# Graph35*
# A LaTeX package to display keys and screen of (some) Casio calculators.

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**Abstract**

This package provides macros to display keys and menu items of some Casio calculators (including Graph25, Graph35, Graph75 and others…).

## Foreword

My dear English readers, I am really sorry… I had my French colleagues in mind when I wrote this package, so, once in a while, the main documentation is written in French. The document you are reading now is only a translation, and I fear that my English translation is worse than what you would have read if I had written it directly in English. Sorry. And good luck reading this…

## Contents



*This document corresponds to graph35 0.1.4, dated 2023-04-04. Home page, bug requests, etc. at http://framagit.org/spalax/graph35.

# 1 Introduction

This document introduces the graph35 package.

## 1.1 Licence



Further information can be found in the `.dtx` file used to build the `.sty` document and the main (French) documentation, available at http://ctan.org/pkg/graph35.

## 1.2 Summary

Section 2 covers installation instruction. Macros and package options are introduced in section 3. Some software developped together with this package are described in section 4. Appendixes A to D list available calculators, keys, menu items, and illustrates some options. This document does not include the implementation: it is available in the main (French) documentation.

# 2 Download and install

## 2.1 Gnu/Linux Distribution

If applicable, the easiest way to get graph35 working is by installing it by your distribution package. In Debian (and Ubuntu, and surely other distributions that inherit from Debian) it is packaged in `texlive-pictures` since version `2018.20180404-1`. So you can install it by running:

```
sudo apt install texlive-pictures
```

## 2.2 LaTeX distribution

This package is included both in TeXLive and MiKTeX. It can be installed by their respective package managers.

## 2.3 Manual install

- Download the archive:

  **Stable version** http://mirrors.ctan.org/graphics/graph35.zip

  **Development version** https://framagit.org/spalax/graph35/repository/archive.zip?ref=main

- Uncompress the archive.
- Compile the package : `latex graph35.ins`
- Move the several `.sty` files in a directory that is part of the LaTeX path.

# 3 Usage

## 3.1 Supported calculators

**Case and keys** The macros can display case and keys of the Graph35 calculator only (although it can have another name in another country).

**Screen** This package implements screen items of models Graph25, Graph35, Graph75, fx-9860Gii, fx-9750Gii, and others.

## 3.2 Package options

This package has a single `color` option, which is set to `color=real` by default.

This option accepts two values: `real` and `blackandwhite`, defining the default key and case color. See next section for more details.

Moreover, this is not, strictly speaking, a package option, but it is possible, to make compilation faster, to add the following line before loading this package.

```
1 \PassOptionsToPackage{draft}{pixelart0}
```

This line will disable pixelart images (mainly the `\function` macros, see part C.2). Indeed, having a lot of those macros can make compilation very long, and adding this line can make it faster[1].

## 3.3 Colors

### 3.3.1 Preset colors

You can chose the case and key colors from preset profiles, or customize them. Those preset profiles are:

**real** Realistic colors, but can be hard to read when printed in black and white.

[1] For instance, on my computer, adding this line to this files make compiling thirty times faster, from eight minutes to sixteen seconds.

**blackandwhite** Black and white, hight contrast, that will be easier to read when printed.

### 3.3.2 Color choice

There are several ways to set colors.

- Package argument `color` defines the default color to use (which can be later overloaded using option `color` of the macros). For instance, to make all drawing black and white, load the package using the following line.

```
\usepackage[color=blackandwhite]{graph35}
```

  By default, realistic color are used (`color=real`).

- Option `color` of macros `\key` and `\calculator` can have an additional value `default`. Using this explicitely uses the default color defined while loading the package.

`\setgraphcolor`

- At last, default color can be redefined at any time using macro `\setgraphcolor{`⟨*color*⟩`}`. For instance, if the package was loaded with option `color=blackandwhite`, use `\setgraphcolor{real}` to use the `real` colors by default.

### 3.3.3 Custom colors

Arbitrary colors can also be used, by defining the following colors.

`graph35ACON` : Key `ACON`.

`graph35ACONBORDER` : Border of key `ACON`.

`graph35ALPHA` : Key `ALPHA`.

`graph35ALPHABORDER` : Border of key `ALPHA`.

`graph35SHIFT` : Key `SHIFT`.

`graph35SHIFTBORDER` : Border of key `SHIFT`.

`graph35SCREEN` : Screen pixels.

`graph35SCREENBG` : Screen background.

`graph35CASE` : Case.

`graph35CASEBORDER` : Case border.

`graph35EXE` : Key `EXE`.

`graph35EXEBORDER` : Border of key `EXE`.

`graph35NUMBER` : Number keys.

`graph35NUMBERBORDER` : Border of number keys.

`graph35KEYTEXT` : Text on keys.

`graph35ALPHATEXT` : Text *alpha* above keys.

`graph35SHIFTTEXT` : Text *shift* above keys.

Those colors are color names as defined by package `xcolor`, and can be defined using macros from this package. For instance, to display  , use the following code:

```
\colorlet{graph35KEYTEXT}{green}
\colorlet{graph35SHIFTTEXT}{orange}
\definecolor{graph35ALPHATEXT}{RGB}{0, 0, 255}
\definecolor{graph35NUMBER}{RGB}{200, 200, 200}
\colorlet{graph35NUMBERBORDER}{graph35NUMBER}

\key[shift, alpha]{7}
```

## 3.4 Calculators

`\calculator` Right now, only one model is available: GRAPH35+.
Syntax is: `\calculator[`⟨*color, scale*⟩`]{`⟨*model*⟩`}`.

- `{`⟨*model*⟩`}` The list of available models is available in appendix A (page 9).
- `[`⟨*color*⟩`]` Change calculator colors (see previous part 3.3).
- `[`⟨*scale*⟩`]` Change calculator scale. The drawing you get might not be what you expect: see part 3.7 for more information.

For instance, command `\calculator[color=real]{graph35+E}` displays a calculator ten times bigger than the following calculator (scaled down here for readability; a bigger version is displayed in appendix A, page 9).

`\tikzcalculator` One can include a calculator in a Ti*k*Z drawing, using command `\tikzcalculator{`⟨*model*⟩`}`. This command takes a single argument `{`⟨*model*⟩`}`, and displays a calculator around coordinates (0; 0). To draw a calculator elsewhere, or with another scale, use the `scope` environment, as in the following example.

```
\begin{tikzpicture}
  \begin{scope}[shift={(1, 2)}, scale=.5]
    \tikzcalculator{graph35+E}
  \end{scope}
\end{tikzpicture}
```

Anchors are defined for each keys, case borders, and screen, to be used within your Ti*k*Zfigures. See appendix B for more information.

## 3.5 Keys

`\key` To draw a calculator key, use:

`\key[`⟨*color, prefix, suffix, scale, shift, alpha*⟩`]{`⟨*key*⟩`}`.

For instance, `\key[color=blackandwhite]{DEL}` displays DEL while `\key[shift, alpha]{DEL}` displays INS UNDO DEL.

Arguments are:

- `{`⟨*key*⟩`}` Key name to display (for instance `1` for 1, and `EXE` for EXE). Key name is more or less what is displayed on it. Key names are available as a list in appendix D.1, or as a calculator with captions in figure 6.
- `[`⟨*color, scale*⟩`]` Scale and color of key. Those options have the same syntax and limitations as options of command `calculator` (see section 3.3 for colors, and 3.7 for scale).
- `[`⟨*shift, alpha*⟩`]` Those options enable or disable yellow and red text describing the key meaning when pressed after the SHIFT or ALPHA keys. By default, those texts are hidden (equivalent to `shift=false, alpha=false`) ; to enable the, use `shift=true` and `alpha=true` or `shift` and `alpha`.
- `[`⟨*prefix, suffix*⟩`]` For each key, anchors are defined, allowing references to the key in Ti*k*Z pictures (for instance, they are used to draw figure 6, page 30). By default, anchor names are `key` followed by the key name (for instance `keyDEL` for the `DEL` key). The `prefix` and `suffix` options make the anchor names customizable (as used in the following pictures). With those options, two keys can have different anchors on the same figure, making it possible to use each of those keys. Those options also define anchor names for `SHIFT` et `ALPHA` texts.

Without options : anchors `keyDEL`, `keyDELshift`, `keyDELalpha`.

With options `prefix=foo, suffix=bar` : anchors `fooDELbar`, `fooDELbarshift`, `fooDELbaralpha`.

The anchor names are listed in appendixes B.1 and B.2.

- Peeking at the source code, you may see that more options are used. Those options are not described here because they are not meant to be used by final users, and might change in a later version without notice.

`\tikzkey` As with `\calculator` and `\tikzcalculator`, macro `\tikzkey` does the same as `\key`, excepted that it is meant to be called from within a Ti*k*Z environment. Its syntax is:

`\tikzkey[`⟨*options*⟩`]{`⟨*key*⟩`}{`⟨*coordinates*⟩`}`

Its arguments are

- `[`⟨*options*⟩`]`: same options as macro `\key` ;
- `{`⟨*key*⟩`}`: name of the key ;
- `{`⟨*coordinates*⟩`}`: coordinates the key is drawn around.

## 3.6 Screen

Three macros can be used to draw parts of the screen: menu items, captions of function keys, battery level.

### 3.6.1 Menu

`\menu` Macro `\menu{`⟨*icon*⟩`}{`⟨*shortcut*⟩`}` draws an icon from the main menu. For instance, `\menu{RUNMAT}{A}` displays  . Shortcut (the character at the bottom right corner of the item) is independant from the icon, because depending of the calculator model or its version, it can change.

Appendix C.1 is a list of every menu icon and shortcut.

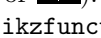
`\tikzmenu` The `\tikzmenu` macro draws a menu item in a Ti*k*Z environment. Its syntax is:

`\tikzmenu[`⟨*options*⟩`]{`⟨*icon*⟩`}{`⟨*shortcut*⟩`}{`⟨*coordinates*⟩`}`

Its arguments are:

- `{`⟨*icon*⟩`}` and `{`⟨*shortcut*⟩`}`: same meaning as the corresponding `\menu` options;
- `{`⟨*coordinates*⟩`}`: coordinates of the top-left corner of the menu item;
- `[`⟨*options*⟩`]`: some options, that are passed as-is to the `\bwpixelart` macro (from the `pixelart0` package). They can be used to change the scale and color of the drawing (for instance `scale=.5, color=red`).

### 3.6.2 Functions

`\function` The `\function{`⟨*function*⟩`}` macro displays the caption of the keys  to  (for instance  or  ). Available pixel-arts are listed in appendix C.2.

`\tikzfunction` Macro `\tikzfunction[`⟨*options*⟩`]{`⟨*function*⟩`}{`⟨*coordinates*⟩`}` is the same as `\function`, but from within a Ti*k*Z environment. The `{`⟨*function*⟩`}` argument is the same as for macro `\function`; see macro `\tikzmenu` for the meaning of arguments `[`⟨*options*⟩`]` and `{`⟨*coordinates*⟩`}`.

### 3.6.3 Battery

`\battery` Macro `\battery{`⟨*state*⟩`}` displays the state of charge of the battery (for instance  ). Available pixel-arts (and arguments) are listed in appendix C.3.

`\tikzbattery` Macro `\tikzbattery[`⟨*options*⟩`]{`⟨*state*⟩`}{`⟨*coordinates*⟩`}` is identical to macro `\battery`, but from within a Ti*k*Z environment. Its `{`⟨*state*⟩`}` argument is the same as for `\battery`; see macro `\tikzmenu` for the meaning of arguments `[`⟨*options*⟩`]` and `{`⟨*coordinates*⟩`}`.

## 3.7 Scaling

Option `scale` used to set size of calculators and keys does not change line width or border radius. The unexpected result is the following drawing of a calculator at a $^1/_{10}$ scale: the case border (green) is too big, and the screen is almost an ellipsis (among other flaws).

.

There are several solutions to fix this, but none of them is perfect, which is why they are not implemented.

- Get used to those flaws. Indeed, for small scale changes, they are barely noticable.
- Embed the drawing in a `\scalebox` or `\resizebox` macro: command `\resizebox{.1}{\calculator{graph35+E}}` gives the following drawing.

- Use option `transform canvas` from the `pgf` package (for instance: `\begin{tikzpicture}[scale=.` Line width and border radius will be correctly scaled, but the bounding box will not be changed, neither will be the coordinates (thus anchors will be useless).

At last, when including drawings in a `tikzpicture` environment using the `scale` option, do not forget to add option `tranrsform shape`, so that bounding box is also changed.

# 4 Binaries

A few Python3 software are maintained together with this LaTeX package. They are not distributed with it, so they have to be downloaded directly from the code repository. They are specialized enough to share this package repository, but if you were to use them for something else, good for you!

Most of those handle `.pxl` files. This is a custom file format, coding a pixel-art picture as lines of `0`s and `1`s. Each menu, battery, function icon is stored as one of those files, and converted to LaTeX code before being included in this package.

`catpxl` Display a `.pxl` file to the terminal.

`completefunctionchars` Each function icon has its readable characters associated to it (it is used in appendix C.2). This software look for function icons without such characters, and asks user for them.

`erate.keys` and `generate.pixelart` Generate the LaTeX files generating the pixel-art and keys, from the source files in this repository.

`screenshot2pixelart` Parse a calculator screenshot to find new function and menu icons.


Figure 1: Calculator `graph35+E`.

# A Calculators

Here is the list of available calculators, together with their keyword (used as argument for macros `\calculator` and `\tikzcalculator`).

- `graph35+E`: figure 1.

# B Anchors

Anchors of keys, shift and alpha texts, screen, etc.

## B.1 Anchors of keys

Each key defines the anchors shown in figure 2.

## B.2 Anchors of key `REPLAY`

The `REPLAY` key defines some additionnal anchors, for each of its arrows. They are illustrated in figure 3.

## B.3 Screen anchors

Anchors of the screen are illustrated in figure 4.

## B.4 Case anchors

Anchors of the case are illustrated in figure 5.

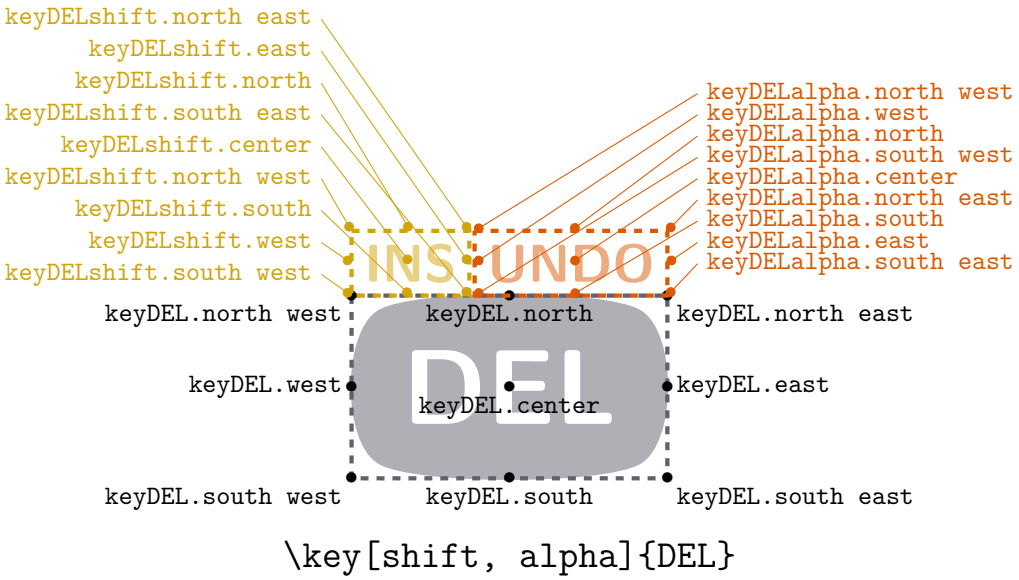



Figure 2: Key anchors

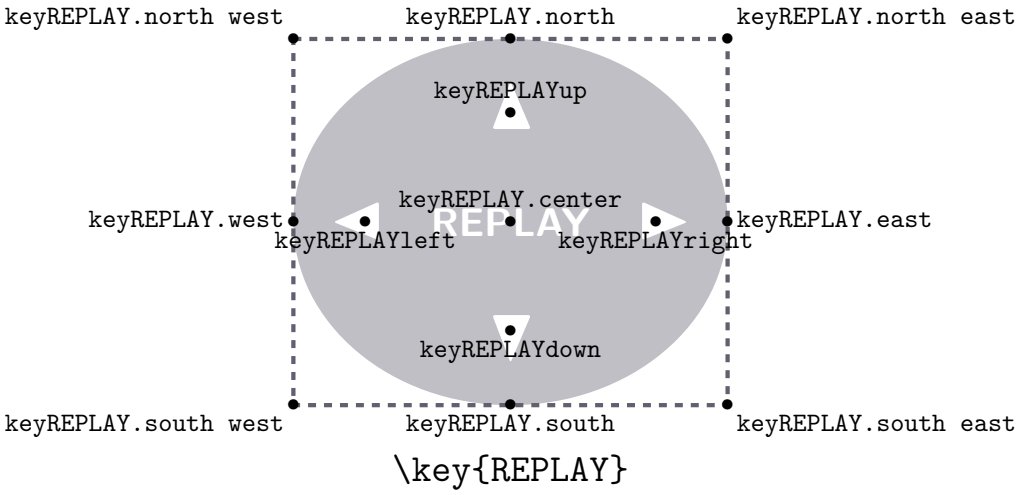



Figure 3: `REPLAY` key anchors

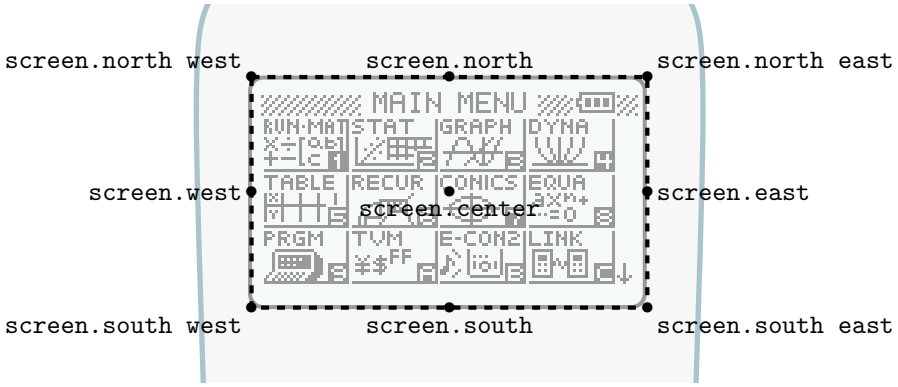



Figure 4: Screen anchors

# C Pixel art

## C.1 Menu

Two special icons and shortcuts are available: `black`, which produces a black pixel-art; and `blank`, which produces nothing.

### C.1.1 Icons

- \menu{black}{black}
- \menu{blank}{black}
- \menu{CONICS}{black}
- \menu{DYNA}{black}
- \menu{eACT}{black}
- \menu{ECON2}{black}
- \menu{eCON3}{black}
- \menu{EQUA}{black}
- \menu{GEOM}{black}
- \menu{GRAPH}{black}
- \menu{LINK}{black}
- \menu{MEMORY}{black}
- \menu{PRGM}{black}
- \menu{RECUR}{black}
- \menu{RUN}{black}
- \menu{RUNMAT}{black}
- \menu{SSHT}{black}
- \menu{STAT}{black}
- \menu{SYSTEM}{black}
- \menu{TABLE}{black}
- \menu{TVM}{black}

### C.1.2 Shortcuts

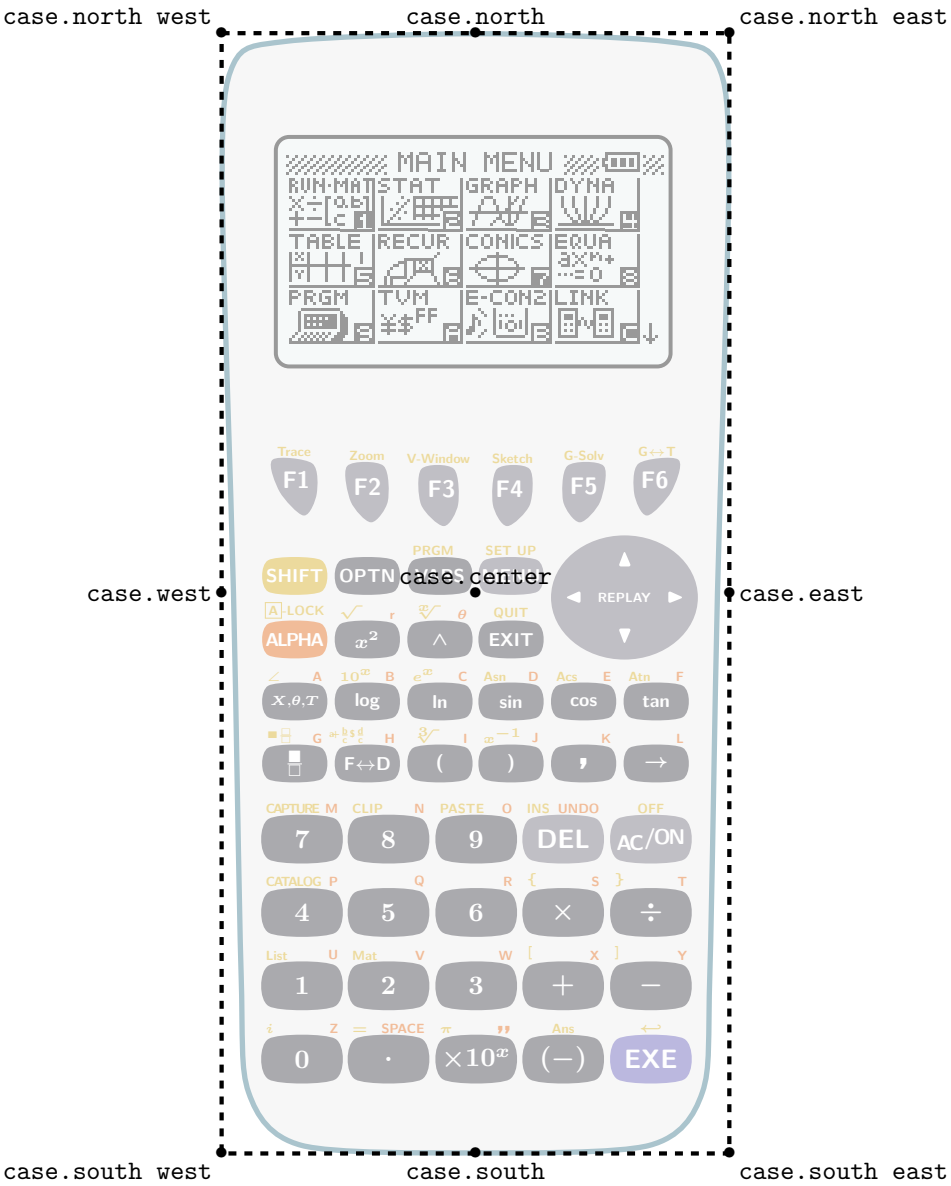



Figure 5: Case anchors

-  \menu{black}{1}
-  \menu{black}{2}
-  \menu{black}{3}
-  \menu{black}{4}
-  \menu{black}{5}
-  \menu{black}{6}
-  \menu{black}{7}
-  \menu{black}{8}
-  \menu{black}{9}
-  \menu{black}{A}
-  \menu{black}{B}
-  \menu{black}{black}
-  \menu{black}{blank}
-  \menu{black}{C}
-  \menu{black}{D}
-  \menu{black}{E}
-  \menu{black}{F}
-  \menu{black}{G}
-  \menu{black}{H}

## C.2 Functions

Available pixel arts are sorted according to the visible characters (latin letters and figures). To find the keyword corresponding to the picture you want, look at its visible characters, and find your picture in the corresponding part of this index.

For example, no character is visible on  or  (indeed, letters of  are greek letters, not latin ones); on , letters `acn` are visible; on  , only the letter `r` is visible; and so on.

***Empty***

 battery

blank

 colon-b

 contrast-b

 degree-b

 Delta-b

 different

 different-b

 dms

 dms-b

 dollar-b

 doublequote-b

 doublerightarrow-b

 equal-b

 geq-b

 GREEK

 greek

 gt

 gt-b

 key

 leq-b

 lt

 lt-b

 micro-b

 next

 nextb

 output-b

 percent-b

 period-b

 question-b

 quote-b

 rightarrow

 Sigma-b

 square-b

 style1

 style2

 style3

 style4

 style5

 style6

 style7

 tilde-b

**1**

 1

**10**

10

**100**



100

**1p**

1P

**1s**



1S

**1var**

1VAR



1VAR-b

**2**

2



2-b

**200**

200

**21**

2x1

**22**



2x2

**2p**

2P

**2s**

2S

**2var**



2VAR



2VAR-b

**2way**



2WAY

**3**

3-b

**31**

3x1

**33**



3x3

**38k**

to38k

**3pin**



3PIN

**4**

4-b

**5**



5-b

**6**



6-b

**60**

60

**7400**



7400

**9850**

9850

**9860**



9860

**a**

a-b

**a0**

a0



a0-b

**a1**



a1



a1-b

**a2**



a2-b

**aa**



Aa

**ab**



ab



Sab

**abc**

ABC

**abdf**

ABdf-b

**abi**



tcomplexalgebraic-b

**abs**



Abs-b

**abt**



ABT

**abx**



aplusbx



aplusbx-b



atimesbx



atimesbx-b

**ac**

ac

Sac

**acn**

Sacn-b

**add**

ADD


ADD-b

**adf**


Adf-b

**adv**


ADV-b

**aebx**


aebx


aebx-b

**all**


ALL


ALL-b

**alway**


Alway

**amt**


AMT-b

**an**


an


an-b


San


San-b

**an1**


an1


an1-b


an1-b2


San1-b

**an2**


an2


an2-b


San2-b

**ancn**


ancn-b

**and**


And-b

**angl**


ANGL-b

**anov**


ANOV

**anpl**


anPl-b

**anst**


anSt-b

**apl**


SaPl-b

**app**


APP-b

**apr**


APR-b


tAPR

**area**


AREA-b

**arg**


Arg-b

**as**


AandS-b

**asgn**


ASGN

**aug**


Aug-b

**auto**


AUTO


Auto


Auto-2


Auto-b

**axb**


axplusb


axplusb-b

**b**


b-b

**b0**


b0-b

**b1**


b1-b

**b2**


b2-b

**bal**


BAL


BAL-b

**bar**


Bar-b

**base**


BASE

**bc**


bc


Sbc

**bcd**


Bcd

**bdf**


Bdf-b

**bin**


BIN-b


Bin-b

**binm**


BINM-b

**bkup**


BKVP-b

**bn**


bn-b


Sbn-b

**bn1**


bn1-b


Sbn1-b

**bn2**


bn2-b


Sbn2-b

**bnst**


bnSt-b

**bond**


BOND-b

**bot**


BOTbottom


BOTright

**box**


BOX


Box-b

**bpd**


Bpd

**brk**


Brk-b

**brkn**


Brkn-b

**btm**


BTM

**c**


c-b

**c0**


C0-b

**c1**


C1-b

**c2**


C2-b

**cabl**


CABL-b

**calb**


CALB-b

**calc**


CALC


CALC-b

**calib**


CALIB

**capa**


CAPA-b

**capt**


capt


CAPT-b

**cash**


CASH-b

**casio**


CASIO-b

**ccd**


Ccd

**cel**


CEL-b

**cell**


CELL

**ch1**


CH1

**char**


CHAR-b

**chg**


Chg-b

**chi**


CHI


CHI-b


Chi-b

**chng**


CHNG

**close**


Close-b

**clr**


CLR


CLR-b

**cls**


cls


Cls-b

**cma**


CMA-b

**cmp**


Cmp-b

**cmpd**

 CMPD-b

**cmpr**

 CMPR-b

**cn**

 cn-b

 Scn-b

**cn1**

 cn1-b

 Scn1-b

**cn2**

 cn2-b

 Scn2-b

**cnst**

 CnSt-b

**cnt**

 cnt

**cnvt**

 CNVT-b

**col**

 COL

 COL-b

**com**

 COM-b

**conj**

 Conj-b

**conv**

 CONV-b

**copy**

 COPY

 COPY-b

**cosh**

 cosh-b

**cosh1**

 cosh1-b

**cost**

 COST

 COST-b

 Cost-b

**cpd**

 Cpd

**cplx**

 CPLX-b

**crcl**

 Crcl

 Crcl-b

**crnt**

 CRNT-b

**cstm**

 CSTM-b

**ctgy**

 CTGY-b

**ctl**

 CTL-b

**cuml**

 Cuml-b

**cut**

 CUT

**cy**

 CY-b

**d**

 d-b

**d2dt2**

 d2dt2

**d2dx2**

 d2dx2-b

**data**

 DATA-b

 Data-b

 percentDATA-b

**days**

 DAYS-b

**db**

 DB

**ddt**

 ddt

**ddx**

 ddx-b

**defg**

 DefG-b

**del**

 DEL

 DEL-b

**dela**

 DELA-b

**dell**

 DELL-b

**depr**

DEPR DEPR-b

**det**

Det Det-b

**df**

df df-b

**diff**

diff diff

**dim**

DIM DIM-b

Dim Dim-b

**disp**

DISP DISP-b

**dist**

DIST DIST-b

**dld**

dlminusD dlminusD

dlplusD dlplusD

**dms**

tDMS tDMS-b

**do**

Do Do-b

**dot**

dot dot-b

**draw**

DRAW DRAW

DRAW DRAW-b

**drwc**

DrwC DrwC-b

**drwf**

DrwF DrwF-b

**drwn**

DrwN DrwN-b

**drwt**

Drwt Drwt-b

**dsz**

Dsz Dsz-b

**dx**

Idx Idx

Idx Idx-b

**dyna**

DYNA DYNA-b

Dyna Dyna-b

**e**

e e-b

E Exa-b

**edf**

Edf Edf-b

**edit**

EDIT EDIT

EDIT EDIT-b

**eff**

EFF EFF-b

tEFF tEFF

**else**

Else Else-b

**end**

End End-b

**eng**

ENG ENGshiftleft

ENG ENGshiftright

**engy**

ENGY ENGY-b

**entr**

ENTR ENTR-b

**equa**

EQUA EQUA-b

**es**

EtS EtS-b

**esym**

ESYM ESYM-b

**exam**

EXAM EXAM-b

**exe**

EXE EXE

**exit**

EXIT EXIT

EXIT EXIT-b

**exp**

Exp Exp

EXP EXP-b

Exp Exp-b

Exp Exp-b2

**extd**

Extd Extd

**f**

F F

F F-b

F F-b2

f femto-b

**fa**


Fa-b

**fab**


Fab-b

**fact**


FACT-b


Fact-b

**fast**


Fast

**fb**


Fb-b

**fcd**


Fcd

**file**


FILE-b

**fill**


FILL-b


Fill-b

**fline**


FLine


FLine-b

**fmax**


FMax-b

**fmin**


FMin-b

**for**


For-b

**forc**


FORC-b

**form**


FORM


FORM-b

**fp**


FP


FP-b

**fpd**


Fpd

**frac**


Frac-b

**ftbl**


FTbl-b

**full**


FULL

**furie**


Furie

**fv**


FV


FV-b

**g**


g-b


Giga-b

**gcd**


Gcd


GCD-b

**gcon**


GCON


Gcon-b

**gdx**


GIdx-b

**geo**


GEO-b

**gmem**


GMEM-b

**go**


GO

**gof**


GOF

**goto**


Goto-b

**gpd**


Gpd

**gph1**


GPH1


GPH1-b

**gph2**


GPH2


GPH2-b

**gph3**


GPH3


GPH3-b

**gplt**


GPLT


GPlt-b

**grab**


GRAB

**grph**


GRPH


GRPH-b


Grph-b

**gslv**


GSLV-b

**gtky**


Gtky-b

**hcd**


Hcd

**help**


HELP-b

**hgeo**


HGEO-b

**hist**


Hist-b

**hpd**


Hpd

**hyp**


HYP-b

**hztl**


Hztl


Hztl-b

**i**


i-b


Ipercent


Ipercent-b

**iden**


Iden-b

**iend**


IEnd-b

**if**


If-b

**imp**


Imp-b

**in**


IN

**init**


INIT

**inpt**


INPT-b

**input**


INPUT

**ins**


INS


INS-b

**int**


INT


INT-b


Int-b


Intdiv-b


SINT


SINT-b

**intg**


INTG


Intg-b

**intr**


INTR-b

**inv**


Inv


Inv-b

**invb**


InvB

**invc**


InvC

**invf**


InvF

**invg**


InvG

**invh**


InvH

**invn**


InvN

**invp**


InvP

**invt**


Invt

**io**


IO-b

**irr**


IRR


IRR-b

**isct**


ISCT

**isz**


Isz-b

**join**


Join-b

**jump**


JUMP-b

**k**


kilo-b

**lang**


LANG-b

**lbl**

Lbl Lbl-b

**lcm**

LCM LCM-b

**lcte**

Lcte Lcte-b

**left**

Left Left-b

**len**

Len Len-b

**leng**

LENG LENG-b

Leng Leng-b

**lgst**

Lgst Lgst

Lgst Lgst-b

**line**

Line Line

LINE LINE-b

Line Line-b

**list**

List List

LIST LIST-b

List List-b

tLST tLIST-b

**lm**

LtoM LtoM-b

**lmem**

LMEM LMEM-b

**load**

LOAD LOAD-b

**log**

Log Log

Log Log-b

**logab**

logab logab-b

**logic**

LOGIC LOGIC-b

**lpw**

LpW LpW-b

**lwr**

Lwr Lwr-b

**m**

M Mega-b

m milli-b

**main**

MAIN MAIN-b

**man**

Man Man

**mark**

MARK MARK-b

**mass**

MASS MASS-b

**mat**

MAT MAT-b

Mat Mat-b

tMAT tMAT-b

**math**

MATH MATH

Math Math

MATH MATH-b

**max**

MAX MAX

Max Max-b

max max-b

**maxx**

maxX maxX-b

**maxy**

maxY maxY-b

**mean**

Mean Mean-b

**med**

Med Med

Med Med-b

**mem**

Mem Mem

MEM MEM-b

**memo**

MEMO MEMO

**menu**

MENU MENU-b

Menu Menu-b

**mid**

Mid Mid-b

**min**

MIN MIN

Min Min-b

min min-b

**minx**

minX minX-b

**miny**

minY minY-b

**mkf**

MKF MKF-b

**ml**

MtoL MtoL-b

**mlti**

MLTI MLTI

**mn**

mxn mxn-b

**mod**

MOD MOD-b

Mod Mod-b

**mode**

MODE MODE-b

MODE MODExp-b

**move**

MOVE MOVE

**mrg**

MRG MRG

Mrg Mrg-b

**ms**

MandS MandS-b

**msa**

MSa MSa-b

**msab**

MSab MSab-b

**msb**

Msb Msb-b

**mse**

Mse Mse-b

**mv**

MV MV

**n**

n n

n n-b

nano nano-b

**n1**

n1 n1-b

**n2**

n2 n2-b

**name**

NAME NAME-b

**nan**

Nan Nan-b

**ncd**

Ncd Ncd

**ncr**

nCr nCr-b

**ndis**

NDis NDis-b

**new**

NEW NEW-b

**next**

Next Next-b

**nfv**

NFV NFV

NFV NFV-b

**no**

NO NO

**none**

None None

None None-b

**norm**

Norm Norm

NORM NORM-b

Norm Norm-b

**not**

Not Not-b

**npd**

Npd Npd

**npp**

NPP NPP-b

**npr**

nPr nPr-b

**npv**

NPV NPV

NPV NPV-b

**num**

NUM NUM-b

**off**

Off Off

Off Off-b

**on**

On On

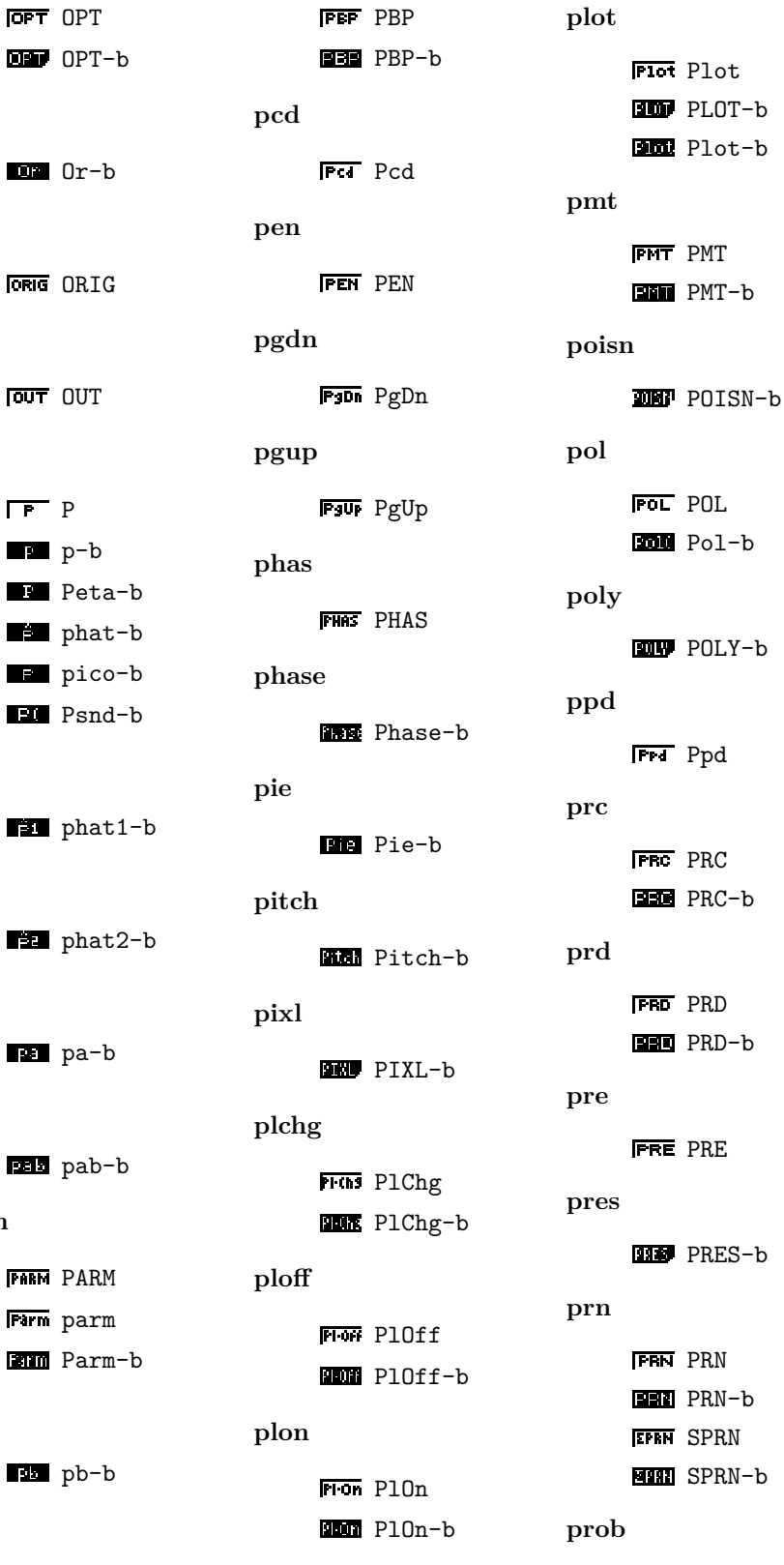
On On-b

**open**

OPEN OPEN-b

Open Open-b

**opt**


OPT OPT
OPT OPT-b
or
Or Or-b
orig
ORIG ORIG
out
OUT OUT
p
P P
p p-b
Peta-b
phat-b
pico-b
Psnd-b
p1
phat1-b
p2
phat2-b
pa
pa pa-b
pab
pab pab-b
parm
PARM PARM
Parm parm
Parm Parm-b
pb
pb pb-b
pbp
PBP PBP
PBP PBP-b
pcd
Pcd Pcd
pen
PEN PEN
pgdn
PgDn PgDn
pgup
PgUp PgUp
phas
PHAS PHAS
phase
Phase Phase-b
pie
Pie Pie-b
pitch
Pitch Pitch-b
pixl
PIXL PIXL-b
plchg
PlChg PlChg
PlChg PlChg-b
ploff
PlOff PlOff
PlOff PlOff-b
plon
PlOn PlOn
PlOn PlOn-b
plot
Plot Plot
PLOT PLOT-b
Plot Plot-b
pmt
PMT PMT
PMT PMT-b
poisn
POISN POISN-b
pol
POL POL
Pol Pol-b
poly
POLY POLY-b
ppd
Ppd Ppd
prc
PRC PRC
PRC PRC-b
prd
PRD PRD
PRD PRD-b
pre
PRE PRE
pres
PRES PRES-b
prn
PRN PRN
PRN PRN-b
SPRN SPRN
SPRN SPRN-b
prob

 PROB-b

**prod**

 Prod-b

**prog**

 PROG-b

 Prog-b

**proj**

 Proj

**ptch**

 Ptch-b

**pts**

 PTS-b

**pv**

 PV

 PV-b

**pwr**

 Pwr

 PWR-b

 Pwr-b

**py**

 PY-b

**q**

 Qsnd-b

**q1**

 Q1-b

**q3**

 Q3-b

**r**

 r-b

 r-b2

 r-b3

 requal

 requal-b

 Rsnd-b

 tcomplexpolar-b

**r2**

 r2-b

**r38k**

 R38k-b

**ran**

 Ran-b

**rand**

 RAND-b

**rang**

 RANG-b

**rcl**

 RCL

 RCL-b

 Rcl-b

**rdel**

 RDEL

**rec**

 Rec-b

**recal**

 RECAL

**recr**

 RECR-b

**rect**

 RECT

**recv**

 RECV

 Recv

 Recv-b

**ref**

 Ref-b

**reg**

 REG

 REG-b

**rel**

 REL-b

**ren**

 REN-b

**rep**

 Rep-b

**rept**

 REPT

**reslt**

 RESLT-b

 Reslt-b

**right**

 Right-b

**rmdr**

 Rmdr-b

**rnd**

 RND

 Rnd-b

**rndfi**

 RndFi-b

**rnf**

RNF RNF-b

**root**

ROOT ROOT

**rop**

ROP ROP-b

**rot**

Rot Rot-b

**row**

ROW ROW
ROW ROW-b

**rref**

Rref Rref-b

**rset**

RSET RSET-b

**rt**

R-T RT
R-TH RTtheta-b

**rtbl**

RTbl RTbl-b

**rtrn**

Rtrn Rtrn-b

**run**

RUN RUN

**rw**

Rw+ Rwplus

**rx**

R-X RX-b

**ry**

R-Y RY-b

**s38k**

S38k S38k-b

**save**

SAVE SAVE-b

**scal**

scal scal-b

**scat**

Scat Scat-b

**sd**

S-D SD-b

**sdev**

SDev SDev-b

**se**

se se-b

**sel**

SEL SEL
SEL SEL-b

**sell**

Sell Sell-b

**sels**

SELS SELS-b

**send**

Send Send-b

**seq**

SEQ SEQ-b
seq seq-b

**set**

SET SET-b

**sfv**

SFV SFV
SFV SFV-b
SFV SFV-b2

**shift**

Shift Shift-b

**si**

SI SI
SI SI-b

**siml**

SIML SIML-b

**simp**

Simp Simp-b
SIMP Simp-b2

**sin**

Sin Sin
Sin Sin-b

**sinh**

sinh sinh-b

**sinh1**

sinh1 sinh1-b

**size**

SIZE SIZE-b

**sktch**

SKTCH SKTCH-b

**sl**

SL SL

**smem**

SMEM SMEM-b

**smpl**

SMPL SMPL-b

**snd**

 Snd

**solv**

 SOLV

 SOLV-b

**solve**

 Solve

**solvn**

 SolvN-b

**sonic**

 sonic

**sp**

 sp-b

**sqr**

 SQR

**src**

 SRC

 SRC-b

 Src-b

**srta**

 SRTA

 SrtA-b

**srtd**

 SRTD

 SrtD-b

**ssa**

 SSa-b

**ssab**

 SSab-b

**ssb**

 SSb-b

**sse**

 SSe-b

**stat**

 STAT-b

 Stat-b

**std**

 STD

**step**

 Step-b

**stick**

 STICK-b

**sto**

 STO-b

 Sto-b

**stop**

 STOP

 Stop-b

**str**

 STR

 STR-b

 Str-b

**strp**

 STRP-b

**strt**

 STRT

 Strt-b

**stup**

 STUP-b

**styl**

 STYL-b

**sum**

 Sum-b

**svas**

 SVAS-b

**swap**

 SWAP

**sx**

 sx-b

**sx1**

 sx1-b

**sx2**

 sx2-b

**sy**

 sy-b

**sybl**

 SYBL

 SYBL-b

**syd**

 SYD

**t**

 T

 t-b

 t-b2

 Tera-b

 tsnd-b

 Ttheta-b

**tabl**

 TABL

 TABL-b

 Tabl-b

**tang**

Tang

Tang-b

**tanh**

tanh-b

**tanh1**

tanh1-b

**tcd**

tcd

**test**

TEST-b

Test-b

**text**

TEXT

Text

Text-b

**then**

Then-b

**time**

TIME-b

**tlow**

tLow-b

**tmpr**

TMPR-b

**to**

To-b

**tool**

TOOL-b

**top**

TOP

TOPleft

TOPtop

**tpd**

tpd

**tran**

TRAN

TRAN-b

**trig**

TRIG

**trn**

Trn-b

**tup**

tUp-b

**tvm**

TVM-b

**type**

TYPE-b

**unit**

UNIT-b

**upr**

Upr-b

**usb**

USB

**var**

var

VAR-b

Var-b

**vct**

VCT-b

**velo**

VELO-b

**ver**

VER-b

**vert**

Vert

Vert-b

**vlum**

VLUM-b

**vnlk**

VNLK-b

**vrnr**

VRNR-b

**vwin**

VWIN-b

VWin-b

**wake**

WAKE-b

**web**

WEB

Web-b

**wend**

WEnd-b

**whle**

Whle-b

**wiz**

WIZ-b

**x**

factorialx-b

sigmax-b

 Sx-b

 txequal

 txgeq

 txgt

 txleq

 txlt

 x

 X-b

 x-b

 X-b2

 X-b3

 xbar-b

 xequal

 xequal-b

 xgeq-b

 xgt-b

 xhat-b

 xleq-b

 xlt-b

**x1**

 x1-b

 xbar1-b

**x1inv**

 x1Inv-b

**x2**

 Sx2-b

 X2

 x2

 x2-b

 xbar2-b

 xpower2-b

**x2inv**

 x2Inv-b

**x3**

 X3

 x3

 x3-b

 xpower3-b

**x4**

 X4

 x4

 xpower4-b

**xcal**

 XCAL

**xfct**

 Xfct-b

**xinv**

 xInv-b

**xor**

 Xor-b

**xrw**

 XRw

 XRwplus

**xt**

 Xt-b

**xy**

 Sxy-b

 xy-b

**y**

 sigmay-b

 Sy-b

 tYequal

 tYgeq

 tYgt

 tYleq

 tYlt

 Y

 Y-b

 Y-b2

 ybar-b

 Yequal

 Yequal-b

 Ygeq-b

 Ygt-b

 yhat-b

 Yleq-b

 Ylt-b

**y1**

 y1-b

**y2**

 Sy2-b

 y2-b

**y3**

 y3-b

**ycal**

 YCAL

**yes**

 YES

**yfct**

 Yfct-b

**yicpt**

 YICPT

**yld**

 YLD

 YLD-b

**yt**

**z**

- Yt-b
- Z
- Z-b
- z-b

**zero**

- ZERO

**zlow**

- zLow-b

**zoom**

- ZOOM
- ZOOM-b

**zup**

- zUp-b

## C.3 Battery

List of status of battery charge.

- \battery{empty}
- \battery{low}
- \battery{high}
- \battery{medium}

# D Keys

## D.1 List of keys

Sorting order is arbitrary. To find them on a calculator, see figure 6.

- \key{ACON}
- \key{DEL}
- \key{ALPHA}
- \key{EXE}
- \key{F5}
- \key{F4}
- \key{F1}
- \key{F6}
- \key{F3}
- \key{F2}
- \key{MENU}
- \key{EXIT}
- \key{FD}
- \key{OPTN}
- \key{VARS}
- \key{XthetaT}
- \key{closeparen}
- \key{comma}
- \key{cos}
- \key{fraction}
- \key{ln}
- \key{log}
- \key{openparen}
- \key{power}
- \key{rightarrow}
- \key{sin}
- \key{square}
- \key{tan}
- \key{1}
- \key{10}
- \key{2}
- \key{3}
- \key{4}
- \key{5}
- \key{6}
- \key{7}
- \key{8}
- \key{9}
- \key{divide}
- \key{dot}
- \key{minus}
- \key{opposite}
- \key{plus}
- \key{times}
- \key{zero}
- \key{REPLAY}
- \key{SHIFT}

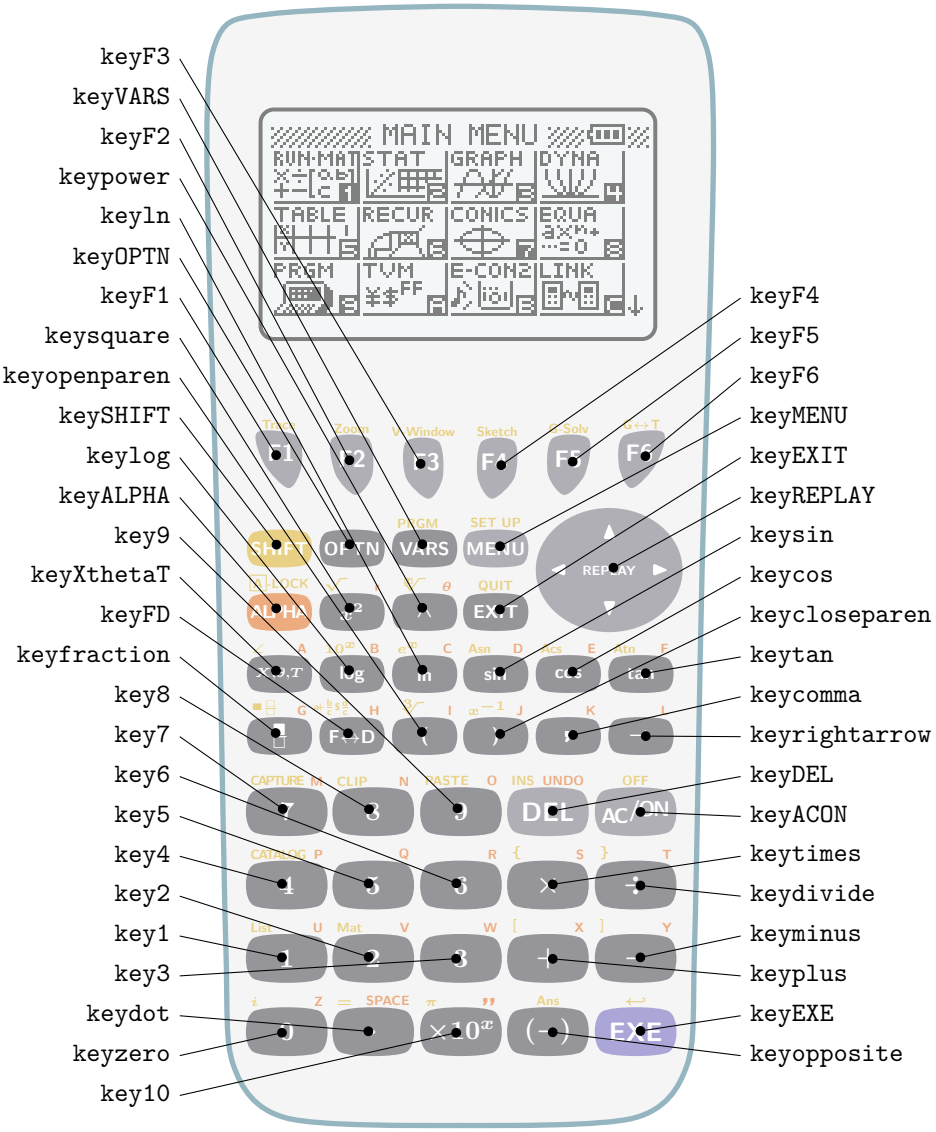



Figure 6: Keywords of keys

# List of Figures