Radio Shack EC-4000 Reference Guide

Always refer to *Train-ing with Your EC-4000* for complete details of calculator operation.

AOS™ ENTRY METHOD

Lets you enter problems directly as they're usually written, left to right. Calculator will execute operations in the following order: 1) single variable functions 2) powers/roots 3) multiplication/division 4) add/subtract. [=] (Equals Key) completes all pending operations. This order of operations is also followed inside parentheses.

CLEARING:

Turning your calculator OFF and ON clears it completely.

- [CE] – clears last number entered (if not followed by an operation).
- [2nd] [C.t] – clears the "t" register (memory 7) only.
- [CLR] – clears machine, except for memories and program steps.
- [INV] [2nd] [C.t] – clears the display, and all memories, but not program steps.

POWERS AND ROOTS:

To raise a number (y) to any power (x)

- Enter the number (y).
- Press [y^x].
- Enter the power (x).
- Press [=] (or other function key).

To take the x^th root of a number (y). ($\sqrt[x]{y}$)

- Enter the number (y).
- Press [INV] [y^x].
- Enter the root (x).
- Press [=] (or other function key).

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MEMORIES:

8 memories (numbered **0** through **7**) are available for your use:

[STO] **n** (**n** from **0** to **7**) stores the number in the display in the memory you select (**0** to **7**).
[RCL] **n** recalls the number from memory **n** into the display.
[2nd] [Exc] **n** – swaps the display value with what's in memory **n**.
[SUM] **n** – sums the number in the display into memory **n** (the result stays in the memory).
[INV] [SUM] **n** – subtracts the number in the display from what's in memory **n** (the result stays in memory).
[2nd] [Prd] **n** – multiplies what's in memory **n** by the number in the display (result stays in memory).
[INV] [2nd] [Prd] **n** – divides what's in memory **n** by the number in the display (result stays in memory).

FIX DECIMAL:

To Set the Number of Decimal Places in the Display, press [2nd] [FIX] **n**, where **n** is the desired number of digits to the right of the decimal point (**0** to **8**).
Pressing [INV] [2nd] [FIX] or [2nd] [FIX] **9** removes the fix on the decimal point.

ANGLE MODE:

Your calculator is equipped to accept angle inputs, and to return angle calculation results, in 3 systems of units: Degrees, Radians, and Grads. When first turned on, the calculator is always in Degree mode.

- Press [2nd] [Rad] to change to Radian mode.
- Press [2nd] [Grad] to change to Grad mode.
- Press [2nd] [Deg] to change to Degree mode.

Be certain that your calculator is in the correct mode for the angular units you desire when performing any calculations involving angles, including:

- Trigonometric functions: [2nd] [sin], [2nd] [cos], [2nd] [tan], and their inverses.
- Polar to Rectangular Conversion: [2nd] [P→R], and its inverse.

CONVERSIONS:

Polar to Rectangular

- Enter R, Press: [x⇄t]
- Enter Θ
- Press [2nd] [P→R] – y is displayed.
- Press [x⇄t] to read x.

Rectangular to Polar

- Enter x · Press [x⇄t]
- Enter y
- Press [INV] [2nd] [P→R] –
- Θ is displayed.
- Press [x⇄t] to read R.

Degrees, Min, sec to Decimal Degrees

- Enter degrees, Press [•]
- Enter minutes (2 digits) and seconds (2 digits).
- Press [2nd] [D.MS] for decimal value.

Decimal Degrees to Degrees, Min, Sec

- Enter decimal degrees.
- Press [INV] [2nd] [D.MS].
- (Degrees, minutes, seconds) now displayed.

STATISTICAL KEYS AND FUNCTIONS:

Begin statistical calculations by turning calculator OFF and ON; or by pressing [INV] [2nd] [C.t].

If you have only one set of data to analyze:

- Enter each data point.
- Press [2nd] [Σ+].
- Repeat for all points.
- Press [2nd] [$\bar{x}$] to calculate the *mean*.
- Press [2nd] [σ^2] to calculate the *variance* (with N weighting).
- Press [2nd] [σ^2] [$\sqrt{x}$] to calculate the standard deviation of the data (with N weighting). ("N weighting" means that the total number of data points is used in the calculation of the variance – this type of variance is called a population variance.)

If you have two sets of data to analyze simultaneously:

Call the two sets of data "x" and "y" *arrays*.

- Enter an "x" data point.
- Press [x⇄t].
- Enter a "y" data point.
- Press [2nd] [Σ+].
- Repeat for all points.
- Press [INV] [2nd] [$\bar{x}$] to calculate the mean of the "x" data points.
- Press [2nd] [$\bar{x}$] to calculate the mean of the "y" data points.
- Press [INV] [2nd] [σ^2] to calculate the variance of the "x" data points.
- Press [2nd] [σ^2] to calculate the variance of the "y" data points. (use [$\sqrt{x}$] key to calculate standard deviation).

CALCULATOR KEY CODES IN NUMERICAL ORDER

00	0			42	EE		
01	1			−42	INV	EE	
↓				43	(		
09	9			44	)		
13	Inx			45	÷		
−13	INV	Inx		46	2nd	Nop	
14	CE			48	2nd	FIX	
15	CLR			−48	INV	2nd	FIX
18	2nd	log		49	2nd	Int	
−18	INV	2nd	log	−49	INV	2nd	Int
19	2nd	C.t		50	2nd	Deg	
−19	INV	2nd	C.t	51	GTO		
20	2nd	tan		55	×		
−20	INV	2nd	tan	56	2nd	Dsz	
22	x⇄t			−56	INV	2nd	Dsz
23	x^2			60	2nd	Rad	
24	$\sqrt{x}$			61	SBR		
25	$1/x$			−61	INV	SBR	
26	2nd	D.MS		65	−		
−26	INV	2nd	D.MS	66	2nd	x⇄t	
27	2nd	P→R		−66	INV	2nd	x⇄t
−27	INV	2nd	P→R	70	2nd	Grad	
28	2nd	sin		71	RST		
−28	INV	2nd	sin	75	+		
29	2nd	cos		76	2nd	x≥t	
−29	INV	2nd	cos	−76	INV	2nd	x≥t
30	2nd	π		80	2nd	σ^2	
32	STO			−80	INV	2nd	σ^2
33	RCL			81	R/S		
34	SUM			83	•		
−34	INV	SUM		84	+/−		
35	y^x			85	=		
−35	INV	y^x		86	2nd	Lbl	
36	2nd	Pause		88	2nd	Σ+	
38	2nd	Exc		−88	INV	2nd	Σ+
39	2nd	Prd		89	2nd	$\bar{x}$	
−39	INV	2nd	Prd	−89	INV	2nd	$\bar{x}$
40	2nd	|x|					

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Basic Programming Keys

LRN — "Learn" Key

- Pressing this key *once*, puts calculator in "learn" mode — ready to remember up to 50 program steps (numbered 00 to 49). Display switches to special format: **00 00**.
- Pressing this key once again takes calculator *out* of learn mode, calculator retains program steps. (Display reverts to the standard format).

RST — Reset Key

Resets program pointer to first step (step 00), whether entered from the keyboard or encountered as part of a program. (Also, clears Subroutine Return register.)

R/S — Run/Stop Key

When out of learn mode, this is the start/stop key for your program. if the program is stopped, pressing R/S starts it; if it's running, pressing R/S stops it. When R/S is inserted as part of a program (in learn mode) it will stop the program at that point.

2nd Pause

While a program is running, encountering a 2nd Pause instruction causes the program to halt and display contents of the display register for about ¾ of a second.

2nd Lbl **n — Label Key Sequence**

Allows you to label up to 10 points in a program — **n** is from **0** to **9**. (Labels cannot be used more than once within the same program.)

GTO n — Go to Label n Key Sequence

Causes program pointer to immediately go to label **n** (**n** from **0** to **9**), whether encountered as part of a program, or used from the keyboard.

GTO 2nd **nn — Go to Step Number nn Key Sequence**

(**nn** from **00** to **49**) — May be used when *out* of learn mode only. Positions program pointer at step number **nn**.

Program Decision-Making

2nd Dsz **— Decrement and Skip on Zero Key Sequence**

Works together with memory zero. When 2nd Dsz is encountered in a program:

- First, the contents of memory zero are decreased by one (Increased by one if the contents are negative),
- If the result is *NOT ZERO*, the calculator proceeds to the step following 2nd Dsz .
- If the result *IS ZERO*, the calculator *SKIPS* the step following 2nd Dsz , and continues.

INV 2nd Dsz **— Decrement and Skip if *not* Zero Key Sequence**

When encountered in a program:

- First, the contents of memory zero are decreased by one (increased if the contents are negative).
- If the result is *NOT ZERO*, the calculator *SKIPS* the step following INV 2nd Dsz and continues.
- If the result *IS ZERO*, the calculator proceeds to the step following 2nd Dsz .

x≷t **— x exchange with t Key**

Swaps what's in the display register with what's in the "t" or "test" register. (The t register is memory 7.)

The Conditional Transfer *Test* Key Sequences — cause the calculator to compare the contents of display (or "x") register with what's in the test (or "t") register, and ask one of the 4 questions below:

2nd x=t — Is x equal to t?

INV 2nd x=t Is x not equal to t? (x≠t?)

2nd x≠t Is x greater than or equal to t?

INV 2nd x≠t Is x less than t? (x<t?)

If the answer is *YES*, program goes directly to step that follows key sequence.

If the answer is *NO*, program *SKIPS* step that follows key sequence, and continues.

Subroutines:

SBR **n and** INV SBR **Key Sequences**

To Create a Subroutine — just begin any series of program steps you need to use repetitively with a label. End the series of steps with an INV SBR key sequence.

To Use a Subroutine — Insert an SBR **n** Key sequence in your program where **n** is the label number of the subroutine.

Editing Keys:

SST **— Single Step Key**

Steps through program steps one at a time. When used in "learn" mode, displays program key codes sequentially. When used *out* of "learn" mode, executes program one step at a time.

BST **— Back Step Key**

When used in "learn" mode, steps backwards through a program one step at a time.

To Write Over a Program Step:

Just get to the exact step number of a step you need to change, and (while in "learn" mode) key in the new instruction. It will replace the old one.

2nd Nop **— No Operation Key**

Can be used while in learn mode to blank out any program step with a null step.

2nd Ins **— Insert Key Sequence**

To insert program steps, just get to the location at which you'd like to add steps and press 2nd Ins (while in "learn" mode). That instruction, and all that follow it, will be moved down one step.

2nd Del **— Delete Key Sequence**

To delete program steps, just get to the location of any step you'd like to delete, and (while in "learn" mode) press 2nd Del . The instruction at that location will be deleted, and all those after it will be "brought up" one location to fill the gap it leaves.

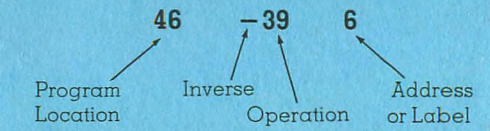
Calculator Key Program Codes

Rows	No	Minus				
1	2nd Code	INV Sign	log 18	Ct 19		
			10x 13	CE 14	CLR 15	
2	D.MS 26	P→R 27	sin 28	cos 29	tan 20	
	LRN (No Code)	x≷t 22	x² 23	√x 24	1/x 25	
	Pause 36	Ins (No Code)	Exc 38	Prd 39	π 30	
3	SST (No Code)	STO 32	RCL 33	SUM 34	yˣ 35	
	Nop 46	Del (No Code)	FIX 48	Int 49	|x| 40	
4	BST (No Code)	EE 42	(43	) 44	÷ 45	
	Dsz 56				Deg 50	
5	GTO 51	7 07	8 08	9 09	× 55	
	x=t 66				Rad 60	
6	SBR 61	4 04	5 05	6 06	− 65	
	x≠t 76				Grad 70	
7	RST 71	1 01	2 02	3 03	+ 75	
	Lbl 86		Σ+ 88	x̄ 89	σ2 80	
8	R/S 81	0 00	• 83	+/− 84	= 85	

Columns

1	2	3	4	5
(for second functions)				
6	7	8	9	0

Display in "Learn" Mode



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