INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)
Volume VIII - User Interface Subsystem
Part 9 - Graph Definition Language Unit Test Plan

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September 1990

Final Report for Period 1 April 1987 - 31 December 1990

Approved for Public Release; Distribution is Unlimited

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This technical report has been reviewed and is approved for publication.

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FOR THE COMMANDER:

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25 July 91

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Copies of this report should not be returned unless return is required by security considerations, contractual obligations, or notice on a specific document.
This unit test plan establishes the methodology and procedures used to test the Graph Definition Language computer program. It details the procedures for testing the Graph Definition Language Unit Test Plan for the Integrated Information Support System Volume VIII - User Interface Subsystem. The abstract provides a summary of the test plan and its purpose.
This technical report covers work performed under Air Force Contract F33600-87-C-0423, DAPro Project. This contract is sponsored by the Manufacturing Technology Directorate, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Bruce A. Rasmussen, Branch Chief, Manufacturing Technology Directorate, through Mr. David L. Judson, Project Manager. The Prime Contractor was Integration Technology Services, Software Programs Division, of the Control Data Corporation, Dayton, Ohio, under the direction of Mr. W. A. Osborne. The DAPro Project Manager for Control Data Corporation was Mr. J. P. Maxwell.

The DAPro project was created to continue the development, test, and demonstration of the Integrated Information Support System (IISS). The IISS technology work comprises enhancements to IISS software and the establishment and operation of IISS test bed hardware and communications for developers and users.

The following list names the Control Data Corporation subcontractors and their contributing activities:

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<th>SUBCONTRACTOR</th>
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<td>Control Data Corporation</td>
<td>Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.</td>
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<tr>
<td>D. Appleton Company</td>
<td>Responsible for providing software information services for the Common Data Model and IDEFIX integration methodology.</td>
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<tr>
<td>ONTEK</td>
<td>Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.</td>
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<tr>
<td>Simpact Corporation</td>
<td>Responsible for Communication development.</td>
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<td>Structural Dynamics</td>
<td>Responsible for User Interfaces, Research Corporation Virtual Terminal Interface, and Network Transaction Manager design, development, implementation, and support.</td>
</tr>
<tr>
<td>Arizona State University</td>
<td>Responsible for test bed operations and support.</td>
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SECTION 1
GENERAL

1.1 Purpose

This unit test plan establishes the methodology and procedures used to adequately test the capabilities of the computer programs identified collectively as the Graph Definition Language and known in this document as the GDL. The GDL is one configuration item of the Integrated Information Support System (IISS) User Interface (UI).

1.2 Project References


1.3 Terms and Abbreviations

Application Generator (AG): A subset of the IISS User Interface that consists of software modules that generate IISS application code and associated form definitions based on a language input. The part of the AG that generates report programs is called the Report Writer. The part of the AG that generates interactive applications is called the Rapid Application Generator.
Application Interface (AI): A subset of the IISS User Interface that consists of the callable routines that are linked with applications that use the Form Processor or Virtual Terminal. The AI enables applications to be hosted on computers other than the host of the User Interface.

Application Process (AP): A cohesive unit of software that can be initiated as a unit to perform some function or functions.

Attribute: A field characteristic such as blinking, highlighted, black, etc., and various other combinations. Background attributes are defined for some forms or windows only. Foreground attributes are defined for items. Attributes may be permanent, i.e., they remain the same unless changed by the application program, or they may be temporary, i.e., they remain in effect until the window is redisplayed.

Closed Figure: A figure is closed if the path traced by a moving point returns to its starting position. The starting position may be arbitrarily assigned. "Fillarea" is synonymous with "closed figure".

Complex Figure: A figure is complex if the path traced by a moving point crosses itself. An arbitrary point may be determined to be contained within the traced boundary if a line drawn to infinity crosses the boundary an odd number of times. If the number of crossings is zero or even, the point is outside the traced boundary.

Dependent Data: Data correlated to a dependent variable.

Dependent Variable: A mathematical variable whose value is determined by that of one or more other variables in a function.

Device Drivers (DD): Software modules written to handle I/O for a specific kind of terminal. The modules map terminal-specific commands and data to a neutral format. Device Drivers are part of the UI Virtual Terminal.

Display List: An internal Form Processor list that contains only those forms that have been added to the screen and are currently displayed on the screen, along with information on where those forms are used.

Element: A graphics line or other primitive composed of graphics lines, such as an arc.
Field: In reference to the Forms Processor, "field" refers to any object on the open or display list. These objects can be forms, items, windows, etc.

In reference to graphs, "field" refers to a collection of one or more graph figures. A graph field can be an axis, curve, pie chart, grid, etc.

Figure: A collection of elements. A figure may be closed or open.

Fillarea: A collection of elements. A fillarea must be closed. "Closed figure" is synonymous with "fillarea".

Form: A structured view which may be imposed on windows or other forms. A form is composed of fields. These fields may be defined as forms, items, windows, prompts, non-graphics lines, and graphics.

Forms Definition Language (FDL): The language in which electronic forms are defined.

Forms Driven Form Editor (FDFE): A subset of the Form Editor which consists of a forms-driven application used to create and/or modify Form Definition files interactively.

Form Editor (FE): A subset of the IISS User Interface that is used to create definitions of forms. The FE consists of the Forms Driven Form Editor (FDFE) and the Forms Language Compiler (FLAN).

Form Hierarchy: A graphic representation of the way in which fields are related to their parent form.

Forms Language Compiler (FLAN): A subset of the Form Editor that consists of a batch process that accepts a series of Forms Definition Language (FDL) statements and produces form definition files as output.

Form Processor (FP): A subset of the IISS User Interface that consists of a set of callable execution-time routines available to an application program for form processing.

Graph: A picture correlated with data that alters as the data changes; by necessity, this is a dynamic (not pre-defined) picture. A graph may be imposed on windows or forms.
Graph Definition Language (GDL): An extension of the Forms Definition Language (FDL) which is used to define business graphs such as pie charts, X-Y plots, and bar charts.

Graph Figure: A collection of graphics primitives. The primitives can be circles, lines, arcs, etc.

Graphics Kernel System (GKS): A 2-dimensional graphics standard which is defined independently of any programming language.

Icon: A collection of figures and points that is pre-defined. An icon may be imposed on windows or forms. "Icon" is synonymous with "picture".

Independent Data: Data that is correlated to an independent variable.

Independent Variable: A mathematical variable whose value is specified first and determines the value of one or more other values in an expression or function. For example, in a business graph of sales versus month, month is the independent variable and sales is the dependent variable, because sales varies by month.

Integrated Information Support System (IISS): A test computing environment used to investigate, demonstrate, and test the concepts of information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous data bases supported by heterogeneous computers interconnected via a Local Area Network (LAN).

Item: A non-decomposable area of a form in which hard-coded descriptive text may be placed and the only defined area where user data may be input/output.

Local Area Network (LAN): A privately owned network that offers reliable, high-speed communications channels optimized for connecting information processing equipment in a limited geographic area.

Message: Descriptive text which may be returned in the standard message line on the terminal screen. They are used to warn of errors or to provide other user information.
Message Line: A line on the terminal screen that is used to display messages.

Open Figure: A figure is open if the path traced by a moving point does not return to its starting position. The starting position may be arbitrarily assigned. "Polyline" is synonymous with "open figure".

Open List: An internal Form Processor list that contains all forms that the application has opened for use along with information on where the form is used.

Operating System (OS): Software supplied with a computer which allows it to supervise its own operations and manage access to hardware facilities such as memory and peripherals.

Page: An instance of a form in a window that is created whenever a form is added to a window.

Physical Device: A hardware terminal.

Picture: A collection of figures and points that is pre-defined. A picture may be imposed on a window or a form. "Picture" is synonymous with "icon".

Picture Definition Language (PDL): An extension of the Forms Definition Language (FDL) which allows the definition of any graphics picture.

Point: A marker or a symbol.

Polyline: A collection of elements. A polyline must be an open figure. "Open figure" is synonymous with "polyline".

Primitive: The smallest unit of graphic detail. A graphic primitive can be a line, point, arc, etc.

Qualified Name: The name of a field preceded by the hierarchy path so that it is uniquely identified.

Report Writer (RW): Part of the Application Generator (AG) that generates source code for report programs based on a language input.

Subform: A form that is used within another form.
Text Editor (TE): A subset of the IISS User Interface that consists of a file editor that is based on the text editing functions built into the Form Processor (FP).

User Data: Data which is either input by the user or output by the application programs to items.

User Interface (UI): A subsystem of IISS that controls the user's terminal and interfaces with the rest of the subsystem. The UI consists of two major subsystems: the User Interface Development System (UIDS) and the User Interface Management System (UIMS).

User Interface Development System (UIDS): A collection of IISS User Interface subsystems that is used by application programmers as they develop IISS applications. The UIDS includes the Form Editor (FE) and the Application Generator (AG).

User Interface Management System (UIMS): The run-time UI. It consists of the Form Processor (FP), Virtual Terminal (VT), Application Interface (AI), the User Interface Services (UIS), and the Text Editor (TE).

User Interface Services (UIS): A subset of the IISS User Interface that consists of a package of routines that aids users in controlling their environment. It includes message management, change password, and application definition services.

User Interface/Virtual Terminal Interface (UI/VTI): Another name for the User Interface.

Window: A dynamic area of a terminal screen on which pre-defined forms may be placed at run-time.

Window Manager: A facility which allows the following to be manipulated: size and location of windows, the device on which an application is running, the position of a form within a window. It is part of the Form Processor (FP).
SECTION 2
DEVELOPMENT ACTIVITY

2.1 Statement of Pretest Activity

During system development, the computer programs were tested progressively. Functionality was incrementally tested and, as bugs were discovered by this testing, the software was corrected.

Each form used in the UTP for business graphs was tested individually. This testing was conducted by the individual program developer in a manual mode. The developer manually entered data onto the screen and observed the results. Any errors were noted by the developer and corrections to the program were then made after the testing session.

2.2 Pretest Activity Results

Testing of the graph forms used in the UTP uncovered a few minor bugs which were then corrected and retested successfully. Testing included exceptional conditions and error conditions for data entered on the forms.
SECTION 3
SYSTEM DESCRIPTION

3.1 System Description

The GDL does not interface directly with end users as an application, rather the Graph Definition Language (GDL) is an extension to the Forms Definition Language (FDL) which enables the definition of graphs through the User Interface software. Physical terminals are assumed to have both video display and graphics, a textual keyboard, four cursor positioning keys or key sequences, a help key or key sequence, a message key, an entry key, and a quit key. The GDL must interface with the following software tools: the Forms Processor (FP), the Forms Compiler (FLAN), C language runtime routines, and the Application Generator (AG). They are used to create or modify FDL files and to create new FD files and finally to display these FD files at run time.

This section describes the interfaces within the graphics software. In the following figures, GI stands for graphics interface, GKS is the graphics software which builds the internal data structures, GKS2 is the actual graphics software, and AI is the application interface. The AI routines are the calls to the UI which specify the actions to be performed. The FP, GI, GKS, and GKS2 systems perform the required actions. For graphics, clipping is performed in the VTI. Existing graphics applications written using the Fortran GKS binding will be able to call the comparable routines in the GKS subsystem. It should be noted that if the Graph Definition Language is used, the application will not normally be using the Graph or Picture AI routines.
3.2 Testing Schedule

The production of business graphs is dependent upon the NTM subsystem of IISS, so testing of the graph capability of the Form Processor should be performed after the NTM has been successfully tested. Within the UI subsystem, this capability is part of the FP, VT, and FLAN, and therefore, there are no other restrictions.
3.3 First Location Testing

These tests of the business graphs capability of the Form Processor require the following:

**Equipment:** IISS VAX, Tektonix model 4100 or 4200 series terminal supported by the VT as listed in the UI Terminal Operator Guide. The terminal should have certain characteristics set. The tester should press the setup key and type the following:

```
  code ansi
dal 30
bypass 00
flagging in/out
eol /\CR/
```

The above may be saved in nonvolatile memory by typing NSAVE. To exit setup mode, press the setup key again.

**Support Software:** The Integrated Information Support System; C run-time libraries.

**Personnel:** One integrator familiar with the UIMS.

**Training:** FP manuals have been previously provided with the past release.

**Deliverables:** The GDL subsystem of the UI.

**Test Materials:** This test uses the test programs GRFTST and GRAPDE and the forms defined in GRFTEST.FDL. Appendix C explains how to create the executables for these programs.

**Security Considerations:** None.

3.4 Subsequent Location Testing

The requirements as listed above need to be met. Since the test consists of a routine that issues the Form Processor calls necessary to supply the data and display the graphical forms, there will be no differences in how testing should occur unless the tester wishes to script. Scripting is discussed in Section 5.
4.1 Test Specification

The following functionality of the GDL is demonstrated by the test outlined in section 5:

List of Functions

GRAPH DEFINITION
1. bar
2. pie
3. line
4. independent axis
5. independent data

ATTRIBUTE DEFINITION
6. color
7. font
8. size
9. upvector
10. line width
11. line type
12. symbol
13. symbol frequency

DATA LOCATION
14. constant list
15. path list

CURVE DEFINITION
16. absolute display
17. additive display
18. dependent axis
19. independent data
20. shading
21. monochromatic shading
22. display
23. monochromatic display
24. legend label
LEGEND
25. enclosed
26. not enclosed
27. horizontal
28. vertical

PIE SEGMENT
29. explosion
30. shading
31. monochromatic shading
32. legend label
33. label
34. inside percent label
35. outside percent label
36. inside quantity label
37. outside quantity label

AXIS DEFINITION
38. length
39. log scale
40. linear scale
41. grid lines
42. fine grid lines
43. horizontal
44. vertical
45. location
46. label
47. maximum limit
48. minimum limit
49. minor tick marks
50. major tick marks by step
51. major tick marks by number
52. major tick mark labels

AUTOMATIC GENERATION
53. independent axis
54. dependent axis
55. tick marks
56. axis length
57. minimum axis value
58. maximum axis value
59. tick mark labels
60. legend labels
61. pie segments
62. pie segment percent label
63. automatic layout
Dynamic Creation and Alteration of Graph Definitions

GENERAL GRAPH DEFINITION
64. define a graph
65. define a graph location
66. delete graph
67. add graph label
68. remove graph labels
69. add where data is located clause
70. add a constant list of data
71. define an attribute bundle
72. delete an attribute bundle
73. define a graphics clipping window
74. define the graph extent within the window
75. add an independent axis
76. legend label
77. delete where data is located clause

LEGEND DEFINITION
78. add legend
79. delete legend

PIE DEFINITION
80. pie segment definition
81. delete pie segment labels
82. percent or quantity label to segment
83. pie segment label
84. delete pie segment

CURVE DEFINITION
85. define a curve
86. delete a curve

AXIS DEFINITION
87. delete tick mark labels
88. delete axis labels
89. delete axis definition
90. define maximum and minimum values on axis
91. location of axis
92. add tick mark labels
93. add axis labels
94. define an axis
95. add tick marks
96. polyline clipping
97. fillarea clipping
98. text clipping

Tables 4-1 and 4-2 show the direct correspondence between the test graphs and the functional requirements as listed in this section. These functions directly correspond to the detailed functional requirements of the Graph Definition Language Development Specification. The '.' indicates the tests for the functionality implemented in the current release. The '*' indicates functionality not yet implemented.
| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| 23 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 24 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 25 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 26 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 27 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 28 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 29 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 30 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 31 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 32 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 33 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
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| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
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| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
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Table 4-1 Matrix Mapping GDL Functions to Test Graphs
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Table 4-2 Matrix Mapping GDL Functions to Test Graphs

The test activities labeled A through GG map to the figures in Appendices A and B as follows:

A - Figure A-1
B - Figure A-2
C - Figure A-3
D - Figure A-4
E - Figure A-5
F - Figure A-6
G - Figure A-7
H - Figure A-8
I - Figure A-9
J - Figure A-10
K - Figure A-11
L - Figure A-12
M - Figure A-13
N - Figure A-14
O - Figure A-15
P - Figure A-16
Q - Figure A-17
R - Figure A-18
S - Figure A-19
4.2 Testing Methods and Constraints

The testing as outlined in Section 5 must be followed. The required input is stated for each test. This testing tests the normal mode of operation of these functions and does not completely exercise all the error combinations that a user of GDL might create by faulty definitions of the graph. These tests have been done, however, through the normal testing done by the developer of these functions. IISSULIB and IISSSLIB should point to the default directory. No additional constraints are placed on this unit test besides those listed in sections 3.2 and 3.3 of this unit test plan.

4.3 Test Progression

The progression of testing of the GDL is fully outlined in Section 5 of this unit test plan. This progression should be followed exactly to insure the successful testing of this IISS configuration item.

4.4 Test Evaluation

The test results are evaluated by comparing the information returned on the various output screens with that specified as successful for the given test. As outlined in section 5, each test of GDL functionality provides a screen with the output for a successful test. The data necessary for input is done automatically before the output screen. The only differences found should be the date and time stamps on the IISS Function Screen (Figure 5-3) and the first test output screen (Figure A-1).
SECTION 5
TEST SPECIFICATIONS AND EVALUATIONS

5.1 Test Description

Two test programs are used to test the GDL. The test program GRFTST uses explicit FP calls to place the form within a window, place data within the form fields where the graph data is to be located, display the graph form, and remove the graph form from the window. Since the program issues the data using data from internal arrays, no data entry is required by the tester.

The test program GRAFDE is an interactive application that is generated using the Rapid Application Generator. GRAFDE represents user entered data as a pie, bar, or line graph.

5.2 Test Control

As outlined, this unit test is a manual test which may be done by anyone. The required input data for each function being tested, the resulting successful output and the order of the testing are completely specified below. Accurate observation of the resulting successful output must be made to ensure the unit test was done properly.

5.3 Test Procedures

To run the unit test plan in the VAX/VMS environment as outlined below, one must be logged onto an IISS account. The NTM must be up and running and the UI logical names IISSFILIB, IISSULIB, IISSSLIB, and IISSMLIB must be set properly at the group level. IISSFILIB points to the directory containing system form definitions (FD files). IISSULIB points to the directory containing the user's form definitions (FD files). IISSSLIB points to the directory containing the user's form definition source files (FDL files). IISSMLIB points to the directory containing the UI error and help messages (MSG files). To perform this test IISSULIB and IISSSLIB must be pointing to the default directory.
Assuming the NTM is up and running, an IISS user may start this test as follows:

```bash
$ SET DEF <to directory containing NTM environment>
$ TEK4100
```

These commands start up the TEK4100 device driver.

5.3.1 Access to GDL Test Programs

Following entry of the system command "TEK4100" which activates the User Interface the following form appears:

```
+---------------------------------------------------------------------------------
| USER ID:  
| PASSWORD: 
| ROLE:     
+---------------------------------------------------------------------------------
```

Figure 5-1 IISS Logon Screen

(1) USER ID is the identification name of the user, and is 1 to 10 alpha-numeric characters. USER ID is input as "MORENC".

(2) PASSWORD must be the password associated with the USER ID, and is 1 to 10 alpha-numeric characters. PASSWORD was input as "STANLEY".
(3) ROLE is any of the identifiers which are associated with the USER ID, and is 1 to 10 alpha-numeric characters. It will be checked against functions and applications which are selected by the user. ROLE is input as "MANAGER".

When this form is correctly completed and the <ENTER> key is pressed, the IISS Function Screen is displayed.

<table>
<thead>
<tr>
<th>IISS TEST BED VERSION 2.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE:<strong>/</strong>/__</td>
</tr>
<tr>
<td>FUNCTION:__________</td>
</tr>
</tbody>
</table>

Msg: 0 application

Figure 5-2 IISS Function Screen

When this form appears, the cursor is located in the input field labeled FUNCTION. The items in the form are summarized below:

(1) DATE contains the current date. This may not be changed by the user.

(2) TIME contains the current time. This may not be changed by the user.
(3) USER ID is the user's identification that was entered in the previous form. This may not be changed by the user.

(4) ROLE is the currently active role and was entered in the previous form. This may be changed at any time.

(5) FUNCTION is the function the user desires to activate.

To run the GDL test programs, proceed as described in the following sections.

5.3.2 Running the GRFTST Program

To run the GRFTST program, enter "GRFTST" in the FUNCTION field on the IISS Function Screen and press the <ENTER> key. This program produces the 27 graphs shown in Appendix A. Test Graph A is displayed when the program begins. Each succeeding graph is displayed by repeatedly pressing the <ENTER> key. Before proceeding to the next graph, the graph displayed on the terminal screen should be compared with the corresponding graph in Appendix A. When all 27 graphs have been displayed and compared, a final press of the <ENTER> key terminates the program and redisplays the IISS Function Screen.
5.3.3 **Running the GRAFDE Program**

To run the GRAFDE program, enter "GRAFDE" in the FUNCTION field on the IISS Function Screen and press the <ENTER> key. The following screen is displayed.

![Initial GRAFDE Screen](image-url)

**Figure 5-3 Initial GRAFDE Screen**
Enter the data as shown in Figure 5-4 and press the appropriate function key to produce the desired graph as described in Table 5-1.

![Figure 5-4 Test Data for GRAFDE](image)

A total of six separate screens may be presented using the data. To display the appropriate graph, press the indicated function key.

<table>
<thead>
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<th>PFKEY</th>
<th>APPENDIX FIGURE</th>
<th>DESCRIPTION</th>
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<td>5</td>
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<td>Pie chart with percentages outside</td>
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<tr>
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<td>B-2</td>
<td>Horizontal bar chart</td>
</tr>
<tr>
<td>7</td>
<td>B-3</td>
<td>Line graph</td>
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<tr>
<td>9</td>
<td>B-4</td>
<td>Pie chart with percentages inside and labels</td>
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<td>B-5</td>
<td>Vertical bar chart</td>
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<td>B-6</td>
<td>Line chart with area under curves shaded</td>
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<tr>
<td>4</td>
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<td>Quit application</td>
</tr>
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</table>

Table 5-1 PFKEY and Figure Correlation

The screens displayed should be compared with the indicated graph figures in Appendix B. Only the time/date stamps should differ.
APPENDIX A
SCREENS AND GDL FOR GRFTST

This appendix contains all the screens for the first test of the Graph Definition Language. The necessary FDL follows the screens.
Figure A-1 and corresponding GDL
create form grftstl
size 80 by 30
prompt at 2 20 "ENGINEERING CHANGE ANALYSIS SYSTEM -"
prompt at 3 30 "CHANGE COST GRAPH"
attribute out (background white, display blue, guarded, nowrite)
attribute out2 (background blue, display yellow, guarded)
attribute out3 (background red, display black, guarded)
attribute nosee (guarded, hidden)

item curdat
at 2 68
size 8
prompt at 2 62 "DATE:"
'value .'_date'
display as out

item curtim
at 3 68
size 8
prompt at 3 62 "TIME:"
'value .'_time'
display as out

item anlid
at 5 10
size 3
prompt at 5 2 "ANL ID:"
display as out2

item chgid
at 6 10
size 6
prompt at 6 2 "CHG ID:"
display as out2

item chgdsc
at 6 28
size 50
prompt at 6 18 "CHG DESC:"
display as out3

item eleid
at 7 10
size 3
prompt at 7 2 "ELE ID:"
display as out2
item eledsc
at 7 28
size 50
prompt at 7 18 "ELE DESC:"
display as out3

graph cstgrf
at 9 2
display as blue
size 60 by 21

form csttab
at 9 65
display as black
size 16 by 21

create bar graph cstgrf
using ('csttab.ids' axis ax1)
attribute a line (display yellow)
attribute b prompt (display white)
attribute c prompt (display green)
attribute d prompt (display red)
legend at 2 2
label display as d, at 20 2 "DISPOSITION = SCRAP + REWORK"

curve rework
'csttab.rewcst' using axis ax2
legend c "rework"
absolute

curve misc
'csttab.mscrcst'
additive using curve scrap
legend c "misc."

curve scrap
'csttab.scrcst'
additive using curve rework
legend c "scrap"
axis ax1
horizontal
display as a
at 16 25
min 0
size 30
label b "result id"
tick every 1 d "1", "2", "3", "4", "5", "6", "7", "8", "9", "10"

axis ax2
at 16 25
size 15
label b "cost $"
vertical
min 0
display as a

create form csttab
prompt at 1 2 "RES."
prompt at 2 2 "ID"
prompt at 1 8 "EFF."
prompt at 2 8 "DATE"
attribute hid (hidden, guarded)

item dates (10 v 0)
size 8
at 3 6
display as magenta

item ids (10 v 0)
size 3
at 3 2
domain (numeric)
display as cyan

item msccst (10 v 0)
size 6
at 3 15
display as hid
domain (numeric)

item scrcst (9 v 0)
at 3 35
domain (numeric)
display as hid
size 6
item rewcst (5 v 0)
at 3 45
size 6
domain (numeric)
display as hid
Figure A-2 and corresponding GDL
create form grftst2
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grfl
  at 1 15
  size 60 by 20
  display as blue

create line graph grfl
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  background blue

curve aaa
  'grftst2.i1' using axis ax2
  absolute

curve two
  'grftst2.i2'
  additive using curve aaa

axis ax1
  horizontal
  display as x
  at 15 30
  size 30
axis ax2
at 15 30
size 15
vertical
display as x
Figure A-3 and corresponding GDL

- 29.6%
- 66.7%
- 12.3%
create form grftst3
  size 80 by 30

form fgrf (3 v 0)
  at 1 1
  size 5 by 1

graph grf2
  at 1 15
  size 60 by 20
  display as blue

create pie graph grf2
  at 10 30
  size 20 by 8
  using ('grftst3.fgrf(*).il')

  pie 1
    shade color red

  pie 2
    shade color magenta

  pie 3
    shade color white

create form fgrf

item i1
  display as red
  at 1 2
  size 3
  domain (numeric)
Figure A-4 and corresponding GDL
create form grftst4
  size 80 by 30

item il (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

graph grf3
  at 1 15
  size 60 by 20
  display as blue

create pie graph grf3
  at 10 30
  size 20 by 8
  using ('grftst4.il')

pie 1
  shade color red

pie 2
  shade color magenta
  explode 2

pie 3
  shade color white
Figure A-5 and corresponding GDL
create form grftst5
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf4
  at 1 15
  size 60 by 20
  display as blue

create line graph grf4
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  background blue

curve aaa
  'grftst5.i1' using axis ax2
  absolute

curve two
  'grftst5.i2'
  additive using curve aaa

axis ax1
  horizontal
  display as x
  at 18 2
  size 30
  label c "this is a label"
axis ax2
  at 18 2
  size 15
  label c "this is a label"
  vertical
  display as x
Figure A-6 and corresponding GDL
create form grftst6
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf5
  at 1 15
  size 60 by 20
  display as blue

create line graph grf5
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  background blue

curve aaa
  'grftst6.i1' using axis ax2
  absolute

curve two
  'grftst6.i2'
  additive using curve aaa

axis ax1
  horizontal
  display as x
  label c "this is axis ax1"
  at 15 30
  size 30
axis ax2
  at 15 30
  size 15
  vertical
display as x
label xy "this is axis ax2"
Figure A-7 and corresponding GDL
create form grftst7
  size 80 by 30

item il (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

graph grf6
  at 1 15
  size 60 by 20
  display as blue

create pie graph grf6
  at 10 2
  size 40 by 16
  using ('grftst7.il')

pie 1
  shade color red

pie 2
  shade color magenta

pie 3
  shade color white
  explode 20
Figure A-8 and corresponding GDL
create form grftst8
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

graph grf7
  at 1 15
  size 60 by 20
  display as blue

create pie graph grf7
  at 2 2
  size 40 by 16
  using ('grftst8.il')

  pie 1
    shade color yellow

  pie 2
    shade color white

  pie 3
    shade color red
    explode 20
Figure A-9 and corresponding GDL
create form grftst9
size 80 by 30

item il (3 v 0)
display as red
at 1 2
size 3
domain (numeric)

graph grf8
at 1 15
size 60 by 20
display as blue

create pie graph grf8
at 10 30
size 20 by 8
using ('grftst9.il')

pie 1
shade color red

pie 2
shade color magenta
explode 35

pie 3
shade color white
Figure A-10 and corresponding GDL
create form grftst10
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf9
  at 1 15
  size 60 by 20
  display as blue

create bar graph grf9
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  background blue

curve aaa
  'grftst10.i1' using axis ax2
  absolute

curve two
  'grftst10.i2'
  additive using curve aaa

axis ax1
  horizontal
  display as x
  at 15 30
  tick 5 1 c "A" "B" "C"
  size 30
axis ax2
  at 15 30
  size 15
  vertical
  display as x
Figure A-11 and corresponding GDL

[Diagram with axes and curves labeled as 'two' and 'aaa']
create form grftst11
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf10
  at 1 15
  size 60 by 20
  display as blue

create line graph grf10
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend at 2 2
  background blue

curve aaa
  'grftst11.i1' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftst11.i2'
  additive using curve aaa
  legend xy "curve two"

axis ax1
  horizontal
  display as x
  at 15 30
  size 30
axis ax2
  at 15 30
  size 15
  vertical
  display as x
Figure A-12 and corresponding GDL
create form grftstl2
  size 80 by 30

  item i1 (3 v 0)
    display as red
    at 1 2
    size 3
    domain (numeric)

  item i2 (5 v 0)
    display as yellow
    at 1 6
    size 3
    domain (numeric)

graph grf11
  at 1 15
  size 60 by 20
  display as blue

  create line graph grf11
    using (1, 2, 3, 4, 5 axis ax1)
    attribute a fill (display cyan)
    attribute b line (display magenta)
    attribute xy prompt (display yellow)
    attribute x line (display yellow)
    attribute c prompt (display white)
    attribute d line (display green)
    legend at 2 2
    label display as c, at 15 2 "STUPID GRAPH"
    background blue

  curve aaa
    'grftstl2.i1' using axis ax2
    absolute
    legend xy "curve aaa"

  curve two
    'grftstl2.i2'
    additive using curve aaa
    legend xy "curve two"
axis ax1
  horizontal
display as x
at 15 30
size 30
label c "axis ax1"

axis ax2
at 15 30
size 15
label c "axis ax2"
vertical
display as x
Figure A-13 and corresponding GDL
create form grftstl3
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf12
  at 1 15
  size 60 by 20
  display as blue

create line graph grfl2
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend h at 2 2
  label display as c, at 15 2 "STUPID GRAPH"
  background blue

curve aaa
  'grftstl3.i1' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftstl3.i2'
  additive using curve aaa
  legend xy "curve two"
axis ax1
horizontal
display as x
at 15 30
size 30
label c "axis ax1"

axis ax2
at 15 30
size 15
label c "axis ax2"
vertical
display as x
Figure A-14 and corresponding GDL
create form grftstl4
  size 80 by 30

item il (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grfl3
  at 1 15
  size 60 by 20
  display as blue

create bar graph grf13
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend h at 2 2
  label display as c, at 1 5 2 "STUPID GRAPH"
  background blue

curve aaa
  'grftstl4.il' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftstl4.i2'
  additive using curve aaa
  legend xy "curve two"
axis ax1
  horizontal
display as x
at 15 30
size 30
label c "axis ax1"

axis ax2
  at 15 30
  size 15
  label c "axis ax2"
  vertical
display as x
Figure A-15 and corresponding GDL
create form grftst15
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf14
  at 1 15
  size 60 by 20
  display as blue

create bar graph grf14
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend at 2 2
  label display as c, at 15 2 "STUPID GRAPH"
  background blue

curve aaa
  'grftst15.i1' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftst15.i2'
  additive using curve aaa
  legend xy "curve two"
axis ax1
  horizontal
  display as x
  at 15 30
  size 30
  label c "axis ax1"

axis ax2
  at 15 30
  size 15
  label c "axis ax2"
  vertical
  display as x
Figure A-16 and corresponding GDL
create form grftstl6
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf15
  at 1 15
  size 60 by 20
  display as blue

create line graph grf15
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend at 2 2 box
  label display as c, at 15 2 "STUPID GRAPH"
  background blue

curve aaa
  'grftst16.i1' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftst16.i2'
  additive using curve aaa
  legend xy "curve two"
axis ax1
  horizontal
display as x
at 15 30
size 30
label c "axis ax1"

axis ax2
at 15 30
size 15
label c "axis ax2"
vertical
display as x
Figure A-17 and corresponding GDL
create form grftstl7
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf16
  at 1 15
  size 60 by 20
  display as blue

create line graph grf16
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend h at 2 2 box
  label display as c, at 15 2 "STUPID GRAPH"
  background blue

curve aaa
  'grftstl7.i1' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftstl7.i2'
  additive using curve aaa
  legend xy "curve two"
axis ax1
    horizontal
display as x
at 15 30
size 30
label c "axis ax1"

axis ax2
    at 15 30
size 15
label c "axis ax2"
vertical
display as x
Figure A-18 and corresponding GDL
create form grftst18
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf17
  at 1 15
  size 60 by 20
  display as blue

create bar graph grf17
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend at 2 2 box
  label display as c, at 15 2 "STUPID GRAPH"
  background blue

curve aaa
  'grftst18.i1' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftst18.i2'
  additive using curve aaa
  legend xy "curve two"
axis ax1
  horizontal
display as x
at 15 30
size 30
label c "axis ax1"

axis ax2
  at 15 30
  size 15
  label c "axis ax2"
  vertical
display as x
Figure A-19 and corresponding GDL
create form grftst19
  size 80 by 30

item i1 (3 v 0)
display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grf18
  at 1 15
  size 60 by 20
  display as blue

create bar graph grf18
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend h at 2 2 box
  label display as c, at 15 2 "STUPID GRAPH"
  background blue

curve aaa
  'grftst19.i1' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftst19.i2'
  additive using curve aaa
  legend xy "curve two"
axis ax1
horizontal
display as x
at 15 30
size 30
label c "axis ax1"

axis ax2
at 15 30
size 15
label c "axis ax2"
vertical
display as x
Figure A-20 and corresponding GDL
create form grftst20
  size 80 by 30

item i1 (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

item i2 (5 v 0)
  display as yellow
  at 1 6
  size 3
  domain (numeric)

graph grfl19
  at 1 15
  size 60 by 20
  display as blue

create bar graph grfl19
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a fill (display cyan)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend h at 6 2 box
text at 15 2 "STUPID GRAPH"
  background blue

curve aaa
  'grftst20.i1' using axis ax2
  absolute
  legend xy "curve aaa"

curve two
  'grftst20.i2'
  additive using curve aaa
  legend xy "curve two"
axis ax1
  horizontal
display as x
at 15 30
size 30
label c "axis ax1"

axis ax2
at 15 30
size 15
label c "axis ax2"
vertical
display as x
Figure A-21 and corresponding GDL
create form grftst21
   size 80 by 30

item il (3 v 0)
   display as red
   at 1 2
   size 3
   domain (numeric)

graph grf20
   at 1 15
   size 60 by 20
   display as blue

create pie graph grf20
   at 2 2
   size 40 by 16
   using ('grftst21.il')
   attribute c prompt (display magenta)

pie 1
   quantity c outside
   shade color yellow

pie 2
   percent c inside
   quantity c outside
   shade color white

pie 3
   shade color red
   explode 20
Figure A-22 and corresponding GDL
create form grftst22
  size 80 by 30

item il (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

graph grf21
  at 1 15
  size 60 by 20
  display as blue

create pie graph grf21
  at 2 2
  size 40 by 16
  using ('grftst22.il')
  attribute c prompt (display magenta)

pie 1
  quantity c outside
  shade color yellow

pie 2
  shade color red

pie 3
  percent c outside
  quantity c outside
  label c "this is a white pie slice"
  shade color white
  explode 20
Figure A-23 and corresponding GDL
create form grftst23
  size 80 by 30

item il (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

graph grf22
  at 1 15
  size 60 by 20
  display as blue

create pie graph grf22
  at 2 2
  size 40 by 16
  using ('grftst23.il')
  attribute c prompt (display magenta)
  legend at 2 48 box

pie 1
  quantity c outside
  shade color yellow
  legend c "segment 1"

pie 2
  shade color red
  legend c "segment 2"

pie 3
  percent c outside
  quantity c outside
  shade color white
  legend c "segment 3"
  explode 20
Figure A-24 and corresponding GDL
create form grftst24
  size 80 by 30

  item il (3 v 0)
    display as red
    at 1 2
    size 3
    domain (numeric)

graph grf23
  at 1 15
  size 60 by 20
  display as blue

create pie graph grf23
  at 5 2
  size 40 by 10
  using ('grftst24.il')
  attribute c prompt (display magenta)
  legend at 5 45 box

  pie 1
    quantity c outside
    shade color yellow
    legend c "segment 1"

  pie 2
    shade color red
    legend c "segment 2"

  pie 3
    percent c outside
    quantity c outside
    shade color white
    legend c "segment 3"
    explode 20
Figure A-25 and corresponding GDL
create form grftst25
  size 80 by 30

item il (3 v 0)
  display as red
  at 1 2
  size 3
  domain (numeric)

graph grf24
  at 1 15
  size 60 by 20
  display as blue

create pie graph grf24
  at 5 2
  size 40 by 10
  using ('grftst25.ii')
  attribute a prompt (display red)
  attribute b prompt (display blue)
  attribute c prompt (display magenta)
  legend at 5 45 box

pie 1
  quantity c outside
  shade color yellow
  percent b inside
  legend c "segment 1"

pie 2
  shade color red
  label a "The Shadow knows!!"
  legend c "segment 2"

pie 3
  percent c outside
  quantity c outside
  shade color white
  label c "Who knows what evil lurks"
  label c "in the hearts of men?"
  legend c "segment 3"
  explode 20
Figure A-26 and corresponding GDL
create form grftst26
size 80 by 30

item i1 (3 v 0)
display as red
at 1 2
size 3
domain (numeric)

item i2 (5 v 0)
display as yellow
at 1 6
size 3
domain (numeric)

graph grf25
at 1 15
size 60 by 20
display as blue

create bar graph grf25
using (1, 2, 3, 4, 5 axis ax1)
attribute a fill (display cyan)
attribute b line (display magenta)
attribute xy prompt (display yellow)
attribute x line (display yellow)
attribute c prompt (display white)
attribute d line (display green)

curve aaa
'grftst26.i1' using axis ax2
absolute

curve two
'grftst26.i2'
additive using curve aaa

axis ax1
horizontal
display as x
at 15 30
size 30
axis ax2
  at 15 30
  size 15
  vertical
display as x
Figure A-27 and corresponding GDL
create form grftst27
  size 80 by 30

item i1 (3 v 0)
display as red
  at 1 2
  size 3
domain (numeric)

item i2 (5 v 0)
display as yellow
  at 1 6
  size 3
domain (numeric)

graph grf26
  at 1 15
  size 60 by 20
  display as blue

create bar graph grf26
  using (1, 2, 3, 4, 5 axis ax1)
  attribute a line (display cyan)
  attribute e line (display red)
  attribute b line (display magenta)
  attribute xy prompt (display yellow)
  attribute x line (display yellow)
  attribute c prompt (display white)
  attribute d line (display green)
  legend at 2 2
  background blue

curve aaa
  'grftst10.i1' using axis ax2
  absolute
  shade color yellow
  display as a

curve two
  'grftst10.i2'
  additive using curve aaa
  shade color green
  display as e
axis ax1
   horizontal
display as x
at 15 30
tick 5 1 c "A" "B" "C"
size 30
fine grid

axis ax2
at 15 30
size 15
vertical
display as x
grid
maximum 110
APPENDIX B
SCREENS AND GDL FOR GRAFDE

This appendix contains all the screens for the second test of the Graph Definition Language. The corresponding GDL follows the screens. Also included is the ADL that defines the interactive portion of the application.

create application grafdemo

keypad ( entkey = 0 exitkey = 4 )

on ( startup() )
    { present masterfrm }

on ( pick ( piel1 ) )
    { present graffrm1 in 'grafwin' }

on ( pick ( bar1 ) )
    { present graffrm2 in 'grafwin' }

on ( pick ( line1 ) )
    { present graffrm3 in 'grafwin' }

on ( pick ( pie2 ) )
    { present graffrm4 in 'grafwin' }

on ( pick ( bar2 ) )
    { present graffrm5 in 'grafwin' }
on ( pick ( line2 ))
{
    present graffrm6 in 'grafwin'
}
on ( pick ( exitkey ))
{
    exit
}
create form masterfrm

keypad (exitkey = 4 pie1 = 5 bar1 = 6 line1 = 7 pie2 = 9
bar2 = 10 line2 = 11)
    size 79 by 23
    prompt at 1 23
        "ENGINEERING CHANGE ANALYSIS CENTER"
    prompt at 2 32
        "CHANGE COST GRAPH"
    attribute BLAKGARD (background black, display yellow,
guarded, nowrite)

ITEM todat
    at 1 68
    size 8
    prompt at 1 62 "DATE:"
    value '.date'
    display as BLAKGARD

ITEM curtime
    at 2 68
    size 8
    prompt at 2 62 "TIME:"
    value '.time'
    display as BLAKGARD

form userdat
    at 3 2
    size 78 by 6

window grafwin
    at 9 2
    size 78 by 15
    display as XPARNT
create form userdat
size 78 by 6
prompt at 1 11
prompt at 2 2
"Rework:
prompt at 3 2
"Scrap :
prompt at 4 2
"Misc :
prompt at 6 2
"Enter data and press <PF5> - Pie, <PF6> - Bar,<PF7> - Line"
form datafrm (4 h 5)
at 2 10
size 7 by 3

create form datafrm
size 7 by 3

item rework
at 1 2
size 6
display as INPUT
domain ( numeric )

item scrap
at 2 2
size 6
display as INPUT
domain ( numeric )

item misc
at 3 2
size 6
display as INPUT
domain ( numeric )
Figure B-1 and corresponding GDL
create form graffrm1
  size 79 by 15
graph piegraf
  at 1 1
  size 79 by 15
  display as XPARNT
create pie graph piegraf
  at 3 15
  size 50 by 9
  using
    ('datafrm(1).rework','datafrm(1).scrap','datafrm(1).misc')
  attribute bluetext prompt (display blue)
  attribute whittext prompt (display white)

pie 1
  shade color red
  percent whittext outside

pie 2
  shade color white
  explode 20
  percent whittext outside

pie 3
  shade color blue
  percent whittext outside
Figure B-2 and corresponding GDL
create form graffrm2
  size 79 by 15

graph bargraf
  at 1 1
  size 79 by 15
  display as XPARNT

create bar graph bargraf
  using (1,2,3,4 AXIS AX1)
  attribute whitline line (display white)
  attribute redtext prompt (display red)
  attribute bluetext prompt (display blue)
  attribute whittext prompt (display white)
  legend at 2 2

curve rework
  'datafrm(*).rework' using axis ax2
  legend redtext "rework"
  shade color red
  absolute

curve scrap
  'datafrm(*).scrap' using axis ax2
  legend whittext "scrap"
  shade color white
  additive using curve rework

curve misc
  'datafrm(*).misc' using axis ax2
  legend bluetext "misc"
  shade color blue
  additive using curve scrap

axis ax1
  horizontal
  size 45
  display as whitline
  at 12 22
  label whittext "YEAR"
  tick 4 whittext "1987" "1986" "1985" "1984"
axis ax2
vertical
size 12
display as whitline
at 12 22
min 0
label whittext " $ (in thousands)"
grid
Figure B-3 and corresponding GDL
create form graffrm3
  size 79 by 15

graph linegraf
  at 1 1
  size 79 by 15
  display as XPARNT

create line graph linegraf
  using (1,2,3,4 AXIS AXI)
  attribute redline line (display red)
  attribute whiteline line (display white)
  attribute blueline line (display blue)
  attribute redtext prompt (display red)
  attribute whitetext prompt (display white)
  attribute bluetext prompt (display blue)
  attribute cyanline line (display cyan)
  legend at 2 2

curve rework
  'datafrm(*).rework' using axis ax2
  legend redtext "rework"
  display as redline
  absolute

curve scrap
  'datafrm(*).scrap' using axis ax2
  legend whitetext "scrap"
  display as whiteline
  absolute

curve misc
  'datafrm(*).misc' using axis ax2
  legend bluetext "misc"
  display as blueline
  absolute

axis ax1
  horizontal
  display as cyanline
  at 13 22
  size 45
  label whitetext "YEAR"
  tick 4 whitetext "1987" "1986" "1985" "1984"
  grid
axis ax2
vertical
display as cyanline
at 13 22
min 0
size 12
label whittex " $ (in thousands)" 
grid
Figure B-4 and corresponding GDL
create form graffrm4
size 79 by 15

graph piegraf2
  at 1 1
  size 79 by 15
  display as XPARNT

create pie graph piegraf2
  at 3 15
  size 50 by 9
  using
  ('datafrm(1).rework','datafrm(1).scrap','datafrm(1).misc')
  attribute bluetext prompt (display blue)
  attribute whittext prompt (display white)

pie 1
  shade color red
  percent whittext inside
  label whittext "Rework"

pie 2
  shade color white
  explode 20
  percent bluetext inside
  label whittext "Scrap"

pie 3
  shade color blue
  percent whittext inside
  label whittext "Misc."
Figure B-5 and corresponding GDL
create form graffrm5
size 79 by 15

graph bargraf2
at 1 1
size 79 by 15
display as XPARNT

create bar graph bargraf2
using (1,2,3,4 AXIS AX1)
attribute whitline line (display white)
attribute redtext prompt (display red)
attribute bluetext prompt (display blue)
attribute whittext prompt (display white)
legend at 2 2

curve rework
'datafrm(*).rework' using axis ax2
legend redtext "rework"
shade color red
absolute

curve scrap
'datafrm(*).scrap' using axis ax2
legend whittext "scrap"
shade color white
absolute

curve misc
'datafrm(*).misc' using axis ax2
legend bluetext "misc"
shade color blue
absolute

axis ax1
vertical
size 12
display as whitline
at 12 22
label whittext "YEAR"
tick 4 whittext "1987" "1986" "1985" "1984"
axis ax2
  horizontal
  size 45
  display as whitline
  at 12 22
  min 0
  label whittext "  $ (in thousands)"
  grid
create form graffrm6
  size 79 by 15
graph linegraf2
  at 1 1
  size 79 by 15
  display as XPARNT
create line graph linegraf2
  using (1,2,3,4 AXI AXI)
  attribute redline line (display red)
  attribute whitline line (display white)
  attribute blueline line (display blue)
  attribute redtext prompt (display red)
  attribute whittext prompt (display white)
  attribute bluetext prompt (display blue)
  attribute cyanline line (display cyan)
  legend at 2 2
curve rework
  'datafrm(*).rework' using axis ax2
  legend redtext "rework"
  display as redline
  absolute
  shade color red
curve scrap
  'datafrm(*).scrap' using axis ax2
  legend whittext "scrap"
  display as whitline
  additive using curve rework
  shade color white
curve misc
  'datafrm(*).misc' using axis ax2
  legend bluetext "misc"
  display as blueline
  additive using curve scrap
  shade color blue
axis ax1
  horizontal
  display as cyanline
  at 13 22
  size 45
  label whittext "YEAR"
tick 4 whittext "1987" "1986" "1985" "1984"
grid
axis ax2
vertical
display as cyanline
at 13 22
min 0
size 12
label whitext " $ (in thousands)"
grid
APPENDIX C

PRE-TEST PROCEDURES

This appendix describes the procedures for compiling and linking the test programs and for compiling the form definitions prior to running the tests.

For the first test, it is necessary to compile and link the test program. The following steps should be executed once the user has moved to the directory which contains the source code, grftst.c.

\$ CC GRFTST
\$ DEFNTM
\$ @LGRFTST

Once the link has finished, the form definition file GRFTEST.FDL must be compiled. The following commands should be issued.

\$ FLAN GRFTEST

The warnings may be ignored. All the necessary FD files will have been created and put in the location defined by IISSFLIB. NOTE that these steps may have been performed as part of the Configuration Management build process for the release.

For the second test, it is necessary to run the application generator. This may be performed in the IISS environment. Once an NTM is running, the IISS Login Screen (Figure 5-1) and Function Screen (Figure 5-2) may be brought up as described in Section 5. On the IISS Function Screen, enter APPGENER in the FUNCTION field. The following screen will appear when the <ENTER> key is pressed:
Enter GRFDEMO onto the screen where the ADL file name is requested. Once the RAP has generated the FD files and the application, an application terminated message is displayed. Press the <QUIT> key to return to the IISS Function Screen. Press the <QUIT> key again to return to the system prompt.

Once the VAX system prompt is obtained, the program needs to be compiled and linked using the following commands:

```bash
$ CC GRAFDE
$ @cmdir:[ui]LNKAPC GRAFDE nomap GRAFDE
```

Before the test programs can be run, they must be defined in the UI database using SYSGEN. This is done as follows:
$ VT100

Fill in the fields on the IISS Logon Screen as follows:

Username: MORENC
Password: STANLEY
Role: MANAGER
Press <ENTER>

Fill in the FUNCTION field on the IISS Function Screen as follows:

FUNCTION: SYSGEN
Press <ENTER>

The SYSGEN main menu screen will be displayed

Press <PF7>

In the input field enter "GRAFDE".

Press <PF7>

Enter the following information:

Description: Business Graphs Interactive Test Program
Name: SDGRAFDE7L
Press <ENTER>

When the input field appears under Authorized Roles, enter "*".

Press <ENTER>

Application acknowledges entry.

Press <QUIT>

Displays the SYSGEN main menu.

Press <PF7>

In the input field enter "GRFTST".

Press <PF>

Enter the following information:

Description: Business Graphs Test Program
Name: SDGRFTSTZZ
Press <ENTER>

When the input field appears under Authorized Roles, enter "*".
Press <ENTER> Application acknowledges entry.
Press <QUIT> Displays the SYSGEN main menu.
Press <QUIT> Displays the IISS Function Screen.
Press <QUIT> Returns to the system prompt.

The test program GRAFDE and GRFTST are now defined to IISS and the unit test may be performed.