CSDS User Interface
ISDAT *cuigr* Client
User's Manual

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with change bars for changes introduced in issue 2.0 and 2.1

Contents

1 Introduction

1.1 Intended readership

This manual is intended for the user of the ISDAT *cuigr* client within the CSDS User Interface ISDAT Client package.

1.2 Applicability of the manual

The current version of the document applies to the ISDAT version 2.2, delivered as release 4 within the CSDS User Interface Project. It is valid for UNIX, SUN Solaris workstations.

1.3 Purpose of the software

The purpose of the CSDS User Interface Data Manipulation software package, of which *cuigr* is one component, is to provide the scientific community with software tools to manipulate and display Cluster CSDS summary and primary parameters. The *cuigr* client is the general purpose data manipulation and display client provided within the package.

1.4 How to use this document

This document consists of an overview of the software in order to familiarize the user with the capabilities provided and introduce the concepts and terminology used. The User Instructions section (3) should be read in connection with the first hands-on encounter with the *cuigr*.

For the use of this document it is assumed that:

- You are familiar with the X-window and mouse usage. If not, consult the appropriate manuals for your work station.
- You have logged in and have a CSDS *session manager* running. If not,see [Ref. 3] for instructions.
- The ISDAT client package has been properly installed and configured at your local workstation. If not, see [Ref. 4] for instructions.
- That you are a registered user at your *CSDS National Data Centre*.

The *cuigr* is designed to provide an extremely flexible tool for composing a data display as well as manipulating and combining data from different instruments. Therefore, by necessity, the underlying structure is complex, and the concepts, as described in section 2.2 may seem hard to understand. However, a user who intend to use *cuigr* only for simple plots, do not have to bother about the underlying structure and may jump to section 3 to get started.

1.5 Related documents

An overview of the CSDS UI ISDAT Client Package is given in [Ref. 5]. It is assumed that the reader is familiar with the information given in that manual. The installation of the ISDAT client package is described in [Ref. 4]. The CSDS User Interface is described in [Ref. 2].

1.6 Conventions and acronyms

In the following, we will use:

- *italics* to indicate exact names or expressions.
- Courier fonts to give command line expressions or file excerpts.

Acronyms and abbrieviations used are described in Table 1.

Acronym	Meaning
ASCII	American Standard Code for Information Interchange
CDF	Common Data Format
CSDS	Cluster Science data System
CUI	CSDS User Interface
IRF-U	Institutet för Rymdfysik, Uppsalaavdelningen Swedish Inst. of Space Phys., Uppsala Division
ISDAT	Interactive Science Data Analysis Tool
NDC	National Data Centre
TBD	To be defined
TBW	To be written
UI	User Interface
UR	User Requirement

Table 1: Acronyms and abbrieviations

1.7 Problem reporting

Problems should be reported to the CSDS National Data Centre.

2 Overview

2.1 Cuigr capabilities

The *cuigr* graphic client has the following capabilities:

- display up to 30 panels with up to 4 parameters in each panel

- plot line graphic (lines, scatter and hodograms)
- manipulate input data (+, - , * and / between parameters)
- customize plot layout (panels, colors, axis)
- plot parameter versus time
- plot parameter 1 versus parameter 2
- expand time axis (zoom time scale)
- produce hard copies (black & white and colors)
- save configuration to a file (ascii)
- load configuration from a file
- save data as flat files (ascii)
- save data as CDF files

2.2 Underlying structure and concepts

In the following we will use the concepts:

- panels
- quantities
- plots

They are defined and described in the sections 2.2.1, 2.2.2 and 2.2.3.

2.2.1 Panels

By *panels* we understand plot areas that may hold zero to four *plots*. The *cuigr* client can display one or more panels. When the program starts panel 0 is defined.

The menubar *Graphics→Panel→Create* buttons are used to create new panels, as described in 3.16.1.

The numbering of the panels is defined in the panels matrix, shown in Table 2:

The borders between the panels can be changed as described in section 3.17.

The *current panel* is the panel containing the *current plot*, (see section 2.2.3). When the user selects the current plot (see below section 2.2.3) he automatically selects the *current panel*.

Panel 0	Panel 10	Panel 20
Panel 1	Panel 11	Panel 21
Panel 2	Panel 12	Panel 22
Panel 3	Panel 13	Panel 23
Panel 4	Panel 14	Panel 24
Panel 5	Panel 15	Panel 25
Panel 6	Panel 16	Panel 26
Panel 7	Panel 17	Panel 27
Panel 8	Panel 18	Panel 28
Panel 9	Panel 19	Panel 29

Table 2: Panel matrix

2.2.2 Quantities

The data structure containing the input data from the ISDAT server is named *quantity*. Each quantity is a data element qty[]. One quantity is selected (see section 3.12), this is named the *current quantity*. The user specifies what data is read into the *current quantity* (see section 3.13 and 3.15). Information about the *current quantity* is always shown in the *current quantity status line* (see section 3.1).

When a request about new data from the data base handler appears the *cuigr* client read data into all *defined quantities* (see section 3.12).

The data are then passed trough the *Calculator* function (see section 3.22). In the *Calculator* function the data are transferred from the quantity structure into the plot structure.

2.2.3 Plots

The *plot* structure contains the data plotted in the panels. A plot may correspond to a *quantity*. However a *plot* may also require input from several quantities, for example a sum of two *quantities*.

Each of the plots are associated with a pushbutton in the right upper corner of the panel. When pressing one of the pushbuttons this plot is selected as *current plot*. At the same time the information about this plot is written in the *current plot status line*.

When the *cuigr* starts the default links between the quantities and plots are:

```
qty[k] -> plot[k]
```

The data from quantity number k is automatically passed to plot number k. The reason for this is that this client shall also be useful for an unexperienced user.

When the *Calculator Selection* Window is used (see section 3.22) all default links between the quantities and plots are broken for all plots in the current panel. The user must then in the *Calculator* specify which quantities are to be put into the current plot.

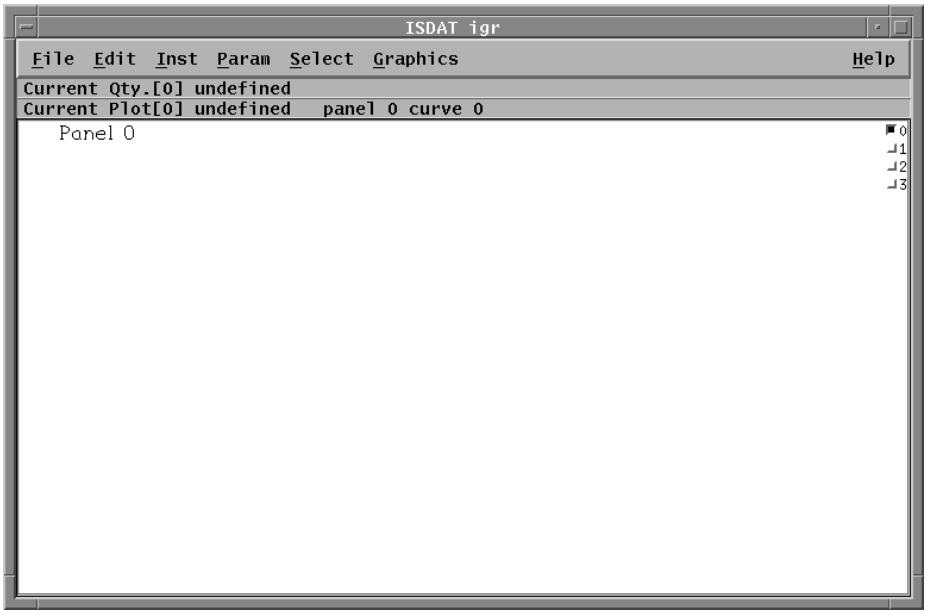

Figure 1: The cuigr client window

3 User Instructions

3.1 Main window layout

When the *cuigr* starts it has the layout shown in Figure 1. The layout consists of four fields, which are described below. The *menubar* is located at the top of the window. Below this menubar are two text lines, the *current quantity status line* and the *current plot status line*. When the program starts it contains one *graphic panel* (Panel 0).

menubar - program control The menubar consists of the *File, Edit, Inst, Param, Select, Graphics* and *Help* buttons. Each of these buttons is associated with a pull-down menu. These pulldown menues are used for program control. Some pulldown menues can be "teared off" for permanent access. These menues are recognized by a dashed line at the top of the menu.

current quantity status line In this text field is shown information about *current quantity*. The quantities and the *current quantity* are further explained in section 2.2 page 3.

current plot status line In this text field is shown information about *current plot*. The plots and the current plots are further explained in section 2.2 page 3.

graphic panel The panels are graphic widgets. The panels are used to display graphic data. Panel 0 is the only panel defined when the program starts. Up to 30 panels can be displayed in variable configurations as explained in section 2.2 page 3.

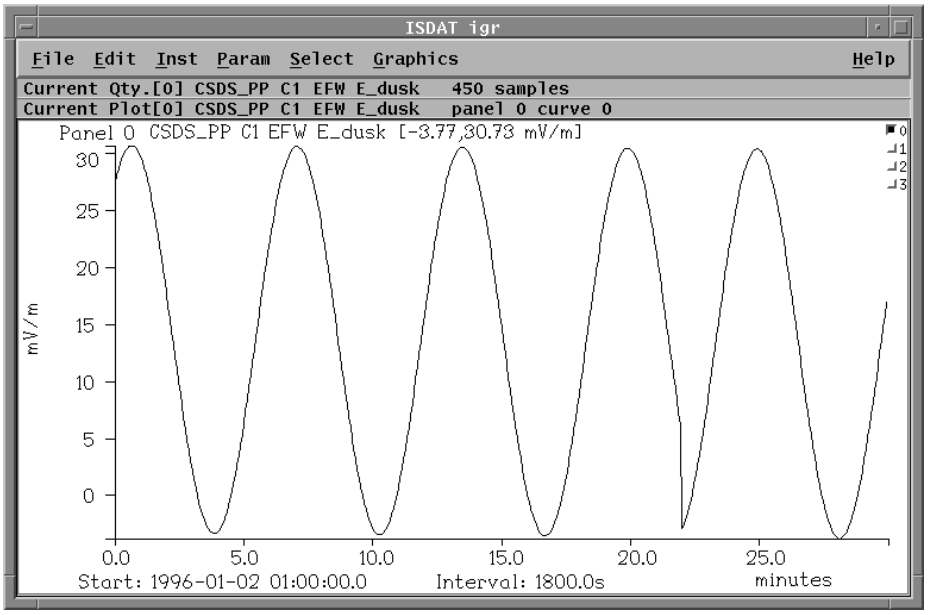

Figure 2: Cuigr window with one plot panel

3.2 How to get started

An ISDAT server must be running at your National Data Centre or locally and the *time manager (cuitm)*, (see [Ref. 6]), must have been started at your local workstation. The *cuigr* client is started from the *time manager*. The user presses the *clients*, *general* and *cuigr* buttons. Now a window similar to that in Figure 1 will appear.

3.3 How to exit from *cuigr*

The *cuigr* client is stopped by pressing *File* in the main menubar and *Exit*. The *cuigr* will terminate and the window disappear. *Cuigr* will also terminate when the associated *time manager* is terminating.

3.4 How to plot time series

The client has been started as explained in 3.2.

The user presses the *Param* button and then selects one of the parameters in the pulldown menu. Now he presses the right mouse button when the cursor is located inside the graphic Panel 0. The data should now be displayed in the panel similar to that shown in Figure 2. Pressing the right button updates the panel.

When pressing the *forward arrow* button in the *time manager* the subsequent data interval is displayed (see [Ref. 6]).

Cuigr will automatically be informed about the type of variable returned from the ISDAT server. Depending on the type of variable, *cuigr* will act in different ways (see the following

sections).

3.4.1 Plotting scalars

No particular action has to be taken by the user in order to plot scalars (see 3.4).

3.4.2 Plotting vectors

When *cuigr* gets a vector variable to plot as a time series, *cuigr* will automatically plot the norm of the vector. If plotting of vector components is desired, this has to be specified by using the *calculator* (see "Treating vectors", page 23).

A vector variable will be handled as a gap when all vector components have *fill values*. If only one or two vector copmponents have *fill values* the Isdat server will communicate the variable and the *cuigr* will understand the *fill values* (-1*e31) as ordinary numbers. In case the scale is *preset* (see section 3.5), this will result in an *off-scale* plot for the anomalous values. In case the scale is set to *auto* (see section 3.5), the result will be an *infinite* y-axis.

3.5 How to adjust scales

When the *Graphics→Plot→Control* buttons in the main menubar are pressed the *Plot Control Dialog* window appears. The layout is shown in Figure 3 . The *Plot Control Dialog* window is used to customize the *current plot*. The top of the *Plot Control Dialog* window consists of five columns with radio buttons. The plot control settings are effective on the *current plot*. See however in section 3.6 below how to make it work on all plots in the *current panel*.

The *Scale* radio buttons determine the maximum and minimum of the ordinate and abscissa scales. When it is on *preset* (default) the program uses the scaleMin and scaleMax which was provided by the ISDAT server. The scaleMin and scaleMax are elements that are provided from the data base. If *preset* is requested and no scaleMin and scaleMax are provided by the server, *auto* scaling is used.

When the radio button *auto* is pressed the *cuigr* client computes the maximum and minimum from the data values. When *manual* is pressed the user inputs the maximum and minimum vales by using this dialog.

Only when the *Scale* radio button *manual* is on, the four scale windows and four text lines are sensitive. The scales are used to set the maximum and minimum of the ordinate and abscissa for the current plot. If higher accuracy is needed, or if the wanted maximum or minimum is outside the scale range, the user can input the numbers in the text lines below the scales.

The *Update* or *OK* buttons has to be pressed before the *cuigr* client will use the new settings.

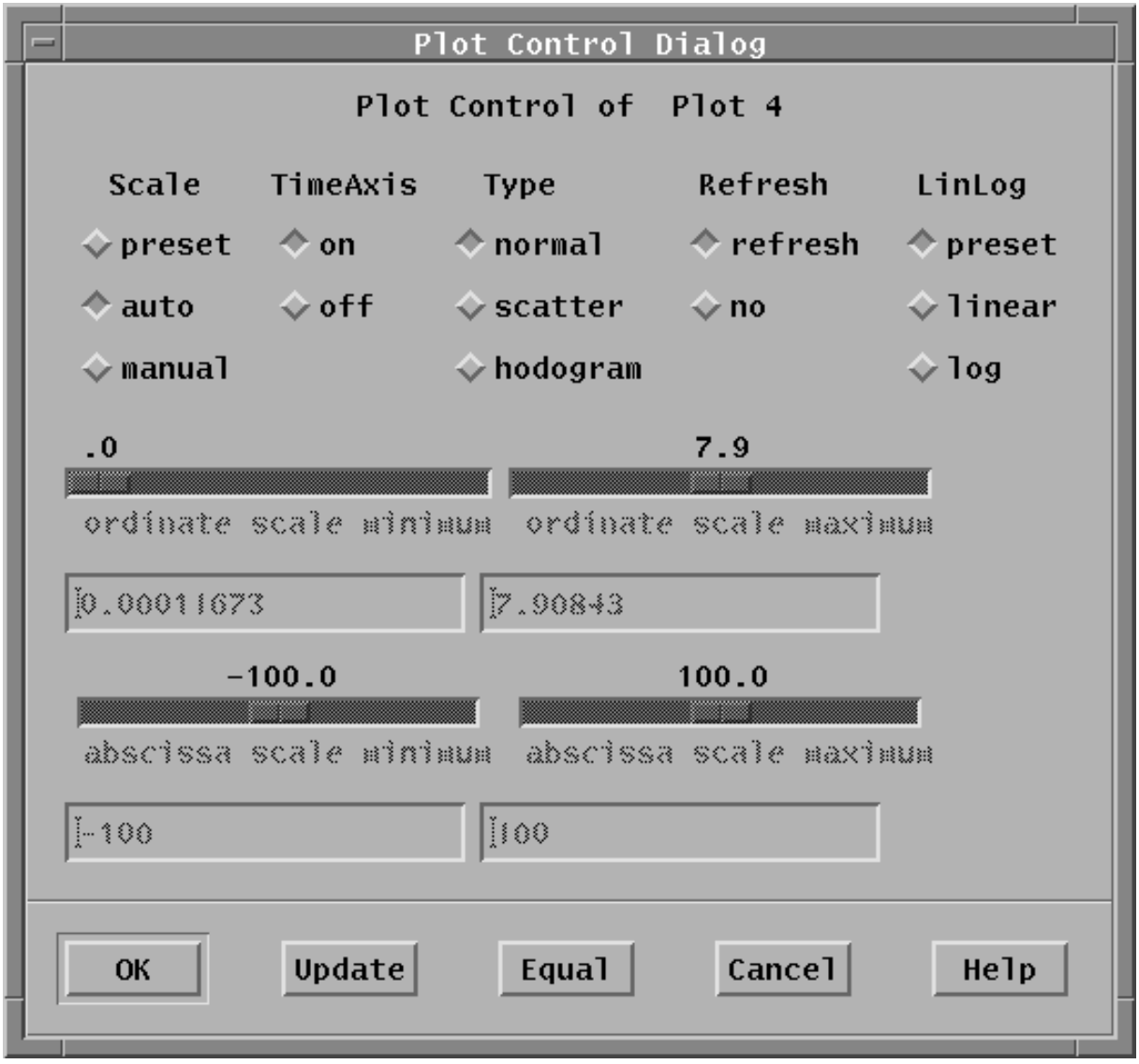

Figure 3: Cuigr plot control window

The *abscissa scale minimum* and *abscissa scale maximum* have no effect when the abscissa scale is the time axis.

In every panel is printed one line with header text for each plot. This header text contains the name of the plotted parameter and the ordinate scale range.

Example:

```
CSDS_PP C1 EFW E_dusk [-20,20 mV/m]
```

The name of the parameter is CSDS_PP C1 EFW E_dusk and the ordinate scale for this parameter is -20 to 20 millivolt per meter.

Usually the different plots in a panel have different ordinate scales. However only one label and tic marks are shown.

If a common scale for all plots in a panel is desired, see section 3.9.

3.6 How to set plot style

When the *Graphics→Plot→Control* buttons in the main menubar are pressed the *Plot Control Dialog* window appears, see Figure 3.

The *Type* radio buttons are used to set the plot type. The default is normal line plot. In the scatter plot each data point is drawn as a cross or a dot. The selection of dots or crosses in the scatter plot is done using the pull down menus *Graphics→Plot→Marker→Dot* or *Graphics→Plot→Marker→Cross* respectively. The default is cross. In the hodogram an arrow is drawn from each data point to the next.

The default is to label the time axis only in the lowest panel. The time axis can however be labeled in other panels by using the *TimeAxis* radio buttons.

3.7 How to change between linear and logarithmic axis

The *cuigr* client can display data along a logarithmic or a linear scale. Again the *Plot Control Dialog* window is used, see 3.6.

The *LinLog* radio buttons determines if the data is plotted at a linear or logarithmic scale. When it is on *preset* (default) the scale type which was proposed by the data base handler is used. When the *linear* button is pressed the data is always plotted in a linear scale. When the *log* button is pressed the data is plotted in a logarithmic scale.

If the data is plotted in a logarithmic scale *(log)* is written behind the name of the parameter in the plot header text.

If it is impossible to use logarithmic scale (e.g. negative data) the *cuigr* client automatically switches to linear scale. The user will notify this by the missing *(log)* at the end of the plot header text.

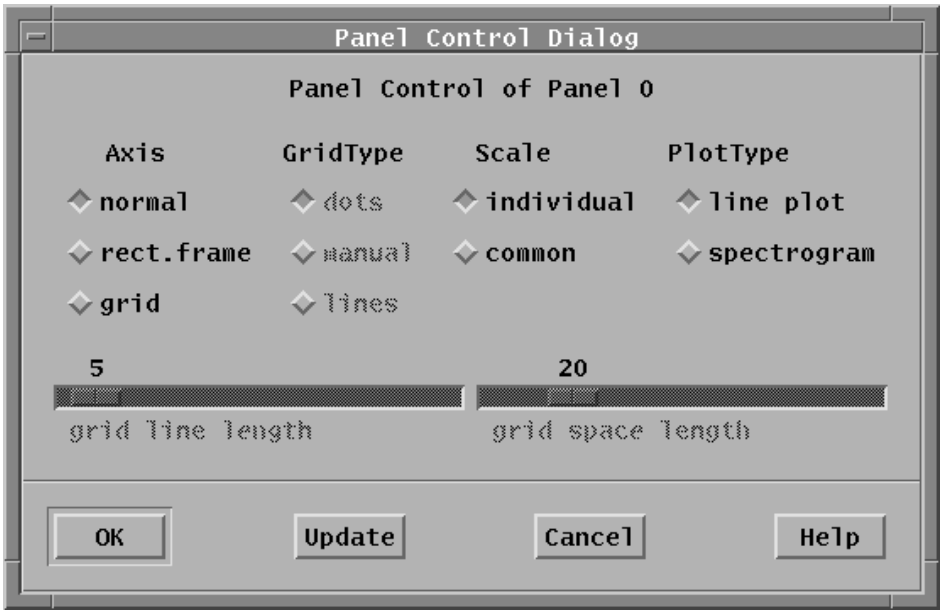

Figure 4: Cuigr panel control window

3.8 How to select frame and grids for the panel

When the *Graphics→Panel→Control* buttons in the main menubar is pressed the *Panel Control Dialog* appears, see Figure 4. The *Panel Control Dialog* window is used to customize the current panel. (The current panel is the panel containing the current plot.) The top of the *Panel Control Dialog* window consists of three columns with radio buttons.

The *Axis* radio buttons determine the type of axis used in the panel. When it is on *normal* (default) only the y-axis to the left and a x-axis at the bottom of the panel is drawn. When the toggle button *rect.frame* is pressed a frame around the panel with tick marks are drawn. When it is on *grid*, a frame around the panel and grids inside the panel are drawn. When *grid* is selected the *GridType* radio buttons can also be used.

The *GridType* radio buttons are only sensitive when the *grid* radio button is pressed. These radio buttons determines the grid type used. The default is *dots*. In this case the grid is marked with dots. The dots are one pixel wide with a 10 pixels space between each dot. When *manual* is pressed the scales below is used to set the grid line length and the space between each. When the *lines* radio button is pressed the grids are drawn as continous lines.

3.9 How to change between individual and common scale

The *Panel Control Dialog* as explained in the previous section, 3.8, is selected. The default is: each curve in the panel has it's own scale (*individual*).The scale used for the plot is drawn between the [ ] brackets at the end of the plot name in the top of the panel. When the *common* button is pressed the settings for the current plot will be used for all

plots in the current panel.

3.10 How to adjust colours

The *Graphics→Plot→Color* in the main menubar is used to select colour for the current plot. A list of colour names appears and the user selects the colour by clicking at one of the names. Then the colour of the *current plot* is set.

In order to adjust colours for the current panel the *Graphics→Panel→Color* in the main menubar is used.

The *Axis* is used to select colour of the axis and text in the current panel. The *Background* and *Border* is used to set background and border colour of the current panel, respectively. *Grid* is used to select grid (see section 3.8) colour of the current panel.

3.11 How to select the current plot

The panel number is printed in the left upper corner of each panel, (e.g. Panel 0). Each panel can contain maximum four plots. In the right upper corner of the panel are four small pushbuttons . Each pushbutton is associated with one plot. The plot numbers are written at the right side of the small pushbutton.

One of the pushbuttons is pressed. This represents the current plot. Information about this plot is written in the second status line (current plot status line).

Example:

```
Current Plot[0] CSDS_PP C1 EFW E_dusk panel 0 curve 0
```

The user presses one of these small pushbuttons. The plot associated with this plot is named the *current plot*.

The panel containing the *current plot* is the *current panel*.

3.12 How to select parameters to plot

The data are read into *current quantity*. The data from quantity k is as default transferred to plot k.

In ISDAT, data is described as *conceptual instruments* in an hierarchical structure, *project member instrument sensor signal channel parameter* (see [Ref. 7]).

The *Inst* pulldown menu in the main menubar is used for selecting the *project*, *member* and *instrument* for the current quantity. The *Param* pulldown menu is used to select the *sensor, signal, channel* and *parameter* for the current quantity.

Note that the contents of the *Inst* and *Param* menues depend on the data base currently in use. The content of the menues may also depend on the access rights of the user. The *cuigr* actually queers the ISDAT server about descriptions of the data and dynamically

builds the menues depending on the information obtained from the server and ultimately from the database. This is for example illustrated by changing the *Inst* setting. The content of the *Param* menu is then instantly re-built.

3.13 How to plot several parameters in one panel

It is assumed the user has already selected one time series as explained in 3.4 above.

The user presses one of the small pushbuttons in the right upper corner of Panel 0. If he presses the second pushbutton (1) the first status line (current quantity status line) will display :

```
Current Qty.[1] undefined
```

The current plot status line will display:

```
Current Plot[1] undefined panel 0 curve 1
```

(This text is written if plot 1 has not been defined before.)

The user has now selected current plot 1 and current quantity 1.

Then he uses the *Param* pulldown menu in the main menubar to select the data he wants to read into quantity 1.

Now he presses the right mouse button when the cursor is located inside graphic Panel 0 or the *update* button of the time manager. Then the *time series* is displayed. Now in Panel 0 two parameters are displayed, (Plot 0 and Plot 1).

This procedure can be repeated for plot 2 and 3.

(More information about quantities and plots are given in 3.22 below.)

3.14 How to delete quantities

The data is first read into the quantities, q0, q1, ..., from the ISDAT server and then later transferred to the plots, p0, p1, ..., in the *Calculator* (see sections 2.2.2 and 2.2.3). The *Quantity Dialog* is selected by pressing *Select*→*Quantity* in the main menubar. This dialog shows all quantities used by the *cuigr* client. The *undefined* lines indicate the quantities not in use.

The pushbutton *in/selected* marks the current quantity. This quantity can be removed by pressing the *Clear* button at the bottom of the panel. Then the text after the pushbutton changes to *undefined*. No data is then read from the ISDAT server into this quantity any more.

3.15 How to delete plots

To delete a *plot* proceed as follows:

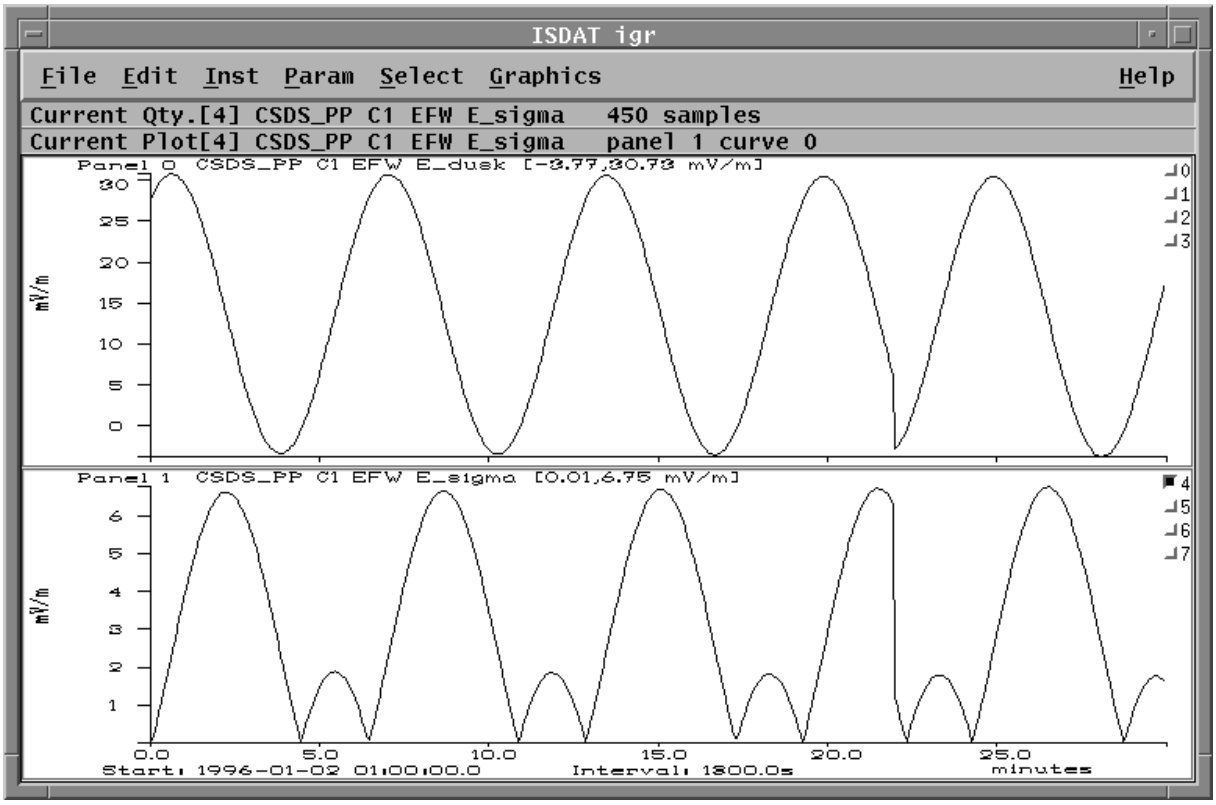

Figure 5: Cuigr window with two plot panels

1. Press the *Select* → *Calculator* menu item.
2. On the *calculator* mark the *plot* to be deleted.
3. On the *calculator* press the *Edit* → *clear marked plot* menu item.
4. On the *calculator*, press the *Apply* button.
5. On the *time manager* press the *update* button.

See also page 27.

Note that during this process also the default *plot vs. quantity* binding is lost for the particular *plot*.

3.16 How to add or delete plot panels

3.16.1 Adding panels

When the *Graphics*→*Panel*→*Create* buttons in the main menubar are pressed a *Create Panel Dialog* window appears. This window consists of a matrix with 10 times 3 push-button. Each pushbutton indicates one panel. The existing panels are in the upper left corner. The possible new panel positions are marked with sensitive (boldface) pushbuttons. When one of the sensitive pushbuttons is pressed a corresponding panel is created.

Note that the *current plot* is changed to the first plot in the new panel. See Figure 5.

3.16.2 Deleting panels

When the *Graphics→Panel→Remove* buttons in the main menubar are pressed a *Remove Panel Dialog* window appears. This window consists of a matrix with 10 times 3 push-button. Each pushbutton indicates one panel. The existing panels are in the upper left corner. The possible removable panel positions are marked with sensitive pushbuttons. When one of the sensitive pushbuttons are pressed the corresponding panel is removed. At the same time all plots in this panel are removed (undefined). Note that panel 0 cannot be removed.

3.17 How to change size of a panel

The user is expected to have added several panels using the procedure explained in 3.16.

You are expected to run a window manager which allows you to resize windows. When the user resizes the main *cuigr* window all panels inside the window are rescaled with the same factors as the main *cuigr* window.

In order to change the size of an individual panel without changing the size and shape of the main *cuigr* window the left mouse button is used.

When the cursor is located on the panel borders the shape of the cursor is changed to a cross (XC_tcross). The user now presses the left mouse button. The left mouse button is pressed as the cursor is moved to the new panel border position.

When the cursor is moved to the new horizontal border position the shape of the cursor is an arrow pointing down (XC_bottom_side). When the cursor is moved to the new vertical border position the shape of the cursor is an arrow pointing left (XC_left_side).

The user releases the mouse button and the *cuigr* client resizes the panels.

When a panel is resized all graphics inside the panel is resized to the same scale. An exception is the four small pushbutton associated with plots located in the right upper corner of each panel.

3.18 How to expand the time axis

If a long time interval is selected (e.g. one orbit) the user probably wants to investigate some interesting features at a finer time scale. One method is to specify new *Start* and *Interval* times in the time manager (*cuitm*) and then to press the *Update* button in *cuitm*.

However, this can also be accomplished by the *cuigr* client. Now the middle mouse button is used. When the user presses the middle mouse button and the cursor is located in a graphic panel a start time is recorded. In order to notify the user about the location of the start time a vertical line is drawn. At the same time the shape of the cursor is

changed to a cross. The user now moves the mouse in the rightward direction and releases the middle mouse button. The location of the release point is recorded as stop time. The time between the start time and stop time is computed and sent to the time manager. The time manger changes to this start and stop time, and then immediately notifies all clients about this new start and stop times. One of the clients is *cuigr* and it will now get new data from the data base handler and, *cuigr* will display this data. *Cuigr* is an exceptional client in the sence that it has the privilege to change the time manager time.

The previous time interval is recorded in a stack and can be restored with the *Edit→Undo→TimeScale* buttons in the main menu bar. The time intervals can be restored in 8 levels. When no previous time interval is available the *TimeScale* button is not sensitive.

Note that time axis expansion can only be done when data is explicitely plotted along a time axis, not when y is plotted versus x.

3.19 How to save data in a file

3.19.1 Flat File

The data (in the time interval) displayed in the graphic panels can be stored in an ASCII file. When the *File→SaveData→FlatFile* buttons in the main menubar are pressed the *Flat File Dialog* appears, see Figure 6. This dialog consists of a scrolled panel with 8 buttons at the top and a file selection part at the bottom. The file selection part is not sensitive when the dialog starts.

The user now presses one of the eight pushbuttons (with numbers from 0 to 7). Then the current plot is assigned to one column in the flat file. If the user then wants to save several plots in the same flat file he selects another plot as the current plot (see section 3.11).Then he has to press one of the other buttons (with numbers from 0 to 7). If the user wants to undo the selection he presses the *Reset* button. Then all the buttons are marked with *undefined*.

When the plot selection is finished he presses the *Apply* button. Now the file selection part becomes sensitive. The user selects one of the files in the *Files* panel or writes a new file name in the *Selection* line. The default name is *$HOME/igr.flat*.

When the *OK* button is pressed the flat file is created.

The error messages are written in the *Error messages* line at the bottom of the dialog.

One example of a flat file is:

```
# Data from CSDS
#
# Filename:     igr.flat
# Created date: Mon Sep 4 12:48:29 1995
# Version:       blybekk@tiger 1995-09-04 12:48:29.0
#
#
```

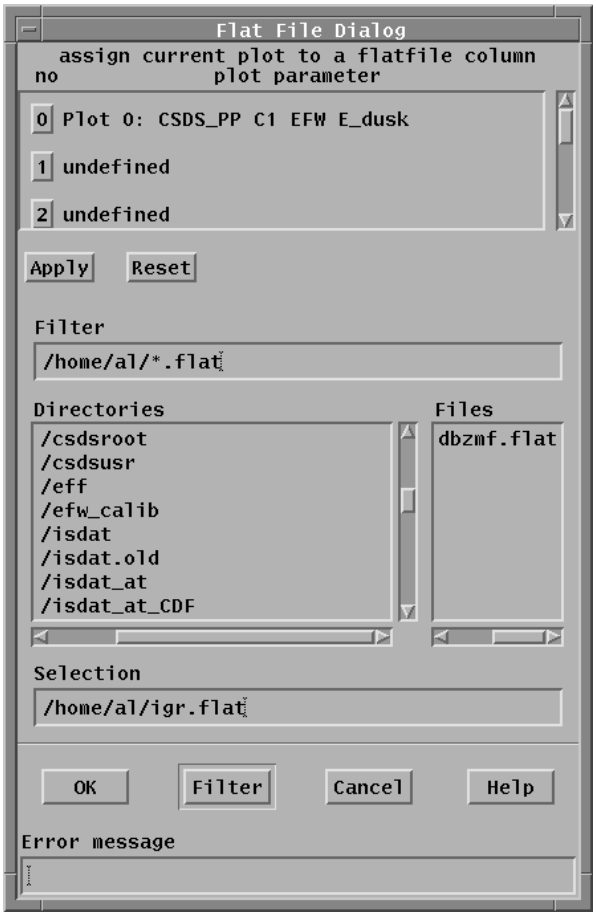

Figure 6: Flat file dialog window

```
#
# Time start at 1996-01-01 00:53:14.195953
#
#   Time from start     CSDS_PP C1 EFW E_dusk
#       [s]             [mV/m]
       2.248047233      23.87999916
       6.248047233            24.75
      10.248047233      25.56999969
      14.248047233      26.35000038
      18.248047233      27.07999992
      22.248047233      27.73999977
      26.248047233      28.34000015
      30.248047233      28.88999939
      34.248047233      29.37000084
      38.248047233      29.78000069
      42.248047233      30.13999939
      46.248047233      30.40999985
      50.247047782      30.61000061
      54.248047233      30.76000023
      58.248047233      30.81999969
      62.248047233      30.79999924
      66.248047233      30.71999931
      70.248047233      30.56999969
      74.248047233      30.35000038
      78.248047233      30.04999924
      82.248047233      29.68000031
```

The lines starting with '#' are comment lines. The left column shows seconds from start of the time interval. The second column contains data values. The user can for example use *xgraph* to display the two first columns of the flat files. (*xgraph* is a standard X-tool, not included in the CSDS User Interface client package.)

Only data with a common time line can be saved in one file. See however, section 3.23, how to force data to a common time line.

3.19.2 CDF File

The data in the time interval displayed in the graphic panel can be stored in a CDF file. When the *File→SaveData→CDF* buttons in the main menubar are pressed the *CDF control* window is displayed.

One to sixteen plots can be stored as a parameter in a CDF file. These plots are associated with the buttons 0 to 15. The user presses one of these buttons to assign the current plot to a parameter in the CDF file. The variable names are set to DP_0 to DP_15 by default but can be changed by editing the names.

The user can add his own entries of the global attributes *Data_version*, *MODS* and *Caveats* by pressing the *Global attributes* button.

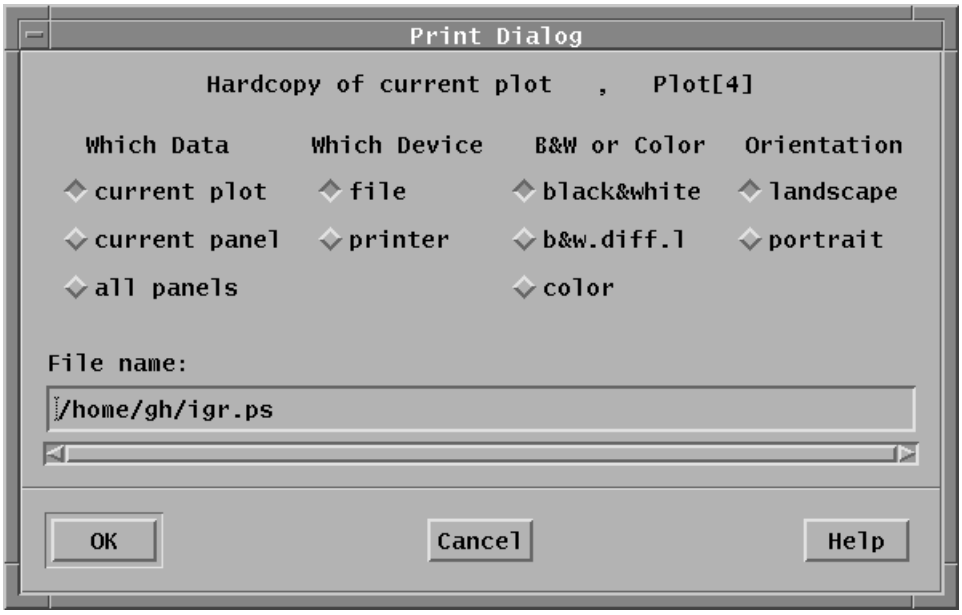

Figure 7: Cuigr print dialog window

All associations between plots and CDF variables can be removed by pressing the *Reset* button.

Pressing *Apply* will do a consistency check of all defined variables verifying that they all have the same time resolution. If the consistency check fails an error message will be printed at the bottom of the window.

If all is good the file selection part will be set sensitive, ie. the greyish look will disappear, a default file name will also be constructed based on the selected start time and time resolution. The default name can be changed by editing the Selection field.

When the *OK* button is pressed the CDF file is created.

3.20 How to print data

The data displayed in the panel can be copied to a postscript file or directly printed as a hard copy. Note however, that in cases of extremely much data ($\geq$ 10000 samples) it may be more practical to make a screen dump and not produce a postscript file.

When the *File→Print* buttons in the main menubar are pressed the *Print Dialog* window appears, see figure 7.

This window consists of four radio button columns.

Which Data: When the *current plot*, *current panel* or *all panels* radio button is pressed the data from current plot, all plots in current panels or all panels respectively are copied to a postscript file.

Which device: When the *file* radio button is pressed the data is written to a postscript file. The name of this file is written in the *File name:* text field. When the *printer*

radio button is pressed the data is transferred directly to the printer. The printer name is now written in the *Printer name:* text field.

B&W or Color: When the *black&white*, *b&w.diff.l* or *color* radio button is pressed the hardcopy will be in black and white, black and white with dotted lines or color respectively.

Orientation: The *landscape* and *portrait* buttons determines if the plot should be orientated in landscape or portrait direction.

The default printer command is *lp*. The default command can be modified in the igr resource file named *Igr*:

```
Specifies the print command with options
example: Igr*printCommand: lp
         Igr*printOption:  -d
         When nothing is specified in the "Printer name:"
         line in the PrintDialog the printer command
         will be: 'lp'
         When a name of a printer e.g. 'myprinter' is
         written in the "Printer name:" line the printer
         command will be: 'lp -d myprinter'

Igr*printCommand: lp
Igr*printOption:  -d
```

When the *OK* button is pressed the postscript file is created and the dialog window disappears. The postscript file can then be inspected using a postscript preview program, (gs, ghostview, pageview, ..).

3.21 How to save and restore a plot layout

3.21.1 Save a plot layout

The complete settings of the *cuigr* client can be stored in a file. This file is an ASCII file and is named the *configuration file*. When the *File*→*Config*→*Save* buttons in the main menubar are pressed the *Config Save Dialog* window appears. This is a *Motif File Selection* dialog.

The filename is either selected in the *Files* panel or written behind the directory name in the *Selection* line. If not present the extension ".igr" is automatically added to the filename. The user presses the *OK* button to save the file. The program checks if the file name is valid (and not a directory). Error messages are written in the *Error messages* line in the *Config Save* dialog window.

If the file already exists a *warning* dialog appears. The user then presses *Yes* to overwrite or *No* to cancel.

The configuration files can be interchanged between different users (e.g. with e-mail), running *cuigr* of the same version.

Note that the time specification is not a *cuigr* setting, see however [Ref. 6].

3.21.2 Restore a plot layout

The *cuigr* client can read and interpret the configuration files saved as explained in 3.21.1. Now the *File→Config→Load* buttons in the main menubar are pressed. Then the *Config Load Dialog* window appears.

The user selects the correct file and presses the *OK* button. When the configuration file is loaded the *cuigr* client gets the same configuration as when this file was stored. Note, however, that the time interval is a time manager issue and is not restored. Error messages are written in the *Error messages* line in the *Config Load* dialog window.

3.21.3 Predefined plot layout

For the CSDS a number of predefined plot layouts are supplied.They can be retrieved via the *File→Config→Predefined* menu button.

In CSDS User Interface, Release 4, the following pre-defined configuration files are provided:

File	cuigr setting
CSDS-PP-C1.igr	A 24 panel collection of PP from Cluster 1
CSDS-PP-C1_overview.igr	Like the CSDS Summary plot but for PP Cluster 1
CSDS-PP-C2.igr	A 24 panel collection of PP from Cluster 2
CSDS-PP-C2_overview.igr	Like the CSDS Summary plot but for PP Cluster 2
CSDS-PP-C3.igr	A 24 panel collection of PP from Cluster 3
CSDS-PP-C3_overview.igr	Like the CSDS Summary plot but for PP Cluster 3
CSDS-PP-C4.igr	A 24 panel collection of PP from Cluster 4
CSDS-PP-C4_overview.igr	Like the CSDS Summary plot but for PP Cluster 4
CSDS-PP_ASPOC.igr	ASPOC PP from all four satellites
CSDS-PP_CIS.igr	CIS PP from all four satellites
CSDS-PP_DWP.igr	DWP PP from all four satellites
CSDS-PP_EDI.igr	EDI PP from all four satellites
CSDS-PP_EFW.igr	EFW PP from all four satellites
CSDS-PP_FGM.igr	FGM PP from all four satellites
CSDS-PP_PEACE.igr	PEACE PP from all four satellites
CSDS-PP_RAPID.igr	RAPID PP from all four satellites
CSDS-PP_STAFF.igr	STAFF PP from all four satellites
CSDS-PP_WHISPER.igr	WHISPER PP from all four satellites
CSDS-SP.igr	A 24 panel plot of summary parameters
CSDS-SP_AUX.igr	A 30 panel plot of all AUX summary parameters
CSDS-SP_comp.igr	Like the CSDS summary plot
CSDS-SP_config.igr	Like the CSDS summary plot
CSDS-SP_fields_1.igr	Like the CSDS summary plot (part 1)

```
CSDS-SP_fields_2.igr       Like the CSDS summary plot (part 2)
CSDS-SP_overview.igr       Like the CSDS summary plot
white_landscape.igr        An empty plot panel with A sheet proportions, landscape
white_portrait.igr         An empty plot panel with A sheet proportions, landscape
```

3.22 How to use the Calculator

3.22.1 Overview

The *Calculator* can do arithmetical operations on the *quantities* defined in *cuigr*. It can make functions to operate on them, rotate them and "join" quantities. The calculator client also defines in which plot in *cuigr* the result of the operations should be displayed, and on which axis. Note that the quantities are not known to the *calculator* unless an *update* has been performed after the quantity was specified. It should also be noted that unit labels may be missing for manipulated data.

Examples:

- 'p3y = q1 + q2' Which means that the sum of quantities q1 and q2 will be plotted in plot 3 on the y-axis (and time along the x-axis which is default).
- 'p4x = q2' and 'p4y = 4*(q1 - q0)' will plot the expression of the quantities q1 and q0 as a function of the quantity q2.
- 'p1y = {T0*q2}[0]' will plot the first component of the result of the multiplication of tensor the T0 (to be set up by the user) and the quantity q2.

The expressions are typed in the text field at the top of the window (see Figure 8). The plot specifications and quantity codes can alternatively be chosen from the pull-down menus just below the input text field. The result will then be seen in the text field at the bottom of the window, see Figure 8. When an update is performed (either on the *time manager* or in *cuigr*) the expressions in the lower text field will be used to define what to plot in the different plots of *cuigr*.

Legal operators: Vector multiplication cross 'x' and dot '$*$', division '/', addition '+' and subtraction '-'. Division by zero normally introduces a gap in data for integer values.

Legal tokens: In addition to the operators listed above, '(', ')', '[', ']', '{', '}' are legal.

- ( ) are used for overriding precedence rules.
- [ ] are used for indexing vectors
- { } are used for indexing the vector results of an operation (see "Expression with tensors", page 26).

Quantity names

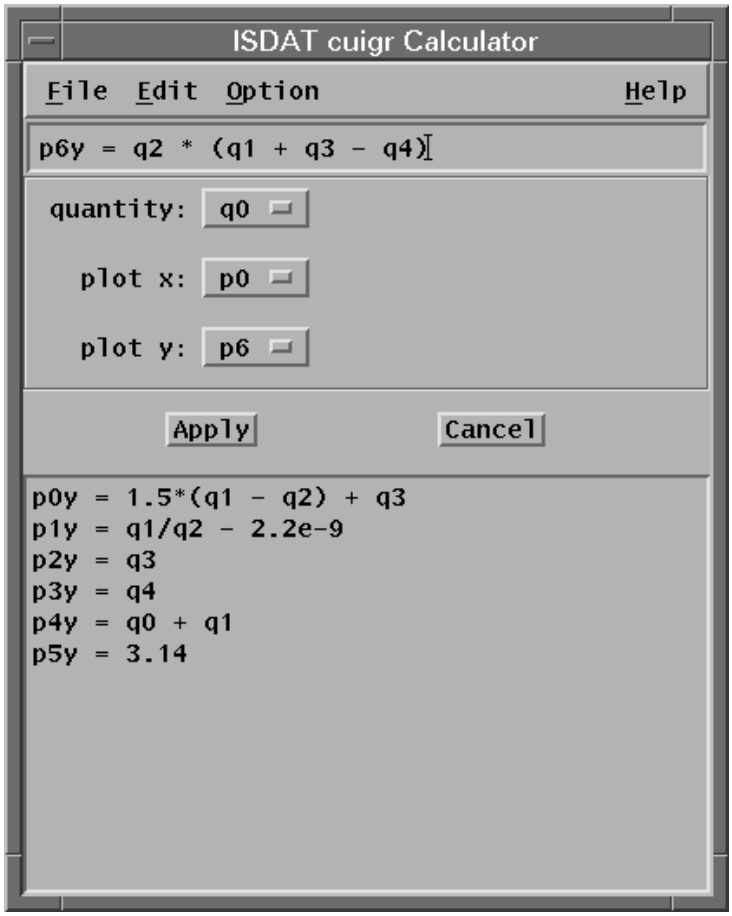

Figure 8: The cuigr calculator window

```
q0, q1, ......
```

Plot names and axes

```
p0x, p1x, p2x, ......
p0y, p1y, p2y, ......
```

The quantities may have an index

```
q0[0], q0[1], q0[2]
q1[0], q1[1], q1[2]
.
.
.
```

After a data manipulation, the pre-set scale values will be over-written with max and min values found for the resulting value for the current interval. *Manual scaling* will be retained. A plot can be set to a constant, e.g. p0y = 5 provided that at least one *quantity* is defined. This is needed to define the time interval for the *calculator*. Note however that the setting to a constant normally is only meaningful if all *plots* in the *panel* have manually set scales equal for all plots in the panel.

Precedence in arithmetical expressions: Unary minus has the highest precedence. 'x' and '/' have higher precedence than '+' and '-'. To override this precedence scheme use paranthesis.

Treating vectors If the quantity to plot is of type vector, or the result of the expression is of type vector, the norm is computed before it is plotted. If plotting of components is desired it has to be explicitely specified by using brackets, e.g. q[0]. Components are numbered from 0. See also "Expression with tensors", page 26.

An example of vector component plotting is shown in Figure 9.

Transformations to polar coordinates The calculator contains predefined functions to convert from a vector in Cartesian coordinates and associated settings to the components of a polar coordinate system. The functions are: pol_r(), pol_phi() and pol_th().

The function pol_r(v) is defined as $\sqrt{x^2 + y^2 + x^2}$.

The function pol_phi() is defined as atan(y/x), the result is given in degrees in the range -180 to 180 degrees.

The function pol_th() is defined as acos(z/r) where r = $\sqrt{x^2 + y^2 + z^2}$, the result is given in degrees in the range 0 to 180 degrees.

To get the length of a vector q0 use the equation p0y = pol_r(q0).

Joining of data Joining will be performed if needed. E.g. p0y = q0 + q1, if q0 and q1 do not have the same number of samples or the sample times are not the same, the

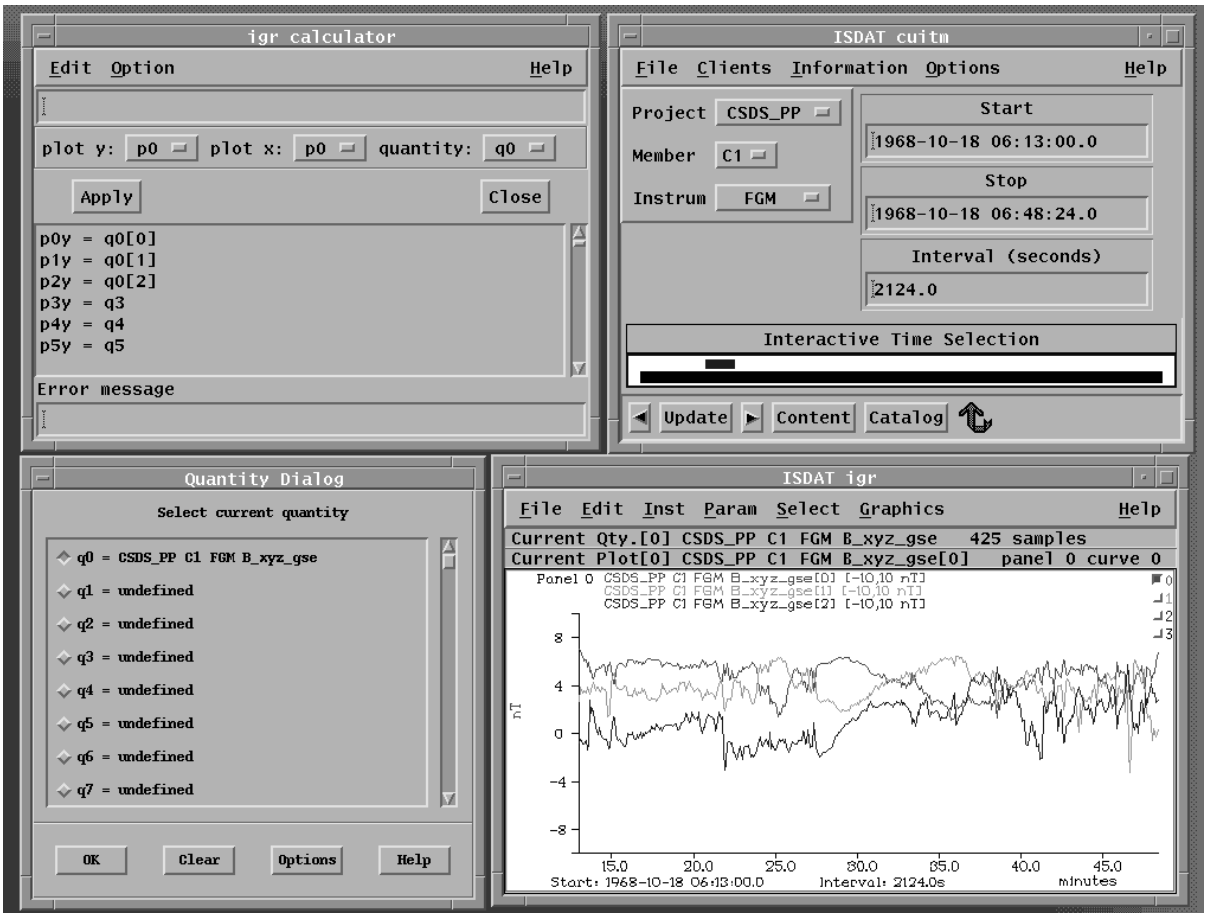

Figure 9: Plotting of vector components

Calculator will automatically join the least sparse of the two quantities to the same time line as the most sparse one. Fuzzy join is used as described in [Ref. 1]. Joining of data is further described in section 3.23.

Word explanations and definitions:

Binding the connection of a quantity or an expression of quantities to a plots x- or y-axis

Setting used in the same meaning as binding

Joining the modification of a quantity so its sample frequency and "time line" will be in accordance with another quantity

Plot name a 'p' and the plot number, e.g. q3

Tensor name a 'T' or 't' and the tensor number, e.g. T5

3.22.2 Use of the calculator

How to start the Calculator The *Calculator* can be started by choosing *Calculator* in the *Select* menu on the *cuigr* menu bar.

How to exit the Calculator To exit the *Calculator* press the *Close* button.

How to make bindings To make a binding of an expression of quantities to a plots x- or y-axis, use the input text field a the top of the window. First should the plot name (a 'p', the plot number, e.g. p12) and axis specification (x or y) be typed in. Then an equal sign as a separator, and finally the expression. Examples:

```
p0y = q0
p2x = q1*q2 + 10.0
```

If the axis is not specified, *Calculator* will assume that it is the y-axis. The plot names can alternatively be choosen from the 'plot x' and 'plot y' menus below the input text field. These menus contain the first 20 plot names and axis. Choosing one of these will clean the input text field and print the plot name and an equal sign. Double-clicking on an expression in the text-field at the bottom of the window will result in copying the expression to the input text field at the top of the window. Syntax- or semantic errors will normally result in an error message in the error message field below the *Apply* button. Some help is usually provided by underlining the character, where the problem was first identified.

How to make corrections Point with the mouse on the character just after the part to erase. Press the left button and the cursor is in position for using the 'Back space' button.

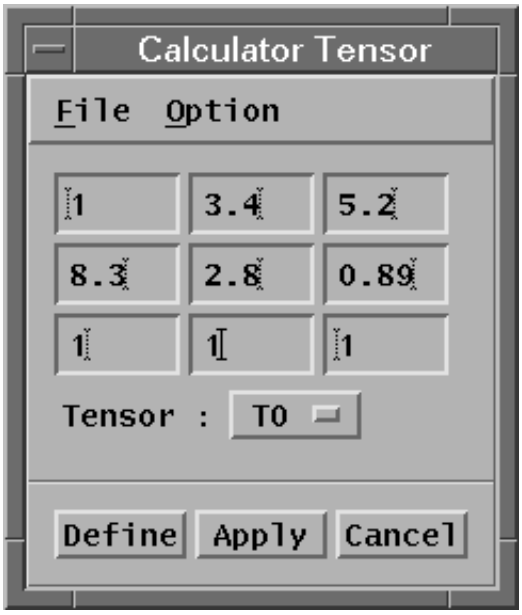

Figure 10: The calculator tensor

How to set up a tensor Under the menu *Options*, choose *Tensor* and a window will pop up, see Figure 10.

That window has a field for a 3x3 tensor where all elements can be typed in separately. First choose a tensor name on the menu below the tensor field. Up to eight different tensors can be defined. Type in the tensors elements and press the *Define* button. This tensor can now be used in expressions in the *Calculator*.

How to save a tensor to a file In the Tensor windows File menu, choose *Save*. A file selector will then pop up. Select the file name where to save the tensor currently seen in the Tensor windows tensor field. Press the *OK* button and the tensor will be written to the file and the file selector window will disappear.

How to read a tensor from file In the Tensor windows *File* menu, choose *Read*. A file selector will then pop up. Select the file You desire to read the tensor from. Press the *OK* button and the tensor will be copied to the Tensor windows tensor field, and the file selector window will disappear. Choose a tensor number from the tensor menu. Press the *Define* button on the Tensor window so this tensor can be used in the *Calculator*.

Expression with tensors Tensors can be multiplied to expressions, e.g. p0y = T1*q2 The result of the expression (T1*q2) is of type vector and the norm will be computed so it can be plotted. If a specific component of the vector should be plotted, it can be obtained by extracting it from the result, e.g. p0y = {T1*q2}[1] where the second component is extracted (the components are numbered 0, 1 and 2). Observe curly braces should be used, not paranthesis. Since vectors are assumed to be "column arrays", only tensors

multiplied by a vector, **T0** $*$ **v**, is legal, not **v** $*$ **T0**. A tensor could be multiplied to an expression including tensor expressions, e.g. p2y = T3*(q1+T3*q0).

How to erase all settings To take away all bindings and make the plot text field clean, choose *Release all bindings* under the *Edit* menu.

How to retrieve the default settings To erase all bindings and retrieve the default bindings, choose *Reset to default bindings* under the *Edit* menu.

How to erase a binding To erase one or more bindings, and still retain the other, mark those bindings by clicking on them with the mouse. Then, in the *Edit* menu, select *Clear marked plot*. The marked bindings will then dissappear, and if an update is performed, these plots will no more be displayed. To take away an unwanted marking of a binding, point on that binding with the mouse and press the control key and the left button on the mouse.

How to take away an error message To erase the error message in the error message label (below the *Apply* and *Cancel* buttons) either correct the error and make an *apply* again or select *Clean input line* in the *Edit* menu.

3.23 How to join data sets to a common time line

See also page 23. To force which quantity will be guiding, when we adopt quantities to the same sampling frequency and to the same time line, the syntax is 'Join(qX, qY)'. The result of 'Join(q2,q3)' is q3 adopted to the sampling frequency and time line of quantity q2. 'p0y = q0 + join(q0, q1)' will thus add q0 and q1, and the result will have the same time line as quantity q0. If we don't use this forced joining, the *Calculator* will automatically perform joining (if necessary) with the most sparse quantity as guiding. Joining of several quantities is not yet implemented, at the moment one has to explicitly make a binding for each quantity. E.g., quantities q0, q2, q4, q6 and q8 should be joined with q2 as the quiding quantity:

```
p0y = join(q2,q0)
p1y = q2
p2y = join(q2,q4)
p3y = join(q2,q6)
p4y = join(q2,q8)
```

3.24 How to do arithmetic manipulations

See section 3.22, page 21 ff.

3.25 How to do vector and tensor operations

See section 3.22, page 26 ff.

3.26 How to transform vectors from Cartesian to polar coordinates

See section 3.22, page 21 ff.

3.27 How to specify, save and retrieve a Tensor

See section 3.22, page 26.

3.28 How to plot a vector

See section 3.22, page 23.

3.29 How to plot one parameter versus another parameter

This section contains some information about the *Calculator*. The *Calculator* is further explained in 3.22.

The *cuigr* client is started and one parameter is plotted in plot 0 and one in plot 1 as explained in 3.13.

The *Calculator* is selected by pressing *Select* and *Calculator* in the main menubar. The *Calculator* window now appears, see Figure 8.

The user now can release all default bindings by pressing *Edit* and *Release all bindings* in the *Calculator* window. Now all text in the lower part of the *Calculator* window disappear.

He now writes in the *Calculator* input line (upper):

```
p0y = q0
p0x = q1
```

Each line is ended by the *Enter* key or the *Apply* button. Then these two line is interpreted by the *Calculator* and the:

```
p0y = q0
p0x = q1
```

is written in the lower part of the *Calculator* window. The meaning of these two lines is that quantity 0 is plotted along the ordinate of plot 0, and quantity 1 is plotted along the abscissa of plot 0.

Now the user has to press the *Update* button in the time manager (*cuitm*). Then quantity 0 is plotted as function of quantity 1.

The *Calculator* window is removed by pressing *Close* in the *Calculator* window.

3.30 Errors and probable causes

3.30.1 Error messages

- Load configuration (File Config Load). Warning messages are written at the bottom text line of the *File Selection* window.

  These are:

  ```
  "filename" is a directory
  "filename" No such file or directory
  "filename" Permission denied
  "filename" not a configuration file
  ```

  The filename is the full path of the selected file.

- Save configuration

  Warning message is written at the bottom text line of the *File Selection* window.

  This is:

  ```
  "filename" Permission denied
  ```

- SaveData Flatfile has the error messages:

  ```
  "filename" is a directory
  "filename" Permission denied
  only one xy-plot is allowed in flat file
  ordinate and abscissa timelines differs
  time line in plot #1 and plot#2 differs

  (The '#1' and '#2' are numbers).
  ```

- Print has the error messages:

  ```
  "filename" is a directory
  cannot open "filename"
  ```

  (The "filename" is the full path of the selected file.)

- The error messages from the data base handler are written into the relevant panels.

  Examples:

```
"bad zone (between two samples)"
"bad time"
```

3.30.2 Common user errors and probable causes

The most common errors are explained in [Ref. 5].

4 User reference

This section is also available on-line.

4.1 Cuigr

```
NAME
     cuigr - graphic display of CDF data

SYNOPSIS
     cuigr

ARGUMENTS
     Handles all generic ISDAT and X arguments.

DESCRIPTION
     Cuigr is an ISDAT client of type "general clients". It is designed for
     CSDS summary (CSDS-SP) and prime (CSDS-PP) parameter data bases. .

     The cuigr client can be called from the time manger, cuitm.  It is
     used for data manipulation and display.



     Menu bar entries:


     File with buttons:

          Config

               Load, is used for loading a configuration file.  This
               configuration file is created when the user presses the
               Config Save button.  The configuration file is a an ASCII
               file.  When the Load button is pressed a File Selection
               Dialog appears. The user select the correct file and presses
               the OK button.  When the configuration file is loaded the
               cuigr client get the same configuration as when this file
```

was stored.

Save, is used to save the complete status of the cuigr client to a file. This file is an ASCII file and is named the configuration file. When the Save button is pressed a File Selection window appear. The filename is either selected in the Files panel or written behind the directory name in the Selection line. If not present the extension ".igr" is automatically added to the filename. The user presses the OK button to save the file. The program checks if the file name is valid (and not a directory). If the file already exists a warning dialog appears. The user then presses OK to overwrite or Cancel. The configuration files are ASCII files and can be interchanged between different users (e.g. with email).

Predefined, is almost equal to Load. The difference is: In this case predefined configuration file(s) delivered with the system is loaded.

SaveData

FlatFile The data (in the time interval) displayed in the graphic panels can be stored in an ASCII file. When the FlatFile button is pressed The Flat File Dialog appears. This dialog consists of a scrolled panel with 8 buttons at the top and a file selection part at the bottom. The file selection part is not sensitive when the dialog starts. The user now presses one of the the eight pushbuttons, (with numbers from 0 to 7). Then the current plot is assigned to one column in the flat file. If the user then wants to save several plots in the same flat file he selects another plot as the current plot. Then he has to press one of the other buttons. (with numbers from 0 to 7). If the user wants to undo the selection he presses the Reset button. Then all the buttons are marked with undefined. When the plot selection is finished he presses the Apply button. Now the file selection part becomes sensitive. The user selects one of the files in the Files panel or write a new file name in the Selction line. The default file name is $HOME/igr.flat . When the OK button is pressed the flat file is created.

CDF The data in the time interval displayed in the graphic panel is stored in a CDF file. A CDF Dialog Window is displayed. One to four plots can be stored as a parameter in a CDF file. These plots are associated with the buttons 1 to 4. The user presses one of these buttons to assign the

current plot to a parameter in the CDF file. When the OK button is pressed the CDF file is created.

Print The data displayed in the panel can be copied to a postscript file. When the Print button is pressed the Print Dialog window appears. This window consist of four radio button columns.

- Which Data: When the current plot, current panel or all panels radio button is pressed the data from current plot , all plots in current panels or all panels respectively are copied to a postscript file.
- Which device: When the file radio button is pressed the data is written to a postscript file. The name of this file is written in the File name: text field. When the printer radio button is pressed the data is transferred directly to the printer. The printer name is now written in the Printer name: text field.
- B&W or Color: When the black&white, b&w.diff.1 or color radio button is pressed the hardcopy will be in black and white, black and white with dotted lines or color respectively.
- Orientation: The landscape and portrait buttons determines if the plot should be orientated in landscape or portrait direction.

When the OK button is pressed the postscript file is created.

Exit To exit the client.

Edit with buttons:

Undo

TimeScale, When the user presses the middle mouse button and the cursor is located in a graphic panel a start time is recorded. In order to notify the user about the location of the start time a vertical line is drawn. The user now moves the mouse in the rightward direction and releases the middle mouse button. This location of the release point is recorded as stop time. The time between the start time and stop time is computed and sent to the time manager via the IsChangeTime() function. The time manger will immediately notify all clients about this new time.
The previous time interval is recorded at a stack and can be restored with the Undo TimeScale button. The time intervals can be restored in 8 levels. When no previous time interval is available the TimeScale button is not sensitive. (The XtSetSensitive() function is used.)

Reset, When the Reset button is pressed the cuigr client is reset. All panels except Panel 0 are removed. All quantities and plots are also removed. the cuigr client then get the same configuration as when started.

Inst The user selects from this pulldown menu the project, member and instrument for the current quantity. When this menu is used the Param pulldown menu is regenerated.

Param This pulldown menu is used to select the sensor, signal, channel and parameter for the current quantity,

Select with buttons:

Quantity When the Select Quantity button is pressed the Quantity Dialog appears. This window consists of one radio button for each possible quantity (q0, q1, .. , q19). The radio button which is on/in is the current quantity. The user use this dialog to select the current quantity. The name of the each of the defined quantities are written to the right of the radio buttons. This dialog is also used to see what data is read into the defined quantities.
The OK button is pressed when the selection is finished. When the Clear button is pressed the current quantity is removed. No data is then read from the ISDAT server into this quantity. When the Option button is pressed the Request Specification dialog appears. This dialog is used to select the reduction and samples elements in the data set. This dialog is usually not used.

Calculator When this button is pressed the Calculator Dialog appears. This dialog is used for defining the transfer functions from quantities to plots.

Graphics with buttons:

Plot

Control When the Contol button is pressed the Plot Control Dialog window appears. The Plot Control Dialog is used to customize the current plot. The top of the Plot Control window consists of five columns with radio buttons.

- Scale The Scale radio buttons determine the maximum and minimum of the ordinate and abscissa scales. When it is on preset (default) the program uses the scaleMin and scaleMax which was delivered by the data base handler. The scaleMin and scaleMax are provided from the data base. When the toggle button auto is pressed the cuigr client computes the maximum and minimum from the data values. When manual is pressed the user inputs

the maximum and minimum vales by using this dialog.
- TimeAxis The TimeAxis radio buttons determines if the time axis should be printed in the current panel. (The current panel is the panel containing the current plot.) The default is to plot time axis only in the lowest panel.
- Type The Type radio buttons determines the plot type. The default is normal line plot. In the scatter plot each data point is drawn as a cross (or a dot). In the hodogram an arrow is drawn from each data point to the next.
- Refresh The Refresh radio buttons determines if the panel should be cleared between each time a new data interval is read from the data base handler. This feature can sometimes be useful to switch off.
- LinLog These radio buttons determines if the data is plotted at a linear or logarithmic scale. When it is on preset (default) the scale type which was delivered by the data base handler is used. When the linear button is pressed the data is always plotted at a linear scale. When the log button is pressed the data is (if possible) plotted at a logarithmic scale.

When the manual radio button is pressed the scale widgets are sensitive. The scales are used to set the maximum and minimum of the ordinate and abscissa for the current plot. If higher accuracy is needed, or if the wanted maximum or minimum is outside the scale range, the user can input the numbers in the text lines below the scales. The abscissa scale minimum and abscissa scale maximum has no effect when the abscissa scale is the time axis.

When the OK button is pressed the settings for the current plot is updated and the Plot Control Dialog disappears. When The Update button is pressed the settings for the current plot is updated. When the Cancel button is pressed the Plot Control Dialog disappears.

Color is used to select color for the current plot. A list widget appears and the user selects the color by clicking on one of the names.

Marker with buttons:

Dot , In the scatter plot each data point is drawn as a dot.

Cross , In the scatter plot each data point is drawn as a cross.

Info A text window appears. This text window contains information about all available plots.

Panel with buttons:

Control When the Control button is pressed the Panel Control Dialog window appears. The Panel Control Dialog is used to customize the current panel. The top of the Panel Control window consists of three columns with radio buttons.

- Axis The Axis radio buttons determine the type of axis used. When normal (default) is pressed the normal axis are used. Then only the ordinate to the left and abscissa at the lower part of the panel are drawn. When rect.frame is used a rectangular frame with tick marks are drawn at all sides of the panel. When grid is used also a grid is drawn in the panel.
- GridType The GridType radio buttons are only sensitive when the grid radio button is pressed. When the dots (default) is used the grid is drawn as dots. The size of the dot is 1 pixel and the spacing between each dot is 10 pixels. When the manual button is pressed the scale widgets are sensitive. The user then using the scale widgets below, interactively determine the grid line length and the grid space length. When the lines button is pressed instead of a grid continous lines are drawn.
- Scale The Scale radio buttons determine if each curve in the panel should have individual or common ordinate scales. When the common button is pressed the settings for the current plot will be used for all plots in the current panel.

When the OK button is pressed the settings for the current panel is updated and the Panel Control Dialog disappears. When The Update button is pressed the settings for the current panel is updated. When the Cancel button is pressed the Panel Control Dialog disappears.

Create When the Create button is pressed a panel selection window appears. This window consists of an matrix with 10 times 3 pushbuttons. Each pushbutton indicates one panel. The existing panels are in the upper left corner. The

possible new panel positions are marked with sensitive pushbuttons. When one of the sensitive pushbuttons is pressed this panel is created.

Remove When the Remove button is pressed a panel selection window appears. This window consists of an matrix with 10 times 3 pushbuttons. Each pushbutton indicates one panel. The existing panels are in the upper left corner. The possible panels to be removed are marked with sensitive pushbuttons. When one of the sensitive pushbuttons is pressed this panel is removed. The plots inside this panel are also removed.

Color with buttons:

Axis is used to select color of the axis and text in the current panel.

Background is used to set background color in the current panel.

Border is used to set border color in the current panel.

Grid is used to set grid color in the current panel. If the background color in the panel is set then it is necessary also to set the grid color.

Help The Help pulldown menu is used to display help about the client. When any of the buttons are pressed a help window appears. This help window contains user information about the selected topic.

ERROR MESSAGES

File Config Load,

loading a configuration file. Warning messages are written at the bottom text line of the Config Load Dialog window. These are:

filename can not open
filename is a directory
filename does not exist
filename not a config file

(The filename is the full path of the selected file.)

File Config Save,

```
          saving the program state to a configuration file.  Warning
          messages are written at the bottom text line of the Config Save
          Dialog window. These are:
               filename is a directory.  No file is  created.

          When the user tries to open a file at a directory without write
          permission or to overwrite a file without write permission a
          warning dialog appears.  The text in this dialog is filename can
          not open. In this case no file is created.
          (The filename is the full path of the selected file.)

     File SaveData FlatFile,
          error messages are written in the Error messages line at the
          bottom of the Flat File Dialog:
               filename is a directory
               Time series and xy-plot are not allowed to combine in a flat
               file.
               Sampling frequency (ordinate # abscissa #) are not equal. (#
               denotes a number.)


     File Print has the error message:
          filename is a directory.  No file is  created.

     Graphics menubar button have the error message
          Plot # does not exists.  (# denotes a a number.)

     The error messages from the data base handler are written in the panel
     where the plot is expected.
          Examples:
          Quantity 0 Database Error: bad zone (between two samples)
          Quantity 3 Database Error: bad time



SEE ALSO
     cuitm(1), DbGetData(3)



WARNINGS
     When the fvwm window manager is in use and the user tries to remove
     the tear off menues by using the kill in the fvwm pulldown menu the
     cuigr client is stopped.  The user should instead use the delete in
     the fvwm pulldown menu.
```

4.2 Calculator

```
NAME
     Calculator - Manupulates the quantities for cuigr

SYNOPSIS
     Calculator

DESCRIPTION
     The Calculator is a tool for manipulating the quantities that should
     be plotted by the cuigr client.  It can be started from the cuigr
     "Select" menu.

     Menu bar:
          Edit, pull down menu with:
               Clean input line
                 Erase the text in the input text field and
                 reset the error label

               Clean marked plot
                 Will take away the bindings that are
                 marked in the plot text field

               Reset to default bindings
                 Will replace bindings for plot 0
                 to 19 with the default bindings

               Release all bindings
                 Will erase all bindings

          Option, pull down menu with:
               Tensor
                 Will pop up a window with the ability to type in a
                 3x3 tensor.
                    File, pull down menu with:
                         Read tensor, which will pop up a file selector for
                         saving the current tensor

                         Save tensor, which will pop up a file selector for
                         reading a tensor from a file into the current
                         tensor

                         Option, pull down menu with:
                              Reset to unit tensor, which will erase the
                              current tensor and fill in the unit tensor.

                    Tensor menu: A table of the tensor names available

                    Define button: Makes the current tensor defined
```

```
                Apply button: Makes the current tensor defined and
                prints the tensor name in the input text field.

                Close button: Pops down the tensor window

        Help
          Shows this text in a separate window

    Input text field:
        The place where one types in what will be plotted along the x-
        and y-axis (default for the x-axis is time).

        To bind a quantity to a plot without manipulation:
             p2y = q3    quantity number 3 will be plotted on the y-axis
             in plot number 2
             p1x = q1    quantity number 1 will be plotted on the x-axis
             in plot number 1

        Multiplication and division have higher precedence than addition
        and subtraction:
             p0y = 3*q0 + q1/10 means (3*q0) + (q1/10) not ((3*q0) + q1)
             / 10

        Unaryminus has the highest precedence:
             p1y = q0 * -q1  means q0 * ( -q1)

        Quantities of vector type:
             p0y = q0    will normalize (f=sqrt(x^2 + y^2 + z^2) q0
             before it's sent for plotting.
             p0y = q0 [0]   will extract the first component of q0. The
             components are named 0, 1, and 2.

        Tensor operations:
             p0y = T2*q0
             p0y = {T2*q0}[1] to extract component 2 of the result curly
             brackets must be used, paranthesis are not allowed for this
             case

        Polar coordinate functions:
             p0y = pol_r(q0)
             p0y = pol_phi(q0)
             p0y = pol_th(q0)

        Plotting a constant (can only be done for the y-axis):
             p0y = 3.14

        Forced joining of a quantity:
             p0y = q0 + Join(q0, q1)  will first join q1 to the same time
```

```
          line as q0 and then perform q0 + q1

     Exponents are written with 'e' or 'E':
          p2y = 1.5e-9 * (q1 - q2)

Pulldown menus:
     Quantity
       A menu with the 20 first quantities (quantities with
       higher numbers has to be typed by hand). The text on the selected
       button will be inserted at the cursor position in the input text
       field.

     Plot x
       A menu with the first 20 plot numbers. When a button is
       selected, the input text field will be erased an the text on the
       buttom plus 'x' and an equal sign, will be printed.

     Plot y
       Same as for the plot x menu except that 'x' is replaced
       with 'y'.

Action buttons:
     Apply button
       Have the same function as typing a return in the
       input text field, checks the text string and add the binding to
       the list shown in the plot text field. If the text string is not
       ok, it will instead show an error message on the error label.

     Cancel button
       Makes the calculator window disappear (pop down).
       The information in the plot text field is saved and is rertrieved
       when the Calculator is poped up again.

Error label
  When an error occurs will this field pop up and show the
  error message.  When the error is corrected or the input text field
  clean with 'clean input line' will the message disappear.

Plot text field
  Shows the bindings that are prepared (of default
  bindings).  If You want to take away one or more bindings, click on
  them with the mouse, and then choose the function 'Clean marked
  bindings' in the 'Edit' menu.  To take away a marking use ctrl-left
  button on the mouse.

The plot text field
  Shows what calculations will be performed when an
  update is requested. At startup of the client we have default
  bindings, i.e. quantity n is bounded to plot n, where n is 0 to 19.
```

```
ERROR MESSAGES AND RECOVERY PROCEDURES
     Non existing quantity: q*
       No parameter has been bound in cuigr to the quantity q*.
       qX, or, a parameter has been bound to it but no update has been
       performed.

     Function not implemented
       The function name is misspelled or is not
       implemented.

     Syntax error
       The expression in the input line is not syntactically
       correct. It can be that the expression is not completed or some
       character is missing or put at the wrong place.

     Nonexisting tensor Tx
       The Tensor is not defined. Under 'Option'
       choose 'Make Tensor' and type in the wanted tensor. Then press the
       'Define' button and this tensor can be used by the Calculator.



SEE ALSO
     cuigr


BUGS
     Focus is not on the input text field if the pointer is not there.
```

A Reference Documents

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[4] CSDS User Interface, ISDAT Installation Manual. Technical Report DS-IRF-IM-0001, IRF-U, September 1995.

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[6] CSDS User Interface, ISDAT cuitm User Manual. Technical Report DS-IRF-UM-0004, IRF-U, September 1995.

[7] WECdata structure working group. Editor C. Harvey. The structure of the WEC/ISDAT data. Technical Report CWD-OBSPM-DD-001, OBSPM, March 1995.