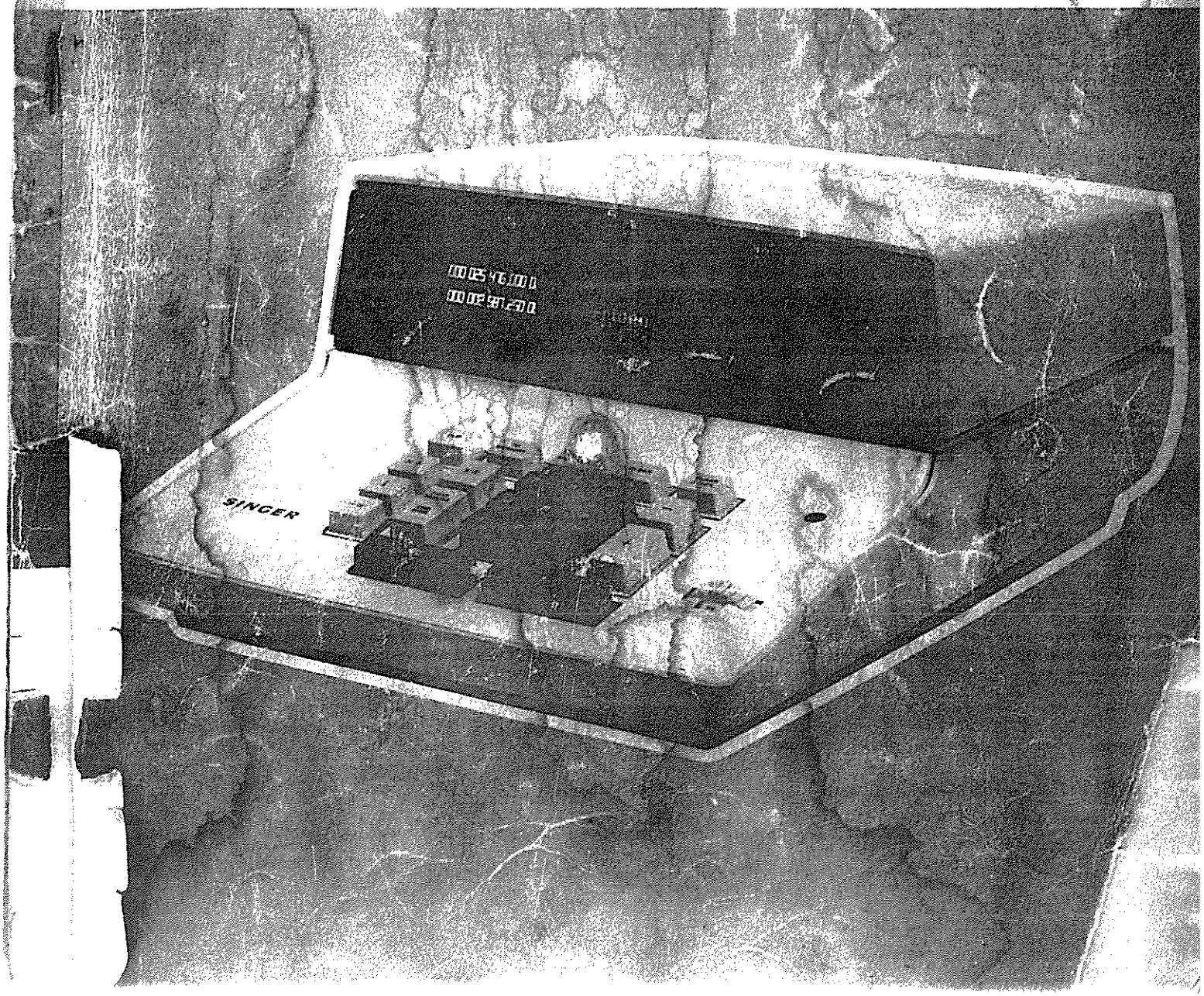
1160/1162
electronic calculators
by FRIDEN



Friden

1160/1162 Electronic Calculators

Operating Instructions

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INTRODUCTION

The FRIDEN 1160 and 1162 Electronic Calculators incorporate two calculating concepts that result in special benefits for the operator.

The first is the use of one key to enter the first number in any calculation. Separate keys for entry of a divisor, dividend, multiplier or multiplicand have thus been eliminated! The result is keyboard simplicity—ease of operation.

The second concept is the use of the "stacking principle." The stacking principle is a special register organization that allows for automatic retention of two intermediate answers. Thus, in multi-part problems, the operator need not write down individual answers and re-enter them to obtain a final answer! The result is faster calculating and fewer errors.

A simple rule is followed for all calculations:

ALL ARITHMETIC OPERATIONS
INVOLVE TWO NUMBERS

```
1+2=3
3×5=15
8÷2=4
7 - 5=2
```

The first number of a calculation is indexed on the keyboard and the FIRST NUMBER key depressed. Then, the second number is indexed, and any of the arithmetic function keys (+, —, ×=, ÷=) may be depressed to perform the desired operation.

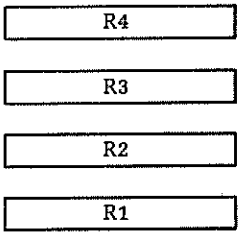
Defining a "register" as a place in which a number is stored, the stacking principle can be described as follows:

Four registers, R1, R2, R3 and R4, are arranged in a stack with R1 on the bottom. Each register can hold up to 14 digits, plus decimal point and sign. Entries and answers are grouped in triplets to the left and right of the decimal in the DISPLAY.

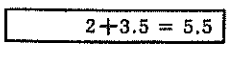
Registers R3 and R4 automatically hold partial or intermediate answers.

All arithmetic is performed on the two numbers in R1 and R2.

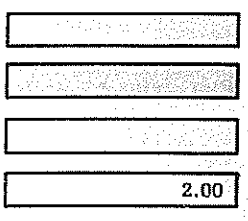
All numbers enter this stack through R1.
All answers occur in R1.



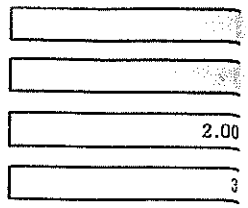
The contents of R1 and R2 appear in the DISPLAY: the contents of R3 and R4 are not displayed.



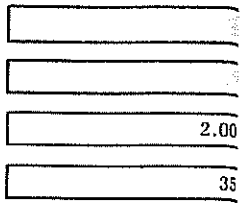
As a number is indexed on the keyboard it appears in the DISPLAY without decimal point or triplicate spacing. Depressing the FIRST NUMBER key aligns the number about the preselected decimal setting, spaces it by triplets and prepares the calculator to accept another number.



When the first digit of a second number is indexed on the keyboard, the first number automatically "shifts up" to R2.



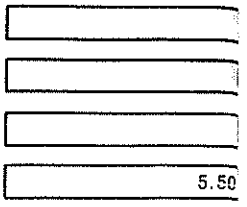
When the last digit of the second number has been indexed, the operator may depress any of the arithmetic function keys and perform the calculation.



Depression of an arithmetic function key causes the contents of R2 to be operated on by the contents of R1—

$$R2 \div R1;\ R2 \times R1;\ R2 + R1;\ R2 - R1$$

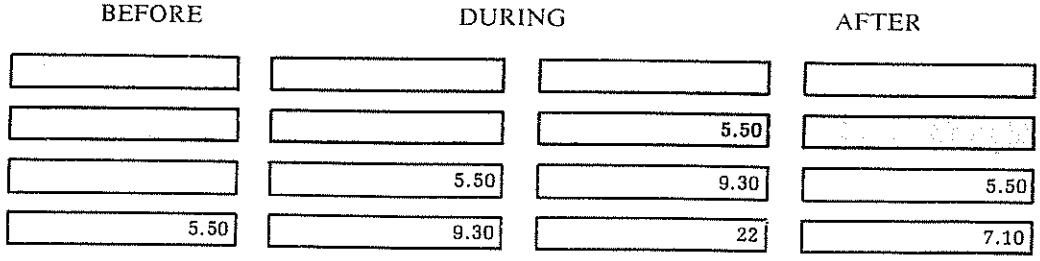
—and the answer to be produced in R1.



Entries cause the stack to "shift up."
Operations cause the stack to "shift down."

2+3.5 = 5.5
9.3 - 2.2 = 7.1

Continuing with a second problem (involving, again two numbers), the stack functions as follows:



R3 automatically stores the answer to the first problem while the second is being worked. At the completion of the second calculation the two answers are in R2 and R1.

Following the previous rules, these may be combined by addition, subtraction, multiplication or division, to give a final answer in R1.

39.05

$5.5 \times 7.1 = 39.05$

R3 and R4 provide automatic storage so that **two** previous answers can be carried while a third problem is being worked. This capability is provided to permit complex calculations, such as the one illustrated below, to be worked just as easily as simple ones.

$$\frac{(2\times3)+\dfrac{4+5+6}{7+8}-\left(\dfrac{7}{3}\times\dfrac{4}{6}\right)}{(5\times6)+(7\times8)} = 0.06$$

A "complex" problem consists of smaller problems with intermediate answers which must be combined as they are produced.

It is actually **unnecessary** to "clear the stack"... new problems may be worked, with the old answers being automatically disposed of, with no concern to the operator.

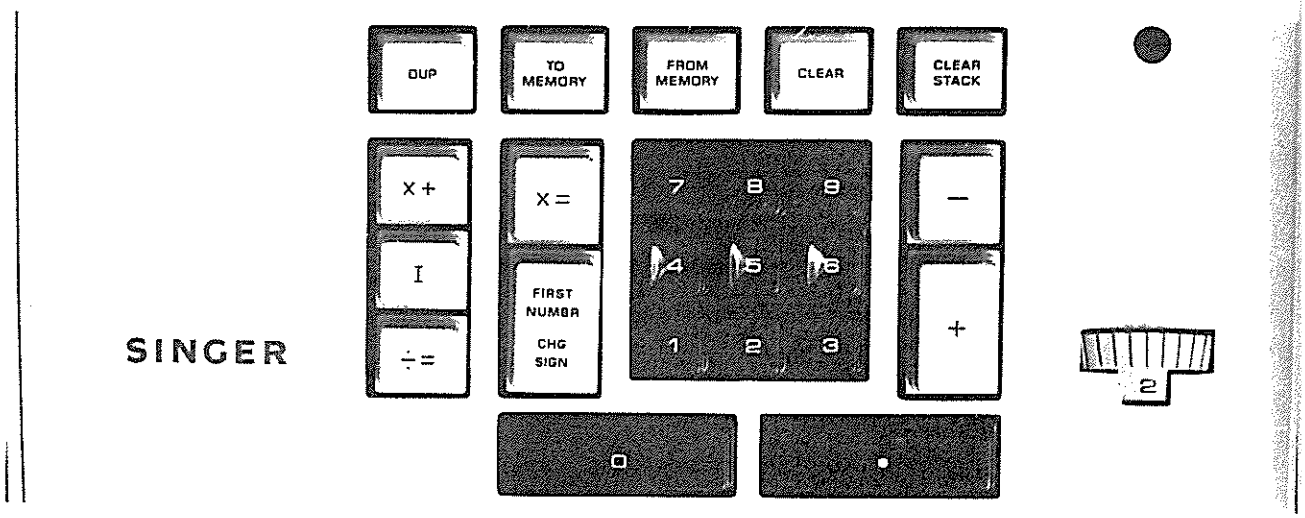
1.00
2.00
3.00
4.00

If the stack is full and a fifth number is entered, the upshift causes R4 to "overflow", and the old contents of R4 to be dropped.

2.00
3.00
4.00
5.00

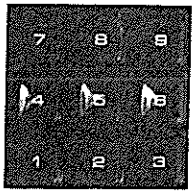
A fifth register (memory), not part of the stack, is provided for retention of constant numbers or intermediate answers. Depressing the TO MEMORY key causes the number in R1 to be transferred to the memory register, with the resulting downshift in the stack. Depressing FROM MEMORY returns the number in memory to R1. A number in memory may be used as many times as desired, because it remains in memory until replaced by some other number.

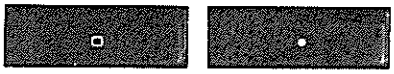
OPERATING CONTROLS



1160 Electronic Calculator

The ON/OFF switch is located to the rear, below the left side cover of the machine. Pushing it towards the rear will turn the power on.



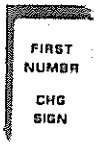


The "11-key" keyboard is used to enter numbers into R1. The decimal point key (the eleventh key) is used when a decimal point occurs in the number. If not used, the entry is treated as a whole number.

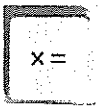
The 1160 and 1162 employ a "fixed" decimal system. The DECIMAL SELECTOR has settings from 0 to 11 inclusive. The operator selects the decimal setting that best fits the requirements of the problem. As a number is indexed on the keyboard it appears in the display in R1 without decimal point. The number is aligned about the selected decimal setting when any of the function keys are depressed.

A touch of the CLEAR Key clears R1.

A touch of the CLEAR STACK Key clears all four registers in the stack. The memory unit is not affected.



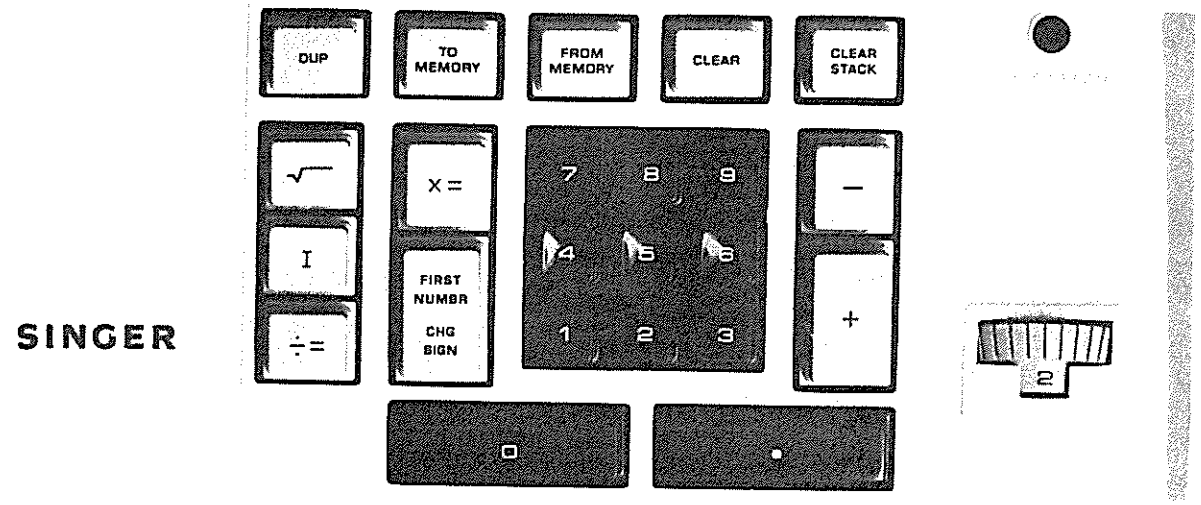
The FIRST NUMBER/CHANGE SIGN Key is used to enter the first number in a problem into R1. Once a number has been entered into R1, a second depression of this key will change the algebraic sign of the number.



A touch of the MULTIPLICATION Key causes multiplication of the contents of R2 by the contents of R1: round-off of all answers in multiplication is automatic on the 1160 and 1162.

Touching the ACCUMULATIVE MULTIPLICATION Key (1160 only) multiplies the contents of R2 by the contents of R1, then adds the product to the contents of R3. The sum occurs in R1.

OPERATING CONTROLS



1162 Electronic Calculator

The DUPLICATE Key permits duplication in R2 of the contents in R1.

Touching the SQUARE ROOT Key (1162 only) extracts the square root of the contents of R1. The answer occurs in R1.

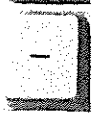
A touch of the INTERCHANGE Key exchanges the contents of R1 with the contents of R2.

The DIVISION Key causes division of the contents of R2 by the contents of R1. The quotient occurs in R1. (Remainder is discarded.)

The TO MEMORY Key transfers the contents of R1 decimally correct to the separate memory register.

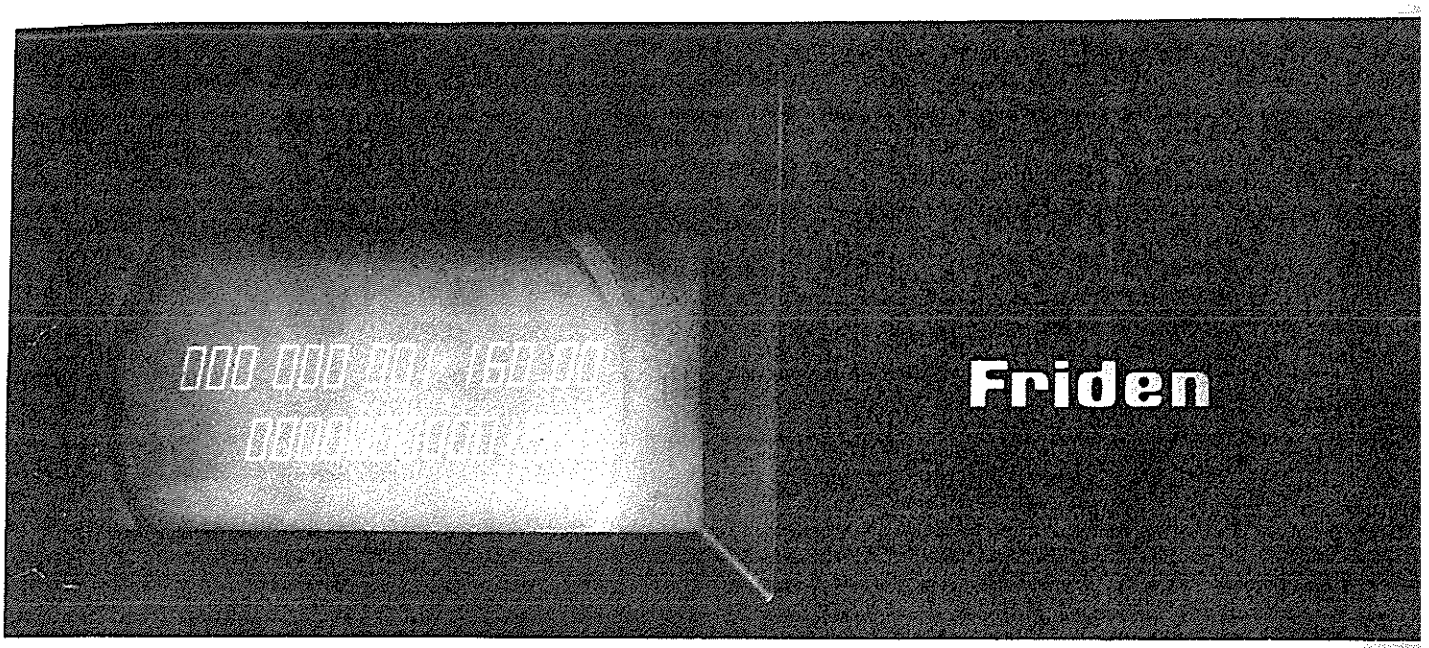
Touching the FROM MEMORY Key enters the contents of the memory unit into R1 (the number is preserved in memory until destroyed by entering a new number).

A touch of the ADD Key adds the contents of R1 to the contents of R2. The answer is produced in R1.



A touch of the MINUS Key subtracts the contents of R1 from the contents of R2. The difference is produced in R1.

The OVERFLOW INDICATOR will light whenever an entry or answer exceeds register capacity. When in an overflow condition, the keyboard is "locked". Depressing CLEAR STACK will unlock the keyboard and clear all four registers in the stack. Depressing CLEAR will unlock the keyboard, leaving the portion of the number which is not overcapacity in R1; the contents of the remaining registers are not disturbed.



Basic Operations and Applications

ADDITION/SUBTRACTION

GENERAL

Addition and subtraction problems couldn't be solved any faster . . . or easier! No clearance is required. Each number, as it is indexed on the keyboard, appears in the DISPLAY; you always know that you have entered the correct number!

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 2
238.65	238●65	FIRST NUMBR
42.87	42●87	+
-23.22	23●22	–
177.76	177●76	+
-1.44	1●44	–
434.62		

MULTIPLICATION

GENERAL

Multiplication problems are a pleasure to work. You always have a check on entry accuracy because the 1160 and 1162 display **both** factors in your problem before they are combined to give the answer!

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
Multiplication with decimals		Move Decimal Point Selector to 5
24.02 x .94015 = 22.58240	24●02 ●94015	FIRST NUMBR x =
Chain Multiplication 23.8 x 16.92 x .70805 = 285.12890	23●8 16●92 ●70805	FIRST NUMBR x = x =
Accumulation of Products (Model 1160) (39.445 x 15.2) + (41 x .6) = 624.16400	39●445 15●2 41 ●6	FIRST NUMBR x = FIRST NUMBR x +
Squaring 15.23^2 = 231.95290	15●23	DUP x =

DIVISION

GENERAL

Division was never easier! Just as in multiplication, both factors are displayed prior to being combined to giv the final answer.

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
Division with decimal factors		Move Decimal Point Selector to 5
$4962.18475 \div 13.2 = 375.92308$	4962●18475	FIRST NUMBR
	13●2	÷ =
Chain division		
$\frac{145.02}{37.6} \div 194 = .01988$	145●02	FIRST NUMBR
	37●6	÷=
	194	÷=
Addition/Subtraction of quotients		
	45	FIRST NUMBR
	3	÷=
	34●26	FIRST NUMBR
$\frac{45}{3} + \frac{34.26}{12.1} - \frac{17.76}{3.125} = 12.14820$	12●1	÷=
		+
	17●76	FIRST NUMBR
	3●125	÷=
		—

THE MEMORY UNIT

GENERAL

The Memory Unit is one of the most important features of the 1160 and 1162! Any number up to 14 digits plus decimal point and algebraic sign may be stored in the Memory Unit.

A number placed in Memory may be used indefinitely in any arithmetic operation. Simply touch the FROM MEMORY Key and the number is displayed in the bottom register, R1, ready to be used in addition, subtraction, multiplication, or division!

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
Constant Multiplier		Move Decimal Point Selector to 5
	1●25	TO MEMORY
1.25 x 21 = 26.25	21	FROM MEMORY
1.25 x 64 = 80.00		x =
	64	FROM MEMORY
		x =
Constant Divisor		
	145	FIRST NUMBR
145÷12.13 = 11.95383	12●13	TO MEMORY
214÷12.13 = 17.64220		FROM MEMORY
		÷=
	214	FROM MEMORY
		÷=
Constant Dividend		
	164	TO MEMORY
164÷18.92 = 8.66807		FROM MEMORY
164÷24.16 = 6.78807	18●92	÷=
		FROM MEMORY
	24●16	÷=

INTERCHANGE

GENERAL

The INTERCHANGE key lends great flexibility to calculating procedures.

Many times, the denominator in a division problem, for example, must be calculated before the numerato Although the problem shown below could be easily calculated either way, the denominator will be calculated fir then the numerator, to show the function of the INTERCHANGE key.

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 5
$\frac{(90)^2}{4 \times 12 \times 7} = 24.10714$	4	FIRST NUMBR
	12	x =
	7	x =
	90	DUP
		x =
		INTERCHANGE
		: =

SQUARE ROOT (Model 1162)

GENERAL

Depression of this key shall cause the square root of the contents of R1 to be extracted. The precision of the root shall be to the number of places shown on the decimal set indicator.

NOTE: Upon completion of the square root operation the contents of R4 shall have been cleared. The contents of R2 and R3 shall be unaffected.

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
$\sqrt{25} = 5$ $\sqrt{5} = 2.236\ 067\ 97$ $\sqrt{2.236\ 067\ 97} = 1.495\ 348\ 77$	25	Move Decimal Point Selector to 8 $\sqrt{\ }$ $\sqrt{\ }$ $\sqrt{\ }$
$\sqrt{25} + \sqrt{.05} - \sqrt{.000\ 000\ 37}$ $= 5.222\ 998\ 52$	25 •05 •00000037	$\sqrt{\ }$ $\sqrt{\ }$ + $\sqrt{\ }$ −
$\sqrt{\frac{126 \times .035}{46}} = .309\ 628\ 09$	126 •035 46	FIRST NUMBR x = ÷ = $\sqrt{\ }$

CALCULATING ALGEBRAICALLY

GENERAL

THE FIRST NUMBER/CHG SIGN key permits calculations with algebraic signed numbers. The entries and the answers appear with the correct sign.

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 5
$\frac{-147.12}{-13.67} = 10.76225$	147●12	FIRST NUMBR
		CHG SIGN
	13●67	FIRST NUMBR
		CHG SIGN
		÷ =
(Model 1162) $\sqrt{\frac{-278.35}{9.035} \times \frac{-843.7}{28.001}} = 30.46763$	278●35	FIRST NUMBR
		CHG SIGN
	9●035	÷ =
	834●7	FIRST NUMBR
		CHG SIGN
	28●001	÷ =
		x =
		√

SEQUENTIAL OPERATIONS

GENERAL

The 1160 and 1162 make multi-part problems easy to calculate! Notice how, in the problem below, intermediate answers are automatically retained, eliminating any need for re-entry. That's built-in error prevention!

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN IN SEQUENCE
		Move Decimal Point Selector to 
$\dfrac{\frac{164}{13.1} \times (1.4)^3}{\frac{8.9}{2} \times 4.5 \times 7} = .24506$	164	FIRST NUMBR
	13●1	÷ =
	1●4	DUP
		DUP
		x =
		x =
		x =
	8●9	FIRST NUMBR
	2	÷ =
	4●5	x =
	7	x =
		÷ =

SEQUENTIAL OPERATIONS

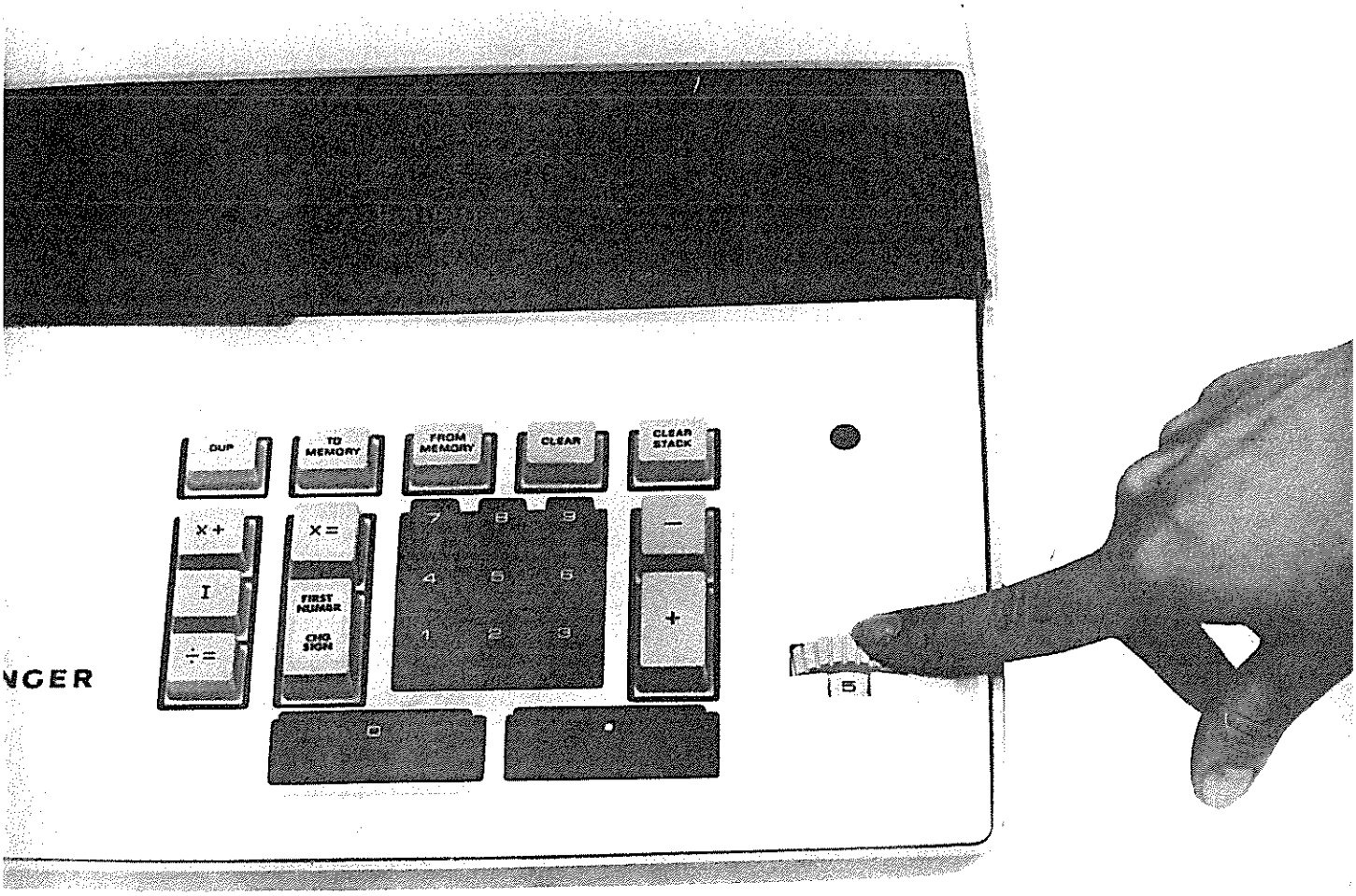
GENERAL

The 1162 features Square Root computations.

Notice how, in the problem below, square roots are automatically extracted, while intermediate answers are tained.

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 5
$\sqrt{\sqrt{\frac{\frac{164}{13.1} \times (1.4)^3}{\frac{8.9}{2} \times 4.7 \times \sqrt{.89}}}}$	164	FIRST NUMBR
	13●1	÷ =
	1●4	DUP
		DUP
		x =
		x =
		x =
	8●9	FIRST NUMBR
	2	÷ =
	4●7	x =
= 2.78093	●89	√
		x =
		√
		÷ =
		√

Special Applications



INVOICING

GENERAL

The 1160 provides the advantages of individual extensions and grand total! No special presetting of controls no special keys for subtotals and totals!

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 2
14 @ .56 = 7.84	14	FIRST NUMBR
23 @ .57 = 13.11	•56	x =
5 @ 5.01 = 25.05	23	FIRST NUMBR
Subtotal 46.00	•57	x =
10% Discount −4.60		+
Subtotal 41.40	5	FIRST NUMBR
5% Sales Tax + 2.07	5•01	x =
Total 43.47		+
		DUP
	•1	x =
		−
		DUP
	•05	x =
		+

SIMPLE AND COMPOUND INTEREST

GENERAL

The 1160 and 1162 make compound interest problems as easy as simple interest calculations!

In the first problem, below, we are computing the simple interest on a loan of 1700.000 at $5^3/_4\%$ for 92 days. We use the formula:

$$\text{Interest} = (\text{Principal} \times \text{Rate} \times \text{Days}) / 360$$

In the second problem, we are calculating the compounded **amount** of 6,150.00 at 5% compounded quarterly for four years. We use the formula:

$$S = P\,(1 + i)^n$$

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 4
$(1700.00 \times .0575 \times 92) \div 360 =$	1700	FIRST NUMBR
24.98	.0575	x =
	92	x =
	360	÷ =
		Move Decimal Point Selector to 7
	6150	FIRST NUMBR
$6150.00\left[1 + \frac{.05}{4}\right]^{16} =$	1.0125	DUP
		x =
$6150 \times (1.0125)^{16}$		DUP
		x =
		DUP
$S = 7502.32$		x =
		DUP
		x =
		x =

PERCENT INCREASE/DECREASE

GENERAL

For the problems below, we are given the following sales figures:

This Year	Last Year
7,894.65	6,375.85
3,975.42	8,765.45

We are to calculate the amount and percent of increase or decrease.

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 5
Amount of Change	7894●65	FIRST NUMBR
7894.65 – 6375.85 = 1518.80	6375●85	TO MEMORY
		FROM MEMORY
% Change		–
$\frac{1518.80}{6375.85} = 23.82\%$		FROM MEMORY
		÷ =
Amount of Change	3975●42	FIRST NUMBR
3975.42 – 8765.45 = –4790.03	8765●45	TO MEMORY
		FROM MEMORY
% Change		–
$\frac{-4790.03}{8765.45} = -54.65\%$ *		FROM MEMORY
		÷ =

** Rounded to the nearest .01 percent.*

PERCENT PRORATION

GENERAL

The ability of the 1160 and 1162 to retain a constant number in Memory makes proration problems particularly easy.

The total sales figure is first placed in Memory. Each individual department sales figure is then entered and divided by the total sales to produce the corresponding percent.

PROBLEM			INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
				Move Decimal Point Selector to 5
			24562●83	TO MEMORY
			2565●45	FROM MEMORY
Dept.	Sales	% to Total		÷ =
A	2565.45	10.45*		
B	3228.67	13.14	3228●67	FROM MEMORY
C	7346.52	29.91		÷ =
D	8265.41	33.65		
E	3156.78	12.85		+
Total	24562.83	100.00%	7346●52	FROM MEMORY
				÷ =
				+
			8265●41	FROM MEMORY
				÷ =
				+
			3156●78	FROM MEMORY
				÷ =
				+

** Adjusted upward for .01%*
Other answers are rounded to the nearest .01 percent.

INSURANCE (PRO-RATA CANCELLATION)

GENERAL

The 1162 features square root computations.

Notice in this problem how the Stacking Principle and the DUPLICATE key allow us to index a number o and use it twice in separate calculations!

In our example, below, the premium is 145 and the policy is in effect for 196 days.

To obtain the earned and returned premium for pro-rata calculation of a policy we use these formulas:

$$\text{EARNED PREMIUM} = \frac{\text{PREMIUM} \times \text{TIME}}{365}$$

$$\text{RETURNED PREMIUM} = \text{PREMIUM} - \text{EARNED PREMIUM}$$

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 3
Earned Premium $\frac{145 \times 196}{365} = 77.86$	145 196 365	DUP x = ÷ =
Returned Premium 145.00 – 77.86 = 67.14		–

SQUARE ROOT

GENERAL

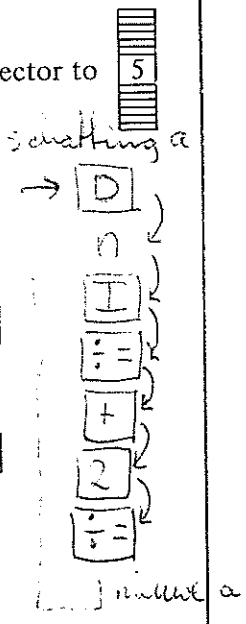
On the 1160, square roots of numbers are calculated using Newton's Method of Approximations:

$$\sqrt{N} = \frac{\frac{N}{a} + a}{2}$$

Where: N = the radicand (1738)
a = an approximation of the square root of N

PROBLEM: Find the square root of 1738. The first approximation for $\sqrt{1738}$ is 40.

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 5
$\frac{\frac{1738}{40} + 40}{2}$ =	1738	DUP
	40	TO MEMORY
		FROM MEMORY
		÷ =
		FROM MEMORY
41.72500		+
	2	÷ =



41.725 is the second approximation of the square root of 1738.

For closer values of $\sqrt{N}$, repeat the above sequence.

Third approximation = 41.68934
Fourth approximation = 41.68932

PROOF:

Touch DUP x = Answer: 1737.99940 or 1738 rounded off

STANDARD DEVIATION

GENERAL

The calculations for Standard Deviation are simplified using the 1162. For the example below, we are given the following data:

$$\Sigma x = 155$$
$$\Sigma x^2 = 2499$$
$$n = 11$$

The formula for Standard Deviation is:

$$\sigma = \sqrt{\frac{n\ (\Sigma x^2) - (\Sigma x)^2}{n^2}}$$

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 2
	11	TO MEMORY
	2499	FROM MEMORY
		x =
	155	DUP
$\sqrt{\frac{11(2499) - (155)^2}{11^2}} =$		x =
		−
		FROM MEMORY
		FROM MEMORY
		x =
$\sigma = 5.34$		÷ =
		$\sqrt{\ }$

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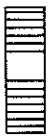
PROBLEM :

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 

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PROBLEM:

PROBLEM	INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE
		Move Decimal Point Selector to 

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