

Graph35*

A L^AT_EX package to display keys and screen of
(some) CASIO calculators.

Louis Paternault
spalax+ctan(at)gresille(dot)org

March 22, 2018

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

1	Introduction	2
1.1	Licence	2
1.2	Summary	2
2	Download and install	3
2.1	Manual install	3
3	Usage	3
3.1	Supported calculators	3
3.2	Package options	3
3.3	Colors	3

*This document corresponds to `graph35` 0.1.0, dated 2018-03-21. Home page, bug requests, etc. at <http://framagit.org/spalax/graph35>.

3.4	Calculators	5
3.5	Keys	6
3.6	Screen	7
3.7	Scaling	8
4	Binaries	9
A	Calculators	9
B	anchors	9
B.1	anchors of keys	9
B.2	anchors of key <code>REPLAY</code>	9
B.3	Screen anchors	11
B.4	Case anchors	11
C	Pixel art	11
C.1	Menu	11
C.2	Functions	14
C.3	Battery	31
D	Keys	31
D.1	List of keys	31
	List of figures	31

1 Introduction

This document introduces the `graph35` package.

1.1 Licence

This work may be distributed and/or modified under the conditions of the L^AT_EX Project Public License, either version 1.3 of this license or (at your option) any later version.

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 developed 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 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=master>

- 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}{pixelart}
```


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 faster¹.


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:

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

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

blackandwhite  Black and white, high 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.

```
1 \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 explicitly 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:

```
1 \colorlet{graph35KEYTEXT}{green}
2 \colorlet{graph35SHIFTTEXT}{orange}
3 \definecolor{graph35ALPHATEXT}{RGB}{0, 0, 255}
4 \definecolor{graph35NUMBER}{RGB}{200, 200, 200}
5 \colorlet{graph35NUMBERBORDER}{graph35NUMBER}
6
7 \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 TikZ 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.

```

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



```

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





3.5 Keys

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


$$\text{\key}[\langle color, prefix, suffix, scale, shift, alpha \rangle]{\langle key \rangle}.$$

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

Arguments are:

- $\{\langle key \rangle\}$ Key name to display (for instance 1 for , and EXE for ). 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.
- $[\langle color, scale \rangle]$ 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).
- $[\langle shift, alpha \rangle]$ Those options enable or disable yellow and red text describing the key meaning when pressed after the  or  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`.
- $[\langle prefix, suffix \rangle]$ For each key, anchors are defined, allowing references to the key in TikZ pictures (for instance, they are used to draw figure 6, page 32). 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 TikZ environment. Its syntax is:

$$\text{\tikzkey}[\langle options \rangle]{\langle key \rangle}{\langle coordinates \rangle}$$


Its arguments are

- $[\langle options \rangle]$: same options as macro `\key` ;
- $\{\langle key \rangle\}$: name of the key ;
- $\{\langle coordinates \rangle\}$: 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{\langle icon \rangle}{\langle shortcut \rangle}` 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 TikZ environment. Its syntax is:

$$\text{\tikzmenu}[\langle options \rangle]{\langle icon \rangle}{\langle shortcut \rangle}{\langle coordinates \rangle}$$


Its arguments are:

- $\{\langle icon \rangle\}$ and $\{\langle shortcut \rangle\}$: same meaning as the corresponding `\menu` options;
- $\{\langle coordinates \rangle\}$: coordinates of the top-left corner of the menu item;
- $[\langle options \rangle]$: some options, that are passed as-is to the `\bwpixelart` macro (from the `pixelart` 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 TikZ 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 TikZ 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=.1` 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 `transform 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 0s and 1s. 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.

`generate.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.

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.



Figure 1: Calculator graph35+E.

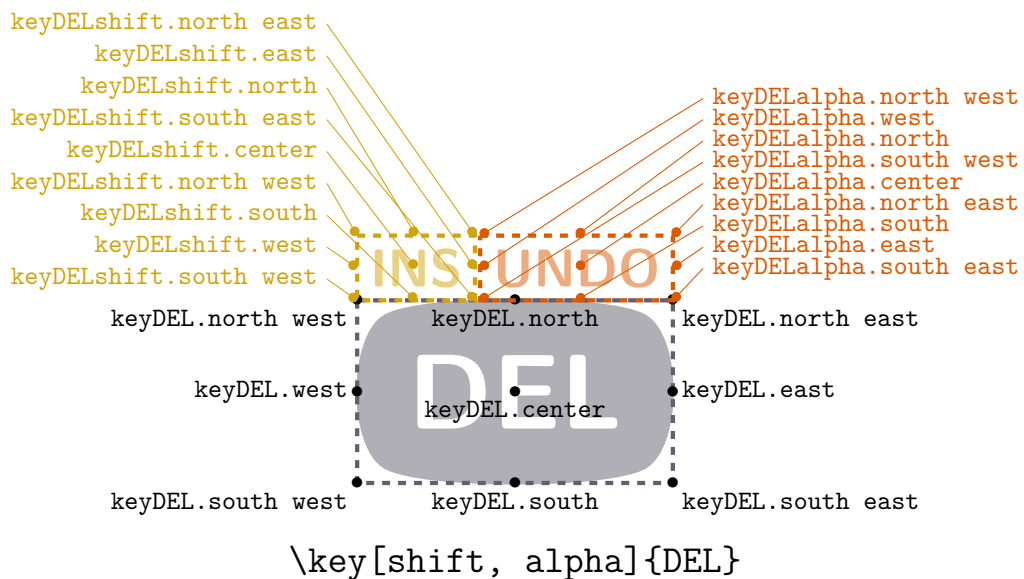


Figure 2: Key anchors

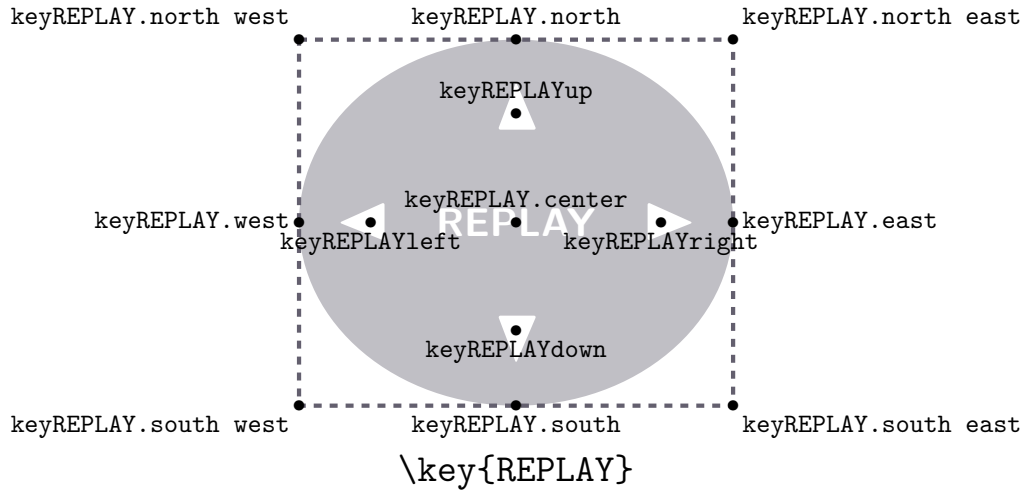


Figure 3: REPLAY key anchors

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.

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

- | | |
|---|---|
| •  <code>\menu{black}{black}</code> | •  <code>\menu{ECON2}{black}</code> |
| •  <code>\menu{blank}{black}</code> | •  <code>\menu{eCON3}{black}</code> |
| •  <code>\menu{CONICS}{black}</code> | •  <code>\menu{EQUA}{black}</code> |
| •  <code>\menu{DYNA}{black}</code> | •  <code>\menu{GEOM}{black}</code> |
| •  <code>\menu{eACT}{black}</code> | •  <code>\menu{GRAPH}{black}</code> |

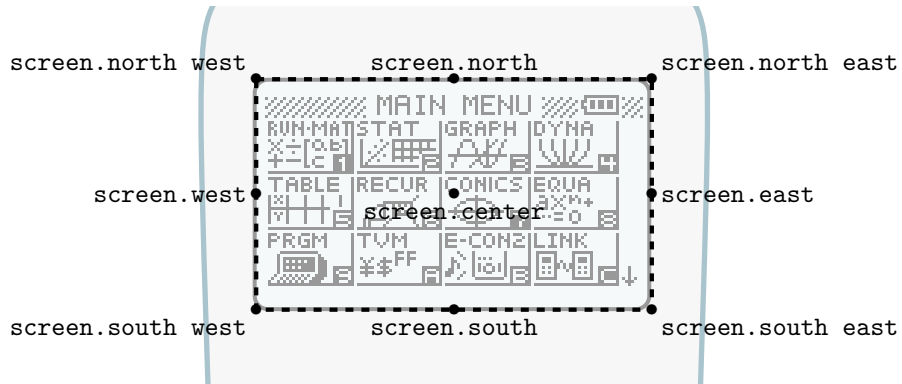














Figure 4: Screen anchors

-  \menu{LINK}{black}
-  \menu{SSHT}{black}
-  \menu{MEMORY}{black}
-  \menu{STAT}{black}
-  \menu{PRGM}{black}
-  \menu{SYSTEM}{black}
-  \menu{RECUR}{black}
-  \menu{TABLE}{black}
-  \menu{RUN}{black}
-  \menu{TVM}{black}
-  \menu{RUNMAT}{black}
-  \menu{E-CONZ}{black}

C.1.2 Shortcuts

-  \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}

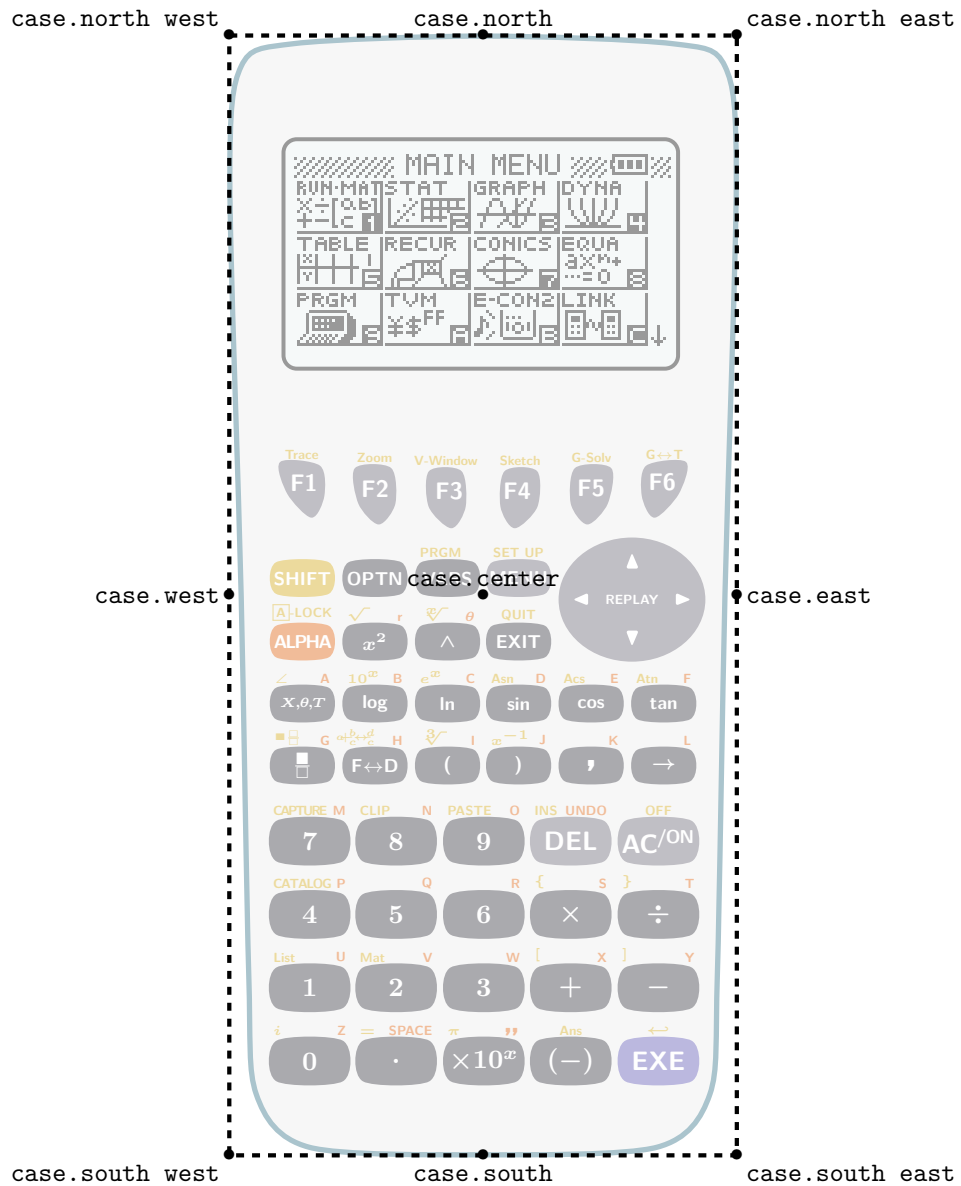
































































Figure 5: Case anchors

-  \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.

<i>Empty</i>		 nextb	 1P
 battery		 output-b	1s
blank		 percent-b	
 colon-b		 period-b	 1S
 contrast-b		 question-b	1var
 degree-b		 quote-b	 1VAR
 Delta-b		 rightarrow	 1VAR-b
 different		 Sigma-b	2
 different-b		 square-b	
 dms		 style1	 2
 dms-b		 style2	 2-b
 dollar-b		 style3	200
 doublequote-b		 style4	 200
 doublerightarrow-b		 style5	21
 equal-b		 style6	 2x1
 geq-b		 style7	
 GREEK		 tilde-b	22
 greek	1		 2x2
 gt		 1	2p
 gt-b			 2P
 key	10		2s
 leq-b		 10	
 lt	100		 2S
 lt-b			2var
 micro-b		 100	 2VAR
 next	1p		 2VAR-b

2way	a	aplxb aplusbx
2WAY 2WAY	a a-b	aplxb aplusbx-b
3	a0	atimesbx atimesbx
3 3-b	a0 a0	atimesbx-b atimesbx-b
31	a0-b a0-b	ac
3x1 3x1	a1	ac ac
33	a1 a1	Sac Sac
3x3 3x3	a1-b a1-b	acn
38k	a2	Sacn-b Sacn-b
to38k to38k	a2	add
3pin	aa	ADD ADD
3PIN 3PIN	Aa Aa	ADD-b ADD-b
4	ab	adf
4-b 4-b	ab ab	Adf-b Adf-b
5	Sab Sab	adv
5-b 5-b	abc	ADV-b ADV-b
6	ABC ABC	aebx
6-b 6-b	abdf	aebx-b aebx-b
60	ABdf-b ABdf-b	all
60 60	abi	ALL ALL
7400	tcomplexalgebraic-b tcomplexalgebraic-b	ALL-b ALL-b
7400 7400	abs	alway
9850	Abs-b Abs-b	amt
9850 9850	abt	AMT-b AMT-b
9860	ABT ABT	an
9860 9860	abx	an an
		an-b an-b
		San San

	San San-b	APR APR-b	b2 b2-b
an1		tAPR tAPR	bal
	an1 an1	area	BAL BAL
	an1-b an1-b	AREA AREA-b	BAL BAL-b
	an1-b2 an1-b2	arg	bar
	San1-b San1-b	Arg Arg-b	Bar Bar-b
an2		as	base
	an2 an2	AandS AandS-b	BASE BASE
	an2-b an2-b	asgn	bc
	San2-b San2-b	ASGN ASGN	bc bc
ancn		aug	Sbc Sbc
	ancn-b ancn-b	Aug Aug-b	bcd
and		auto	Bcd Bcd
	And And-b	AUTO AUTO	bdf
angl		Auto Auto	Bdf Bdf-b
	ANGL ANGL-b	Auto-2 Auto-2	bin
anov		Auto-b Auto-b	BIN BIN-b
	ANOV ANOV	axb	Bin Bin-b
anpl		axplusb axplusb	binm
	anPl-b anPl-b	axplusb-b axplusb-b	BINM BINM-b
anst		b	bkup
	anSt-b anSt-b	b b-b	BKUP BKVP-b
apl		b0	bn
	SaPl-b SaPl-b	b0 b0-b	bn bn-b
app		b1	Sbn Sbn-b
	APP APP-b	b1 b1-b	bn1
apr		b2	bn1 bn1-b
			Sbn1 Sbn1-b
			bn2

bn2	bn2-b	c2		ch1	
Sbn2	Sbn2-b	C2	C2-b	CH1	CH1
bnst		cabl		char	
bnSt	bnSt-b	CABL	CABL-b	CHAR	CHAR-b
bond		calb		chg	
BOND	BOND-b	CALB	CALB-b	CHG	Chg-b
bot		calc		chi	
BOT	BOTbottom	CALC	CALC	CHI	CHI
BOT	BOTright	CALC	CALC-b	CHI	CHI-b
				Chi	Chi-b
box		calib		chnng	
BOX	BOX	CALIB	CALIB	CHNG	CHNG
Box	Box-b	capa		close	
bpd		CAPA	CAPA-b	CLOSE	Close-b
Bpd	Bpd	capt		clr	
brk		Capt	capt	CLR	CLR
Brk	Brk-b	CAPT	CAPT-b	CLR	CLR-b
brkn		cash		cls	
Brkn	Brkn-b	CASH	CASH-b	CLS	cls
				Cls	Cls-b
btm		casio		cma	
BTM	BTM	CASIO	CASIO-b	CMA	CMA-b
c		ccd		cmp	
C	c-b	CCD	Ccd	CMP	Cmp-b
c0		cel		cmpd	
C0	C0-b	CEL	CEL-b	CMPD	CMPD-b
c1		cell		cmpr	
C1	C1-b	CELL	CELL	CMPR	CMPR-b
				cn	

Cn cn-b	COSH cosh-b	cy
Scn Scn-b		CY CY-b
cn1	cosh1	d
	COSH cosh1-b	d d-b
Cn1 cn1-b	cost	d2dt2
Scn1 Scn1-b	COST COST	d2dt2 d2dt2
cn2	COST COST-b	d2dx2
Cn2 cn2-b	COST Cost-b	d2dx2 d2dx2-b
Scn2 Scn2-b	cpd	data
cnst	Cpd Cpd	DATA DATA-b
CnSt CnSt-b	cplx	Data Data-b
cnt	CPLX CPLX-b	percentDATA percentDATA-b
Cnt cnt	crcl	days
cnvt	Crcl Crcl	DAYS DAYS-b
CNVT CNVT-b	Crcl Crcl-b	db
col	crnt	DB DB
COL COL	CRNT CRNT-b	ddt
COL COL-b	cstm	ddt ddt
com	CSTM CSTM-b	ddx
COM COM-b	ctgy	ddx ddx-b
conj	CTGY CTGY-b	defg
Conj Conj-b	ctl	DefG DefG-b
conv	CTL CTL-b	del
CONV CONV-b	cuml	DEL DEL
copy	Cuml Cuml-b	DEL DEL-b
COPY COPY	cut	dela
COPY COPY-b	CUT CUT	DELA DELA-b
cosh		dell
		DELL DELL-b

depr	DEPR DRAW-b	DEFF tEFF
DEPR DEPR-b	drwc	else
det	DrwC DrwC-b	ELSE Else-b
Det Det-b	drwf	end
df	DrwF DrwF-b	END End-b
df df-b	drwn	eng
diff	DrwN DrwN-b	ENG ENGshiftleft
diff diff	drwt	ENG ENGshiftright
dim	Drwt Drwt-b	engy
DIM DIM-b	dsz	ENG ENGY-b
Dim Dim-b	Dsz Dsz-b	entr
disp	dx	ENTR ENTR-b
DISP DISP-b	Idx Idx	equa
dist	Idx Idx-b	EQUA EQUA-b
DIST DIST-b	dyna	es
dld	DYNA DYNA-b	ES EtS-b
dlminusD dlminusD	Dyna Dyna-b	esym
dlplusD dlplusD	e	ESYM ESYM-b
dms	E e-b	exam
DMS tDMS-b	E Exa-b	EXAM EXAM-b
do	edf	exe
Do Do-b	Edf Edf-b	EXE EXE
dot	edit	exit
dot dot-b	EDIT EDIT	EXIT EXIT
draw	EDIT EDIT-b	EXIT EXIT-b
DRAW DRAW	eff	exp
	EFF EFF-b	EXP Exp
		EXP EXP-b
		Exp Exp-b

Exp Exp-b2	FLine FLine	fv
extd	FLine FLine-b	FV FV
ExtD Extd	fmax	FV FV-b
f	FMax FMax-b	g
F F	fmin	S g-b
F F-b	FMin FMin-b	G Giga-b
F F-b2	for	gcd
F femto-b	For For-b	Gcd Gcd
fa	forc	GCD GCD-b
Fa Fa-b	FORC FORC-b	gcon
fab	form	GCON GCON
Fab Fab-b	FORM FORM	Gcon Gcon-b
fact	FORM FORM-b	gdx
FACT FACT-b	fp	GIDX GIdx-b
Fact Fact-b	FP FP	geo
fast	FP FP-b	GEO GEO-b
Fast Fast	fpd	gmem
fb	Fpd Fpd	GMEM GMEM-b
Fb Fb-b	frac	go
fcd	Frac Frac-b	GO GO
Fcd Fcd	ftbl	gof
file	FTbl FTbl-b	GOF GOF
FILE FILE-b	full	goto
fill	FULL FULL	GOTO Goto-b
FILL FILL-b	furie	gpd
Fill Fill-b	Furie Furie	Gpd Gpd
fline		gph1
		GPH1 GPH1
		GPH1 GPH1-b

gph2	hpd	INPUT INPUT
GPH2 GPH2	HPD Hpd	ins
GPH2 GPH2-b	hyp	INS INS
gph3	HYP HYP-b	INS INS-b
GPH3 GPH3	hzt1	int
GPH3 GPH3-b	HZT1 Hzt1	INT INT
gplt	HZT1 Hzt1-b	INT INT-b
GPLT GPLT	i	INT Int-b
GPLT GPlt-b	I i-b	INT Intdiv-b
grab	IP Ipercent	SINT SINT
GRAB GRAB	IP Ipercent-b	SINT SINT-b
grph	iden	intg
GRPH GRPH	IDEN Iden-b	INTG INTG
GRPH GRPH-b	iend	INTG Intg-b
GRPH Grph-b	IEND IEnd-b	intr
gslv	if	INTR INTR-b
GSLV GSLV-b	IF If-b	inv
gtsky	imp	INV Inv
GTSKY Gtsky-b	IMP Imp-b	INV Inv-b
hcd	in	invb
HCD Hcd	IN IN	INVB InvB
help	init	invc
HELP HELP-b	INIT INIT	INVC InvC
hgeo	inpt	invf
HGEO HGEO-b	INPT INPT-b	INVF InvF
hist	input	invg
HIST Hist-b		INVG InvG
		invh
		INVH InvH
		invn

InvN InvN	lcte	Log Log
invp	Lcte Lcte-b	Log Log-b
InvP InvP	left	logab
invt	Left Left-b	logab logab-b
InvT Invt	len	logic
io	Len Len-b	LOGIC LOGIC-b
IO IO-b	leng	lpw
irr	LENG LENG-b	LPW LpW-b
IRR IRR	Leng Leng-b	lwr
IRR IRR-b	lgst	LWR Lwr-b
isct	Lgst Lgst	m
ISCT ISCT	Lgst Lgst-b	M Mega-b
isz	line	m milli-b
Isz Isz-b	Line Line	main
join	LINE LINE-b	MAIN MAIN-b
Join Join-b	Line Line-b	man
jump	list	Man Man
JUMP JUMP-b	List List	mark
k	LIST LIST-b	MARK MARK-b
K kilo-b	List List-b	mass
lang	tLIST tLIST-b	MASS MASS-b
LANG LANG-b	lm	mat
lbl	LtoM LtoM-b	MAT MAT-b
Lbl Lbl-b	lmem	Mat Mat-b
lcm	LMEM LMEM-b	tMAT tMAT-b
LCM LCM-b	load	math
	LOAD LOAD-b	MATH MATH
	log	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

MtL MtoL-b

mti

MTI MLTI

mn

mn mxn-b

mod

MOD MOD-b

Mod Mod-b

mode

MODE MODE-b

MODE MODEExp-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

n 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	NUM NUM-b	p2
next		off	Ph2 phat2-b
	Next Next-b	Off Off	pa
nfv		Off Off-b	Pa pa-b
	NFV NFV	on	pab
	NFV NFV-b	On On	Pab pab-b
no		On On-b	parm
	NO NO	open	PARM PARM
none		OPEN OPEN-b	Parm parm
	None None	Open Open-b	Parm Parm-b
	None None-b	opt	pb
norm		OPT OPT	Pb pb-b
	Norm Norm	OPT OPT-b	pbp
	NORM NORM-b	or	PBP PBP
	Norm Norm-b	Or Or-b	PBP PBP-b
not		orig	pcd
	Not Not-b	ORIG ORIG	Pcd Pcd
npd		out	pen
	Npd Npd	OUT OUT	PEN PEN
npp		p	pgdn
	NPP NPP-b	P P	PgDn PgDn
npr		P p-b	pgup
	nPr nPr-b	P Peta-b	PgUp PgUp
npv		P phat-b	phas
	NPV NPV	P pico-b	PHAS PHAS
	NPV NPV-b	P Psnd-b	phase
num		p1	Phase Phase-b
		P1 phat1-b	pie

Pie Pie-b	ppd	Ptch Ptch-b
pitch	PPd Ppd	pts
Ptch Pitch-b	prc	PTS PTS-b
pixl	PRC PRC	pV
PIXL PIXL-b	PRC PRC-b	PV PV
plchg	prd	PV PV-b
PlChg PlChg	PRD PRD	pwr
PlChg PlChg-b	PRD PRD-b	Pwr Pwr
ploff	pre	PWR PWR-b
Ploff Ploff	PRE PRE	Pwr Pwr-b
Ploff Ploff-b	pres	py
plon	PRES PRES-b	PY PY-b
PlOn PlOn	prn	q
PlOn PlOn-b	PRN PRN	Q Qsnd-b
plot	PRN PRN-b	q1
Plot Plot	SPRN SPRN	Q1 Q1-b
PLOT PLOT-b	SPRN SPRN-b	q3
Plot Plot-b	prob	Q3 Q3-b
pmt	PROB PROB-b	r
PMT PMT	prod	r r-b
PMT PMT-b	Prod Prod-b	r r-b2
poisn	prog	r r-b3
POISN POISN-b	PROG PROG-b	requal
pol	Prog Prog-b	requal requal-b
POL POL	proj	Rsnd Rsnd-b
Pol Pol-b	Proj Proj	tcomplexpolar tcomplexpolar-b
poly	ptch	r2
POLY POLY-b		r2 r2-b
		r38k
		R38k R38k-b

ran	[REG] REG	rop
[Ran] Ran-b	[REG] REG-b	[ROP] ROP-b
rand	rel	rot
[RAND] RAND-b	[REL] REL-b	[ROT] Rot-b
rang	ren	row
[RANG] RANG-b	[REN] REN-b	[ROW] ROW
rcl	rep	[ROW] ROW-b
[RCL] RCL	[REP] Rep-b	rref
[RCL] RCL-b	rept	[RRef] Rref-b
[Rcl] Rcl-b	[REPT] REPT	rset
rdel	reslt	[RSET] RSET-b
[RDEL] RDEL	[RESLT] RESLT-b	rt
rec	[RESLT] Reslt-b	[RT] RT
[REC] Rec-b	right	[RT] RTtheta-b
recal	[RIGHT] Right-b	rtbl
[RECAL] RECAL	rmdr	[RTbl] RTbl-b
recr	[RMDR] Rmdr-b	rtrn
[RECR] RECR-b	rnd	[Rtrn] Rtrn-b
rect	[RND] RND	run
[RECT] RECT	[RND] Rnd-b	[RUN] RUN
recv	rndfi	rw
[RECV] RECV	[RNDfi] RndFi-b	[Rw+] Rwplus
[Recv] Recv	rnf	rx
[Recv] Recv-b	[RNF] RNF-b	[RX] RX-b
ref	root	ry
[Ref] Ref-b	[ROOT] ROOT	s38k
reg		[S38k] S38k-b

save	 SAVE-b	sfv	 SFV	smem	 SMEM-b
scal			 SFV-b	smpl	
	 scal-b		 SFV-b2		 SMPL-b
scat		shift		snd	
	 Scat-b		 Shift-b		 Snd
sd		si		solv	
	 SD-b		 SI		 SOLV
			 SI-b		 SOLV-b
sdev		siml		solve	
	 SDev-b		 SIML-b		 Solve
se		simp		solvN	
	 se-b		 Simp-b		 SolvN-b
			 Simp-b2	sonic	
sel		sin			 sonic
	 SEL		 Sin	sp	
	 SEL-b		 Sin-b		 sp-b
sell		sinh		sqr	
	 Sell-b		 sinh-b		 SQR
sels		sinh1		src	
	 SELS-b		 sinh1-b		 SRC
send					 SRC-b
	 Send-b	size			 Src-b
			 SIZE-b	srta	
seq		sktch			 SRTA
	 SEQ-b		 SKTCH-b		 SrtA-b
	 seq-b			srtD	
set		sl			 SRTD
	 SET-b		 SL		 SrtD-b





ssa	strp	syd
SSa SSa-b	STRP STRP-b	SYD SYD
ssab	strt	t
SSab SSab-b	STRT STRT	T T
ssb	Strt Strt-b	t t-b
SSb SSb-b	stup	t t-b2
sse	STUP STUP-b	T Tera-b
SSe SSe-b	styl	ti tsnd-b
stat	STYL STYL-b	Tt Ttheta-b
STAT STAT-b	sum	tabl
Stat Stat-b	Sum Sum-b	TABL TABL
std	svas	TABL TABL-b
STD STD	SVAS SVAS-b	TABL Tabl-b
step	swap	tang
Step Step-b	SWAP SWAP	Tang Tang
stick	sx	Tang Tang-b
STICK STICK-b	sx sx-b	tanh
sto	sx1	tanh tanh-b
STO STO-b	sx1 sx1-b	tanh1
Sto Sto-b	sx2	tanh1 tanh1-b
stop	sx2 sx2-b	tcd
STOP STOP	sy	tcd tcd
Stop Stop-b	sy sy-b	test
str	sybl	TEST TEST-b
STR STR	SYBL SYBL	Test Test-b
STR STR-b	SYBL SYBL-b	text
Str Str-b		TEXT TEXT
		Text Text
		Text Text-b
		then
		Then Then-b

time	TIME TVM-b	vrnr	VRNR VRNR-b
TIME TIME-b	type		
tlow	TYPE TYPE-b	vwin	VWIN VWIN-b
TLow tLow-b	unit		VWin VWin-b
tmpr	UNIT UNIT-b	wake	WAKE WAKE-b
TMPR TMPR-b	upr		
to	UPR Upr-b	web	WEB WEB
To To-b	usb		Web Web-b
tool	USB USB	wend	WEND WEnd-b
TOOL TOOL-b	var		
top	VAR var	while	WHILE While-b
TOP TOP	VAR VAR-b		
TOPLeft TOPleft	Var Var-b	wiz	WIZ WIZ-b
TOPtop TOPtop	vct		
tpd	VCT VCT-b	x	X! factorialx-b
TPD tpd	velo		SX sigmax-b
tran	VELO VELO-b		Sx Sx-b
TRAN TRAN	ver		TX= txequal
TRAN TRAN-b	VER VER-b		TX≥ txgeq
trig			TX> txgt
TRIG TRIG	vert		TX≤ txleq
trn	Vert Vert		TX< txlt
Trn Trn-b	VERT Vert-b		X x
tup	VLUM VLUM-b		X X-b
tUp tUp-b	vnlk		X x-b
tvm	VNLK VNLK-b		X X-b2
			X X-b3
			X xbar-b
			X= xequal
			X= xequal-b

$\mathbb{X} \geq$	xgeq-b	$\mathbb{X} \text{Inv}$	xInv-b	$\mathbb{Y} \geq$	y2-b
$\mathbb{X} >$	xgt-b				
$\hat{\mathbb{X}}$	xhat-b	xor		y3	
$\mathbb{X} \leq$	xleq-b	$\mathbb{X} \text{or}$	Xor-b	$\mathbb{Y} \leq$	y3-b
$\mathbb{X} <$	xlt-b	xrw		ycal	
x1		$\mathbb{X} \text{Rw}$	XRw	$\mathbb{Y} \text{CAL}$	YCAL
$\mathbb{X} 1$	x1-b	$\mathbb{X} \text{Rw}+$	XRwplus	yes	
$\bar{\mathbb{X}} 1$	xbar1-b	xt		$\mathbb{Y} \text{ES}$	YES
x1inv		$\mathbb{X} 1$	Xt-b	yfct	
$\mathbb{X} \text{Inv}$	x1Inv-b	xy		$\mathbb{Y} \text{fct}$	Yfct-b
x2		$\mathbb{S} \text{xy}$	Sxy-b	yicpt	
$\mathbb{S} \text{x} 2$	Sx2-b	$\mathbb{X} \text{y}$	xy-b	$\mathbb{Y} \text{ICPT}$	YICPT
\mathbb{X}^2	X2	y		yld	
\mathbb{X}^2	x2	$\mathbb{S} \text{y}$	sigmay-b	$\mathbb{Y} \text{LD}$	YLD
$\mathbb{X} 2$	x2-b	$\mathbb{S} \text{y}$	Sy-b	$\mathbb{Y} \text{LD}$	YLD-b
$\bar{\mathbb{X}} 2$	xbar2-b	$\mathbb{Y} =$	tYequal		
\mathbb{X}^2	xpower2-b	$\mathbb{Y} \geq$	tYgeq	yt	
x2inv		$\mathbb{Y} >$	tYgt	$\mathbb{Y} t$	Yt-b
$\mathbb{X} \text{Inv}$	x2Inv-b	$\mathbb{Y} \leq$	tYleq		
x3		$\mathbb{Y} <$	tYlt		
\mathbb{X}^3	X3	\mathbb{Y}	Y	z	
\mathbb{X}^3	x3	\mathbb{Y}	Y-b	\mathbb{Z}	Z
$\mathbb{X} 3$	x3-b	\mathbb{Y}	Y-b2	\mathbb{Z}	Z-b
\mathbb{X}^3	xpower3-b	\mathbb{Y}	ybar-b	\mathbb{Z}	z-b
x4		$\mathbb{Y} =$	Yequal	zero	
\mathbb{X}^4	X4	$\mathbb{Y} =$	Yequal-b	$\mathbb{Z} \text{ERO}$	ZERO
\mathbb{X}^4	x4	$\mathbb{Y} \geq$	Ygeq-b	zlow	
\mathbb{X}^4	xpower4-b	$\mathbb{Y} >$	Ygt-b	$\mathbb{Z} \text{Low}$	zLow-b
xcal		\mathbb{Y}	yhat-b	zoom	
$\mathbb{X} \text{CAL}$	XCAL	$\mathbb{Y} \leq$	Yleq-b	$\mathbb{Z} \text{OOM}$	ZOOM
xfct		$\mathbb{Y} <$	Ylt-b	$\mathbb{Z} \text{OOM}$	ZOOM-b
$\mathbb{X} \text{fct}$	Xfct-b	y1	$\mathbb{Y} 1$	zup	
xinv		y2		$\mathbb{Z} \text{Up}$	zUp-b
		$\mathbb{S} \text{y} 2$	Sy2-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{closeparen} | •  \key{4} |
| •  \key{DEL} | •  \key{comma} | •  \key{5} |
| •  \key{ALPHA} | •  \key{cos} | •  \key{6} |
| •  \key{EXE} | •  \key{fraction} | •  \key{7} |
| •  \key{F5} | •  \key{ln} | •  \key{8} |
| •  \key{F4} | •  \key{log} | •  \key{9} |
| •  \key{F1} | •  \key{openparen} | •  \key{divide} |
| •  \key{F6} | •  \key{power} | •  \key{dot} |
| •  \key{F3} | •  \key{rightarrow} | •  \key{minus} |
| •  \key{F2} | •  \key{sin} | •  \key{opposite} |
| •  \key{MENU} | •  \key{square} | •  \key{plus} |
| •  \key{EXIT} | •  \key{tan} | •  \key{times} |
| •  \key{FD} | •  \key{1} | •  \key{zero} |
| •  \key{OPTN} | •  \key{10} | •  \key{REPLAY} |
| •  \key{VARS} | •  \key{2} | •  \key{SHIFT} |
| •  \key{XthetaT} | •  \key{3} | |

List of Figures

- 1 Calculator graph35+E. 10

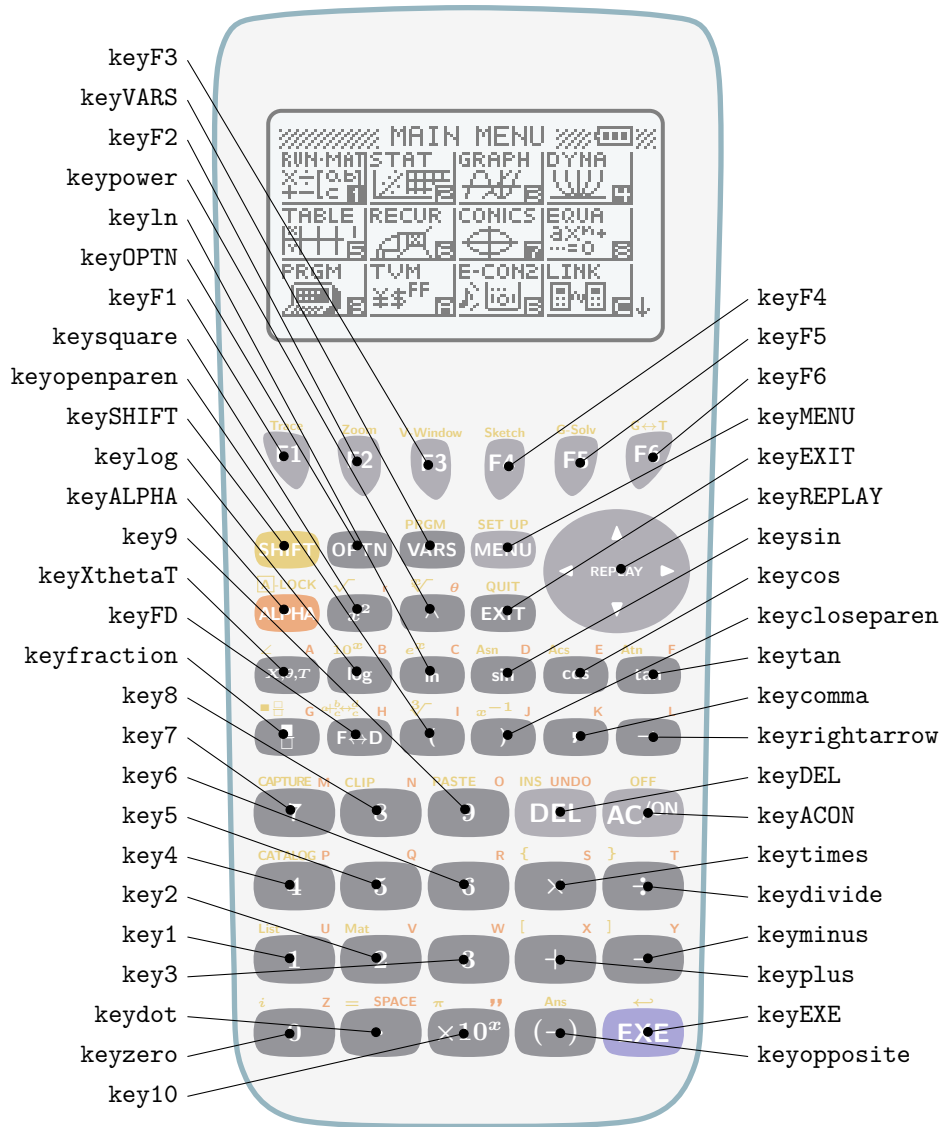


Figure 6: Keywords of keys

2	Key anchors	10
3	REPLAY key anchors	11
4	Screen anchors	12
5	Case anchors	13
6	Keywords of keys	32