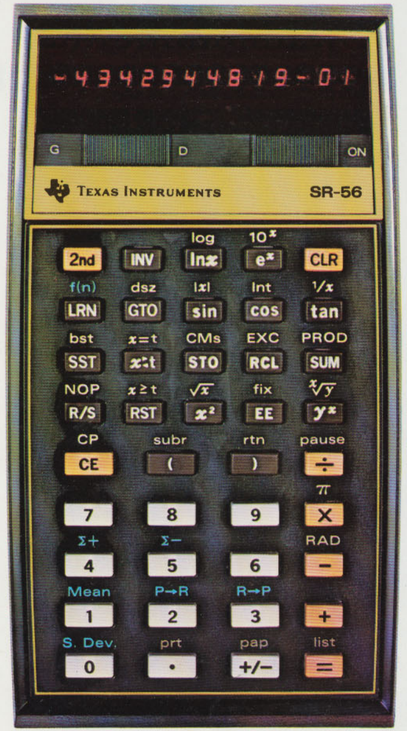
Texas Instruments
SR-56

Texas Instruments SR-56. A new dimension in problem-solving for professionals, business, industry, students.



Never more than two functions per key.

Most of the usual functions are « prime » functions. So you need only one keystroke to activate them. This is why the SR-56 is so handy to use.

Problem-solving is an integral part of every field of study. It is through the solutions to problems that the basic decisions of business and science are tested and verified. The Texas Instruments SR-56 is an advanced problem-solving instrument, an invaluable tool for any field of study. As a professional calculator, it has all the functions and math power that you will normally need. The power of the SR-56 lies not only with its full complement of functions, but with its innovative operating system and its programmability. Every feature of the SR-56 has been designed to greatly simplify its use, while creating a powerful calculation base with which to solve problems.

The SR-56 is programmable from the keyboard, a feature which will enable you to achieve a new level of problem-solving. Not only will you solve repetitive problems more efficiently (because you no longer need to re-enter the solution sequence for each set of data), but you will be able to solve problems that were previously solvable only on large-scale computers.

The Texas Instruments SR-56 is the only key programmable calculator offering automatic loop-control and subroutine capabilities.

The solutions to many problems require iterative processing. The two « dsz » instructions of the SR-56 will allow you to automatically control loops. Four subroutine levels allow you to build sophisticated program structures which would otherwise be impossible to achieve, even on a 100-step machine like the SR-56.

These problem-solving functions make the SR-56 outstanding value for the price.

- 100 program steps
- 10 user memories
- 8 levels register stack
- 9 levels of parentheses
- 5 program levels
- 4 conditional branches
- 3 unconditional branches
- 2 loop-control functions
- 3 angular modes (degree, grade, radian)

Texas Instruments chose A.O.S. to make the SR-56 easier to use . . . right away.

Formulae are normally written from left to right, and formula-processing is governed by the rules of algebra. The same rules everywhere in the world. With the SR-56, you do not have to learn any special language: TI has included the familiar rules of algebra in its Algebraic Operating System. Therefore, you can use the SR-56 right away. These rules are as follows.

Algebra priority rules	SR-56 A.O.S. rules
1. First, evaluate all single-variable functions (trigonometric, logarithmic)	SAME
2. Then perform exponentiation (y^x) and root extraction ($x\sqrt{y}$)	SAME
3. Next, perform multiplication ($\times$) and division ($\div$)	SAME
4. Next, perform addition ($+$) and subtraction ($-$)	SAME
5. Within the same level of parentheses, perform from left to right	SAME
6. If several operations within the same level of parentheses have the same priority level, perform from left to right	SAME

Up to seven pending operations with up to eight associated operands can be stored in the SR-56 internal processing registers.

Operations are completed in their order of priority. Operands and their associated operators are stored until an operation of lesser or equal priority is encountered, then they are completed. This process is entirely automatic on the SR-56: The 8-level internal register stack is managed by the calculator itself, not by the user.

Up to nine levels of nested parentheses are possible.

Regardless how complicated a mathematical expression becomes, parentheses allow you to input the equation exactly as it is written. Your addressable memory registers can be used for purposes other than just storing the intermediate results which would be required if parentheses were not available. In addition, when parentheses are used in programming, you not only minimize preparation time but you also create program coding which is clear and concise.

Algebraic Operating System Versus Reverse Polish Notation

A calculator is a machine to help people do better jobs faster. But a machine should conform to human ways of thinking. Not the reverse.

At Texas Instruments, we believe that it is more familiar and thus easier for the vast majority of people to say, to write, or to program:

$$2 + 6 =$$

rather than

$$2 \uparrow 6 +$$

TI has striven to make the use of calculators as close as possible to day-to-day life by introducing the Full Algebraic Operating System, which includes all the basic rules of algebra, the same rules that are taught in schools, colleges, and universities all over the world.

Compare for yourself

Example : $(2 \times 3) + (4 \times 5) =$
A.O.S. : $2 \times 3 + 4 \times 5 =$
R.P.N. : $2 \uparrow 3 \times 4 \uparrow 5 \times +$
Example : $5 + 8/(9 - 2/(3 + 1)) =$
A.O.S. : $5 + 8 \div (9 - 2 \div (3 + 1)) =$
or : $5 + 8 \div (9 - 2 \div (3 + 1 =$ (short form)
R.P.N. : $9 \uparrow 2 \uparrow 3 \uparrow 1 + \div - 8 \times \rightleftarrows y \div 5 +$

In this last example, we would have blown the 4-level stack of an R.P.N. machine and would have had to pre-solve the problem by starting from the inside of the formula. This is normal: a 4-level stack allows you only three pending operations with four pending operands, while the SR-56 gives you up to seven pending operations with eight pending operands.

In the previous example, the SR-56 internal registers had enough room to store and automatically take care of two additional operators and two additional operands. This gives you an idea of the extraordinary power of the SR-56.

Operated manually, the SR-56 is a very powerful professional calculator

Manual Mode.

The manual mode is the foundation of the SR-56's programming ease and efficiency. You also use this mode to begin building your own programs. As you work with an SR-56, you will discover new dimensions of its flexibility and power, perhaps far more than you initially expected.

Second Function

2nd — Second Function. Provides a second use for nearly every key. Increases the power of the calculator without increasing its size.

Inverse Function

INV — Used with trig, logs, conversions, sum and product to memories. Fixed point. EE keys.

Data Entry

0 9 — Digit Keys. Enter numbers 0 through 9 to a limit of a 10-digit mantissa and a 2-digit exponent.

• — Decimal Point.

2nd π — Pi. Enters pi to 12 digits. Display indicates value rounded off to 10 digits.

+/− — Change Sign. Changes the sign of either the mantissa or the exponent.

Fixed Decimal

2nd fix — Fixed Decimal. Allows calculated results to be displayed with 0 to 9 decimal places.

Scientific Notation

EE — Enter Exponent. Enters subsequent digits as an exponent of 10.

INV EE — Delete Exponent. Removes scientific notation when not required.

Clear Keys

CE — Clear Entry. Clears last entry made with 0 through 9 keys. Also stops flashing display without affecting displayed number.

CLR — Clear Key. Clears display and calculation in progress. Does not affect contents of memory registers, counters, program memory, or fixed decimal.

2nd CMs — Clear Memories. Clears all 10 memory registers.

Arithmetic Operations

+ − × ÷ — Add. Subtract. Multiply. Divide.

= — Equals. Completes all pending operations.

Parentheses

( ) — Parentheses. Alter order of processing according to standard algebraic rules. Nine levels possible.

Single Variable Functions

x^2 — Square. Squares number displayed.

2nd $\sqrt{x}$ — Square Root. Calculates square root of number displayed.

2nd $1/x$ — Reciprocal. Calculates reciprocal of number displayed.

2nd |x| — Absolute value. Takes the absolute value of the number displayed.

2nd Int — Integer part. Suppresses the fractional part of the number displayed.

INV 2nd Int — Fractional part. Suppresses the integer part of the number displayed.

Two Variable Functions

y^x — y to the x power.

$\sqrt[x]{y}$ — xth root of y.

Logarithmic and Exponential Functions

ln x — Natural Logarithm. Determines base e logarithm of displayed number.

e^x — e to the x power. Calculates natural antilogarithm. Raises e to displayed power.

2nd log — Common Logarithm. Determines base 10 logarithm of displayed number.

2nd 10^x — Antilogarithm. Calculates common antilogarithm. Raises 10 to the displayed power.

Memory Register Addressing Keys

STO — Store. Stores displayed number into one of the 10 addressable memory registers.

RCL — Recall. Displays data stored in a selected register.

2nd EXC — Exchange. Exchanges contents of a selected register with the displayed number.

SUM — Sum. Algebraically sums displayed number to contents of a selected register and retains result.

INV SUM — Subtract. Subtracts displayed number from contents of a selected register. P

2nd PROD — Product. Multiplies contents of a selected register by the displayed number and retains result in that register.

INV 2nd PROD — Divide. Divides contents of a selected register by the displayed number and retains result in that register.

Trigonometric Functions

G [switch] D — Angular Mode Switch. Selects degree or grade mode for trig functions and P/R conversions.

sin — Sine. Calculates sine of the angle displayed.

cos — Cosine. Calculates cosine of the angle displayed.

tan — Tangent. Calculates tangent of the angle displayed.

INV sin — Inverse Sine. Calculates $\sin^{-1}$ of the number displayed.

INV cos — Inverse Cosine. Calculates $\cos^{-1}$ of the number displayed.

INV tan — Inverse Tangent. Calculates $\tan^{-1}$ of the number displayed.

2nd RAD — Selects radian angular mode.

Statistic Functions

2nd f(n) Σ+ — Accumulates Σx_i in R_s and Σx_i in R_t.

2nd f(n) Σ− — Removes x_i from Σx_i and Σx_i^2.

2nd f(n) Mean — Computes the mean.

2nd f(n) S. Dev — Computes the standard deviation.

Conversions

2nd f(n) P→R — Converts from polar to rectangular coordinates.

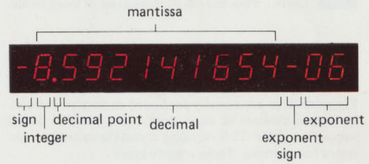
2nd f(n) R→P — Converts from rectangular to polar coordinates.

Overflow and Underflow Indications

Display flashes when number entered or calculation result is larger than $\pm 9.999999999 \times 10^{99}$ and when number entered or calculation is closer to zero than $\pm 1. \times 10^{-99}$. Display also flashes to indicate certain error conditions.

Display

Power-on and numerical information. Provides indication of a negative number, decimal point, overflow, underflow and error. Displays 10-digit mantissa and 2-digit exponent.



Fast-recharging Battery Pack

Provides up to five hours' operation without re-charging. Recharging for about four hours restores full charge.

Size

Length: 14.8 cm (5.82 in), maximum
Width: 7.9 cm (3.11 in), maximum
Thickness: 3.1 cm (1.22 in)
Weight: 240.7 grams (8.49 ounces)

Under program control, the SR-56 helps you solve computer-type problems.

Learn mode.

Simply key in your problem left-to-right as you would in the manual mode. You can construct a program of up to 100 steps (00 to 99) containing up to 200 keystrokes and store it in the program memory.

LRN Learn. Puts the SR-56 in and out of learn mode.

Program Transfer Statements or Branching
Program steps are usually processed as they're entered. But often clusters of steps need to be handled out of sequential order. This skipping around is called branching or transferring. There are two types:

Unconditional Transfers

GTO Go To. A prefix key. Moves program counter to a new program location, defined by a 2-digit program location.

subr Subroutine. A prefix key. Used with 2-digit program location. Causes a transfer to a program segment to be used as a subroutine.

rtn Return. Last step of every subroutine. Gives the control back to the calling routine.
Up to four levels of nested subroutines is possible.

Conditional Transfers
These statements depend on tests. If test conditions are met, then transfer or branch takes place. Otherwise, the regular sequence continues.
Several instructions make it possible to compare the current value in the display register against the value stored in the T-register:

2nd **x=t** Asks «Is the display register value equal to the T-register value?»

INV **2nd** **x=t** Asks «Is the display register value unequal to the T-register value?»

2nd **x≥t** Asks «Is the display register value greater than or equal to the T-register value?»

INV **2nd** **x≥t** Asks «Is the display register value less than the T-register value?»

When the answer is «yes» to any of the above questions, the flow of processing branches to the address (nn) that immediately follows the instruction. If the answer is «no», processing simply skips the accompanying address and goes on to the next instruction.
These branches do not affect pending operations, hence they can be used wherever desired in a program.

Loop control

2nd **dsz** Decrement and Skip on Zero. Decrements the contents of memory register 0, then tests these contents for zero. If it is not zero, transfer occurs to a location. If it is, no transfer.

INV **2nd** **dsz** Decrement and skip or non-zero. Functions in the same way as dsz except for reversing the test. Transfer occurs if content of register 0 is zero.

Program Control

R/S Run-Stop. Reverses the status of processing.

RST Reset. Resets the program counter and the subroutine level counter to zero.

pause Pause. During program execution, causes the current value of the display register to be displayed for approximately 1/2 second. When actioned manually, inserts approximately 1/4 second delay between execution of each step.

CP In manual mode, clears the program memory. During program execution, resets the T-register to zero.

x≥t Exchanges the display register value with the T-register value.

Edit and Debug

Let you trial-run your program. Move through a program a step at a time, forward or backward. Add more steps. Write over steps. Negate steps.

SST Single Step. Permits single-stepping through a program in the learn mode.
Also used in the manual mode to execute a program one step at a time.

2nd **bst** Back Step. Single-steps backward through a program in the learn mode.

2nd **NOP** No operation. Negates an unwanted instruction or provides spacing between program parts for later additions. Performs no operation.

GTO n n **LRN** Displays the program step to be negated or overwritten.

The Technological achievement beneath the keyboard is the reason the SR-56 offers so much programming value.

A full-function professional calculator is a state-of-the-art product reflecting state-of-the-art technologies. It's logical, then, to look first to the manufacturer known worldwide for both—Texas Instruments.
TI has long been a leader in solid-state technology and has pioneered a series of landmark developments relating directly to calculators: The original integrated circuit. Basic MOS/LSI technology. The «calculator-on-a-chip» integrated circuit which became the heart of miniature calculators. And development of the miniature calculator itself.
TI is steeped in calculator technologies from start to finish, making all critical parts and controlling quality every step of the way. And that's the key to the exceptional quality and value of the SR-56.

A powerful instruction: dsz

Computing N! i.e. N × (N — 1) × (N — 2) . . . (N — 1) × 1 is quite easy when n is a very small number, but is a very lengthy exercise on a non-programmable calculator when n is a 2-digit number. The following program allows you to compute factorials in seconds. And repeat for other values of n as many times as you want.
Add a **rtn** instruction at the end, and you have a subroutine ready to use in a more evolved program dealing with permutations and combinations that can be loaded at the same time in the program memory.

In this program, N is stored into the register that the dsz instruction decrements. R_0. The content of R_0 is continually the factor multiplied until the content of R_0 is zero.
To execute this program press **RST**, enter N then press **R/S**.
This program takes only 16 steps out of 100 available, and leaves you 84% of the program memory for other uses. This is just an example of the power of the SR-56.

Location	Code	Key	Comments
		LRN	Places calculator in learn mode
00	33	STO	
01	00	0	Stores N in R_0
02	56	*CP	Clears T-register
03	37	*x = t	Test if zero. Goes to
04	01	1	location 12 if answer is
05	02	2	yes to display 1 ! = 1 otherwise skips to location 06
06	34	RCL	Recalls content of R_0
07	00	0	i.e. N the first time, N — 1
08	64	x	the second time etc . . .
09	27	*dsz	Decrements content of
10	00	0	R_0 by 1 and transfer to 06 for as long as
11	06	6	$R_0 = 0$.
12	1	1	
13	94	=	Final answer
14	41	R/S	Stops and displays answer
15	42	RST	When R/S is pressed again will reset program counter to 00 for a new program execution.
		LRN	Returns calculator to manual mode.

56 ready-made programs come with your SR-56 to help you solve problems in most fields, including electrical engineering.

MATH PROGRAMS
Solution of Quadratic Equations
Simultaneous Equations for two Unknowns
Greatest Common Divisor/Least Common Multiple
Prime Number Generator
Arithmetic, Geometric, Harmonic Progressions
Base Conversions
Zeros of functions
Complex Arithmetic
First-order Differential Equations
Simpson's Approximation

STATISTICAL PROGRAMS
Statistical Means and Moments (1)
Statistical Means and Moments (2)
Linear Regression
Histogram
Poisson Distribution
Binomial Distribution
Normal Distribution
Hypergeometric Distribution
F Distribution
Chi-Square Distribution
Combinations/Permutations/Factorials
Random Number Generator

FINANCIAL PROGRAMS
Compound Interest
Ordinary Annuity (Interest Rate Known)
Ordinary Annuity (Interest Rate Unknown)
Simple Accrued Interest
Amortized Loan Schedule
Bond Yield
Bond Present Value
Sinking Fund (Interest Rate Known)
Sinking Fund (Interest Rate Unknown)
Days Between Dates
Trendline Analysis

ELECTRICAL ENGINEERING PROGRAMS
Series Resonant Circuit
Parallel Resonant Circuit
Low-pass Active Filter
High-pass Active Filter
Active Bandpass Filter Design
Passive Bandpass Filter Design (1)
Passive Bandpass Filter Design (2)
Low-frequency Transistor Amplifier Design
Transmission Line Impedance
T and π Attenuators
T to π and π to T Transformations

NAVIGATION PROGRAMS
Aircraft Flight Plan
Dead Reckoning
Great Circle Navigation
Course Correction
Degrees Format Conversion
Hour, Minute, Second Arithmetic
Time of Sunrise/Sunset

ADDITIONAL PROGRAMS
General Aircraft Weight and Balance
Statia Reduction
EDM Slope Reduction
Battleship
Lunar Lander

Standard accessories
The SR-56 comes with a vinyl carrying case, an AC adapter/charger, a 124-page owners manual, a 192-page applications manual, and 50 coding sheets.

Warranty
The SR-56 carries a 1-year limited warranty.

For added capabilities, lock your SR-56 into a Texas Instruments PC-100 security print cradle.

Print results. Print program listing. Trace intermediate results step by step automatically. The PC-100 security print cradle adds a new dimension to your SR-56, while securing it on your desk.

Keys that Print Your Calculations

2nd list	Prints out an entire program.
2nd prt	Prints calculate mode results.
2nd pap	Advances paper.
TRACE	While executing a program, prints the symbol of every function executed and the corresponding result. Ideal for debugging programs.

Ask your local retailer for more information on the PC-100 security print cradle.

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