Instructions

MONROE IQ

MONROE

CALCULATOR MONRO-MATIC MODEL IQ-213

INSTRUCTIONS

MONROE

MONROE INTERNATIONAL, INC · A DIVISION OF LITTON INDUSTRIES • ORANGE, NEW JERSEY · SALES AND SERVICE THROUGHOUT THE WORLD

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INSTRUCTIONS

MONROE CALCULATOR MONRO-MATIC MODEL IQ-213

A Few Words of Introduction

The Monroe Calculator is an all-round figuring machine that adds, subtracts, multiplies, and divides, also extracts roots. Being very flexible, it can be applied to all kinds of both ordinary and complicated figuring which makes it a most useful desk tool for saving the time and effort of the engineer, statistician, and researcher as well as anyone in business.

The Monroe is made up of two units: The keyboard (Figure 1) with the keys and controls by means of which amounts are entered in the machine and the figuring operations performed; the carriage (Figure 2) with its dials in which results and proof of the work are registered. Monroes are outstanding for simplicity; all models have the same principles of operation, and even though each type has its own special features a person familiar with any one can readily use another.

A fully automatic machine, the IQ Monro-Matic calls for a minimum amount of concentration or manipulation on the part of the operator whose attention can be devoted solely to the figuring, letting the machine do all the work. The Monroe also has an automatic decimal system so that all results are correctly and automatically pointed off. The versatility of the IQ is particularly notable due to its exclusive "memory" features which further save time by eliminating many operating steps and the need for numerous keyboard settings.

The following pages give detailed information for using the Monroe IQ. First, each part, which is numbered so it can be quickly identified in the illustrations, is described and its functions explained. Next, there are brief instructions for performing the fundamental arithmetical processes. The principal keys are designated to indicate the machine operations they control. As a further aid, the controls are color-coded; that is, those relating to multiplication are green, those for division are coral, those for the memory functions are charcoal gray.

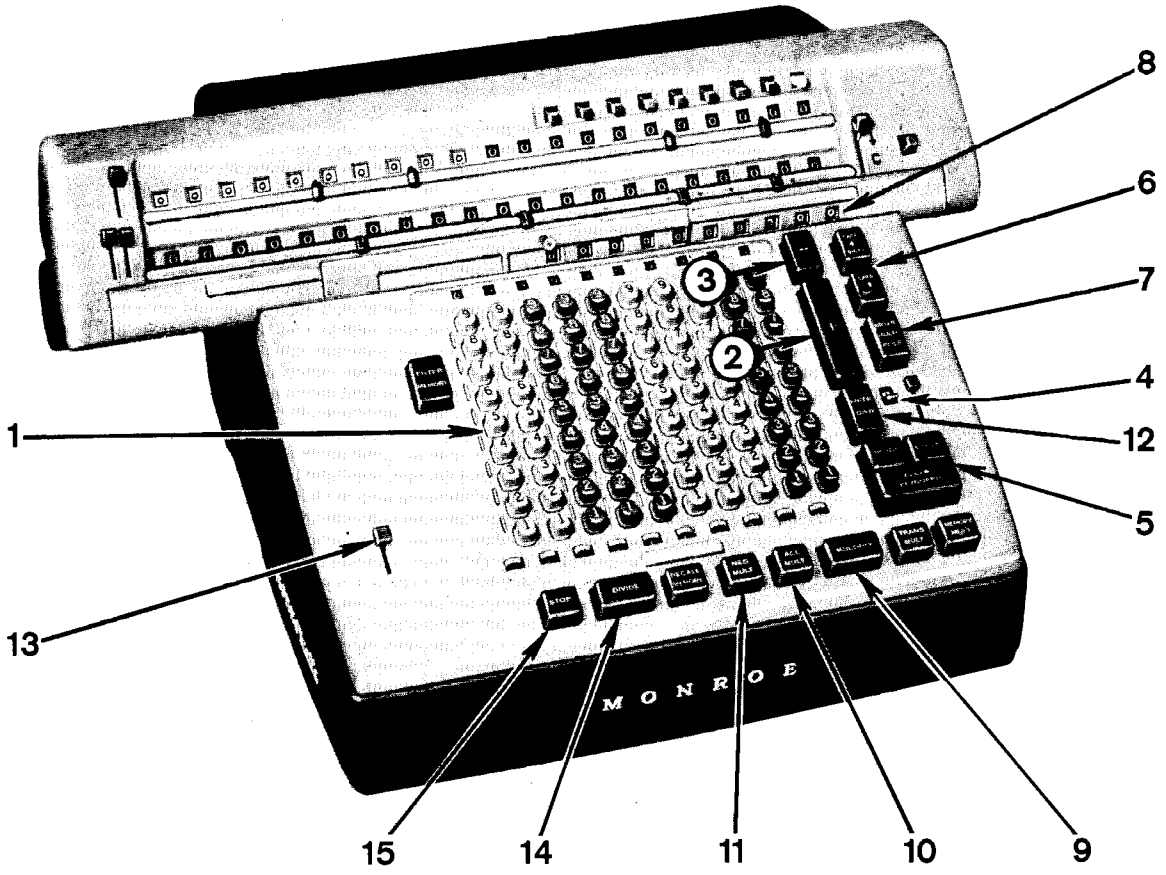

FIGURE 1 The Keyboard and Its Controls

1 Keyboard
2 Plus Bar
3 Minus Bar
4 Repeat and Non-repeat Lever
5 Clear Keys
6 Carriage Shift Keys
7 Enter Multiplier Key
8 Multiplier Dials
9 Multiply Key
10 Accumulative Multiply Key
11 Negative Multiply Key
12 Enter Dividend Key
13 Dividend Alignment Lever
14 Divide Key
15 Stop Key

OPERATING CONTROLS

1 Keyboard Like every Monroe Calculator, the Model IQ has a single keyboard by which all figures are entered for all operations. As a safeguard against depressing a key inadvertently the keyboard is automatically locked during a machine operation.

2 Plus Bar The plus bar is used for addition. Each time it is depressed the amount set on the keyboard is added in the lower dials.

3 Minus Bar The minus bar is used for subtraction. When it is depressed the amount set on the keyboard is subtracted from the lower dials.

4 Repeat and Non-repeat Lever For addition and subtraction this lever should be in the down position so that the NR symbol shows; then an amount set on the keyboard is automatically cleared upon each depression of the plus or minus bar. When the lever is in the upper position with the R symbol visible, an amount will be retained on the keyboard until cleared by the operator. In fully automatic operations the lever can be in either the upper or lower position for its functioning is then automatically controlled.

5 Clear Keys After most operations, amounts are cleared from the dials and keyboard automatically (see description of Automatic Keyboard Clear, 31). Whenever manual clearance is required the operator depresses one or more of the group of three keys. The key marked UPPER clears the upper dials; the one marked LOWER clears the lower dials; the bottom key labeled CLEAR KEYBOARD clears an entire amount on the keyboard. These clear keys can be depressed separately or jointly; only the slightest pressure of a finger is required.

6 Carriage Shift Keys In most operations of the Monroe IQ the shifting of the carriage is automatic. At other times the carriage can be shifted by depressing the keys which are marked with arrows to designate the direction in which the carriage moves. Depression of the upper key shifts the carriage to the left. Depression of the lower key shifts the carriage to the right.

7 Enter Multiplier Key Depressing the ENTER MULTIPLIER key transfers an amount set on the keyboard to be used as a multiplier into the multiplier dials; the amount automatically clears from the keyboard. When the carriage is in any but the first position, depressing the ENTER MULTIPLIER key also returns the carriage to the extreme left or first position. For squaring an amount that has been set on the keyboard, the ENTER MULTIPLIER is depressed and held down until the machine cycle is fully completed; the amount will still remain on the keyboard after it has been entered in the multiplier dials.

8 Multiplier Dials When a multiplier is entered in the machine, as just described, it is registered in the multiplier dials.

9 Multiply Key Depressing the MULTIPLY key clears the upper and lower dials and the amount set on the keyboard is automatically multiplied by the amount in the multiplier dials. At the completion of the multiplication, the keyboard clears and the carriage returns to either the first position or to a tab stop position; the multiplier is registered in the upper dials and the result in the lower dials. If the carriage is in any but the first position and the MULTIPLY key is depressed, the upper and lower dials clear and the carriage returns to a tab stop or the first position.

10 Accumulative Multiply Key When the ACC MULT key is depressed the amount on the keyboard is multiplied by the amount in the multiplier dials and the product is automatically added to any amount previously registered in the lower dials. The multiplier is also added to whatever amount may be in the right upper dials.

11 Negative Multiply Key When the NEG MULT key is depressed the amount on the keyboard is multiplied negatively by the amount in the multiplier dials and the result is simultaneously subtracted from whatever amount may be in the lower dials. The multiplier is registered in the upper dials negatively. If it is desired to have the multiplier register positively in the upper dials, the Counter Dials Control Lever (30) should be shifted down to the − position.

12 Enter Dividend Key Depression of the ENTER DIVD key causes the machine, in one automatic operation, to: Clear the upper and lower dials, shift the carriage to the extreme right or a tab stop position, enter the keyboard amount in the lower dials, and then clear the keyboard.

13 Dividend Alignment Lever The DIVD ALIGN lever controls the automatic alignment of the carriage for lining up the dividend in the lower dials with the divisor on the keyboard. It functions when in the upper position and generally it is left there for all regular work. It is usually moved to the lower position for percentage work.

14 Divide Key The DIV key is used for performing automatic division. When the DIVD ALIGN is up, depression of the DIV key clears the upper dials, shifts the carriage to the extreme right or a tab stop position, and the amount on the keyboard is automatically divided into the amount in the lower dials. The quotient appears in the upper dials; the keyboard clears. When the DIVD ALIGN lever is down and the DIV key depressed, the upper dials do not clear and the carriage does not tabulate to the right before the automatic division is started.

15 Stop Key Depressing this key stops the machine when it is performing automatic multiplication or division.

16 Lower Dials The lower dials register results in addition and subtraction and the product in

multiplication. A dividend is registered in the lower dials before the division is started.

17 Right Upper Dials The Monroe IQ has a double set of upper counting dials, which are sometimes called proof dials. The right-hand set registers the multiplier in multiplication and the quotient in division. They are carry-over dials which give a true count above 9 and serve as an item counter in addition. They are also used for accumulating multipliers or quotients.

18 Left Upper Dials The left-hand or Series 3 dials, an exclusive feature of the Monroe, also register multipliers or quotients. These dials, which are not the carry-over type, show multipliers in black figures and quotients in red figures, this color differentiation being useful in certain applications.

19 Upper Dials Lock This lever controls the clearing or retention of figures in the right upper dials. Normally it remains in the upper position. When it is shifted down the figures in the right upper dials will not clear and amounts can be accumulated.

20 Lower Dials Locks There are two locks that control the clearing of the lower dials. When both of the levers are up, as in most operations, all the lower dials can be cleared. When both levers are down, all the lower dials are locked against clearance. When the left-hand lever is shifted down, all the lower dials from the 10th to the 21st inclusive are locked and do not clear but the dials from the 1st to the 9th inclusive can be cleared. When the right-hand lever is shifted down, the right-hand section of the lower dials from 1 to 9 inclusive is locked against clearance and the dials from 10 to 21 can be cleared.

21 Tab Stops When any of the eight tab stops is depressed it determines the position in which the carriage will stop in multiplication and division. A depressed tab stops the carriage when it is shifted in either direction. When two tab stops are required both should be depressed simultaneously. Tab stops are released by depressing the yellow clear tab on the extreme right.

22 Constant Multiplier Lever To retain an amount in the multiplier dials for use as a constant multiplier, this lever is shifted down. When the constant factor is no longer required the lever is moved to the upper position before the last multiplication of the series is performed. When the constant lever is down other figures cannot be entered in the multiplier dials.

23 Transfer Slide The purpose of the transfer slide is to control the automatic shifting and positioning of the carriage. The slide is moved to the right or left by first pulling out the small knob, shifting the slide to the desired position, and then releasing the knob so it seats. The green strip at the right-hand end of the slide serves as a guide to the transfer position; for example, when the slide is positioned so that there are four multiplier dials to the right of the green strip, the slide is said to be in the 4 position.

24 Half-cent Control Lower dials 2, 4, 5, 6, and 8 of the Monroe IQ-213 are equipped for automatic half-cent adjustment of results. These half-cent dials are easily identified by the distinctive coloring of the corresponding numerals on the lower dials decimal slide. To prepare the machine for half-cent adjustment, set a 5 in the keyboard column directly in line with the dial (or dials if more than one is to be used) and depress the plus bar. Then hold down the half-cent control at

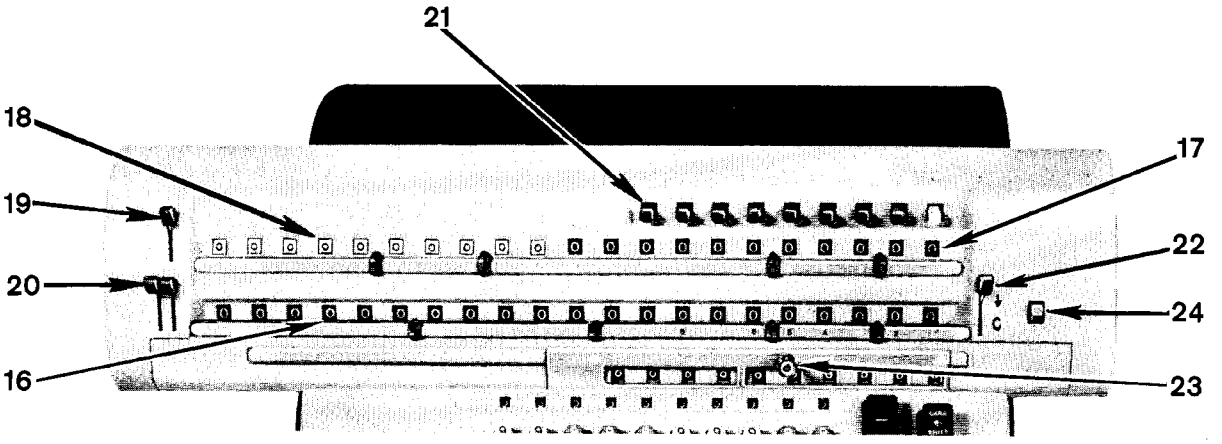

FIGURE 2 The Carriage

16 Lower Dials	20 Lower Dials Locks
17 Right Upper Dials	21 Tab Stops
18 Left Upper Dials	22 Constant Multiplier Lever
19 Upper Dials Lock	23 Transfer Slide
24 Half-cent Control	

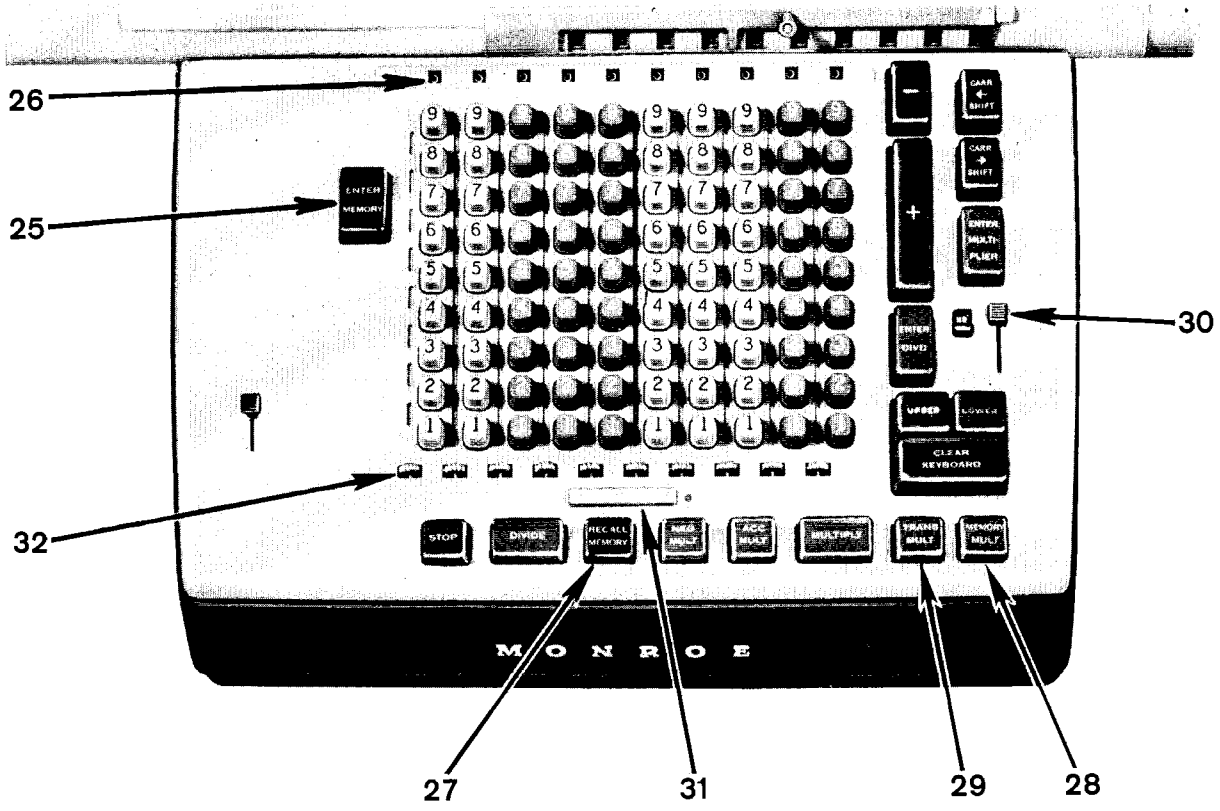

FIGURE 3 Memory and Other Controls

25 Enter Memory Key
26 Memory Dials
27 Recall Memory Key
28 Memory Multiplication Key
29 Transfer Multiplication Key
30 Counter Dials Control Lever
31 Automatic Keyboard Clear
32 Keyboard Column Locks

the same time depressing the lower dials clear key. Thereafter every time the lower dials are cleared the particular dial or dials with half-cent will clear to 5 instead of 0. When automatic half-cent adjusting is no longer needed the lower dials are returned to normal operation by setting a 5 in the keyboard column directly under the dial or dials and depressing the minus bar once; then the half-cent control is held down while the lower dials clear key is depressed.

25 Enter Memory Key After an amount has been set on the keyboard, depressing the ENTER MEMORY key enters it in the machine's "memory." The amount so entered can be changed in the memory by setting the second amount on the keyboard and depressing the ENTER MEMORY key; then the first amount is replaced by the new one. The memory is cleared by depressing the ENTER MEMORY key.

26 Memory Dials When an amount has been entered in the memory it is visible in these dials.

27 Recall Memory Key Whenever the amount in the memory is to be used, depressing this key clears any keys that may be depressed on the keyboard and sets up the figures which are in the memory as a keyboard amount, although keys are not actually set. The amount that has been recalled can then be used for adding, subtracting, multiplying, and dividing just as any keyboard amount set in the ordinary way. After an amount has been recalled depressing any key on the keyboard will replace the recalled entry.

28 Memory Multiplication Key Depression of the MEMORY MULT key transfers an amount set on the keyboard into the multiplier dials, clears the keyboard, and automatically multiplies by the amount in the memory.

29 Transfer Multiplication Key Depressing the TRANS MULT key transfers an amount in the lower dials to the multiplier dials and immediately multiplies it by the factor on the keyboard. The figures that transfer are those located in the lower dials between the two arrows on the transfer slide.

30 Counter Dials Control Lever This lever, which has three positions, controls the direction of rota-

tion of the upper dials. For all ordinary operations it should be left in the upper position. When the lever is in the upper or plus position (marked +), plus operations of the machine are registered positively in the upper dials and minus operations negatively. When in the lower position, marked by the minus sign (−), the functioning is reversed; that is, plus operations register negatively and minus operations positively. When the lever is in the middle or non-entry position (designated NE), multipliers and other plus and minus counts do not register in the right upper dials; only quotients will register in those dials.

31 Automatic Keyboard Clear Normally this small bar remains in its left-hand position indicated by the arrow so the yellow dot is exposed; then the keyboard automatically clears after a multiplication or division. In certain figuring work, when it is necessary to retain an amount on the keyboard after an automatic operation, the AUTO KB CLEAR is shifted to the right.

32 Keyboard Column Locks The small discs with knurled edges at the bottom of the keyboard serve both for indicating decimals on the keyboard and for locking keys. Turning a disc sets a decimal marker on the keyboard for that column. To lock a figure in any column the key is depressed and the disc under that column is shifted down; then no other key in the column that has been locked can be depressed. The column is unlocked by shifting the disc up to its normal position.

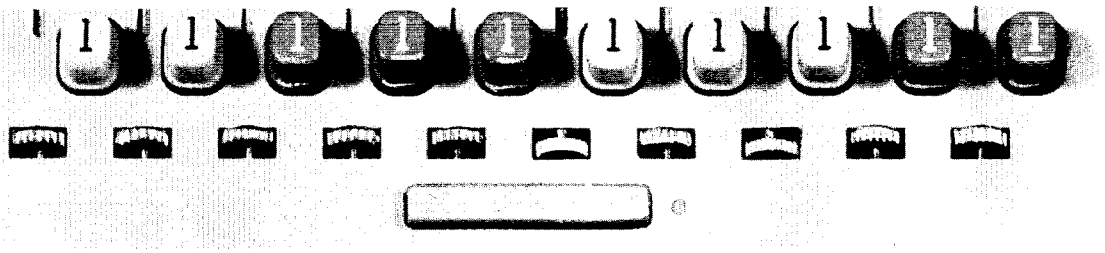

FIGURE 4 Showing keyboard locks down, locking fifth and third keyboard columns

DECIMALS

One of the greatest advantages of the Monroe Calculator is its automatic decimal system. For the guidance of the operator the dials have movable markers and there are decimal markers between the columns of keys to indicate the position of the decimal point on the keyboard. Generally once these markers are set the Monroe is ready for any and all calculations; changing from one problem to another does not require changing decimals. The system relieves the operator of any concern over the accuracy of decimal points, for with amounts set around a constant decimal answers appear correctly pointed off automatically.

Monroe Rule

The setting of decimals is the same for all Monroe Calculators and is based on the one, easily remembered, simple rule.

Keyboard Decimal + Upper Dials Decimal = Lower Dials Decimal

That is, the number of decimal places in the lower dials is always the total of the decimal places in the upper dials plus the decimal places on the keyboard. The same decimal setting is used in both the right and left upper dials, except in rare cases. If the Monroe rule is followed, results are produced automatically around the correct preset decimal markers.

The operator, by examining the work in hand, quickly determines the maximum number of decimal places involved and the maximum number of decimal places desired in the result. A few pointers are given that will aid in setting the decimals for most kinds of ordinary figuring work.

Decimals in Addition and Subtraction

Keyboard	Set decimal to handle largest number of decimal places in the numbers to be added.
Upper Dials	No decimal required.
Lower Dials	Set decimal same as keyboard Keyboard decimal + Upper dials decimal = Lower dials decimal.

Decimals in Multiplication

Keyboard	Examine the multiplier and multiplicand and determine which has the larger number of decimal places. Set the keyboard decimal to accommodate this number of decimal places.
Upper Dials	Set decimal same as keyboard.
Lower Dials	Keyboard decimal + Upper dials decimal = Lower dials decimal.

Decimals in Division

Keyboard	Examine the divisor and dividend and determine which has the larger number of decimal places. Set the keyboard decimal to accommodate this number of decimal places.
Upper Dials	Always decide how many decimal places are required in the answer and set the decimal to one more than this (to permit rounding off if required).
Lower Dials	Keyboard decimal + Upper dials decimal = Lower dials decimal.

A standard decimal set-up for the Monroe IQ-213 that is preferred by many operators is: Keyboard 5, upper dials 5, lower dials 10.

CONTROL SETTINGS

In much the same way as fixed decimals are set, the operator of the Monroe can keep to a minimum the changing of controls by deciding an arrangement that will take care of a major part of the figuring work being performed. In the instructions that follow the recommended settings of the controls for the method of solution are given in the program directions at the beginning of the step-by-step instructions.

Regular Set-up of Controls

The operating controls remain in their regular or normal positions unless otherwise stated in the program. These regular operating positions can be summed up briefly as follows:

KEY OR CONTROL	REGULAR OPERATING POSITION
Repeat and non-repeat lever	Non-repeat
Counter dials control lever	+ position
Automatic keyboard clear	Left position
Dividend alignment lever	Up
Tab stops	None
Transfer slide	To extreme right
Constant multiplier lever	Up
Dials locks	Up
Individual column locks	Up

SOME APPLICATIONS

Anyone having read the preceding pages and followed the step-by-step directions has become familiar with the controls of the Monroe IQ and has learned their use and how to perform the basic arithmetical processes. Since these fundamental processes, in one form or another, underlie all business and technical calculations, the operator who understands them can readily apply the Monroe to any kind of problem.

The additional information that follows provides material for further practice and can be helpful in developing greater skill. These applications describe in detail machine methods for some of the more usual types of figure jobs found in many lines of business and bring out certain short-cuts for simplifying and speeding the work.

PERCENTAGE WORK

Percentage Distribution

Finding a percentage is a division operation and for a series when it is required to determine what per cent each part is of the total it is generally figured by multiplying by a large reciprocal.

With the Monroe IQ it is no longer necessary to find and set a reciprocal on the machine as the work can be performed directly and rapidly by storing the total as a constant divisor in the memory.

Example Calculate the per cent each group is of the total value.

GROUP	VALUE	PER CENT
A	$1164	13.39
B	1629	18.74
C	2371	27.28
D	3528	40.59
	$8692	100.00

Program Decimals: Keyboard 2 Tabs at 5 and 6
Upper Dials 2-4 Upper Dials Locked
Lower Dials 6 Right Lower Dials Locked

Step 1 Set 8692, total value, on the keyboard. Depress ENTER MEMORY.

Step 2 Set 1164, Group A value, on the keyboard. Depress ENTER DIVD. Depress RECALL MEMORY and then DIVIDE.

Result Upper dials 13.39, Per cent Group A

Step 3 Set 1629, Group B value, on the keyboard. Depress ENTER DIVD. Depress RECALL MEMORY and then DIVIDE.

Results Left upper dials 18.74, Per cent Group B
Right upper dials 32.13, Accumulated per cents

Step 4 Set 2371, Group C value, on the keyboard. Depress ENTER DIVD. Depress RECALL MEMORY, then DIVIDE.

Results Left upper dials 27.28, Per cent Group C
Right upper dials 59.41, Accumulated per cents

Step 5 Set 3528, Group D value, on the keyboard. Depress ENTER DIVD. Depress RECALL MEMORY, then DIVIDE.

Results Left upper dials 40.59, Per cent Group D
Right upper dials 100.00, Accumulated per cents

The example brings out the value of the Monroe's exclusive Series 3 dials as the 100.00 total in the right upper dials shows as proof, and the lower dials cleared to all zeros is a further check of accuracy.

Per cent of Expense by Sales

Example Each of four departments has the same appropriation for advertising. Determine the percentage of advertising expense of each according to actual sales.

DEPT.	SALES	ADVERTISING APPROPRIATION	PER CENT ADV. EXP. BASED ON SALES
A	$546,245	$23,500	4.3
B	398,000	23,500	5.9
C	425,268	23,500	5.5
D	497,500	23,500	4.7

Program Decimals: Keyboard 3 Tabs at 4 and 5
Upper Dials 3
Lower Dials 6

Step 1 Set 23,500 on the keyboard and depress ENTER MEMORY.

Step 2 Depress RECALL MEMORY and then ENTER DIVD. Set 546,245 on the keyboard and depress DIVIDE.

Result Upper dials .043 or 4.3%, Dept. A

Step 3 Depress RECALL MEMORY and then ENTER DIVD. Set 398,000 on the keyboard and depress DIVIDE.

Result Upper dials .059 or 5.9%, Dept. B

Repeat Step 3 for Depts. C and D.

Percentage of Increase or Decrease

Monroe Series 3 dials are useful in another kind of percentage work for they automatically register whether a per cent is an increase or a decrease. The operator can tell at a glance because a 1 in the left upper dials indicates an increase and if the 1 is lacking it indicates a decrease, according to the following simple rule.

> If a 1 appears to the left of the decimal in the left upper dials, the percentage is read as an **increase** in those dials.
>
> If a 0 appears to the left of the decimal in the left upper dials, the percentage is read as a **decrease** in the right upper dials.

Example

DEPT.	SALES THIS YEAR	SALES LAST YEAR	PER CENT DECREASE	PER CENT INCREASE
W	$ 958.22	$ 723.90		32.37
X	850.00	1047.16	18.83	
Y	1127.65	959.35		17.54

Program Decimals: Keyboard 5 Tab at 6
Upper Dials 5 Counter Dials Control Lever at —
Lower Dials 10 DIVD ALIGN Down

Step 1 Set 958.22, this year's figure, on the keyboard. Depress ENTER DIVD.

Step 2 Set 723.90, last year's figure, on the keyboard. Depress DIVIDE. Because 1 appears to the left of the decimal in the left upper dials, the answer is read in those dials.

Result Left upper dials .32369 or 32.37%, Increase for Dept. W

Step 3 Set 850.00, this year's figure, on the keyboard. Depress ENTER DIVD.

Step 4 Set 1047.16, last year's figure, on the keyboard. Depress DIVIDE. Because 0 appears to the left of the decimal in the left upper dials, the answer is read in the right upper dials.

Result Right upper dials .18829 or 18.83%, Decrease for Dept. X

Step 5 Set 1127.65 on the keyboard and depress ENTER DIVD.

Step 6 Set 959.35 on the keyboard and depress DIVIDE. Because 1 appears to the left of the decimal in the left upper dials, the answer is taken from those dials.

Result Left upper dials .17543 or 17.54%, Increase for Dept. Y

PRORATION

Prorating Rental Expense

The Monroe IQ exclusive feature of storing two constants at the same time makes proration simple and fast. Moreover, the operator is assured of accuracy.

Example Prorate $4273.69, rental expense, according to the floor space occupied by each office.

OFFICE	FLOOR SPACE	PRORATED AMOUNTS
Administration	4850	$1448.96
Accounting	1945	581.08
Sales	2765	826.05
Advertising	1790	534.77
Records	2955	882.83
	14305	$4273.69

Program

Decimals:	Keyboard	2	Tabs at 5 and 7
	Upper Dials	2	Counter Dials Control at NE
	Lower Dials	4	Upper Dials Locked
			Right Lower Dials Locked

Step 1 Set 14305, constant divisor, on the keyboard. Depress ENTER MEMORY. Set 4273.69, constant multiplier, on the keyboard. Depress ENTER MULTIPLIER. Move down constant lever lock.

Step 2 Set 4850 on the keyboard and depress MULTIPLY. Depress RECALL MEMORY and then DIVIDE.

Result Upper dials 1448.96, Prorated amount for Administration

Step 3 Set 1945 on the keyboard and depress MULTIPLY. Depress RECALL MEMORY and then DIVIDE.

Results Left upper dials 581.08, Prorated amount for Accounting
Right upper dials 2030.04, Accumulated amount

Repeat Step 3 for the remaining offices. Move the constant lever up before making the last multiplication for Records, which gives the following:

Results Left upper dials 882.83, Prorated amount for Records
Right upper dials 4273.69, Total rental expense

Reciprocals

Proration, whether it is for an amount or for a percentage distribution as in the foregoing applications, is an efficient operation with the Monroe IQ since the constant divisor can be stored in the memory and repetitive keyboard settings are unnecessary. The division method is particularly recommended in cases where prorations are to be made over a small number of units. Some operators, however, who have become accustomed to the reciprocal method, may still prefer it, especially if the amounts are large. In spite of the extra operation of finding the reciprocal, the method does have the advantage that multiplying may be somewhat faster in some instances of prorating over many units. It may be even more pronounced now with the Monroe IQ because of its ability to hold a large reciprocal in the memory and multiplying by the smaller amounts.

Finding a Reciprocal

The reciprocal of a number is 1 divided by that number. For example, the reciprocal of 4 is ¼ or .25; the reciprocal of 6 is .166667.

Example The reciprocal of 682 is .00146627565

No decimal set-up on the machine is necessary as the pointing off of the decimal in the reciprocal is determined by the rule below.

Step 1 Set 1 on the extreme left of the keyboard. Depress ENTER DIVD.

Step 2 Set 682 on the extreme left of the keyboard. Depress DIVIDE.

Result Upper dials 146627565 or .00146627565

Decimals are pointed off in reciprocals according to the following rule:

> The reciprocal of any whole number or of a whole number and decimal is always a decimal. Prefix as many zeros to the reciprocal as there are whole numbers in the divisor, **less one.**
>
> The reciprocal of any decimal is always a whole number or a whole number and a decimal. Point off as many whole numbers in the reciprocal as there are ciphers in the divisor, **plus one.**

Percentage Distribution by Reciprocal

Example

GROUP	VALUE	PER CENT
A	$ 382.42	16.93
B	193.61	8.57
C	1265.84	56.03
D	417.25	18.47
	$2259.12	100.00

Program

Decimals:	Keyboard	2	Half-cent Control at 8
	Upper Dials	2	Lower Dial 8 Covered
	Lower Dials	10	

Step 1 To find the reciprocal of 2259.12, set 1 on the extreme left of the keyboard in the tenth column. Depress ENTER DIVD. Set 225912 on the extreme left of the keyboard. Depress DIVIDE. *Result* Upper dials 4426502 which, when pointed off according to the rule, is .0004426502, the reciprocal.

Step 2 Set .0004426502 on the keyboard at the tenth decimal and depress ENTER MEMORY.

Step 3 Set 382.42, value of Group A, on the keyboard and depress MEMORY MULT.
Result Lower dials 16.93%, Group A

Step 4 Set 193.61, value of Group B, on the keyboard and depress MEMORY MULT.
Result Lower dials 8.57%, Group B

Step 5 Set 1265.84, value of Group C, on the keyboard and depress MEMORY MULT.
Result Lower dials 56.03%, Group C

Step 6 Set 417.25, value of Group D, on the keyboard and depress MEMORY MULT.
Result Lower dials 18.47%, Group D

Percentage Distribution by Reciprocal with Dials Proof

A second method for percentage distribution by reciprocal, in addition to the speed of memory multiplication has the advantage of the Monroe exclusive dials proof.

Example

DIVISION	PROFIT	PER CENT
1-A	$ 842.35	25.93
1-B	474.63	14.61
1-C	1249.81	38.48
1-D	681.32	20.98
	$3248.11	100.00

Program Decimals: Keyboard 2 — Right Lower Dials Locked
Upper Dials 2 — Lower Dial 9 Covered
Lower Dials 11

Step 1 Set 100.00, per cent, on the keyboard and depress ENTER DIVD. Set 3248.11, total profit, on the keyboard and depress DIVIDE. *Result* Upper dials 30787134, reciprocal.

Step 2 Copy 30787134 from the upper dials directly in line to the keyboard. Depress ENTER MEMORY.

Step 3 Set 842.35, profit 1-A, on the keyboard and depress MEMORY MULT. Lock upper dials.
Result Lower dials 25.93%, Div. 1-A

Step 4 Set 474.63, profit 1-B, on the keyboard and depress MEMORY MULT.
Results Lower dials 14.61%, Div. 1-B
Right upper dials 1316.98, Accumulated profits
Left upper dials 474.63, Proof

Step 5 Set 1249.81 on the keyboard and depress MEMORY MULT.
Results Lower dials 38.48%, Div. 1-C
Right upper dials 2566.79, Accumulated profits
Left upper dials 1249.81, Proof

Step 6 Set 681.32 on the keyboard and depress MEMORY MULT.
Results Lower dials 20.98%, Div. 1-D
Right upper dials 3248.11, Total profit, proof
Left upper dials 681.32, Proof

Besides the accuracy checks of the left and right upper dials, the lower dials to the right of the final per cent give a zero proof.

INVOICE AND DISCOUNT WORK

Checking Net Amounts

Example

QUANTITY	ITEM	PRICE	DISCOUNT	NET
75	#81 large tube	$19.95	15%	$1271.81
110	Bolters A	2.08	15%	194.48
32	#42 boxes	4.15	15%	112.88
58	#801 clamps	1.66	15%	81.84

Program

Decimals:	Keyboard	2	Transfer Slide 2
	Upper Dials	2	
	Lower Dials	4	

Step 1 Set .85, complement of 15% (1.00 — .15), on the keyboard and depress ENTER MEMORY.

Step 2 Set 75, quantity first line, on the keyboard and depress ENTER MULTIPLIER.

Step 3 Set 19.95, price first line, on the keyboard and depress MULTIPLY.

Step 4 Depress RECALL MEMORY and then TRANS MULT.

Result Lower dials 1271.81, Net first line

Step 5 Set 110, quantity second line, on the keyboard and depress ENTER MULTIPLIER.

Step 6 Set 2.08, price second line, on the keyboard and depress MULTIPLY.

Step 7 Depress RECALL MEMORY and then TRANS MULT.

Result Lower dials 194.48, Net second line

Continue Steps 5, 6, and 7 for each of the remaining lines.

Discount and Net

In the application of figuring discount and net simultaneously, the Monroe IQ makes half-cent adjustments in two positions. Accumulating net amounts by means of memory division eliminates resetting figures.

Example Given the gross amounts and the per cent of discount, calculate the discounts, net amounts, and total net of invoice.

GROSS	DISCOUNT	NET
$ 8.95 less 25%	$2.24	$ 6.71
17.83 less 25%	4.46	13.37
35.72 less 25%	8.93	26.79
13.25 less 25%	3.31	9.94
		$56.81 Total Net

Program

Decimals:	Keyboard	2- 8	Tab at 4
	Upper Dials	2	DIVD ALIGN Down
	Lower Dials	4-10	Counter Dials Control at NE
			Half-cent Control at 2 and 8
			Upper Dials Locked

Step 1 Set .25 on the keyboard at second decimal and .75 at eighth decimal. Depress ENTER MULTIPLIER. Move constant lever down. Set 1 on the keyboard at eighth decimal and depress ENTER MEMORY.

Step 2 Set 8.95 on the keyboard at second decimal and depress MULTIPLY.

Results Lower dials at tenth decimal 6.71, Net
Lower dials at fourth decimal 2.24, Discount

Step 3 Depress RECALL MEMORY and then DIVIDE. The 6.71 in the lower dials transfers to the right upper dials to accumulate.

Step 4 Set 17.83 on the keyboard at second decimal and depress MULTIPLY.

Results Lower dials at tenth decimal 13.37, Net
Lower dials at fourth decimal 4.46, Discount

Step 5 Depress RECALL MEMORY and then DIVIDE. Right upper dials show 20.08, accumulated net.

Step 6 Set 35.72 on the keyboard at second decimal and depress MULTIPLY.

Results Lower dials at tenth decimal 26.79, Net
Lower dials at fourth decimal 8.93, Discount

Step 7 Depress RECALL MEMORY and then DIVIDE. Right upper dials show 46.87, accumulated net.

Step 8 Set 13.25 on the keyboard at second decimal. Move constant lever up. Depress MULTIPLY.

Results Lower dials at tenth decimal 9.94, Net
Lower dials at fourth decimal 3.31, Discount

Step 9 Depress RECALL MEMORY and then DIVIDE.

Result Right upper dials 56.81, Total net

Total Items, Gross, Discount, and Net

Checking an invoice for gross, discount, net, and total number of items can be performed in one continuous operation with no rehandling of the figures.

Example Check the number of dozens, gross, discount, and net of the following invoice.

654	doz. @	$1.04	
703½	doz. @	2.00	
425¾	doz. @	4.15	
580	doz. @	3.20	
2363¼	doz.	Gross	$5710.02
		Less 15%	856.50
		Net	$4853.52

Program Decimals: Keyboard 2 — Tab at 3
Upper Dials 2 — Transfer Slide 2
Lower Dials 4 — Half-cent Control at 2
Lower Dial 2 Covered

Step 1 Set .15, discount, on the keyboard and depress ENTER MEMORY.

Step 2 Set 654, dozens, on the keyboard and depress ENTER MULTIPLIER. Set 1.04, price, on the keyboard and depress MULTIPLY.

Step 3 Set 703.5, dozens, on the keyboard and depress ENTER MULTIPLIER. Set 2.00, price, on the keyboard and depress ACC MULT.

Continue Step 3 for the rest of the lines on the invoice.

Results Upper dials 2363.25, Total number of dozens
Lower dials 5710.02, Gross invoice

Step 4 Depress RECALL MEMORY and then TRANS MULT.

Result Lower dials 856.50, Total discount

Step 5 Lock upper dials and move counter dials control lever to — position. Set 1 on the keyboard and depress DIVIDE.

Result Upper dials 4853.52, Net amount of invoice

Unlock upper dials, move counter dials control lever back to + and the machine is ready for the next invoice.

Lumber Invoice

Example Figure the following invoice, finding the individual extensions and the total amount.

SIZE	QUANTITY	PRICE BOARD FOOT	AMOUNT
2 x 4	18/10	$.11	$13.20
2 x 8	15/14	.21	58.80
1 x 4	48/12 Sub. flooring	.08	15.36
1 x 4	20/12 Knotty pine	.13	10.40
1 x 6	25/14 Knotty pine	.18	31.50
1 x 8	18/10 Knotty pine	.22	26.40
			$155.66 Total

Program Decimals: Keyboard 3 — Tab at 7
Upper Dials 3 — Transfer Slide 3
Lower Dials 6 — Counter Dials Control at NE
Upper Dials Locked

Step 1 Set 12 (in. per ft.) on the keyboard and depress ENTER MEMORY. Set 2 on the keyboard and depress ENTER MULTIPLIER.

Step 2 Set 4 on the keyboard and depress MULTIPLY.

Step 3 Set 18, number of pieces, on the keyboard and depress TRANS MULT. Set 10, length, on the keyboard and depress TRANS MULT. Set .11 on the keyboard and depress TRANS MULT.

Step 4 Depress RECALL MEMORY and then DIVIDE.

Result Left upper dials 13.20, First extension

Continue in the same way for the remaining extensions. Omit any multiplication by 1 (1 × 4 is set on the keyboard as 4). The individual extensions appear in the left upper dials while the accumulated total appears in the right upper dials.

INTEREST

Loan Interest

Banks and other lending institutions that make short-term loans have to figure the interest on various amounts for various periods of time. By storing a factor (interest on $1.00 for one day) as a constant in the memory of the Monroe IQ, the interest charges for a batch of loans can be calculated rapidly, one after another, by 3-factor multiplication (amount × time × interest factor).

Example

LOAN NO.	AMOUNT	RATE	DAYS	INTEREST
1001-F	$ 865.00	6%	46	$ 6.63
1002-F	1225.92	6%	150	30.65
1003-F	2475.25	6%	96	39.60
1056-G	948.00	5½%	79	11.44
1057-G	1017.50	5½%	55	8.55

Program Decimals: Keyboard 2- 8 Transfer Slide 2
Upper Dials 2
Lower Dials 10

The constant interest factor can be taken from the Monroe Interest Table, Form 456-S, or calculated as described in Step 1.

Step 1 To find the interest factor: Set 1 ($1.) on the extreme left of the keyboard and depress ENTER MULTIPLIER. Set 6, interest rate, on the extreme left of the keyboard and depress MULTIPLY. Set 360 (days in year) on the extreme left of the keyboard and depress DIVIDE. Prefixing three zeros to the amount in the upper dials, copy to the keyboard setting it at the eighth decimal as .00016667 (interest on $1 for one day). Depress ENTER MEMORY.

Step 2 Set 865.00, amount of loan 1001-F, on the keyboard and depress ENTER MULTIPLIER. Set 46, days, on the keyboard and depress MULTIPLY. Depress RECALL MEMORY and then TRANS MULT.

Result Lower dials 6.63, Interest loan 1001-F

Step 3 Set 1225.92, amount of loan 1002-F, on the keyboard and depress ENTER MULTIPLIER. Set 150, days, on the keyboard and depress MULTIPLY. Depress RECALL MEMORY and then TRANS MULT.

Result Lower dials 30.65, Interest loan 1002-F

Repeat Step 3 for all the rest of the loans at 6%.

For loans at 5½%:

Step 4 Set .00015278 (interest factor for 5½%) on the keyboard and depress ENTER MEMORY.

Step 5 Set 948.00, amount of loan 1056-G, on the keyboard and depress ENTER MULTIPLIER. Set 79, days, on the keyboard and depress MULTIPLY. Depress RECALL MEMORY and then TRANS MULT.

Result Lower dials 11.44, Interest loan 1056-G

Continue Step 5 for all loans at 5½%.

Installment Payments

Example A $575.00 loan at 6% is to be repaid in twelve monthly installments. Find the interest, total to be repaid, and the monthly payment.

Program Decimals: Keyboard 2 Tabs at 3 and 6
Upper Dials 2 Transfer Slide 2
Lower Dials 4 AUTO KB CLEAR to Right

Step 1 Set 12, number of payments, on the keyboard and depress ENTER MEMORY. Set .06, interest rate, on the keyboard and depress ENTER MULTIPLIER.

Step 2 Set 575.00, principal, on the keyboard and depress MULTIPLY.

Result Lower dials 34.50, Interest

Step 3 Depress plus bar.

Result Lower dials 609.50, Total to be repaid

Step 4 Depress RECALL MEMORY and then DIVIDE.

Results Upper dials 50.79, Monthly payment
Lower dials .02, Adjustment to be made on final payment

PAYROLL

Example An employee worked 44 hours at the rate of $2.255 per hour for a 40-hour week with time and one-half for overtime. Calculate overtime and gross pay, taxes, and net pay.

Program Decimals: Keyboard 2-5- 8 Tab at 6
Upper Dials 5 Transfer Slide 5
Lower Dials 7-13 Left Lower Dials Locked

Step 1 Set 2.255, hourly rate, at fifth decimal. Depress ENTER MULTIPLIER.

Step 2 Set 46, base hours plus overtime hours, at eighth decimal, and 6, overtime hours, at second decimal. Depress MULTIPLY.

Results Lower dials at 13th decimal 103.73, Gross pay
Lower dials at 7th decimal 13.53, Overtime pay

Step 3 Copy 103.73, gross pay, to the keyboard at second decimal. Depress ENTER MEMORY.

Step 4 Set .18, tax rate, on the keyboard at fifth decimal. Depress MEMORY MULT. Set 9.36, exemption deduction, at second decimal. Depress minus bar.

Result Lower dials at 7th decimal 9.31, Tax

Step 5 Copy 9.31, tax, to the keyboard at eighth decimal. Depress minus bar.

Step 6 Set .03625, FICA rate, on the keyboard at fifth decimal. Depress MEMORY MULT.

Result Lower dials at 7th decimal 3.76, FICA

Step 7 Copy 3.76, FICA, to the keyboard at eighth decimal. Depress minus bar.

Result Lower dials at 13th decimal 90.66, Net pay

Subtract 90.66 to clear left lower dials before figuring pay of next employee.

INSURANCE

Return Premiums

Example Find the return premiums for the cancelled policies below.

POLICY NO.	DATE WRITTEN	DATE CANCELLED	DATE EXPIRATION	PREMIUM	RETURN PREMIUM
01	2-17-62	10-30-62	2-17-63	$ 30.15	$ 9.09
03	4-23-62	10-30-62	4-23-63	91.00	43.63
05	5-15-62	10-30-62	5-15-63	231.00	124.68
09	7-26-62	10-30-62	7-26-63	113.88	83.93

Program Decimals: Keyboard 5 Tab at 6
Upper Dials 5 Transfer Slide 5
Lower Dials 10

The decimal equivalent factor for 10-30-62, from Monroe table 159-S, is 62.83014.

Step 1 Set 62.83014 on the keyboard and depress ENTER MEMORY.

Step 2 Set 63.13151 (equivalent of 2-17-63) on the keyboard and depress ENTER DIVD. Depress RECALL MEMORY and then minus bar.

Step 3 Set 30.15 on the keyboard and depress TRANS MULT.

Result Lower dials 9.09, Return premium, policy 01

Step 4 Set 63.30959 (equivalent of 4-23-63) on the keyboard and depress ENTER DIVD. Depress RECALL MEMORY and then minus bar.

Step 5 Set 91.00 on the keyboard and depress TRANS MULT.

Result Lower dials 43.63, Return premium, policy 03

Continue in the same way for the remaining cancelled policies, using the equivalents 63.36986 and 63.56712 for 5-15-63 and 7-26-63 respectively.

Prorating Claim Loss

Example A $1,325.31 claim loss is to be prorated over five companies according to the amount of insurance issued by each.

COMPANY	AMOUNT	CLAIM ADJUSTMENT
A	$2,532.00	$ 174.14
B	3,756.75	258.37
C	1,250.00	85.97
D	7,156.00	492.16
E	4,575.25	314.67
	$19,270.00	$1,325.31

Program Decimals: Keyboard 2 Tabs at 5 and 6
Upper Dials 2 Counter Dials Control at NE
Lower Dials 4 Upper Dials Locked
Right Lower Dials Locked

Step 1 Set 1,325.31, total claim, on the keyboard and depress ENTER MULTIPLIER. Move constant lever down.

Step 2 Set 19,270.00 on the keyboard and depress ENTER MEMORY. Set 2,532.00 on the keyboard and depress MULTIPLY.

Step 3 Depress RECALL MEMORY and then DIVIDE.

Result Upper dials 174.14, Company A adjustment

Step 4 Set 3,756.75 on the keyboard and depress MULTIPLY. Depress RECALL MEMORY and then DIVIDE.

Results Left upper dials 258.37, Company B adjustment
Right upper dials 432.51, Accumulated adjustments

Continue in the same manner for the remaining amounts of Companies C, D, and E. Move the constant lever up before the last multiplication.

SQUARE ROOT

Monroe Simplified Method

The Monroe Simplified Method for Extracting Square Root is rapid and secures a result with accuracy to five significant figures with an error of less than 5 in the sixth figure. If required, the five-place root can be carried out by the same method to ten significant figures.

The necessary factors and brief instructions are published as a handy table, Monroe Form 1228-S, which is available upon request. More detailed instructions for extraction of square, cube, and higher roots are contained in a booklet, Monroe Form 1191-S, which will also be furnished gratis by any Branch Office or by the company's Publications Department, Orange, N. J.

Example $\sqrt{843.73} = 29.047$

It is not necessary to set up decimals on the machine as the pointing off of the decimal in the root is according to the simple rule given in the Monroe table.

Step 1 Set 843.73 on the extreme left of the keyboard. Depress ENTER DIVD.

Step 2 Set 8404, from column A of the table, on the extreme left of the keyboard. Depress the plus bar.

Step 3 Set 5798, from column D of the table, on the extreme left of the keyboard. Depress DIVIDE.

Result Upper dials 29.047, Root to five significant figures