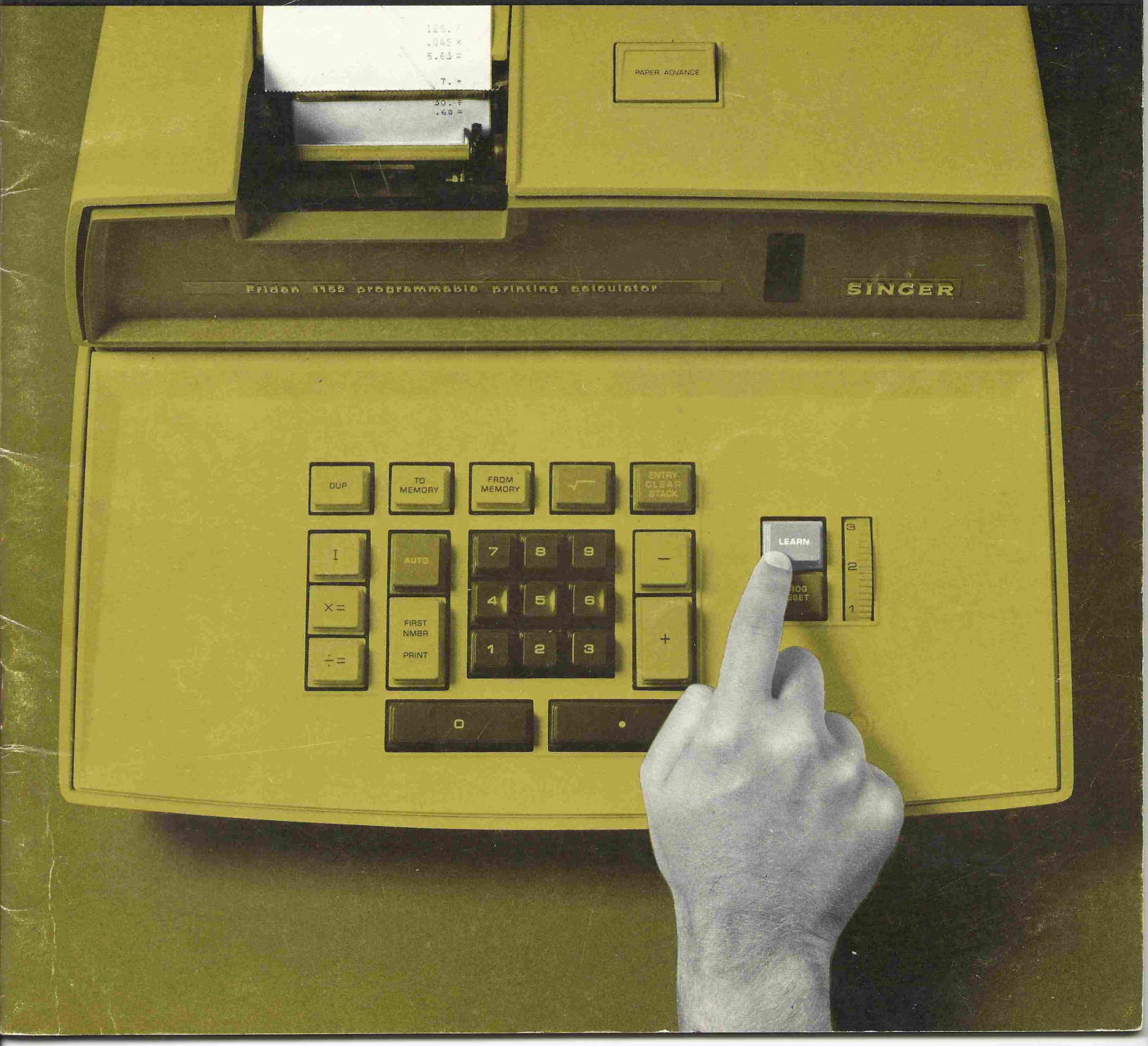
FRIDEN 1152 PROGRAMMABLE CALCULATOR OPERATING INSTRUCTIONS




SINGER
Friden 1152 programmable printing calculator

TABLE OF CONTENTS

Introduction

The 1152 Programmable Calculator combines some of the most advanced computing refinements available in electronic calculators with the printed record so desirable for auditing purposes. To understand the logical flow of work through the 1152, the following description of the machine organization will be helpful.

Singer's Friden Division has departed from the industry tradition of special keys for entering multipliers or dividends. The 1152 uses one key, FIRST NUMBER/PRINT, to begin all problems. A simple rule is followed for all calculations:

All arithmetic operations involve two numbers

$1 + 2 = 3$
$3 \times 5 = 15$
$8 \div 2 = 4$
$7 - 5 = 2$

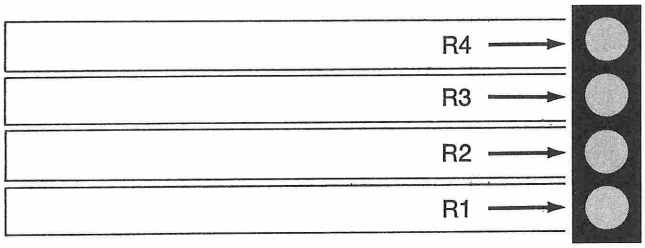
Index the first number on the keyboard and touch the FIRST NUMBER/PRINT key. After the second number is indexed, any of the arithmetic function keys $(+, -, \times, \div)$ may be used to perform the desired operation.

The value of this principle increases, particularly with the use of the "stack" organization, as problems become more complex. Defining a "register" as a place in which a number can be 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.

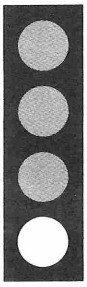
Each register can hold up to 13 digits, plus decimal point and sign.

All numbers enter this stack through R1.
All arithmetic is performed on the two numbers in R1 and R2.
All answers occur in R1.
Registers R3 and R4 automatically hold partial or intermediate answers.

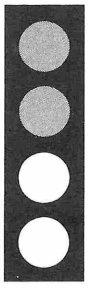


$2 + 3 = 5$

As a number is indexed into the keyboard, it enters R1 and the lowest of the four red lights on the front panel of the machine comes on to indicate that that register is occupied. Pressing the FIRST NUMBER/PRINT key causes the number to be printed and prepares the machine to receive the next entry.



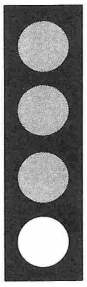
When the first digit of a second number is indexed, the first number automatically "shifts up" to R2. The lower two lights now indicate that the lower two registers are occupied.



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

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

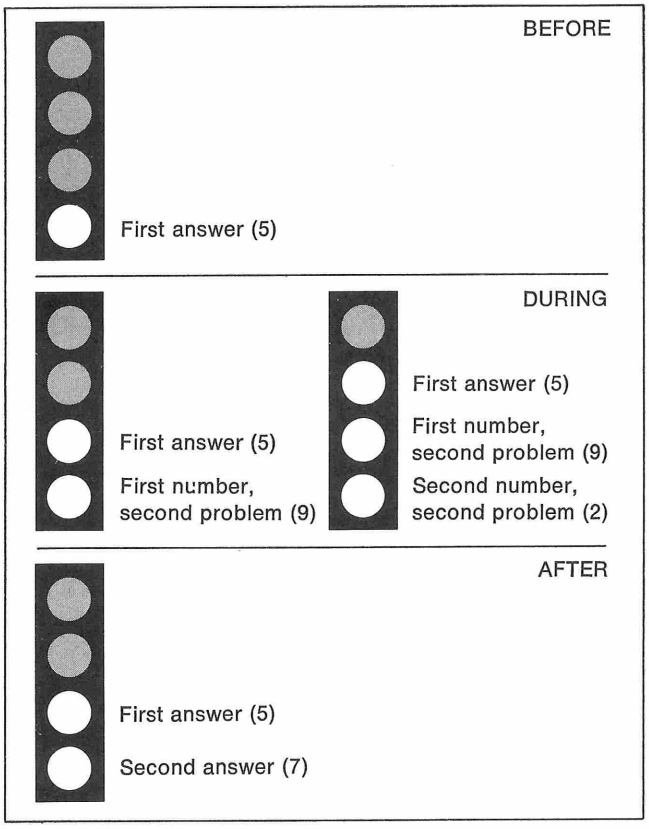
—and the answer is produced in R1.



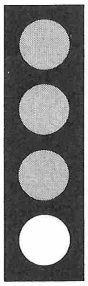
Entries cause the stack to "shift up."
Operations cause the stack to "shift down."

$$2 + 3 = 5$$
$$9 - 2 = 7$$

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



R3 is used to store 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 single answer in R1.



$$5 \times 7 = 35$$

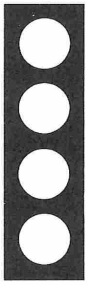
R3 and R4 provide automatic storage capacity so that *two* previous answers can be carried while a third problem is being worked. This capacity is provided to permit complex problems, such as the one illustrated, to be worked just as easily as simple ones.

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

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

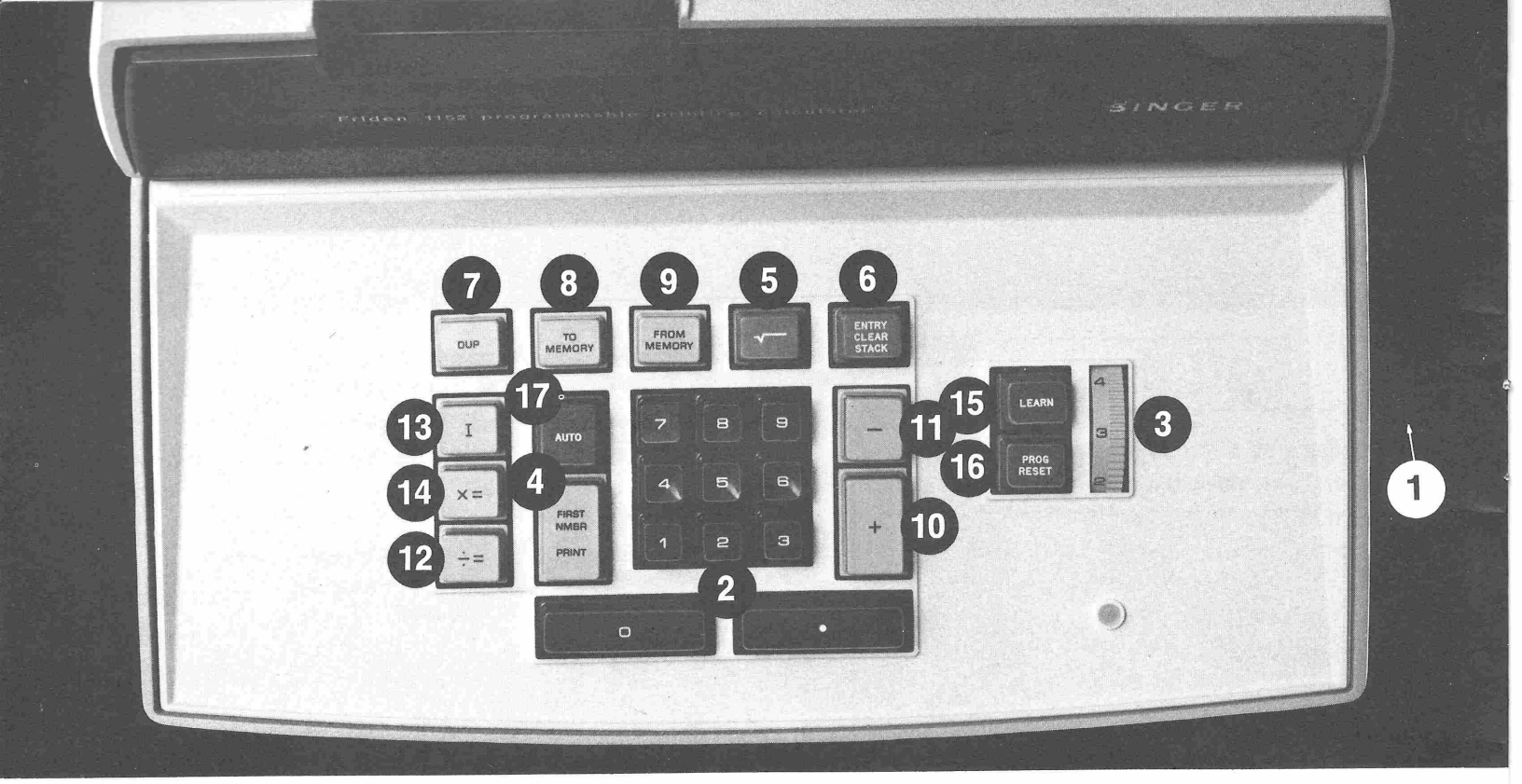
It is actually *unnecessary* to "clear the stack"... new problems may be worked with the old answers being automatically disposed of with no concern to the operator.

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



A fifth register (memory), not part of the stack, is provided for retention of constant numbers. Depressing the TO MEMORY key causes the number in R1 to be transferred to this memory register, with the resulting downshift of the stack. The FROM MEMORY key transfers the number from memory to R1. It may be used as many times as desired; the number remains in the memory unit until some different number is stored.

With this understanding the following brief definition of the function of each control and its associated symbol will permit immediate, efficient use of the 1152.



1 The ON/OFF switch is located *below* the right side cover of the machine. Pushing it toward the rear will turn the power on.

2 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.

3 The DECIMAL POINT CONTROL establishes the desired number of decimal places in the answer. Up to nine decimal places may be entered in either number; the answer will contain only the number of decimal places called for by the setting. Sums, differences and products are rounded off. A position marked plus (+) disengages the decimal point control, thereby permitting faster addition and subtraction with all numbers entered as whole numbers; when the decimal control wheel is in this position, answers are not rounded off.

4 The FIRST NUMBER/PRINT Key has three functions:

(a) To enter the first number in a problem into R1: the number is also printed on the tape, identified by the symbol "F."

(b) To print the content of R1: after addition or subtraction, the answer contained in R1 can be printed on the tape, identified by an equal (=) symbol.

(c) To accomplish STACK READ-OUT: after printout (manual or automatic) of R1, a touch of the key prints the contents of R4, R3, R2 and R1, in that order. The original contents of the registers are not affected by this operation.

5 In order to extract the square root of the content of R1, touch the SQUARE ROOT Key. The answer occurs in R1.

6 Touching the ENTRY CLEAR STACK key once will clear R1. If it is used for following a digit key (as in correcting a keyboard entry) there is no printout. If it is used after an operating key, a "C" is printed in the symbol column next to the number cleared.

A second touch of this key will clear all four registers in the stack. The symbol "C" is printed in the center of the tape. However, the memory unit is not affected.

7 The DUPLICATE Key permits duplication in R2 of the content in R1:

(a) If used after a digit key, the number indexed is entered into R1 and R2, and printed twice; both numbers are identified by an "F" symbol.

(b) If the content of R1 has not been printed, it is duplicated in R2 and printed, followed by an equal (=) symbol, and printed again followed by an "F."

(c) If the content of R1 has been printed, it is duplicated in R2 and printed once with the symbol "F."

Operating Controls

8 The TO MEMORY Key transfers the content of R1 decimally correct to the separate memory register. The number transferred is printed and identified by the symbol "M."

9 Touching the FROM MEMORY Key enters the content of the memory unit into R1 (the number is preserved in memory until destroyed by entering a new number) and prints the number followed by an "F."

(a) If used following a digit key, the keyboard entry is first placed into R2 and printed followed by an "F." Then, the number transferred from memory to R1 is printed, followed by an "F."

(b) If the number in R1 has not been printed, the content of R1 is first transferred to R2 and printed with an equal (=) symbol, followed by the transferred number, which is also printed, "F."

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

(a) If used after a digit key, the number indexed on the keyboard is printed followed by a plus (+) symbol.

(b) If used after a function key, an offset plus (+) symbol only is printed indicating an accumulation in the stack.

11 A touch of the MINUS KEY subtracts the content of R1 from the content of R2. The difference is produced in R1.

(a) If used after a digit key, the number indexed on the keyboard is printed followed by a minus (−) symbol.

(b) If used after a function key, an offset minus (−) symbol is printed indicating a subtraction from an accumulation in the stack.

Answers in addition and subtraction are printed by touching the FIRST NUMBER/PRINT Key, and are identified by an equal (=) sign.

All negatives values are identfied by a minus sign in the second (offset) symbol position.

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

(a) If used after a digit key, the divisor is printed followed by a divide (÷) symbol. The quotient is then printed followed by an equal (=) symbol.

(b) If used after a function key, a divide (÷) symbol is printed, then the quotient followed by an equal (=) symbol.

13 A touch of the INTERCHANGE key exchanges the content of R1 with the content of R2:

(a) If used following a digit key, the keyboard entry is printed with the symbol "F" and placed in R2. The new content of R1 is printed with no symbol.

(b) If the content of R1 has not been printed, it is printed with an equal (=) symbol and placed in R2. The new content of R1 is printed with no symbol.

(c) If the content of R1 has been printed, it is placed in R2 and the new content of R1 is printed with no symbol.

14 A touch of the MULTIPLICATION Key causes multiplication of the content of R2 by the content of R1.

(a) If used following a digit key, the keyboard entry is printed and identified by a multiplication (×) symbol; the product is then produced in R1 and printed with an equal (=) symbol.

(b) If used after a function key, a multiplication (×) symbol is printed, then the product is produced in R1 and printed with an equal (=) symbol.

Note:

In the event that an answer exceeds the capacity remaining to the left of the answer decimal setting, the machine automatically clears R1 to destroy the incomplete answer and prints an "E" in the symbol column. This action will also occur during keyboarding operation if the available capacity is exceeded.

The Learning Operation

The 1152 Programmable Calculator uses a very special concept: Program Learning. No special programming ability on the part of the operator is required; anyone who can perform manual calculations on the 1152 can take advantage of the calculator's learning ability.

The Square Root Key is not programmable.

15

Learning Keys:

Depression of the LEARN key places the 1152 into a learning condition. Until the LEARN key is restored to its original position by depressing the PROGRAM RESET key, the 1152 will learn in sequence the functions required to perform the desired calculation.

Depression of the PROGRAM RESET key cycles the 1152 program memory back to the first step in the calculating procedure. If the first step in the learned program was a manual keyboard entry (stop command), the 1152 will stop, ready to accept a new manual entry. If the first step in the program is not a manual entry, the 1152 will automatically carry out all the steps up to the first point where a manual entry is to be made and then stop.

At any point where a manual entry must be made in an established program, the number is indexed on the keyboard and entered into the calculator by depressing the AUTO key. The 1152 will then continue with the automatic program using the new number. When the AUTO key is depressed, the number indexed on the keyboard is printed on the tape and identified by the symbol "F."

16

The Learning Operation:

Any calculating procedure can be learned by the 1152 provided that the number of steps in the operation does not exceed the 30 step learning capacity of the calculator. The operator depresses the LEARN key, then proceeds to perform the calculations required to solve the first problem. *No* answers are automatically printed while the 1152 is learning a calculating procedure. This allows the operator to instruct the 1152 as to what answers should be printed on the tape by simply depressing the FIRST NMBR/PRINT key when the desired answer is in R1.

Having calculated the required answers for the first problem, the operator depresses PROGRAM RESET; the 1152 program memory cycles back to the first step in the program and is now ready to accept the values for the second problem and automatically calculate the required answers.

17

Automatic Calculating:

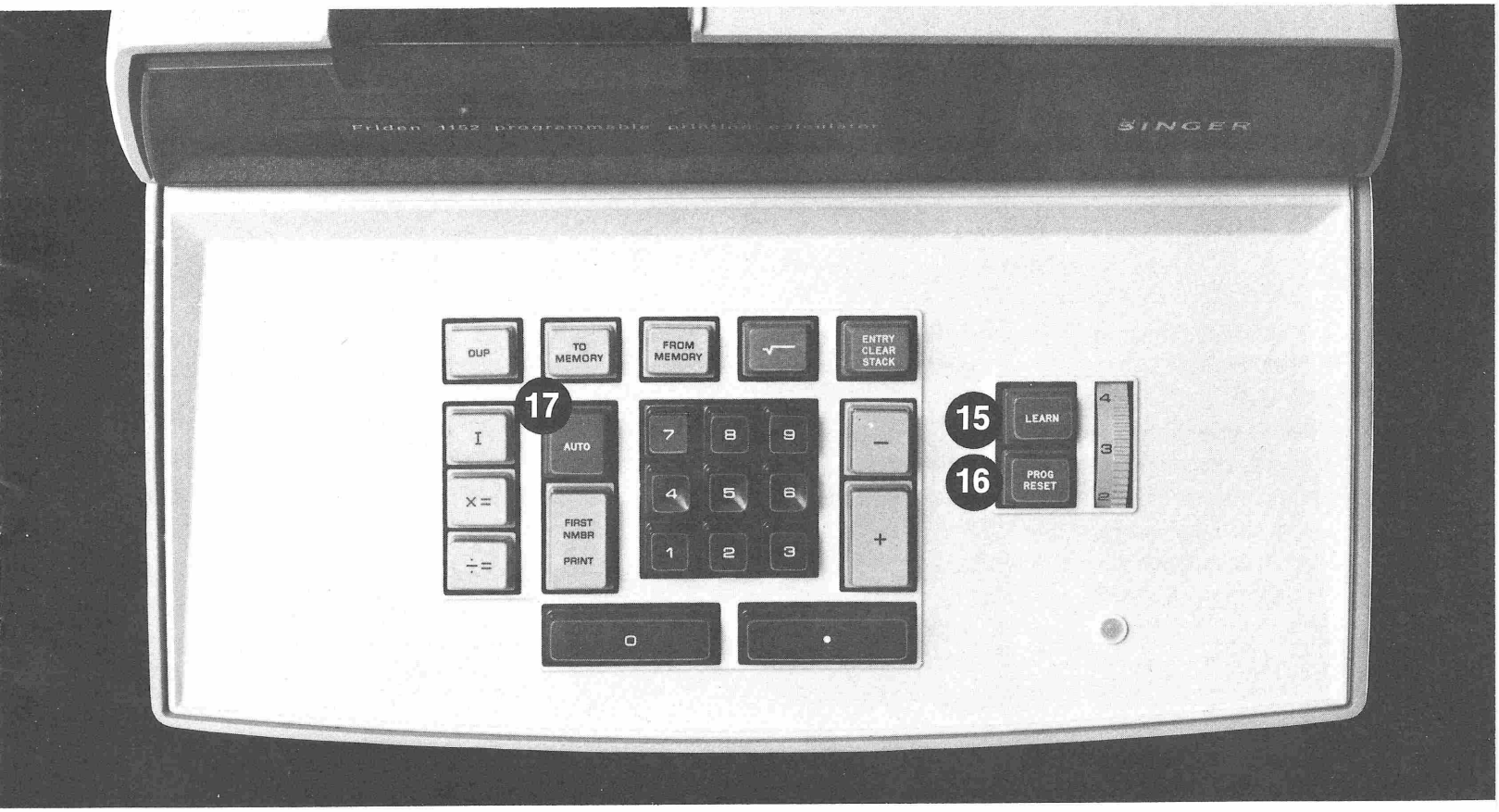
During the Learning Operation there can be one or more points at which a number is manually entered into the calculator by indexing the number on the keyboard, creating a stop command in the program, and depressing a function key. When the PROGRAM RESET key is depressed, the 1152 cycles to the first step in the calculating procedure, and automatically performs any steps prior to the point where a manual entry (stop command) occurs. Automatic operation will then stop to allow the operator to manually enter a new number for calculation. Depressing the AUTO key will continue with the automatic program up to the next point where a manual entry must be made. At each such point, the operator indexes the number on the keyboard and depresses the AUTO key. When all the numbers for the calculation have been entered and all the required answers have been printed, the 1152 automatically cycles back to the beginning of the program sequence, and proceeds to the point of the first manual entry (stop command).

Note:

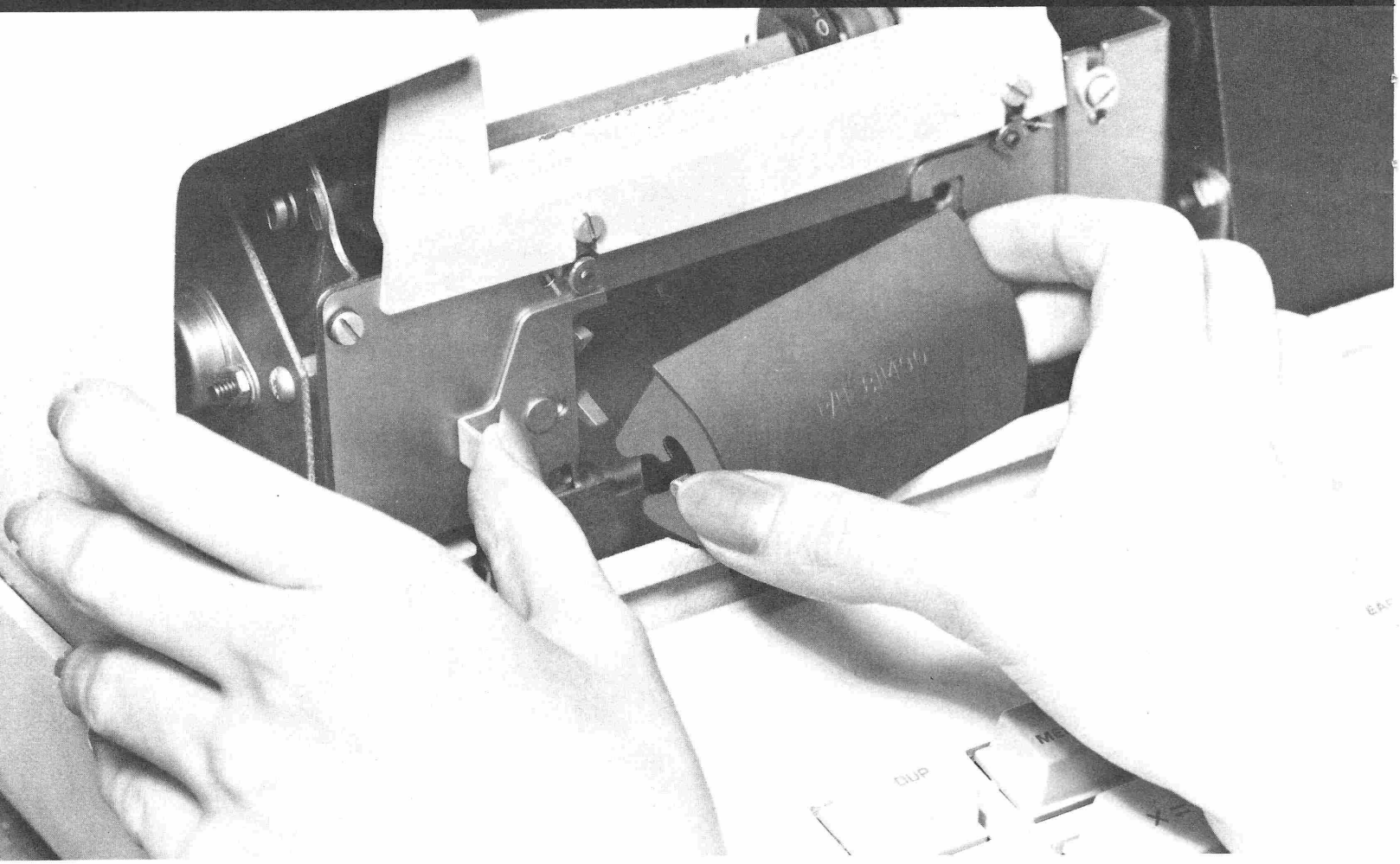
At any point in the learned program where the 1152 has stopped to accept a manual entry (stop command), any manual calculations may be performed. This allows the operator, if required, to manually perform any random calculations. Having obtained the answer, the operator then depresses the AUTO key to continue with the program. Additionally, at any point where a manual entry would normally be made, the operator may depress the PROGRAM RESET key. This allows the operator to repeat the first part of the automatic calculating sequence one or several times before using the remainder of the sequence. This is commonly called "looping."

A thorough knowledge of the operating instructions and an understanding of the applications presented will enable any operator to utilize the capabilities of the 1152 to the fullest. The portions of this manual devoted to the techniques involved in program learning are particularly important. Programming could not be simpler, yet the benefits to be reaped with this powerful tool are manifold.

Many specialized program applications are available from your local FRIDEN representative. He will gladly assist you in your calculating problems and will furnish you with applications specifically related to your work.



Ink Cartridge Changing Procedure

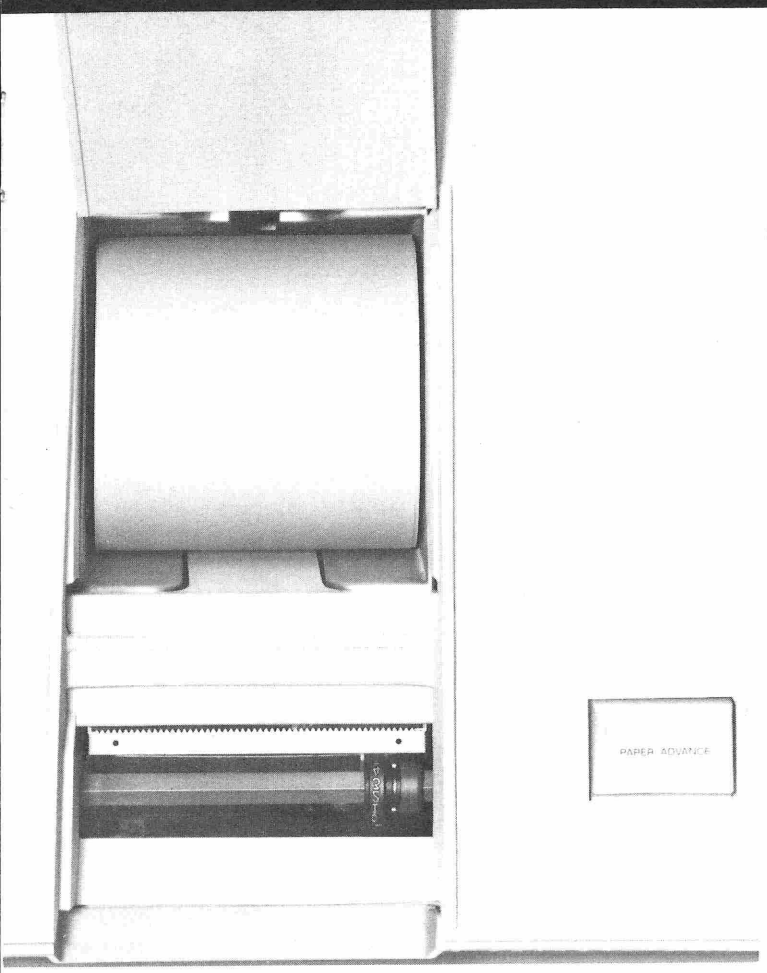


The 1152 contains a unique ink roller that eliminates ribbons. Designed for maximum convenience, each ink roller lasts much longer than a ribbon, and eliminates ribbon threading and stained hands.

Simply replace the old ink cartridge with a new one according to the following procedure. The new cartridge is conveniently packaged in a plastic container so you never have to touch the ink.

1. Remove the snap-on plate on the front of the machine.
2. Push Locking Tab (Yellow) to left and Hold.
3. Grasp ink cartridge with right hand and extract.
4. Release Locking Tab (Yellow). Calculator is now ready to receive new ink cartridge.
5. Hold Locking Tab (Yellow) to left. Grasp new ink cartridge by ends. Insert new cartridge, checking to see that both ends of the inker shaft are inserted in the Yokes.
6. Release Locking Tab (Yellow). Make sure ink cartridge is locked in place.
7. Replace the snap-on front plate.

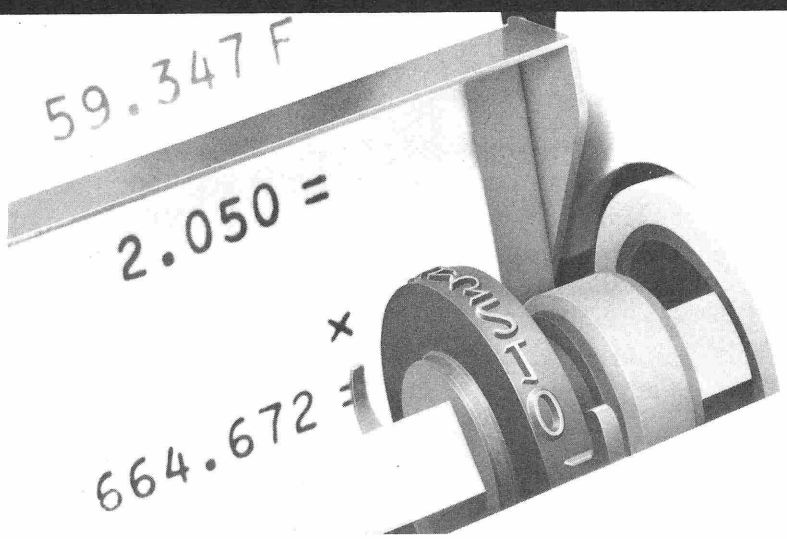
Tape Changing



The paper tape roll is contained under the hinged cover located on top of the calculator. To replace the paper tape, raise the hinged cover and proceed as follows:

1. Remove the remaining roll by lifting the roll from the well and tearing the tape to free the spool.
2. Depress PAPER ADVANCE until the remaining paper is free.
3. Tear leading edge of new roll to form a smooth, flat edge.
4. Drop the roll in the well, leading edge facing down.
5. Depress PAPER ADVANCE key until paper appears above the paper tear off.
6. After closing the cover, the machine is ready to operate.

Printing Mechanism



The 1152 incorporates a high speed, single-wheel printing mechanism.

Located directly in front of the paper tape tear-off, the printer, or "print wheel," consists of a single row of numbers, symbols, and signs arranged on the outer edge of a wheel. A total of 20 characters are contained on the print wheel. When printing, the wheel rotates while moving across the tape, printing at the rate of 47 characters per second. Each character is large, distinct, and evenly printed. For easy reading, figures are spaced in triplets to the left of the printed decimal point.

The printed symbols are easy to understand and calculations are easy to follow on the tape. Double spacing occurs after each answer for easy identification, and negative answers are printed with an offset minus (—) sign.

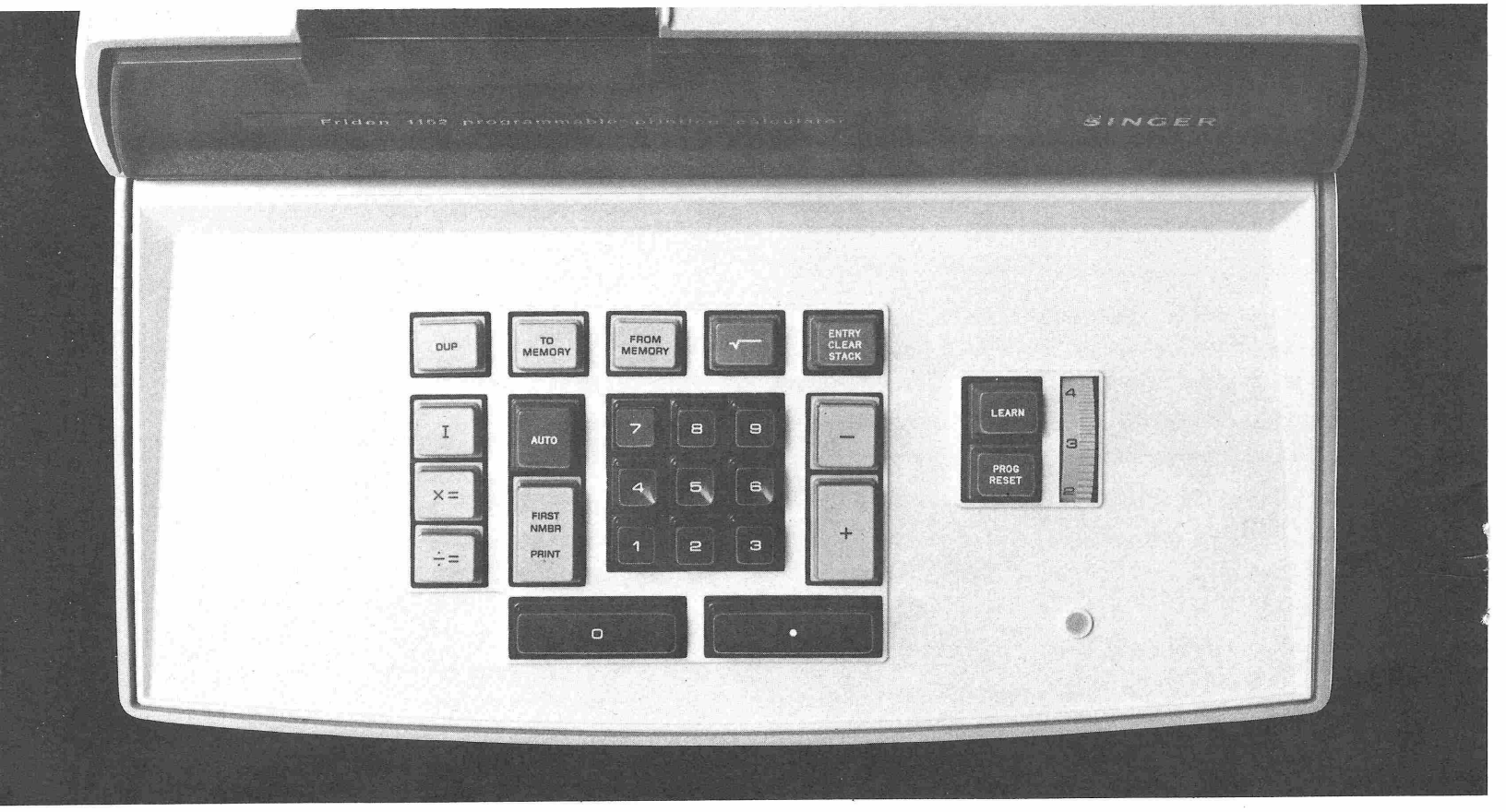
A single printed line can contain up to 13 digits, a decimal point, two symbols, and up to four spaces for triplicate punctuation. This makes possible 20 character spaces in each printed line.

The simplicity of one moving part in the "print wheel," as compared to approximately 20 in a conventional calculator printing mechanism, allows for trouble free operation of the 1152.

The print-wheel makes the 1152 an operator-oriented machine by producing an easily read printout accompanied by simple symbology that permits easy identification of operations performed.

Applications

The following applications are representative of the wide range of calculations capable of being performed on the 1152 in a logical and direct manner, but by no means does this manual completely cover the vast variety of applications capable of being performed on the 1152. A review of the applications presented and the knowledge acquired by reading this manual will enable the operator to develop his own specialized applications.



Addition/Subtraction

Addition and subtraction can be accomplished at *any* ANSWER DECIMAL setting, or by use of the ADD MODE (+). The ADD MODE allows for a faster operation, but does not allow for automatic decimalization or automatic round off of answers.

PROBLEM 1:

238.65
42.875
−23.22
177.76
−1.44
434.63

PROBLEM 2:

1412
7876
12165
−8008
13445

PROBLEM 1:

SET ANSWER DECIMAL ON 2

INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
238.65	FIRST NMBR	238.65 F
42.875	+	42.875 +
23.22	−	23.22 −
177.76	+	177.76 +
1.44	−	1.44 −
	PRINT	434.63 =
	Answer is automatically rounded off at two decimal places as indicated by the Answer Decimal.	

PROBLEM 2:

SET ANSWER DECIMAL ON +

INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
1412	FIRST NMBR	1412 F
7876	+	7876 +
12165	+	12165 +
8008	−	8008 −
	PRINT	13445 =
	Note: When operating on the Add Mode it is not necessary to touch the decimal point key when indexing numbers on the Keyboard.	

Multiplication

In multiplication problems on the 1152, the need for clearance is eliminated by use of the FIRST NMBR Key. A touch of the × = Key automatically multiplies the factors entered and prints the answer instantly on the tape. Products are automatically rounded off to the number of decimal places indicated by the ANSWER DECIMAL setting.

PROBLEM 1: 24.02 × .9401547 = 22.58252

PROBLEM 2: (39.445 × 15.2) + (41 × .6) = 624.164

PROBLEM 3: (3 × .14) − (.007 × 21) = .273

PROBLEM 4: 23.8 × 16.92 × .708055 = 285.13092

PROBLEM 1:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
24.02	FIRST NMBR	24.02 F
.9401547	× =	.9401547 ×
		22.58252 =

PROBLEM 2:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
39.445	FIRST NMBR	39.445 F
15.2	× =	15.2 ×
		599.56400 =
41	FIRST NMBR	41. F
.6	× =	.6 ×
	+	24.60000 =
		+
	PRINT	624.16400 =

PROBLEM 3:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
3	FIRST NMBR	3. F
.14	× =	.14 ×
		.42000 =
.007	FIRST NMBR	.007 F
21	× =	21. ×
		.14700 =
	−	−
	PRINT	.27300 =

PROBLEM 4:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
23.8	FIRST NMBR	23.8 F
16.92	× =	16.92 ×
		402.69600 =
.708055	× =	.708055 ×
		285.13092 =

Division

Division is as simple as multiplication on the 1152. Problems shown here cover regular division, addition of quotients, and subtraction of quotients.

PROBLEM 1: 145 ÷ 12 = 12.08333

PROBLEM 2: (624 ÷ 13) + (78.2 ÷ 4.7) = 64.63289

PROBLEM 3: (45 ÷ 3) + (34.26 ÷ 12.1) − (17.76 ÷ 3.125) = 12.14820

PROBLEM 1:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
145	[FIRST NMBR]	145. F
12	[÷ =]	12. ÷
		12.08333 =

PROBLEM 2:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
624	[FIRST NMBR]	624. F
13	[÷ =]	13. ÷
		48.00000 =
78.2	[FIRST NMBR]	78.2 F
4.7	[÷ =]	4.7 ÷
		16.63829 =
	[+]	+
	[PRINT]	64.63829 =

PROBLEM 3:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
45	[FIRST NMBR]	45. F
3	[÷ =]	3. ÷
		15.00000 =
34.26	[FIRST NMBR]	34.26 F
12.1	[÷ =]	12.1 ÷
		2.83140 =
	[+]	+
17.76	[FIRST NMBR]	17.76 F
3.125	[÷ =]	3.125 ÷
		5.68320 =
	[−]	−
	[PRINT]	12.14820 =

Squaring a Number

Here we show how easily the 1152 handles the accumulation of positive and negative square numbers. Notice how the use of the DUP Key eliminates the need for entering any number more than once.

PROBLEM: $18.124^2 + 9.18^2 - 15.23^2 - 3.1416^2 = 170.92923$

PROBLEM:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
18.124	DUP	18.124 F
		18.124 F
	× =	×
		328.47938 =
9.18	DUP	9.18 F
		9.18 F
	× =	×
		84.27240 =
	+	+
15.23	DUP	15.23 F
		15.23 F
	× =	×
		231.95290 =
	−	−
3.1416	DUP	3.1416 F
		3.1416 F
	× =	×
		9.86965 =
	−	−
	PRINT	170.92923 =

The Memory Unit

To enter a number into the Memory Unit, index the number on the Keyboard (unless you want to store the number already in the Working Register) and touch the TO MEMORY Key. To recall the number from memory, touch the FROM MEMORY Key. The number entered into memory remains there for subsequent usage. It will continue to remain there until another number is entered into memory. The TO MEMORY Key can be used in place of the FIRST NMBR Key.

PROBLEM 1: CONSTANT MULTIPLIER— $1.25 × 21 = $26.25
$1.25 × 64 = $80.00

PROBLEM 2: CONSTANT DIVISOR— 145 ÷ 12.13 = 11.95383
214 ÷ 12.13 = 17.64220

PROBLEM 3: CONSTANT DIVIDEND— 164 ÷ 18.92 = 8.66807
164 ÷ 24.16 = 6.78807

PROBLEM 1:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
1.25	TO MEMORY	1.25 M
21	FROM MEMORY	21. F
		1.25 F
	× =	×
		26.25000 =
64	FROM MEMORY	64. F
		1.25 F
	× =	×
		80.00000 =

PROBLEM 2:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
145	FIRST NMBR	145. F
12.13	TO MEMORY	12.13 M
		145. =
	FROM MEMORY	12.13 F
	÷ =	÷
		11.95383 =
214	FROM MEMORY	214. F
		12.13 F
	÷ =	÷
		17.64220 =

PROBLEM 3:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
164	TO MEMORY	164. M
		=
	FROM MEMORY	164. F
18.92	÷ =	18.92 ÷
		8.66807 =
	FROM MEMORY	164. F
24.16	÷ =	24.16 ÷
		6.78807 =

Sequential Operations

Here we illustrate how the Stacking Principle works to retain intermediate answers for further calculating without having to re-index any numbers.

PROBLEM:

$$\frac{\frac{164}{13.1} \times (1.4)^3}{\frac{8.9}{2} \times 4.5 \times 7} = .24506$$

PROBLEM:

SET ANSWER DECIMAL ON 5

INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
164	FIRST NMBR	164. F
13.1	÷ =	13.1 ÷
		12.51908 =
1.4	DUP	1.4 F
		1.4 F
	DUP	1.4 F
	× =	×
		1.96000 =
	× =	×
		2.74400 =
	× =	×
		34.35236 =
8.9	FIRST NMBR	8.9 F
2	÷ =	2. ÷
		4.45000 =
4.5	× =	4.5 ×
		20.02500 =
7	× =	7. ×
		140.17500 =
	÷ =	÷
		.24506 =

Interchange

Many calculations require that a denominator in a division problem, for instance, be calculated before the numerator is calculated. Though the following example could be easily calculated either way, the denominator will be first calculated, then the numerator to show the function of the INTERCHANGE Key.

PROBLEM:

$$\frac{(90)^2}{4 \times 12 \times 7} = 24.10714$$

PROBLEM:

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
4	FIRST NMBR	4. F
12	× =	12. ×
		48.00000 =
7	× =	7. ×
		336.00000 =
90	DUP	90. F
		90. F
	× =	×
		8 100.00000 =
	INTERCHANGE	
		336.00000
	÷ =	÷
		24.10714 =

Learning Operations

Using the Learn Mode, the volumes of the spheres in problems 2 and 3 are calculated using the program established after calculating the volume for problem 1.

Formula: $V = \frac{4}{3} \pi r^3$

PROBLEM 1:

r = 7.26
V = 1602.86674

PROBLEM 2:

r = 8.934
V = 2986.93256

PROBLEM 3:

r = 7.12986
V = 1518.20538

SET ANSWER DECIMAL ON 5			
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE		TAPE
4	FIRST NMBR		4. F
3.14159	× =		3.14159 ×
			12.56636 =
3	÷ =		3. ÷
			4.18878 =
	TO MEMORY		4.18878 M
	LEARN		
7.26	DUP		7.26 F
			7.26 F
	DUP		7.26 F
	× =		×
	× =		×
			382.65718 =
	FROM MEMORY		4.18878 F
	× =		×
	FIRST NMBR	**(Answer 1)**	1 602.86674 =
	PROG RESET		
8.934	AUTO		8.934 F
		(Answer 2)	2 986.93256 =
7.12986	AUTO		7.12986 F
		(Answer 3)	1 518.20538 =

Learning Operations

Here we make use of the Learn Mode on the 1152 for repetitive calculations. Because calculations are performed automatically using the learned program, there is greater speed and less operator decision.

The arithmetic operations required to solve the following two problems are the same, only the values are different. Calculating the first problem in the Learn Mode will allow us to solve the second problem by simply indexing the new values and depressing the AUTO Key.

PROBLEM 1:

$$\frac{\frac{164}{13.1} \times (1.4)^3}{4.5} = 7.63385$$

PROBLEM 2:

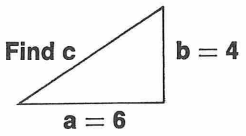
$$\frac{\frac{189}{14.2} \times (2.3)^3}{3.9} = 41.52331$$

SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
	LEARN	
164	FIRST NMBR	164. F
13.1	÷ =	13.1 ÷
1.4	DUP	1.4 F
		1.4 F
	DUP	1.4 F
	× =	×
	× =	×
	× =	×
4.5	÷ =	4.5 ÷
	PRINT (Answer 1)	7.63385 =
	PROG RESET	
189	AUTO	189. F
14.2	AUTO	14.2 F
2.3	AUTO	2.3 F
3.9	AUTO	3.9 F
	(Answer 2)	41.52331 =

Pythagorean Theorem

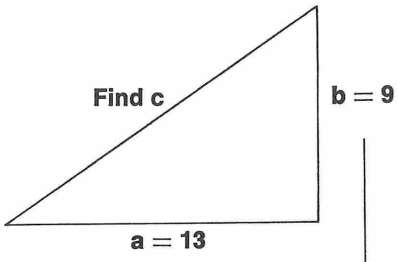
Here, with the use of program learning and the Square Root Key, we are able to make short work of this type of problem. Using the formula $C = \sqrt{a^2 + b^2}$ and its algebraic derivatives, we are able to find the hypotenuse or any side of a right triangle.

PROBLEM 1:

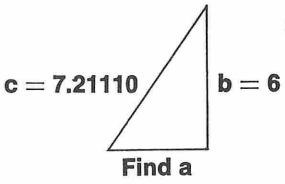


$$c = \sqrt{a^2 + b^2}$$

PROBLEM 2:

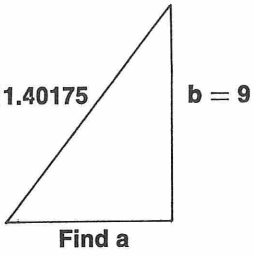


PROBLEM 3:



$$a = \sqrt{c^2 - b^2}$$

PROBLEM 4:



SET ANSWER DECIMAL ON 5		
INDEX IN KEYBOARD	TOUCH CONTROL KEYS IN SEQUENCE	TAPE
	LEARN	
4	DUP	4. F
		4. F
	× =	×
6	DUP	6. F
		6. F
	× =	×
	+	+
	√ (Answer 1)	7.21110 =
	PROG RESET	
9	AUTO	9. F
13	AUTO	13. F
	√	
	(Answer 2)	15.81138 =
	LEARN	
7.21110	DUP	7.21110 F
		7.21110 F
	× =	×
6	DUP	6. F
		6. F
	× =	×
	−	−
	√ (Answer 3)	3.99999 =
	PROG RESET	
11.40175	AUTO	11.40175 F
9	AUTO	9. F
	√	
	(Answer 4)	6.99999 =

Maintenance Agreements

A Friden full coverage maintenance agreement is available for FRIDEN* machines or equipment for successive periods of one year each, effective at expiration of the Friden guarantee.

Friden maintenance agreement will cover:

- ☐ Periodic diagnostic check to condition the equipment for continuous peak performance. This includes thorough adjustments, cleaning, oiling and replacement of parts.
- ☐ Incorporation of engineering advances and technical experience obtained since initial production of the unit.
- ☐ All emergency service during normal business hours.

The Friden maintenance agreement gives full coverage on Friden machines or equipment with factory trained service technicians, factory authorized parts, fully equipped branch-office shops, branch-office service records, and the latest methods of repair.

*A TRADEMARK OF THE SINGER COMPANY

FRIDEN DIVISION, THE SINGER COMPANY, SAN LEANDRO, CALIFORNIA 94577

SINGER
FRIDEN DIVISION

FORM 55-530 PRINTED IN U.S.A.