
Appendix C: Glossary

This section defines some terms I use in the tips. Some definitions may seem obvious to English-speaking users, but the calculator community is thoroughly international. The glossary incorporates (with permission) many entries from Ray Kremer's Graphing Calculator glossary.

@1...@255

Represents an arbitrary constant, where distinct constants are distinguished by the numbers 1, 2 and so on, appended to the @ symbol. The constant may not be an integer; see @n1 below for comparison. Arbitrary constants may occur in solutions returned by *zeros()*. The first arbitrary constant created is called @1. Subsequent constants are numbered from 2 to 255. The suffix resets to 1 when you use *ClrHome*.

@n1...@n255

Represents an arbitrary integer, where distinct integers are distinguished by the numbers 1, 2 and so on, appended to the @n. Arbitrary integers may occur in the solutions to some equations, for example, in the expression @n1 + 7, @n1 may be replaced by any integer. The first arbitrary integer which is created is called @n1. Subsequent integers are numbered from 2 to 255. After the 255th integer is created, numbering continues with @n0. You may use [F6] Clean Up 2:NewProb to reset arbitrary integers to @n1.

2D

Acronym for 'two dimensional'. Refers to the calculator graphing mode in which functions one independent variable are plotted, for example, $y=f(x)$

3D

Acronym for 'three dimensional'. Refers to the calculator graphing mode in which functions of two independent variables can be plotted, for example, $z = f(x,y)$.

68K, 68000

Refers to the microprocessor used in the TI-89 / TI-92 Plus, which is a Motorola MC68000.

89

Abbreviation for TI-89

92, 92+, 92p

Abbreviations for TI-92 Plus, although 92 strictly refers to the original TI-92, not the TI-92 Plus.

algebraic entry

Method of typing an expression on the calculator in much the same way that expressions are shown in text books. Compare to *RPN*.

AMS

TI's acronym for *advanced mathematics software*. This refers to the basic operating software (operating system) for the TI-89 / TI-92 Plus calculators. Various revisions are identified by the version number, for example, AMS 2.05. Some bugs, fixes and tips only apply to certain AMS versions. TI seems to be abandoning the term AMS in favor of *base code*.

Only the most recent version of the AMS is available for download on the TI web site, but TI will e-mail older versions on request. Your e-mail service must be able to handle the AMS as an attachment, which is over one megabyte. Assembly programs are often incompatible with newer AMS versions.

These are known AMS versions:

1.00	Original version for TI-92 with Plus module. Also HW1 TI-89
1.01	TI-92 Plus, HW1 TI-89
1.05	TI-92 Plus, HW2 TI-89
2.01	Not an official release; leaked out on a few TI-89s in Europe
2.03	Added flash application support
2.04	Changed assembly program size limit from 8K to 24K
2.05	Fixed a bug in 2.04. The most current version.
2.06	Rumored version number for upcoming Voyage 200 Personal Learning Tool. Adds icon flash application menu and real-time clock support

annunciator

A legend in the display status line, which shows particular states of the calculator. For example, some annunciators are RAD, DEG, BUSY and BATT.

ans

Refers in general to answers (results) to previous entries. The *ans* items are shown on the right-hand side of the history display.

"anything but math"

A TI contest in early 2002, the purpose of which was to contribute classroom activities designed to use TI products outside of math classes. Roughly coincided with the announcement of the Voyage 200 Personal Learning Tool. Since the contest required submission of classroom plans and other teacher-specific activities, it was not really intended for student participation.

APD™

Automatic Power Down™. A calculator feature: the calculator automatically turns itself off (powers down) after some time interval. The APD delay can be adjusted with ASM programs; see the archives at ticalc.org. The APD will be defeated on some IBM-compatible PCs if you leave the black GraphLink cable connected, but close the GraphLink software.

Approx mode See *Auto, Exact, Approx modes*

archive, unarchive

archive means to move a variable from RAM to flash memory. *unarchive* means to move a variable from flash memory to RAM. Archive may also refer to the flash memory itself.

argument

An argument is a number or expression which is supplied as input to a program, function or command. For example, in the expression $\sin(x)$, x is the argument.

asm, ASM

An abbreviation for 'assembler' or 'assembly language'. 'Assembler' may also refer to the program which converts assembly program source code to object code. Assembly is the lowest level language in which the calculator can practically be programmed. Assembler allows the fastest possible programs, as well as direct access to the calculator hardware. However, carelessly written assembly programs can cause crashes which disable the calculator, or worse, cause incorrect operation. C programs are also considered assembly programs, since only the assembled object code is on the calculator. See also *machine code, shell* and *no-stub*.

ASM limit

This is an artificial limit to the size of compiled programs that can be run on the TI-89 / TI-92 Plus. TI enforces this limit to prevent software piracy (theft) of a few large, for-pay applications. The ASM limit unfortunately also severely limits the program functionality that can be implemented by independent developers. The ASM limit was originally 8K bytes, but was later increased to 24K bytes.

assembler, assembly See *asm*.

Auto, Exact, Approx modes

The modes in which the TI-89 / TI-92 Plus can be set, to evaluate expressions. In Exact mode, all calculations are performed with exact values for constants. In Approx mode, all calculations are performed with floating-point approximations of numeric constants. In Auto mode, the calculator attempts to use the 'best' mode (either Exact or Approx) to evaluate the expression. If an expression includes constants with decimal points, Approx mode will be used. The mode is set in the Mode screen, which is displayed when the [MODE] key is pressed.

Automatic Power Down™. See APD.

Auto-paste

A calculator home screen feature. Use [UP] and [DOWN] to highlight an entry or answer in the home screen, then press [ENTER] to paste the expression to the current cursor position in the entry line.

auto-repeat

The cursor movement feature by which the cursor will automatically move if the cursor keys are pressed and not released.

auto-simplify

The process by which the calculator automatically simplifies symbolic expressions. Expressions are simplified to put them into a standard form. Auto-simplification may sometimes be desired, but often it makes some algebraic operations difficult or impossible. Auto-simplification cannot be disabled on the TI-89 / TI-92 Plus.

backup, back-up

A complete copy of the memory of the calculator that is stored on a PC. May also refer to the act of creating a backup. GraphLink software is used to create a backup. *Restoring a backup* means to copy the backup from the PC to the calculator.

backup battery

The lithium coin cell in the TI-89 and TI-92 Plus which maintains RAM contents if the main batteries discharge or are replaced.

base code

An alternative TI term for AMS; see *AMS*.

benchmark

A program or test case with the sole purpose of evaluating some aspect of the performance of the calculator or computer. Accuracy, correctness, speed or code size may be tested.

binary

Refers to numbers expressed in the base-2 number system. The TI-89 / TI-92 Plus can represent integers in base-10 (decimal), binary and hexadecimal (base-16).

black-bar See *crash*.

boolean

Applies to variables or conditional (logical) expressions which evaluate to values of *true* or *false*. *True* and *false* are boolean constants. A boolean expression combines boolean constants and variables with boolean operators and evaluates to a boolean constant. Boolean logic is named in honor of the 19th century English mathematician George Boole, who first formalized this logical system.

brick

Rarely-used slang which refers to the TI92 or TI92+ calculator, because of its large size and weight, compared to the TI-89.

bug

A flaw or fault in software which causes incorrect results. More specifically, a program has a bug, by definition, if it returns results which do not meet the specification for the software.

built-in

Describes functions or features which are available in the calculator AMS, without installing other programs or applications.

C

A high-level language used to write calculator programs. C programs can be faster than TI Basic programs, and can directly access the calculator hardware and internal operating system functions. C programs must be written and compiled on a PC, then the object code is downloaded to the calculator for execution. Two C compilers are available: TIGCC is a third-party free-ware compiler, and TI also supplies a C compiler with the SDK.

Cabri Geometry

A flash application for the TI-89 and TI-92 Plus which allows editing and analyzing Euclidean geometrical constructions. Also available as PC-based software as Cabri Geometry II. Cabri Geometry is free for the TI-92 Plus but not for the TI-89. Cabri Geometry was developed by TI and supports language localization. See also *Geometer's Sketchpad*.

CAS

An acronym for *computer algebra system*. This term refers to the calculator software specifically concerned with performing symbolic calculations, as opposed to purely numeric calculations.

CBL™

Acronym for 'calculator-based laboratory'. The CBL (a TI product) is a hardware device which connects to the TI-89/TI-92 Plus (and other calculators) through the GraphLink port. The CBL provides data acquisition functions and can measure voltage, temperature, frequency and other physical parameters.

CBR™

Acronym for 'calculator-based ranger'. The CBR (a TI product) is a hardware device which connects to the TI-89 / TI-92 Plus (and other calculators) through the GraphLink port. The CBR uses ultrasonic ranging to measure the distance between itself and the target.

certificate

A file which is generated by TI. Signed applications (see *signing*) require a certificate so that they can run on the calculator. See also *SDK*.

clipboard

Calculator memory in which cut or copied expressions are temporarily stored. The clipboard contents can be pasted.

command

A routine which is neither a function nor a program. All commands are built-in. The arguments for a command are not passed in parentheses, unlike the arguments for programs and functions. See also *program* and *function*.

command line See *entry line*

complex

Applies to an expression or number which has an imaginary component. For example, $3 + 2i$ is a complex number, where $i = \sqrt{-1}$. *Complex* does not mean 'complicated'.

conditional operator

An operator such as $>$, $<$ or $=$, which is applied to two expressions. A conditional expression evaluates to *true* or *false*.

constraint

An expression that limits the range of operation of expression evaluation. Constraints are applied with the 'with' operator $|$. For example, in the expression $a+b|a=2$, the constraint is $a=2$. Constraints may be composed with various combinations of Boolean operators.

contrast

Refers to the LCD screen contrast, that is, the level of darkness. The contrast changes with battery voltage. New batteries result in a dark screen, but the contrast decreases as the batteries age. The contrast is adjusted by pressing the [DIAMOND] key simultaneously with the [+] and [-] keys, as indicated by the green legend on the keyboard. If the contrast is set too light, it may appear that the calculator is off when it is actually on. Oddly, the contrast can be set on the VTI emulator, and must be changed when the emulator is reset.

copy See *cut*, *copy*, *paste*

crash

An error condition in which the calculator will not respond to keystrokes, perform calculations, or turn on or off. Also called freeze-up, lockup or black-bar. The 'black-bar' term comes from the symptom of a thick black bar appearing at the top of the LCD display when a crash occurs. Crashes are usually caused by ASM games and shells. Crashes from normal calculator operation or TI Basic programs are extremely rare. The display often shows the error message *Address Error* after a crash. Instructions for recovering from a crash are given in the User's Guides.

current

Adjective which describes a default calculator object. For example, the 'current folder' is the folder in which variables are stored, if a different folder is not specified. The 'current matrix' is the matrix that is currently in the Data/Matrix editor.

cursor

The display symbol which indicates the position at which text appears when keys are pressed. The cursor symbol is shown as a flashing vertical bar, unless *insert* mode is active, in which case the cursor is shown as a flashing solid rectangle.

cursor keys

The keys which move the cursor in the display. Also called the 'arrow keys'. In this document I refer to these keys as [UP], [DOWN], [LEFT] and [RIGHT]. The TI-89 has dedicated cursor keys, the TI-92 Plus has a blue cursor pad.

cursor pad See *cursor keys*

cut, copy, paste

Calculator text editing features. *Cut* removes the marked expression and places a copy in the clipboard. *Copy* places a copy of the marked expression in the clipboard. *Paste* inserts the clipboard contents at the cursor location.

Data/Matrix Editor

The application built into the calculator which is used to create or edit data variables, matrices and lists. It is accessed with the [APPS] key.

DBus

The name of the GraphLink serial link as described in the SDK manual. So named because the data lines are labeled D0 and D1?

Derive

A trade name for a PC-based computer algebra system, from which the TI-89 / TI-92 Plus CAS was derived. TI now owns Derive and continues to sell it.

DG

Acronym for discussion group.

discussion group

An electronic messaging system provided for users by TI on their web site. Discussion groups are similar to Usenet news groups, but the TI discussion groups are moderated by TI to remove trolls, vulgarity and profanity, and offers to buy or sell. There are dozens of TI discussion groups, focusing on different calculators and fields of study.

ebay

Abbreviation for the web auction site www.ebay.com. An inconvenient way to buy used calculators at prices near those of brand new units.

emulator

An emulator is software that runs on a PC which simulates the operation of the calculator, including running programs. Only one third-party emulator, called VTI, is available. To use the emulator, you must have a calculator ROM image on the PC. You violate TI copyrights if you use a ROM image with the emulator and you do not actually own the calculator.

entry line

The line at the bottom of the calculator display where commands and instructions are entered.

EOS; EOS hierarchy

A TI acronym for Equation Operating System. The EOS specifies the order in which operators are applied. The TI-89 / TI-92 Plus Guidebook specifies the EOS hierarchy in Appendix B. Note that exponentiation is applied before negation, and that logical operators (and, or, etc.) are also prioritized.

Exact mode See *auto, exact, approx modes*

Equation Writer See *EQW*.

EQW

Acronym for equation writer. An equation writer is a program which enables you to enter expressions in Pretty Print format, in contrast to the usual command line format. This is similar to the equation editors in MS Word, or WordPerfect, but calculator equation writers actually perform math. A programmer who

goes by the pseudonym E.W. has written an equation writer for the TI-89 / TI-92 Plus. Two versions are available: a free version, and a for-pay flash application. The flash application includes additional features and functions.

errornum

A system variable which contains the number of the most recent error. *errornum* is zero if no errors have occurred, or if ClrErr has been executed.

expression

A combination of variables and, optionally, operators and functions. For example, $a+b$, $\sin(x)$ and y are all expressions.

false

A built-in system variable which indicates the Boolean 'false' value.

file extension

This is a three character suffix on the names of files stored on a personal computer. The following table shows the file extensions for the TI-89 and TI-92 Plus.

TI-89	TI-92 Plus	Description
n/a	.9xa	Geometry figure (constructions)
.89c	.9xc	Data variable
.89d	.9xd	GDB (Graph database)
.89e	.9xe	Expression (numbers, equations, etc)
.89f	.9xf	Function (Y-vars, user-defined functions)
.89g	.9xg	Group
.89i	.9xi	Picture
.89k	.9xk	Flash Application Software
.89l	.9xl	List
.89m	.9xm	Matrix
.89p	.9xp	Program
.89q	.9xq	Certificate
.89r	.9xr	Lab report
.89s	.9xs	String variable
.89t	.9xt	Text variable
.89u	.9xu	Operating system
n/a	.9xx	Geometry macro

flash application or flash app

An application that can run directly from flash memory, without first being copied into RAM. Flash applications can only be created with the TI SDK and by obtaining a certificate from TI. Certificates are not free; TI charges for them. Flash applications are started from the [DIAMOND] [APPS] key.

flash; flash ROM

flash is a short way to say flash EEPROM, which is one of the two types of memory on the TI-89/TI-92 Plus: the other type of memory is RAM. 'EEPROM' is an abbreviation for electrically erasable programmable read-only memory. You can store programs and variables from RAM to flash with the archive operation, which frees up RAM for calculations. The contents of FLASH can be quickly read, but it takes more time to write to the flash memory. The contents of flash memory are retained if the batteries are discharged or removed. See also *RAM*.

Flash memory has a limited (but large) number of erase/write cycles. The rating for the TI flash

memory is a conservative 100,000 cycles. An erase cycle occurs only when a *garbage collection* is done, or when you upgrade the AMS. Under normal use, the flash will last for many years.

'Flash' can also be used as a verb: to *flash the calculator* or *flash the ROM* usually means to upgrade to a new operating system.

floating-point

A method used by calculators (and computers) to represent numbers with non-zero fractional components. A variety of methods and number bases can be used, but, in general, a number is represented as a signed mantissa implicitly multiplied by a signed exponent. Floating-point calculations are inherently imprecise, since some numbers cannot be exactly represented with a finite number of bits.

flood

A large number of messages posted to a discussion group with malicious intent to displace other valid messages.

folder

A named area of memory in which variables are saved. The calculator always has at least one folder called *main*. You may create your own folders. It is not possible to create a folder within a folder. One folder is always the *current* folder. The name of the current folder is shown in the display status line.

friendly window

A graph window with settings that result in pixel coordinates with 'round' values. This means that the pixel coordinates of the graph cursor are values such as 1.5, 1.51, 1.52, instead of 1.499, 1.54999, 1.51999, etc.

freeze-up See *crash*

function

A routine with zero, one or more arguments which may return a result to the home screen or to a calling routine. See also *program* and *command*.

function key

The blue keys labeled [F1] to [F8] on the TI-92 Plus, and [F1] to [F5] on the TI-89. On the TI-89, [F6], [F7] and [F8] are accessed with the yellow [2nd] key. The operations performed by the function keys are determined by the current operating mode of the calculator, and usually select functions in the toolbar.

garbage collection

A process that the calculator automatically performs to reorganize the contents of flash memory, which packs the variables into memory more efficiently. When you delete a variable from flash memory, it is not deleted at that time, it is just marked as 'not used'. The variable still occupies flash memory space. When the flash memory is full, the calculator operating system performs a garbage collection. Variables marked as deleted are actually erased at this time. This process is similar to defragmenting a PC hard drive. Refer to the *TI-89 / TI-92 Plus Guidebook* for more details.

Geometer's Sketchpad

A flash application for the TI-89 and TI-92 Plus which allows construction and analysis of geometrical models. Geometer's Sketchpad was developed by KCP Technologies Inc, and does not support language localization. See also *Cabri Geometry*.

global variable

A variable which is stored in a folder. Global variables can be recalled to the history display, and

programs and functions can also read the contents of global variables. See also *local variable*.

GraphLink; GraphLink cable

'GraphLink' can refer either to the physical cable that connects the calculator and the PC (or two calculators), or the software that runs on the PC. The GraphLink cables are not free; the GraphLink software is free and can be obtained from the TI web site. The GraphLink cable is not the same as the unit-to-unit cable included when the calculator is purchased.

There are four different versions of the GraphLink cable: the gray GraphLink, the black GraphLink, the USB GraphLink, and third-party cables. The gray GraphLink was the original cable. The black GraphLink is the new cable, and it can transfer data much faster than the gray cable. The USB cable is only available for Apple computers.

The GraphLink software is available for IBM-compatible PCs and Apple computers. The purpose of the software is to transfer variables and programs between the calculator and the PC. GraphLink software can also be used to back-up and restore the calculator's memory, and to edit TI Basic source code.

The GraphLink connector is the small round connector on the calculator into which the GraphLink cable is plugged.

graph screen

The screen on which function graphs and data plots are shown.

group file

Calculator files which have been combined into one file with the GraphLink software.

hand key

The TI-92 Plus has the hand key; the TI-89 does not. It is located above function key [F5]. It is used with [UP] and [DOWN] to scroll large expressions.

hardware version See *HW1*, *HW2*.

hexadecimal, hex

Refers to numbers expressed in the base-16 number system. The TI-89 / TI-92 Plus can represent integers in base-10 (decimal), base-2 (binary) and hexadecimal.

history, history display, history area

The area of the home screen in which previous calculations and results are shown. The history display is directly above the entry line.

home screen

The default display screen on which calculations and commands are entered, and calculated results are shown. The home screen is one of several display screens used by the calculator. Other screens are the graph screen and the program I/O screen. The home screen is displayed by pressing [HOME] if some other screen is currently shown.

HW1, HW2

Acronyms for *hardware version 1* and *hardware version 2*. The original TI-89 and TI-92 were built with HW1. More recent TI89s and the TI92+ are built with HW2. HW1 TI-89s are hard to find now. HW2 calculators run about 20% faster than HW1 calculators. HW2 calculators have different display driver hardware that also improves performance. HW2 calculators also have built-in hardware which TI uses to enforce the ASM limit.

HP

An acronym for Hewlett-Packard, another respected vendor of fine graphing calculators.

implied multiplication

A convention used by the TI-89 / TI-92 Plus CAS which allows omission of the multiplication operator in some expressions. For example, $2x$ is equivalent to $2*x$. However $a(x)$ is not interpreted as $a*x$, but instead as calling function $a()$ with an argument of x . Also, the expression $2ab$ is not interpreted as $2*a*b$, but instead as $2*ab$, where ab is a single variable.

integer

A number with no fractional component. -1 , 0 and 42 are integers; -1.1 and $2/3$ are not integers. See also *floating-point*.

interpolation

Estimating the value of a function between two known values.

k or K

Abbreviation for 1024. 1K bytes is 1024 bytes.

kernel

Software which gives assembly programs access to calculator machine resources. Assembly programs which are not no-stub require a kernel. See also *shell*.

keyboard shortcut

A key press combination to perform a calculator function. The keyboard shortcuts are listed in the *TI-89/TI-92 Plus Guidebook*.

LCD

An acronym for liquid-crystal display. The displays used on the TI-89 / TI-92 Plus are LCDs.

LCD connector; LCD port

The unlabeled rectangular connector on the back of the TI-92 Plus which is used to connect an LCD display screen for overhead projection. Actually called the ViewScreen port. The TI-89 does not have this connector. See also *ViewScreen*.

LSD; LSB See *most significant digit*

least significant digit; least significant bit See *most significant digit*

library

A calculator file containing ASM utility programs which are used by other programs. Libraries save memory when several calculator programs need the same utilities, since the library eliminates duplicating the utilities in each program. Libraries can cause problems if programmers do not ensure that the library version is compatible with the program version, or the library is not located in the correct folder.

linear format

The opposite of 'Pretty print': a representation of an expression such that all the symbols and operators are on one line. Expressions are shown in linear format in the entry line. The expression $(a^b+b^a)^{1/3}$ is in linear format.

Linux

An open-source operating system alternative to Windows. There is some Linux support for TI-89/TI-92 Plus calculators, including a TIGCC C compiler and file transfer software which performs GraphLink functions.

local variable

A local variable is created by a function or program, and only exists while the program is running. Local variables are used for temporary storage during program execution. See also *global variable*.

lockup See *crash*

machine code

Strictly, program code for the calculator expressed as binary integers. Machine code is the lowest level of programming, assembly language (with mnemonics) is the next level up, and high-level languages such as TI Basic or C are the highest programming level. Assemblers and compilers convert language instructions to machine code. Sometimes *machine code* is used when *assembly* is meant.

manual

Instructions for the calculator. TI no longer includes complete manuals with the TI-89 and TI-92 Plus, instead, an abbreviated edition is included. Complete manuals, which are necessary for most calculator operation, are available for download at www.education.ti.com. Bound, printed editions can also be purchased from TI, in a variety of languages, but these are usually not as up to date as the downloaded versions.

math class

From Ray Kremer's glossary: "The source of many concepts used by the calculators. Useful for determining what entry will achieve the desired result".

mode

A means to control different aspects of calculator operation. The mode settings are shown with the [MODE] key.

model family

A group of calculator models with similar hardware, software or compatibility. The TI-89, TI-92, TI-92 Plus and the (unreleased) Voyage 200 form a model family.

modifier key

A key which modifies the function of other keys. The modifier keys are [2nd], [DIAMOND], [SHIFT], [alpha] (TI-89 only) and [HAND] (TI-92 Plus only).

most significant digit

Refers to the digit in a number with the greatest positional magnitude. For example, in the number 12345, '1' is the most significant digit. May be abbreviated MSD. The *least significant digit* is the digit in the number with the least positional magnitude; in the number 12345, '5' is the least significant digit, or LSD. For binary (base-2) numbers, the most significant digit is called the most significant bit (MSB), and the least significant digit is called the least significant bit (LSB).

MSD; MSB See *most significant digit*

multiplication, implied See *implied multiplication*

native assembly

Describes assembly programs which need no shell. See also *ASM*.

no-stub

Describes an assembly or C program which can (or must) be run without a shell. I have suggested that programs which are *not* no-stub be called 'stubby' programs, but this hasn't caught on. The term *no-stub* comes from the C source code directive which results in object code not requiring shell support.

numeric

Used to describe operations on number, as opposed to operations on symbols. See also *symbolic*.

on-line store

The TI web page (<http://epsstore.ti.com/>) where you can download software including AMS versions, the GraphLink software, and free and for-pay applications. You can also buy some calculators and accessories.

order of operations

Operation priority is specified by the operating system. The priorities are

1. Parentheses (), brackets [], braces { }
2. Indirection (#)
3. Function calls
4. Post operators: degrees-minutes-seconds (° , ' , "), factorial (!), percentage (%), radian (°), subscript ([]), transpose (°)
5. Exponentiation, power operator (^)
6. Negation (-)
7. String concatenation (&)
8. Multiplication (*), division (/)
9. Addition (+), subtraction (-)
10. Equality relations: equal (=), not equal (≠ or /=), less than (<), less than or equal (≤ or <=), greater than (>), greater than or equal (≥ or >=)
11. Logical not
12. Logical and
13. Logical or, exclusive logical xor
14. Constraint "with" operator (|)
15. Store (→)

over-clock

A modification to the calculator processor clock circuit which increases the operating frequency and therefore increases the calculator operating speed. Since the TI-89 / TI-92 Plus clock speed is set with a capacitor, over-clocking involves replacing the capacitor with one of smaller value. Over-clocking voids the warrantee and reduces battery life. If taken to extremes, over-clocking can also cause faulty operation, crashes and GraphLink transmission problems.

parameter

A constant which controls the operation of a function or feature. Most often refers to the settings in the *Window* screen, which controls the appearance of graphs. Sometimes also used to mean *argument*.

paste See *cut, copy, paste*

PC

Acronym for personal computer. Usually refers to an IBM-compatible computer, unless Apple computers are specifically mentioned.

pixel

A single point or 'dot' on the calculator display.

PLT

TI's acronym for Personal Learning Tool, which they use to describe the Voyage 200. Although the Voyage 200 is an updated TI-92 Plus, TI does not specifically call it a graphing calculator. See also *Voyage 200* and *v200*.

port, porting (software)

Porting is the process of rewriting a program to run on a calculator other than that which it was originally intended. For example, TI-83 programs cannot run on the TI-89. Ports of popular programs are common.

post

A discussion group message.

Pretty print

The graphical method of displaying expressions in which the expression elements are shown as they are usually written by hand or set in type. For example, fractions are shown with the numerator above the denominator, and exponents are shown slightly above the other elements.

program

A routine which has zero, one or more arguments. Programs cannot return results to calling routines or to the home screen. See also *command* and *function*.

program archive

A large collection of calculator programs on the internet, either on a web site or FTP site. Used to download other people's programs, and to distribute your own.

program I/O screen

The screen on which programs display text and expressions. One of several calculator display screens.

QWERTY

Alpha keyboard as used on the TI-92 Plus and the Voyage 200. So named because of the arrangement of the letters QWERTY on the top row.

RAM

One of two types of memory in the calculator; also see *flash*. RAM is an acronym for random access memory. Variables and programs are stored in RAM, unless you store them into flash memory by archiving them. Variables can be quickly stored into RAM and read from RAM. The contents of RAM can be lost if the main batteries are removed *and* the RAM lithium back-up battery is discharged.

Usually, programs can only run in RAM. An archived program (in the flash memory) is first copied to RAM before execution. However, *flash applications* are executed directly from flash memory.

reserved function name

The TI-89 / TI-92 Plus reserve some names for system variables and reserved function names. These names are specified in the *TI-89 / TI-92 Plus Guidebook*, in Appendix B. You cannot use these names for your own variables.

ROM

1) The integrated circuit (microchip) on which the calculator operating system (AMS) is stored. ROM is an acronym for Read-Only Memory. The TI-89 and TI-92 Plus use flash ROM. 2) The calculator operating system itself, as in the ROM version.

ROM version

A number which specifies the version of the calculator operating system software. Changes are made to the OS software over the product life of the calculator, and the ROM version number identifies the particular version on a given calculator. The OS changes may include added features or functionality, bug fixes, or software changes to comply with hardware changes. Assembly programs must often be rewritten to accommodate a new ROM version. The ROM version can be displayed by pressing [F1] at the home screen, then [A] About. The ROM version is specified as "Advanced Mathematics Software Version xxx", where "xxx" is the ROM version number. Also see *AMS*.

routine

A general term which refers to programs, functions and commands. Routines may be built-in to the calculator, or may also be written in assembly, TI Basic or C.

RPN

An acronym for Reverse Polish Notation. This is a calculator operating method in which the expression operands are entered on a stack, then operations are performed on the stack elements.

Hewlett-Packard calculators use RPN; TI calculators do not. Independent programmers have written RPN interfaces for the TI-89 / TI-92 Plus. RPN is more keystroke-efficient than other interface methods; complicated expressions can be entered in fewer keystrokes without parentheses. More description of RPN can be found at the HP Museum calculator site (<http://www.hpmuseum.org/>).

scroll

To move the display contents so that hidden parts of an expression are shown. Long or large expressions will not fit in the small calculator display, and you need to scroll the expression to see all of it.

SDK

Acronym for Software Development Kit. The SDK is a combination of software and documentation with which you can write applications for the TI-89 / TI-92 Plus. The software consists of a C compiler and assembler. Flash applications can only be developed with the SDK. The SDK is available from TI in two versions; one version is free. With the free version, you cannot create flash applications.

self-test

Software built into the calculator to test operation during manufacturing or repair. While the self-test software is not documented by TI, some user have discovered certain parts of it. The self-test usually results in reset memory.

serial port

The RS232 serial port on a computer. This is not a USB port. One version of the GraphLink cable is compatible with serial ports.

shell

An alternative operating environment which supports assembly programs. Shells are not developed or supported by TI. Shells were originally needed to run assembly programs on the TI-89 and TI-92 Plus. Assembly programs which are properly coded do not need shells; see *no-stub*. A shell is essentially an assembly program used to run other assembly programs.

signing

The process by which TI turns a program into an application which runs on the calculator.

silent linking

TI's term for the capability of GraphLink communications without using the Link menu. Older TI calculators do not have silent linking.

SMAP II

The name of the BCD floating point number format used on the TI-89 and TI-92 Plus. Refer to the *TI-89 / TI-92 Plus Developer Guide* (the SDK manual) for more details.

source code

The original, human-readable form of calculator programs. Can refer to programs in assembly, C or TI Basic. The source code is converted to assembly code with an assembler or compiler. In the case of TI Basic, the source code is converted to tokens by an on-calculator interpreter. These tokens in turn invoke built-in assembly language segments on execution.

status line

The line at the very bottom of the calculator display, which shows the current folder and various annunciators.

symbolic

Used to describe operations on variables as opposed to numeric calculations. For example, $a+b$ is a symbolic calculation, but $1.2 + 3$ is a numeric calculation.

symbolic constant

A constant which can be manipulated by the CAS as a symbolic value, instead of simply a numeric value. Symbolic constants include π , i , e and ∞ .

syntax error

Message displayed by the calculator when a program does not have the proper syntax, that is, the program does not conform to the rules of the programming language. The syntax error dialog box usually includes an option to open the program editor at the offending line of code. To fix a syntax error, you must understand both the intent of the program and the programming language.

system variable See *reserved function name*

text editor

The built-in TI-89 / TI-92 Plus application in which you create and edit text variables.

test operator See *conditional operator*

TI

Texas Instruments (what else?)

TI92+

Acronym for TI-92 Plus.

TI Basic

The BASIC programming language interpreter which is built into the TI-89 / TI-92 Plus. Often just called BASIC.

ticalc, ti-calc

Refers to the web site www.ticalc.org, a popular third-party site for TI calculator information and programs. Heavily oriented towards games, and accepts all program submissions, regardless of

repetition with existing programs. Not affiliated with TI, but probably the most popular, well-known TI enthusiast site.

TI-cares

A TI expression for calculator customer support. You may telephone, mail or email TI-cares.

ticas, ti-cas

Refers to the web site <http://www.ti-cas.org/>, a popular third-party site for TI calculator information and programs. Has both French and English pages. Oriented towards education, mathematics and practical applications, not games. Unfortunately, ti-cas is not available at the time of this writing because of a disagreement between TI France and the web site author.

TI Connect

TI software designed to replace the GraphLink software. Provides file transfer and supports the USB GraphLink cable, but does not yet include a TI Basic program editor. TI Connect is only compatible with flash-based calculators, including the TI-89 and TI-92 Plus.

TIGCC

Acronym for TI Gnu C compiler, which is a C cross-compiler for the TI-89 / TI-92 Plus based on the Gnu compiler collection. TIGCC is a third-party compiler, not a TI product. TIGCC is a popular alternative to TI's SDK. For more information, see <http://tigcc.ticalc.org/>.

tios; TIOS; TI-OS

Acronym for 'TI operating system'. Describes the built-in operating system which controls the operation of the calculator. See also *AMS*.

tokenize

The process by which TI Basic programs are converted to tokens. Tokens are short constants which represent TI Basic commands and functions. Programs are tokenized the first time the program runs.

toolbar

The toolbar is the set of menu tabs that are displayed at the top of the screen, and are accessed with the function keys [F1] -[F8]. The toolbars change depending on which screen is shown, and you can create your own custom toolbars.

troll

A person who posts to a discussion group for the primary purpose of annoying or inciting other members of the group. May also refer to the post itself.

true

A built-in system variable which indicates the Boolean 'true' value.

UI

Acronym for user interface, which is the visible system through which you specify input to the calculator, and the calculator provides the results.

unarchive See *archive*, *unarchive*

underscore character

The character "_". Type it with [DIAMOND] [MODE] on the TI-89, and [2nd] [P] on the TI-92 Plus. Used to specify a measurement unit (_kg) or complex symbolic variables (var_).

unit-to-unit cable

Cable used to connect two calculators of the same model family for file transfers. Included in the package with the calculator. It is not a GraphLink cable and cannot be used for file transfer with a personal computer.

USB

Universal Serial Bus. A relatively new computer port which is replacing serial and parallel ports on PCs. New Apple Macintosh PCs have only USB ports. A USB GraphLink cable is available.

v200

Voyage 200

ViewScreen, ViewScreen port

LCD display panel for overhead projectors which displays the calculator screen. TI-92, TI-92 Plus and Voyage 200 calculators all have a built-in ViewScreen port; a special version of the TI-89 is available with a ViewScreen port. Each ViewScreen port support all the calculators in a model family.

Voyage 200

An updated TI-92 PLUS with more flash memory, an optional icon-based user interface for flash applications, and a real time clock. TI calls this a 'personal learning tool' (PLT) instead of 'graphing calculator', with the intent that it be used in classes other than math. The Voyage 200 is physically smaller than the TI-92 Plus and comes with a USB GraphLink cable. The Voyage 200 will be available in the fall of 2002. See also *PLT*, *v200*.

VTI

Acronym for Virtual TI; a calculator emulator. See *emulator*.

window screen

The screen which is shown when the [WINDOW] key is pressed. This screen shows the parameters that control the appearance of graphs and data plots.

'with' operator

The binary operator indicated by the vertical bar character '|'. The 'with' operator is entered with [2ND] [K] on the TI92+, and with the dedicated [||] key on the TI-89.

Y= Editor

The built-in editor which is used to enter and edit the y-functions. The Y= Editor is displayed by pressing [Y=].

Zip file

A PC file which contains one or more compressed PC files. Most calculator programs are distributed as zip files, and you must use an unzip utility (such as WinZip or PKzip) to unzip the files before sending them to the calculator.