selected axis is that against which data is plotted by the plotting routines CHPLOT, CHSURF, CHHIST, and CHBAR.

In addition, CHXSET options and calls to CHXRNG, CHXTTL, CHXTIC, CHXINT, CHXSCL, CHXLAB, CHXMTH, and CHXDAY apply to the selected axis.

Valid in state-1 or state-2.

Principal errors

```
ADM0506 E INVALID AXIS SELECTION VALUE
```

CHXSET

Function: To specify x-axis options.

CHXSET (option)	
APL code	733
PGF RCP code	X'10020401' (268567553)

Parameters

option *(specified by user) (4-byte character string)*
The option string must be at least four characters long and must be enclosed in single quotes. If more than four characters are specified, they are ignored. However, they can be used to increase the readability of the program.

The options are as follows, in alphabetic order by function; the defaults are shown **LIKE THIS**:

Function	Option
Axis, drawn or not	**AXIS** **NOAXIS**
Axis, intercept	**LOWAXIS** **MIDDLE** **HIGHAXIS** **INTERCEPT**
Axis, title position	**ATCENTER** **ATEND** **ATABOVE**
Grid drawn or not	**GRID** **NOGRID**
Label position	**LABADJACENT** **LABMIDDLE** **NOLAB**
Label, punctuation	**PGFS** **NPGFS**
Label, type of	**NUMERIC** **ALPHANUMERIC** **DATE**
Scale, linear or logarithmic	**LINEAR** **LOGARITHMIC**
Tick mark, style	**NTICK** **PTICK** **XTICK** **PLAIN**
Zero forced into autorange	**FORCEZERO** **NOFORCEZERO**

Description

Controls how the lines on the currently selected x axis are drawn when the chart is constructed.

Note: Only one option can be used per call. For example, if the x axis is to be logarithmic and to have no tick marks, enter the following:

```
CALL CHXSET('LOGA')
CALL CHXSET('PLAIN')
```

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0505 E INVALID PARAMETER: a
```

CHXSET Options

The groups of CHXSET options are listed below in alphabetic order by option:

- '**ATCENTER**' | '**ATEND**' | '**ATABOVE**'

  Control the positioning or justification of the titles, or both, for the currently selected axis.

  ATCENTER specifies that the axis title should be centered along the axis.

  ATEND specifies that the axis title should be right-justified for a horizontal axis and justified to the top for a vertical axis.

  ATABOVE provides for placing the title above the vertical axis.

  For a horizontal axis, the **ATABOVE** specification is equivalent to **ATEND**.

  When both primary and secondary vertical axes are employed, and the titles are positioned above them, overlap may occur, depending on the distance between the axes and the title lengths. Note also that an '**ATABOVE**' title may overlap horizontal axis labels and scale marks if the horizontal axis is at the top of the chart.

- '**AXIS**' | '**NOAXIS**'

  Control whether the currently selected axis lines will be drawn when the chart is constructed.

  On a table chart, it controls whether the primary grid will be drawn.

  AXIS specifies that the axis line is to be drawn.

  NOAXIS specifies that the axis line should not be drawn. The axis title will not be suppressed, nor will the scale marks and labels, unless they have been suppressed by other options.

- '**FORCEZERO**' | '**NOFORCEZERO**'

  If autoranging applies, these options specify whether the range is to be extended, if necessary, to include zero.

  FORCEZERO specifies that the axis range is to be extended to include zero, if the range of the data does not. This option is ignored for bar-chart x axes, for logarithmic axes, and for axes whose range is explicitly specified by CHXRNG calls.

  NOFORCEZERO suppresses the forced inclusion of zero in the range.

- '**GRID**' | '**NOGRID**'

  Specify whether grid lines are to be constructed.

  CHXSET controls grid lines perpendicular to the x axis. On a table chart, it controls both vertical and horizontal grid lines. Grid lines are constructed at the same time as their associated axes. Grid lines are positioned on major tick marks, whose positions are controlled by CHXTIC calls. The attributes of the grid lines are controlled by CHGATT.

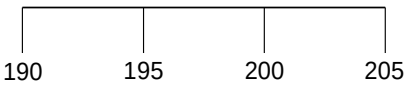
  GRID specifies that grid lines are to be constructed when the axis is constructed.

  NOGRID specifies that grid lines are not required.

- '**LABADJACENT**' | '**LABMIDDLE**' | '**NOLAB**'

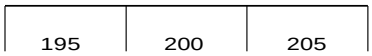
  Specify label position for the currently selected x axis. This call controls the positioning of labels with respect to the major scale marks.

  LABADJACENT centers the label on the major scale-mark position, thus:



  LABMIDDLE places the label between the major scale mark it is associated with and the *preceding* one. (The label that would normally

be adjacent to the first mark on the axis is omitted.) The label is centered on the point midway between the two scale marks as shown below. This option is ignored for logarithmic axes.



NOLAB specifies that no labels are to be constructed for the corresponding axis.

- '**LINEAR**' | '**LOGARITHMIC**'

  Specify whether the axis scale is linear or logarithmic (base 10). The x axis of a bar chart is forced to be linear even if it is specified as logarithmic.

  A logarithmic specification is ignored unless the axis label type is numeric. In particular, a logarithmic specification is ignored if alphanumeric labels are specified via CHXLAB.

- '**LOWAXIS**' | '**MIDDLE**' | '**HIGHAXIS**'

  LOWAXIS positions the selected axis at the bottom or left-hand side of the plot area.

  MIDDLE positions the selected axis in the middle of the plot area.

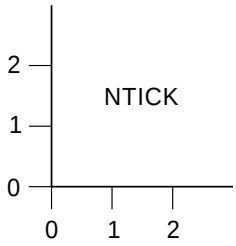
  HIGHAXIS positions the selected axis at the top or right-hand side of the plot area.

  INTERCEPT indicates that the position of the selected axis will be controlled by the CHXINT (or CHYINT) call referring to the other selected axis. CHXSET is used with CHYINT, and CHYSET with CHXINT. If the appropriate CHXINT call is not made, an intercept value of 0 is assumed.

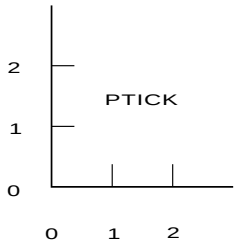
- '**NTICK**' | '**PTICK**' | '**XTICK**' | '**PLAIN**'

  Specify whether tick marks are to be drawn on the axis and, if so, the style of drawing. The options apply to both major and minor scale marks on the currently selected x axis.

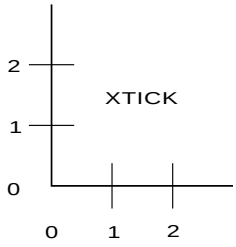
  NTICK draws scale marks from the x axis in the negative direction of the y axis, as shown below. The positive direction of an axis is that defined by movement from the end of the axis with the algebraically lower value to the end with the algebraically higher value. The negative direction is the opposite. **NTICK** is recommended for the x axis of shaded bar charts and histograms to avoid obscuring the scale marks by the shading (assuming the default axis orientation and positions).



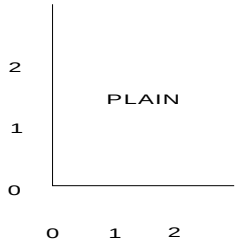
PTICK reverses the scale-mark direction from that described for **NTICK**:



XTICK draws scale marks perpendicular to the axis and crossing it, projecting equally on each side:



PLAIN indicates that the axis is to be constructed without scale marks:



Note: '**NTICK**' is the default for primary axes, and '**PTICK**' for secondary axes.

- '**NUMERIC**' | '**ALPHANUMERIC**' | '**DATE**'

  Specify the labeling method used for the currently selected axis.

  NUMERIC specifies that a label is to be generated automatically for each major scale mark. The label is an EBCDIC representation of the numeric value along the axis defining the scale mark. The representation may be in fixed- or floating-point format. If in fixed-point format, the application program may control the format by means of CHSET or CHXSET('**NPGFS**') and CHSET or CHXSET('**PGFS**') calls, and the scaling by using CHXSCL.

  ALPHANUMERIC specifies that each interval on the axis represents an item described by a label provided by a CHXLAB call. **ALPHANUMERIC** is implicitly set by a CHXLAB call.

  DATE implies that each interval on the axis is associated with a month of the year or a day of the week as specified by calls to CHXMTH or CHXDAY. **DATE** is implicitly set by these calls.

  If **ALPHANUMERIC** or **DATE** is specified, any logarithmic-axis type specification is ignored; the axis is forced to be linear.

  Note that all forms of labels correspond one-for-one with the major scale marks. The spacing of such marks along an axis is controlled by CHXTIC.

- '**PGFS**' | '**NPGFS**'

  Specifies the method used on the x axis to punctuate numbers of 1,000 and over except on table charts, where it has no effect. The convention is used for the displaying numeric data values in fixed-point format.

  PGFS suppresses all punctuation except the decimal point. This minimizes the space required for numeric values, for example: `1234567.999`

  NPGFS selects the default national convention that may be specified when GDDM is installed. Widely used conventions are:

  – The period decimal convention. Example: 1,234,567.999

  – The comma decimal convention. Example: 1.234.567,999

  – The French convention. Example: 1 234 567,999

  Valid in state-1 or state-2.

CHXTAT

Function: To set x-axis title attributes.

CHXTAT (count, array)	
APL code	713
PGF RCP code	X'10020909' (268568841)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of elements in **array**. If more than five elements are specified, the excess elements are ignored. If fewer than five, the remainder are unchanged from their previous setting. If zero is specified, all five defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of at most five fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2

3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set
   n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. (The default character size is the size of hardware characters for the device on which the chart will be displayed.) For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the basic. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

Description

Establishes the default character-appearance attributes to be used in displaying titles for the currently selected x axis.

The **defaults** are:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHXTIC

Function: To specify x-axis scale mark interval.

CHXTIC (major, minor)	
APL code	743
PGF RCP code	X'100A0605' (269092357)

Parameters

major *(specified by user) (short floating point)*
Specifies the interval between major scale marks. If zero, the default action is taken. Linear and logarithmic axes are treated differently.

Linear axes

Linear axes can have both minor and major scale marks. The major scale marks are placed at the interval specified by **major**.

Logarithmic axes

Logarithmic axes, if they have any major scale marks, **always** have them at powers of 10. CHXTIC is used to define extra tick marks between the powers of ten.

Only the high-order digit of the parameter has any effect. The high-order digit specifies at which multiples of power of 10 extra marks should be drawn.

Assume a logarithmic axis with a range of 1 through 100 (remember, there is no 0 on a logarithmic axis). Tick marks are placed at the points shown in the table:

CHXTIC value	**Major scale-mark points (assuming an axis range of 1 to 100)**
0	'1,10,100'
1	'1,2,3,4,5,6,7,8,9,10,20,30,40, 50,60,70,80,90,100'
2	'1,2,4,6,8,10,20,40,60,80,100'
3	'1,3,6,9,10,30,60,90,100'
4	'1,4,8,10,40,80,100'
5	'1,5,10,50,100'
6	'1,6,10,60,100'
7	'1,7,10,70,100'
8	'1,8,10,80,100'
9	'1,9,10,90,100'
10	'1,2,3,4,5,6,7,8,9,10,20,30,40, 50,60,70,80,90,100'

Method of determining logarithmic scale marks: If marks are required on a logarithmic axis, each power of 10 receives a major mark, and additional intermediate major marks are placed at a frequency corresponding to the high-order digit (base 10) of the major interval specification. This correspondence is as follows. If the digit is n, major marks are placed, in the interval between 10**i and 10**(i+1), at each point defined by the following equation:

```
P=j*n*10**i
```

for j=1, 2, 3, ... 9, if (j*n)<10

For logarithmic-axis scale marks, each power-of-ten scale mark is labeled in full. Intermediate scale marks are labeled with a digit in the range 2 through 9. This is the multiplication factor that must be applied to the immediately lower power-of-ten label to derive the value of the scale mark.

minor *(specified by user) (short floating point)*
Specifies the **number** of minor marks between major marks. If zero, no minor marks are drawn. Minor marks may be specified even though major marks are automatically generated (by means of major=0). The maximum number of minor marks that can be specified is 2048.

Minor marks are drawn half the length of major marks. Minor marks are never drawn for logarithmic axes, so the parameter is ignored.

Description

Overrides the default positions of major and minor scale marks (also known as tick marks) on the currently selected x axis. CHXTIC is ignored for bar charts.

By **default**, the interval on a linear axis is 1, 2, or 5 multiplied by some power of ten. Minor marks are never generated for logarithmic axes.

The **default** for logarithmic axes places a major mark at each power of 10 over the range of the axis; for example: 1, 10, 100, 1000 (and so on). Because minor marks cannot be generated for logarithmic axes, **minor** specifications are ignored.

The above default actions are taken if no CHXTIC call is issued.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHXTTL

Function: To set x-axis title specification.

CHXTTL (length, text)	
APL code	737
PGF RCP code	X'10020501' (268567809)

Parameters

length *(specified by user) (fullword integer)*
A fullword integer specifying the number of characters in the title. A length of zero suppresses the title. The length must not exceed 32000.

text *(specified by user) (character)*
Specifies the EBCDIC character string to be used as a title.

Description

Specifies a title for the currently selected x axis. Semicolons can be used to force line breaks if CHSET ('TLBREAK') is set.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
```

CHYDAY

Function: To specify y-axis day labels.

CHYDAY (day)	
APL code	753
PGF RCP code	X'1002060C' (268568076)

Parameters

day *(specified by user) (fullword integer)*
A fullword integer that identifies the day to be associated with the first major scale mark. Valid values are 1 through 7. Monday is day 1.

Description

Specifies uppercase day labels for the y axis. The specified day is associated with the first major scale mark position. Each successive day is assigned to the next major mark. The labels are normally 3-letter abbreviations, but a CHSET option is available to change this; see CHSET('ABREV').

This call implicitly sets the corresponding label type to 'DATE'.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0505 E INVALID PARAMETER: a
```

CHYDTM

Function: To specify y-axis datum line.

CHYDTM (yvalue)	
APL code	756
PGF RCP code	X'100E060E' (269354510)

Parameters

yvalue *(specified by user) (short floating point)*
Short floating-point number giving the y-axis value through which the datum line is to pass.

Description

Specifies a y datum line relative to the currently selected y axis. The **yvalue** must lie within the axis range. The y datum lines are drawn parallel to the x axis with the **yvalue** specifying the point of intersection with the y axis.

The color, line type, and line width are controlled by the current datum line attribute values, which may be specified by CHDATT.

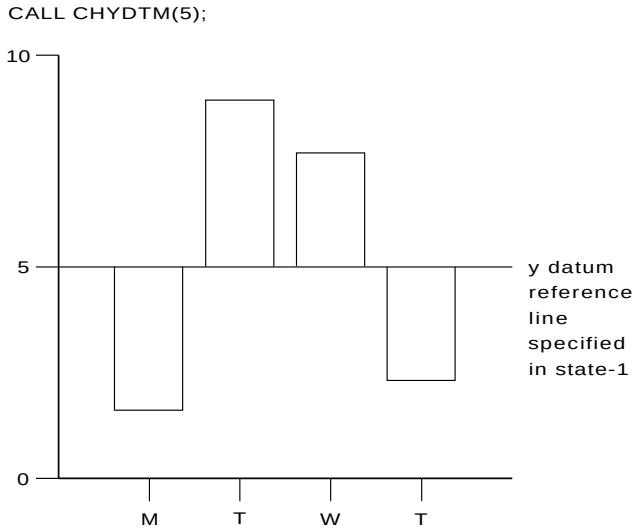
In **state-1**, the call results in the specification of a datum line that is constructed when the axis is constructed. **If a y datum line is specified, it is also the line that is used in place of the axis for all shaded charts. It also acts as a baseline for bars of bar charts or risers of histograms**. If more than one call is made in state-1, the most recent is used.

In the ICU, a datum line created in state-1 is called a reference line.

In **state-2**, the call results in the immediate construction of a datum line. More than one datum line can be added in State 2. Such lines have no effect on the shading of charts.

Principal errors

```
ADM0530 E A SELECTED AXIS HAS NOT BEEN
          GENERATED
ADM0531 W DATUM LINE DATA VALUE LIES OUTSIDE
          AXIS RANGE
```



Note that a y datum line is parallel to the x axis.

Figure 15. An example of a state-1 y datum line

CHYINT

Function: To specify y-axis interception point.

CHYINT (y)	
APL code	742
PGF RCP code	X'100A0604' (269092356)

Parameters

y *(specified by user) (short floating point)*
Short floating-point number specifying the y-axis interception point.

Description

Specifies the interception point for the currently selected y axis. (Primary axes are selected by default.) CHYINT positions the x axis by giving the position on the y axis where the x axis should cross it. (CHXINT positions the y axis by giving the position on the x axis at which the y axis should cross it.)

CHYINT is only applied if CHYSET('INTERCEPT') is also specified. CHYINT is ignored for pie charts and Venn diagrams.

If the interception value is outside the range when the axis is to be constructed, the range will be extended to include it. Note that interception values for logarithmic axes must be positive, and nonzero.

If CHYSET('INTERCEPT') is specified and CHYINT is not used, a default intercept of 0 is assumed.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
```

CHYLAB

Function: To specify y-axis label text.

CHYLAB (count, length, text)	
APL code	749
PGF RCP code	X'10020504' (268567812)

Parameters

count *(specified by user) (fullword integer)*
Fullword binary integer specifying the number of labels supplied. A specification of zero suppresses the labels.

length *(specified by user) (fullword integer)*
Fullword binary integer specifying the number of characters associated with each label. All labels must be the same length. Each label is centered on the corresponding axis position (scale-mark position, or point midway between scale-mark positions). Centering occurs after any trailing null (X'00') characters have been deleted. Hence, the effect of varying-length labels can be obtained by using nulls as padding characters to extend each label to the standard length.

text *(specified by user) (character)*
An EBCDIC character string that contains all of the labels, in order of use. The total length of the string must not exceed 32000 characters.

Description

Specifies alphanumeric labels as a sequence of EBCDIC text strings. The labels are placed, in sequence, at major scale marks on the corresponding currently selected y axis, starting with the scale mark with the algebraically lowest value. If the number of labels specified is less than the number of major scale marks on the axis, the sequence of labels is reused as necessary until each scale mark is associated with a label.

Semicolons can be used to cause line breaks in the labels.

This call implicitly causes a call to CHYSET('ALPHANUMERIC') and causes a logarithmic axis type specification to be ignored.

CHSET('BLABEL') can be used to clear the areas to be occupied by labels, before labels are written.

The label text attributes can be set by CHLATT.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
```

CHYLAT

Function: To set y-axis label attributes.

CHYLAT (count, array)	
APL code	712
PGF RCP code	X'10020908' (268568840)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of elements in **array**. If more than six elements are specified, the excess elements are ignored. If fewer than six, the remainder are unchanged from their previous setting. If zero is specified, all six defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of, at most, six fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set
   n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the basic size set by CHCGRD. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

6. Axis-label rotation

   When axis-label rotation is requested, each label is written at the specified angle to the horizontal. Label rotation is indicated by specifying a nonzero value in this element. The value must be from –9000 through +9000. This number is divided by 100 to give a value from –90 through +90, which is the angle, in degrees, to the horizontal at which the labels will be drawn. The default is zero. When positive, the angle is in a counterclockwise direction. When negative, it is in a clockwise direction.

Description

Establishes the default character-appearance attributes to be used in displaying labels for the currently selected y axis.

By **default**, the attributes are as follows:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Label rotation	0	

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHYMTH

Function: To specify y-axis month labels.

CHYMTH (month)	
APL code	751
PGF RCP code	X'1002060A' (268568074)

Parameters

month *(specified by user) (fullword integer)*
A fullword integer that identifies the month to be associated with the first scale mark. Valid values are 1 through 12. January is month 1.

Description

Specifies English language, uppercase month labels for the currently selected y axis. The specified month is associated with the first major scale mark position. Each successive month is assigned to the next major mark. The labels are normally 3-letter abbreviations, but a CHSET option is available to change this; see CHSET('ABREV').

This call implicitly sets the corresponding label type to 'DATE'.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0505 E INVALID PARAMETER: a
```

CHYRNG

Function: To set y-axis explicit range.

CHYRNG (y1, y2)	
APL code	740
PGF RCP code	X'100A0602' (269092354)

Parameters

y1 *(specified by user) (short floating point)*
Short floating-point number specifying the data value at the start point of the y axis. For a horizontal y axis, the start-point data value is at the left. For a vertical y axis, the start-point data value is at the bottom.

y2 *(specified by user) (short floating point)*
Short floating-point number specifying the data value at the end of the y axis. For a vertical y axis, the end-point data value is at the top. For a horizontal y axis, the end-point data value is at the right.

Description

Specifies explicitly the range of the currently selected y axis. If the range is not specified or is specified as (n,n) (with lower and upper limit values identical), autoranging applies to the axis. In general, the second parameter is greater than the first, but you may switch the direction of the axis by reversing the order of the parameters. Note that logarithmic axis ranges must have positive, nonzero values.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
```

CHYSCL

Function: To set y-axis scale factor.

CHYSCL (scale-factor)	
APL code	746
PGF RCP code	X'10020608' (268568072)

Parameters

scale-factor *(specified by user) (short floating point)*
Short floating-point number to act as a scaling factor for each label to be generated. The value associated with each major scale mark is first multiplied by **scale-factor**. For example, if the value is 7000 and the factor is 0.001, the resulting label is 7. The value must be greater than zero.

Description

Specifies a scale factor for numeric labels on the currently selected y axis. The call specifies that, when labels are generated from numeric values, the values should be multiplied by the scale factor before the labels are generated. This enables superfluous zeros to be suppressed. Scale factors are ignored for alphanumeric and date labeling.

If a scaling factor is specified, it may be useful to include a notation in the axis title describing its use. For example, if the scaling factor is 0.001 and the data is in dollars, the axis title might be “Thousands of Dollars.”

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

CHYSEL

Function: To specify y-axis selection.

CHYSEL (axis-number)	
APL code	732
PGF RCP code	X'100F0802' (269420546)

Parameters

axis-number *(specified by user) (fullword integer)*
A fullword integer specifying the axis number to be selected. The integer must be 1 for the primary axis, or 2 for the secondary axis. The default is 1.

Description

Overrides the default axis selection to select the primary or secondary y axis. By default, the primary axis is selected.

The selected axis is that against which data is plotted by the plotting routines CHPLOT, CHSURF, CHHIST, and CHBAR.

In addition, CHYSET options and calls to CHYRNG, CHYTTL, CHYTIC, CHYINT, CHYSCL, CHYLAB, CHYMTH, and CHYDAY apply to the selected axis.

Valid in state-1 or state-2.

Principal errors

```
ADM0506 E INVALID AXIS SELECTION VALUE
```

CHYSET

Function: To set y-axis options.

CHYSET (option)	
APL code	734
PGF RCP code	X'10020402' (268567554)

Parameters

option *(specified by user) (4-byte character string)*
The option string must be at least four characters long and must be enclosed in single quotes. If more than four characters are specified, they are ignored. However, they can be used to increase the readability of the program.

The options are as follows, in alphabetic order by function; the defaults are shown **LIKE THIS**:

Function	Option
Axis, drawn or not	**AXIS** **NOAXIS**
Axis, intercept	**LOWAXIS** **MIDDLE** **HIGHAXIS** **INTERCEPT**
Axis, title position	**ATCENTER** **ATEND** **ATABOVE**
Grid, drawn or not	**GRID** **NOGRID**
Label position	**LABADJACENT** **LABMIDDLE** **NOLAB**
Label, punctuation	**PGFS** **NPGFS**
Label, type of	**NUMERIC** **ALPHANUMERIC** **DATE**
Scale, linear or logarithmic	**LINEAR** **LOGARITHMIC**
Tick mark, style	**NTICK** **PTICK** **XTICK** **PLAIN**
Zero forced into autorange	**FORCEZERO** **NOFORCEZERO**

Description

Controls how the lines on the currently selected y axis are drawn when the chart is constructed.

Note: Only one option can be used per call. For example, if you want your y axis to be logarithmic and to have no tick marks, you would need to enter:

```
CALL CHYSET('LOGA')
CALL CHYSET('PLAIN')
```

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0505 E INVALID PARAMETER: a
```

CHYSET Options

The groups of CHYSET options are listed below in alphabetic order:

- '**ATCENTER**' | '**ATEND**' | '**ATABOVE**'

  Control the positioning or justification of the titles, or both, for the currently selected axis.

  ATCENTER specifies that the axis title is centered along the axis.

  ATEND specifies that the axis title is right-justified for a horizontal axis and justified to the top for a vertical axis.

  ATABOVE provides for placing the title above the vertical axis.

  For a horizontal axis, the **ATABOVE** specification is equivalent to **ATEND**.

  When both primary and secondary vertical axes are employed, and the titles are positioned above them, overlap may occur, depending on the distance between the axes and the title lengths. **ATABOVE** may cause the titles to overlap horizontal axis labels and scale marks, if the horizontal axis is at the top of the chart.

- '**AXIS**' | '**NOAXIS**'

  Control whether the currently selected axis lines are drawn when the chart is constructed.

  AXIS specifies that the axis line is to be drawn.

  NOAXIS specifies that the axis line should not be drawn. The axis title is not suppressed, nor are the scale marks and labels, unless they have been suppressed by other options.

- '**FORCEZERO**' | '**NOFORCEZERO**'

  If autoranging applies, these options specify whether the range is to be extended, if necessary, to include zero.

  FORCEZERO specifies that the axis range is to be extended to include zero, if the range of the data does not. This option is ignored for logarithmic axes and for axes whose range is explicitly specified by a CHYRNG call.

  NOFORCEZERO suppresses the forced inclusion of zero in the range.

- '**GRID**' | '**NOGRID**'

  Specify whether grid lines are to be constructed.

  CHYSET controls grid lines perpendicular to the y axis. Grid lines are constructed at the same time as their associated axes. Grid lines are positioned on major tick marks, whose positions are controlled by a CHYTIC call. The attributes of the grid lines are controlled by CHGATT.

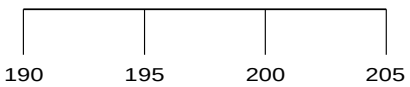
  GRID specifies that grid lines are to be constructed when the axis is constructed.

  NOGRID specifies that grid lines are not required.

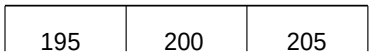
- '**LABADJACENT**' | '**LABMIDDLE**' | '**NOLAB**'

  Specify label position for the currently selected y axis. These calls control the positioning of labels with respect to the major scale marks.

  LABADJACENT centers the label on the major scale-mark position, thus:



  LABMIDDLE places the label between the major scale mark it is associated with and the *preceding* one. (The label that would normally be adjacent to the first mark on the axis is omitted.) The label is centered on the point midway between the two scale marks as shown below. This option is ignored for logarithmic axes.



NOLAB specifies that no labels are to be constructed for the corresponding axis.

- '**LINEAR**' | '**LOGARITHMIC**'

  Specify whether the axis scale is linear or logarithmic (base 10).

  A logarithmic specification is ignored unless the axis label type is numeric. In particular, a logarithmic specification is ignored if alphanumeric labels are specified by means of CHYLAB.

- '**LOWAXIS**' | '**MIDDLE**' | '**HIGHAXIS**' | '**INTERCEPT**'

  LOWAXIS positions the selected axis at the bottom or left-hand side of the plot area.

  MIDDLE positions the selected axis in the middle of the plot area.

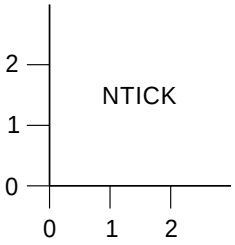
  HIGHAXIS positions the selected axis at the top or right-hand side of the plot area.

  INTERCEPT indicates that the position of the selected axis will be controlled by the CHYINT call referring to the other selected axis. CHYSET is used with CHXINT, and CHXSET with CHYINT. If the appropriate CHYINT (or CHXINT) call is not made, an intercept value of 0 is assumed.

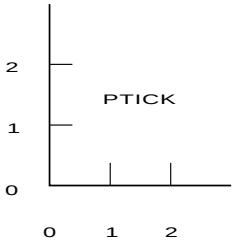
- '**NTICK**' | '**PTICK**' | '**XTICK**' | '**PLAIN**'

  Specify whether tick marks are to be drawn on the axis and, if so, the style of drawing. The options apply to both major and minor scale marks, on the currently selected y axis.

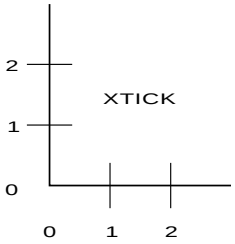
  NTICK draws scale marks from the y axis in the negative direction of the x axis, as shown below. The positive direction of an axis is that defined by movement from the end of the axis with the algebraically lower value to the end with the algebraically higher value. The negative direction is the opposite.



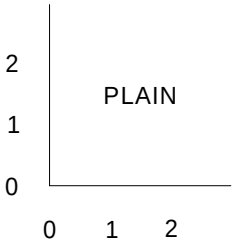
PTICK reverses the scale-mark direction from that described for **NTICK**:



XTICK draws scale marks perpendicular to the axis and crossing it, projecting equally on each side:



PLAIN indicates that the axis is to be constructed without scale marks:



Note: '**NTICK**' is the default for primary axes, and '**PTICK**' for secondary axes.

- '**NUMERIC**' | '**ALPHANUMERIC**' | '**DATE**'

  Specify the labeling method used for the currently selected axis.

  NUMERIC specifies that a label is to be generated automatically for each major scale mark. The label is an EBCDIC representation of the numeric value along the axis defining the scale mark. The representation may be in fixed- or floating-point format. If in fixed-point format, you can control the format using CHSET or CHYSET('**NPGFS**'), and CHSET or CHYSET('**PGFS**') calls. You canb control scaling by using CHYSCL.

  ALPHANUMERIC specifies that each interval on the axis represents an item described by a

label provided by a CHYLAB call. **ALPHANUMERIC** is implicitly set by a CHYLAB call.

DATE implies that each interval on the axis is associated with a month of the year or a day of the week as specified by calls to CHYMTH and CHYDAY. **DATE** is implicitly set by these calls.

If **ALPHANUMERIC** or **DATE** is specified, any logarithmic axis-type specification is ignored; the axis is forced to be linear.

Note that all forms of labels correspond one-for-one with the major scale marks. The spacing of such marks along an axis is controlled by CHYTIC.

- '**PGFS**' | '**NPGFS**'

  Specifies the method used on the y axis to punctuate numbers of 1,000 and over. The convention is used for the display of numeric data values in fixed-point format. These options also control how bar values are punctuated in bar charts.

  PGFS suppresses all punctuation except the decimal point. This minimizes the space required for numeric values, for example: `1234567.999`

  NPGFS selects the default national convention which may be specified when GDDM is installed. Widely used conventions are:

  – The period decimal convention. Example: 1,234,567.999

  – The comma decimal convention. Example: 1.234.567,999

  – The French convention. Example: 1 234 567,999

  Valid in state-1 or state-2.

CHYTAT

Function: To specify y-axis title attributes.

CHYTAT (count, array)	
APL code	714
PGF RCP code	X'1002090A' (268568842)

Parameters

count *(specified by user) (fullword integer)*
A fullword integer specifying the number of elements in **array**. If more than five elements are specified, the excess elements are ignored. If fewer than five, the remainder are unchanged from their previous setting. If zero is specified, all five defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of at most five fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   .
   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set

n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. (The default character size is the size of hardware characters for the device on which the chart will be displayed.) For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the basic. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

Description

Establishes the default character-appearance attributes to be used in displaying titles for the currently selected y axis.

The **defaults** are:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHYTIC

Function: To specify y-axis scale mark interval.

CHYTIC (major, minor)	
APL code	744
PGF RCP code	X'100A0606' (269092358)

Parameters

major *(specified by user) (short floating point)*
Specifies the interval between major scale marks. If zero, the default action is taken. Linear and logarithmic axes are treated differently.

Linear axes

Linear axes can have both minor and major scale marks. The major scale marks are placed at the interval specified by **major**.

Logarithmic axes

Logarithmic axes, if they have any major scale marks, **always** have them at powers of 10. CHYTIC defines extra tick marks between the powers of ten.

Only the high-order digit of the parameter has any effect. The high-order digit specifies at which multiples of power of 10 extra marks should be drawn.

Assume a logarithmic axis with a range of 1 through 100 (remember, there is no 0 on a logarithmic axis). Tick marks are placed at the points shown in the table:

CHYTIC value	Major scale-mark points (assuming an axis range of 1 to 100)
0	'1,10,100'
1	'1,2,3,4,5,6,7,8,9,10,20,30,40, 50,60,70,80,90,100'
2	'1,2,4,6,8,10,20,40,60,80,100'
3	'1,3,6,9,10,30,60,90,100'
4	'1,4,8,10,40,80,100'
5	'1,5,10,50,100'
6	'1,6,10,60,100'
7	'1,7,10,70,100'
8	'1,8,10,80,100'
9	'1,9,10,90,100'
10	'1,2,3,4,5,6,7,8,9,10,20,30,40, 50,60,70,80,90,100'

Method of determining logarithmic scale marks: If marks are required on a logarithmic axis, each power of 10 receives a major mark, and additional intermediate major marks are placed at a frequency corresponding to the high-order digit (base 10) of the major interval specification. This correspondence is as follows. If the digit is n, major marks are placed, in the interval between 10**i and 10**(i+1), at each point defined by the following equation:

```
P=j*n*10**i
```

for j=1, 2, 3, ... 9, if (j*n)<10

For logarithmic-axis scale marks, each power-of-ten scale mark is labeled in full. Intermediate scale marks are labeled with a digit in the range 2 through 9. This is the multiplication factor that must be applied to the immediately lower power-of-ten label to derive the value of the scale mark.

minor *(specified by user) (short floating point)*
Specifies the **number** of minor marks between major marks. If zero, no minor marks are drawn. Minor marks may be specified even though major marks are automatically generated (by means of major=0). The maximum number of minor marks that can be specified is 2048.

Minor marks are drawn half the length of major marks. Minor marks are never drawn for logarithmic axes, so the parameter is ignored.

Description

Overrides the default positions of major and minor scale marks (also known as “tick marks”) on the currently selected y axis.

By **default**, the interval on a linear axis is 1, 2, or 5 multiplied by some power of ten. Minor marks are never generated for logarithmic axes.

The **default** for logarithmic axes places a major mark at each power of 10 over the range of the axis; for example: 1, 10, 100, 1000 (and so on). Because minor marks cannot be generated for logarithmic axes, “minor” specifications are ignored.

The above default actions are taken if no CHYTIC call is issued.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

CHYTTL

Function: To set y-axis title specification.

CHYTTL (length, text)

APL code	738
PGF RCP code	X'10020502' (268567810)

Parameters

length *(specified by user) (fullword integer)*
A fullword integer specifying the number of characters in the title. A length of zero suppresses the title. The length must not exceed 32000.

text *(specified by user) (character)*
Specifies the EBCDIC character string to be used as a title.

Description

Specifies a title for the currently selected y axis. Semicolons can be used to force line breaks if CHSET ('TLBREAK') is set.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
```

CHZDLB

Function: To specify z-axis data labels.

CHZDLB (n1, n2, z-array, lab-array)	
APL code	779
PGF RCP code	X'10020507' (268567815)

Parameters

n1 *(specified by user) (fullword integer)*
Specifies the number of values in **z-array** and the length of each label in **lab-array**.

n2 *(specified by user) (fullword integer)*
Specifies the length of each z-axis label in the **lab-array** parameter.

z-array *(specified by user) (array of short floating-point numbers)*
Specifies the z-axis value that corresponds to a scale-mark value.

lab-array *(specified by user) (character)*
Specifies an array of labels in the form of character strings.

Description

Specifies user-provided data labels for the z axis.

When a label is to be associated with a major scale mark on the z axis, the **z-array** parameter of CHZDLB is searched for a value that corresponds to the scale-mark value. If such a value is found, the corresponding label from the **lab-array** parameter is drawn at the scale mark. A **z-array** value is considered to correspond to a scale-mark value if it is the nearest value (either greater than or less than) to the scale-mark value, and if it lies within 10% of the scale-mark interval of the scale-mark value. If two **z-array** values are the same distance from the scale-mark value, the first value is used.

Valid only in state-1.

Principal errors

```
ADM0508 E COUNT PARAMETER IS NEGATIVE, OR
          LENGTH PARAMETER IS NON-POSITIVE
ADM0509 E CHARACTER STRING TOO LONG
ADM0550 E INSUFFICIENT STORAGE AVAILABLE
```

CHZGAP

Function: To specify spacing between towers.

CHZGAP (gap-to-tower-ratio)	
APL code	709
PGF RCP code	X'1002061B' (268568091)

Parameters

gap-to-tower-ratio *(specified by user) (short floating point)*
A positive or zero short floating-point value that specifies the ratio of the gap between towers to the width of the towers. If **gap-to-tower-ratio** is set to zero, towers have common lines that may appear in unexpected colors because of color mixing.

If a negative value is specified, a value of zero is used.

The total length of the axis must accommodate all towers and gaps. As this

parameter is increased, the actual tower width decreases. It is therefore possible to produce towers that appear as single lines.

Description

For tower charts, CHZGAP overrides the default ratio of the gap between adjacent towers to the width of the towers.

The **default** ratio is half the tower width (0.5).

Valid in state-1 or state-2.

Principal errors

```
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
```

CHZLAT

Function: To specify z-axis label attributes.

CHZLAT (count, array)	
APL code	715
PGF RCP code	X'1002090B' (268568843)

Parameters

count *(specified by user) (fullword integer)*
Specifies the number of elements in **array**. If more than six elements are specified, the excess elements are ignored. If fewer than six, the remainder are unchanged from their previous setting. If zero is specified, all six defaults are reinstated.

array *(specified by user) (an array of fullword integers)*
An array of, at most, six fullword integers:

1. Color

   For valid values of color, see Appendix C. Colors, line types, markers, and shading patterns on page 209.

2. Character mode

   Valid values are:

   0 system default (mode 3)
   1 mode 1
   2 mode 2
   3 mode 3

3. Symbol-set identifier

   For mode 1, the identifier denotes:

   0 the default hardware set
   1 an alternative hardware set (valid only on terminals that have this facility)
   n a programmed symbol set that has been previously loaded into the device by the application program using the GDDM call PSLSS

   For mode 2 or mode 3, the identifier denotes:

   0 the default character set
   n a programmed symbol set that has been previously loaded into GDDM by the application program using the GDDM call GSLSS

4. Character-size multiplier

   This specification is ignored for character mode 1. For modes 2 and 3, the character-size multiplier is divided by 100, and the horizontal and vertical spacings or sizes specified by CHCGRD (or its defaults) are multiplied by this factor before the characters are drawn. For example, if character-size multiplier = 200 and mode 3 characters are being used, they are drawn twice as large as the basic size set by CHCGRD. The character-size multiplier must have a value greater than zero.

5. Character height/width multiplier

   Specifies the height of the character box relative to its width. For example, 100 indicates that the height is multiplied by the same amount as the width. 200 causes the height to be multiplied by twice the amount of the width.

6. Axis-label rotation

   When axis-label rotation is requested, each label will be written at the specified angle to the horizontal. Label rotation is indicated by specifying a non-zero value in this element. The value must be from –9000 through +9000. This number is divided by 100 to give a value between –90 and +90, which is the angle, in

degrees, to the horizontal at which the labels will be drawn. The default is zero. When positive, the angle is in a counterclockwise direction. When negative, it is in a clockwise direction.

Description

For tower charts, CHZLAT establishes the default character-appearance attributes to be used in displaying z-axis labels.

By **default**, the attributes are as follows:

Color	0	green (displays), black (printers)
Character mode	3	
Symbol-set identifier	0	system default
Character-size multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Character height/width multiplier	100	results in the text size as defined by CHCGRD (by default, the size of the hardware characters)
Label rotation	0	

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0515 E ATTRIBUTE COUNT IS NEGATIVE
ADM0516 W ARRAY COUNT EXCEEDS THE MAXIMUM
          ALLOWED
ADM0517 E INVALID COLOR VALUE
ADM0520 E INVALID SYMBOL SET IDENTIFIER
ADM0521 E INVALID CHARACTER MODE VALUE
ADM0522 E INVALID CHARACTER SIZE MULTIPLIER
```

CHZRNG

Function: To specify z-axis explicit range.

CHZRNG (z1, z2)

APL code	707
PGF RCP code	X'100A061D' (269092381)

Parameters

z1 *(specified by user) (short floating point)*
Specifies the data value at the start point of the z axis. The start-point data value is at the left.

z2 *(specified by user) (short floating point)*
Specifies the data value at the end point of the z axis.

Description

For tower charts, CHZRNG specifies explicitly the range of the z axis. If the range is not specified or is specified as (n,n) (with lower- and upper-limit values identical), autoranging applies to the axis. In general, the second parameter is greater than the first, but you may switch the direction of the axis by reversing the order of the parameters.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
```

CHZSET

Function: To specify z-axis options.

CHZSET (option)	
APL code	777
PGF RCP code	X'10020403' (268567555)

Parameters

option *(specified by user) (4-byte character string)*
The option string must be at least four characters long and must be enclosed in single quotes. If more than four characters are specified, they are ignored. However, they can be used to increase the readability of the program.

The options are as follows, in alphabetic order by function; the defaults are shown **LIKE THIS**:

Function	Option
Axis, drawn or not	**AXIS** **NOAXIS**
Grid, drawn or not	**GRID** **NOGRID**
Label position	**LABADJACENT** **LABMIDDLE** **NOLAB**
Label, punctuation	**PGFS** **NPGFS**
Label, type of	**NUMERIC** **ALPHANUMERIC** **DATE**
Tick mark, style	**NTICK** **PTICK** **XTICK** **PLAIN**

Description

For tower charts, CHZSET controls how the lines on the z axis are to be drawn when the chart is constructed.

Note: Only one option can be used per call. For example, if you wanted your z axis to have a grid and to have numeric labels on the axis, you need to enter:

```
CALL CHZSET('GRID')
CALL CHZSET('NUMERIC')
```

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0505 E INVALID PARAMETER: a
```

CHZSET Options

The groups of CHZSET options are listed below in alphabetic order:

- '**AXIS**' | '**NOAXIS**'

  Control whether the z-axis lines are drawn when the chart is constructed except on a table chart, where it has no effect.

  AXIS specifies that the axis line is to be drawn.

  NOAXIS specifies that the axis line should not be drawn. The axis title is not suppressed, nor are the scale marks and labels, unless they have been suppressed by other options.

- '**GRID**' | '**NOGRID**'

  Specify whether grid lines are to be constructed. On a table chart, control grid lines between data groups.

  Grid lines are constructed at the same time as their associated axes. Grid lines are positioned on major tick marks, whose positions are controlled by CHZTIC calls. The attributes of the grid lines are controlled by CHGATT.

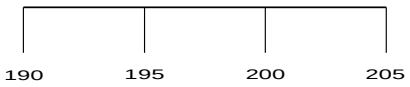
  GRID specifies that grid lines are to be constructed when the z axis is constructed.

  NOGRID specifies that grid lines are not required.

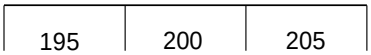
- '**LABADJACENT**' | '**LABMIDDLE**' | '**NOLAB**'

  Specify label position for the z axis. This call controls the positioning of labels with respect to the major scale marks. It has no effect on table charts.

  LABADJACENT centers the label on the major scale-mark position, thus:



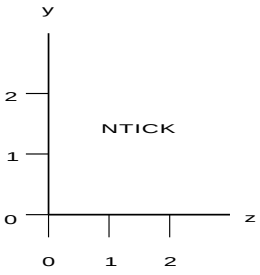
LABMIDDLE places the label between the major scale mark it is associated with and the *preceding* one. (The label that would normally be adjacent to the first mark on the axis is omitted.) The label is centered on the point midway between the two scale marks, as shown below.



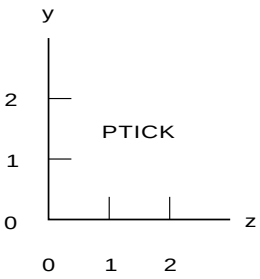
- '**NTICK**' | '**PTICK**' | '**XTICK**' | '**PLAIN**'

  Specify whether tick marks are to be drawn on the axis and, if so, the style of drawing. The options apply to both major and minor scale marks.

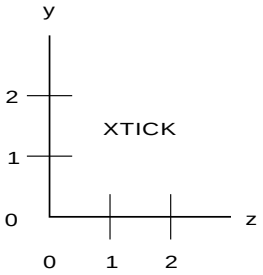
  NTICK draws scale marks from the z axis in the negative direction of the x axis, as shown below. The positive direction of an axis is that defined by movement from the end of the axis with the algebraically lower value to the end with the algebraically higher value. The negative direction is the opposite.



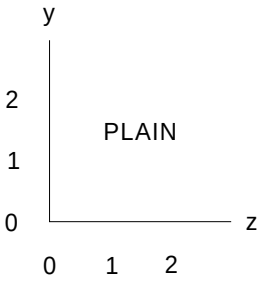
PTICK reverses the scale-mark direction from that described for **NTICK**:



XTICK draws scale marks perpendicular to the axis and crossing it, projecting equally on each side:



PLAIN indicates that the axis is to be constructed without scale marks:



- '**NUMERIC**' | '**ALPHANUMERIC**' | '**DATE**'

  Specify the labeling method used for the z axis.

  NUMERIC specifies that a label is to be generated automatically for each major scale mark. The label is an EBCDIC representation of the numeric value along the axis defining the scale mark. The representation may be in fixed- or floating-point format. If in fixed-point format, the application program may control the format by a CHZSET('**PGFS**') call.

  ALPHANUMERIC specifies that labels are provided by a CHZDLB call. **ALPHANUMERIC** is implicitly set by a CHZDLB call.

  DATE implies that each interval on the axis is associated with a month of the year or a day of the week as specified by calls to CHYMTH and CHYDAY. **DATE** is implicitly set by these calls.

- '**PGFS**' | '**NPGFS**'

  Specifies the method used on the z axis to punctuate numbers of 1,000 and over except on a table chart where it has no effect. The

convention is used for the displaying numeric data values in fixed-point format.

PGFS suppresses all punctuation except the decimal point. This minimizes the space required for numeric values, for example: `1234567.999`

NPGFS selects the default national convention that may be specified when GDDM is installed. Widely used conventions are:

- The period decimal convention. Example: 1,234,567.999
- The comma decimal convention. Example: 1.234.567,999
- The French convention. Example: 1 234 567,999

CHZTIC

Function: To specify z-axis scale mark interval.

CHZTIC (major, minor)	
APL code	706
PGF RCP code	X'100A061C' (269092380)

Parameters

major *(specified by user) (short floating point)*
Specifies the interval between major scale marks. If zero, the default action is taken.

minor *(specified by user) (short floating point)*
Specifies the **number** of minor marks between major marks. If zero, no minor marks are drawn. Minor marks may be specified even though major marks are automatically generated (by means of major=0). The maximum number of minor marks that can be specified is 2048.

Minor marks are drawn half the length of major marks.

Description

For tower charts, CHZTIC overrides the default positions of major and minor scale marks (also known as tick marks) on the z axis.

The axis can have both minor and major scale marks. The major scale marks are placed at the interval specified by **major**.

By **default**, the interval on an axis is 1, 2, or 5 multiplied by some power of ten. The default action is taken if no CHZTIC call is issued.

Valid only in state-1.

Principal errors

```
ADM0501 E THIS FUNCTION CANNOT BE INVOKED IN
          THE CHART-DRAWING STATE
ADM0523 E PARAMETER IS LESS THAN THE
          ALLOWABLE MINIMUM
ADM0524 E PARAMETER IS GREATER THAN THE
          ALLOWABLE MAXIMUM
```

Alphabetic list of chart calls

This section lists and describes the CSxxxx calls in alphabetic order.

With the CSxxxx calls, any number of chart instances can exist concurrently. The **chart instances** can be several different charts or the same chart reproduced more than once, or a mixture of the two. Each chart instance has a unique identifier (chart-id) which must be passed with most of the CSxxxx calls that you make.

CHART calls can be mixed with CSxxxx calls. The chart instance used by a CHART call is independent of any used by CSxxxx calls or other CHART calls, and cannot be accessed by them.

For simplicity, most call descriptions refer to a **chart** and not a chart instance.

CHART

Function: To invoke Interactive Chart Utility.

CHART	**(chart_control, data_control, x, y, keys, labels, heading)**
APL code	1200
PGF RCP code	X'14000000' (335544320)

Parameters

Note: Names in capitals (like BINDING) are fields in **chart_control**.

chart_control *(specified by user) (124-byte character string)*
A structure giving invocation control information and describing the contents of later parameters. The format and more detailed information are given in “Format of the chart_control parameter” on page 119.

data_control *(specified by user) (undefined)*
Integer array used only for free data (that is, only when BINDING=1). Must always be included.

Contains an integer value for each data group (see NG). These integer values indicate the actual number of elements in each data group (note that these values control the interpretation of the storage occupied by the x- and y-array parameters below). The values are in the order of the data groups (for example, the first value is the number of elements for the first data group). Each value must lie in the range 0 through NE.

Ignored if BINDING=0, if NG=0, if NE=0, or if DISPLAY≠0 and DATANAME≠'*'.

x *(specified by user) (undefined)*
Array containing **x-data values** in short floating-point format. Data is arranged data group by data group. Data must be stored such that all the elements of data group (i) precede the elements of data group (i+1).

Note: Line graphs, surface charts, and histograms use x values when they are plotted. Bar charts, pie charts, and Venn diagrams use x-data labels, whose values are supplied in the labels parameter.

For tied data (BINDING=0 in **chart_control**), x contains one set of NE values. These values apply to all data groups.

For free data (BINDING=1 in **chart_control**) x contains NG sets of values. The number of values in each set is determined by the corresponding value in data_control, which may not exceed NE.

The x array is ignored if LABELL>0 and NE>0. Both x and y arrays are ignored if NE=0, or if DISPLAY≠0 and DATANAME≠'*'.

y *(specified by user) (undefined)*
Array containing **y-coordinate data** in short floating-point format. Data is arranged data group by data group. Data must be stored such that all the elements of data group (i) precede the elements of data group (i+1).

For tied data (BINDING=0 in **chart_control**) y contains NG sets of NE values.

For free data (BINDING=1 in **chart_control**) y contains NG sets of values. The number of values in each set is determined by the corresponding value in data_control, which must not exceed NE.

The y array is ignored if NG=0. Both x and y arrays are ignored if NE=0, or if DISPLAY≠0 and DATANAME≠'*'.

keys *(specified by user) (undefined)*
An array containing NG character strings, each giving the key (description), of length KEYL, for a particular data group. The number of the corresponding data group is determined by the position of the string within **keys** (for example, the first string describes the first data group). For information on formatting the keys by means of control characters within the key character strings, see the CHKEY call description.

Ignored if KEYL=0, if NG=0, or if DISPLAY≠0 and DATANAME≠'*'

labels *(specified by user) (undefined)*
An array containing NE character strings, each giving the data label (x label), of length LABELL, to be displayed instead of x values, for bar charts, pie charts, and Venn diagrams.

Note: Bar charts, pie charts, and Venn diagrams use x data labels, whose values are supplied in this parameter. Line graphs, surface charts, and histograms use x axis values that are supplied in the x parameter.

Ignored if LABELL=0, if NE=0, or if DISPLAY≠0 and DATANAME≠'*'.

Note: If this parameter is not initialized, LABELL must be set to 0.

heading *(specified by user) (undefined)*
A string of length HEADINGL giving the chart heading to be displayed with the data.

When DISPLAY=0, the string is also taken as the description of the chart and is stored with the chart data. The text appears in the Description column of the Directory panel when the chart data file is listed in an interactive session. Only the first 52 bytes of the string are stored as the description.

In displaying the heading, the ICU interprets ";" as a new line character and ";;" as ";" In storing the description text, it replaces ";" with a blank and ";;" with ";".

Ignored if HEADINGL=0, or if DISPLAY≠0 and DATANAME≠'*'.

Description

Invokes the ICU from an application program. When the ICU is started from an application program by a call to the entry point CHART, seven parameters are always required, **irrespective of whether they are all used by the particular call**.

Principal errors

```
ADM0700 E INVALID PRINTER WIDTH, DEPTH, OR
          OFFSET
ADM0701 E FIRST DATA GROUP DOES NOT HAVE 3
          VALUES FOR VENN DIAGRAM
ADM0702 S INVALID PRIMARY DEVICE
ADM0704 S SCREEN IS TOO SMALL (n1 BY n2
          REQUIRED)
ADM0706 E 'a' (=n) IS INVALID
ADM0707 E NUMBER OF COPIES FOR PRINT (=n) IS
          INVALID
ADM0708 E MISSING X VALUES NOT ALLOWED IN
          'FREE' DATA
ADM0716 E INVALID {PRINT|GRAPHIC DATA FORMAT
          (GDF)} DESTINATION NAME
ADM0717 E PRINT NAME IS '*OPEN' BUT NO
          ALTERNATE DEVICE IS IN USE
```

Format of the chart_control parameter

The structure of the **chart_control** parameter, which provides overall control information for a CHART call, is described below. The interpretation of the parameter is shown schematically in Figure 16 on page 120.

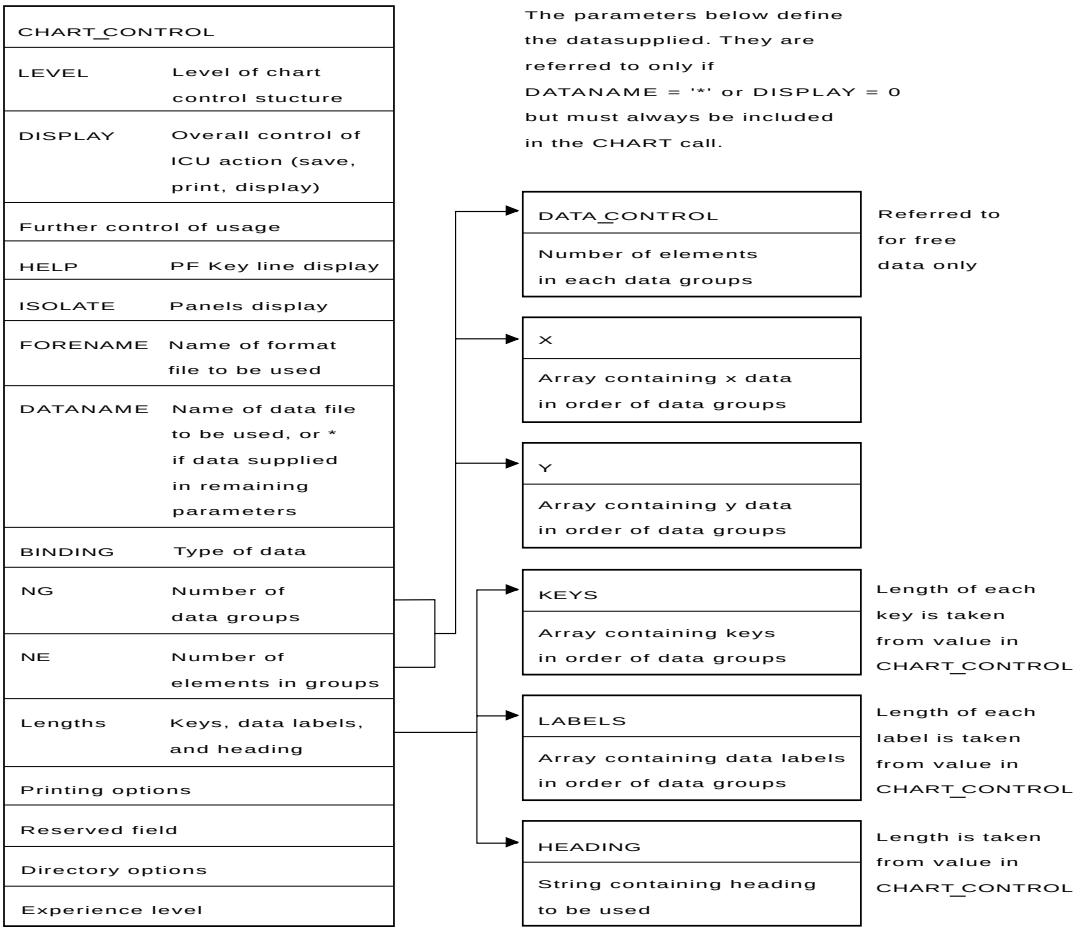


Figure 16. Parameters passed in a CHART call

The **chart_control** parameter is a structure containing information that controls (among other things) the use of the remaining parameters. The arrows in the figure show dependencies between fields in **chart_control** and other parameters of the CHART call. All the fields illustrated are described below:

- LEVEL (offset 0; fullword integer)

  Indicates whether **chart_control** contains all the currently defined fields, or only those that were defined at Version 1, Releases 1 and 2 of GDDM-PGF. See page 126 for details of using LEVEL.

- DISPLAY (offset 4; fullword integer)

  The value supplied in this field controls the overall function of the CHART call. For example, it controls whether operator interaction is supported, and if so, whether the Home Panel or the Display Panel is displayed initially.

  The DISPLAY field of the **chart_control** parameter may be set by the calling application program to a value from 0 through 9.

  Values 0 and 9 apply to the CHART call only and are described fully below with possible applications. Values 1 through 8 are very similar to those of element 1 of the control parameter of the CSSICU call. A brief description of these values is given below. Fuller explanations and possible applications are given with “CSSICU – Start an ICU session for a chart” on page 162.

  – DISPLAY = 0

  Meaning - Save a chart

  When DISPLAY = 0, the only action taken by the ICU is to create a new Chart Data file from the data supplied in the remaining parameters of the CHART call. No operator interaction occurs and no chart is drawn.

The DATANAME field must contain the name to be assigned to the newly created Chart Data file. If a Chart Data file with the same name already exists, no action is taken, and control is returned to the calling program with an error message.

The data is supplied by setting fields NG, NE, LABELL, KEYL, and HEADINGL in **chart_control** appropriately, and by supplying corresponding data arrays in the remaining parameters of the CHART call. The string supplied in the heading parameter is used for the description text associated with the saved chart data file, as well as for the chart heading.

Possible application

Data derived from an application file or data base may be converted and stored as Chart Data files with DISPLAY = 0 for later access by operator action during an ICU interactive session. Or, instead, a Chart Data file created in this way may be passed to the ICU on a later call (when the original application file or data base may no longer be accessible) by placing the Chart Data name in DATANAME.

– DISPLAY = 1, 2, or 3

Meaning - Display panels

These are the only values by which a CHART call can initiate an interactive session, defined as access by the operator (at the GDDM primary device) to the ICU Display panel and to some or all of the other panels and help information, using the standard ICU interpretation of interrupts (ENTER key, PF keys, and so on).

Note: An interactive session in the above sense cannot be initiated by a program running under the IMS subsystem. In general, when DISPLAY=1, 2, or 3, the primary device must be one that supports input.

DISPLAY = 1 causes the Home Panel to be displayed to the operator initially, and so gives access to the panel hierarchy. All panels are accessible except possibly the Save, Restore, and Directory panels (see the ISOLATE field) and possibly the Print panel (see the DESTNAME field). Chart format and data are initialized according to the values of FORMNAME and DATANAME.

– DISPLAY = 4

Meaning - Print or plot a chart

This value is used to invoke the ICU as a subroutine that causes a specified chart to be printed on a specified GDDM printer or plotter. The chart is specified in FORMNAME and DATANAME, and the printer or plotter is specified by the value in the DESTNAME field.

For a valid print destination name in DESTNAME, the specified chart is printed as one print file. A header page is added, unless otherwise specified in PRTHEAD. The number of copies is given by PRTCOPY. The size of the printed chart is given by PRTDEP and PRTWID, in units defined by PRTUNIT. The position of the chart on the page is controlled by PRTVOFF and PRTHOFF, which specify the vertical and horizontal offsets, also in units defined by PRTUNIT.

Or, instead, the calling program may add the chart to a print file that it has already opened, by specifying `'*OPEN'` as the value of DESTNAME. In this case, PRTCOPY is ignored because the number of copies to be printed was specified on the FSOPEN or DSOPEN call issued by the application program to open the print file. PRTHEAD is also ignored. However, PRTDEP, PRTWID, PRTVOFF, and PRTHOFF can be used to specify the size and position of the chart on the printed page.

– DISPLAY = 5 or 6

Meaning - Construct a chart

These values cause a specified chart to be constructed in the calling program's current GDDM page. The chart constructed is that specified by FORMNAME and DATANAME.

– DISPLAY = 7

Meaning - Only display a chart

This value causes the ICU to construct a chart on a GDDM page inaccessible to the calling program (as for DISPLAY = 1, 2, 3, and 4), and then to output the constructed chart with a GDDM ASREAD call. On return from this ASREAD call, the ICU immediately returns control to the calling program.

– DISPLAY = 8

Meaning - Only show the directory

This value restricts the ICU to the Directory panel in advanced mode format, and its associated Help panel.

– DISPLAY = 9

Meaning - Create a GDF file

The only action taken by the ICU is to create a new Graphics Data Format (GDF) file from the Chart Format and Chart Data supplied in the CHART call parameters. No operator interaction occurs.

Chart Data can be supplied with the CHART call parameters by setting DATANAME = '*', or can be taken from an existing Chart Data file by specifying DATANAME = 'file-name'.

The Chart Format used can be the default if FORMNAME = '*', or can be taken from an existing Chart Format file if FORMNAME = 'file-name'.

Any string supplied with the heading parameter is used as a file descriptor for the GDF file, as well as any possible use as part of the Chart Data.

The destination name DESTNAME = 'file-name' is used to determine the name of the GDF file that is produced.

Possible application

Data derived from an application file or data base may be merged with a Chart Format to produce a GDF file that contains a chart picture using specific data.

GDF files can be used by a wider range of applications than the ICU; this type of file may, therefore, find wider usage than Chart Format and Chart Data files.

- HELP (offset 8; fullword integer)

  0 PF key information is not displayed initially on the Display and GDF Display panels. This setting can be changed by using ENTER whenever either panel is displayed.
  1 PF key information is displayed initially on the Display and GDF Display panels. This setting may be changed by using ENTER whenever either panel is displayed.

  Ignored unless DISPLAY = 1, 2, 3, or 8.

- ISOLATE (offset 12; fullword integer)

  0 Save, Restore, and Directory panels are made available to the operator. The setting is taken from the value of the ICUISOL option in GDDM's external defaults (see the *GDDM System Customization and Administration* book).
  1 Save, Restore, and Directory panels are not made available to the operator.
  2 Save and Restore panels are made available to the operator, but the Directory panel is not.

  Ignored unless DISPLAY = 1, 2, or 3.

- FORMNAME (offset 16; 8-byte character)

  and

- DATANAME (offset 24; 8-byte character)

  These two fields specify the use of Chart Format and Chart Data files respectively. The name of an existing Chart Format file may be supplied by the calling program in FORMNAME. If specified in FORMNAME, the named Chart Format file is used by the ICU to initialize the chart format. Similarly, DATANAME may be used to initialize chart data.

  If FORMNAME contains the reserved name '*', the chart format is initialized to the default format. This is the format used when the ICU is used in stand-alone mode. It specifies a line graph with autoscaled axes, a legend in the center of the right margin, and so on.

  The '*' is also a reserved name for DATANAME. It specifies that chart data is to be initialized from data supplied in the other

parameters of the CHART call. These parameters define the x- and y-data values, the data labels (used instead of x-data values for bar charts, pie charts, and Venn diagrams), the keys (which describe data groups), and the chart heading.

Only when DATANAME = '*' (or when DISPLAY = 0) are these remaining parameters accessed during ICU execution. If no data is to be supplied on the CHART call, DATANAME should be set to '*' and other fields (NG, NE, KEYL, LABELL, and HEADINGL – see below), which describe the data supplied in the remaining parameters, should be set to zero.

- BINDING (offset 32; fullword integer)

  The BINDING field is used only when DATANAME = '*' or when DISPLAY = 0. It indicates whether the data supplied is free or tied. In free mode, each data group has its own set of x values that are different from other data groups. A typical example where free data mode is appropriate is a scatter plot, where each data group is an arbitrary set of (x,y) pairs, and is unrelated to other data groups. In tied data mode, all data groups have the same set of x values.

  Free data was formerly known as paired data, and tied as non-paired.

  In both free and tied modes there is only one set of data labels, which is common to all data groups (but only used for bar charts, pie charts, Venn diagrams, and table charts).

  Valid values are:

  0 Sets of x and y values are tied. There is one set of x values, against which each set of y values is plotted.
  1 Sets of x and y values are free. For each set of y values there is a corresponding set of x values. The sets of x values are distinct.

  Note: For further details on free and tied data see “Free (paired) and tied (non-paired) data” on page 13.

- NG (offset 36; fullword integer)

  The NG field is used only when DATANAME = '*' or when DISPLAY = 0. It specifies the number of data groups supplied.

  For tied data, NG specifies the number of sets of y values in the y-array parameter.

  For free data, NG specifies the number of sets of values in each of the x- and y-array parameters, and the number of values in the **data_control** parameter.

  For both free and tied data, NG also specifies the number of character-string elements in the **keys** array parameter (if the length of each string, given by KEYL, is nonzero).

  If BINDING = 0, the number of data groups for which values are specified in the y-array parameter. If BINDING = 1, the number of data groups for which values are specified in the x- and y-array parameters, and the number of values in the data_control array parameter. Range 0 through 999.

- NE (offset 40; fullword integer)

  The NE field is used only when DATANAME = '*' or when DISPLAY = 0. It specifies the exact number of points in each data group (for tied data), or the maximum number of points in any data group (for free data).

  For tied data, NE specifies the number of y values in each set of values in the y-array parameter, and the number of x values in the x-array parameter (which is common to all data groups).

  For free data, NE specifies the maximum value of any element in the data_control array parameter. The values in data_control specify the actual number of elements in each data group.

  For both free and tied data, NE also specifies the number of data label character string elements in the labels array parameter (provided the length of each string, given by LABELL, is non-zero).

  The calling program may choose whether to supply just data labels, or just x data values, or both data labels and x data values. Specifies the number of elements (per data group) in x and y. Also specifies the number of label strings in labels (if LABELL>0). Range –999 through 999. A positive value causes either labels (if LABELL>0) or x (if LABELL=0) to be passed, but not both. A negative value acts in the same way as the corresponding positive value except that x is

passed even if LABELL>0. (This allows both x and labels to be passed.)

If BINDING = 1, the absolute value of NE gives the maximum number of elements in any data group. The actual number in each data group is specified in the data_control array parameter.

- Length fields

  The length fields KEYL, LABELL, and HEADINGL are used only when DATANAME = '*' or when DISPLAY = 0. They specify respectively the number of characters in each key in the keys parameter, the number of characters in each label in the labels parameter, and the number of characters in the heading parameter. In each case, a zero value is allowed, and the corresponding parameter is then ignored.

  – KEYL (offset 44; fullword integer) Length of each string in keys. Range 0 through 132.

    Ignored unless NG≠0 and either DISPLAY = 0 or DATANAME='*'.

  – LABELL (offset 48; fullword integer) Length of each string in labels. Range 0 through 132.

    Ignored unless NE≠0 and either DISPLAY = 0 or DATANAME='*'.

  – HEADINGL (offset 52; fullword integer) Length of heading. Range 0 through 132.

    Ignored unless DISPLAY=0, DISPLAY=9, or DATANAME='*'.

- DESTNAME (offset 56; 8-byte character)

  IF DISPLAY=1, 2, 3, 4, the DESTNAME field describes the destination name for a print or plot operation.

  DESTNAME=' ' indicates no printer is available (for DISPLAY = 1, 2, or 3 this makes the Print panel inaccessible). DESTNAME='*' indicates that the name is unknown (for DISPLAY = 1, 2, or 3 the name appears blank initially on the Print panel). DESTNAME='*OPEN' indicates that only the current open alternate device supplied by the calling program may be used. These three names are reserved names. Any other name is used as follows:

  For DISPLAY = 1, 2, or 3 the name appears on the Print panel and cannot be modified by the operator.

  For DISPLAY = 4 the name identifies the print destination device.

  The reserved names ' ' and '*' are not valid for DISPLAY = 4.

  IF DISPLAY=9, DESTNAME is the name of the GDF file to be produced.

  Ignored unless DISPLAY = 1, 2, 3, 4, or 9.

- Printing fields

  The PRTDEP, PRTWID, PRTCOPY, PRTHEAD, PRTVOFF, PRTHOFF, and PRTUNIT fields may be used to control the printing action of the ICU.

  If DISPLAY = 1, 2, or 3, used to initialize the Print panel.

  – PRTDEP (offset 64; short floating point)

    Depth of the chart area on the printer, in units given by PRTUNIT. A 0 gives the default depth (the same as '*' on the ICU Print panel). Ignored unless DISPLAY = 1, 2, 3, or 4, and DESTNAME≠' '.

  – PRTWID (offset 68; short floating point)

    Width of the chart area on the printer, in units given by PRTUNIT. A 0 gives the default width (the same as '*' on the ICU Print panel). Ignored unless DISPLAY = 1, 2, 3, or 4, and DESTNAME≠' '.

  – PRTCOPY (offset 72; fullword integer)

    Number of copies to be printed. Range 0 through 99 (0 is treated as a request for the ICU default value of 1). Ignored unless DISPLAY = 1, 2, 3, or 4, and DESTNAME≠' ' and DESTNAME ≠ '*OPEN'.

  – PRTHEAD (offset 76; fullword integer)

    Specifies the type of identification that is to precede the output. The identification can have combinations of a header page, an origin identification (userid/time/date), neither, or both.

    0 default (same meaning as 1)
    1 header page, no origin identification
    2 no header page, no origin identification

3 header page plus origin identification
4 origin identification, no header page

Ignored unless DESTNAME ≠ ' ' and DESTNAME ≠ '*OPEN'.

– PRTVOFF (offset 80; short floating point)

Vertical offset of chart area on the printer from top of page, in units given by PRTUNIT. –1 gives the default offset (the same as '*' on the ICU Print panel.)

Ignored unless DESTNAME≠' '.

– PRTHOFF (offset 84; short floating point)

Horizontal offset of chart area on the printer from the left-hand edge of the page, in units given by PRTUNIT. –1 gives the default offset (the same as '*' on the ICU Print panel.)

Ignored unless DESTNAME≠' '.

– PRTUNIT (offset 88; fullword integer)

Units of measurement for page layout fields PRTDEP, PRTWID, PRTVOFF, and PRTHOFF.

0 default (same meaning as 1)
1 percent of corresponding page dimension (depth or width)
2 inches
3 centimeters
4 printer rows for PRTDEP and PRTVOFF, or columns for PRTWID and PRTHOFF

Ignored unless DESTNAME≠' '.

- RESERVED (offset 92; fullword integer)

  Reserved field.

- Directory fields

  DRYNAME, DRYTYPE, DRYTYPEQ, and DRYLIB are used to control the content of the initial Directory panel. Ignored unless DISPLAY=8.

  – DRYNAME (offset 96; 8-byte character)

  Names of objects to be listed on initial Directory panel. Can begin and/or end with '*', to specify a set of object to list. Blank means list all names.

  – DRYTYPE (offset 104; fullword integer)

  Type of object to be listed on initial Directory panel. Some types must be further defined by the type qualifier field, DRYTYPEQ.

  0 list nothing
  1 list symbol sets (as qualified)
  2 list generated mapgroups
  3 list pictures stored with FSSAVE
  4 list chart descriptor(s) (as qualified)
  5 list chart descriptor(s) (as qualified)
  7 list GDF files
  9 list data definitions
  10 list image projection files
  11 list image data files.

  – DRYTYPEQ (offset 108; fullword integer)

  Qualifier for type of object to be listed on initial Directory panel.

  If DRYTYPE = 1 then

  0 default: same effect as 2
  1 list image symbol sets
  2 list vector symbol sets

  If DRYTYPE = 4 then

  0 default: same effect as 1
  1 list chart format objects only
  2 list chart data objects only
  3 list chart format and data objects

  If DRYTYPE = 5 then

  0 default: same effect as 2
  1 list chart format objects only
  2 list chart data objects only
  3 list chart format and data objects

  Ignored unless DRYTYPE = 1, 4, or 5.

  – DRYLIB (offset 112; 8-byte character)

  Library containing objects to be listed on initial Directory panel. Must be left-justified and padded with blanks.

  Under TSO, a ddname
  Under CICS, a symbolic data set name
  Under VM, a 1- or 2-character filemode
  Under IMS, a DBD name

  In all cases, a blank means that the library defined by ESLIB calls (or GDDM defaults) is listed.

- EXPLVL (offset 120; fullword integer)

  The EXPLVL field defines the experience level mode (standard or advanced) of the initial Directory panel, as discussed under “Format of the chart_control parameter” on page 119. Initial experience level mode for Directory panel.

  The ICU provides two modes, called standard and advanced. They differ in the amount of function available.

  0 default, same effect as 1
  1 standard
  2 advanced

  Ignored unless DISPLAY = 1, 2, or 3.

Passing chart data

Chart data may be supplied by one of two methods:

1. By specifying the name of an existing Chart Data file in DATANAME. Such a Chart Data file must have been created previously by operator action during an ICU session, or by invocation of the ICU with DISPLAY=0, supplying data by method 2 below, or by using CSSAVE.
2. By specifying '*' in DATANAME, and supplying chart data in array parameters of the CHART call.

   One use of this method is to supply no data with the CHART call (in order, for example, to invoke the ICU with a specific initial format, but without supplying any data). To achieve this result, put DATANAME='*', NG=0, NE=0, KEYL=0, LABELL=0 and HEADINGL=0. Only the **chart_control** parameter is accessed by the ICU in this case; values for the other parameters may be dummy values.

Passing z-axis data to the ICU

Tower charts have z-axes, but you cannot pass z-axis data in the CHART call. However, you can still create tower charts because, in the absence of z-axis data, the ICU creates a logical z axis with the data groups spaced evenly along it. If you want to pass z-axis data, use the CSxxxx calls.

Using the chart_control parameter

When including the **chart_control** parameter in your program, you may find it convenient to copy it from a sample program and make alterations to suit your needs. A PL/I version can be seen in the sample program ADMUSP6 in Appendix A, “Sample programs” on page 175. For a COBOL version or a FORTRAN version, see the sample programs ADMUSC6 and ASMUSF6, also in Appendix A, “Sample programs.”

The structure has two versions, or levels. You must indicate which you are using in the field called LEVEL. If LEVEL=0, the current release of GDDM interprets the structure in the same way as in Version 1 Releases 1 and 2. This means that fields beyond PRTCOPY are not inspected. Instead, the following default values are assumed:

```
PRTHEAD=0
PRTVOFF=0
PRTHOFF=0
PRTUNIT=4
DRYNAME=' '
DRYTYPE=0
DRYLIB=' '
EXPLVL=0
```

In addition, PRTDEP and PRTWID are interpreted as fullword binary integers instead of floating point numbers, and DISPLAY=8, and ISOLATE=2 are invalid. These actions ensure that, when LEVEL=0, the CHART call gives the same result as under Version 1 Releases 1 and 2.

If you specify LEVEL=1, you must include the full structure shown above.

Note that it is not necessary to use the field names shown here. Any names that obey the conventions of the corresponding language may be used.

CSCCRT

Function: To create a chart.

CSCCRT (chart-id, level)	
APL code	1203
PGF RCP code	X'14040000' (335806464)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the unique identification number of the chart to be created. It must be greater than 0.

level *(specified by user) (fullword integer)*
This must be set to 1.

Description

Creates a new chart initialized with default format information and null data for a new chart instance.

The defaults that you get are shown with the CSCHA, CSFLT, CSINT, and CSNUM calls. Where a default is device-dependent, the default that you get will be the one for the primary device at the time you make the CSCCRT call. If there is no primary device, a 3179-PC/G is assumed.

To obtain the same results with CSCCRT as with the CSSICU call or when using the ICU interactively, a DSOPEN call must first be issued.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0722 E CHART WITH IDENTIFIER n ALREADY
          EXISTS
ADM0723 E 'LEVEL' (=n) IS INVALID
```

CSCDEL

Function: To delete a chart.

CSCDEL (chart-id)	
APL code	1210
PGF RCP code	X'14040004' (335806468)

Parameters

chart-id *(specified by user) (fullword integer)*
If greater than 0, gives the identification number of the chart to be deleted. If -1, requests that the previously built directory list be deleted.

Description

Deletes a specified chart format and its related data, or deletes a directory list previously built by a CSDIR call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0724 E NO DIRECTORY LIST EXISTS
```

CSCHA

Function: To set character values for a chart.

CSCHA (chart-id, type, start, count, length, chars)	
APL code	1219
PGF RCP code	X'14080008' (336068616)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart for which the character items are to be set.

type *(specified by user) (fullword integer)*
Gives the type of character item to be set. See the table below for valid settings of **type**.

start *(specified by user) (fullword integer)*
For character items that have a number of values (like labels), gives the number of the first character item to be set. For other character items, it must be 1. See the table below for valid settings of **start**.

count *(specified by user) (fullword integer)*
Gives the number of character items in the **chars** parameter.

See the table below for valid settings of **count**.

length *(specified by user) (fullword integer)*
Gives the length of each character item in the **chars** parameter. See the table below for valid settings of **length**.

chars *(specified by user) (character)*
A character item array made up of **count** individual items. All the items must be the same **length** and padded with blanks if necessary.

The length of the array must be equal to **count** * **length**.

For character items that have a number of values (like labels), the items in **chars** set **count** consecutive values, from **start** onward.

If a character item contains six values and you want to set values 3 and 4, set **start** to 3 and set **count** to 2.

Description

Sets character items for a chart. These items normally correspond to items on ICU panels. See the *GDDM-PGF Interactive Chart Utility* book or help panels for more information.

Typical character items are labels, the heading, data group names, symbol set names, directory names, chart format and data names, and printer/plotter destination names.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0729 E FOR TYPE t, 'START' (=n1) PLUS
          'COUNT' (=n2) IS TOO LARGE
ADM0732 E FOR TYPE t, 'LENGTH' (=n) IS
          INVALID
ADM0736 E FOR TYPE t, NO INSTANCE EXISTS
ADM0740 E FOR TYPE t, 'COUNT' (=n) IS INVALID
ADM0741 E FOR TYPE t, 'START' (=n) IS INVALID
ADM0743 E VALUE IS INVALID FOR THE MASTER
          CHART
```

Valid Type settings

Range Gives the lower and upper limits for the **start** and **count** parameters and the upper limit for **start** + **count** - 1.

Default Gives the value set by the CSCCRT call. For some settings of **type**, there are two defaults. These are shown in the table as two values with "|" between them. The first is the Version 1 Release 4 default, the second is the Version 2 default. The default is selected depending on the setting of the GDDM external default, ICUFMDF. For details of this GDDM external default, see the *GDDM System Customization and Administration* book.

Where saved

- **D** indicates that the item is saved in the chart data file
- **DD** indicates that the item is saved in a data definition file
- **F** indicates that the item is saved in the chart format file
- **–** indicates that the item is not saved.

Table 3 (Page 1 of 2). Valid type settings

Type	Range	Length	Default	Where saved
1 Chart format name	1	1 to 8	' '	–
2 Chart data name	1	1 to 8	' '	–
3 Printer/plotter destination name ' ' = no printer available '*' = name is unknown '*OPEN' = only the current open alternate device supplied by the calling program may be used	1	1 to 8	*	–
4 Object names to appear on Directory panel when using CSSICU with DISPLAY=8 ' ' = list all objects '*' = any character in this position	1	1 to 8	' '	–
5 Library name for Directory panel when using CSSICU with DISPLAY=8 TSO = ddname CICS = symbolic data set name VM = 1 or 2 character filemode IMS = DBD name	1	1 to 8	' '	–
6 Data group names for keys (See Note)	1 to number of components	0 to 255	All null	D
7 Data labels (See Note)	1 to number of elements	0 to 255	All null	D
8 Chart heading (See Note)	1	0 to 132	Null	D
9 Chart heading symbol set name	1	1 to 8	* or ADMUUKSF	F
10 User-defined x-axis labels (See Note) The number of labels is increased if necessary	0 to 999	0 to 255	All null	F
11 x-axis labels symbol set name	1	1 to 8	* or ADMUUSRP	F
12 y-axis labels symbol set name	1	1 to 8	* or ADMUUSRP	F
13 x-axis title symbol set name	1	1 to 8	* or ADMUUDRP	F
14 y-axis title symbol set name	1	1 to 8	* or ADMUUDRP	F
15 x-axis title (See Note)	1	0 to 52	null	F
16 y-axis title (See Note)	1	0 to 52	null	F
17 Data group names symbol set name	1	1 to 8	* or ADMUUSRP	F

Table 3 (Page 2 of 2). Valid type settings

Type	Range	Length	Default	Where saved
18 Bar values symbol set name	1	1 to 8	* or ADMUUSRP	F
19 Chart note symbol set name (for the current chart note (See CSNUM type 1))	1	1 to 8	* or ADMUUKSF	F
20 Chart note text (for the current chart note (See CSNUM type 1))	1	0 to 255	Null	F
21 Format name for the current subchart (See CSNUM type 3) (Must be blank for master chart)	1	1 to 8	' '	F
22 Data name for the current subchart (See CSNUM type 3) (Must be blank for master chart)	1	1 to 8	' '	F
23 Table chart text symbol set name	1	1 to 8	* or ADMUUSRP	F
24 Text for table chart missing values	1	0 to 20	'.'	F
25 Data import file identifier VM = fn ft fm TSO = data set name or DD name	1	0 to 56	' '	DD
26 Text for data import missing values	1 to 3	0 to 12	All null	DD
27 Chart format description	1	0 to 52	Null	–
28 Chart data description	1	0 to 52	Null	–
29 GDF name	1	1 to 8	' '	–
30 GDF description	1	0 to 52	Null	–
31 Data definition name	1	1 to 8	' '	–
32 Data definition description	1	0 to 52	Null	–
33 User-defined y-axis labels The number of labels is increased if necessary	0 to 999	0 to 255	All null	F

Note: When the text is displayed, ";" causes a new line. If you want to display a ";", use two of them together.

The text can contain mixed EBCDIC and DBCS (Kanji) characters if the chart format specified allows this (see the *GDDM-PGF Interactive Chart Utility* book for details of this).

CSDEL

Function: To delete item for a chart.

CSDEL	**(chart-id, type, value)**
APL code	1227
PGF RCP code	X'14000824' (335546404)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be used.

type *(specified by user) (fullword integer)*
Indicates the type of item to be deleted.

1 delete the chart note specified by the number in **value**
3 delete the subchart specified by the number in **value**. (This is invalid for the master chart.)

All subsequent notes or subcharts are renumbered and the maximum number is reduced by one.

value *(specified by user) (fullword integer)*
Gives the number of the note or subchart to delete.

Description

Delete chart notes or subcharts.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
```

CSDIR

Function: To build object directory list.

CSDIR	**(name, type, library, count)**
APL code	1224
PGF RCP code	X'14000020' (335544352)

Parameters

name *(specified by user) (8-byte character string)*
The file name of objects to be included in the list.

Partial names may be used by substituting '*' for parts of the name. Thus 'AB*' lists all objects with names beginning 'AB'.

' ' gives a complete list of file names.

type *(specified by user) (fullword integer)*
The file type of objects to be included in the list.

0 Image symbol sets
1 Vector symbol sets
2 Generated map groups
3 Saved pictures (in device-dependent form)
4 Chart format
5 Chart data
6 Chart format and data
7 GDF files (in device-independent form)
9 Chart data definitions
10 Projections
11 Image data

' ' gives a complete list of file types.

library *(specified by user) (8-byte character string)*
The library objects to be included in the list.

Under TSO, this is a ddname.
Under CICS, this is a symbolic data set name.
Under VM, this is a one- or two-character filemode.
Under IMS, this is a DBD name.

' ' gives a complete list of libraries.

count *(returned by GDDM) (fullword integer)*
The number of objects in the list that has been created.

Description

Creates a list of GDDM objects. Any existing list is replaced by this new one. The list created can then be queried using CSQDIR.

The list is not affected by any other CSxxxx call, but it can be deleted by using CSCDEL (-1).

Principal errors

```
ADM0724 E NO DIRECTORY LIST EXISTS
```

CSFLT

Function: To set floating-point values for a chart.

CSFLT	**(chart-id, type, start, count, control, values)**
APL code	1207
PGF RCP code	X'14080004' (336068612)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart for which floating-point items are to be set.

type *(specified by user) (fullword integer)*
Gives the group of items to be set, for example note attributes.

See the table below for the valid settings of **type** and the associated elements of **values**.

start *(specified by user) (fullword integer)*
Gives the number of the first item in the group to be set.

count *(specified by user) (fullword integer)*
Gives the number of items to be set.

If a group contains six items and you want to set items 3 and 4, set **start** to 3 and set **count** to 2.

control *(specified by user) (an array of fullword integers)*
This array indicates how the elements in the **values** parameter are to be used. The first element in this array corresponds to the first one in the **values** array, and so on.

The valid values for the control parameter are:

0 Set the item to that given in the corresponding element of values.
1 Leave the item as it is. Ignore the corresponding element of values.
3 Set the item as though * had been entered on the corresponding ICU panel. Ignore the corresponding element of values. See “Range” in the table below for items that can have this.

values *(specified by user) (array of short floating-point numbers)*
Gives the values to be used for the set of items defined by **type** and subject to the setting of **control**.

The table below gives the meaning of each element of **values** for each setting of **type**.

Description

Sets the value of floating-point items for a chart. These items normally correspond to items on the ICU panels.

Use the *GDDM-PGF Interactive Chart Utility* book or help panels for more information. Typical floating-point items are line width, character widths and note positions.

Items are divided into groups, defined by **type**.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0729 E FOR TYPE t, 'START' (=n1) PLUS
          'COUNT' (=n2) IS TOO LARGE
ADM0730 E FOR TYPE t, ELEMENT n1 OF 'CONTROL'
          (=n2) IS INVALID
ADM0731 E FOR TYPE t, ELEMENT n1 OF 'VALUES'
          (=n2) IS INVALID
ADM0736 E FOR TYPE t, NO INSTANCE EXISTS
ADM0740 E FOR TYPE t, 'COUNT' (=n) IS INVALID
ADM0741 E FOR TYPE t, 'START' (=n) IS INVALID
ADM0743 E VALUE IS INVALID FOR THE MASTER
          CHART
```

Valid Type settings

Default Gives the value set by the CSCCRT call. For some settings of **type**, there are two defaults. These are shown in the table as two values with "|" between them. The first is the Version 1 Release 4 default, the second is the Version 2 default. The default is selected depending on the setting of the external default, ICUFMDF. For details of this external default, see the *GDDM System Customization and Administration* book.

Range Gives the range of values allowed for each item. "Any number" means any number in the valid number range of the ICU.

Where saved

F indicates that the item is saved in the chart format file

– indicates that the item is not saved.

Unless otherwise shown, the indicator in this column applies to all elements of **values**.

Type	Element of Values	Default	Range	Where saved
1 Printer options Units set by CSINT type 45. The defaults (*) give a chart in the center of the paper. Use a pair of elements (1 and 3, or 2 and 4) to get a non-centered chart.	1. Depth of chart area 2. Width of chart area 3. Vertical offset from top of page 4. Horizontal offset from left-hand edge	* * * * If CSINT type 45 element 3 is set to 4 (units are rows and columns), the defaults are 60, 120, 0, and 0.	1 to 100 1 to 100 0 to 100 0 to 100 The sum of an element pair must be less than 101.	–
2 Bar chart options	1. Gap between bars as a percentage of bar width 2. Gap between bar sets as a percentage of bar width 3. Smallest bar value as a percentage of y-axis range	50 or -20 200 or 50 0	-100 to 10000 0 to 10000 0 to 100	F
3 Tower chart options	1. Gap between towers on x axis as a percentage of tower width 2. Gap between towers on z axis as a percentage of tower depth 3. Angle of z axis 4. Relative size of z axis	50 50 45 or 30 100 or 30	0 to 1000 0 to 1000 0 to 180 10 to 1000	F
4 Line widths for data groups	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ... , and so on See CSNUM type 7 for the number of sets of data attributes.	1 or 2	0 to 100	F
5 Marker scale for data groups	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ... , and so on See CSNUM type 7 for the number of sets of data attributes.	1 or 2	0 to 100	F
6 Indexing of y values	1. The x value at which y values should be indexed 2. Data group at which y values should be indexed	1 1	Any number Any number	F
7 Data group name attributes	1. Character width 2. Character height 3. Must be 0	1 * 0	0.01 to 100 0.01 to 100 or * (makes height equal to width) 0	F

Type	Element of Values	Default	Range	Where saved
8 Bar value attributes	1. Character width	1	0.01 to 100	F
	2. Character height	*	0.01 to 100 or * (makes height equal to width)	
	3. Rotation angle	0	-90 to +90	
9 x-axis range	1. Range start	*	Any number or * (allows the data to dictate the axis range)	F
	2. Range end	*		
	3. Intersection with opposite axis	*		
10 y-axis range	1. Range start	*	Any number or * (allows the data to dictate the axis range)	F
	2. Range end	*		
	3. Intersection with opposite axis	*		
11 x-axis labels	1. Numeric multiplier if labels are numeric	1	Any number > 0	F
12 y-axis labels	1. Numeric multiplier if labels are numeric	1	Any number > 0	F
13 x-axis label attributes	1. Character width	1	0.01 to 100	F
	2. Character height	*	0.01 to 100 or * (makes height equal to width)	
	3. Character rotation angle	0	-90 to +90	
14 y-axis label attributes	1. Character width	1	0.01 to 100	F
	2. Character height	*	0.01 to 100 or * (makes height equal to width)	
	3. Character rotation angle	0	-90 to +90	
15 x-axis scale marks	1. Major scale mark interval	*	Any number or * (gives a sensible value based on the data for linear axes and powers of 10 for logarithmic axes)	F
	2. Number of minor scale marks	*	0 to 2048 or *	
16 y-axis scale marks	1. Major scale mark interval	*	Any number or * (gives a sensible value based on the data for linear axes and powers of 10 for logarithmic axes)	F
	2. Number of minor scale marks	*	0 to 2048 or *	

Type	Element of Values	Default	Range	Where saved
17 Heading attributes	1. Character width	1 or 2.5	0.01 to 100	F
	2. Character height	*	0.01 to 100 or * (makes height equal to width)	
	3. Must be 0	0	0	
18 Legend offset from base position	1. Horizontal	0	Any number	F
	2. Vertical	0		
19 Chart proportions	1. Horizontal	device-dependent or 11	0.01 to 100 or * (stretch to cover output area)	F
	2. Vertical	1 or 8.5	0.01 to 100	
20 Note position (for the current note, set by CSNUM type 1)	1. Horizontal	Half the default horizontal character grid	Any number	F
For units see CSINT type 42	2. Vertical	Half the default vertical character grid (but sets of new notes are evenly spaced down the chart area)	Any number	
21 Subchart options (for the current subchart, set by CSNUM type 3)	1. Leftmost position	30	0 to 100	F
	2. Rightmost position	70	0 to 100	
	3. Top position	70	0 to 100	
	4. Bottom position	30	0 to 100	
	All these are percentages of the chart area	(but initially 4 subcharts, one in each corner)	Master chart settings must be: Element 1 0 Element 2 100 Element 3 100 Element 4 0	
	5. Box line width	1	0 to 100	
22 x-reference-line options	1. Reference value	0	Any number	F
23 y-reference-line options	1. Reference value	0	Any number	F
24 x-datum-line options	1. Datum value	0	Any number	F

Type	Element of Values	Default	Range	Where saved
25 y-datum-line options	1. Datum value	0	Any number	F
26 Note attributes (for the current note, set by CSNUM type 1)	1. Character width	1 or 2	0.01 to 100	F
	2. Character height	*	0.01 to 100 or * (makes height equal to width)	
	3. Character rotation angle	0	-180 to 180	
27 Table chart text attributes	1. Character width	1	0.01 to 100	F
	2. Character height	*	0.01 to 100 or * (makes height equal to width)	
	3. Must be 0	0	0	
28 Character width multiplier	1. Character width multiplier	1 or 1.74	0.01 to 100	F
29 x-axis title attributes	1. Character width	1	0.01 to 100	F
	2. Character height	*	0.01 to 100 or * (makes height equal to width)	
	3. Must be 0	0	0	
30 y-axis title attributes	1. Character width	1	0.01 to 100	F
	2. Character height	*	0.01 to 100 or * (makes height equal to width)	
	3. Must be 0	0	0	
31 Table chart options	1. Relative size	100	10 to 1000	F

CSINT

Function: To set integer values for a chart.

CSINT	**(chart-id, type, start, count, control, values)**
APL code	1205
PGF RCP code	X'14080000' (336068608)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart for which values are to be set.

type *(specified by user) (fullword integer)*
Gives the group of items to be set; for example, bar chart attributes.

See the table below for the valid settings of **type** and the associated elements of **values**.

start *(specified by user) (fullword integer)*
Gives the number of the first item in the group to be set.

count *(specified by user) (fullword integer)*
Gives the number of items to be set.

If a group contains six items and you want to set items 3 and 4, set **start** to 3 and set **count** to 2.

control *(specified by user) (an array of fullword integers)*
This array indicates how the elements in the **values** parameter are to be used. The first

element in this array corresponds to the first one in the **values** array, and so on.

The valid values for the control parameter are:

0 Set the item to that given in the corresponding element of values.

1 Leave the item as it is. Ignore the corresponding element of values.

3 Set the item as though * had been entered on the corresponding ICU panel. Ignore the corresponding element of values. See “Range” in the table below for items that can have this.

values *(specified by user) (an array of fullword integers)*
Gives the values to be used for the set of items defined by **type** and subject to the setting of **control**.

The table below gives the meaning of each element of **values** for each setting of **type**.

Description

Sets the value of integer items for a chart. These items normally correspond to items on the ICU panels. Use the *GDDM-PGF Interactive Chart Utility* book or help panels for more information.

Typical items are chart type, line colors, and data interpretation options. Items are divided into groups depending on type.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0729 E FOR TYPE t, 'START' (=n1) PLUS
          'COUNT' (=n2) IS TOO LARGE
ADM0730 E FOR TYPE t, ELEMENT n1 OF 'CONTROL'
          (=n2) IS INVALID
ADM0731 E FOR TYPE t, ELEMENT n1 OF 'VALUES'
          (=n2) IS INVALID
ADM0736 E FOR TYPE t, NO INSTANCE EXISTS
ADM0740 E FOR TYPE t, 'COUNT' (=n) IS INVALID
ADM0741 E FOR TYPE t, 'START' (=n) IS INVALID
ADM0743 E VALUE IS INVALID FOR THE MASTER
          CHART
```

Valid Type settings

Default Gives the value set by the CSCCRT call. For some settings of **type**, there are two defaults. These are shown in the table as two values with “|” between them. The first is the Version 1 Release 4 default, the second is the Version 2 default. The default is selected depending on the setting of the external default, ICUFMDF. For details of this external default, see the *GDDM System Customization and Administration* book.

Range and meaning Gives the values allowed for each item and their meaning.

Where saved

D indicates that the item is saved in the chart data file.
DD indicates that the item is saved in a data definition file.
F indicates that the item is saved in the chart format file.
– indicates that the item is not saved.

Unless otherwise shown, the indicator in this column applies to all elements of **values**.

Type	Element of Values	Default	Range and meaning	Where saved
1 Chart type options (Element 1 is ignored when element 2 is set to 2.)	1. Chart type	1	1 line graph 2 surface chart 3 histogram 4 bar chart 5 pie chart 6 Venn diagram 7 polar chart 8 tower chart 9 table chart	F
	2. Single or mixed chart	1	1 single chart 2 mixed chart	
2 Line graph options	1. Data type	1	1 absolute 2 relative	F
	2. Markers	1	1 yes 2 no	
	3. Connected points	1	1 yes 2 no	
	4. Connector type	1	1 straight line 2 curved line	
	5. Curve smoothness	10	1 to 99 Higher numbers give a smoother curve	
3 Surface chart options	1. Data type	2	1 absolute 2 relative	F
	2. Shading	1	1 mountain range 2 to previous line	
	3. First data group shaded	1	1 yes 2 no	
	4. Connector type	1	1 straight line 2 curved line	
	5. Curve smoothness	10	1 to 99 Higher numbers give a smoother curve	
4 Histogram options	1. Data type	1 or 2	1 absolute 2 relative	F
	2. y-value representation	2 or 1	1 bar areas 2 bar heights	
	3. y value to be ignored	1	1 last value 2 first value	
	4. Riser lines from x axis	1	1 yes 2 no	
	5. Data group shading	1	1 yes 2 no	
	6. First data group shaded	1	1 yes 2 no	

Type	Element of Values	Default	Range and meaning	Where saved
5 Bar chart options	1. Data group position	1	1 side by side 2 stacked 3 overlaid	F
	2. Bars shaded	1	1 yes 2 no	
	3. First data group visible	1	1 yes 2 no	
	4. Position of bar values	0	0 no bar values 1 at bar end 2 inside bars 3 values as in Version 1 Release 3	
	5. Scientific notation	2	1 yes 2 no	
	6. Number of digits after decimal point	2	0 to 6	
6 Bar value attributes	1. Bar value color (see Color numbers on page 209)	0 or 7	0 to 255	F
	2. Character mode	1	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Bar value areas blanked	1	1 yes 2 no	
	4. Must be 0	0	0	
7 Pie chart options	1. Data type	1	1 absolute 2 relative	F
	2. Size of pies	1	1 all the same size 2 size related to total value	
	3. Label position	1 or 2	1 attached to slices 2 in a legend	
	4. Shading of slices	1	1 yes 2 no	
	5. Position of values	1	1 yes 2 no	
	6. Size of pies compared to maximum	100	1 to 100	
	7. Tilt away from viewer	0	0 to 99	
	8. Thickness of pies compared to slices	0	0 to 250	
	9. Amount that exploded slices should be moved	20	0 to 250	
8 Venn diagram options	1. Areas shaded	1	1 yes 2 no	F

Type	Element of Values	Default	Range and meaning	Where saved
9 Polar chart options	1. Data type	1	1 absolute 2 relative	F
	2. Bands shaded	1 or 2	1 yes 2 no	
	3. Shading type	2 or 1	1 mountain range 2 to reference line	
	4. Markers	1	1 yes 2 no	
	5. Points connected	1	1 yes 2 no	
	6. Connector type	1	1 straight line 2 curved line	
	7. Curve smoothness	10	1 to 99 Higher numbers give a smoother curve	
10 Tower chart options	1. Grid	0	0 on base only 1 on base and behind 2 on base and one side 3 on all three	F
	2. Attributes selected	1	1 along z axis 2 along x axis	
	3. z-axis labels	1	1 no labels 2 data group names 3 numeric labels	
	4. Scale mark shadows on towers	2 or 1	1 yes 2 no	
	5. Scale tower drawn	2	1 yes 2 no	
11 Shading and marker color for each data group (see Color numbers on page 209)	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ..., and so on see CSNUM type 7 for the number of sets of data attributes.	Depends on data-attribute-set-number and primary device	0 to 255	F
12 Line color for each data group (see Color numbers on page 209)	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ..., and so on see CSNUM type 7 for the number of sets of data attributes.	*	0 to 255 or * (same as type 11)	F
13 Shading pattern for each data group (see Figure 19 on page 210)	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ..., and so on see CSNUM type 7 for the number of sets of data attributes.	Depends on data-attribute-set-number and primary device	0 to 16 and 65 to 254	F

Type	Element of Values	Default	Range and meaning	Where saved
14 Line type for each data group (see "Line type numbers" on page 209)	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ..., and so on see CSNUM type 7 for the number of sets of data attributes.	7	0 to 8	F
15 Marker type for each data group (see "Marker numbers" on page 209)	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ..., and so on see CSNUM type 7 for the number of sets of data attributes.	Depends on data-attribute-set-number and primary device	0 to 62 and 65 to 254	F
16 Chart type for each data group	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ..., and so on see CSNUM type 7 for the number of sets of data attributes.	Depends on data-attribute-set-number and primary device	1 line 2 surface 3 histogram 4 bar	F
17 Pie slices to be exploded	1. Applies to the set of data attributes indicated by **start** 2. Applies to the next set of data attributes, ..., and so on see CSNUM type 7 for the number of sets of data attributes.	2	1 exploded 2 not exploded	F
18 Profile options	1. Preview chart	1	1 no preview chart 2 on all panels except data entry 3 on all panels	–
	2. Screen line for start of preview chart (counted from top)	23	1 to 99	–
	3. Screen line for end of preview chart (counted from bottom)	3	1 to 99	–
	4. Text highlighting	1	1 no 2 reverse video	–
	5. Characters in text strings	1	1 latin 2 latin and DBCS mixed, with position 3 latin and DBCS mixed, no position	F and D
	6. Type of directory	1	1 standard 2 advanced	–

Type	Element of Values	Default	Range and meaning	Where saved
19 Data interpretation options	1. Position of y values	1	1 at specified x values (see CSXDT) 2 at equal x intervals	F
	2. y value representation	1	1 as entered 2 as indicated by element 3	
	3. y value indexing	1	1 as percentage of all y at x 2 as percentage of all y in that data group 3 as percentage of the y at the x value given in the first element of CSFLT type 6 4 as percentage of the y value in data group given in the second element of CSFLT type 6	
	4. y value position	1	1 at specified z values 2 at equal z intervals	
20 Data-group-name attributes	1. Data-group-name color (see Color numbers on page 209)	0 or 7	0 to 255	F
	2. Character mode	3	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Data-group-name areas blank	1	1 yes 2 no	
	4. Data-group-name areas outlined	1	1 yes 2 no	
21 x-axis title options	1. Axis position	1	1 Parallel to axis, centered 2 Parallel to axis, at end 3 Horizontal above axis (if axis vertical) Parallel to axis (if axis horizontal)	F
22 y-axis title options	1. Axis position	1 or 3	1 Parallel to axis, centered 2 Parallel to axis, at end 3 Horizontal above axis (if axis vertical) Parallel to axis (if axis horizontal)	F

Type	Element of Values	Default	Range and meaning	Where saved
23 x-axis line options	1. Axis line required	1	1 yes 2 no	F
	2. Axis line color (see Color numbers on page 209)	0 or 7	0 to 255	
	3. Axis line type (see "Line type numbers" on page 209)	7	1 to 8	
	4. Axis line width	1	1 to 2	
24 y-axis line options	1. Axis line required	1	1 yes 2 no	F
	2. Axis line color (see Color numbers on page 209)	0 or 7	0 to 255	
	3. Axis line type (see "Line type numbers" on page 209)	7	1 to 8	
	4. Axis line width	1	1 to 2	
25 x-axis scale and range	1. Axis type (normally only the y axis is logarithmic)	1	1 linear 2 logarithmic	F
	2. Make 0 appear on axis	2	1 yes 2 no	
26 y-axis scale and range	1. Axis type (normally only the y axis is logarithmic)	1	1 linear 2 logarithmic	F
	2. Make 0 appear on axis	2	1 yes 2 no	
27 x-axis label options	1. Label type	5	0 no labels 1 numeric values multiplied by value in CSFLT type 11 2 your own labels 3 day labels 4 month labels 5 data labels	F
	2. First label if label type is 4	1	1 to 12 1 = January etc.	
	3. Position of labels	1	1 beside scale marks 2 between scale marks	
	4. Label abbreviations if label type is 3 or 4	1	1 no abbreviations 2 first three letters 3 first letter	
	5. Punctuation type if labels are numeric	1	1 none 2 standard	
	6. First label if label type is 3	1	1 to 7 1 = Monday etc.	

Type	Element of Values	Default	Range and meaning	Where saved
28 y-axis label options	1. Label type	1	0 no labels 1 numeric values multiplied by value in CSFLT type 12 2 your own labels 3 day labels 4 month labels 5 data labels	F
	2. First label if label type is 4	1	1 to 12 1 = January etc.	
	3. Position of labels	1	1 beside scale marks 2 between scale marks	
	4. Label abbreviations if label type is 3 or 4	1	1 no abbreviations 2 first three letters 3 first letter	
	5. Punctuation type if labels are numeric	1	1 none 2 standard	
	6. First label if label type is 3	1	1 to 7 1 = Monday etc.	
29 x-axis label attributes	1. Label color (see Color numbers on page 209)	0 or 7	0 to 255	F
	2. Character mode	3	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Must be 0	0	0	
	4. Must be 0	0	0	
30 y-axis label attributes	1. Label color (see Color numbers on page 209)	0 or 7	0 to 255	F
	2. Character mode	3	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Must be 0	0	0	
	4. Must be 0	0	0	
31 x-axis scale marks	1. Scale mark type	3	1 no scale marks 2 scale marks on one side of axis 3 scale marks on other side of axis 4 scale marks across axis	F

Type	Element of Values	Default	Range and meaning	Where saved
32 y-axis scale marks	1. Scale mark type	3	1 no scale marks 2 scale marks on one side of axis 3 scale marks on other side of axis 4 scale marks across axis	F
33 x-axis grid line options	1. Grid lines required	2	1 yes 2 no	F
	2. Grid line color (see Color numbers on page 209)	0 or 7	0 to 255	
	3. Grid line type (see “Line type numbers” on page 209)	7 or 1	1 to 8	
	4. Grid line width	1	1 to 2	
34 y-axis grid line options	1. Grid lines required	2	1 yes 2 no	F
	2. Grid line color (see Color numbers on page 209)	0 or 7	0 to 255	
	3. Grid line type (see “Line type numbers” on page 209)	7 or 1	1 to 8	
	4. Grid line width	1	1 to 2	
35 x-reference-line options (elements 2, 3, 4 also affect type 51)	1. y-reference-line required	2	1 yes 2 no	F
	2. x- and y-line color (see Color numbers on page 209)	0 or 7	0 to 255	
	3. x- and y-line type (see “Line type numbers” on page 209)	7	1 to 8	
	4. x- and y-line width	1	1 to 2	
36 x-datum-line options	1. Line required	2	1 yes 2 no	F
	2. Line color (see Color numbers on page 209)	0 or 7	0 to 255	
	3. Line type (see “Line type numbers” on page 209)	7	1 to 8	
	4. Line width	1	1 to 2	
37 y-datum-line options	1. Line required	2	1 yes 2 no	F
	2. Line color (see Color numbers on page 209)	0 or 7	0 to 255	
	3. Line type (see “Line type numbers” on page 209)	7	1 to 8	
	4. Line width	1	1 to 2	

Type	Element of Values	Default	Range and meaning	Where saved
38 Heading attributes	1. Heading color (see Color numbers on page 209)	0 or 7	0 to 255	F
	2. Character mode	3	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Must be 0	0	0	
	4. Must be 0	0	0	
39 Heading and axis positions	1. Heading position	1	1 no heading 2 top of chart 3 bottom of chart	F
	2. Heading justification	1	1 centered 2 right justified 3 left justified	
	3. Axis orientation	1	1 vertical y axis and bars, side by side pies, and Venn circles, x values at left side of table 2 horizontal y axis and bars, top to bottom pies, and Venn circles, x values across top of table	
	4. Horizontal axis position	1	1 bottom left-hand 2 centered 3 top right-hand	
	5. Vertical axis position	1	1 bottom left-hand 2 centered 3 top right-hand	
40 Legend position and format	1. Legend required	1	1 yes 2 no	F
	2. Base position	1	1 right margin 2 left margin 3 bottom margin 4 top margin	
	3. Position within margin	1	1 left to right or bottom to top 2 right to left or top to bottom	
	4. Maximum width (horizontal legend)	*	1 to 255 or * (chart width)	
	5. Maximum height (vertical legend)	*	1 to 255 or * (chart height)	
	6. Order of construction	1	1 centered 2 at top or right 3 at bottom or left	

Type	Element of Values	Default	Range and meaning	Where saved
41 Chart dimensions	1. Number of grid rows	device rows or 32	1 to 255	F
	2. Number of grid columns	device columns or 80	1 to 255	
	3. Number of rows in top margin	5	0 to 255	
	4. Number of rows in bottom margin	5	0 to 255	
	5. Number of columns in left margin	10	0 to 255	
	6. Number of columns in right margin	10	0 to 255	
42 Note options (for the current note, set by CSNUM type1)	1. Horizontal distance units	1	1 character grid 2 axis	F
	2. Vertical distance units	1	1 character grid 2 axis	
	3. Point on the note rectangle at which to apply the distance	5	1 to 9	
	4. Interactive note	1	1 yes 2 no	
	5. Note is selected	1	1 yes 2 no	
43 Subchart options (for the current subchart, set by CSNUM type 3)	1. Subchart shaded	0	1 yes 2 no	F
	2. Background shading color (see Color numbers on page 209)	8	0 to 255	
	3. Background shading pattern (see Figure 19 on page 210)	16	0 to 16, 65 to 254	
	4. Boxed subchart	2	1 yes 2 no	
	5. Box line color (see Color numbers on page 209)	7	0 to 255	
	6. Box line type (see “Line type numbers” on page 209)	7	0 to 8	
	7. Subchart selected	1	1 yes 2 no	
	8. Chart identification of main storage chart. If not zero, the identification number of a chart to be the subchart rather than the one named in CSCHA type 21 or 22.	0	≥ 0	
44 Data import options	1. Type of file	1	1 unformatted (sequential) 2 Data Interchange Format (DIF)	DD
	2. First data group placement	0	0 (replace all) 1 to 999 or * (add at end)	
	3. First note placement	0	0 (replace all) 1 to 999 or * (add at end)	
	4. Transpose after import	2	1 yes 2 no	

Type	Element of Values	Default	Range and meaning	Where saved
45 Printing options	1. Number of copies to print	1	1 to 99	–
	2. Content of header pages	0	0 default (same as 1) 1 header page and no origin identification 2 no header page or origin identification 3 header page and origin identification 4 no header page but origin identification	
	3. Units to be used for print position (CSFLT type 1)	0	0 default (same as 1) 1 a percentage of the appropriate page dimension (depth or length) 2 inches 3 centimeters 4 number of rows for calls affecting page depth, number of columns for calls affecting page width	
	4. Protect print name fields	2	1 yes 2 no	
46 x-axis title attributes	1. Title color (see Color numbers on page 209)	0 or 7	0 to 255	F
	2. Character mode	3	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Must be 0	0	0	
	4. Must be 0	0	0	
47 y-axis title attributes	1. Title color (see Color numbers on page 209)	0 or 7	0 to 255	
	2. Character mode	3	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Must be 0	0	0	
	4. Must be 0	0	0	

Type	Element of Values	Default	Range and meaning	Where saved
48 Note attributes (for the current note, set by CSNUM type 1)	1. Note color (see Color numbers on page 209)	0 or 7	0 to 255	F
	2. Character mode	3	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Area behind note blanked	2	1 yes 2 no	
	4. Note to be outlined	2	1 yes 2 no	
49 Table chart options	1. Color of numeric data	0	0 all the same 1 varies by data group 2 varies by x slice	F
	2. Number of x slices per set	*	1 to 250 or * (all)	
	3. Lines drawn between sets of x slices	2	1 yes 2 no	
	4. Gap between sets of x slices	100	0 to 250	
	5. Number of data groups per set	1	1 to 250 or * (all)	
	6. Lines drawn between sets of data groups	1	1 yes 2 no	
	7. Gap between sets of data groups	100	0 to 250	
	8. z-axis labels	2	1 none 2 use data group names 3 use z values	
	9. Scientific notation	2	1 yes 2 no	
	10. Number of digits after decimal point	2	0 to 6	
50 Table chart text attributes	1. Text color (see Color numbers on page 209)	0 or 4	0 to 255	
	2. Character mode	3	1 fixed size, approximate positioning 2 fixed size, exact positioning 3 scaled, exact positioning	
	3. Must be 0	0	0	
	4. Must be 0	0	0	
51 x-reference-line (attributes set by type 35)	1. Line required	2	1 yes 2 no	

CSLOAD

Function: To restore saved chart information.

CSLOAD (chart-id, type, name)

APL code	1222
PGF RCP code	X'14000010' (335544336)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart for which the object is to be restored.

type *(specified by user) (fullword integer)*
Indicates the type of chart object to be restored:

- **1** Load a format object. The name of the format file to be loaded must be given in the **name** parameter.
- **2** Load a data object. The name of the data file to be loaded must be given in the **name** parameter.
- **5** Load a data definition object. The name of the data definition file must be given in the **name** parameter.
- **6** Import a data file using a previously loaded data definition object. The **name** parameter is ignored.

name *(specified by user) (8-byte character string)*
Gives the name of the chart object to be restored. The character string must be eight characters long.

`'*'` resets an object to the default state.

The special names `'*TIED'` and `'*FREE'` that are available on the ICU panels, are not available with this call, use CSNUM type 12.

Description

Loads a chart object that has previously been saved. The **name** parameter updates the corresponding chart name set by CSCHA. The description loaded with the chart updates the corresponding chart description set by CSCHA.

Principal errors

```
ADM0711 E CHART {DATA|FORMAT} 'a' HAS INVALID
          CONTENTS
ADM0712 E CANNOT {LOAD|DISPLAY|PRINT}
          KANJI/HANGEUL CHART
          {FORMAT|DATA|FORMAT AND DATA} 'a'
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM1154 E NO CURRENT DATA DEFINITION
          AVAILABLE
ADM1155 E CURRENT DATA DEFINITION HAS NO
          VALID ITEMS DEFINED
```

CSNUM

Function: To set control value for a chart.

CSNUM	**(chart-id, type, value)**
APL code	1211
PGF RCP code	X'14080020' (336068640)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart for which control values are to be set.

type *(specified by user) (fullword integer)*
Indicates the type of control value to be set.

The valid types are:

1. Set the current note number to the number in the **value** parameter. If the number is greater than the current maximum, new empty notes are created and the maximum is increased to this number.

   The current note number is set to the default of 0:

   When a new chart is created
   After a CSNUM type 2 call
   After a CSSICU call with DISPLAY = 1 or 2
   After a CSDEL type 1 call
   After a CSLOAD type 1 call.

   The **value** parameter must be in the range 0 through 999. This item is not saved.

2. Set the maximum note number to the number in the **value** parameter. If the number is greater than the current maximum, new empty notes are created and the maximum is increased to this number. If the number is less than the current maximum, the excess notes are deleted. The maximum note number is 8 when a new chart is created.

The **value** parameter must be in the range 0 through 999. This item is saved in the chart format file.

3. Set the current subchart number to the number in the **value** parameter. If the number is greater than the current maximum, new empty subcharts are created and the maximum is increased to this number.

   The current subchart number is set to the default of 0:

   When a new chart is created
   After a CSNUM type 4 call
   After a CSSICU call with DISPLAY = 1 or 2
   After a CSDEL type 3 call
   After a CSLOAD type 1 call.

   The **value** parameter must be in the range 0 through 999. This item is not saved.

4. Set the maximum subchart number to the number in the **value** parameter. If the number is greater than the current maximum, new default subcharts are created and the maximum is increased to this number. If the number is less than the current maximum, the excess subcharts are deleted (but never the master chart). The maximum subchart number is 5 when a new chart is created.

   The **value** parameter must be in the range 1 through 999. This item is saved in the chart format file.

5. Set the number of data groups to the number in the **value** parameter. If the number is greater than the current number, new data groups with missing values, null names, and appropriate z values are created. If the number is less than the current number, the excess data groups are deleted. The number of data groups is 0 when a new chart is created.

   The **value** parameter must be in the range 0 through 999. This item is saved in the chart data file.

6. Set the number of elements (x values) to the number in the **value** parameter. If the number is greater than the current number, new elements with missing values are added to each data group and appropriate x values and null data values are created. If the number is less than the current number, the excess elements are deleted. The number of elements is 0 when a new chart is created.

   For free data, the number of elements is set for the current component, as defined by CSNUM type 13.

   The **value** parameter must be in the range 0 through 999. This item is saved in the chart data file.

7. Set the number of data attribute sets to the number in the **value** parameter. If the number is greater than the current number, new sets are created and attribute values are created as if the I command had been used on the ICU data attributes panel (2.6). If the number is less than the current number, the excess attribute sets are deleted. The number of sets is 12 if Version 2 defaults have been selected or 8 if not, when a new chart is created. (See ICUFMDF in the *GDDM System Customization and Administration* book for information on selecting these GDDM external defaults.)

   The **value** parameter must be in the range 0 through 32. This item is saved in the chart format file.

8. Set the type of object to be listed on the directory panel when using CSSICU with DISPLAY = 8. The number in the **value** parameter must be one of the following:

   –1 No list
   0 Image symbol sets
   1 Vector symbol sets
   2 Generated map groups
   3 Saved pictures (in device-dependent form)
   4 Chart format
   5 Chart data
   6 Chart format and data
   7 GDF files (in device-independent form)
   9 Chart data definitions
   10 Projections
   11 Image data

   This item is not saved.

9. Reserved. The **value** must be 0.

10. Set the number of the master chart to the number in the **value** parameter. The master chart is moved so that it precedes the subchart with this number. The subcharts are renumbered. The number must not be greater than the maximum subchart number. The number is set to 1 when a new chart is created.

    This item is saved in the chart format file.

11. Set the subchart nesting level to the number in the **value** parameter. The number must be in the range 0 through 5. The number is set to 5 when a new chart is created.

    This item is not saved.

12. Set type of data: tied or free data. All existing data is cleared and all data groups are deleted.

    1 = tied data
    2 = free data

    This is set to 1 when a new chart is created.

    This item is saved in the chart data file.

13. Set the current component for x data to be used by CSNUM and CSQNUM type 6. The number in the **value** parameter must not exceed the current number of components as set by CSNUM type 5.

    It must be set to 0 for tied data. It is set to 1 for free data:

    When a new chart is created
    After a CSSICU call with DISPLAY = 1 or 2
    After a CSNUM type 5 call
    After a CSLOAD type 2 call.

    This item is not saved.

value *(specified by user) (fullword integer)*
An integer giving the control number as indicated by the **type** parameter.

Description

Sets control values for a chart.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0738 E FOR TYPE t, 'VALUE' (=n) IS INVALID
```

CSQCHA

Function: To query character values for a chart.

CSQCHA	**(chart-id, type, start, count, length, chars)**
APL code	1220
PGF RCP code	X'140C0008' (336330760)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

type *(specified by user) (fullword integer)*
Gives the type of character item to be queried. See CSCHA on page 127 for the meaning and valid settings of **type**, **start**, **count**, and **length**.

start *(specified by user) (fullword integer)*
For character items that have a number of values (like labels), gives the number of the first character item to be queried. For other character items, it must be 1.

count *(specified by user) (fullword integer)*
Gives the number of character items to be queried.

For example, if a character item contains six values and you want to look at values 3 and 4, set **start** to 3 and set **count** to 2.

length *(specified by user) (fullword integer)*
Gives the length of each character item in the **chars** parameter. All the items in the array must be the same length.

chars *(returned by GDDM) (character)*
A character string array made up of **count** individual items each of length **length**. An array of length **count** * **length** will be returned, starting with the element specified by **start**.

Description

Queries character items for a chart.

The items returned can be used unchanged in a subsequent CSCHA call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0729 E FOR TYPE t, 'START' (=n1) PLUS
          'COUNT' (=n2) IS TOO LARGE
ADM0732 E FOR TYPE t, 'LENGTH' (=n) IS
          INVALID
ADM0740 E FOR TYPE t, 'COUNT' (=n) IS INVALID
ADM0741 E FOR TYPE t, 'START' (=n) IS INVALID
```

CSQCHL

Function: To query character lengths for a chart.

CSQCHL (chart-id, type, count, length)	
APL code	1221
PGF RCP code	X'140C000C' (336330764)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

type *(specified by user) (fullword integer)*
Gives the type of character item to be queried. See CSCHA on page “CSCHA – Set character values for a chart” on page 127 for valid settings of **type**.

count *(returned by GDDM) (fullword integer)*
Returns the number of values for the character item being queried.

length *(returned by GDDM) (fullword integer)*
Returns the length of each character item in the **char** parameter.

Description

Queries a character item set by a CSCHA call to find the number of values and the length of each value.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0736 E FOR TYPE t, NO INSTANCE EXISTS
```

CSQCS

Function: To query CSxxxx call information.

CSQCS (chart-id, mode, type, count, values)	
APL code	1226
PGF RCP code	X'14040014' (335806484)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

mode *(specified by user) (fullword integer)*
Use with the **type** parameter to specify the information required.

See the table under the **type** parameter for valid combinations of the mode and type parameters.

type *(specified by user) (fullword integer)*
Use with the **mode** parameter to specify the information required.

Valid mode and type combinations

Mode	Type	Requests
0	0	maximum type value for CSNUM and CSQNUM
1	0	maximum type value allowed for CSINT and CSQINT
1	n	current item information and number of elements valid for CSINT and CSQINT type n
2	0	maximum type value allowed for CSFLT and CSQFLT
2	n	current item information and number of elements valid for CSFLT and CSQFLT type n
3	0	maximum type value allowed for CSCHA, CSQCHA, and CSQCHL
3	n	current item information valid for CSCHA, CSQCHA, and CSQCHL type n

count *(specified by user) (fullword integer)*
Gives the number of elements to be returned in the **values** parameter.

values *(returned by GDDM) (an array of fullword integers)*
Returns the requested information.

The elements are arranged as follows:

Element 1 The maximum type **value** or the number of elements allowed, as requested by the mode and type parameters.

For mode 3 Type n, the returned value is always 1.

Element 2 and Element 3 These give the instance information, if any, for the call and type specified by **mode** and **type**.

Where a call (like CSINT type 42) refers to an item (like notes) that can have a number of instances, element 2 gives the type value to use with CSNUM and CSQNUM to set or query the total number of instances.

Element 3 gives the type value to use to set or query the **current** instance.

If the call and type specified by **mode** and **type** do not apply to items that can have several instances, then elements 2 and 3 are both set to 0.

Note: Elements 2 and 3 contain 0 if **type** is 0.

Description

Gives information about the valid parameter ranges of other CSxxxx calls.

If you use this call with other CSQxxx calls, you can discover all you need to know about any chart.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0726 E 'MODE' (=n) IS INVALID
ADM0727 E 'COUNT' (=n) IS INVALID
ADM0737 E FOR MODE n, 'TYPE' (=t) IS INVALID
```

CSQDIR

Function: To query object directory list.

CSQDIR	**(count, name, type, library, date, length, description)**
APL code	1225
PGF RCP code	X'14000024' (335544356)

Parameters

count *(specified by user) (fullword integer)*
Gives the number of the object in a list of GDDM objects created by a CSDIR call, about which information is required. CSDIR will have returned the total number of objects in the list.

name *(returned by GDDM) (8-byte character string)*
Returns the name of the object whose number was given by the **count** parameter.

type *(returned by GDDM) (fullword integer)*
Returns the type of the object whose number was given by the **count** parameter. Possible types are:

0	Image symbol sets
1	Vector symbol sets
2	Generated map groups
3	Saved pictures (in device-dependent form)
4	Chart format
5	Chart data
6	Chart format and data
7	GDF files (in device-independent form)
9	Chart data definitions
10	Projections
11	Image data

library *(returned by GDDM) (8-byte character string)*
Returns the library of the object whose number was given by the **count** parameter.

Under TSO, this will be a ddname.
Under CICS, this will be a symbolic data set name.
Under VM, this will be a one- or two-character filemode.
Under IMS, this will be a DBD name.

date *(returned by GDDM) (20-byte character string)*
Returns the date and time of the last update of the object whose number was given by the **count** parameter. Your GDDM defaults give the format for the date and time. The field is left-justified.

length *(specified by user) (fullword integer)*
Gives the length of the string to be returned in the **description** parameter.

description *(returned by GDDM) (character)*
Returns the description of the object whose number was given by the **count** parameter.

Description

Queries a list of GDDM objects created by a CSDIR call.

Principal errors

```
ADM0724 E NO DIRECTORY LIST EXISTS
ADM0727 E 'COUNT' (=n) IS INVALID
```

CSQFLT

Function: To query floating-point values for a chart.

CSQFLT	**(chart-id, type, start, count, control, values)**
APL code	1208
PGF RCP code	X'140C0004' (336330756)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

type *(specified by user) (fullword integer)*
Gives the group of items to be queried; for example, note attributes.

See CSFLT on page 132 for the meaning and the valid settings of **type**, **start**, and **count**.

start *(specified by user) (fullword integer)*
Gives the number of the first item in the group to be queried.

count *(specified by user) (fullword integer)*
Gives the number of items in the group to be queried.

For example, if a group contains six items and you want to look at items 3 and 4, set **start** to 3 and set **count** to 2.

control *(returned by GDDM) (an array of fullword integers)*
This returned array indicates how the elements in the **values** parameter are to be interpreted. The first element in this array corresponds to the first one in the **values** array, and so on.

The valid values for the control parameter are:

0 The item has the value given in the corresponding element of values.

3 The item is set as though * had been entered on the corresponding ICU panel.

values *(returned by GDDM) (array of short floating-point numbers)*
Returns the values of the group of items requested.

Description

Queries floating-point items for a chart.

The information returned is in a format suitable for use in a subsequent CSFLT call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0729 E FOR TYPE t, 'START' (=n1) PLUS
          'COUNT' (=n2) IS TOO LARGE
ADM0736 E FOR TYPE t, NO INSTANCE EXISTS
ADM0740 E FOR TYPE t, 'COUNT' (=n) IS INVALID
ADM0741 E FOR TYPE t, 'START' (=n) IS INVALID
```

CSQINT

Function: To query integer values for a chart.

CSQINT	**(chart-id, type, start, count, control, values)**
APL code	1206
PGF RCP code	X'140C0000' (336330752)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

type *(specified by user) (fullword integer)*
Gives the group of items to be queried; for example, bar chart attributes.

See CSINT on page 137 for the meaning and the valid settings of **type**, **start**, and **count**.

start *(specified by user) (fullword integer)*
Gives the number of the first integer item to be queried.

count *(specified by user) (fullword integer)*
Gives the number of items in the group to be queried.

For example, if a group contains six items and you want to look at items 3 and 4, set **start** to 3 and set **count** to 2.

control *(returned by GDDM) (an array of fullword integers)*
This returned array indicates how the elements in the **values** parameter are to be interpreted. The first element in this array corresponds to the first one in the **values** array, and so on.

The valid values for the control parameter are:

0 The item has the value given in the corresponding element of values.

3 The item is set as though * had been entered on the corresponding ICU panel.

values *(returned by GDDM) (an array of fullword integers)*
Returns the values of the group of items requested.

Description

Queries integer items for a chart.

The information returned is in a format suitable for use in a subsequent CSINT call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0728 E FOR TYPE t, ELEMENT n1 OF 'VALUES'
          (=n2) IS INVALID
ADM0736 E FOR TYPE t, NO INSTANCE EXISTS
ADM0740 E FOR TYPE t, 'COUNT' (=n) IS INVALID
ADM0741 E FOR TYPE t, 'START' (=n) IS INVALID
```

CSQNUM

Function: To query control value for chart.

CSQNUM (chart-id, type, value)	
APL code	1212
PGF RCP code	X'140C0020' (336330784)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

type *(specified by user) (fullword integer)*
Gives the type of control value to be queried.

The valid types are:

1. Query the current note number.
2. Query the maximum note number.
3. Query the current subchart number.
4. Query the maximum subchart number.
5. Query the number of data groups.
6. Query the number of elements (x values).
7. Query the number of data attribute sets.
8. Query the type of object listed on the initial directory panel. The number returned in the **value** parameter will be one of the following:
   - -1 No list
   - 0 Image symbol sets
   - 1 Vector symbol sets
   - 2 Generated map groups
   - 3 Saved pictures (in device-dependent form)
   - 4 Chart format
   - 5 Chart data
   - 6 Chart format and data
   - 7 GDF files (in device-independent form)
   - 9 Chart data definitions
   - 10 Projections
   - 11 Image data
9. Reserved. The number returned in the **value** parameter will be 0.
10. Query the number of the master chart.
11. Query the subchart nesting level.
12. Query whether the data is tied or free. The number returned in the **value** parameter will be one of the following:
    - 1 tied data
    - 2 free data
13. Query the current component for x data to be used by CSNUM and CSQNUM type 6.

value *(returned by GDDM) (fullword integer)*
Returns an integer giving the control number as indicated by the **type** parameter.

Description

Queries control values for a chart.

The information returned is in a form suitable for use in a subsequent CSNUM call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
```

CSQUID

Function: To query unique chart identifier.

CSQUID (chart-id)	
APL code	1209
PGF RCP code	X'14040010' (335806480)

Parameters

chart-id *(returned by GDDM) (fullword integer)*
Returns the next unused chart identification number.

Description

Gives an unused chart identification number. (The number will be the highest available unused number.)

Principal errors

None

CSQXDT

Function: To query independent (x) data values for a chart.

CSQXDT	(chart-id, component, count, x-values)
APL code	1216
PGF RCP code	X'140C0010' (336330768)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

component *(specified by user) (fullword integer)*
For tied data, this must be 0.

For free data, gives the number of the component for which x data values are required. The number must be less than or equal to the current number of components as returned by CSQNUM type 5.

count *(specified by user) (fullword integer)*
Gives the number of elements to be returned in **values**.

x-values *(returned by GDDM) (array of short floating-point numbers)*
An array containing the queried independent (x) data values.

Description

Queries the x (independent) data values for a chart.

The information returned is in a format suitable for use with a subsequent CSXDT call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0727 E 'COUNT' (=n) IS INVALID
ADM0734 E 'COMPONENT' (=n) IS INVALID
```

CSQXSL

Function: To query independent (x) data selection for a chart.

CSQXSL	(chart-id, component, count, x-values)
APL code	1229
PGF RCP code	X'140C0030' (336330800)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

component *(specified by user) (fullword integer)*
For tied data, this must be 0.

For free data, gives the number of the component for which x data values are required. The number must be less than or equal to the current number of components as returned by CSQNUM type 5.

count *(specified by user) (fullword integer)*
Gives the number of elements to be returned in the **values** array.

x-values *(returned by GDDM) (an array of fullword integers)*
An array indicating which corresponding independent (x) data values are selected and which excluded. Possible values are:

1 selected
2 excluded

Description

Queries the independent (x) data values selected for a chart.

The information returned is in a format suitable for use with a subsequent CSXSL call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0727 E 'COUNT' (=n) IS INVALID
ADM0734 E 'COMPONENT' (=n) IS INVALID
```

CSQYDT

Function: To query dependent (y) data values for a chart.

CSQYDT (chart-id, component, count, y-values)	
APL code	1217
PGF RCP code	X'140C0014' (336330772)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

component *(specified by user) (fullword integer)*
Gives the number of the component for which y data values are to be returned in the **values** array. It must be less than or equal to the number of components as returned by CSQNUM type 5.

count *(specified by user) (fullword integer)*
Gives the number of elements to be returned in the **values** array.

y-values *(returned by GDDM) (array of short floating-point numbers)*
An array containing the queried dependent (y) data values.

Description

Queries the dependent (y) data values for a chart.

The information returned is in a format suitable for use with a subsequent CSYDT call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0727 E 'COUNT' (=n) IS INVALID
ADM0734 E 'COMPONENT' (=n) IS INVALID
```

CSQZDT

Function: To query data group (z) values for a chart.

CSQZDT (chart-id, components, z-values)	
APL code	1218
PGF RCP code	X'140C0018' (336330776)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

components *(specified by user) (fullword integer)*
Gives the number elements to be returned in the **values** array. Must be less than or equal to the current number of components as returned by CSQNUM type 5.

z-values *(returned by GDDM) (array of short floating-point numbers)*
An array giving the queried data group (z) values.

Description

Queries the data group (z) values for a chart.

The information returned is in a format suitable for use with a subsequent CSZDT call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0735 E 'COMPONENTS' (=n) IS INVALID
```

CSQZSL

Function: To query data group (z) selection for a chart.

CSQZSL (chart-id, components, z-values)	
APL code	1231
PGF RCP code	X'140C0038' (336330808)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be queried.

components *(specified by user) (fullword integer)*
Gives the number of elements to be returned in **values**.

z-values *(returned by GDDM) (an array of fullword integers)*
An array indicating which corresponding data group (z) values are selected and which excluded. Possible values are:

1 selected
2 excluded

Description

Queries the data group (z) values selected for a chart.

The information returned is in a format suitable for use with a subsequent CSZSL call.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0735 E 'COMPONENTS' (=n) IS INVALID
```

CSSAVE

Function: To save chart information.

CSSAVE (chart-id, type, name, mode)	
APL code	1223
PGF RCP code	X'14000014' (335544340)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be saved.

type *(specified by user) (fullword integer)*
Gives the type of chart object to be saved.

1 Save a chart format in an object called **name**

2 Save a chart data in an object called **name**

4 Save a chart data and format as a graphic data format (GDF) file in an object called **name**

5 Save a data definition in an object called **name**.

See CSCHA, CSFLT, CSINT, CSNUM, CSXDT, CSXSL, CSYDT, CSYSL, CSZDT, and CSZSL for details of which items are saved with which type of chart object.

name *(specified by user) (8-byte character string)*
Gives the name of the chart object to be saved.

mode *(specified by user) (fullword integer)*
Indicates whether an existing object with the same name can be overwritten or not.

1 An existing object may not be overwritten.

2 An existing object may be overwritten.

Description

Saves chart objects. The **name** parameter updates the current chart name set by CSCHA. The description saved with the current chart object is taken from the chart description set by CSCHA.

Principal errors

```
ADM0324 E FILE 'a' ALREADY EXISTS
ADM0713 E CHART {DATA|FORMAT} CANNOT BE SAVED
          WITH NAME '*'
ADM0714 E TOO MUCH DATA TO
          {SAVE|PRINT|DISPLAY}
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0725 E 'TYPE' (=t) IS INVALID
ADM0726 E 'MODE' (=n) IS INVALID
```

CSSICU

Function: To start an ICU session for a chart.

CSSICU (chart-id, count, control)	
APL code	1204
PGF RCP code	X'14000004' (335544324)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be used.

count *(specified by user) (fullword integer)*
Gives the number of elements in the **control** parameter.

control *(specified by user) (an array of fullword integers)*
This array can have up to three elements. These elements define how the ICU session will operate.

Element 1 - Display

The value in this element must be in the range 1 through 8. If omitted, 1 is assumed.

1 Full interactivity, with the Home panel seen first

2 Full interactivity, with the Display panel seen first

3 Only the Save/load and Display panels available

4 Print or plot a chart

5, 6 Draw a chart in the current page

7 Only the Display panel available

8 Only the Directory panel available

A full explanation of each setting is given below.

Element 2 - Help

Sets the help level.

If omitted, 1 is assumed. This is ignored unless element 1 is set to 1, 2, 3, or 8.

0 PF key information is not shown initially on the Display and GDF Display panels. This can be changed by pressing ENTER on either panel.

1 PF key information is shown initially on the Display and GDF Display panels. This can be changed by pressing ENTER on either panel.

Element 3 - Isolate

Indicates which Save/load and Directory panels are available to the user.

If omitted, 0 is assumed. This is ignored unless element 1 is set to 1, 2, or 3.

0 Panels specified by the ICUISOL option in the GDDM external defaults are available (see the *GDDM System Customization and Administration* book). If this is 0, all Save/load and Directory panels are available.

1 No Save/load or Directory panels available.

2 Save/load panels are available, but not the Directory panels.

Description

Starts an ICU session using a chart that has been specified already.

The amount of control that the user has over the chart is specified by this call. The user may have access to all the ICU panels or to only a few, for example the display and print panels.

Principal errors

```
ADM0700 E INVALID PRINTER WIDTH, DEPTH, OR
          OFFSET
ADM0701 E FIRST DATA GROUP DOES NOT HAVE 3
          VALUES FOR VENN DIAGRAM
ADM0702 S INVALID PRIMARY DEVICE
ADM0704 S SCREEN IS TOO SMALL (n1 BY n2
          REQUIRED)
ADM0706 E 'a' (=n) IS INVALID
ADM0707 E NUMBER OF COPIES FOR PRINT (=n) IS
          INVALID
ADM0708 E MISSING X VALUES NOT ALLOWED IN
          'FREE' DATA
ADM0716 E INVALID {PRINT|GRAPHIC DATA FORMAT
          (GDF)} DESTINATION NAME
ADM0717 E PRINT NAME IS '*OPEN' BUT NO
          ALTERNATE DEVICE IS IN USE
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
```

Valid values for control element 1 - Display

– DISPLAY = 1, 2, or 3

Meaning - Display panels

These values initiate an **interactive** session, defined as access by the operator (at the GDDM primary device) to the ICU Display panel and to some or all of the other panels and help information, using the standard ICU interpretation of interrupts (ENTER key, PF keys, and so on). For interactive sessions, the ICU constructs charts using a unique GDDM page that is not accessible to the calling application program. This means that once an interactive session starts, GDDM calls cannot affect the chart. Conversely, ICU internal processing does not affect the calling program. (There is one exception: whenever the ICU constructs a chart, the PG routines call CHTERM to reinitialize the PG routines, and this may affect a calling program that uses PG routines.)

DISPLAY = 5 and DISPLAY = 6 (see below) should be used if further control over charts constructed by the ICU is desired.

Note: An interactive session in the above sense cannot be initiated by a program running under the IMS subsystem. In general, when DISPLAY = 1, 2, or 3, the primary device must be one that supports input.

DISPLAY = 1 causes the Home Panel to be displayed to the operator initially, and so gives access to the panel hierarchy. All panels are accessible except possibly the Save/load, and Directory panels (see element 3 of the control parameter) and possibly the Print panel.

DISPLAY = 2 causes the Display panel, showing a chart constructed from the specified data and format, to be displayed initially to the operator (if there is data to display). The operator can then choose to exit directly from the Display panel to the calling program, or may use the Home PF key to display the Home Panel and so get access to the panel hierarchy, as for DISPLAY = 1. In this case, if a chart cannot be constructed because there is no data available, the Home Panel is displayed as for DISPLAY = 1.

DISPLAY = 3 causes the Display panel to be displayed initially to the operator as for DISPLAY = 2, but with access to panels and help very much restricted. Only the Print and Save panels, at most, are accessible. Help information for the Display panel, and for the Print and Save panels, is available.

Possible application

DISPLAY = 1 is used to give normal full access to the ICU panels, as in stand-alone mode.

DISPLAY = 2 may be used, for example, where normally the operator wants only to see the chart, but sometimes may want access to all the ICU panels.

DISPLAY = 3 may be used, for example, to present a given set of data values in a given graphical format, and to allow the operator additional choices of printing or saving the chart, or both. Note that the interpretation of the ENTER and PF keys is the normal interpretation in an interactive ICU session. If the

requirement is simply to display a chart for an operator who is not experienced in the use of the ICU, DISPLAY = 7 (see below) may be a better choice, because in that case **any** interrupt returns control to the calling program.

– DISPLAY = 4

Meaning - Print or plot a chart

This value is used to invoke the ICU as a subroutine that causes a created or loaded chart to be printed on a specified GDDM printer or plotter with a name specified by CSCHA type 3. (Note that, under VM/SP, a print file is created, but may have to be printed separately.)

If a valid print destination name has been specified, the specified chart is printed as one print file. A header page is added, unless otherwise specified by CSINT type 45. The number of copies is also given by CSINT type 45. The size and position of the printed chart are given by CSFLT type 1 in units defined by CSINT type 45.

Another way is for the calling program to add the chart to a print file that it has already opened, by specifying '*OPEN' as the value of CSCHA type 3. In this case, the type of heading page and the number of copies as specified by CSINT type 45 are ignored because the number of copies to be printed was specified on the FSOPEN or DSOPEN call issued by the application program to open the print file. However, CSFLT type 1 can still be used to specify the size and position of the chart on the printed page.

As for DISPLAY = 1, 2, or 3, the application program cannot modify or access the chart constructed for printing, because it is created using a GDDM page inaccessible to the calling program.

Possible application

DISPLAY = 4 may be used to print charts without operator interaction (or create a print file under VM/SP). Setting CSCHA type 3 to '*OPEN' may be used to include a chart in a print file already being created by an application program. In this case, the application program should open a print file, set CSCHA type 3 to '*OPEN', and use the CSSICU call with DISPLAY = 4 for each chart to be printed, then close the print file.

– DISPLAY = 5 or 6

Meaning - Construct a chart

These values cause a specified chart to be constructed in the calling program's current GDDM page. Control is returned to the calling program with the chart available for modification or use in the current page. ICU action is limited to chart construction; the chart is not written to a device.

The chart constructed differs from the form in which it would be displayed in the Display panel of an ICU interactive session in that it contains no alphanumeric fields. (The Display panel, as shown with DISPLAY = 3 or 7, may show PF key information and error message information in alphanumeric fields overlaying the displayed chart.)

If an error message is returned from a CSSICU call when DISPLAY = 5 or 6, the error is the first one of highest severity generated during chart construction.

The chart constructed is that created or loaded by the application object names already specified, as usual. On return to the calling program, the chart exists in the current page as a collection of unnamed (zero-id) graphics segments in a GDDM graphics field. The graphics field and picture space are those defined by the caller, or defaulted by GDDM. The window and viewport are set as follows:

- If the chart constructed is a line graph, surface chart, histogram, or bar chart the viewport boundaries are defined by the edges of the plotting area (in picture space coordinates), and the window boundaries are defined by the extreme values of the horizontal and vertical axis ranges (in axis coordinates).
- If the chart constructed is a pie chart, Venn diagram, polar chart, tower chart, or table chart, both viewport and window boundaries are undefined.

DISPLAY = 5 and DISPLAY = 6 differ in the following way:

DISPLAY = 5 causes the ICU to issue a CHRNIT call (to initialize the PG routines) before chart construction, and a CHTERM call (to terminate the PG routines) after chart construction. This is the same action as is taken for DISPLAY = 1, 2, 3, and 4. The effect is that chart construction is isolated from PG routine calls issued by the calling program. The chart is drawn as large as possible within the graphics field.

DISPLAY = 6 causes the ICU to construct the chart without issuing the CHTERM call after chart construction. The effect is that the chart constructed can be modified by PG routine calls issued by the calling program after the CSSICU call. Control is returned to the calling program with the PG routines in state-2. Any further PG routine calls issued by the application program must be valid in state-2 (for example, plotting routine calls), unless the program first returns to state-1 with a CHRNIT or CHSTRT call. With DISPLAY = 6, the chart is drawn as large as possible within the area specified with the CHAREA call. This area may be a subset of the graphics field.

Possible application

DISPLAY = 5 and DISPLAY = 6 allow the CSSICU call to be used as a high-level graphics call that may be combined with other GDDM or PGF calls in a straightforward manner to construct a picture. Any further use of the constructed picture (for example, to display it, print it, or save it) is under the control of the application program issuing the CSSICU call.

DISPLAY = 5 is used when the calling program does not issue PG routine calls, or when the calling program does not need to modify chart construction by PG routine calls. For example, a chart may be constructed with DISPLAY = 5 and then saved in data-stream form by the calling program issuing the GDDM FSSAVE call.

DISPLAY = 6 allows the calling program to modify the chart by issuing PG routine calls after the CSSICU call. Some examples follow, to illustrate the power of this technique:

- CHAREA can be issued before the CSSICU call to specify the size and position of the chart area within which the chart is to be constructed. Thus CHAREA may be used, for example, to specify a chart area occupying the top left-hand quarter of the picture space. With normal GDDM defaults, this causes the chart constructed by the CSSICU call and displayed by means of FSFRCE or ASREAD to appear one-quarter its normal size, in the top left-hand corner of the screen.
- Additional data groups can be added to the chart by plotting routine calls issued after the CSSICU call. For example, the CSSICU call can construct a bar chart. A subsequent CHPLOT call can be used to plot a line (a data group of a line graph) over this bar chart, thus mixing chart types.

  Note that the CSSICU call leaves the PG routines in state-2. A plotting routine call such as CHPLOT is valid in state-2, and has the effect of plotting the specified data against the axes already constructed by the CSSICU call (the x coordinates of the points of the line are plotted against the bar chart x axis).

  Note that no entry appears in the legend for the added line. This is because the ICU issues a CHKEY call (in state-1) for the keys of the plotted bar chart data groups. All the keys in the list specified in this CHKEY call are used in the bar chart legend, so there is no key available for the additional data group constructed by the CHPLOT call.
- Secondary axes may be utilized by a similar technique. If the CHPLOT call is preceded by CHYSEL(2) (in order to select the secondary y axis), the

effect is that the line graph is plotted against the bar chart x axis already constructed by the CSSICU call, and against a secondary y axis that is constructed by the CHPLOT call.

- Finally, two (or more) charts can be overlaid by a sequence such as:

```
CALL CSSICU(...);    /*with element = 6*/
   .
   .
   .
   .
Specify another chart
   .
   .
   .
   .
CALL CSSICU(...);    /*with element = 6*/
```

The main difference between this case and the examples discussed above is that two sets of axes, and two legends, are constructed (one from each CSSICU call). With appropriate chart formats, the sets of axes may be made to coincide, or they may be made to appear in left/right and top/bottom pairs (like primary and secondary axes). Again, with suitable chart format specifications, the two legends can be made to appear as parts of a single legend, or they can be separated (one on the left and one on the right of the chart, for example).

– DISPLAY = 7

Meaning - Only display a chart

DISPLAY = 7 causes the ICU to construct a chart on a GDDM page inaccessible to the calling program (as for DISPLAY = 1, 2, 3, and 4), and then to output the constructed chart with a GDDM ASREAD call. On return from this ASREAD call, the ICU immediately returns control to the calling program.

The chart is displayed without the error message or PF key information lines that may appear in alphanumeric fields on the Display panel during an interactive session.

Possible application

DISPLAY = 7 can be used as a simple means of causing a specified chart to be displayed on the GDDM primary device. The application programmer need not know anything about GDDM concepts such as pages or graphics fields, because the ICU action is completely isolated from the calling program. The primary device is normally a display terminal, but could also be a queued printer (for example). This allows the same application program to be used to present a chart on different types of device.

In the normal case where the primary device is a screen, the ASREAD is terminated when the operator causes an interrupt of any kind (by pressing any key, for example). Hence DISPLAY = 7 can be used by an operator unfamiliar with the input conventions of an interactive ICU session. For example, an application program can display a sequence of charts by using a sequence of CSSICU calls with DISPLAY = 7. The operator can examine each chart for as long as is required, then press any key to get the next chart in the sequence. However, the calling program cannot determine what type of interrupt completed the ASREAD. Thus, the application cannot take different actions depending upon which PF key was pressed.

Note: If the primary device is defined as output-only (as under IMS, for example) the ASREAD call acts like FSFRCE. In this case the chart remains on a display screen until the application program causes further output, and operator input is disallowed.

– DISPLAY = 8

Meaning - Only display a chart

This value restricts the ICU to the Directory panel in advanced mode format, and its associated Help panel. The Directory panel is displayed initially, not the Home panel, and no other panel, apart from Help panels, can be accessed. Library management functions only are included on the panels: chart display and printing functions are not accessible, nor are the chart update, save, or restore facilities. However, GDF files can be displayed and printed.

The Directory panel may be used to list those objects that are listed when the ICU is started in stand-alone mode (namely, chart data and formats, vector and image symbol sets, pictures saved with FSSAVE calls, GDF files, and generated mapgroups). Delete, list and copy functions are available for all these objects.

Possible application

DISPLAY = 8 allows the ICU to be used as an interactive library manager.

CSXDT

Function: To set independent (x) data values for a chart.

CSXDT	**(chart-id, component, count, x-values)**
APL code	1213
PGF RCP code	X'14080010' (336068624)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be used.

component *(specified by user) (fullword integer)*
Gives the number of the component for which the x data values are to be set.

It must be 0 for tied data.

For free data, it must be less than or equal to the current number of components as set by CSNUM type 5.

count *(specified by user) (fullword integer)*
Gives the number of elements in the **values** array.

It must be less than or equal to the number of elements set by CSNUM type 6.

For tied data, if this number is smaller than the current number of x data values, the **values** array replaces the first **count** elements in the current array, and those not replaced are set to missing values.

For free data, the number in **count** must be the same as the current number of x data values. (Missing values are not valid for free data.)

x-values *(specified by user) (array of short floating-point numbers)*
An array containing the independent (x) data values to be set.

Description

Sets the independent (x) data values for a chart.

The number of x values set is normally the same as the current number of elements as set by CSNUM type 6.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0727 E 'COUNT' (=n) IS INVALID
ADM0734 E 'COMPONENT' (=n) IS INVALID
ADM0739 E ELEMENT n1 OF 'VALUES' (=n2) IS
          INVALID
```

CSXSL

Function: To set independent (x) data selection for a chart.

CSXSL	**(chart-id, component, count, x-values)**
APL code	1228
PGF RCP code	X'14080030' (336068656)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be used.

component *(specified by user) (fullword integer)*
Gives the number of the component for which the x-data values are to be selected or excluded.

It must be 0 for tied data.

For free data, it must be less than or equal to the current number of components as set by CSNUM type 5.

count *(specified by user) (fullword integer)*
Gives the number of elements in the **values** array.

It must be less than or equal to the number of elements set by CSNUM type 6.

For tied data, if this number is smaller than the current number of x data values, the **values** array selects or excludes the first **count** elements in the current array, and those not set remain as they were.

You cannot exclude x data values with free data.

x-values *(specified by user) (an array of fullword integers)*
An array corresponding to the x-values array of CSXDT, which indicates those values to be excluded. Valid values are:

1 selected
2 excluded

Description

Selects and excludes independent (x) data values for a chart.

The number of x values is normally the same as the current number of elements as set by CSNUM type 6.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0727 E 'COUNT' (=n) IS INVALID
ADM0734 E 'COMPONENT' (=n) IS INVALID
ADM0739 E ELEMENT n1 OF 'VALUES' (=n2) IS
          INVALID
```

CSYDT

Function: To set dependent (y) data values for a chart.

CSYDT	**(chart-id, component, count, y-values)**
APL code	1214
PGF RCP code	X'14080014' (336068628)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the chart identification number of the chart to be used.

component *(specified by user) (fullword integer)*
Gives the number of the component for which the y data values are to be set. It must be less than or equal to the current number of components as set by CSNUM type 5.

count *(specified by user) (fullword integer)*
Gives the number of elements in **values**.

It must be less than or equal to the number of elements set by CSNUM type 6.

For tied data, if this number is smaller than the current number of y data values, the **values** array replaces the first **count** elements

in the current array, and those not replaced are set to missing values.

For free data, the number in **count** must be the same as the current number of y data values. (Missing values are not valid for free data.)

y-values *(specified by user) (array of short floating-point numbers)*
An array containing the dependent (y) data values to be set.

Description

Sets dependent (y) data values for a chart.

The number of y values passed is normally the same as the current number of elements as set by CSNUM type 6.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0727 E 'COUNT' (=n) IS INVALID
ADM0734 E 'COMPONENT' (=n) IS INVALID
ADM0739 E ELEMENT n1 OF 'VALUES' (=n2) IS
          INVALID
```

CSZDT

Function: To set data group (z) data values for a chart.

CSZDT	**(chart-id, components, z-values)**
APL code	1215
PGF RCP code	X'14080018' (336068632)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be used.

components *(specified by user) (fullword integer)*
Gives the number of elements in **values**. It must be equal to the current number of components as set by CSNUM type 5.

z-values *(specified by user) (array of short floating-point numbers)*
An array giving the data group (z) values to be set.

Description

Sets the data group (z) values for a chart.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0735 E 'COMPONENTS' (=n) IS INVALID
ADM0739 E ELEMENT n1 OF 'VALUES' (=n2) IS
          INVALID
```

CSZSL

Function: To set data group (z) selection for a chart.

CSZSL	**(chart-id, components, z-values)**
APL code	1230
PGF RCP code	X'14080038' (336068664)

Parameters

chart-id *(specified by user) (fullword integer)*
Gives the identification number of the chart to be used.

components *(specified by user) (fullword integer)*
Gives the number of elements in **values** to be selected or excluded.

It must be equal to the current number of components as set by CSNUM type 5.

z-values *(specified by user) (an array of fullword integers)*
An array corresponding to the data group (z) values array of CSZDT, which indicates those values to be excluded. Valid values are:

1 selected
2 excluded

Description

Selects and excludes data group (z) values for a chart.

Principal errors

```
ADM0720 E CHART IDENTIFIER (=n) IS INVALID
ADM0721 E CHART WITH IDENTIFIER n DOES NOT
          EXIST
ADM0735 E 'COMPONENTS' (=n) IS INVALID
ADM0739 E ELEMENT n1 OF 'VALUES' (=n2) IS
          INVALID
```

VSSE

Function: To invoke the Vector Symbol Editor

VSSE	**(symbol-set-name)**
APL code	1202
PGF RCP code	X'20000000' (536870912)

Parameters

symbol-set-name *(specified by user) (character)*
Either the name of a new or existing symbol set. If no name is entered, the operator will need to enter one after the first Vector Symbol Editor panel has been presented.

Description

When the Vector Symbol Editor is called from an application program, the GDDM ESLIB routine can be called beforehand, to specify the libraries to be used for retrieving and storing symbol sets and object decks. For a full description of the ESLIB function and the subsystems in which it applies, refer to the *GDDM Base Application Programming Reference* book.

In PL/I, VSSE must be declared as an external entry point name. PGF provides a declaration that you can include into your program by using the following statement:

```
%INCLUDE SYSLIB(ADMPIRV);
```

For details of using the Vector Symbol Editor see the *GDDM-PGF Vector Symbol Editor* book.

Principal errors

None

GDDM-PGF APL codes in numeric order

APL code	Call name	Description
703	CHSTRT	Reset the processing state to state-1
704	CHRNIT	Reinitialize PG routines
705	CHTERM	Terminate the PG routines
706	CHZTIC	Z-axis scale mark interval
707	CHZRNG	Z-axis explicit range
709	CHZGAP	Spacing between towers
710	CHPCTL	Control pie chart slices
711	CHXLAT	X-axis label attributes
712	CHYLAT	Y-axis label attributes
713	CHXTAT	X-axis title attributes
714	CHYTAT	Y-axis title attributes
715	CHZLAT	Z-axis label attributes
717	CHSSEG	Set segment number
718	CHQPOS	Query positional information
719	CHCONV	Convert coordinate values
720	CHTPRJ	Tower chart projection
721	CHAREA	Chart area
722	CHBATT	Set framing box attributes
723	CHCGRD	Basic character spacing/size
724	CHHMAR	Horizontal margins
725	CHVMAR	Vertical margins
726	CHKEY	Legend key labels
727	CHKATT	Legend text attributes
728	CHKEYP	Legend base position
729	CHHATT	Heading text attributes
730	CHHEAD	Heading text
731	CHXSEL	X-axis selection
732	CHYSEL	Y-axis selection
733	CHXSET	X-axis options
734	CHYSET	Y-axis options
735	CHAATT	Axis line attributes
736	CHTATT	Axis title text attributes
737	CHXTTL	X-axis title specification
738	CHYTTL	Y-axis title specification
739	CHXRNG	X-axis explicit range
740	CHYRNG	Y-axis explicit range
741	CHXINT	X-axis interception point
742	CHYINT	Y-axis interception point
743	CHXTIC	X-axis scale mark interval
744	CHYTIC	Y-axis scale mark interval
745	CHXSCL	X-axis scale factor
746	CHYSCL	Y-axis scale factor
747	CHLATT	Axis label text attributes
748	CHXLAB	X-axis label text
749	CHYLAB	Y-axis label text
750	CHXMTH	X-axis month labels
751	CHYMTH	Y-axis month labels
752	CHXDAY	X-axis day labels
753	CHYDAY	Y-axis day labels
754	CHGATT	Grid line attributes
755	CHXDTM	X-axis datum line
756	CHYDTM	Y-axis datum line
757	CHDATT	Datum line attributes
758	CHNOTE	Construct a character string at a designated position
759	CHNOFF	Specify offsets for CHNOTE
760	CHNATT	Specify attributes for notes
761	CHCOL	Component basic color table
762	CHLT	Component line type table
763	CHMARK	Component marker table
764	CHPAT	Component shading pattern table
765	CHGAP	Spacing between bars
766	CHGGAP	Spacing between bar groups
767	CHVCHR	Number of characters in bar values
768	CHPIER	Reduce pie chart size
769	CHVATT	Attributes of values text in bar and pie charts
770	CHKMAX	Maximum legend width/height
771	CHKOFF	Legend offsets
772	CHLW	Component line width table
773	CHXDLB	X-axis data labels
774	CHVDIG	Set decimal digits for bars and tables
775	CHPEXP	Exploded slices in pie charts
776	CHTHRS	Bar value threshold limit
777	CHZSET	Z-axis options
779	CHZDLB	Z-axis data labels
781	CHMKSC	Set marker scale values
782	CHBARX	Plot a bar chart with numeric x-axis values
783	CHPOLR	Plot a polar chart
785	CHTOWR	Plot a tower chart
790	CHDRAX	Specific control of axis drawing
791	CHPLOT	Line graphs and scatter plots
792	CHSURF	Surface charts
793	CHHIST	Histograms
794	CHNUM	Set number of components
795	CHBAR	Plot a bar chart
796	CHPIE	Pie charts
797	CHVENN	Venn diagram
798	CHSET	Specify chart options
799	CHFINE	Curve fitting smoothness
800	CHLC	Component line color table
801	CHQRNG	Query axis ranges
802	CHQARE	Query chart area
804	CHMISS	Missing values on a table chart
805	CHDCTL	Control the format of values, and the overall size of table charts
806	CHDTAB	Construct a table chart
1200	CHART	Invoke Interactive Chart Utility
1202	VSSE	Run the Vector Symbol Editor
1203	CSCCRT	Create a chart
1204	CSSICU	Start an ICU session for a chart

APL code	Call name	Description
1205	CSINT	Set integer values for a chart
1206	CSQINT	Query integer values for a chart
1207	CSFLT	Set floating-point values for a chart
1208	CSQFLT	Query floating-point values for a chart
1209	CSQUID	Query unique chart identifier
1210	CSCDEL	Delete a chart
1211	CSNUM	Set control value for a chart
1212	CSQNUM	Query control value for chart
1213	CSXDT	Set independent (x) data values for a chart
1214	CSYDT	Set dependent (y) data values for a chart
1215	CSZDT	Set data group (z) data values for a chart
1216	CSQXDT	Query independent (x) data values for a chart
1217	CSQYDT	Query dependent (y) data values for a chart
1218	CSQZDT	Query data group (z) values for a chart
1219	CSCHA	Set character values for a chart
1220	CSQCHA	Query character values for a chart
1221	CSQCHL	Query character lengths for a chart
1222	CSLOAD	Restore saved chart information
1223	CSSAVE	Save chart information
1224	CSDIR	Build object directory list
1225	CSQDIR	Query object directory list
1226	CSQCS	Query CSxxxx call information
1227	CSDEL	Delete item for a chart
1228	CSXSL	Set independent (x) data selection for a chart
1229	CSQXSL	Query independent (x) data selection for a chart
1230	CSZSL	Set data group (z) selection for a chart
1231	CSQZSL	Query data group (z) selection for a chart

End of General-Use Programming Interface

Chapter 5. Using PGF under various subsystems

The basic considerations for running PGF under CICS, IMS, TSO, and VM/SP CMS are the same as those described in the *GDDM Base Application Programming Guide*. This appendix provides some additional subsystem-specific information on the data-set characteristics that are required for PGF.

The Interactive Chart Utility

The Interactive Chart Utility (which is described in “Chapter 2. Invoking the Interactive Chart Utility (ICU)” on page 9) provides the means for storing and retrieving chart formats and chart data.

CICS

The Vector Symbol Editor

The Vector Symbol Editor (which is described in the *GDDM-PGF Vector Symbol Editor* book) provides the means for storing and retrieving vector symbol sets (VSS).

Data sets and file processing

The PGF file names, file types, and record types used (according to the subsystem environment) for symbol sets, chart formats, and chart data are shown in the following tables.

Table 4. PGF data set characteristics for CICS

Type of Data	PGF Default Name or Type	Data Set Type	Data Characteristics
Chart Format	Data set name = ADMF Record type = ADMCFORM	Records in VSAM data set	RECORDSIZE(400 400) KEYS(20 0)
Chart Data	Data set name = ADMF Record type = ADMCDATA	Records in VSAM data set	RECORDSIZE(400 400) KEYS(20 0)
Chart Data Definition	Data set name = ADMF Record type = ADMCDEF	Records in VSAM data set	RECORDSIZE(400 400) KEYS(20 0)
Symbol Sets	Data set name = ADMF Record type = ADMSYMBL	Records in VSAM data set	RECORDSIZE(400 400) KEYS(20 0)
GDF Files	Data set name = ADMF Record type = ADMGDF	Records in VSAM data set	RECORDSIZE(400 400) KEYS(20 0)

Note: COBOL programs running under CICS must not end with a STOP RUN statement. A GO BACK statement or an EXEC CICS RETURN must be used instead.

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IMS

Table 5. PGF default DBD names for IMS

Type of Data	PGF Default DBD Name
Chart Format	ADMOBJ1
Chart Data	ADMOBJ1
Chart Data Definition	ADMOBJ1
Symbol Sets	ADMOBJ1
GDF Files	ADMGDF

TSO

Table 6. PGF data set characteristics for TSO

Type of Data	PGF Default File Name	Data Set Type	DCB Format (RECFM)	DCB Record Length (LRECL)	DCB Block Size (BLKSIZE)
Chart Format	ADMCFORM	Partitioned	F or FB	400 400	400 400*n
Chart Data	ADMCDATA	Partitioned	F or FB	400 400	400 400*n
Chart Data Definition	ADMCDATA	Partitioned	F or FB	400 400	400 400*n
Symbol Sets	ADMSYMBL	Partitioned	F or FB	400 400	400 400*n
GDF Files	ADMGDF	Partitioned	F or FB	400 400	400 400*n

VM/SP CMS

Table 7. PGF file characteristics for VM/SP CMS

Type of Data	PGF Default Filetype	RECFM (Record Format)	LRECL (Record Length)
Chart Format	ADMCFORM	F	400
Chart Data	ADMCDATA	F	400
Chart Data Definition	ADMCDEF	F	400
Symbol Sets	ADMSYMBL	F	400
GDF Files	ADMGDF	F	400

Appendix A. Sample programs

This appendix contains listings of the following sample PGF programs supplied on the installation tape. The statements listed are those of the sample programs initially supplied with Version 2 Release 1 of PGF. Sample programs shipped with subsequent PTFs may differ from these listings.

The sample programs shown in this appendix are:

- A program that uses PG routines to draw a simple histogram. The same program is given in three languages, with the following names:

  COBOL ADMUSC5
  FORTRAN ADMUSF5
  PL/I ADMUSP5

  The IMS version of this program is distributed as ADMUSP5I. However, its main entry point is still ADMUSP5.

  A C/370 version of this program, called ADMUSB5, is supplied with GDDM-PGF 2.1.2. ADMUSB5 is not listed in this appendix.

- Programs that call the Interactive Chart Utility (ICU) using the CHART call to plot supplied data that is built into the programs. The programs are given in three languages, with the following names:

  COBOL ADMUSC6
  FORTRAN ADMUSF6
  PL/I ADMUSP6

  No version of this program is provided for IMS.

  A C/370 version of this program, called ADMUSB6, is supplied with GDDM-PGF 2.1.2. ADMUSB6 is not listed in this appendix.

Sample program ADMUSP7, which is supplied in PL/I only, performs translation of chart objects from one country-extended code page (CECP) to another. ADMUSP7 displays a panel on which the user specifies the names and types of chart objects that are to undergo code-page conversion. The user can specify whether characters in the chart data, the chart format, or in both are to be represented by code points on the country extended code page (CECP) shown on the panel.

When the user presses the ENTER key, the translation starts. The program translates all character strings in the chart objects from the object code page to the application code page. If the translation is successful, the program replaces the chart objects, overwriting previous versions saved under the same name. If any of the chart objects is not found, or if the chart type is invalid, the program issues an error message. If any other errors occur, the program does not save the translated chart but issues the appropriate GDDM message instead.

ADMUSP7 is not listed in this appendix.

Compiling the programs

All of the sample programs should be compiled, link-edited, and executed as follows. (Refer also to the *GDDM Base Application Programming Guide*, which contains more detailed instructions for the various subsystems.) The source programs do not need to be modified except for:

1. Optional changes to the FSINIT call, as noted below under “Link-Editing the Programs.”
2. Replacing the STOP RUN statements in the COBOL programs if they are to run under CICS. The statements should be replaced with GO BACK or EXEC CICS RETURN.

The programs should be compiled by a compiler appropriate to the source language and target subsystem (DOS/VS or OS/VS COBOL, FORTRAN G or H, or PL/I Optimizing Compiler). Note that CICS does not support programs written in FORTRAN.

Release 2 of the OS/VS COBOL compiler has a default option QUOTE, causing the " (double quote) to be used as the string delimiter. This is a change from OS/VS COBOL Release 1, and in order to compile the sample COBOL programs, the APOST option must be explicitly specified.

ADMUSP5 makes use of the supplied files of GDDM PL/I entry declarations. The members ADMUPINC, ADMUPINF, and ADMUPING are used by both versions of the program, and, in addition, ADMUPINA by the non-IMS version, and

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ADMUPINE by the IMS version. All the necessary members must be available to the compiler in a source statement library on DOS/VS, via a SYSLIB specification on OS/VS, or via a GLOBAL MACLIB command on CMS. The compilation of ADMUSP5 must be performed with the MACRO option. No errors should result from the compilation steps.

Link-editing the programs

Except under VM/CMS the object code from the compilation must be link-edited with a GDDM interface routine appropriate to the subsystem and to the interface used (reentrant or nonreentrant).

Under OS/VS, the link-edit SYSLIBs should include the GDDM load library. The correct interface module is selected by an INCLUDE control statement specifying the appropriate member, as follows:

	ADMUSC5 ADMUSC6 ADMUSF5 ADMUSF6 ADMUSP5 ADMUSP6 (nonreentrant)
CICS/ESA IMS TSO	ADMASNC ADMASNJ ADMASNT

Another way is to use the automatic-library-call facility. For this, the source programs must be changed to replace the references to FSINIT with the appropriate member, as follows:

	ADMUSC5 ADMUSC6 ADMUSF5 ADMUSF6 ADMUSP5 ADMUSP6 (nonreentrant)
CICS/ESA IMS TSO	FSINNC FSINNPI FSINN

Note that for PL/I the standard declarations do not include the other forms of FSINIT. They must, therefore, always be explicitly declared thus:

```
DCL FSINNC ENTRY EXTERNAL OPTIONS (ASM INTER);
```

On DOS/VS, GDDM should be included from the relocatable libraries during link-editing. The correct interface modules should be selected as follows:

	ADMUSC5 ADMUSC6 ADMUSF5 ADMUSF6 ADMUSP5 ADMUSP6 (nonreentrant)
CICS/DOS/VS	ADMASNO and ADMASLC

and should be included as described under the information on link-editing for CICS/DOS/VS in the *GDDM Base Application Programming Guide*. The automatic inclusion of the interface modules by source-program modification is not available for DOS/VS.

In VM/CMS, there is no link-editing. However, the CMS GLOBAL TXTLIB command must be executed (as described in the *GDDM Base Application Programming Guide* under the information on running a program

under CMS) to identify TXTLIBs from which GDDM/PGF routines can be loaded. The TXTLIBs required depend on the sample program attributes and the presence of GDDM/PGF in a discontiguous shared segment (DCSS), as follows:

	ADMUSC5 ADMUSC6 ADMUSF5 ADMUSF6 ADMUSP5 ADMUSP6 (nonreentrant)
VM/CMS	ADMNLIB

Plus,

If a DCSS is available ... no extra TXTLIBs

If no DCSS is available ... ADMGLIB & ADMPLIB

Executing the programs

Note that the COBOL programs should not be run under CICS unless the STOP RUN statements have been replaced by a GO BACK statement or an EXEC CICS RETURN.

When the programs are executed, the GDDM load (or core-image) library containing PGF code must be available. The same library is used for nonreentrant and reentrant programs.

On CICS, the programs must be added to the Program Control Table (PCT) and Processing Program Table (PPT). The GDDM and PGF load library (or core-image library) must be specified when CICS is started.

On IMS, a PSB and ACB must be built for the transaction, and a data base, used to define the characteristics of the terminal from which it is executed, must be allocated and initialized. This is part of the installation procedure for PGF under IMS.

On TSO, the GDDM and PGF load library should be available (for example, in a STEPLIB). If a print is requested, the print queue data set (ADMPRINT.REQUEST.QUEUE by default) must have been created and initialized.

On VM/CMS, the GDDM/PGF TXTLIBs should be included in the GLOBAL libraries during execution, as described above, together with the language libraries.

To allow sufficient storage for GDDM, PL/I execution should specify ISASIZE. A value of 10K bytes is sufficient.

No GDDM files are used by the sample programs, and no printing is performed (unless requested from the ICU in ADMUSC6, ADMUSF6, and ADMUSP6).

ADMUSC5 – COBOL program to draw a simple histogram

```
       IDENTIFICATION DIVISION.                                         00300000
       PROGRAM-ID.  ADMUSC5.                                            00600000
       REMARKS.                                                         00900000
      ****************************************************************  01400000
      *                   ADMUSC5                                    *  01500000
      *      PROGRAM TO DISPLAY A SIMPLE HISTOGRAM USING THE         *  02100000
      *      PRESENTATION GRAPHICS FACILITY OF GDDM.                 *  02400000
      *      THE HISTOGRAM DISPLAYS THE DISTRIBUTION OF AN           *  03000000
      *      IMAGINARY POPULATION BY AGE.                            *  03300000
      *      IF A PRINT IS TO BE PRODUCED, ON VM OR TSO,             *  03900000
      *      SYSIN AND SYSOUT SHOULD BE DIRECTED AT THE              *  04200000
      *      TERMINAL.  ON CICS, PRINT SHOULD NOT BE USED            *  04500000
      *      WITHOUT CHANGING THE PROGRAM TO FETCH THE PRINTER       *  04800000
      *      NAME FROM THE TERMINAL.                                 *  05100000
      ****************************************************************  05700000
       ENVIRONMENT DIVISION.                                            06000000
       CONFIGURATION SECTION.                                           06300000
       SOURCE-COMPUTER. IBM-370.                                        06600000
       OBJECT-COMPUTER. IBM-370.                                        06900000
       INPUT-OUTPUT SECTION.                                            07200000
       FILE-CONTROL.                                                    07500000
       DATA DIVISION.                                                   07800000
       WORKING-STORAGE SECTION.                                         08100000
                                                                        08400000
       77  OPTION-STRING   PIC A(8).                                    08700000
                                                                        09000000
      *****************************************************************09300000
      *  DATA FOR RANGE LABELS                                       *16800000
      *****************************************************************17100000
                                                                        17400000
       01  RANGE-LABEL-DATA.                                            17700000
           02  RANGE-LABEL-COUNT     PIC S9(8) COMP VALUE +8.           18000000
           02  RANGE-LABEL-LENGTH    PIC S9(8) COMP VALUE +5.           18300000
           02  RANGE-LABELS.                                            18600000
               03  RANGE-LABEL1       PIC X(5) VALUE '     '.           18900000
               03  RANGE-LABEL2       PIC X(5) VALUE ' <11 '.           19200000
               03  RANGE-LABEL3       PIC X(5) VALUE '11-20'.           19500000
               03  RANGE-LABEL4       PIC X(5) VALUE '21-30'.           19800000
               03  RANGE-LABEL5       PIC X(5) VALUE '31-40'.           20100000
               03  RANGE-LABEL6       PIC X(5) VALUE '41-50'.           20400000
               03  RANGE-LABEL7       PIC X(5) VALUE '51-60'.           20700000
               03  RANGE-LABEL8       PIC X(5) VALUE ' >60 '.           21000000
                                                                        21300000
      *****************************************************************21900000
      *  THE HEADING DATA SPECIFIES THE ATTRIBUTES, OF WHICH ONLY THE  *22200000
      *  COLOR IS GIVEN (AS YELLOW, COLOR 6), THE HEADING LENGTH       *22500000
      *  AND THE HEADING TEXT ITSELF.                                  *22800000
      *****************************************************************23100000
                                                                        23400000
       01  HEADING-DATA.                                                23700000
           02  HEADING-ATTR-COUNT   PIC S9(8) COMP VALUE +1.            24000000
           02  HEADING-ATTRS.                                           24300000
             03  HEADING-COLOR   PIC S9(8) COMP VALUE +6.               24600000
           02  HEADING-LENGTH    PIC S9(8) COMP VALUE +47.              24900000
           02  HEADING-TEXT      PIC A(47) VALUE,                       25200000
```

```
     'PERCENTAGE POPULATION DISTRIBUTION BY AGE GROUP'.          25500000
                                                                25800000
****************************************************************26100000
*  X AXIS SPECIFICATION                                       *26400000
*    SPECIFIES THE AXIS TITLE, THE AXIS RANGE                 *26700000
*    AND THE SCALE MARK INTERVAL.                             *27000000
****************************************************************27300000
                                                                27600000
 01  X-AXIS.                                                   27900000
   02  TITLE.                                                  28200000
     03  TITLE-LENGTH   PIC S9(8) COMP VALUE +10.              28500000
     03  TITLE-TEXT     PIC A(10) VALUE 'AGE GROUPS'.          28800000
   02  RANGE.                                                  29100000
     03  MIN             COMP-1 VALUE  0.0E0.                  29400000
     03  MAX             COMP-1 VALUE 70.0E0.                  29700000
   02  SCALE-MARKS.                                            30000000
     03  MAJOR           COMP-1 VALUE 10.0E0.                  30300000
     03  MINOR           COMP-1 VALUE  0.0E0.                  30600000
                                                                30900000
****************************************************************31200000
*  Y AXIS SPECIFICATION                                       *31500000
*    SPECIFIES THE AXIS TITLE, THE AXIS RANGE                 *31800000
*    AND THE SCALE MARK INTERVAL.                             *32100000
****************************************************************32400000
                                                                32700000
 01  Y-AXIS.                                                   33000000
   02  TITLE.                                                  33300000
     03 TITLE-LENGTH  PIC S9(8) COMP VALUE +10.              33600000
     03 TITLE-TEXT    PIC A(10) VALUE 'PERCENTAGE'.          33900000
   02  RANGE.                                                  34200000
     03  MIN             COMP-1 VALUE  0.0E0.                  34500000
     03  MAX             COMP-1 VALUE 22.0E0.                  34800000
   02  SCALE-MARKS.                                            35100000
     03  MAJOR           COMP-1 VALUE  2.0E0.                  35400000
     03  MINOR           COMP-1 VALUE  1.0E0.                  35700000
                                                                36000000
                                                                36300000
****************************************************************36600000
*  X AXIS RANGE DATA                                          *36900000
****************************************************************37200000
 01  RANGES.                                                   37500000
     02  RANGE-COUNT      PIC S9(8) COMP VALUE +7.             37800000
     02  RANGE-STARTS.                                         38100000
       03  RANGE-START    COMP-1 OCCURS 7 TIMES.               38400000
     02  RANGE-ENDS.                                           38700000
       03  RANGE-END      COMP-1 OCCURS 7 TIMES.               39000000
                                                                39300000
****************************************************************39600000
*  Y DATA VALUES                                              *39900000
****************************************************************40200000
 01  DATA-VALUES.                                              40500000
     02  DATA-VALUE        COMP-1 OCCURS 7 TIMES.              40800000
****************************************************************41400000
*  ATTRIBUTE VALUES USED FOR THE CHART.                       *41700000
*        - HISTOGRAM IS RED                                   *42000000
*        - AND IS IN PATTERN 12, A SPRINKLING OF DOTS.        *42300000
****************************************************************42600000
                                                                42900000
```

```
 01  CHART-ATTRIBUTES.                                                43200000
    02  COMPONENT-COUNT   PIC S9(8) COMP VALUE +1.                    43500000
    02  CHART-COLOR       PIC S9(8) COMP VALUE +2.                    43800000
    02  CHART-PATTERN     PIC S9(8) COMP VALUE +1.                    44100000
                                                                       44400000
*******************************************************************44700000
*  THE ANNOTATION DATA APPEARS AT THE BOTTOM OF THE CHART        *45000000
*  TO SPECIFY THE ACTIONS THAT CAN BE TAKEN.                     *45300000
*******************************************************************45600000
                                                                       45900000
 01  ANNOTATION-DATA.                                                 46200000
     02  ANNOTATION-POSITION PIC X(2)  VALUE 'BL'.                    46500000
     02  ANNOTATION-LENGTH   PIC S9(8) COMP VALUE +30.                46800000
     02  ANNOTATION-TEXT     PIC X(30) VALUE,                         47100000
     'PRESS ENTER TO END THE PROGRAM'.                                 47400000
                                                                       47700000
*******************************************************************48000000
*  PARAMETERS TO THE SCREEN READ OPERATION:                      *48300000
*******************************************************************48600000
                                                                       48900000
 01  READ-DATA.                                                       49200000
     02  ATTENTION-TYPE      PIC S9(8) COMP.                          49500000
     02  ATTENTION-MODIFIER  PIC S9(8) COMP.                          49800000
     02  FIELD-COUNT         PIC S9(8) COMP.                          50100000
                                                                       50400000
                                                                       51000000
                                                                       51300000
 PROCEDURE DIVISION.                                                   51600000
                                                                       51900000
                                                                       52200000
*******************************************************************52500000
*  INITIALIZE THE RANGES.                                        *52800000
*     RANGE-START (I) GIVES THE START OF THE I'TH RANGE OF AGES  *53100000
*     RANGE-END (I)  GIVES THE END OF THE I'TH RANGE OF AGES     *53400000
*     EACH RANGE IS 10 YEARS.                                    *53700000
*******************************************************************54000000
                                                                       54300000
     MOVE 0 TO RANGE-START (1).                                        54600000
     MOVE 10 TO RANGE-END (1).                                         54900000
                                                                       55200000
     MOVE 10 TO RANGE-START (2).                                       55500000
     MOVE 20 TO RANGE-END (2).                                         55800000
                                                                       56100000
     MOVE 20 TO RANGE-START (3).                                       56400000
     MOVE 30 TO RANGE-END (3).                                         56700000
                                                                       57000000
     MOVE 30 TO RANGE-START (4).                                       57300000
     MOVE 40 TO RANGE-END (4).                                         57600000
                                                                       57900000
     MOVE 40 TO RANGE-START (5).                                       58200000
     MOVE 50 TO RANGE-END (5).                                         58500000
                                                                       58800000
     MOVE 50 TO RANGE-START (6).                                       59100000
     MOVE 60 TO RANGE-END (6).                                         59400000
                                                                       59700000
     MOVE 60 TO RANGE-START (7).                                       60000000
     MOVE 70 TO RANGE-END (7).                                         60300000
                                                                       60600000
```

```
*****************************************************************60900000
*  INITIALIZE THE DATA VALUES.                                  *61200000
*     DATA-VALUE (I) IS THE PROPORTION OF THE POPULATION        *61500000
*     HAVING AN AGE BETWEEN (I-1)*10 YEARS AND I*10 YEARS       *61800000
*     EXCEPT FOR THE LAST, WHICH INCLUDES ALL THOSE OVER 70.    *62100000
*****************************************************************62400000
                                                                 62700000
     MOVE 12.3 TO DATA-VALUE (1).                                63000000
     MOVE 15.0 TO DATA-VALUE (2).                                63300000
     MOVE 21.3 TO DATA-VALUE (3).                                63600000
     MOVE 20.2 TO DATA-VALUE (4).                                63900000
     MOVE 15.3 TO DATA-VALUE (5).                                64200000
     MOVE 11.4 TO DATA-VALUE (6).                                64500000
     MOVE  4.5 TO DATA-VALUE (7).                                64800000
                                                                 65100000
*****************************************************************65400000
*  INITIALIZE GDDM.                                             *65700000
*   A DEFAULT GRAPHIC FIELD WILL BE USED THAT COVERS THE SCREEN. *66000000
*****************************************************************66900000
                                                                 67200000
     CALL 'FSINIT'.                                              67500000
                                                                 70000000
*****************************************************************70400000
*  SPECIFY THE CHART HEADING AND THE HEADING ATTRIBUTES.        *70800000
*  THIS DATA IS GIVEN BY THE STRUCTURE HEADING-DATA.            *71200000
*****************************************************************71600000
                                                                 72000000
     CALL 'CHHATT' USING HEADING-ATTR-COUNT, HEADING-ATTRS.      72400000
     CALL 'CHHEAD' USING HEADING-LENGTH, HEADING-TEXT.           72800000
                                                                 73200000
*****************************************************************73600000
*  SPECIFY THE X (HORIZONTAL) TITLE AND THE Y (VERTICAL) TITLE. *74000000
*  THE ATTRIBUTES ARE NOT GIVEN AND WILL BE THE DEFAULT ONES -  *74400000
*  (GREEN, STANDARD MODE 1 TEXT).                               *74800000
*****************************************************************75200000
                                                                 75600000
     CALL 'CHXTTL' USING TITLE-LENGTH OF X-AXIS,                 76000000
                         TITLE-TEXT OF X-AXIS.                   76400000
     CALL 'CHYTTL' USING TITLE-LENGTH OF Y-AXIS,                 76800000
                         TITLE-TEXT OF Y-AXIS.                   77200000
                                                                 77600000
*****************************************************************78000000
*  BECAUSE THE BARS REPRESENT RANGES, EACH IS LABELED WITH      *78400000
*  THE RANGE IT REPRESENTS.  IF THIS LABELING IS OMITTED        *78800000
*  THE NORMAL NUMERIC AXIS LABELING WOULD BE SUFFICIENT TO      *79200000
*  INDICATE THE RANGES EXCEPT AT THE EXTREMES.                  *79600000
*  THE RANGE OF X VALUES IS 0 TO 70, WITH TICKS EVERY 10.       *80000000
*  THE LABELS ARE CENTERED  BETWEEN THE TICKS.                  *80400000
*****************************************************************80800000
                                                                 81200000
     CALL 'CHXRNG' USING MIN OF X-AXIS, MAX OF X-AXIS.           81600000
     CALL 'CHXTIC' USING MAJOR OF X-AXIS, MINOR OF X-AXIS.       82000000
     CALL 'CHXLAB' USING RANGE-LABEL-COUNT, RANGE-LABEL-LENGTH,  82400000
                         RANGE-LABELS.                           82800000
     MOVE 'LABMIDDL' TO OPTION-STRING.                           83200000
     CALL 'CHXSET' USING OPTION-STRING.                          83600000
                                                                 84000000
*****************************************************************84400000
```

```
*  SPECIFY A VERTICAL Y RANGE OF 22 WITH LONG (MAJOR) TICKS      *84800000
*  EVERY TWO, AND ONE SHORT (MINOR) TICK BETWEEN.                *85200000
*  - IF THE RANGE IS OMITTED, AUTOSCALING WILL NORMALLY          *85600000
*  PRODUCE A SUITABLE AXIS RANGE PROVIDED CONSISTENCY FROM       *86000000
*  CHART TO CHART IS NOT IMPORTANT.                              *86400000
****************************************************************86800000
                                                                 87200000
     CALL 'CHYRNG' USING MIN OF Y-AXIS, MAX OF Y-AXIS.           87600000
     CALL 'CHYTIC' USING MAJOR OF Y-AXIS, MINOR OF Y-AXIS.       88000000
                                                                 88400000

****************************************************************88800000
*  HAVING SPECIFIED THE AXIS CHARACTERISTICS, THE DATA           *89200000
*  IS PLOTTED.   FIRST THE COLOR AND PATTERN ARE                 *89600000
*  SPECIFIED FROM THE STRUCTURE CHART-ATTRIBUTES.                *90000000
*  (IF THEY ARE NOT, PGF WILL USE PATTERN 1 AND BLUE).           *90400000
****************************************************************90800000
                                                                 91200000
     CALL 'CHCOL'  USING COMPONENT-COUNT, CHART-COLOR.           91600000
     CALL 'CHPAT'  USING COMPONENT-COUNT, CHART-PATTERN.         92000000
     CALL 'CHHIST' USING COMPONENT-COUNT, RANGE-COUNT,           92400000
                   RANGE-STARTS, RANGE-ENDS, DATA-VALUES.        92800000
                                                                 93200000
****************************************************************93600000
*  PUT A NOTE ON THE CHART WITH INSTRUCTIONS ABOUT PRINTING      *94000000
****************************************************************94400000
     CALL 'CHNOTE' USING ANNOTATION-POSITION, ANNOTATION-LENGTH,  94800000
                   ANNOTATION-TEXT.                              95200000
****************************************************************95600000
*  PRESENT THE CHART AND READ THE KEYBOARD.                      *96000000
*  THIS SERVES TO HOLD THE PICTURE ON THE SCREEN UNTIL           *96400000
*  SOME ACTION (SUCH AS THE ENTER KEY) IS TAKEN.                 *96800000
****************************************************************97200000
     CALL 'CHTERM'.                                              97600000
     CALL 'ASREAD' USING ATTENTION-TYPE, ATTENTION-MODIFIER,      98000000
                   FIELD-COUNT.                                  98400000
     CALL 'FSTERM'.                                              98800000
     GOBACK.                                                     99200000
                                                                 99600000
```

ADMUSF5 – FORTRAN program to draw a simple histogram

```
C*********************************************************************  00700000
C*                        ADMUSF5                                    *  01400000
C*                                                                   *  02100000
C*           PROGRAM TO DISPLAY A SIMPLE HISTOGRAM USING THE         *  02800000
C*           PRESENTATION GRAPHICS FACILITY OF GDDM.                 *  03500000
C*                                                                   *  04200000
C*           THE HISTOGRAM DISPLAYS THE DISTRIBUTION OF AN           *  04900000
C*           IMAGINARY POPULATION BY AGE.                            *  05600000
C*********************************************************************  08400000
C*********************************************************************  10500000
C*     ATTRIBUTE ARRAYS USED FOR THE CHART.                          *  11200000
C*********************************************************************  11900000
      INTEGER*4                                                          12600000
     *   YELLOW(1) /6/,                                                 13300000
     *   RED   (1) /2/,                                                 14000000
     *   PAT   (1)/12/                                                  14700000
C                                                                        15400000
C*********************************************************************  16100000
C*     HISTOGRAM BAR EXTREMES.                                       *  16800000
C*         RANGE1  GIVES LEFT-HAND SIDE OF CONSECUTIVE BARS,         *  17500000
C*         RANGE2  GIVES RIGHT-HAND SIDE.                            *  18200000
C*         - THERE ARE TO BE SEVEN BARS.                             *  18900000
C*********************************************************************  19600000
      REAL*4                                                             20300000
     *   RANGE1 (7) /0.0,10.0,20.0,30.0,40.0,50.0,60.0/,                 21000000
     *   RANGE2 (7) /10.0,20.0,30.0,40.0,50.0,60.0,70.0/                 21700000
C                                                                        22400000
C                                                                        23100000
C*********************************************************************  23800000
C*     DATA TO BE PLOTTED.                                           *  24500000
C*     THE DATA IS CONSTANT IN THIS EXAMPLE PROGRAM SO THAT THE      *  25200000
C*     PROGRAM WILL RUN WITHOUT INPUT.                               *  25900000
C*     THERE IS ONE VALUE FOR EACH BAR, GIVING ITS HEIGHT.           *  26600000
C*********************************************************************  27300000
      REAL*4                                                             28000000
     *  DATA (7) /12.3,15.0,21.3,20.2,15.3,11.4,4.5/                    28700000
C*********************************************************************  30100000
C*     VARIABLES CONCERNED WITH SCREEN READ -                        *  30800000
C*     THE ATTENTION TYPE, ATTENTION MODIFIER AND FIELD COUNT        *  32900000
C*********************************************************************  32200000
      INTEGER*4                                                          33600000
     *  ATYPE,                                                          34400000
     *  ATMOD,                                                          35200000
     *  FLDCT                                                           36000000
C*********************************************************************  43200000
C*     INITIALIZE GDDM.                                              *  44000000
C*     A DEFAULT GRAPHIC FIELD WILL BE USED THAT COVERS THE SCREEN.  *  44800000
C*********************************************************************  48000000
      CALL FSINIT                                                        48800000
C*********************************************************************  51200000
C*     SPECIFY THE CHART HEADING IN COLOR YELLOW. BECAUSE NO OTHER   *  52000000
C*     ATTRIBUTES ARE GIVEN, THEY WILL DEFAULT TO STANDARD SIZE,     *  52800000
C*     STANDARD CHARACTER-SET MODE 1 TEXT.                           *  53600000
C*********************************************************************  54400000
      CALL CHHATT(1,YELLOW)                                              55200000
```

```
      CALL CHHEAD(47,'PERCENTAGE POPULATION DISTRIBUTION BY AGE GROUP') 56000000
C*********************************************************************  56800000
C*     SPECIFY THE X (HORIZONTAL) TITLE AND THE Y (VERTICAL) TITLE.  *  57600000
C*     THE ATTRIBUTES ARE NOT GIVEN AND WILL BE THE DEFAULT ONES -   *  58400000
C*     (GREEN, STANDARD MODE 1 TEXT).                                *  59200000
C*********************************************************************  60000000
      CALL CHXTTL (10,'AGE GROUPS')                                      60800000
      CALL CHYTTL (10,'PERCENTAGE')                                      61600000
C*********************************************************************  62400000
C*     BECAUSE THE BARS REPRESENT RANGES, EACH IS LABELED WITH       *  63200000
C*     THE RANGE IT REPRESENTS.  IF THIS LABELING IS OMITTED         *  64000000
C*     THE NORMAL NUMERIC AXIS LABELING WOULD BE SUFFICIENT TO       *  64800000
C*     INDICATE THE RANGES EXCEPT AT THE EXTREMES.                   *  65600000
C*     THE RANGE OF X VALUES IS 0 TO 70, WITH TICKS EVERY 10.        *  66400000
C*     THE LABELS ARE CENTERED BETWEEN THE TICKS.                    *  67200000
C*********************************************************************  68000000
      CALL CHXRNG(0.0,70.0)                                              68800000
      CALL CHXTIC(10.0,0.0)                                              69600000
      CALL CHXLAB(8,5,'      <11 11-2021-3031-4041-5051-60 >60 ')        70400000
      CALL CHXSET('LABMIDDLE')                                           71200000
C*********************************************************************  72000000
C*     SPECIFY A VERTICAL Y RANGE OF 22 WITH LONG (MAJOR) TICKS      *  72800000
C*     EVERY TWO, AND ONE SHORT (MINOR) TICK BETWEEN.                *  73600000
C*     - IF THE RANGE IS OMITTED, AUTOSCALING WILL NORMALLY          *  74400000
C*     PRODUCE A SUITABLE AXIS RANGE PROVIDED CONSISTENCY FROM       *  75200000
C*     CHART TO CHART IS NOT IMPORTANT.                              *  76000000
C*********************************************************************  76800000
      CALL CHYRNG(0.0,22.0)                                              77600000
      CALL CHYTIC(2.0,1.0)                                               78400000
C*********************************************************************  80800000
C*     HAVING SPECIFIED THE AXIS CHARACTERISTICS, THE DATA           *  81600000
C*     IS PLOTTED.   THE HISTOGRAM IS SPECIFIED AS RED AND           *  82400000
C*     USING PATTERN 12 (A DUSTING OF DOTS).  BY DEFAULT THE         *  83200000
C*     PGF ROUTINES WILL GENERATE THE GRAPH IN BLUE USING PATTERN 1. *  84000000
C*********************************************************************  84800000
      CALL CHCOL(1,RED)                                                  85600000
      CALL CHPAT(1,PAT)                                                  86400000
      CALL CHHIST(1,7,RANGE1,RANGE2,DATA)                                87200000
C*********************************************************************  88800000
C*     PUT A NOTE AT THE BOTTOM LEFT OF THE CHART WITH INSTRUCTIONS  *  89600000
C*********************************************************************  90400000
      CALL CHNOTE('BL',30,'PRESS ENTER TO END THE PROGRAM')              91200000
C*********************************************************************  93600000
C*     FINALLY ISSUE A SCREEN READ.  WHICHEVER INTERRUPT IS          *  94400000
C*     GENERATED, THE PROGRAM TERMINATES (IN SPITE OF INSTRUCTIONS)  *  95200000
C*********************************************************************  96000000
      CALL ASREAD(ATYPE,ATMOD,FLDCT)                                     96800000
      CALL FSTERM                                                        97600000
      STOP                                                               98400000
      END                                                                99200000
```

ADMUSP5 – PL/I program to draw a simple histogram

```
 ADMUSP5: PROCEDURE REORDER OPTIONS (MAIN);                              00700000
/*********************************************************************/ 01400000
/*          $MOD(ADMUSP5),COMP(SMP-PLI),PROD(GDDMPGF):               */ 01600000
/*********************************************************************/ 01800000
/*                        ADMUSP5                                    */ 02100000
/*          PROGRAM TO DISPLAY A SIMPLE HISTOGRAM USING THE          */ 03500000
/*          PRESENTATION GRAPHICS FACILITY OF GDDM.                  */ 04200000
/*                                                                   */ 04900000
/*          THE HISTOGRAM DISPLAYS THE DISTRIBUTION OF AN            */ 05600000
/*          IMAGINARY POPULATION BY AGE.                             */ 06300000
/*                                                                   */ 07000000
/*          THE GRAPH IS DISPLAYED, AND WHEN ANY INTERRUPT IS        */ 07700000
/*          GENERATED BY THE TERMINAL USER, THE PROGRAM TERMINATES   */ 08400000
/*********************************************************************/ 09800000
 %INCLUDE (ADMUPINA);                                                   10700000
 %INCLUDE (ADMUPINC);                                                   11000000
 %INCLUDE (ADMUPINF);                                                   11200000
 %INCLUDE (ADMUPING);                                                   11600000
                                                                        11900000
/*********************************************************************/ 12600000
/*    ATTRIBUTE ARRAYS USED FOR THE CHART.                           */ 13300000
/*********************************************************************/ 14000000
 DECLARE HBOUND BUILTIN ;                                               14700000
 DECLARE                                                                15000000
     YELLOW (1) FIXED BIN(31) STATIC INIT(6),                           15400000
     RED    (1) FIXED BIN(31) STATIC INIT(2),                           16100000
     PAT   (12) FIXED BIN(31) STATIC INIT(1);                           16800000
                                                                        17600000
/*********************************************************************/ 18400000
/*    HISTOGRAM BAR EXTREMES.                                        */ 19200000
/*        RANGE1  GIVES LEFT-HAND SIDE OF CONSECUTIVE BARS,          */ 20000000
/*        RANGE2  GIVES RIGHT-HAND SIDE.                             */ 20800000
/*        - THERE ARE TO BE SEVEN BARS.                              */ 21600000
/*********************************************************************/ 22400000
 DECLARE                                                                23200000
     RANGE1 (7) FLOAT STATIC INIT(0,10,20,30,40,50,60),                 24000000
     RANGE2 (7) FLOAT STATIC INIT(10,20,30,40,50,60,70),                24800000
/*********************************************************************/ 25600000
/*    DATA TO BE PLOTTED.                                            */ 26400000
/*    THE DATA IS CONSTANT IN THIS EXAMPLE PROGRAM SO THAT THE       */ 27200000
/*    PROGRAM WILL RUN WITHOUT INPUT.                                */ 28000000
/*    THERE IS ONE VALUE FOR EACH BAR, GIVING ITS HEIGHT.            */ 28800000
/*********************************************************************/ 29600000
     DATA (7) FLOAT INIT(12.3,15,21.3,20.2,15.3,11.4,4.5);              30400000
                                                                        31200000
/*********************************************************************/ 32000000
/*    VARIABLES CONCERNED WITH SCREEN READ.                          */ 32800000
/*********************************************************************/ 34400000
  DECLARE                                                               35200000
   ( ATTENTION_TYPE ,                  /* TYPE OF KEY USED        */ 36000000
     ATTENTION_MOD ,                   /* NUMBER OF KEY USED      */ 36800000
     FLD_COUNT )                       /* COUNT OF MODIFIED FIELDS*/ 37600000
     FIXED BIN(31) INIT(0) ;           /*                         */ 40000000
/*********************************************************************/ 44000000
/*    INITIALIZE GDDM.                                               */ 44800000
/*    A DEFAULT GRAPHIC FIELD WILL BE USED THAT COVERS THE SCREEN.   */ 45600000
```

```
/*****************************************************************/ 48800000
     CALL FSINIT;                                                     49600000
/*****************************************************************/ 52000000
/*    SPECIFY THE CHART HEADING IN COLOR YELLOW. BECAUSE NO OTHER   */ 52800000
/*    ATTRIBUTES ARE GIVEN, THEY WILL DEFAULT TO STANDARD SIZE,     */ 53600000
/*    STANDARD CHARACTER-SET MODE 1 TEXT.                           */ 54400000
/*****************************************************************/ 55200000
     CALL CHHATT(1,YELLOW);                                           56000000
     CALL CHHEAD(47,'PERCENTAGE POPULATION DISTRIBUTION BY AGE GROUP');56800000
/*****************************************************************/ 57600000
/*    SPECIFY THE X (HORIZONTAL) TITLE AND THE Y (VERTICAL) TITLE.  */ 58400000
/*    THE ATTRIBUTES ARE NOT GIVEN AND WILL BE THE DEFAULT ONES -   */ 59200000
/*    (GREEN, STANDARD MODE 1 TEXT).                                */ 60000000
/*****************************************************************/ 60800000
     CALL CHXTTL (10,'AGE GROUPS');                                   61600000
     CALL CHYTTL (10,'PERCENTAGE');                                   62400000
/*****************************************************************/ 63200000
/*    BECAUSE THE BARS REPRESENT RANGES, EACH IS LABELED WITH       */ 64000000
/*    THE RANGE IT REPRESENTS.  IF THIS LABELING IS OMITTED         */ 64800000
/*    THE NORMAL NUMERIC AXIS LABELING WOULD BE SUFFICIENT TO       */ 65600000
/*    INDICATE THE RANGES EXCEPT AT THE EXTREMES.                   */ 66400000
/*    THE RANGE OF X VALUES IS 0 TO 70, WITH TICKS EVERY 10.        */ 67200000
/*    THE LABELS ARE CENTERED BETWEEN THE TICKS.                    */ 68000000
/*****************************************************************/ 68800000
     CALL CHXRNG(0,70);                                               69600000
     CALL CHXTIC(10,0);                                               70400000
     CALL CHXLAB(8,5,'      <11 11-2021-3031-4041-5051-60 >60 ');     71200000
     CALL CHXSET('LABMIDDLE');                                        72000000
/*****************************************************************/ 72800000
/*    SPECIFY A VERTICAL Y RANGE OF 22 WITH LONG (MAJOR) TICKS      */ 73600000
/*    EVERY TWO, AND ONE SHORT (MINOR) TICK BETWEEN.                */ 74400000
/*    - IF THE RANGE IS OMITTED, AUTOSCALING WILL NORMALLY          */ 75200000
/*    PRODUCE A SUITABLE AXIS RANGE PROVIDED CONSISTENCY FROM       */ 76000000
/*    CHART TO CHART IS NOT IMPORTANT.                              */ 76800000
/*****************************************************************/ 77600000
     CALL CHYRNG(0,22);                                               78400000
     CALL CHYTIC(2,1);                                                79200000
                                                                      80000000
                                                                      80800000
/*****************************************************************/ 81600000
/*    HAVING SPECIFIED THE AXIS CHARACTERISTICS, THE DATA           */ 82400000
/*    IS PLOTTED.   THE HISTOGRAM IS SPECIFIED AS RED AND           */ 83200000
/*    USING PATTERN 12 (A DUSTING OF DOTS).  BY DEFAULT THE         */ 84000000
/*    PGF ROUTINES WILL GENERATE THE GRAPH IN BLUE USING PATTERN 1. */ 84800000
/*****************************************************************/ 85600000
     CALL CHCOL(1,RED);                                               86400000
     CALL CHPAT(1,PAT);                                               87200000
     CALL CHHIST(1,7,RANGE1,RANGE2,DATA);                             88000000
                                                                      88800000
/*****************************************************************/ 89600000
/*    PUT A NOTE AT THE BOTTOM LEFT OF THE CHART WITH INSTRUCTIONS  */ 90400000
/*****************************************************************/ 91200000
     CALL CHNOTE('BL',30,'PRESS ENTER TO END THE PROGRAM');           92000000
                                                                      92800000
                                                                      93600000
/*****************************************************************/ 94400000
/*    FINALLY ISSUE A SCREEN READ.  WHEN ANY INTERRUPT IS GENERATED */ 95200000
/*    BY THE TERMINAL OPERATOR, THE PROGRAM TERMINATES.             */ 96000000
```

```
/*****************************************************************/ 96800000
     CALL ASREAD(ATTENTION_TYPE,ATTENTION_MOD,FLD_COUNT);           97600000
     CALL FSTERM;                                                   98400000
 END ADMUSP5;                                                       99200000
```

ADMUSP5 – IMS PL/I program to draw a simple histogram

```
1ADMUSP5: PROC                                                          00500000
           (IOPCBP,                /* TO IO PCB                   */ 01000000
            SYSPCBP                /* TO SYSTEM DEFN. PCB         */ 01500000
           ) OPTIONS(MAIN);                                             02000000
                                                                        02500000
 /*****************************************************************/ 03000000
 /*          $MOD(ADMUSP5I),COMP(SMP-PLI),PROD(GDDMPGF):          */ 03100000
 /*****************************************************************/ 03300000
 /*                        ADMUSP5                                */ 03500000
 /*                                                               */ 04000000
 /*          PROGRAM TO DISPLAY A SIMPLE HISTOGRAM USING THE      */ 04500000
 /*          PRESENTATION GRAPHICS FEATURE OF GDDM.               */ 05000000
 /*                                                               */ 05500000
 /*          THE HISTOGRAM DISPLAYS THE DISTRIBUTION OF AN        */ 06000000
 /*          IMAGINARY POPULATION BY AGE.                         */ 06500000
 /*                                                               */ 07000000
 /*          THE PROGRAM IS PASSED TWO PCBS                       */ 07500000
 /*            (1). THE I/O PCB TO WHICH TO PICTURE IS SENT       */ 08000000
 /*            (2). THE SYSTEM DEFINITION DATABASE CONTAINING     */ 08500000
 /*                 TERMINAL CHARACTERISTICS                      */ 09000000
 /*                                                               */ 09500000
 /*****************************************************************/ 10000000
                                                                      10500000
  %INCLUDE (ADMUPINC);                                                10900000
  %INCLUDE (ADMUPINE);                                                11000000
  %INCLUDE (ADMUPINF);                                                11700000
  %INCLUDE (ADMUPING);                                                12100000
                                                                      12500000
 /*****************************************************************/ 13000000
 /*    INPUT PARAMETERS                                           */ 13500000
 /*****************************************************************/ 14000000
                                                                      14500000
 DECLARE                           /* INPUT PARAMETERS            */ 15000000
    IOPCBP POINTER,                /* TO IO PCB                   */ 15500000
    SYSPCBP POINTER;               /* TO SYSTEM DEFN. PCB         */ 16000000
 DECLARE                           /* SKELETAL PCB OVERLAY        */ 16500000
   1 PCB BASED,                                                       17000000
    2 PCBNAME CHAR(8),                                                17500000
    2 PCBRESV FIXED BINARY(15),                                       18000000
    2 PCBSTAT CHAR(2);                                                18500000
                                                                      19000000
 /*****************************************************************/ 19500000
 /*    ATTRIBUTE ARRAYS USED FOR THE CHART.                       */ 20000000
 /*****************************************************************/ 20500000
                                                                      21000000
  DECLARE                                                             21500000
      YELLOW (1) FIXED BIN(31) STATIC INIT(6),                        22000000
      RED (1) FIXED BIN(31)    STATIC INIT(2),                        22500000
      PAT (12) FIXED BIN(31)   STATIC INIT(1);                        23000000
                                                                      23500000
 /*****************************************************************/ 24000000
 /*    HISTOGRAM BAR EXTREMES.                                    */ 24500000
 /*        RANGE1  GIVES LEFT-HAND SIDE OF CONSECUTIVE BARS,      */ 25000000
 /*        RANGE2  GIVES RIGHT-HAND SIDE.                         */ 25500000
 /*        - THERE ARE TO BE SEVEN BARS.                          */ 26000000
 /*****************************************************************/ 26500000
```

```
 DECLARE                                                                27000000
     RANGE1 (7) FLOAT STATIC INIT(0,10,20,30,40,50,60),                 27500000
     RANGE2 (7) FLOAT STATIC INIT(10,20,30,40,50,60,70),                28000000
/*****************************************************************/ 28500000
/*    DATA TO BE PLOTTED.                                        */ 29000000
/*    THE DATA IS CONSTANT IN THIS EXAMPLE PROGRAM SO THAT THE   */ 29500000
/*    PROGRAM WILL RUN WITHOUT INPUT.                            */ 30000000
/*    THERE IS ONE VALUE FOR EACH BAR, GIVING ITS HEIGHT.        */ 30500000
/*****************************************************************/ 31000000
     DATA (7) FLOAT INIT(12.3,15,21.3,20.2,15.3,11.4,4.5);              31500000
                                                                        32000000
 DECLARE                                                                37000000
   PLITDLI EXTERNAL ENTRY,         /* IMS PLI INTERFACE ROUTINE   */ 37500000
   THREE FIXED BIN(31) STATIC INIT(3),                                  38000000
   GUFUNC CHAR(4) STATIC INIT('GU  '), /* GET UNIQUE DLI CODE        */ 38500000
   1 INPUTSEG,                     /* INPUT SEGMENT                 */ 39000000
    2 INPUTLL FIXED BIN(31),       /* INPUT LENGTH                  */ 39500000
    2 INPUTZZ CHAR(2),             /* THE ZZ BYTES                  */ 40000000
    2 INPUT_TEXT CHAR(80);         /* THE INPUT MESSAGE             */ 40500000
 DECLARE                                                                41000000
   (IOPCB STATIC INIT(0),          /* ESPCB CODE FOR I/O PCB        */ 41500000
    DBPCB STATIC INIT(2))          /* ESPCB CODE FOR DATABASE PCB   */ 42000000
       FIXED BIN(31);                                                   42500000
                                                                        43000000
1/*****************************************************************/ 43500000
 /*                                                               */ 44000000
 /*       ISSUE A GU TO THE IOPCB. TERMINATE THE TRANSACTION IF   */ 44500000
 /*       NO MESSAGE IS RETURNED.                                 */ 45000000
 /*                                                               */ 45500000
 /*****************************************************************/ 46000000
                                                                        46500000
  GU:                                                                   47000000
    CALL PLITDLI(THREE,GUFUNC,IOPCBP->PCB,INPUTSEG);                    47500000
    IF IOPCBP->PCBSTAT¬='  ' THEN GOTO EXIT;                            48000000
    INPUTLL=INPUTLL-4;             /* SET LENGTH OF TEXT ENTERED    */ 48500000
                                                                        49000000
 /*****************************************************************/ 49500000
 /*                                                               */ 50000000
 /*       INITIALIZE GDDM, AND IDENTIFY THE PCBS TO GDDM          */ 50500000
 /*                                                               */ 51000000
 /*****************************************************************/ 51500000
                                                                        52000000
                                                                        52500000
  CALL FSINIT;                     /* INITIALIZE.                   */ 53000000
                                                                        53500000
  CALL ESPCB(IOPCB,IOPCBP->PCB);   /* DEFINE IO PCB                 */ 54000000
  CALL ESPCB(DBPCB,SYSPCBP->PCB);  /* DEFINE SYSTEM DEFINITION PCB  */ 54500000
                                                                        60500000
 /*****************************************************************/ 61000000
 /*    SPECIFY THE CHART HEADING IN COLOR YELLOW. BECAUSE NO OTHER */ 61600000
 /*    ATTRIBUTES ARE GIVEN, THEY WILL DEFAULT TO STANDARD SIZE,   */ 62200000
 /*    STANDARD CHARACTER-SET MODE 1 TEXT.                         */ 62800000
 /*****************************************************************/ 63400000
     CALL CHHATT(1,YELLOW);                                             64000000
     CALL CHHEAD(47,'PERCENTAGE POPULATION DISTRIBUTION BY AGE GROUP');64600000
 /*****************************************************************/ 65200000
 /*    SPECIFY THE X (HORIZONTAL) TITLE AND THE Y (VERTICAL) TITLE. */ 65800000
 /*    THE ATTRIBUTES ARE NOT GIVEN AND WILL BE THE DEFAULT ONES -  */ 66400000
```

```
/*    (GREEN, STANDARD MODE 1 TEXT).                                */ 67000000
/*****************************************************************/ 67600000
     CALL CHXTTL (10,'AGE GROUPS');                                    68200000
     CALL CHYTTL (10,'PERCENTAGE');                                    68800000
/*****************************************************************/ 69400000
/*    BECAUSE THE BARS REPRESENT RANGES, EACH IS LABELED WITH       */ 70000000
/*    THE RANGE IT REPRESENTS.  IF THIS LABELING IS OMITTED         */ 70600000
/*    THE NORMAL NUMERIC AXIS LABELING WOULD BE SUFFICIENT TO       */ 71200000
/*    INDICATE THE RANGES EXCEPT AT THE EXTREMES.                   */ 71800000
/*    THE RANGE OF X VALUES IS 0 TO 70, WITH TICKS EVERY 10.        */ 72400000
/*    THE LABELS ARE CENTERED BETWEEN THE TICKS.                    */ 73000000
/*****************************************************************/ 73600000
     CALL CHXRNG(0,70);                                                74200000
     CALL CHXTIC(10,0);                                                74800000
     CALL CHXLAB(8,5,'      <11 11-2021-3031-4041-5051-60 >60 ');      75400000
     CALL CHXSET('LABMIDDLE');                                         76000000
/*****************************************************************/ 76600000
/*    SPECIFY A VERTICAL Y RANGE OF 22 WITH LONG (MAJOR) TICKS      */ 77200000
/*    EVERY TWO, AND ONE SHORT (MINOR) TICK BETWEEN.                */ 77800000
/*    - IF THE RANGE IS OMITTED, AUTOSCALING WILL NORMALLY          */ 78400000
/*    PRODUCE A SUITABLE AXIS RANGE PROVIDED CONSISTENCY FROM       */ 79000000
/*    CHART TO CHART IS NOT IMPORTANT.                              */ 79600000
/*****************************************************************/ 80200000
     CALL CHYRNG(0,22);                                                80800000
     CALL CHYTIC(2,1);                                                 81400000
                                                                       82000000
                                                                       82600000
/*****************************************************************/ 83200000
/*    HAVING SPECIFIED THE AXIS CHARACTERISTICS, THE DATA           */ 83800000
/*    IS PLOTTED.   THE HISTOGRAM IS SPECIFIED AS RED AND           */ 84400000
/*    USING PATTERN 12 (A DUSTING OF DOTS).  BY DEFAULT THE         */ 85000000
/*    PGF ROUTINES WILL GENERATE THE GRAPH IN BLUE USING PATTERN 1. */ 85600000
/*****************************************************************/ 86200000
     CALL CHCOL(1,RED);                                                86800000
     CALL CHPAT(1,PAT);                                                87400000
     CALL CHHIST(1,7,RANGE1,RANGE2,DATA);                              88000000
                                                                       88600000
/*****************************************************************/ 89200000
/*    PUT A NOTE AT THE BOTTOM LEFT OF THE CHART WITH INSTRUCTIONS  */ 89800000
/*****************************************************************/ 90400000
     CALL CHNOTE('BL',38,'PRESS CLEAR AND ENTER NEXT TRANSACTION');    91000000
                                                                       91600000
                                                                       92200000
/*****************************************************************/ 92800000
/*    FINALLY CAUSE THE OUTPUT TO BE SENT TO THE TERMINAL USING     */ 93400000
/*    THE FSFRCE FUNCTION.                                          */ 94000000
/*****************************************************************/ 94600000
     CALL FSFRCE;                                                      95200000
/*****************************************************************/ 95800000
/*    TERMINATE GDDM AND THEN REISSUE THE GU.                       */ 96400000
/*****************************************************************/ 97000000
     CALL FSTERM;                                                      97600000
     GOTO GU;                                                          98200000
 EXIT:;                                                                98800000
 END ADMUSP5;                                                          99400000
```

ADMUSC6 – COBOL program that invokes the chart utility to plot data

```
 IDENTIFICATION DIVISION.                                          00300000
 PROGRAM-ID.  ADMUSC6.                                             00600000
 REMARKS.                                                          00900000
*************************************************************      01200000
*              COBOL EXAMPLE PROGRAM TO CALL THE            *      01500000
*              CHART UTILITY WITH SAMPLE DATA.              *      01800000
*************************************************************      01900000
* $MOD(ADMUSC6),COMP(SMP-COB),PROD(GDDMPGF):                *      02000000
*************************************************************.     02100000
 ENVIRONMENT DIVISION.                                             02400000
 CONFIGURATION SECTION.                                            02700000
 SOURCE-COMPUTER.                                                  03000000
 OBJECT-COMPUTER.                                                  03300000
 INPUT-OUTPUT SECTION.                                             03600000
 FILE-CONTROL.                                                     03900000
                                                                   04200000
 DATA DIVISION.                                                    04500000
                                                                   04800000
 WORKING-STORAGE SECTION.                                          05100000
*                                                                  05400000
*         CHART UTILITY PANEL CONTROL STRUCTURE                    05700000
 01  ADMTPCS.                                                      06900000
      02  PCSLEVEL PICTURE S9(8) COMP VALUE +1.                    06950000
*                 CHART UTILITY LEVEL IDENTIFIER                   07000000

*                 1 = CHART UTILITY RELEASE 3                      07050000
      02  PCSDISP  PICTURE S9(8) COMP VALUE +2.                    07100000
*                 CHART UTILITY FUNCTION REQUESTED                 07150000
*                 2 = DISPLAY, THEN HOME PANEL OR EXIT             07200000
      02  PCSHELP  PICTURE S9(8) COMP VALUE +1.                    07250000
*                 PF KEY INFORMATION SWITCH                        07300000
*                 1 = PF KEY INFORMATION IS DISPLAYED              07350000
      02  PCSISOL  PICTURE S9(8) COMP VALUE +0.                    07400000
*                 ISOLATION SWITCH                                 07450000
*                 0 = SAVE/RESTORE/DIRECTORY AVAILABLE             07500000
      02  PCSFNAME PICTURE X(8) VALUE '*       '.                  07550000
*                 NAME OF PREVIOUSLY SAVED CHART FORMAT            07600000
*                 * = DEFAULT CHART FORMAT                         07650000
      02  PCSDNAME PICTURE X(8) VALUE '*       '.                  07700000
*                 NAME OF PREVIOUSLY SAVED CHART DATA              07750000
*                 * = DATA CONTAINED IN PARAMETERS                 07800000
      02  PCSPAIR  PICTURE S9(8) COMP VALUE +0.                    07850000
*                 TIED OR FREE DATA SWITCH                         07900000
*                 0 = TIED, ONE SET OF X-VALUES ONLY               07950000
      02  PCSNC    PICTURE S9(8) COMP VALUE +3.                    08000000
*                 NUMBER OF DATA GROUPS.                           08050000
      02  PCSNE    PICTURE S9(8) COMP VALUE +3.                    08100000
*                 NUMBER OF ELEMENTS  (PER DATA GROUP)             08160000
      02  PCSKEYL  PICTURE S9(8) COMP VALUE +17.                   08220000
*                 LENGTH OF 'KEYS' ARRAY ELEMENT                   08280000
      02  PCSLABL  PICTURE S9(8) COMP VALUE +0.                    08340000
*                 LENGTH OF 'LABELS' ARRAY ELEMENT                 08400000
      02  PCSHEADL PICTURE S9(8) COMP VALUE +11.                   08460000
*                 LENGTH OF 'HEADING' PARAMETER                    08520000
      02  PCSPNAME PICTURE X(8) VALUE '*       '.                  08580000
*                 LOCAL PRINTER DESTINATION NAME                   08640000
```

```
*                                                                       08700000
*            NOTE THAT THE DEFINITIONS OF THE NEXT 2 FIELDS             09000000
*            HAVE BEEN CHANGED TO 'COMP-1' IN RELEASE 3.                09300000
*                                                                       10800000
     02  PCSPRDEP COMP-1 VALUE 6.4E+1.                                  11100000
*                PRINTER DEPTH (ROWS) OF CHART AREA                     11400000
     02  PCSPRWID COMP-1 VALUE 1.2E+2.                                  11700000
*                PRINTER WIDTH (COLS) OF CHART AREA                     12000000
     02  PCSPCOPY PICTURE S9(8) COMP VALUE +1.                          12300000
*                NUMBER OF COPIES OF PRINT FILE                         12600000
*                                                                       13800000
*            THE REMAINING FIELDS ARE NEW IN RELEASE 3,                 14100000
*            ONLY PCSUNIT IS USED IN THIS APPLICATION.                  14400000
*                                                                       15600000
     02  PCSPHEAD PICTURE S9(8) COMP VALUE +0.                          15700000
*                PRINTER HEADER PAGE CONTROL                            15800000
*                0 = DEFAULT, HEADER PAGE OUTPUT                        15900000
     02  PCSPVOFF COMP-1 VALUE 0.0E+1.                                  16000000
*                PRINTER VERTICAL OFFSET (ROWS)                         16100000
     02  PCSPHOFF COMP-1 VALUE 0.0E+1.                                  16200000
*                PRINTER HORIZONTAL OFFSET (COLUMNS)                    16300000
     02  PCSPUNIT PICTURE S9(8) COMP VALUE +4.                          16400000
*                PRINTER LAYOUT PARAMETER UNITS                         16500000
*                4 = ROWS AND COLUMNS                                   16600000
     02  PCSDUMMY PICTURE S9(8) COMP VALUE +0.                          16700000
*                RESERVED                                               16800000
     02  PCSDYNAM PICTURE X(8) VALUE '        '.                        16900000
*                DIRECTORY LISTING OBJECT NAME                          17000000
     02  PCSDYTYP PICTURE S9(8) COMP VALUE +0.                          17100000
*                DIRECTORY LISTING OBJECT TYPE                          17200000
*                0 = DEFAULT, NO INITIAL LIST                           17300000
     02  PCSDYTYQ PICTURE S9(8) COMP VALUE +0.                          17400000
*                DIRECTORY LISTING OBJECT SUBTYPE                       17500000
*                0 = DEFAULT                                            17600000
     02  PCSDYLIB PICTURE X(8) VALUE '        '.                        17700000
*                DIRECTORY LISTING OBJECT LIBRARY                       17800000
     02  PCSEXPL  PICTURE S9(8) COMP VALUE +0.                          17900000
*                INITIAL EXPERIENCE LEVEL VALUE                         18000000
*                0 = DEFAULT, STANDARD LEVEL                            18100000
*                                                                       18300000
*         END OF CHART UTILITY PANEL CONTROL STRUCTURE                  18600000
*                                                                       78000000
*            PAIRED DATA CONTROL STRUCTURE, NOT USED.                   78300000
*                                                                       78600000
 01  DUMMY.                                                            78900000
     02 DUMMY1 PICTURE S9(8) COMP VALUE +0.                            79200000
*                                                                       79500000
*           X DATA                                                      79800000
*                                                                       80100000
 01  XDATA.                                                            80400000
     02  XDATUM COMP-1 OCCURS 3 TIMES.                                 80700000
*                                                                       81000000
*           Y DATA                                                      81300000
*                                                                       81600000
 01  YDATA.                                                            81900000
     02  YDATUM COMP-1 OCCURS 9 TIMES.                                 82200000
*                                                                       82500000
*           CHART KEYS.                                                 82800000
```

```
*                                                                       83100000
 01  KEYS.                                                             83400000
     02  KEYDATA PICTURE X(17) OCCURS 3 TIMES.                         83700000
*                                                                       84000000
*            CHART CHART-HEADING.                                       84300000
*                                                                       84600000
 01  CHART-HEADING PICTURE X9(12) VALUE 'EXPENDITURE'.                 84900000
                                                                        85200000
                                                                        85500000
                                                                        85800000
                                                                        86100000
 PROCEDURE DIVISION.                                                    86400000
*    INITIALIZE X VALUES                                                86700000
                                                                        87000000
     MOVE  1 TO XDATUM (1).                                             87300000
     MOVE  2 TO XDATUM (2).                                             87600000
     MOVE  3 TO XDATUM (3).                                             88000000
                                                                        88400000
                                                                        88800000
*    INITIALIZE KEYS.                                                   89200000
                                                                        89600000
     MOVE 'HOUSING' TO KEYDATA (1).                                     90000000
     MOVE 'TRANSPORT' TO KEYDATA (2).                                   90400000
     MOVE 'FOOD AND CLOTHING' TO KEYDATA (3).                           90800000
                                                                        91200000
*    INITIALIZE Y DATA.                                                 91600000
                                                                        92000000
     MOVE  3.0 TO YDATUM (1).                                           92400000
     MOVE  7.0 TO YDATUM (2).                                           92800000
     MOVE 10.0 TO YDATUM (3).                                           93200000
     MOVE  5.0 TO YDATUM (4).                                           93600000
     MOVE  8.0 TO YDATUM (5).                                           94000000
     MOVE 11.0 TO YDATUM (6).                                           94400000
     MOVE  6.0 TO YDATUM (7).                                           94800000
     MOVE  9.0 TO YDATUM (8).                                           95200000
     MOVE 12.0 TO YDATUM (9).                                           95600000
*    INITIALIZE GDDM                                                    96000000
     CALL 'FSINIT'.                                                     96400000
*                                                                       96800000
*    CALL THE CHART UTILITY WITH THE PREPARED DATA.                     97200000
*                                                                       97600000
     CALL 'CHART' USING ADMTPCS, DUMMY, XDATA, YDATA,                   98000000
                        KEYS, DUMMY, CHART-HEADING.                     98400000
*    TERMINATE GDDM                                                     98800000
     CALL 'FSTERM'.                                                     99200000
     GOBACK.                                                            99600000
```

ADMUSF6 – FORTRAN program that invokes the chart utility to plot data

```
C*********************************************************************** 00300000
C**                                                                   ** 00600000
C**                      ADMUSF6                                      ** 00900000
C**                                                                   ** 01200000
C**      THIS SAMPLE PROGRAM INVOKES THE CHART UTILITY WITH           ** 01500000
C**      SAMPLE DATA.                                                 ** 01800000
C**                                                                   ** 02100000
C*********************************************************************** 02400000
C** $MOD(ADMUSF6),COMP(SMP-ASM),PROD(GDDMPGF):                        ** 02500000
C*********************************************************************** 02600000
C                                                                       02700000
C                                                                       03000000
      BLOCK DATA                                                        03300000
C                                                                       03600000
C     THE CONTROL STRUCTURE FOR CHART                                   03900000
C                                                                       04200000
      COMMON /ADMPCS/                                                   04500000
     -   PCSLVL,    PCSDSP,    PCSHLP,    PCSSR,                       04600000
     -   PCSFNM,    PCSDNM,    PCSPR,     PCSNC,                       04800000
     -   PCSNE,     PCSKYL,    PCSLBL,    PCSHDL,                      05000000
     -   PCSPNM,    PCSPRD,    PCSPRW,    PCSPRC,                      05100000
     -   PCSHPC,    PCSPVO,    PCSPHO,    PCSPUN,                      05400000
     -   PCSDUM,    PCSDYN,    PCSDTP,    PCSDTQ,                      05600000
     -   PCSDYL,    PCSEXP                                            05700000
C                                                                       06000000
      INTEGER*4  PCSLVL  /1/                                            06060000
C                           CHART UTILITY LEVEL IDENTIFIER              06120000
C                           1 = CHART UTILITY RELEASE 3                 06180000
      INTEGER*4  PCSDSP  /1/                                            06240000
C                           CHART UTILITY FUNCTION REQUESTED            06300000
C                           1 = DISPLAY, THEN HOME PANEL                06360000
      INTEGER*4  PCSHLP  /1/                                            06420000
C                           PF KEY INFORMATION SWITCH                   06480000
C                           1 = PF KEY INFORMATION IS DISPLAYED         06540000
      INTEGER*4  PCSSR   /0/                                            06600000
C                           ISOLATION SWITCH                            06660000
C                           0 = SAVE/RESTORE/DIRECTORY AVAILABLE        06720000
      INTEGER*4  PCSFNM(2)  /'*   ','    '/                            06780000
C                           NAME OF PREVIOUSLY SAVED CHART FORMAT       06840000
C                           * = DEFAULT CHART FORMAT                    06900000
      INTEGER*4  PCSDNM(2)  /'*   ','    '/                            06960000
C                           NAME OF PREVIOUSLY SAVED CHART DATA         07020000
C                           * = DATA CONTAINED IN PARAMETERS            07080000
      INTEGER*4  PCSPR   /0/                                            07140000
C                           TIED OR FREE DATA SWITCH                    07200000
C                           0 = TIED DATA, ONE SET OF X-VALUES ONLY     07260000
      INTEGER*4  PCSNC   /3/                                            07320000
C                           NUMBER OF DATA GROUPS                       07380000
      INTEGER*4  PCSNE   /3/                                            07440000
C                           NUMBER OF ELEMENTS (PER DATA GROUP)         07500000
      INTEGER*4  PCSKYL /20/                                            07560000
C                           LENGTH OF "KEYS" ARRAY ELEMENT              07620000
      INTEGER*4  PCSLBL  /0/                                            07680000
C                           LENGTH OF "LABELS" ARRAY ELEMENT            07740000
```

```
      INTEGER*4  PCSHDL /11/                                            07800000
C                           LENGTH OF "HEADING" PARAMETER               07860000
      INTEGER*4  PCSPNM(2)  /'*   ','    '/                             07920000
C                           LOCAL PRINTER DESTINATION NAME.             07980000
C                           * = NAME OF PRINTER IS UNKNOWN              08040000
C                                                                       08100000
C               NOTE THAT THE DEFINITIONS OF THE NEXT 2 FIELDS HAVE     08400000
C               BEEN CHANGED FROM 'INTEGER' TO 'REAL' IN RELEASE 3.     08700000
C                                                                       09600000
      REAL*4     PCSPRD /64/                                            09640000
C                           PRINTER DEPTH (ROWS) OF CHART AREA          09680000
      REAL*4     PCSPRW /120/                                           09720000
C                           PRINTER WIDTH (COLS) OF CHART AREA          09760000
      INTEGER*4  PCSPRC  /1/                                            09800000
C                           NUMBER OF COPIES OF PRINT FILE              09850000
C                                                                       09900000
C               THE REMAINING FIELDS ARE NEW IN RELEASE 3.              10200000
C               ONLY PCSPUN IS USED IN THIS APPLICATION.                10500000
C                                                                       12600000
      INTEGER*4  PCSHPC  /0/                                            12660000
C                           PRINTER HEADER PAGE CONTROL                 12720000
C                           0 = DEFAULT, HEADER PAGE OUTPUT             12790000
      REAL*4     PCSPVO  /0/                                            12860000
C                           PRINTER VERTICAL OFFSET (ROWS)              12900000
      REAL*4     PCSPHO  /0/                                            13000000
C                           PRINTER HORIZONTAL OFFSET (COLUMNS)         13070000
      INTEGER*4  PCSPUN  /4/                                            13140000
C                           PRINTER LAYOUT PARAMETER UNITS              13200000
C                           4 = ROWS AND COLUMNS                        13280000
      INTEGER*4  PCSDUM  /0/                                            13350000
C                           RESERVED                                    13420000
      INTEGER*4  PCSDYN(2)  /'    ','    '/                             13490000
C                           DIRECTORY LISTING OBJECT NAME               13500000
      INTEGER*4  PCSDTP  /0/                                            13630000
C                           DIRECTORY LISTING OBJECT TYPE               13700000
C                           0 = DEFAULT, NO INITIAL LIST                13770000
      INTEGER*4  PCSDTQ  /0/                                            13800000
C                           DIRECTORY LISTING OBJECT SUBTYPE            13910000
C                           0 = DEFAULT                                 13980000
      INTEGER*4  PCSDYL(2)  /'    ','    '/                             14050000
C                           DIRECTORY LISTING OBJECT LIBRARY            14100000
      INTEGER*4  PCSEXP  /0/                                            14190000
C                           INITIAL EXPERIENCE LEVEL VALUE              14260000
C                           0 = DEFAULT, STANDARD LEVEL                 14330000
C                                                                       14400000
C     END OF THE CONTROL STRUCTURE FOR CHART                            14700000
C                                                                       83600000
      END                                                               84000000
C                                                                       84400000
C     CHART CONTROL STRUCTURE BLOCK IN COMMON                           84800000
C                                                                       85200000
      COMMON /ADMPCS/                                                   85600000
     -   PCSLVL,    PCSDSP,    PCSHLP,    PCSSR,                       85800000
     -   PCSFNM,    PCSDNM,    PCSPR,     PCSNC,                       86000000
     -   PCSNE,     PCSKYL,    PCSLBL,    PCSHDL,                      86200000
     -   PCSPNM,    PCSPRD,    PCSPRW,    PCSPRC,                      86400000
     -   PCSHPC,    PCSPVO,    PCSPHO,    PCSPUN,                      86700000
     -   PCSDUM,    PCSDYN,    PCSDTP,    PCSDTQ,                      86800000
```

```
     -   PCSDYL,    PCSEXP                                                 87200000
C                                                                         87600000
C                    HEADING                                              88000000
C                                                                         88400000
      LOGICAL*4 HEAD(3)                                                   88800000
      DATA HEAD /'EXPE','NDIT','URE '/                                    89200000
C                                                                         89600000
C                    X DATA                                               90000000
C                                                                         90400000
      REAL*4 XDATA(3)                                                     90800000
      DATA XDATA /1.0,2.0,3.0/                                            91200000
C                                                                         91600000
C                    Y DATA                                               92000000
C                                                                         92400000
      REAL*4 YDATA(9)                                                     92800000
      DATA YDATA /3.0,7.0,10.0,5.0,8.0,11.0,6.0,9.0,12.0/                 93200000
C                                                                         93600000
C                    KEYS                                                 94000000
C                                                                         94400000
      INTEGER*4 KEYS(15)                                                  94800000
      DATA KEYS /'HOUS','ING ','    ','    ','    ',                     95200000
     -           'TRAN','SPOR','T   ','    ','    ',                     95600000
     -           'FOOD',' AND',' CLO','THIN','G   '/                     96000000
C*********************************************************************  96400000
C**       INITIALIZE GDDM AND CALL THE CHART UTILITY.                 **  96800000
C*********************************************************************  97200000
      CALL FSINIT                                                         97600000
      CALL CHART(PCSLVL, DUMMY, XDATA, YDATA,                             98000000
     _           KEYS, DUMMY, HEAD)                                       98400000
      CALL FSTERM                                                         98800000
       STOP                                                               99200000
       END                                                                99600000
```

ADMUSP6 – PL/I program that invokes the chart utility to plot data

```
ADMUSP6:PROCEDURE OPTIONS(MAIN);                                  00000010
/*********************************************************************/ 00000020
/* $MOD(ADMUSP6),COMP(SMP-PLI),PROD(GDDMPGF):                      */ 00000030
/*********************************************************************/ 00000040
/*       5668-812                                                  */ 00000050
/*       (C) COPYRIGHT IBM CORP. 1979,1986                         */ 00000060
/*       LICENSED MATERIALS - PROPERTY OF IBM                      */ 00000070
/*                                                                 */ 00000080
/*                      ADMUSP6                                    */ 00000930
/*                                                                 */ 00000940
/*       PL/I SAMPLE PROGRAM TO CALL THE CHART UTILITY             */ 00000950
/*                WITH SAMPLE DATA.                                */ 00000960
/*                                                                 */ 00000970
/*********************************************************************/ 00000980
                                                                    00000990
DECLARE                                                             00001000
                         /***************************************/ 00001010
  1 ADMTPCS,             /* CHART UTILITY PANEL CONTROL STRUCTURE*/ 00001020
                         /***************************************/ 00001030
   2 PCSLEVEL FIXED BIN(31) /* CHART UTILITY LEVEL IDENTIFIER      */ 00001040
              INIT(1),      /* 1 = CHART UTILITY RELEASE 3 ONWARDS */ 00001050
   2 PCSDISP  FIXED BIN(31) /* CHART UTILITY FUNCTION REQUESTED    */ 00001060
              INIT(1),      /* 1 = DISPLAY, THEN HOME PANEL        */ 00001070
   2 PCSHELP  FIXED BIN(31) /* PF KEY INFORMATION SWITCH           */ 00001080
              INIT(1),      /* 0 = PF KEY INFORMATION IS SHOWN     */ 00001090
   2 PCSISOL  FIXED BIN(31) /* ISOLATION SWITCH                    */ 00001100
              INIT(0),      /* 0 = SAVE/RESTORE/DIRECTORY AVAILABLE */ 00001110
   2 PCSFNAME CHAR(8)       /* NAME OF ALREADY SAVED CHART FORMAT  */ 00001120
              INIT('*'),    /* * = DEFAULT CHART FORMAT            */ 00001130
   2 PCSDNAME CHAR(8)       /* NAME OF ALREADY SAVED CHART DATA    */ 00001140
              INIT('*'),    /* * = DATA CONTAINED IN PARAMETERS    */ 00001150
   2 PCSPAIR  FIXED BIN(31) /* TIED OR FREE DATA SWITCH            */ 00001160
              INIT(0),      /* 0 = TIED, ONE SET OF X-VALUES ONLY  */ 00001170
   2 PCSNC    FIXED BIN(31) /* NUMBER OF DATA GROUPS               */ 00001180
              INIT(3),      /*                                     */ 00001190
   2 PCSNE    FIXED BIN(31) /* NUMBER OF ELEMENTS (PER DATA GROUP) */ 00001200
              INIT(3),      /*                                     */ 00001210
   2 PCSKEYL  FIXED BIN(31) /* LENGTH OF 'KEYS' ARRAY ELEMENT      */ 00001220
              INIT(17),     /*                                     */ 00001230
   2 PCSLABL  FIXED BIN(31) /* LENGTH OF 'LABELS' ARRAY ELEMENT    */ 00001240
              INIT(0),      /*                                     */ 00001250
   2 PCSHEADL FIXED BIN(31) /* LENGTH OF 'HEADING' PARAMETER       */ 00001260
              INIT(11),     /*                                     */ 00001270
   2 PCSPNAME CHAR(8)       /* PRINTER DESTINATION NAME            */ 00001280
              INIT('*'),    /* * = UNKNOWN NAME                    */ 00001290
                         /***************************************/ 00001300
                         /* NOTE THAT THE DEFINITION OF THE NEXT */ 00001310
                         /* TWO FIELDS HAVE BEEN CHANGED TO      */ 00001320
                         /* 'FLOAT DEC(6)' FROM RELEASE 3 ONWARD */ 00001330
                         /***************************************/ 00001340
   2 PCSPRDEP FLOAT DEC(6)  /* PRINTER DEPTH (ROWS) OF CHART AREA  */ 00001350
              INIT(64),     /*                                     */ 00001360
   2 PCSPRWID FLOAT DEC(6)  /* PRINTER WIDTH (COLS) OF CHART AREA  */ 00001370
              INIT(120),    /*                                     */ 00001380
   2 PCSPCOPY FIXED BIN(31) /* NUMBER OF COPIES OF PRINT FILE      */ 00001390
              INIT(1),      /*                                     */ 00001400
```

```
                        /*************************************/ 00001410
                        /* THE REMAINING FIELDS ARE NEW FROM    */ 00001420
                        /* RELEASE 3 ONWARDS. THEY ARE NOT USED */ 00001430
                        /* IN THIS APPLICATION, EXCEPT PCSUNIT  */ 00001440
                        /*************************************/ 00001450
   2 PCSPHEAD FIXED BIN(31) /* PRINTER HEADER PAGE CONTROL          */ 00001460
              INIT(0),      /* 0 = DEFAULT, HEADER PAGE OUTPUT      */ 00001470
   2 PCSPVOFF FLOAT DEC(6)  /* PRINTER VERTICAL OFFSET (ROWS)       */ 00001480
              INIT(0),      /*                                      */ 00001490
   2 PCSPHOFF FLOAT DEC(6)  /* PRINTER HORIZONTAL OFFSET (COLUMNS)  */ 00001500
              INIT(0),      /*                                      */ 00001510
   2 PCSPUNIT FIXED BIN(31) /* PRINTER LAYOUT PARAMETER UNITS       */ 00001520
              INIT(4),      /* 4 = ROWS AND COLUMNS                 */ 00001530
   2 PCSDUMMY FIXED BIN(31) /* RESERVED                             */ 00001540
              INIT(0),      /*                                      */ 00001550
   2 PCSDYNAM CHAR(8)       /* DIRECTORY LISTING OBJECT NAME        */ 00001560
              INIT(' '),    /*                                      */ 00001570
   2 PCSDYTYP FIXED BIN(31) /* DIRECTORY LISTING OBJECT TYPE        */ 00001580
              INIT(0),      /* 0 = DEFAULT, NO INITIAL LIST         */ 00001590
   2 PCSDYTYQ FIXED BIN(31) /* DIRECTORY LISTING OBJECT SUBTYPE     */ 00001600
              INIT(0),      /* 0 = DEFAULT                          */ 00001610
   2 PCSDYLIB CHAR(8)       /* DIRECTORY LISTING OBJECT LIBRARY     */ 00001620
              INIT(' '),    /*                                      */ 00001630
   2 PCSEXPL  FIXED BIN(31) /* INITIAL EXPERIENCE LEVEL VALUE       */ 00001640
              INIT(0);      /* 0 = DEFAULT, STANDARD LEVEL          */ 00001650
                        /*************************************/ 00001660
                                                                    00001670
DECLARE                                                             00001680
/*******************************************************************/ 00001690
/*                                                                 */ 00001700
/*       VARIOUS LOCAL VARIABLES                                   */ 00001710
/*                                                                 */ 00001720
/*******************************************************************/ 00001730
 DUMMY(1) FIXED BIN(31),                                            00001740
                                                                    00001750
/*******************************************************************/ 00001760
/*       X DATA                                                    */ 00001770
/*******************************************************************/ 00001780
                                                                    00001790
 XDATA(3) FLOAT DEC(6) INIT(1.0,2.0,3.0),                           00001800
                                                                    00001810
/*******************************************************************/ 00001820
/*       Y DATA                                                    */ 00001830
/*******************************************************************/ 00001840
                                                                    00001850
 YDATA(9) FLOAT DEC(6) INIT(3.0,7.0,10.0,5.0,8.0,11.0,6.0,9.0,12.0),  00001860
                                                                    00001870
/*******************************************************************/ 00001880
/*       KEYS                                                      */ 00001890
/*******************************************************************/ 00001900
                                                                    00001910
 KEYS(3) CHAR(17) INIT('HOUSING',                                   00001920
                       'TRANSPORT',                                 00001930
                       'FOOD AND CLOTHING'),                        00001940
                                                                    00001950
/*******************************************************************/ 00001960
/*       KEYS                                                      */ 00001970
/*******************************************************************/ 00001980
```

```
                                                                      00001990
LABELS(3) CHAR(1),                                                    00002000
                                                                      00002010
/*********************************************************************/ 00002020
/*       CHART HEADING                                               */ 00002030
/*********************************************************************/ 00002040
                                                                      00002050
HEADING CHAR(12) INIT('EXPENDITURE');                                 00002060
                                                                      00002070
%INCLUDE(ADMUPINF);                                                   00002080
%INCLUDE(ADMUPINC);                                                   00002090
                                                                      00002100
CALL FSINIT;                    /* INITIALIZE GDDM                */ 00002110
                                                                      00002120
CALL CHART(ADMTPCS, DUMMY, XDATA, YDATA, KEYS, LABELS, HEADING);      00002130
                                /* CALL THE CHART UTILITY         */ 00002140
                                                                      96800000
CALL FSTERM;                    /* TERMINATE GDDM                 */ 97600000
                                                                      98400000
END ADMUSP6;                                                          99200000
```

Appendix B. ADMUCDSO

Chart utility with pre-opened device sample module

```
ADMUCDSO  chartdata chartform disp family token (procopts) (names)
```

To enable you to invoke the Interactive Chart Utility (ICU) in circumstances that require special DSOPEN parameters, PGF provides the sample module ADMUCDSO. This module performs a DSOPEN, then invokes the ICU using the CHART call. ADMUCDSO is supported in TSO and VM/CMS only.

Parameters

The parameters to the DSOPEN call and some of the parameters to the ICU are specified as parameters to ADMUCDSO. These parameters must be in the standard TSO or VM/CMS format.

The parameters are:

chartdata
The chart-data name that is passed to the ICU. The default is `'*'`.

chartform
The chart-format name that is passed to the ICU. The default is `'='`. If the chart-format name is specified as `'='`, the **chart-data name** is used also as the format name.

disp
The **display** parameter (a number, 1 through 7) in the Chart Control Area; see the CHART call. The default is 1.

Note: The **disp** parameter can have the special value 99. In this case, **chartdata** is the name of a GDF file that is to be shown on the device that ADMUCDSO opens. The **chartform** parameter is ignored.

The remaining parameters are used as arguments to the DSOPEN call. See the description of DSOPEN in the *GDDM Base Application Programming Reference* book for further details.

family
The family parameter (a number, 1 through 4) for DSOPEN. The default is 1.

token
The device token for DSOPEN. The default is `'*'`.

procopts
Processing options (numbers) for DSOPEN. The list of procopts is enclosed in parentheses. The default is ().

The procopt-count parameter of DSOPEN is deduced by ADMUCDSO and is, therefore, not specified by the user.

names
The name-list parameter of DSOPEN. For VM/CMS, this parameter is a number of tokens (typically the filename, filetype, and filemode); for TSO, it is a DDNAME or a data-set name. The default is ().

The name-count parameter of DSOPEN is deduced by ADMUCDSO and is, therefore, not specified by the user.

Notes:

1. If any parameter preceding **procopts** is omitted, all following parameters up to **procopts** must also be omitted. For example, if **chartform** is omitted, **disp**, **family**, and **token** must also be omitted.
2. If **procopts** is omitted, **(names)** must also be omitted.

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Messages

ADMUCDSO does not issue any messages directly. Any invalid CHART or DSOPEN parameter is diagnosed by the respective call. ADMUCDSO returns a nonzero return code if it is unable to parse the input parameters. The return codes are:

100 Too many parameters

101 Expected '(' for procopts not found

102 Expected '(' for names not found

103 Too many names

104 Too many procopts

105 Numeric parameter contains a non-numeric

106 Parameter too long (TSO only).

107 Error during chart call.

In addition, ADMUCDSO might also issue a nonzero return code if the DSOPEN call fails.

Invocation

ADMUCDSO is invoked either from a CMS EXEC, or from a TSO CLIST. A sample EXEC and a sample CLIST are provided with GDDM:

ADMUCIMV	EXEC (CMS)
ADMUCIMT	CLIST (TSO)

ADMUCIMV and ADMUCIMT

ADMUCIMV and ADMUCIMT invoke the Chart Utility non-interactively to output a specified chart for a composed page printer. The various DSOPEN printer-control parameters (such as image size, output-file name, whether color masters are to be generated, device token, form of output) are specified in the EXEC or CLIST, and should be edited as required.

ADMUCIMV and ADMUCIMT require two parameters: chart-data name and chart-format name. The chart-format name may be specified as '=' if it is the same as the chart-data name. If the chart-format name is specified as 'GDF', the chart-data name is assumed to be a GDF file to be printed. For example:

```
CMS
      EXEC ADMUCIMV chartdata chartform
      EXEC ADMUCIMV chartdata =
      EXEC ADMUCIMV gdffile GDF

TSO
      EXEC 'SYS1.PROCLIB(ADMUCIMT)' 'chartdata chartform'
      EXEC 'SYS1.PROCLIB(ADMUCIMT)' 'chartdata ='
      EXEC 'SYS1.PROCLIB(ADMUCIMT)' 'gdffile  GDF'
```

If the input is a GDF, the GDF dataset (PDS) that contains the GDF must be preallocated. For example, if the dataset 'USERID.ADMGDF' contains a GDF member 'GDFFILE', issue the command:

```
ALLOC F (ADMGDF) DSN ('USERID.ADMGDF')
```

Contents of ADMUCIMT

```
PROC 2 CHARTDATA FORMAT
/*********************************************************************/
/*                                                                   */
/* NAME:     ADMUCIMT                                                */
/*                                                                   */
/* FUNCTION: DRIVE MODULE ADMUCDSO TO OUTPUT CHARTS OR GDF           */
/*           FOR A COMPOSED PAGE   (FAMILY-4) PRINTER                */
/*                                                                   */
/* INPUT:    CHART_DATA_NAME  CHART_FORMAT_NAME|'GDF'                */
/*                                                                   */
/*********************************************************************/
/*                                                                   */
/*                5668-812                                           */
/*                (C) COPYRIGHT IBM CORP. 1979,1986                  */
/*                LICENSED MATERIALS - PROPERTY OF IBM               */
/*                                                                   */
/*********************************************************************/

/*********************************************************************/
/* PROCESS CHART DATA NAME                                           */
/*         CHART FORMAT NAME                                         */
/*********************************************************************/
SET &CD   = &STR(&CHARTDATA)
SET &CF   = &STR(&FORMAT)

/*********************************************************************/
/* DEFINE CHART DISPLAY OPTION : DEFAULT = 6                         */
/*                             : IF CHART FORMAT IS GDF THEN &DP     */
/*                               SHOULD BE SET TO 99 SO THAT         */
/*                               ADMUCDSO WILL GSLOAD THE GDF FILE   */
/*                               AND THEN DISPLAY IT ON THE SPECIFIED*/
/*                               DEVICE.                             */
/*********************************************************************/
SET &DP   = 6
IF &STR(&CF) = GDF THEN SET &DP = 99

/*********************************************************************
/* DEFINE DEVICE TOKEN: (IMG240  ) 3800-3/3820/3812 PRINTER QUARTO P */
/*                      (A4      ) 3800-3/3820/3812 PRINTER A4 PAPER */
/*                      (IMG300A4) 4028 PRINTER A4 PAPER             */
/*                      (IMG300Q ) 4028 PRINTER QUARTO PAPER         */
/*                      (IMG144A4) 4224/4230 PRINTER A4 PAPER        */
/*                      (IMG144Q ) 4224/4230 PRINTER QUARTO PAPER    */
/*                      (IMG600X ) 4250 PRINTER                      */
/*********************************************************************/
SET &DT   = IMG240

/*********************************************************************/
/* DSOPEN OPTION GROUP 5                                             */
/* ====================                                              */
/* DEFINE DATA STREAM TYPE: (0) DOCUMENT (PRIMARY D/STREAM)          */
/*                          (1) PAGE SEGMENT (SECONDARY D/STREAM)    */
/*                          (2) OVERLAY  (SECONDARY D/STREAM)        */
/*********************************************************************/
SET &DS   = 0
```

```
/*********************************************************************/
/* DSOPEN OPTION GROUP 6                                             */
/* =====================                                             */
/* DEFINE SPILL FILE USAGE: (0) KEEP INTERNAL DATA IN A SPILL FILE   */
/*                          (1) KEEP INTERNAL DATA IN MAIN STORAGE   */
/*********************************************************************/
SET &SP   = 0

/*********************************************************************/
/* DSOPEN OPTION GROUP 7                                             */
/* =====================                                             */
/* DEFINE THE NUMBER OF SWATHES THAT MAKE UP THE COMPLETE IMAGE      */
/*********************************************************************/
SET &N    = 8

/*********************************************************************/
/* DSOPEN OPTION GROUP 8                                             */
/* =====================                                             */
/* DEFINE IMAGE WIDTH                                                */
/*              DEPTH                                                */
/*              UNITS: (0) TENTHS OF AN INCH                         */
/*                     (1) MILLIMETERS                               */
/*********************************************************************/
SET &W    = 60
SET &D    = 40
SET &U    = 0

/*********************************************************************/
/* DSOPEN OPTION GROUP 9                                             */
/* =====================                                             */
/* DEFINE IMAGE FORMAT: (0) UNFORMATTED (BIT ARRAY)                  */
/*                      (1) FORMATTED D/STREAM TO CDPF/PSF           */
/*                          REQUIREMENTS:                            */
/*                          (CDPF IS THE 4250 DEVICE DRIVER)         */
/*                          (PSF IS THE 3800-3/3820 DEVICE DRIVER)   */
/*                      (2) FORMATTED D/STREAM - GOCA UNCOMPRSSD IMGE*/
/*                      (3) FORMATTED D/STREAM - GOCA COMPRESSED IMGE*/
/*********************************************************************/
SET &FO   = 1

/*********************************************************************/
/* DSOPEN NAMELIST PARAMETERS                                        */
/* ==========================                                        */
/* DEFINE OUTPUT IMAGE FILE_IDENTIFER                                */
/*********************************************************************/
SET &F    = &CHARTDATA..&STR(*)

/*********************************************************************/
/* PRINTOUT OF ALL VARIABLES FOR A VISUAL CHECK                      */
/*********************************************************************/

WRITE . CHART DATA NAME = &CD
WRITE CHART FORMAT NAME = &CF
WRITE .... DEVICE TOKEN = &DT
IF &DS = 0 THEN WRITE .DATA STREAM TYPE = DOCUMENT
IF &DS = 1 THEN WRITE .DATA STREAM TYPE = PAGE SEGMENT
IF &DS = 2 THEN WRITE .DATA STREAM TYPE = OVERLAY
IF &SP = 0 THEN WRITE .SPILL FILE USAGE = REQUIRED
```

```
IF &SP = 1 THEN WRITE .SPILL FILE USAGE = NOT REQUIRED
WRITE NUMBER OF SWATHES = &N
WRITE ..... IMAGE WIDTH = &W
WRITE ..... IMAGE DEPTH = &D
IF &U = 0 THEN WRITE .IMAGE SIZE UNITS = TENTHS OF AN INCH
IF &U = 1 THEN WRITE .IMAGE SIZE UNITS = MILIMTRS
IF &FO = 0 THEN WRITE ... OUTPUT FORMAT = BIT ARRAY
IF &FO = 1 THEN WRITE ... OUTPUT FORMAT = CDPF / PSF DATA STREAM
IF &FO = 2 THEN WRITE ... OUTPUT FORMAT = GOCA AND UNCMPRSD IMAGE
IF &FO = 3 THEN WRITE ... OUTPUT FORMAT = GOCA AND COMPRSSD IMAGE

/*********************************************************************/
/* GO/QUIT DECISION                                                  */
/*********************************************************************/

WRITE
WRITE ==> ENTER GO OR QUIT:
READ &REPLY
IF &REPLY ¬= GO THEN GOTO EXIT

/*********************************************************************/
/*                                                                   */
/* PARAMETERS AT ADMUCDSO ENTRY:                                     */
/*                                                                   */
/*  CHARTDATA  CHARTFORM  CHARTDISP  DSOPEN-PARAMETERS               */
/*                                                                   */
/*  CHARTDISP IS THE DISPLAY PARAMETER OF CSSICU.                    */
/*                                                                   */
/*  THE DEVICE-ID IS OMITTED FROM DSOPEN-PARAMETERS. THE             */
/*  PROCLIST AND NAMELIST ARE WRITTEN IN BRACKETS SO THAT THE        */
/*  PROCOPT-COUNT AND NAMELIST COUNT ARE DEDUCED BY ADMUCDSO         */
/*                                                                   */
/* PARAMETERS AT ADMUCDSO DSOPEN CALL TO GDDM:                       */
/*                                                                   */
/*   FAMILY  DEVICE-TOKEN  ( PROCOPT-LIST )  ( NAMELIST )            */
/*                                                                   */
/*********************************************************************/
   CALL 'GDDM.SADMMOD(ADMUCDSO)'           /* INVOKE PROGRAM        */+
   '&CD &CF &DP 4 &DT (5 &DS 6 &SP 7 &N 8 &W &D &U 9 &FO ) ( &F )'

EXIT:EXIT
```

Contents of ADMUCIMV

```
*************************************************************************
*                                                                       *
* NAME:     ADMUCIMV                                                    *
*                                                                       *
* FUNCTION: DRIVE MODULE ADMUCDSO TO OUTPUT CHARTS OR GDF               *
*           FOR A COMPOSED PAGE   (FAMILY-4) PRINTER                    *
*                                                                       *
* INPUT:    CHART_DATA_NAME  CHART_FORMAT_NAME|'GDF'                    *
*                                                                       *
*************************************************************************
*                                                                       *
*                 5668-812                                              *
*                 (C) COPYRIGHT IBM CORP. 1979,1986                     *
*                 LICENSED MATERIALS - PROPERTY OF IBM                  *
*                                                                       *
*************************************************************************
&CONTROL ERROR
*
*************************************************************************
* REQUEST INPUT PARAMETERS IF NOT PRESENT ON ENTRY
*************************************************************************
&IF &INDEX > 0 &GOTO -PARMOK
&SPACE
&BEGTYPE
==> ENTER FILENAME OF CHART DATA (AND FORMAT IF DIFFERENT):
&END
&READ ARGS
&IF &INDEX = 0 &EXIT 4
*
*************************************************************************
* PROCESS CHART DATA NAME
*         CHART FORMAT NAME (OPTIONAL)
*************************************************************************
-PARMOK
&CD = &1
&CF = =
&IF &INDEX = 1 &TYPE *** CHART FORMAT NAME ASSUMED = CHART DATA NAME.
&IF &INDEX > 1 &CF = &2
*
*************************************************************************
* ICU DISPLAY OPTION: DEFAULT DISPLAY = 6
*                     IF THE DATA FILE IS GDF THEN DISPLAY = 99
*                     THIS CAUSES ADMUCDSO TO LOAD THE GDF AND DISPLAY
*                     DIRECTLY ONTO THE REQUESTED DEVICE.
*                     THIS IS NOT A CHART DISPLAY OPTION.
*************************************************************************
&DP = 6
&IF &CF = GDF &DP = 99
*
*************************************************************************
* DEFINE DEVICE TOKEN: (IMG240  ) 3800-3/3820/3812 PRINTER QUARTO PAPER
*                      (A4      ) 3800-3/3820/3812 PRINTER A4 PAPER
*                      (IMG300A4) 4028 PRINTER A4 PAPER
*                      (IMG300Q ) 4028 PRINTER QUARTO PAPER
*                      (IMG144A4) 4224/4230 PRINTER A4 PAPER
*                      (IMG144Q ) 4224/4230 PRINTER QUARTO PAPER
```

```
*                      (IMG600X ) 4250 PRINTER
************************************************************************
&DT = IMG240
*
************************************************************************
* DSOPEN OPTION GROUP 5
* =====================
* DEFINE DATA STREAM TYPE: (0) DOCUMENT (PRIMARY D/STREAM)
*                          (1) PAGE SEGMENT (SECONDARY D/STREAM)
*                          (2) OVERLAY  (SECONDARY D/STREAM)
************************************************************************
&DS = 0
*
************************************************************************
* DSOPEN OPTION GROUP 6
* =====================
* DEFINE SPILL FILE USAGE: (0) KEEP INTERNAL DATA IN A SPILL FILE
*                          (1) KEEP INTERNAL DATA IN MAIN STORAGE
************************************************************************
&SP = 0
*
************************************************************************
* DSOPEN OPTION GROUP 7
* =====================
* DEFINE THE NUMBER OF SWATHES THAT MAKE UP THE COMPLETE IMAGE
************************************************************************
&N = 8
*
************************************************************************
* DSOPEN OPTION GROUP 8
* =====================
* DEFINE IMAGE WIDTH
*              DEPTH
*              UNITS: (0) TENTHS OF AN INCH
*                     (1) MILLIMETERS
************************************************************************
&W = 60
&D = 40
&U = 0
*
************************************************************************
* DSOPEN OPTION GROUP 9
* =====================
* DEFINE IMAGE FORMAT: (0) UNFORMATTED (BIT ARRAY)
*                      (1) FORMATTED D/STREAM TO CDPF/PSF REQUIREMENTS:
*                          (CDPF IS THE 4250 DEVICE DRIVER)
*                          (PSF IS THE 3800-3/3820 DEVICE DRIVER)
*                      (2) FORMATTED D/STREAM - GOCA UNCOMPRESSED IMAGE
*                      (3) FORMATTED D/STREAM - GOCA COMPRESSED IMAGE
************************************************************************
&FO = 1
*
************************************************************************
* DSOPEN NAMELIST PARAMETERS
* ==========================
* DEFINE OUTPUT IMAGE FILE_NAME
*                     FILE_TYPE
*                     FILE_MODE
```

```
************************************************************************
&F = &CD
&T = *
&M = A1
*
************************************************************************
* PRINTOUT OF ALL VARIABLES FOR A VISUAL CHECK
************************************************************************
&SPACE
&TYPE . CHART DATA NAME = &CD
&TYPE CHART FORMAT NAME = &CF
&TYPE .... DEVICE TOKEN = &DT
&IF &DS = 0  &TYPE .DATA STREAM TYPE = DOCUMENT
&IF &DS = 1  &TYPE .DATA STREAM TYPE = PAGE SEGMENT
&IF &DS = 2  &TYPE .DATA STREAM TYPE = OVERLAY
&IF &SP = 0 &TYPE .SPILL FILE USAGE = REQUIRED
&IF &SP = 1 &TYPE .SPILL FILE USAGE = NOT REQUIRED
&TYPE NUMBER OF SWATHES = &N
&TYPE ..... IMAGE WIDTH = &W
&TYPE ..... IMAGE DEPTH = &D
&IF &U = 0 &TYPE .IMAGE SIZE UNITS = TENTHS OF AN INCH
&IF &U = 1 &TYPE .IMAGE SIZE UNITS = MILIMTRS
&IF &FO = 0 &TYPE ... OUTPUT FORMAT = BIT ARRAY
&IF &FO = 1 &TYPE ... OUTPUT FORMAT = CDPF / PSF DATA STREAM
&IF &FO = 2 &TYPE ... OUTPUT FORMAT = GOCA AND UNCMPRSD IMAGE
&IF &FO = 3 &TYPE ... OUTPUT FORMAT = GOCA AND COMPRSSD IMAGE
&TYPE . OUTPUT FILENAME = &F
&TYPE . OUTPUT FILETYPE = &T
&TYPE . OUTPUT FILEMODE = &M
*
************************************************************************
* GO/QUIT DECISION
************************************************************************
&SPACE
&TYPE ==> ENTER GO OR QUIT:
&READ VARS &REPLY
&IF .&REPLY NE .GO &EXIT 100
*
************************************************************************
*                                                                      *
* PARAMETERS AT ADMUCDSO ENTRY:                                        *
*                                                                      *
*   CHARTDATA  CHARTFORM  CHARTDISP  DSOPEN-PARAMETERS                 *
*                                                                      *
*   CHARTDISP IS THE DISPLAY PARAMETER FOR CSSICU.                     *
*                                                                      *
*   THE DEVICE-ID IS OMITTED FROM DSOPEN-PARAMETERS. THE               *
*   PROCLIST AND NAMELIST ARE WRITTEN IN BRACKETS SO THAT THE          *
*   PROCOPT-COUNT AND NAMELIST COUNT ARE DEDUCED BY ADMUCDSO           *
*                                                                      *
* PARAMETERS AT ADMUCDSO DSOPEN CALL TO GDDM:                          *
*                                                                      *
*    FAMILY  DEVICE-TOKEN  ( PROCOPT-LIST )  ( NAMELIST )              *
*                                                                      *
************************************************************************
ADMUCDSO &CD &CF &DP 4 &DT (5 &DS 6 &SP 7 &N 8 &W &D &U 9 &FO)(&F &T &M)
*
&EXIT &RC
```

Appendix C. Colors, line types, markers, and shading patterns

General-Use Programming Interface

The color, line types, markers and shading patterns that are given to distinguish one data group from another are taken from tables whose values are used in rotation. Different data groups, therefore, have different colors and different shading patterns.

Tables with default values are supplied. You can control the colors and other attributes of the data by resetting the values in the tables.

Color numbers Valid color numbers and their meanings are:

0 default (green on displays, black on printers)

1 blue

2 red

3 pink

4 green

5 turquoise

6 yellow

7 neutral (white on displays, black on printers)

8 background (black on displays, white on printers)

9 – 255 user-defined colors

If the device does not support one or more of these colors, another device-dependent color is chosen. For a four-color printer, the primary colors (red, green, and blue) are interpreted correctly. Other colors print as black. The colors produced by plotters depend on the position of the pens in the pen carousel.

Line type numbers Valid line type numbers and their meanings on 3270-family terminals are:

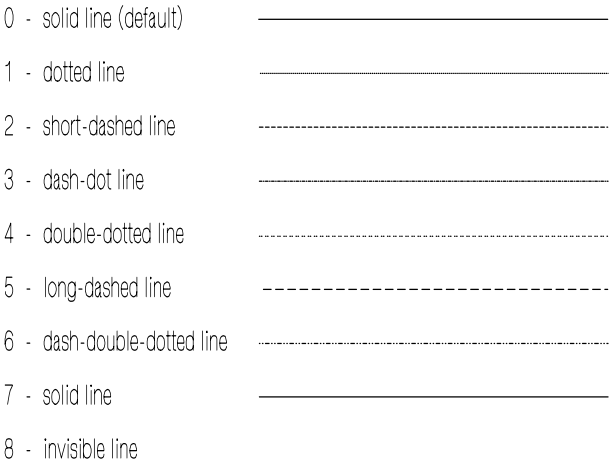

Figure 17. Line type numbers

Some types of terminal do not support all of these line types. In these cases, GDDM draws a line that approximates to the 3270 type as closely as possible.

Marker numbers Valid marker numbers and their meanings are:

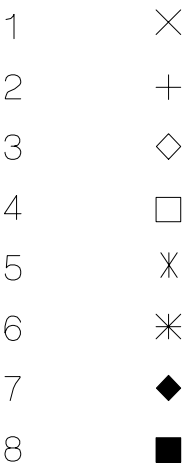

Figure 18. Marker numbers

If values 65 – 254 are used, the symbol set defining the markers must be loaded by the application program before the chart is constructed. (See the description of the GSLSS call in the *GDDM Base Application Programming Reference* book.)

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Shading pattern numbers Valid pattern numbers and their meanings are:

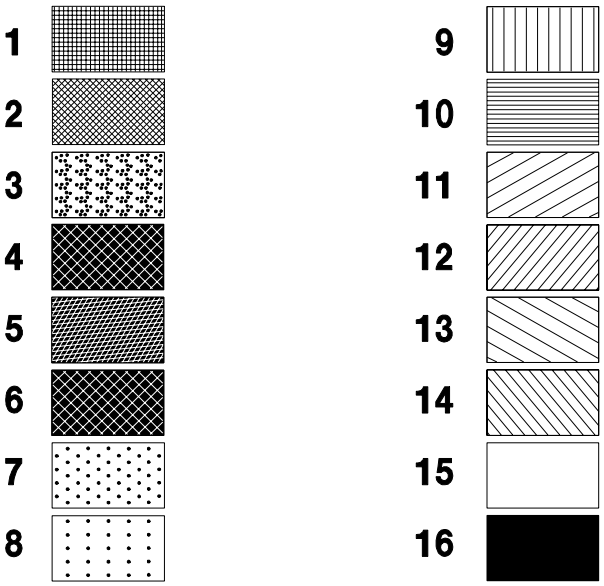

Figure 19. Shading pattern numbers

If values 65 – 254 are used, the symbol set defining the shading patterns must be loaded by the application program before the chart is constructed.

End of General-Use Programming Interface

Appendix D. Interactive Chart Utility panels

This appendix gives the ICU panels in numeric order with the Version 2 Release 1 default values.

(The free data panels are shown after panel 2.9.4.)

```
                    INTERACTIVE CHART UTILITY - HOME PANEL

 * Either choose the following to make a chart by selecting from pictures:
                0 - Chart by Example

 * Or choose from the following to make or change a chart by setting options:
                1 - Chart Type
                2 - Data Entry and Import          M - Menu Control
                3 - Chart Notes                        and Preview Chart
                4 - Axis Options                   S - Save, Load, List,
                5 - Heading, Legend, and Layout        Delete, Reset Chart
                6 - Multiple Charts

 * Type the number or letter of the choice you want ======> 0
 * Press ENTER to continue.

 Use PF12 (Home) to return directly to this panel from other panels.
 Use PF1 (Help) on any panel to get more information about what to do.



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PF: 1=Help 2=Save/Load 4=Print 5=Display 9=Exit 11=Edit
```

```
0                                CHART BY EXAMPLE

 * You will need some data for your chart.  Choose the following to get some:

       1 - Get data, heading, and titles for your chart

 * Choose one of the following to make your chart:

       2 - From a ready-made chart using your data
       3 - A step at a time using your data
       4 - Exclude data values to make a text-only chart

 * You may need the following when you have finished your chart:

       5 - Save your chart in a file
       6 - Reset everything except your data, ready to start again

 * Type the number of the choice you want ======>
 * Press ENTER to continue.



PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
0.1                         CHART BY EXAMPLE - DATA

 * Either choose from the following to get various sorts of sample data, to
           use as a basis for typing your own data:
      1 - General purpose
      2 - Planned against Actual
      3 - Comparison over time
      4 - Parts of a whole, for a Pie Chart                (Choices 4 through 7
      5 - Ranges, for a Histogram                          also set your chart
      6 - Cyclic (daily, yearly), for a Polar Chart        type to match your
      7 - Schedule, for a horizontal Bar Chart             chosen sample data)

 * Or choose from the following to get or type in your own data:
      8 - Load data from a file created by the ICU
      9 - Import data from a file created by another program
     10 - Type in your own data            (Choices 10 and 11 can also be used
     11 - Type in your chart heading       to change data got by other choices)
     12 - Type in your X-axis title
     13 - Type in your Y-axis title

 * Type the number of the choice you want ======>
 * Press ENTER to continue.  Press PF3 (End) to return to Chart by Example.

PF: 1=Help 3=End 4=Print 5=Display 12=Home
```

```
0.2                          READY-MADE CHARTS

 Variations of Chart Type

  1 Chart so far     2 Vertical Bar     3 Pie Chart        4 Surface Chart
                       Chart

  5 Table Chart      6 Line Graph       7 Tower Chart      8 More ...

 Type the number of the chart you want ======> 1
 (Never mind if your data makes some look identical, unsuitable or wrong.)
 Press ENTER to make your choice, or PF5 (Display) to see your chart full size.

PF: 1=Help 3=End 4=Print 5=Display 6=Suppress Charts 12=Home
```

```
0.2                          READY-MADE CHARTS

 This is the chart you have chosen:

 Press PF3 (End) to exit and let you save or print your chart.
 Press PF7 (Back) to retrace your steps and change your choice.

PF: 1=Help 3=End 4=Print 5=Display 7=Back 12=Home
```

```
0.3                          STEP BY STEP CHARTS

 Variations of Chart Type
  1 Chart so far     2 Vertical Bar     3 Pie Chart        4 Surface Chart
                       Chart

  5 Table Chart      6 Line Graph       7 Tower Chart      8 More ...

 Type the number of the chart you prefer ======> 1
 (Never mind if your data makes some look identical, unsuitable or wrong.)
 Press ENTER for the next step, or PF5 (Display) to see your chart full size.

PF: 1=Help 3=End 4=Print 5=Display 6=Suppress Charts 12=Home
```

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```
0.3                          STEP BY STEP CHARTS

 This is your finished chart:
              ┌──────────────────────────────────────────────┐
              │                                              │
              │                                              │
              │                                              │
              │                                              │
              │                                              │
              │                                              │
              │                                              │
              │                                              │
              └──────────────────────────────────────────────┘

 Press PF3 (End) to exit and let you save or print your chart.
 Press PF7 (Back) to retrace your steps and change your choice.

PF: 1=Help 3=End 4=Print 5=Display 7=Back 12=Home
```

```
1                                  CHART TYPE

                    Chart Type ==> 1     1 - Line Graph (or Scatter Plot)
                                         2 - Surface Chart
                                         3 - Histogram
                                         4 - Bar Chart
                                         5 - Pie Chart
                                         6 - Venn Diagram
                                         7 - Polar Chart
                                         8 - Tower Chart
                                         9 - Table Chart

             Chart Type Mixing ==> 1     1 - Single Chart Type (as above)
                                         2 - Mixed Chart Types (see panel 2.6)

 Would you like to define the
 above Chart Type in more detail ? NO    (defaults are provided)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.1                        CHART OPTIONS (LINE GRAPH)

                  Type of Data ==> 1     1 - Absolute
                                         2 - Relative

               Markers on Points ? YES

                Connected Points ? YES   (NO gives a Scatter Plot)

            Type of Connection ==> 1     1 - Straight Lines
                                         2 - A Smooth Curve

              Curve Smoothness ==> 10    (1 through 99: the higher the
                                         number, the smoother the curve)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.2                      CHART OPTIONS (SURFACE CHART)

                  Type of Data ==> 2     1 - Absolute
                                         2 - Relative

               Type of Shading ==> 1     1 - Mountain Range Shading
                                         2 - Shading to Previous Line

         First Data Group Shaded ? YES

            Type of Connection ==> 1     1 - Straight Lines
                                         2 - A Smooth Curve

              Curve Smoothness ==> 10    (1 through 99: the higher the
                                         number, the smoother the curve)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.3                        CHART OPTIONS (HISTOGRAM)

                  Type of Data ==> 2     1 - Absolute
                                         2 - Relative

                Histogram Type ==> 1     1 - Y Values are Bar Areas
                                         2 - Y Values are Bar Heights

            Histogram Y Values ==> 1     1 - Last Y Value Ignored
                                         2 - First Y Value Ignored

        Lines Rising from X Axis ? YES

              Data Groups Shaded ? YES

         First Data Group Shaded ? YES   (used only when Data Groups Shaded)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.4                        CHART OPTIONS (BAR CHART)

           Bar Chart Type ==> 1     1 - Data Groups Side by Side
                                    2 - Data Groups Stacked above each other
                                    3 - Data Groups Overlaid on each other

                Bars Shaded ? YES
   First Data Group Visible ? YES          (for Stacked and Overlaid Bars only)

         Gap between Bars ==> -20          (percentage of Bar Width, negative
                                           value gives Overlapping Bars)
 Gap between Sets of Bars ==> 50           (for Side by Side Bars only)

Bar Values:
       Type of Bar Values ==> 0     0 - No Bar Values
                                    1 - Bar Totals shown at ends of Bars
                                    2 - All Bar Values shown within Bars
                                    3 - As in Version 1 Release 3 (see Help)
        Scientific Notation ? NO           (1,000 shown as 1.00E+03)
        Fractional Digits ==> 2            (0 through 6)
 Smallest Bar Value shown ==> 0            (percentage of Y Axis Range)
Change Text Characteristics ? NO           (defaults are provided)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.4.1                          TEXT ATTRIBUTES

                      Color ==> 7     0 - Default     6 - Yellow
                                      1 - Blue        7 - White (Black on
                                      2 - Red                   a printer)
                                      3 - Pink        8 - Black (White on
                                      4 - Green                 a printer)
                                      5 - Turquoise   9 through 255 - see Help

              Character Mode ==> 3     1 - Fixed Size, Approximate Positioning
                                      2 - Fixed Size, Exact Positioning
                                      3 - Scaled, Exact Positioning

             Symbol Set Name ==> ADMUUSRP

 Character Width  Multiplier ==> 1            (0.01 through 100)
 Character Height Multiplier ==> *            (* = same as Width Multiplier)

         Text Rotation Angle ==> 0            (-90 through +90 degrees)

   Text Area Initially Blanked ? NO

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.5                        CHART OPTIONS (PIE CHART)

                         Data Type ==> 1     1 - Absolute
                                             2 - Percentage

     Pie Sizes (Absolute Data Only) ==> 1     1 - All Same Size
                                             2 - Related to Total Value

                       Pie Labeling ==> 2     1 - Labels Attached to Slices
                                             2 - Labels in a Legend

                        Shaded Slices ? YES

            Values Attached to Slices ? YES

   Size of Pies compared to Maximum ==> 100   (% between 1 and 100)

  Tilt of Pies away from the Viewer ==> 0     (% between 0 and  99)

 Thickness of Pies compared to Size ==> 0     (% between 0 and 250)

        Movement of Exploded Slices ==> 20    (% between 0 and 250)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.6                      CHART OPTIONS (VENN DIAGRAM)

                    Shaded Areas ? YES









PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.7                      CHART OPTIONS (POLAR CHART)

                  Type of Data ==> 1     1 - Absolute
                                         2 - Relative

                    Shaded Bands ? NO

                Type of Shading ==> 1    1 - Mountain Range Shading
                                         2 - Shading to Reference Line

                Markers on Points ? YES

                 Connected Points ? YES

              Type of Connection ==> 1   1 - Straight Lines
                                         2 - A Smooth Curve

               Curve Smoothness ==> 10   (1 through 99: the higher the
                                         number, the smoother the curve)



PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.8                      CHART OPTIONS (TOWER CHART)

X Axis Gap between Towers ==> 50          (percentage of Tower Width)
Z Axis Gap between Towers ==> 50          (percentage of Tower Thickness)

      Attribute Selection ==> 1     1 - Along the Z Axis
                                    2 - Along the X Axis

          Z Axis Labeling ==> 1     1 - Plain
                                    2 - Labeled with Data Group Names
                                    3 - Numeric Labels
          Angle of Z Axis ==> 30          (0 through 180 degrees
                                          counter-clockwise)
  Relative Size of Z Axis ==> 30          (percentage of X Axis size)

            Grid Location ==> 1     0 - On the Base Only
                                    1 - Base and Behind the Chart
                                    2 - Base and to One Side of the Chart
                                    3 - Base, Behind and to One Side
Tick Mark Shadows on Towers ? YES

          Scale Tower Drawn ? NO

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.9                      CHART OPTIONS (TABLE CHART)

                     Data Groups  X slices
  Number in a set ==> 1           *        (1 through 250, '*'=all)
 Lines between sets ? YES         NO       Drawn in X grid attributes
 Gap between sets ==> 100         100      (% between 0 and 250, 100=normal)

        Relative size of Table ==> 100     (% between 10 and 1000, 100=normal)

   How are Data Groups labeled ==> 2     1 - No labels
                                         2 - Use Data Group Names
                                         3 - Use Z values

 Y values:     Color Selection ==> 0     0 - All same color
                                         1 - Varies by Data Group
                                         2 - Varies by X slice (as Pie Charts)
     Change Text Characteristics ? NO    (defaults are provided)
       Missing values shown as ==> .

 All values: Scientific Notation ? NO    (1,000 shown as 1.00E+03)
             Fractional Digits ==> 2     (0 through 6)


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
1.9.1                          TEXT ATTRIBUTES

                       Color ==> 4     0 - Default     6 - Yellow
                                       1 - Blue        7 - White (Black on
                                       2 - Red                   a printer)
                                       3 - Pink        8 - Black (White on
                                       4 - Green                 a printer)
                                       5 - Turquoise   9 through 255 - see Help

                Character Mode ==> 3   1 - Fixed Size, Approximate Positioning
                                       2 - Fixed Size, Exact Positioning
                                       3 - Scaled, Exact Positioning

              Symbol Set Name ==> ADMUUSRP

 Character Width  Multiplier ==> 1           (0.01 through 100)
 Character Height Multiplier ==> *           (* = same as Width Multiplier)

 (The above color is used only if Y values are 'All same color'.  If Y values
 color varies, the colors are given by Data Attributes, panel 2.6.)


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
2                              DATA ENTRY (ROUTING)

 * Choose from the following to enter your data:

                      1 - Data Entry and Initialization
                      2 - Data Entry and Manipulation

                      3 - Long Data Group Names
                      4 - Long Data Labels

                      5 - Data Interpretation

                      6 - Data Attributes
                      7 - Data Group Name Attributes
                      8 - Data Label Attributes

                      9 - Data Import

 * Type the number of the choice you want ======>
 * Press ENTER to continue.


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
2.1                              DATA ENTRY


 Command ==>___________
 Data Group Names ------->
 X Values     X Labels     Y1           Y2           Y3           Y4
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
 .                         .            .            .            .
Commands: SAMPLE (Provide Sample Data) CLEAR (Remove ALL Data)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 7=Up 8=Down 10=Left 11=Right
    12=Home
```

```
2.2                              DATA MANIPULATION

__________       Data Group Names ------->
__________       Data Group (Z) Values --> .            .            .

__________ *** X Values     X Labels     Y1           Y2           Y3
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
__________ X   .                         .            .            .
Commands: D (Delete) R (Repeat) FIT (Least Squares Fit) S (Select) X (Exclude)
          / (Scroll Here) M (Move) A (After) B (Before) I (Insert)
          See Help for More

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 7=Up 8=Down 10=Left 11=Right
    12=Home
```

```
2.3                            DATA GROUP NAMES

 Commands Data Group Names
 ___   ***
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
Commands: I (Insert) D (Delete) R (Repeat) M (Move) A (After) B (Before)
          / (Scroll Here) S (Select) X (Exclude) E (Edit Data Values)
          FIT (Least Squares Fit)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 7=Up 8=Down 12=Home
```

```
2.4                              DATA LABELS

 Commands X Labels
 ___   ***
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
 ___   X
Commands: I (Insert) D (Delete) R (Repeat) M (Move) A (After) B (Before)
          / (Scroll Here) S (Select) X (Exclude)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 7=Up 8=Down 12=Home
```

```
2.5                          DATA INTERPRETATION

   Y values positioned ==> 1     1 - At the specified X values
                                 2 - At equal X intervals

   (Tower Charts only)
   Y values positioned ==> 2     1 - At the specified Z (Data Group) values
                                 2 - At equal Z intervals

    Y values displayed ==> 1     1 - As entered
                                 2 - Indexed (as selected below)

 Each Y value Indexed
    as a Percentage of ==> 1     1 - All Y at that X value
                                 2 - All Y in that Data Group
                                 3 - The Y value at X = 1
                                 4 - The Y value in Data Group ==> 1




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
2.6                            DATA ATTRIBUTES

 Each row in this table refers to a Data Group, Pie Slice, or Venn Diagram
 circle.  The first row corresponds to the first selected Data Group, and so
 on.  Each column describes the appearance of the data in some way, for
 example, its color.  Change any value in the table to change the way the data
 is displayed.  See Help for the meaning of the numbers.

          |----Colors----|          |----Lines----||---Markers---|
          |Shading, Text,| Shading  |             ||             | Chart  Explode
 Commands |Marker   Line | Pattern  |Type Width   ||Type Scale   | Type   Slice
      ***
      001  1        *      2        7    2        8    2         4      NO
      002  2        *      2        7    2        8    2         1      NO
      003  3        *      2        7    2        8    2         2      NO
      004  4        *      2        7    2        8    2         3      NO
      005  5        *      2        7    2        8    2         4      NO
      006  6        *      2        7    2        8    2         1      NO
      007  1        *      4        7    2        36   2         2      NO
      008  2        *      4        7    2        36   2         3      NO
Commands: I (Insert) D (Delete) R (Repeat) M (Move) A (After) B (Before)
          / (Scroll Here)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 7=Up 8=Down 12=Home
```

```
2.7                            TEXT ATTRIBUTES

                        Color ==> 7     0 - Default     6 - Yellow
                                        1 - Blue        7 - White (Black on
                                        2 - Red                  a printer)
                                        3 - Pink        8 - Black (White on
                                        4 - Green                a printer)
                                        5 - Turquoise   9 through 255 - see Help

                Character Mode ==> 3    1 - Fixed Size, Approximate Positioning
                                        2 - Fixed Size, Exact Positioning
                                        3 - Scaled, Exact Positioning

               Symbol Set Name ==> ADMUUSRP

 Character Width  Multiplier ==> 1           (0.01 through 100)
 Character Height Multiplier ==> *           (* = same as Width Multiplier)


   Text Area Initially Blanked ? YES
            Text Area Outlined ? YES

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
2.8                          X TEXT ATTRIBUTES

                        Color ==> 7     0 - Default     6 - Yellow
                                        1 - Blue        7 - White (Black on
                                        2 - Red                  a printer)
                                        3 - Pink        8 - Black (White on
                                        4 - Green                a printer)
                                        5 - Turquoise   9 through 255 - see Help

                Character Mode ==> 3    1 - Fixed Size, Approximate Positioning
                                        2 - Fixed Size, Exact Positioning
                                        3 - Scaled, Exact Positioning

               Symbol Set Name ==> ADMUUSRP

 Character Width  Multiplier ==> 1           (0.01 through 100)
 Character Height Multiplier ==> *           (* = same as Width Multiplier)

        Text Rotation Angle ==> 0           (-90 through +90 degrees)




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
2.9                        DATA IMPORT FILE SELECTION

 Data can be imported into the ICU from another file on your computer.
 The file may either be an unformatted file, such as the output of another
 program, or a Data Interchange Format (DIF) file that has been copied from
 a Personal Computer (PC).

 Choose the action you want.  If you have not already done so (and unless you
 are going to load a previously-saved Data Definition), type in the details of
 the file you want to import data from.  Press ENTER to continue.

 What do you
     want to do? ==>       1 - Look at the file and define the data
                               to be imported
                           2 - Define how to add the data to your existing data
                           3 - Import data from the file
                           4 - Save or Load a Data Definition

 File identifier ==>

    Type of File ==> 1     1 - An unformatted file
                           2 - A DIF file from a PC

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
2.9.1                    FILE VIEW AND DATA DEFINITION

 Use PF4 (Mark Start) and PF5 (Mark End) to define each chosen item.
Which type of item? ==> 1     1 - Heading            4 - Data Groups (Y values)
                              2 - Data labels        5 - X values
                              3 - Data Group names   6 - Notes
 Data Group or Note ==> 1     (ignored for this item)   -1
                 Part ==> 1   (ignored for this item)   -1
  |----- File: ADMUCSIM DATA                                          -----|
  |          Record ==> 1      of 14         Column ==> 1     of 80          |
  JULY 1986     WEATHER IN HONG KONG AND MIAMI        PAGE 1
  THE AVERAGE AMOUNT OF SUNSHINE DAILY THIS YEAR HAS BEEN:
     MONTH       HONG KONG             MIAMI
     JANUARY     5   HOURS             8   HOURS
     FEBRUARY    4   HOURS             8   HOURS
     MARCH       3   HOURS             8.5 HOURS
     APRIL       3   HOURS             9   HOURS
     MAY         4.8 HOURS             9   HOURS
     JUNE        5   HOURS             9   HOURS
  PLEASE USE THESE FIGURES IN ALL YOUR HOLIDAY PROMOTION LITERATURE.
  |  (Use PF5 with the cursor on this line to extend an item to End of File)  |

PF: 1=Help 2=Next Part 3=End 4=Mark Start 5=Mark End 6=Next Data Group/Note
    7=Up 8=Down 9=Unmark 10=Left 11=Right 12=Home
```

```
2.9.2                        DATA IMPORT CONTROL

 Imported data may either replace existing data or be added to it.
 Where is the first imported
      Data Group to be placed? ==> 0     (Number of first Data Group to replace,
                                         or '*' to add after existing data,
                                         or '0' to replace all data)

     Transpose data after import ? NO    (only when all data is being replaced)

 Items that match these strings are made 'missing' without error:
                  First string ==>
                 Second string ==>
                  Third string ==>

 Imported Notes may either replace existing Notes or be added to them.
 Where is the first imported
            Note to be placed? ==> 0     (Number of first Note to replace,
                                         or '*' to add after existing Notes,
                                         or '0' to replace all notes)


PF: 1=Help 3=End 12=Home
```

```
2.4                          DATA LABELS (FREE DATA)

 Commands X Labels
 ___  ***









Commands: / (Scroll Here)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 7=Up 8=Down 12=Home
```

```
2.9.4                   SAVE AND LOAD DATA DEFINITION
ADM1100 W CURRENT CHART DATA DEFINITION HAS UNSAVED CHANGES
What do you want to do? ==>       1 - Load from a File
                                  2 - Reset to initial defaults
                                  3 - Save in a File
                                  4 - List Files, to pick or delete

                  Replace ? NO    (Type YES for Load or Reset to replace
                                  your current data definition even if it
                                  has unsaved changes, or for Save to
                                  replace an existing file)

               File name   Description of file
 Data
 Definition ==>









PF: 1=Help 3=End 4=Print 5=Display 12=Home
```

```
3                                CHART NOTES

 Type in the Notes you want under Note Text , one Note per line.
 Use PF11 (Edit) to change the size or position or angle of a note.
 Use PF6 or the P and T commands to change other properties.


 Commands Note Text
 ___  ***
 ___  001
 ___  002
 ___  003
 ___  004
 ___  005
 ___  006
 ___  007
 ___  008

Commands: I (Insert) D (Delete) R (Repeat) M (Move) A (After) B (Before)
          / (Scroll Here) S (Select) X (Exclude) P (Position)
          T (Text Attributes)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Show Attributes 7=Up 8=Down
    11=Edit 12=Home
```

```
2.1                          DATA ENTRY (FREE DATA)


 Command ==>____________
 Data Group Name -------->
 X1          X Labels     Y1









Commands: SAMPLE (Provide Sample Data) CLEAR (Remove ALL Data)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 7=Up 8=Down 10=Left 11=Right
    12=Home
```

```
3.1                              NOTE POSITION


 Note Position:              Distance          Units (to be used for Distance)
               Horizontal ==> 40            ==> 1
               Vertical   ==> 25.63          ==> 1

                                                 1 - in Character Grid Units from
                                                     bottom left of chart area
                                                 2 - in Axis Units from zero
                                                     position on axis

 Text rectangle point to
  be put at note position ==> 5     1---2---3   (Text rectangle corners
                                    4   5   6   and centers are numbered
                                    7---8---9   as shown on the left)

                  Note Type ==> 1   1 - Interactive
                                    2 - Non-interactive



PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 11=Edit 12=Home
```

```
2.2                      DATA MANIPULATION (FREE DATA)

                 Data Group Name -------->
                 Data Group (Z) Value ---> .

_________  *** X1          X Labels     Y1









Commands: D (Delete) R (Repeat) FIT (Least Squares Fit) S (Select) X (Exclude)
          / (Scroll Here) I (Insert) CONVERT (Convert to TIED Data)
          SAMPLE (Provide Sample Data) CLEAR (Remove ALL Data)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 7=Up 8=Down 10=Left 11=Right
    12=Home
```

```
3.2                              TEXT ATTRIBUTES

                        Color ==> 7     0 - Default     6 - Yellow
                                        1 - Blue        7 - White (Black on
                                        2 - Red                   a printer)
                                        3 - Pink        8 - Black (White on
                                        4 - Green                 a printer)
                                        5 - Turquoise   9 through 255 - see Help

                Character Mode ==> 3    1 - Fixed Size, Approximate Positioning
                                        2 - Fixed Size, Exact Positioning
                                        3 - Scaled, Exact Positioning

               Symbol Set Name ==> ADMUUKSF

 Character Width  Multiplier ==> 2           (0.01 through 100)
 Character Height Multiplier ==> *           (* = same as Width Multiplier)

          Text Rotation Angle ==> 0          (-180 through +180 degrees)

   Text Area Initially Blanked ? NO
         Text Area Outlined ? NO

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 11=Edit 12=Home
```

```
4                                X AXIS

 * Choose from the following to define your axes:

                            1 - Title
                            2 - Axis Line
                            3 - Scale and Range
                            4 - Labels
                            5 - Markings
                            6 - Grid Lines
                            7 - Reference Line
                            8 - Datum Line

 * Type the number of the choice you want ======>
 * Press ENTER to continue.

 Use PF6 (Y Axis) to switch between the X and Y axis options.




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.2.1                        X LINE ATTRIBUTES

              Color ==> 7     0 - Default     6 - Yellow
                              1 - Blue        7 - White (Black on
                              2 - Red                   a printer)
                              3 - Pink        8 - Black (White on
                              4 - Green                 a printer)
                              5 - Turquoise   9 through 255 - see Help

          Line Type ==> 7     1 - Dotted
                              2 - Short Dashed
                              3 - Dash-Dot
                              4 - Double Dotted
                              5 - Long Dashed
                              6 - Dash-double-Dot
                              7 - Continuous
                              8 - Invisible

         Line Width ==> 1     1 - Normal
                              2 - Thickened


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.1                            X AXIS TITLE

     Title Text ==>

                         (The title may be up to 55 characters long.  It may
                         contain ; characters, which act as line separators.)

       Position ==> 1    1 - Parallel to Axis, Centered
                         2 - Parallel to Axis, at End
                         3 - Horizontal Above Axis (if axis vertical)
                             Parallel to Axis, at End (if axis horizontal)

  Would you like to change the color, character size, or typestyle used for
  this axis title ? NO




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.3                        X AXIS SCALE AND RANGE

          Axis Scale Type ==> 1            1 - Linear
                                           2 - Logarithmic

 Range of Axis:      From ==> *            (Either limit may be '*', in which
                     To   ==> *            case the range will be just enough
                                           to display all values)
      Include Zero in Range ? NO

 Intersection with
         Opposite Axis at X = *            (May be '*', in which case the
                                           intersection will vary according
                                           to the Chart Layout)




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.1.1                        X TEXT ATTRIBUTES

                      Color ==> 7     0 - Default     6 - Yellow
                                      1 - Blue        7 - White (Black on
                                      2 - Red                   a printer)
                                      3 - Pink        8 - Black (White on
                                      4 - Green                 a printer)
                                      5 - Turquoise   9 through 255 - see Help

             Character Mode ==> 3     1 - Fixed Size, Approximate Positioning
                                      2 - Fixed Size, Exact Positioning
                                      3 - Scaled, Exact Positioning

           Symbol Set Name ==> ADMUUDRP

 Character Width  Multiplier ==> 1           (0.01 through 100)
 Character Height Multiplier ==> *           (* = same as Width Multiplier)




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.4                            X AXIS LABELS

What do you want to do? ==>       blank - Set Label Options below
                                  1 - Type in Your Own Labels
                                  2 - Change Label Text Characteristics

            Label Type ==> 5      0 - No Labels
                                  1 - Numeric, multiplied by ==> 1
                                  2 - Your Own Labels
                                  3 - Days  :  First day     ==> 1  (Monday =1)
                                  4 - Months:  First month   ==> 1  (January=1)
                                  5 - Data Labels

              Position ==> 1      1 - Next to Tick Marks
                                  2 - Between Tick Marks

    Label Abbreviation ==> 1      1 - No Abbreviation
 (Days and Months only)           2 - First Three Letters
                                  3 - First Letter Only

Style of Numeric Labels ==> 1     1 - No Punctuation
                                  2 - Standard Punctuation

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.2                            X AXIS LINE

                 Do you want the Axis Line to be drawn ? YES

                 Would you like to change the
                        color or type of the Axis Line ? NO









PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.4.1                       X AXIS LABEL VALUES

 Axis Labels appear only at major tick mark intervals.  If there are more
 major tick marks than labels, then the labels will be re-used, again and
 again if necessary.

 Commands Axis Labels
 ___  ***
 ___  001
 ___  002
 ___  003
 ___  004
 ___  005
 ___  006
 ___  007
 ___  008




Commands: I (Insert) D (Delete) / (Scroll Here)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 7=Up 8=Down 12=Home
```

```
4.4.2                          X TEXT ATTRIBUTES

                       Color ==> 7     0 - Default     6 - Yellow
                                       1 - Blue        7 - White (Black on
                                       2 - Red                 a printer)
                                       3 - Pink        8 - Black (White on
                                       4 - Green               a printer)
                                       5 - Turquoise   9 through 255 - see Help

                Character Mode ==> 3   1 - Fixed Size, Approximate Positioning
                                       2 - Fixed Size, Exact Positioning
                                       3 - Scaled, Exact Positioning

              Symbol Set Name ==> ADMUUSRP

 Character Width  Multiplier ==> 1           (0.01 through 100)
 Character Height Multiplier ==> *           (* = same as Width Multiplier)

          Text Rotation Angle ==> 0          (-90 through +90 degrees)



PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.7                            X REFERENCE LINE

                 Do you want a Reference Line to be drawn ? NO

                                   Reference X Value ==> 0

                 Would you like to change the
                      color or type of the Reference Line ? NO
                 (The same attributes affect both X and Y
                 Reference Lines)









PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.5                            X AXIS MARKINGS

                        Tick Marks ==> 3     1 - No Tick Marks
                                             2 - On One Side of the Axis
                                             3 - On the Other Side of the Axis
                                             4 - Across the Axis

 Interval between Major Tick Marks ==> *
 Number of Minor Ticks
          between Major Tick Marks ==> *

 (Either of these values may be '*', in which case default values will apply)









PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.7.1                           LINE ATTRIBUTES

                 Color ==> 7     0 - Default     6 - Yellow
                                 1 - Blue        7 - White (Black on
                                 2 - Red                 a printer)
                                 3 - Pink        8 - Black (White on
                                 4 - Green               a printer)
                                 5 - Turquoise   9 through 255 - see Help

             Line Type ==> 7     1 - Dotted
                                 2 - Short Dashed
                                 3 - Dash-Dot
                                 4 - Double Dotted
                                 5 - Long Dashed
                                 6 - Dash-double-Dot
                                 7 - Continuous
                                 8 - Invisible

            Line Width ==> 1     1 - Normal
                                 2 - Thickened


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
4.6                            X GRID LINES

                  Do you want Grid Lines to be drawn ? NO
                  (Grid lines will be drawn through
                  major tick mark positions)

                  Would you like to change the
                     color or type of the Grid Lines ? NO









PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.8                            X DATUM LINE

                  Do you want a Datum Line to be drawn ? NO

                                   Datum Line X Value ==> 0

                  Would you like to change the
                       color or type of the Datum Line ? NO









PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.6.1                          X LINE ATTRIBUTES

                 Color ==> 7     0 - Default     6 - Yellow
                                 1 - Blue        7 - White (Black on
                                 2 - Red                 a printer)
                                 3 - Pink        8 - Black (White on
                                 4 - Green               a printer)
                                 5 - Turquoise   9 through 255 - see Help

             Line Type ==> 1     1 - Dotted
                                 2 - Short Dashed
                                 3 - Dash-Dot
                                 4 - Double Dotted
                                 5 - Long Dashed
                                 6 - Dash-double-Dot
                                 7 - Continuous
                                 8 - Invisible

            Line Width ==> 1     1 - Normal
                                 2 - Thickened


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
4.8.1                          X LINE ATTRIBUTES

                 Color ==> 7     0 - Default     6 - Yellow
                                 1 - Blue        7 - White (Black on
                                 2 - Red                 a printer)
                                 3 - Pink        8 - Black (White on
                                 4 - Green               a printer)
                                 5 - Turquoise   9 through 255 - see Help

             Line Type ==> 1     1 - Dotted
                                 2 - Short Dashed
                                 3 - Dash-Dot
                                 4 - Double Dotted
                                 5 - Long Dashed
                                 6 - Dash-double-Dot
                                 7 - Continuous
                                 8 - Invisible

            Line Width ==> 1     1 - Normal
                                 2 - Thickened


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Y Axis 12=Home
```

```
5                          HEADING, LEGEND AND LAYOUT

 * Choose from the following to define your heading, legend, or layout:

                     1 - Chart Heading
                     2 - Heading and Axis Positions
                     3 - Legend Position and Format
                     4 - Chart Dimensions (Proportions,
                           Character Grid, and Margins)

 * Type the number of the choice you want ======>
 * Press ENTER to continue.




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
5.3                        LEGEND POSITION AND FORMAT

   Do you want a Legend Produced ? YES

      Margin for Base Position ==> 1     1 - Right            3 - Bottom
                                         2 - Left             4 - Top
 (This also sets the Legend format)      Vertical Legend  or  Horizontal Legend

       Placement within Margin ==> 1     1 - Centered         1 - Centered
                                         2 - At Top           2 - At Right
                                         3 - At Bottom        3 - At Left
 Offset from Base Position
 (in Character Grid Units):
                     Horizontal ==> 0
                       Vertical ==> 0

        Order of Construction ==> 1     1 - Bottom to Top    1 - Left to Right
                                         2 - Top to Bottom    2 - Right to Left

                Maximum Width ==> *                           (Horizontal only)
               Maximum Height ==> *     (Vertical only)


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
5.1                              CHART HEADING

     Heading Text ==>


                    (The heading may be up to 132 characters long.  It may
                    contain ; characters, which act as line separators.)

    Would you like to change the color, character size, or typestyle used
    for the heading ? NO




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
5.4                             CHART DIMENSIONS

 Proportions of Chart:    Horizontal ==> 11            Vertical ==> 8.5

 (The chart will be displayed or printed as large as possible on the output
  area, but with its shape kept in these fixed proportions.  A horizontal value
  of '*' means that the chart will be stretched to cover the whole output area
  without keeping the proportions fixed.  See Help for further details.)
  The proportions of the display you are currently using are:
                         Horizontal  =  11.937        Vertical  =  8.5

 Character Grid Size:          Rows ==> 32             Columns ==> 80

 (These numbers determine an imaginary grid covering the whole chart area.
  The chart margins (see below) are defined in terms of the rows and columns
  of this grid.  The grid also determines the basic character size of all text
  on the chart.  See Help for further details.)

 Margins:              (Rows)    Top ==> 5      (Columns)  Left ==> 10
                                Bottom ==> 5                Right ==> 10

  Overall Character Width Multiplier ==> 1.74         (0.01 through 100)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
5.1.1                            TEXT ATTRIBUTES

                        Color ==> 7     0 - Default     6 - Yellow
                                        1 - Blue        7 - White (Black on
                                        2 - Red                   a printer)
                                        3 - Pink        8 - Black (White on
                                        4 - Green                 a printer)
                                        5 - Turquoise   9 through 255 - see Help

                Character Mode ==> 3    1 - Fixed Size, Approximate Positioning
                                        2 - Fixed Size, Exact Positioning
                                        3 - Scaled, Exact Positioning

              Symbol Set Name ==> ADMUUKSF

 Character Width  Multiplier ==> 2.5          (0.01 through 100)
 Character Height Multiplier ==> *            (* = same as Width Multiplier)




PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
6                                MULTIPLE CHARTS

 Type in the format and data names of the charts you want, and the positions
 and attributes of the areas in which you want the charts to appear.
 You position a chart by giving the distance of each of its edges from the
 lower left corner of the master chart (the chart that you are editing at the
 moment).  Express the distance as a percentage of the size of the master chart.
 Charts may overlap.  Use PF6 to switch between positions and attributes.

          Chart Name         Chart Position
 Commands Format   Data      Left     Right    Bottom   Top
 ___   ***
 ___   001 *MASTER* *CHART*  0        100      0        100
 ___   002                   10       45       55       90
 ___   003                   55       90       55       90
 ___   004                   10       45       10       45
 ___   005                   55       90       10       45


Commands: I (Insert) D (Delete) R (Repeat) M (Move) A (After) B (Before)
          / (Scroll Here) S (Select) X (Exclude)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 6=Show Attributes 7=Up 8=Down
    11=Edit 12=Home
```

```
5.2                          HEADING AND AXIS POSITIONS

         Heading Position ==> 1     0 - No Heading
                                    1 - Top of Chart
                                    2 - Bottom of Chart

     Heading Justification ==> 1    1 - Centered
                                    2 - Left Justified
                                    3 - Right Justified

        Chart Orientation ==> 1     1 - Vertical Y-axis and Bars,
                                        Side by Side Pies and Venn circles,
                                        X-values at Left Side of Table
                                    2 - Horizontal Y-axis and Bars,
                                        Top to Bottom Pies and Venn circles,
                                        X-values across Top of Table
                                   (No effect on Polar and Tower charts)

 Horizontal Axis Position ==> 1     1 - Bottom    2 - Centered    3 - Top

   Vertical Axis Position ==> 1     1 - Left      2 - Centered    3 - Right


PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
                                 MENU CONTROL

  Preview Chart on Panels ==> 1     1 - No
                                    2 - Yes, except for Data Entry Panels
                                    3 - Yes, including Data Entry Panels
                                    (Some panels never show the Preview Chart)

  Preview Chart Position:           (in Screen Rows)
                First Row ==> 23    (numbered from the top)
                Last  Row ==> 3     (numbered from the bottom)

        Text Highlighting ==> 1     1 - None
                                    2 - Reverse Video

     Text String Contents ==> 1     1      - Latin Characters Only
                                    2 or 3 - Mixed Latin and DBCS Characters
                                             (see Help for explanation)

 Usage of Directory Panel ==> 1     1 - Standard Mode
                                    2 - Advanced Mode

 (Panels will not use the space after this line except for the PF key list)

PF: 1=Help 2=Save/Load 3=End 4=Print 5=Display 12=Home
```

```
                          SAVE AND LOAD CHART

What do you want to do? ==>       1 - Load from a File
                                  2 - Reset to initial defaults
                                  3 - Save in a File
                                  4 - List Files, to pick or delete

   Which part of chart? ==>       1 - Format
                                  2 - Data
                                  3 - Both Format and Data
                                  4 - Whole chart as Graphic Data Format (GDF)
                                      (not for Load or Reset)

                 Replace ? NO     (Type YES for Load or Reset to replace your
                                  current chart even if it has unsaved changes,
                                  or for Save to replace an existing file)

               File name   Description of file
     Format ==>
     Data   ==> =          =
     GDF    ==>
              (May be '=' meaning the same as the Format name or description)

PF: 1=Help 3=End 4=Print 5=Display 12=Home
```

```
                      PRINTER/PLOTTER OUTPUT

        Printer/Plotter Name ==>          (? for Printer/Plotter list)

            Number of Copies ==> 1        (1 through 99.  Queued output only)
    Header page preceding output ? YES    (Queued output only)
       Userid and time on output ? NO

 Size and position on the output area:
                         Width ==> *      (See Help for the definition of
                         Depth ==> *      'area', and the default action
       Offset from left of area ==> *     shown by '*')
       Offset from top of area  ==> *
   Units for size and position ==> 1      1 - Percentage of area depth/width
                                          2 - Inches
                                          3 - Centimeters
                                          4 - Rows/columns (for printers
                                                        only:  see Help)

 Press ENTER to start output.
 Press PF6 (Start Series), if shown below, to output a series of charts or
 graphic data formats (GDFs).

PF: 1=Help 3=End 6=Start Series 12=Home
```

```
                                  DIRECTORY
ADM1043 I MAIN FILE TYPES ARE 'FORMAT', 'DATA', 'DATADEF', 'GDF', 'ISS', 'VSS'

 Commands Name     Type     Mode Date and Time        Description
                                Last Written
 ___   *** _______ _______  ___ ____________________ ____________________
 ___   *** _______ _______  ___ ____________________ ____________________
 ___   *** _______ _______  ___ ____________________ ____________________
```

GDDM glossary

This glossary defines technical terms used in GDDM documentation. In the definitions, the qualification "In GDDM" means in the GDDM Base products or in GDDM-PGF (or both). "In GDDM-PGF" means in GDDM-PGF, which includes the ICU.

If you do not find the term you are looking for, refer to the index of the appropriate GDDM manual or view the *IBM Dictionary of Computing*, located on the Internet at:

`http:\\www.networking.ibm.com/nsg/nsgmain.htm`

A

AAB. Application anchor block.

absolute data. In GDDM-PGF, the actual y values to be plotted. Contrast with **relative data**.

alphanumeric character attributes. In GDDM, comprise the highlighting, color, and symbol set to be used.

alphanumeric cursor. A physical indicator on a display. It may be moved from one hardware cell to another.

alphanumeric field. A field (area of a screen or printer page) that can contain alphabetic, numeric, or special characters. In GDDM, contrast with **graphics field**.

alphanumeric field attributes. In GDDM, comprise intensity, highlighting, color, symbol set to be used, field type, field end output conversion, input conversion, translate table assignment, transparency, field outlining, and mixed-string fields.

alphanumeric label. In GDDM-PGF or the ICU, a user-specified alphanumeric string used to annotate an x-axis or y-axis scale mark. Contrast with **numeric label**.

alternate device. In GDDM, a device to which copies are sent of the primary device's output. Usually the alternate device is a printer or plotter. See also **primary device**.

annotation. An added descriptive comment or explanatory note.

API. Application program interface.

APL. One of the programming languages supported by GDDM.

application program interface (API). The formally defined programming-language interface between an IBM system control program or program product and its user.

aspect ratio. The width-to-height ratio of an area, symbol, or shape.

attribute table. In GDDM-PGF, a set of values for one particular attribute (for example, shading pattern), that are used in sequence to display the components of a business chart.

attributes. Characteristics or properties that can be controlled, usually to obtain a required appearance; for example, the color of a line. See also **alphanumeric character attributes**, **alphanumeric field attributes**, and **graphics attributes**.

autoranging. In GDDM-PGF, the process in which the axis ranges are determined by the extremes of the data values passed by the application. Synonymous with **autoscaling**.

autoscaling. Synonym for **autoranging**.

axis. In a chart, a line that is drawn to indicate units of measurement against which items in the chart can be viewed. GDDM-PGF charts have an x, y, and (in the case of tower charts) z axis.

axis label. In GDDM-PGF, text appearing at or between axis major scale marks on a business chart. Such labels may be numeric or alphanumeric. Contrast with **data label**.

axis title. In GDDM-PGF, a text string describing what an axis represents.

B

background color. Black on a display, white on a printer. The initial color of the display medium. Contrast with **neutral color**.

bar chart. A chart consisting of several bars of equal width. The value of the dependent variable is indicated by the height of each bar. Synonymous with **column chart**.

BASIC. One of the programming languages supported by GDDM.

blank character. An empty character represented by X'40' in the EBCDIC code. In GDDM-PGF, such a character occupies one position in a label or a key and

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may be used for positioning purposes. Contrast with **null character**.

business graphics. The methods and techniques for presenting commercial and administrative information in chart form. For example, the creation and display of a sales bar chart. Contrast with **general graphics**.

C

cell. See **character cell**.

character. A letter, digit, or other symbol.

character attributes. See **alphanumeric character attributes**. See also **graphics text attributes**.

character box. In GDDM, the rectangle or (for sheared characters) the parallelogram boundaries that govern the size, orientation, spacing, and italicizing of individual symbols or characters to be shown on a display screen or printer page.

The box width, height, and if required, shear, are specified in world coordinates and may be program-controlled. See also **character mode**. Contrast with **character cell**.

character cell. The physical, rectangular space in which any single character or symbol is displayed on a screen or printer device. The size and position of a character cell are fixed. Size is usually specified in pixels on a given device, for example, 9 by 12 on an IBM 3279 Model 3 display. Position is addressed by row and column coordinates. Synonymous with **hardware cell** and **symbol cell**. Contrast with **character box**.

character code. The means of addressing a symbol in a symbol set, sometimes called **code point**.

The particular form and range of codes depends on the GDDM context, for example:

- For the Image Symbol Editor, a hexadecimal constant in the range X'41'–X'FE', or its EBCDIC character equivalent.
- For the Vector Symbol Editor, a hexadecimal constant in the range X'00'–X'FF' or its EBCDIC character equivalent.
- For the GDDM API, a decimal constant in the range 0 through 239, or subsets of this range (for example, a marker symbol code range of 1 through 8).

character grid. A notional grid that covers the **chart area**. The size of the grid determines the basic size of the characters in all text constructed by PG routines. It is the fundamental measurement in chart layout, governing the spacing of mode-2 characters and the size of mode-3 characters. It also governs the size of the chart margins and thus the plotting area.

character matrix. Synonym for **dot matrix**.

character mode. In GDDM, the type of characters to be used. There are three modes:

- Mode-1 characters are loadable into PS and are of device-dependent fixed size, spacing, and orientation, as are hardware characters.
- Mode-2 characters are image (ISS) characters. Size and orientation are fixed. Spacing is variable by program.
- Mode-3 characters are vector (VSS) characters. Box size, position, spacing, orientation, and shear of individual characters are variable by program.

chart. In GDDM, usually means business chart, for example, a **bar chart**.

chart annotation. Annotative text added to a business chart. In GDDM-PGF, referred to as **chart notes**.

chart area. In GDDM-PGF, the part of the picture space in which a business chart is to be drawn.

chart attributes. In GDDM-PGF, define how each part of the chart will appear - for example, the font to be used for the chart heading.

chart data. An ICU chart is saved in two distinct parts, the data and the format. The chart data consists of the x and y values, the data labels, the data group names, and the chart heading.

chart data attributes. In GDDM-PGF, define the appearance of the data representation. For example, the color of the lines on a line graph or the shading patterns used for the sectors of a pie chart.

chart format. An ICU chart is saved in two distinct parts, the data and the format. The chart format consists of the chart type, the chart attributes, the axis characteristics, the chart layout, and the chart notes.

chart notes. In GDDM-PGF, additional text to annotate a business chart. May be used in isolation to create alphanumeric presentation material (using the ICU interactive notes facility).

chart type. In GDDM-PGF, specifies whether the business chart should be a line graph, surface chart, histogram, bar chart, pie chart, Venn diagram, polar chart, table chart, or tower chart.

choice device. A logical input device that enables the application program to identify keys pressed by the terminal operator.

CICS. Customer Information Control System. A subsystem of MVS or VSE under which GDDM can be used.

CMS. Conversational Monitor System. A time-sharing subsystem that runs under VM/SP.

COBOL. One of the programming languages supported by GDDM.

code point. Synonym for **character code**.

column chart. See **bar chart**.

compass keys. In the GDDM Vector and Image Symbol Editors, a set of PF keys predefined to draw a line in vector symbols or add a dot in image symbols, in directions corresponding to points of the compass.

component (data). In GDDM-PGF, synonym for **data group**. One line on a line graph, for example, or one set of bars on a bar chart.

composite bar chart. In GDDM-PGF, a bar chart in which multiple y values for the same x value or x label are stacked one on top of another. Contrast with **multiple bar chart**. See also **floating bar chart**.

cursor. A physical indicator that may be moved around a display screen. See **alphanumeric cursor** and **graphics cursor**.

curve construction line. In the GDDM Vector Symbol Editor, one of a series of vectors that is used in the construction of a curve.

curve fitting. The construction of a smooth curve through a sequence of plot points, as opposed to their connection by straight lines. In GDDM-PGF or the ICU, curve fitting may be requested for line graphs or polar charts.

D

data group. In GDDM-PGF, one set of y values corresponding to a given set of x values (for example, the data values for one line on a line graph). Synonymous with **component**.

data indexing. In ICU, the display of y values relative to other y values in the same chart, rather than as originally specified. For example, all bars might be displayed as a percentage of the set of bars at X=1979.

data label. In ICU, text specified on the data entry panel rather than on the x-axis label panel. If the chart has axes, the label is displayed on a tick mark that is close to the matching numeric x value. Data labels are attached to the sectors on a pie chart and to the circles and overlap area of a Venn diagram. Contrast with **axis label**.

data values. In GDDM-PGF, the x and y values that are plotted on a business chart.

datum line. In GDDM-PGF, a line drawn parallel to a chart axis, through a specified value along the other axis. See also **datum reference line**.

datum reference line. In GDDM-PGF, a datum line that also acts as a shading boundary for the first component of a surface chart, histogram or composite bar chart, or for all the components of a polar chart or multiple bar chart. If no datum reference line is present, such components are shaded from the x axis.

data set. The major unit of data storage and retrieval, consisting of a collection of data in one of several prescribed arrangements and described by control information to which the system has access.

DBCS. Double-byte character set.

default value. A value chosen by GDDM when no value is explicitly specified by the user. For example, the default line type is a solid line.

device family. In GDDM, a device classification that governs the general way in which I/O will be processed. See also **processing options**. For example:

- Family 1: 3270 display or printer
- Family 2: queued printer
- Family 3: system printer (alphanumerics only)
- Family 4: high-resolution printer.

device token. In GDDM, an 8-byte code giving entry to a table of pre-established device hardware characteristics that are required when the device is opened (initialized).

display device. Any output unit that gives a visual representation of data. For example, a screen or printer. More commonly, the term is used to mean a screen as opposed to a printer.

display point. Synonym for **pixel**.

display terminal. An input/output unit by which a user communicates with a data-processing system or subsystem. Usually includes a keyboard and always provides a visual presentation of data. For example, an IBM 3179 display.

double-byte character set (DBCS). A set of characters in which each character occupies two byte positions in internal storage and in display buffers. Used for oriental languages.

dual characters. In GDDM, characters that each occupy two bytes in internal storage and in display buffers. They are used to display Kanji or Hangeul symbols.

E

edit. To enter, modify, or delete data.

exploded pie chart. A pie chart in which one or more sectors have been moved outward from the center of the pie, to have a greater impact on the eye.

external defaults. GDDM-supplied values that users can change to suit their own needs.

F

field attributes. See **alphanumeric field attributes**.

floating bar chart. In GDDM-PGF, a special type of composite bar chart in which the first data group is not displayed. The stacks of bars representing the remaining data groups therefore appear to “float”.

foil. A transparency for overhead projection.

font. A particular style of typeface (for example, Gothic English). In GDDM, a font may exist as a programmed symbol set.

FORTRAN. One of the programming languages supported by GDDM.

four-button cursor. A hand-held device, with cross-hair sight, for indicating positions on the surface of a tablet. Synonymous with **puck**.

free data. In GDDM-PGF, data that has a separate set of x points for each component. Formerly known as **paired data**. Contrast with **tied data**.

G

GDDM. Graphical Data Display Manager.

GDDM storage. The portion of host computer main storage used by GDDM.

GDF. Graphics data format.

general graphics. The methods and techniques for converting data to or from graphics display in mathematical, scientific, or engineering applications; that is, any application other than business graphics. See also **business graphics**.

graphics. A picture defined in terms of graphics primitives and graphics attributes.

graphics attributes. In GDDM, comprise color selection, color mix, line type, line width, graphics text attributes, marker symbol, and shading pattern definition.

graphics cursor. A physical indicator that can be moved (often with a joystick, mouse, or stylus) to any position on the screen.

graphics data format (GDF). A picture definition in an encoded order format used internally by GDDM and, optionally, providing the user with a lower-level programming interface than the GDDM API.

graphics text attributes. In GDDM, comprise symbol (character) set to be used, character box size, character angle, character mode, character shear angle, and character direction.

grid lines. In GDDM-PGF, lines drawn parallel to one axis and through the major scale marks of the other axis.

H

hardware cell. Synonym for **character cell**.

hardware characters. Synonym for **hardware symbols**.

hardware symbols. The characters that are supplied with the device. The term is loosely used also for GDDM mode-1 symbols that are loaded into a PS store for subsequent display. Synonymous with **hardware characters**.

help panel. A panel presenting tutorial text to assist the terminal user. All the GDDM interactive utilities possess comprehensive help panels.

hidden bars. See **overlapping bar chart**.

high-resolution image file. An intermediate form, residing on disk, of a picture destined for a high-resolution printer.

high-resolution printer. A printer, such as the 4250 or 3800-3, that has a high density of pixels to the inch and therefore produces output of good quality.

histogram. A chart in which each value of the dependent variable corresponds to a range of values of the independent variable (represented by the width of the associated bar). Such a chart might display the number of persons in various age ranges, for example.

home panel. The first panel that is displayed by the ICU. It is the starting point for access to the other panels.

I

ICU. Interactive Chart Utility.

image. Pictorial information that is specified in terms of the dots (pixels) of which it is made up.

image symbol. A character or symbol defined as a dot pattern.

Image Symbol Editor (ISE). A GDDM-supplied interactive editor that lets users create or modify their own image symbol sets (ISS).

image symbol set (ISS). A set of symbols each of which was created as a pattern of dots. Contrast with **vector symbol set (VSS)**.

IMS. Information Management System. A subsystem of MVS under which GDDM can be used.

include member. A collection of source statements stored as a library member for later inclusion in a compilation.

indexing. In ICU, see **data indexing**.

integer. A whole number (for example, -2, 3, 457).

Interactive Chart Utility (ICU). A GDDM-PGF menu-driven program that allows business charts to be created interactively by nonprogrammers.

interactive graphics. In GDDM, those graphics that can be moved or manipulated by a user at a terminal.

interactive mode. A mode of application operation in which each entry receives a response from a system or program, as in an inquiry system or an airline reservation system. An interactive system may also be conversational, implying a continuous dialog between the user and the system.

interactive subsystem. (1) One or more terminals, printers, and any associated local controllers capable of operation in interactive mode. (2) One or more system programs or program products that enable user applications to operate in interactive mode. For example, CICS.

intercept. In a chart, a method of describing the position of one axis relative to another. For example, the x axis can be specified so that it intercepts (crosses) the y axis at the bottom, middle, or top of the plotting area of a chart.

ISE. Image Symbol Editor.

ISS. Image symbol set.

J

JCL. Job Control Language.

joystick. A lever that can pivot in all directions, used as a locator device.

K

Kanji. A character set of symbols used in Japanese ideographic alphabets.

key. In a legend, a symbol and an associated data group name. A key might, for example, indicate that the pink line on a graph represents “Predicted Profit.” See also **legend**.

key symbol. A small part of a line (from a line graph) or an area (from a shaded chart) used in a legend to identify the various data groups.

L

legend. A set of symbolic keys used to identify the data groups in a business chart.

line attributes. In GDDM, color, line type, and line width.

line graph. In GDDM-PGF, a chart in which the plotted points (each optionally represented by a marker) are joined by straight or curved lines. If only the markers are displayed, the chart is known as a scatter plot.

link edit. To create a loadable computer program by means of a linkage editor.

load module. A program unit that is suitable for loading into main storage for execution; it is usually the output of a linkage editor.

logarithmic axis. In GDDM-PGF, an axis on which ascending powers of 10 are equally spaced.

M

Manhattan chart. Synonym for **tower chart**.

menu. A displayed list of logically grouped functions from which the operator may make a selection. Sometimes called a menu panel.

menu-driven. Describes a program that is driven by an operator responding to one or more displayed menus.

missing values. In GDDM-PGF or the ICU, x or y values that are omitted from a chart. For example, one line on a graph might represent a sales forecast and extend to the end of the year on the x axis, while a second line might represent actual sales and extend only to the current month.

mixed character string. A string containing a mixture of Latin (one-byte) and Kanji (two-byte) characters.

mixed chart. In GDDM-PGF or the ICU, the combination of more than one chart type in a business graph. For example, the overlaying of a line graph on top of a bar chart.

mode 1/2/3 characters. See **character mode**.

mountain shading. A method of shading surface charts where each component is shaded separately from the base line, instead of being shaded from the data line of the previous component.

mouse. A hand-held device (the IBM 5277 Mouse) that is moved around a locator pad to position the graphics cursor on the screen.

multicomponent chart. In GDDM-PGF, a chart presenting more than one data group.

multiple axis chart. In GDDM-PGF, a chart in which more than one x axis or y axis, or both, is used. See also **secondary axis**.

multiple bar chart. In GDDM-PGF, a form of bar chart in which the bars at a given x value or label are placed side by side. Contrast with **composite bar chart**.

multiple charts. Two or more charts appearing together on the display screen or page. Multiple charts can be of the same type or different types, and can be derived from one or more sets of data.

N

National Language (NL) feature. The translations of the ICU panels and GDDM messages into a variety of languages other than English.

neutral color. White on a display, black on a printer. Contrast with **background color**.

nickname. In GDDM, a quick and easy means of referring to a device, the characteristics and identity of which have been predefined.

non-paired data. See **tied data**.

null character. An empty character represented by X'00' in the EBCDIC code. In GDDM-PGF, such a character does not occupy a screen position. The trailing positions of short keys or labels may be filled with nulls. Contrast with **blank character**.

numeric label. In GDDM-PGF, an axis major scale mark label derived directly from the data value at that scale mark. Contrast with **alphanumeric label**.

O

overlapping bar chart. A form of business chart where adjacent bars partly overlap each other. Overlapping bars are sometimes called **hidden bars**.

P

page. In GDDM, the main unit of output and input. All specified alphanumerics and graphics are added to the “current page.” An output statement always sends the current page to the device, and an input statement always receives the current page from the device.

paired data. See **free data**.

panel. A predefined display that defines the locations and characteristics of alphanumeric fields on a display terminal. When the panel offers the operator a selection of alternatives it may be called a menu panel. Synonymous with **frame**.

PDS. In TSO, a partitioned data set.

pel. Synonym for **pixel**.

PGF. Presentation Graphics Facility.

picture element. Synonym for **pixel**.

picture interchange format (PIF) file. In graphics systems, the type of file, containing picture data, that can be transferred between GDDM and a 3270-PC/G or 3270-PC/GX work station.

pie chart. A chart that takes the form of one or more circles divided into sectors, the angles of which represent the contributions of each data value to the group total.

PIF. Picture interchange format (PIF) file.

pixel. The smallest area of a display screen capable of being addressed and switched between visible and invisible states. Synonymous with **display point**, **pel**, and **picture element**.

PL/I. One of the programming languages supported by GDDM.

plotter. An output device that uses pens to draw its output on paper or transparency foils.

polar chart. A form of business chart where the x axis is circular and the y axis is radial.

presentation graphics. Computer graphics products or systems, the functions of which are primarily concerned with graphics output presentation. For example, the display of business planning bar charts.

Presentation Graphics Facility (PGF). A member of the GDDM family of program products. It is concerned with business graphics, as opposed to general graphics.

preview chart. A small version of the current chart that may be displayed on ICU menu panels.

primary device. In GDDM, the main destination device for the application program's output, usually a display terminal. The default primary device is the user console. See also **alternate device**.

processing options. Describe how a device's I/O will be processed. These device-family-dependent and subsystem-dependent options are specified when the device is opened. An example is the choice between CMS attention-handling protocols.

program library. (1) A collection of available computer programs and routines. (2) An organized collection of computer programs. (3) Synonym for **partitioned data set**.

programmed symbols (PS). Dot patterns loaded by GDDM into the PS stores of an output device.

PS. Programmed symbols.

PS overflow. A condition where the graphics cannot be displayed in its entirety because the picture is too complex to be contained in the device's PS stores.

puck. Synonym for **four-button cursor**.

Q

queued printer. A printer belonging to the subsystem under which GDDM runs, to which output is sent indirectly by means of the GDDM Print Utility program. In some subsystems, this may allow the printer to be shared between multiple users. Contrast with **system printer**.

R

RCP. Request control parameter.

reentrant. The attribute of a program or routine that allows the same copy of the program or routine to be used concurrently by two or more tasks.

reference line. See **datum reference line**.

regression line. In ICU, the conversion of a set of y values into other values that form a straight line most closely resembling the original values.

relative data. In GDDM-PGF, real y-data values that are to be presented in a stacked chart-type. The actual points to be plotted for a particular component are obtained by adding the y data of that component to the y data of the previous components. Contrast with **absolute data**.

reverse video. A form of alphanumeric highlighting for a character, field, or cursor, in which its color is exchanged with that of its background. For example, changing a red character on a black background to a black character on a red background.

S

scalable markers. In GDDM-PGF, (vector) markers on a line graph or polar chart that may be varied in size.

scale marks. In GDDM-PGF, markings spaced at equal intervals along an axis. Each pair of "major scale marks" may have one or more "minor scale marks" in between. Synonymous with **tick marks**.

scatter plot. In GDDM-PGF, a variety of line graph in which only the marked points, and not their joining lines, are drawn.

scrolling. In computer graphics, moving a display image vertically or horizontally in a manner such that new data appears at one edge as existing data disappears at the opposite edge.

secondary axis. In GDDM-PGF, an x- or y-axis line drawn parallel to the primary axis and capable of having scale marks, labels, and title different from those of the primary axis. Permits the combination of two business charts.

skyscraper chart. Synonym for **tower chart**.

spider labels. In GDDM-PGF, labels that annotate pie-chart sectors. Each label is joined to its associated sector by a line, giving the resulting chart a spider-like appearance.

stacked chart type. A surface chart, composite bar chart, or histogram where the data components are stacked one on top of another. The data value of a particular component is indicated by the depth of the band at that point. See also **relative data**.

stand-alone (mode). Operation that is independent of another device, program, or system.

state-1. In GDDM-PGF, the state of a business graphics program, before the first plot has been made.

state-2. In GDDM-PGF, the state of a business graphics program after the first plot has been made, thereby constructing the axes.

stylus. A pen-like pointer for indicating positions on the surface of a tablet.

surface chart. A chart similar to a line graph, except that no markers appear and the areas between successive lines are shaded.

symbol. Synonymous with **character**. For example, the following terms all have the same meaning: vector symbols, vector characters, vector text.

symbol cell. Synonym for **character cell**.

symbol matrix. Synonym for **dot matrix**.

symbol set. A collection of symbols, usually but not necessarily forming a font. GDDM applications may use the hardware device's own symbol set. Alternatively, they can use image or vector symbol sets, which the user may have created.

symbol set identifier. In GDDM, an integer (or the equivalent EBCDIC character) by which the programmer refers to a loaded symbol set.

system printer. A printer belonging to the subsystem under which GDDM runs, to which output is sent indirectly by means of system spooling facilities. Contrast with **queued printer**.

T

table chart. In GDDM-PGF, a chart in which the data is presented as numbers arranged in rows and columns.

tablet. (1) A locator device with a flat surface and a mechanism that converts indicated positions on the surface into coordinate data. (2) The IBM 5083 Tablet Model 2, which, with a four-button cursor or stylus, allows positions on the screen to be addressed and the graphics cursor to be moved without use of the keyboard.

tag. In interactive graphics, an identifier associated with one or more primitives that is returned to the program if such primitives are subsequently picked.

terminal. A device, usually equipped with a keyboard and a display unit, capable of sending and receiving information over a link. See also **display terminal**.

text. Characters or symbols sent to the device. GDDM provides alphanumeric text and graphics text.

text attributes. See **graphics text attributes**.

tick marks. In GDDM-PGF, synonym for **scale marks**.

tied data. In GDDM-PGF, data that shares the same set of x points for each component. This is the most common form of data. It was formerly known as **non-paired data**. Contrast with **free data**.

tilted pie chart. A pie chart drawn in three dimensions, which has been tilted away from full face to reveal its three-dimensional properties.

tower chart. A form of business chart in which rows of towers stand on a two-dimensional base. Synonymous with **Manhattan chart** and **skyscraper chart**.

transparency. (1) A document on transparent material suitable for overhead projection. (2) An alphanumeric attribute that allows underlying graphics to show.

TSO. Time sharing option. A subsystem of OS/VS under which GDDM can be used.

U

user exit. A point in GDDM execution where a user routine will gain control if such has been requested.

V

variable cell size. In most devices, the hardware cell size is fixed. But the 3290 Information Panel has a cell size that can be varied. This in turn causes the number of rows or columns on the device to alter.

vector symbol. A character or shape made up of a series of lines or curves.

Vector Symbol Editor. A program supplied with GDDM-PGF, the function of which is to create and edit vector symbol sets (VSS).

vector symbol set (VSS). A set of symbols each of which was originally created as a series of lines and curves.

Venn diagram. A form of business chart in which two populations and their intersection are represented by two overlapping circles.

VM/SP CMS. IBM Virtual Machine/System Product Conversational Monitor System. A system under which GDDM can be used.

VSE. Virtual storage extended. An operating system consisting of VSE/Advanced Functions and other IBM programs. In GDDM, the abbreviation VSE has sometimes been used to refer to the Vector Symbol Editor, but to avoid confusion, this usage is deprecated.

VSS. Vector symbol set.

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