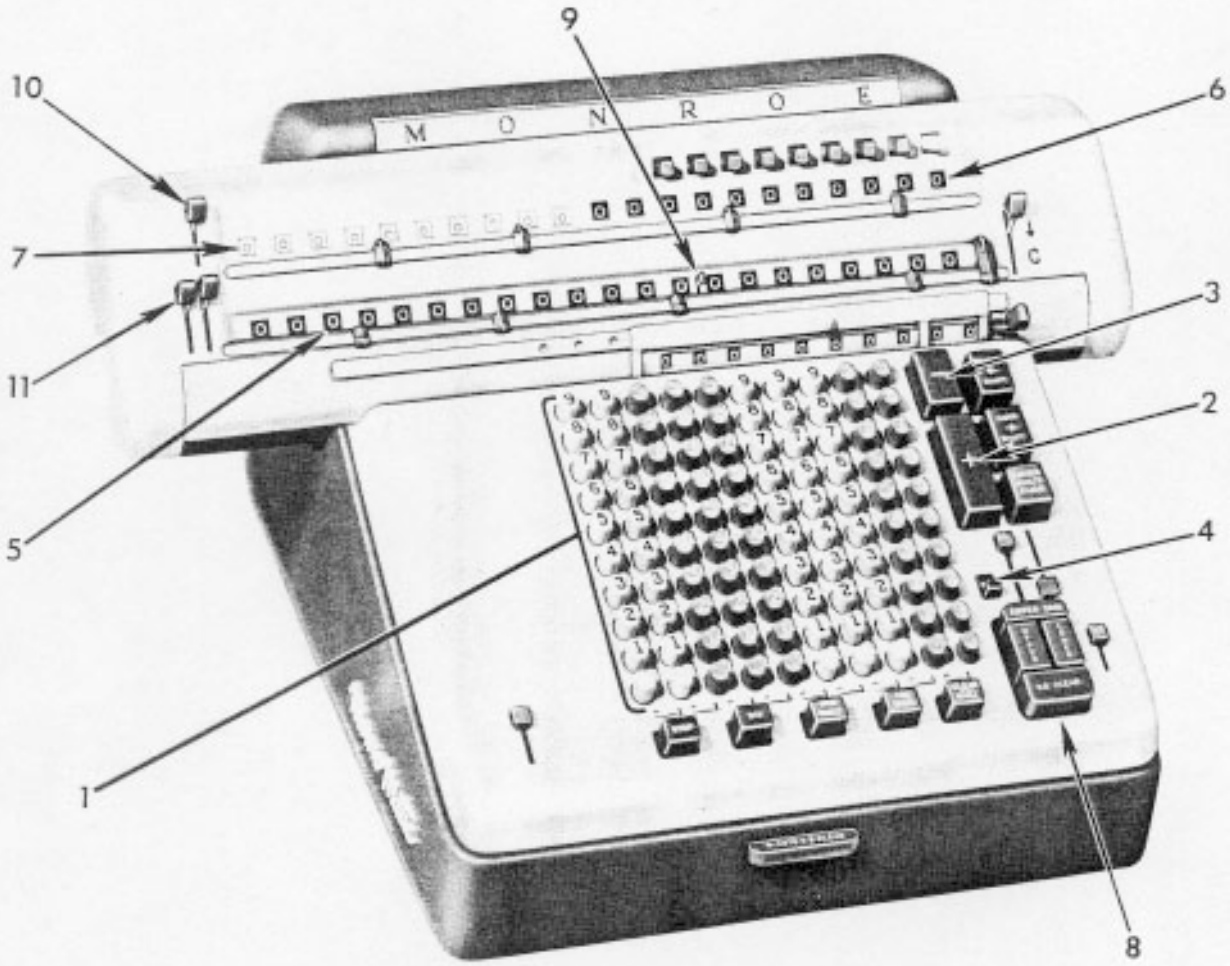
MONROE CALCULATOR MONRO-MATIC MODEL 8N



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Pages 11-16 from “Monroe Machine Methods for Civil Engineering Calculations”, Monroe Calculating Machine Company, Inc., 1961 (First printing)

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THE OPERATING CONTROLS

All the principal operating levers and keys are marked to indicate the functions they control. As a further aid to the operator, controls relating to multiplication are colored green and those for division, coral.

1 Keyboard Every Monroe Calculator has a single keyboard by which all figures are entered for all operations. The unnumbered key at the bottom of each column is the so-called "zero key." When one of these is depressed it will clear whatever numeral key may be depressed in the same column. Depressing the zero key with one finger while depressing simultaneously a numeral key in the same column with another finger locks that figure against normal clearance. The locked figure is released by depressing another numeral key in the same column.

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. Each time 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 is visible; 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 automatically controlled.

5 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 starting a division.

6 Right Upper Dials The Monroe 8N has a double set of upper counting, or 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 also are used for accumulating multipliers or quotients.

7 Left Upper Dials The left-hand or Series 3 dials, an exclusive feature of the Monroe, also register multipliers and quotients. These dials, which show multipliers in black figures and quotients in red figures, are not the carry-over type, for they are intended for certain applications in which this manner of functioning is very useful.

8 Clear Keys In most operations of the 8N, amounts are cleared from the dials and keyboard automatically. When manual clearance is required it is performed by depressing 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 one marked KB CLEAR clears the entire keyboard. They can be depressed separately or jointly. All are electrically operated so only the slightest pressure of the finger is required. When an amount is to be locked on the keyboard, the KB CLEAR is held down while setting the amount on the keyboard. An amount thus locked can be cleared from the keyboard by depressing other keys in the same columns and then depressing the KB CLEAR.

9 Half-cent Control The eighth lower dial of the Monroe 8N-213 is equipped for automatic half-cent adjustment of results. After setting a 5 in the keyboard column directly under the eighth lower dial, the operator holds down the half-cent control and depresses the plus bar. Thereafter every time the lower dials are cleared the eighth dial clears to 5 instead of 0. When this automatic function of the 5 is no longer needed and that dial is to be returned to normal operation, the operator sets a 5 in the keyboard column directly under the eighth lower dial, holds down the half-cent control, and depresses the minus bar.

10 Upper Dials Lock This lever controls the clearance of the right upper dials. Normally it remains in the upper position; when shifted down the figures in the right upper dials will not clear and amounts can be accumulated. Because of their use a lock is not required for the left upper dials.

11 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 of the two levers is shifted down, all 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 inclusive can be cleared.

12 Carriage Shift Keys In most operations of the Monroe 8N, the shifting of the carriage is automatic. At other times the carriage can be shifted by depressing these 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.

13 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 shifting in either direction. When two tab stops are required, both should be depressed simultaneously. Tab stops are released by depressing the yellow clear tab at the right.

14 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.

15 Multiplier Dials When a multiplier is set in the machine as just described, it is registered in the multiplier dials. An amount in the lower dials to be used as a multiplier can be automatically transferred from the lower dials to the multiplier dials.

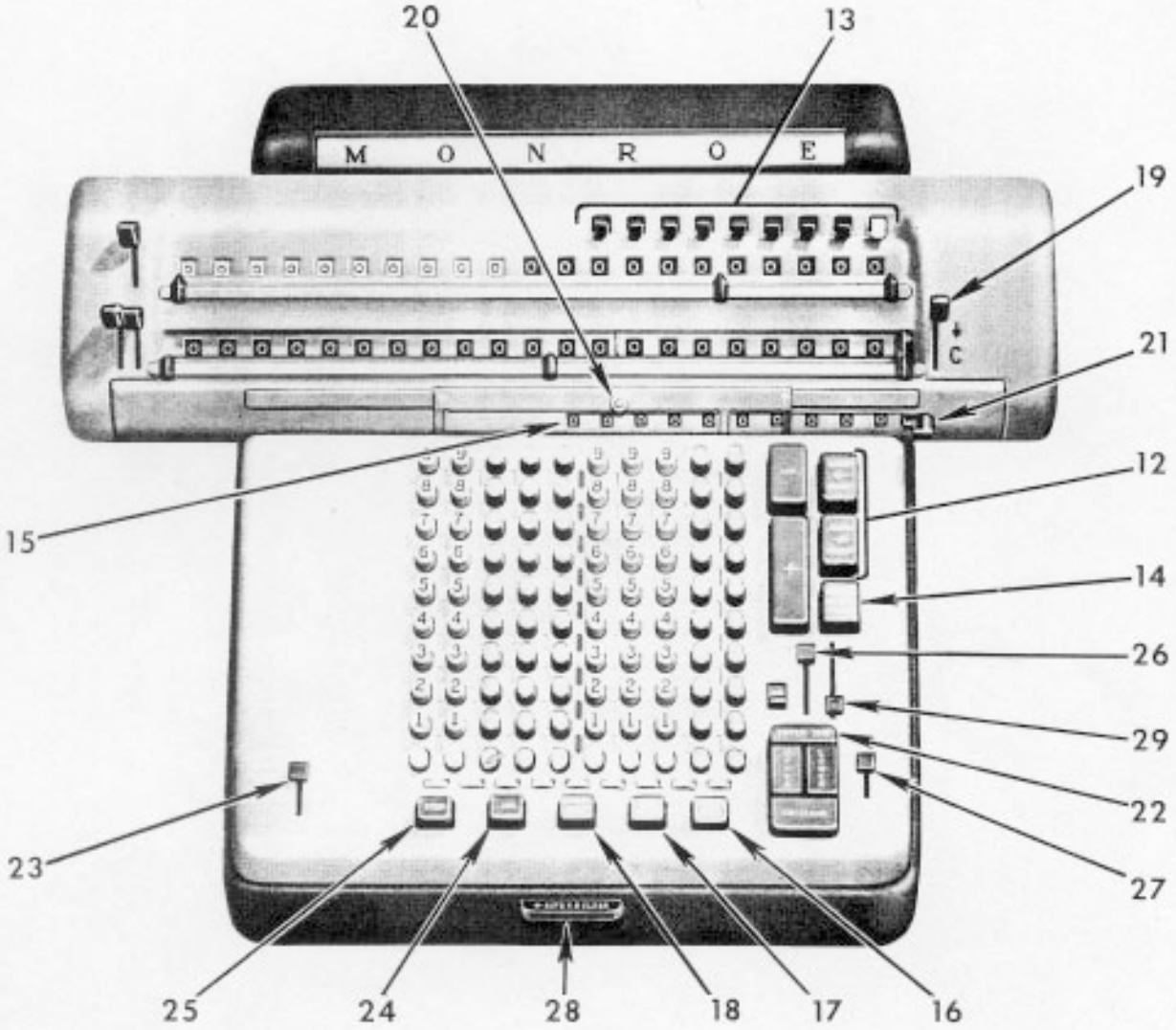
16 Clear Multiply Key After an amount has been registered in the multiplier dials when the carriage is in the first position, depressing the CLEAR MULT key clears the upper and lower dials and the amount set on the keyboard is automatically multiplied by the amount in the multiplier dials. At the completion 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 CLEAR MULT is depressed, the upper and lower dials clear and the carriage returns to a tab stop or the first position.

17 Accumulative Multiply Key The ACC MULT key is used for accumulative multiplication and operates only with the carriage in the first position. When the key is depressed the amount on the keyboard is multiplied by the amount in the multiplier dials and the product is automatically added into an amount previously registered in the lower dials. The multiplier is also added to whatever amount may be in the right upper dials.

18 Negative Multiply Key The NEG MULT key also operates only when the carriage is in the first position. When it is depressed the amount on the keyboard is multiplied negatively by the amount in the multiplier dials and subtracted from whatever amount may be in the lower dials. The multiplier is registered in the upper dials negatively unless the change lever is in the ÷ position.

19 Constant Multiplier Lever To retain an amount in the multiplier dials for using it 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 a series is performed. When the constant lever is down other figures cannot be entered in the multiplier dials.

20 Transfer Slide The principal function 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 and



12	Carriage Shift Keys	21	Transfer Lever
13	Tab Stops	22	Enter Dividend Key
14	Enter Multiplier Key	23	Dividend Alignment Lever
15	Multiplier Dials	24	Divide Key
16	Clear Multiply Key	25	Stop Key
17	Accumulative Multiply Key	26	Change Lever
18	Negative Multiply Key	27	Change Lever Lock
19	Constant Multiplier Lever	28	Automatic Keyboard Clear
20	Transfer Slide	29	Non-entry Lever

seating it. 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 transfer is said to be in the 4 position.

21 Transfer Lever The transfer lever is used for transferring an amount in the lower dials to the multiplier dials. It can be operated only when the carriage is in any but the first position. Shifting the transfer lever to the left as far as possible and depressing the CLEAR MULT key automatically transfers the lower dials amount into the multiplier dials; also the carriage automatically shifts to the first position.

22 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.

23 Dividend Alignment Lever This 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 remains up for all regular work.

24 Divide Key The key marked DIV is used for performing automatic division. When the DIVD ALIGN is up, depressing 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; 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 automatic division is started.

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

26 Change Lever The change lever, which controls the direction of rotation of the upper dials, functions automatically in all regular operations.

27 Change Lever Lock For special applications the change lever can be locked in either the × or ÷ position by shifting down this lever.

28 Automatic Keyboard Clear Normally this lever remains in its left-hand position, indicated by the arrow, 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.

29 Non-entry Lever When, in certain applications, multipliers or other plus and minus counts are not to be registered in the right upper dials, the NON-ENTRY lever is shifted to its upper position. If the NON-ENTRY lever is in the upper position and the change lever (26) is to be locked in the × position, moving the change lever lock (27) down automatically causes the NON-ENTRY control to shift down into its normal position; when the NON-ENTRY lever is returned to the upper position it automatically releases the change lever lock.

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.

Since all the arithmetical processes are frequently called for in a single figuring job of engineering, decimals can be set to provide for performing any combination of these and for

changing readily from one to another. A standard decimal set-up for the Monroe 8N that is preferred by many operators is: Keyboard 5, upper dials 5, lower dials 10. In conjunction with this decimal set-up, a tab stop is set at 6 and the transfer slide at 5.

CONTROL SETTINGS

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 and in the applications, the recommended settings of the controls for the desired 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 a regular or normal position 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
Change lever	× position
Change lever lock	Up
Non-entry lever	Down
Automatic keyboard clear	Left position
Dividend alignment lever	Up
Dials locks	Up
Constant multiplier lever	Up
Transfer slide	To extreme right
Tab stops	None