NAME

  qm, qmf − obtain quick measurements from captured data

SYNOPSIS

  qm [runfile]

  qmf [runfile] ...

DESCRIPTION

  Qm, the "quick measurement" program, allows you to quickly leaf through the frames in a run of data captured by one of the capture programs (*dsepr*(1)), or a run of averaged data from *analysis*(1) or *wtsum*(1). It can display several traces on screen, simultaneously. It also allows you to obtain time and voltage measurements at various points in the data, using the pointing device.

  If the optional argument, *runfile*, is given, *qm* will attempt to perform a *Set/File* operation on this file. (The file must be a run file produced by one of the capture or analysis programs.) If no *runfile* is specified, you will have to select one later.

  Qmf repeatedly calls *qm* for each *runfile* argument given. Whenever you tell *qm* to quit, it will be restarted with the next *runfile*, until all files have been examined. When you call *qmf* with no *runfile* arguments, it will call *qm* with the most recently modified run in the current directory.

  At the bottom of the display, *qm* prints the following menu prompt line:

  Clear Frame Grid Hardcopy Interp. Levels Next Prev. Quit Run Set Traces View X−range Y−range Zoom

  Any time when this menu appears, and there are traces shown on the display, you can use the pointing device to move two markers on the display, to obtain time and voltage measurements from the displayed data. See *MARKER SELECTION* below for details. (If a dashed marker appears on the display, it indicates the end of the "usable window." Data after this marker are likely to be invalid due to window retriggering during the data capture. See *dsepr*(1) for details about trigger modes.)

  Selections from the menu are made via the keyboard, however, and not via the pointing device. An operation is initiated by typing a single letter, the first letter of an item in the menu line. You can also step through the menu using the space bar and the backspace (or erase) key, to highlight the item you want, then press RETURN to select that item.

  Clear

  This selection clears all of the markers on the display, as well as their associated time and voltage measurements.

  Frame

  This selection allows you to view a specific frame in the current run. You are asked for the desired frame number, which is specified as a number from **1** up to and including the total number of frames.

  The selected frame is fetched and displayed. It becomes the current frame; a subsequent *Prev.* or *Next* operation will fetch and display the frame immediately preceding or following this frame. Even if the selected frame has been deleted by *frmsel*(1), it will still be fetched and displayed. An indicator appears on the top line of the display when a deleted frame is being viewed. If a run description was provided after the run was captured, it will appear on the second line of the display. This line will also contain the frame description for the range of frames in which this one falls, if any description was provided during the capture.

  When displaying a group of frames simultaneously, the frame you specify here will be the first of the group (see *Traces* below). A subsequent *Prev.* or *Next* operation will move backward or forward by the number of frames displayed simultaneously.

  Grid

  This selection allows you to set the *grid overlay* option. If this option is enabled, the traces will be drawn inside a grid. If disabled, the grid is not displayed. Initially, this option is disabled.

The grid spacing is automatically calculated, based on the ranges for the X and Y axes. When a dense grid spacing is being used, the screen redraw is slowed down somewhat. In this case, you may want to temporarily disable the grid, to quickly skim through frames.

Hardcopy

This selection brings you to the plotting sub-system, which presents you with a secondary menu. See *PLOTTING* below.

Interp.

This selection allows you to set the *interpolation* option. If this option is enabled, the data points of the displayed traces will be connected by line segments. If disabled, only the data points are displayed. Initially, this option is disabled.

Levels

This selection allows you to set the "level markers" option. If this option is enabled, the markers on the displayed traces appear as a crosshairs pattern, indicating both the time values and the associated levels. If disabled, only the vertical lines are displayed, indicating just the time values. Initially, this option is enabled.

Next

This selection allows you to skim through frames, one at a time, in a forward direction. If you are already at the last frame in the run, then this selection will bring you to the first frame in the run.

When displaying a group of frames simultaneously, the *Next* operation will move forward by the number of frames displayed (see *Traces* below). If this brings you close to the end of the run, and there are not as many consecutive frames as you requested for display, it will show the frames that are there and leave the bottom part of the display blank.

Prev.

This selection allows you to skim through frames, one at a time, in a backward direction. If you are already at the first frame in the run, then this selection will bring you to the last frame in the run.

When displaying a group of frames simultaneously, the *Prev.* operation will move backward by the number of frames displayed (see *Traces* below). If you are already too close to the first frame to back up by this number of frames, it will begin the display with the first frame. If you are already at the first frame in the run, then this selection will display the last complete group of frames from the end of the run.

Quit

This selection causes the program to terminate.

Run

This selection allows you to quickly run another program on your currently selected *runfile*. You are presented a menu of programs to choose from, including *analysis*, *peel*, *raster*, and *wtsum*. The program you select will be called up, with your current *runfile* as an argument. Once you quit that program, you are returned to the main menu of *qm*.

The other choice available from the *Run* menu is the *Calc* selection, which lets you perform several calculations and operations on the frames in your currently selected *runfile*. You are asked for an expression, which is evaluated on every trace in the run, using the frames you specify in the expression. The resulting frame is then displayed. See *CALCULATIONS* below for more details.

Set

This selection allows you to set various parameters that simply couldn't fit on the main menu. You are presented a new menu of parameters to choose from. After you correctly set any of these, *qm* returns to the main menu.

The *Set/Adjust-traces* selection allows you to enable or disable the automatic adjustment of trace lists to the number of frames in the run. When enabled, if the run being displayed is a small one (less than 16 frames), then all frames in the run are displayed by automatically adjusting the trace lists specified by the *Traces* operation below. If there are more trace lists specified than there are frames, the last few lists are ignored. If there are less lists than frames, the last list is re-used as many times as needed for the extra

frames. When this option is disabled, or when the run is large, the program displays as many frames as explicitly called for in the trace lists.

The *Set/Calc−macro* selection allows you to set or change any macro-instruction used by the *Run/Calc* operation. You are first prompted for the macro name. You can enter a new macro name, or the name of an existing macro. You can also leaf through the existing macro names by using the "up arrow" and "down arrow" keys on the graphics terminal. Once you enter a name, you are then prompted for the expression for that macro. For existing macros, the current expression is shown as the default value. You can enter any valid expression, as described under *CALCULATIONS* below. The new macro is saved in your *qm calculation macro file*, **.qmcalcrc**, in your home directory. If this file does not exist yet, it is created. The qm calculation macro file will contain definitions for all your macros, whether predefined, or defined by yourself. Before this file is created in your home directory, macro definitions are obtained from, but not saved into, the system-wide qm calculation macro file, **/usr/neuro/lib/.qmcalcrc**.

The *Set/File* selection allows you to choose a new *runfile* to be displayed. You are prompted to enter the name of the file. Type in this name, then hit RETURN. The name can be given with or without the **.frm** suffix. If the selected file exists and is readable, *qm* selects it as the current run, and attempts to fetch and display the current frame, or the first frame in this run.

Whether you are selecting a new run, or just reselecting the same run, the *Set/File* operation also clears the current markers, and resets the trace list and the X and Y ranges to their initial values, unless parameter saving is enabled. See *QM PARAMETER SAVING* below.

The *Set/Just−1−X* selection allows you to choose whether an X-axis scale bar should appear under each trace when the *X−bars* option is enabled, or whether just one X-axis scale bar should appear under the bottom trace. Disable this option for multiple scale bars.

The *Set/Magnify* selection allows you to choose the Y display range for a trace, as a factor of the original display range, calculated automatically when the run was selected. You are asked first for the trace number. Next, you are asked for a magnification factor. If the the number you enter is greater than 1, the Y range is magnified by the factor you give. If the magnification factor is between 0 and 1 (exclusive), the opposite occurs: the data will shrink in proportion to the factor you give. In either case, the data is automatically centered in the selected range, and will continue to be automatically centered as you go from one frame to another. To automatically center the data, the program looks at the first part of the trace to be displayed, up to the point where a fairly sharp rise is detected in the signal, and centers at the average of those initial data points.

If the magnification factor you provide is exactly **1**, then the Y range for this trace is zoomed out to the original display range, and the automatic centering is disabled. Also, setting the Y range for a trace by any of the other means available will also disable automatic centering. If you want the full display range, but want to keep automatic centering enabled, select a magnification factor close to, but not exactly **1**, such as **.9999**.

The *Set/Next−File* selection allows you to choose a new *runfile* to be displayed. It does this by "incrementing" the current file name, to get the next file in a series. For example, if your current run is **run001**, *qm* will attempt to select **run002**. If the next file exists and is readable, *qm* selects it as the current run, and attempts to fetch and display the current frame, or the first frame in this run, just like the *Set/File* operation above.

The *Set/Offset* selection allows you to shift the X-axis scale bar(s) under the traces by a specified number of milliseconds. The "0" on the scale bar will be shifted to the time coordinate you specify, so a positive value indicates a shift to the right.

The *Set/Prev−File* selection allows you to choose a new *runfile* to be displayed. It does this by "decrementing" the current file name, to get the previous file in a series. For example, if your current run is **run010**, *qm* will attempt to select **run009**. If the previous file exists and is readable, *qm* selects it as the current run, and attempts to fetch and display the current frame, or the first frame in this run, just like the *Set/File* operation above.

The *Set/Show−times/Ahp−decay* and *Set/Show−times/Psp−rise* selections allow you to enable or disable the measurement of AHP duration and half-decay, and of PSP half-width and 10-90% rise time, for all displayed traces. Once either of these options is enabled, set marker **A** to the time of onset, and marker **B** to the time of the peak. The AHP or PSP measurements will be taken based on these marker positions, and will be shown for each displayed trace. The displayed **B−A** values will represent the time to peak and peak heights. See *MARKER SELECTION* below.

The *Set/Top−titles* selection allows you to enable or disable the display of titles at the top of the screen. By disabling them, you gain a few extra lines on the display, but lose some of the information.

The *Set/X−bars* selection allows you to enable or disable the display of X-axis scale bars under each trace (if the *Just−1−X* option is disabled), or the single X-axis scale bar under the bottom trace (if the *Just−1−X* option is enabled).

The *Set/Y−bars* selection allows you to enable or disable the display of Y-axis scale bars to the left of each trace.

Traces

This selection allows you to choose which traces will appear on the display, and in which order they will appear. You are asked for the list of trace numbers. Enter a line containing one or more trace numbers, each separated by one comma and/or one or more blanks. Ranges of traces can be specified by two numbers separated by a colon or dash. For example, entering

    2−4, 0 6

will cause traces 2, 3, 4, 0 and 6 to be displayed, in that order. Non-existent traces are simply ignored. You may also type in the word **all** to select all traces. The trace list is automatically set back to **all** when you select a new *runfile*, unless parameter saving is enabled.

This selection also allows you to display several frames at once. You do this by specifying several trace lists, separated by semicolons. Each list applies to one frame. You can also follow any trace list with "*/n*" to repeat this list for the next *n* frames. Up to a total of 16 frames can be specified in this way. Here are a few examples.

all; all; all
all/3
0,1/2; 3; ; 0,2/2

The first and second examples are equivalent; they show all traces for 3 consecutive frames, starting with the current frame. The third example shows traces 0 and 1 for two frames, trace 3 for a third frame, nothing for the fourth frame, then traces 0 and 2 for the fifth and sixth frames (all starting with the current frame).

Note that when several frames are displayed at once, the title line and the frame description at the top of the display apply to the first frame in the group shown. For instance if the title indicates a deleted frame, it is the first frame of the group which is a deleted frame; the following frames may or may not be deleted.

When displaying a group of frames simultaneously, a subsequent *Prev.* or *Next* operation will move backward or forward by the number of frames displayed simultaneously.

If the current frame is close to the end of the run, and there are not as many consecutive frames as you requested for display, the program will show the frames that are there and leave the bottom part of the display blank.

View

This selection allows you to view the run's header information and trace calibration information, or the run's frame description file.

The *View/Calibration* selection will display the contents of the run's header, such as the run length, number of frames, and calibration information for each trace in the run.

The *View/Text* selection will display the contents of the run's frame description file, if one exists. This lets you see the descriptions for every range of frames, which were entered during the data capture, by pausing the capture of triggered channels after each range of frames. Seeing these descriptions should help you choose the frames you want to view.

X−range

This selection allows you to clip the data displayed, on the left or right sides, in order to zoom in on a specific section. You are asked first for the lower bound (left cutoff point), then for the upper bound (right cutoff point). Both of these are specified in milliseconds. The selected portion of the traces is redisplayed. These parameters are set back to the full range when you select a new *runfile*, unless parameter saving is enabled.

Y−range

This selection allows you to clip the data displayed on the top or bottom of any trace, in order to zoom in, or to expand the range of levels shown. You are asked first for the trace number. Next, you are asked for the lower bound, then the upper bound for this trace. Both of these are specified in the units used on the trace's scale bar, either millivolts or A/D units. The trace is then redisplayed, using the selected range of levels.

Unless parameter saving is enabled, when you select a new *runfile*, the program automatically sets the range of levels for every trace, by looking at the first few and last few frames in the run. The ranges are set to include all the data in these frames, with a little room to spare. However, if the data in any trace fluctuates a lot, that trace may be clipped when other frames are viewed, unless you manually increase the range after selecting the *runfile*.

An alternate method of selecting the Y display range for a trace is to copy the settings from another trace. After selecting *Y−range* from the menu, instead of entering a single trace number, enter a line of the form:

> *n=m*

where *n* is the number of the trace whose Y range you want to change, and *m* is the number of the trace whose range you want to copy. Instead of asking you for the lower and upper bounds, *qm* will simply take the settings from the second trace.

Zoom

This selection allow you to zoom in and out on the data. The *Zoom/In* selection lets you use the pointing device to select the X and Y ranges to be displayed. Use the pointing device to move the cursor to the desired position on the screen, then press button **A** to set one corner of a "bounding box," or press button **B** to set the other corner. Press button **D** when you are done, and the area displayed in the bounding box will be blown up to fill the display area for the trace on which the box was placed. The X range selected affects all traces being displayed. The Y range selected affects only the trace on which the selection was made.

The *Zoom/X−out* selection sets the X range back to the full display window for frames in the current run. The *Zoom/Y−out* selection sets the most recently changed Y range back to the full display range for that trace in the current run, as calculated when the *runfile* was selected.

!command

Whenever the menu prompt line appears at the bottom of the screen, instead of typing a letter to select a menu item, you can type an exclamation point, followed by any UNIX command, then hit RETURN. A UNIX shell is invoked to interpret and execute this command. This can be done at any level in the menu hierarchy, except from the *Zoom/In* operation's menu. You can recall and edit the last command entered, by hitting the "up arrow" key, or Control-K, after typing the exclamation point.

$ or %

Whenever the menu prompt line appears at the bottom of the screen, you can also type either a dollar sign (**$**), to invoke an interactive Bourne shell, or a percent sign (**%**), to invoke an interactive C shell. In either case, the shell will continue accepting commands until you type a **Control-D**, to exit from the

shell, and return to *qm*.

MARKER SELECTION

When traces are displayed on the screen, and the *qm* menu prompt line appears at the bottom, you have the opportunity to place markers on the displayed data. There are two markers, marker **A** and marker **B**. They are positioned via the pointing device; use it to move the graphics cursor to the X coordinate where you wish to place a marker, then press button **A** or **B** (on the pointing device, not on the keyboard) to place the corresponding marker. They can be moved to new locations in the same way.

The markers appear on each trace displayed, as crosshairs patterns indicating the selected X positions, and the levels (Y positions) at those points in the trace, or as vertical lines indicating only the X positions. The actual numerical values for the X and Y positions are also displayed for both markers, when they are set. The X values appear near the top of the display, and the Y values appear above each trace. If both markers are set, the X and Y differences (**B−A**) are also given.

You can also use button **C** on the pointing device to place a time reference marker on the display. If you do so, then the numerical values for the X positions of the A and B markers are calculated relative to this time reference point, rather than relative to the start of the data in the trace.

After setting either of the A and B markers, or the time reference marker, you can make fine adjustments to its position by pressing the "less than sign" key (<) to move it to the left, or the "greater than sign" key (>) to move it to the right. These adjustments apply only to the last marker placed with the pointing device.

If you select a new frame, via the *Frame*, *Prev.* or *Next* operations, the markers remain in their current X positions, and the Y positions are adjusted to fit the new data. You can remove either marker, or the reference, by setting it to the left of the beginning of the traces. The time reference and both markers are removed when you select a new *runfile*, unless parameter saving is enabled. They are also removed by the *Clear* operation.

QM PARAMETER SAVING

Qm usually resets all of its parameters whenever it starts up, and whenever you select a new *runfile*. However, if the environment variable **QMPARM** is set to a file name, then *qm* will save all of its parameters in that file before quitting or before selecting a new *runfile*. It will then reload these parameters after a run is selected, and make use of these parameters rather than returning them all to their initial values. The usual name used for the parameter file is **default.qm**. Before saving its parameters in the file, *qm* will ask you whether it should or not.

Among the parameters saved are the current frame number, the current list of traces to be shown, the interpolation, grid, and levels options, as well as several other options, and the current marker settings and X and Y display ranges.

Qm keeps track of whether you set the X and Y display ranges explicitly, or whether they were set automatically to fit the data in the run being displayed. If you had set them explicitly, they will remained fixed at their current settings until you change them again yourself, or you zoom them out to their automatically scaled values. If they had been set automatically to fit the data in the current run, then they will be recalculated automatically when you select a new run, so that they fit the new data.

CALCULATIONS

The expressions you can enter to perform calculations and operations on frames, using the *Run/Calc* and *Set/Calc−macro* selections, are composed by putting together simple operators using an algebraic notation. For example, the expression "**F6 = F2-F1**" will subtract frame 1 from frame 2, and assign the difference to frame 6.

Expressions are formed by combining simpler expressions with one of the operators below. An expression can also be a *number*, either a whole number or a real number (e.g. **1**, **0.0**, **.2**, **1.5e−2**). For instance, the expression "**F6**", which means "frame number 6 in the current run", is made up of the operator "**F**", and the expression "**6**".

The operators are listed below. In this table, *expr* represents any valid expression.

A *or* **B** *or* **C**   the values of marker A, marker B, or the time reference marker, given as a number of points from the start of the frame.

N *expr*   the numeric variable selected by the integer *expr* (0 to 19). These twenty numeric variables can be used as temporary holding areas for results.

F *expr*   the frame selected by the integer *expr* (1 to *n*, where *n* is the number of frames in the run). You can also assign to frame *n+1* to add a new frame to the run.

$ *expr*   the macro's parameter selected by the integer *expr* (1 to *n*, where *n* is the number of parameters passed to the macro).

(*expr* **)**   the value of *expr*. Parentheses override operator precedence.

expr **[** *expr* **,** *expr* **]**   *or*
expr **[** *expr* **]**   the first *expr* (a frame or sub-frame), subscripted by the other *expr*(s), to yield a sub-frame. If the second subscript is left off, the end of the frame is assumed. To get a single point, the same subscript must be given twice. (e.g. **F6[A,A]**)

D *expr*   the *expr* (a frame or sub-frame), differentiated.

I *expr*   the *expr* (a frame or sub-frame), integrated.

S *expr*   the *expr* (a frame or sub-frame), smoothed. The smoothing algorithm used is a simple three-point moving average.

− *expr*   unary minus, yields the *expr* negated.

*@ *expr*   unary reduction by multiplication, yields the product of the points in the *expr* (a frame or sub-frame).

/@ *expr*   unary reduction by division.

+@ *expr*   unary reduction by addition, yields the sum of the points in the *expr* (a frame or sub-frame).

−@ *expr*   unary reduction by subtraction, yields an alternating sum.

m@ *expr*   unary reduction yielding the minimum point in the *expr* (a frame or sub-frame).

M@ *expr*   unary reduction yielding the maximum point.

expr ***** *expr*   multiply the two *expr*s.

expr **/** *expr*   divide the first *expr* by the second.

expr **+** *expr*   add the two *expr*s.

expr **−** *expr*   subtract the second *expr* from the first.

expr **L** *expr*   shift the first *expr* (a frame or sub-frame) left by the number of points specified by the second *expr* (an integer).

expr **R** *expr*   shift the first *expr* right by the number of points specified by the second.

expr **Z** *expr*   low-pass filter the first *expr* (a frame or sub-frame) at the cutoff frequency specified by the second *expr* (in Hertz). The filtering algorithm used is a "Second-order, zero-lag Butterworth filter," which filters in two passes to eliminate phase-shift distortion. The cutoff frequency is limited to 2/5 of each trace's sampling rate, to avoid ringing.

expr **m** *expr*   the smaller of the two *expr*s.

expr **M** *expr*   the larger of the two *expr*s.

expr **=** *expr*   the first *expr* (a frame or sub-frame, or a numeric variable) is assigned the value of the second *expr*.

expr **;** *expr*   separates multiple operations in one expression. The first *expr* is performed, then the second. (Yields the value of the second *expr*.)

X *name expr* **,** *expr* **,** *...*   *or*
X *name expr*   *or*
X *name*   execute the macro of the given *name*, with as many arguments as it needs. Multiple arguments must be separated by commas.

Expressions can, in some instances, mix single numbers and frames. For example, you can multiply a frame by a scaling factor, or assign a number to a frame.

The operators above can be entered as either upper- or lower-case letters, with the exception of **m** and **M**, which are distinct operators. Macro names can be one or more letters, and are case sensitive. (e.g. "fred", "Fred" and "FRED" are three distinct macro names.)

When combining several operators in an expression, bear in mind that some operators take precedence over others, and that the expression will not necessarily be evaluated strictly from left to right. You can use parentheses to force a low-precedence operator to be evaluated before a higher precedence operator. The operator precedences are as follows, from highest to lowest, with equal precedences on the same line.

(*expr* **)**   *highest precedence*
F, **N**, **$**
subscripting
unary **−**, **D**, **I**, **S**, ***@**, **/@**, **+@**, **−@**, **m@**, **M@**
*, **/**
+, **−**
L, **R**
m, **M**
=
,
X
;   *lowest precedence*

The reduction operators above yield a *scalar* value (a single number) from a *vector* (an array of numbers, i.e. a frame or sub-frame). For example, in the expression "**F6 = F1 − (+@F1[A,B]) / (B+1−A)**", the points in frame 1, from A to B inclusive, are added up. The resulting sum is divided by the number of points to get the mean level in the range, and the mean is subtracted from frame 1 and assigned to frame 6. Thus frame 6 is equal to frame 1 shifted vertically such that the range between A and B is zero. Reduction operators are used in several of the pre-defined macros listed below.

There are five pre-defined macros that are built-in to *qm*, and cannot be changed.

Xdiv   The **div** macro, called as **Xdiv**, gives the sample rate divisor of the trace for which the given expression is currently being evaluated.

Xend   The **end** macro gives the index of the last point in the trace for which the given expression is currently being evaluated.

Xsamprate
     The **samprate** macro gives the sample rate for the current run, in Hz.

Xadpermv The **adpermv** macro gives the calibration scaling factor of the trace for which the given expression is currently being evaluated, as A/D units per mV.

Xzeroad   The **zeroad** macro gives the calibration offset of the trace for which the given expression is currently being evaluated, as the A/D unit level for 0 Volts.

The following pre-defined macros are not built-in, but are simply defined in your **.qmcalcrc** file, and can be changed. Their initial definitions are obtained from **/usr/neuro/lib/.qmcalcrc**. They offer a convenient short-hand for some slightly more complex expressions.

Xmb *n*   finds the minimum point in frame *n* before marker A. (Defined as "**m@F\$1[0,A]**".)

Xma *n*   finds the minimum point in frame *n* after marker A. (Defined as "**m@F\$1[A]**".)

XMb *n*   finds the maximum point in frame *n* before marker A. (Defined as "**M@F\$1[0,A]**".)

XMa *n*   finds the maximum point in frame *n* after marker A. (Defined as "**M@F\$1[A]**".)

Xi *n*   integrates frame *n* between marker A and marker B. (Defined as "**F\$1[A,B] = I F\$1[A,B]**".)

Xd *n*   differentiates frame *n* between marker A and marker B. (Defined as "**F\$1[A,B] = D F\$1[A,B]**".)

Xs *n*   smoothes frame *n* between marker A and marker B. (Defined as "**F\$1[A,B] = S F\$1[A,B]**".)

Xa *n*   adjusts frame *n* such that the level at marker A is zero. (Defined as "**F\$1 = F\$1 − F\$1[A,A]**".)

XA *n*   adjusts frame *n* such that the average level at the first four points is zero. (Defined as "**F\$1 = F\$1 − (+@F\$1[0,3]) / 4**".)

Xn *n***,***m*   normalises frame *n* such that the displacement from zero at marker A is equal to the displacement from zero in frame *m* at marker B. (Defined as "**F\$1 = F\$1 * (+@F\$2[B,B] / +@F\$1[A,A])**".)

ONLINE HELP

Typing a question mark, (**?**), while either the *Run/Calc* or *Set/Calc-macro* menu items is highlighted, will cause the program to show a "help page" describing the operations and macros that can be performed. (This must be done at the menu, not at the prompts you get by actually making these selections from the menu.) The program will pause after each screen-full, waiting for you to hit a key. Hitting the ESCAPE key will get you out of the help facility, and back to the main menu. Any other key will cause the help page to continue being displayed. Once the text has been displayed, the program leaves you at the same menu item where you called up the help facility.

PLOTTING

The *Hardcopy* selection is used to produce a plot similar to what is currently displayed on the screen. A new menu is presented, allowing you to change certain plotting parameters. The choices are:

        Axes Data File Interpolation Markers Plotter Quit Screen Text Video

Selections are made by typing the first letter of an item in this menu.

Axes, Data, and Markers

These selections allow you to change the pen numbers used to plot axes, data points, and markers, respectively. You will be prompted to enter a pen number, an integer from **0** to **8**. The three pen numbers are initially set to **1**. Selecting pen number 0 suppresses plotting of those items.

File

This selection allows you to store the HPGL commands used to plot the graph in a file. You will then be able to plot this graph, at a later time, by invoking *hardcopy*(1). You will be prompted to enter the file name. If you enter a file name, the graph will be stored in this file. If the file already existed, it will be overwritten.

Interpolation

This selection allows you to change the plot interpolation option. If this option is enabled, the data points of the plotted graph will be connected by line segments. If disabled, only the data points are plotted. This is similar to the *Interp.* option for the screen display, but is maintained as a separate option because it is common to want interpolation enabled for plotting, but not for the screen display.

Plotting with interpolation enabled allows the plotter to work much faster, with less wear on the pen.

Plotter

This selection allows you to plot the graph directly to the plotter. The *hardcopy* program is invoked to plot the displayed graph. Before beginning this operation, make sure the plotter is powered up, on-line,

and that a clean sheet of paper has been loaded. Also make sure the plotter's *autoload* option is enabled.

Quit

This selection returns you to the previously displayed menu.

Screen

This selection allows you to change the screen redraw option. If this option is enabled, the graph will be redrawn on the screen while it is being sent to the file or the spooler. If disabled, the current contents of the screen will remain, while the plot is generated.

Text

This selection allows you to change the plot text option. If this option is disabled, the generated plot will not contain any text; all titles and labels will be stripped from it, leaving only the axes, tick marks, data points, etc. This is useful when the plot is reduced in size to the point where the text would be illegible. If enabled, the generated graph will be complete with all titles and labels.

Video

This selection does not affect the pen plotter, but instead produces a printed copy of the video display's current contents – a screen dump – by invoking *sdump*(1). The same thing can be accomplished by pressing the *quit* key, normally **Control-B**. The *Hardcopy/Video* operation has the advantage that it can be used even when the program is reading its commands from a file, rather than the terminal. Also, the *Hardcopy/Video* operation clears the menu area before performing the screen dump.

OPTIONS

Normally, the only command line option given to *qm* is the name of the run to be viewed.

The command, "**qm –dispmenus**", will cause *qm* to print a listing of its hierarchy of menus, to the standard output, then quit. In this mode, the graphics terminal is not required.

X WINDOW SUPPORT

When the X Window version of this program is run on an X Window terminal, a new window will be shown for displaying program output. Unless the input was redirected from a file, it will be taken from the keyboard when this window is the "input focus", i.e. the active window. When running this way, it is essentially detached from the *xterm* window from which you run the command, and it can be run in the background.

As for most other X Window programs in this package, the following X command line options are accepted:

–cursor *num*

You can specify any cursor number (not cursor names) in the Standard Cursor Symbols described in the *X Window System User's Guide* using the **–cursor** or **–curs** option. The default value is 68, the left pointer symbol. This can also be specified using the **CURSOR** environment variable.

–display [*host*]**:***server*[**.***screen*]

By default, the host, server and screen, which identify your X terminal, are obtained from the environment variable **DISPLAY**. However, you can also specify them using the **–display** or **–disp** option. The *host* is the name of the machine or terminal, on which the window is to be created, *server* is the server number, and *screen* is the screen number (default is 0).

–fn *font*

You can specify any fixed-width font to be used for text display using the **–fn** or **–font** option. The default value is **9x15** if the window is at least 900 pixels wide initially, and **fixed** otherwise. This can also be specified using the **SCRFONT** environment variable.

–geometry *geometry*

By default, the program will create a window that covers most of the display. However, you can specify custom window dimensions and location using the **–geometry** or **–geom** option. The format of the *geometry* string is described in the *X Window System User's Guide*. This can also be specified using the **GEOMETRY** environment variable.

–iconic

This option will cause the program to start up in an iconified state, which can be reactivated by double-clicking on the icon.

–rev   This option will cause the program to use reverse video in its display window.

–title *name*

This option will change the name shown on the window's title bar, which is usually just the program name. It can also be given as **–name** *name*.

NOTES

Qm should be run from a graphics terminal, or X terminal, in order to view data traces. It can be run from other types of terminals, to plot out traces, but no traces will be displayed on screen.

FILES

*.frm	the frame file (or runfile)
*.txt	the run description
*.frd	the frame descriptions
default.qm	usual name for qm parameter file
/usr/neuro/lib/.qmcalcrc	system-wide qm calculation macro file
/usr/neuro/lib/qm.hlp	help file
$HOME/.qmcalcrc	user's qm calculation macro file

SEE ALSO

calibrate(1), cap(1), dsepr(1), frmsel(1), analysis(1), peel(1), raster(1), wtsum(1), hardcopy(1), sdump(1)