

1978 DATA CATALOG



GENERAL INSTRUMENT CORPORATION • MICROELECTRONICS



**C/CF-580 SERIES
C/CF-590 SERIES
C/CF-680 SERIES**

GENERAL INFORMATION

Display Calculator Circuits

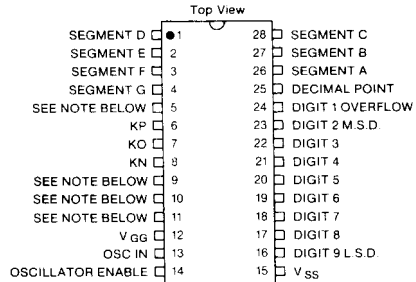
FEATURES

- Printed circuit board compatibility of circuits.
- Direct segment drive for LED displays (C-XXX)
- Direct fluorescent display drive (CF-XXX)
- Direct segment and digit drive for LED display (C-6XXD and C-16XXD)
- Algebraic operation
- Automatic constant
- Floating point operation
- Constant or chain operation (no switch required)
- Leading zero suppression
- Automatic power-on clear
- Internal clock (on-chip oscillator)
- Internal keyboard debounce logic

DESCRIPTION

General Instrument's broad line of display calculator circuits, the C/CF-500 Series and the C/CF-600 Series, consists of pin-for-pin compatible circuits (except C-6XXD and C-16XXD series) designed to fit in the same basic PC board. This provides a high degree of flexibility in calculator models manufactured while minimizing the tooling required.

PIN CONFIGURATION 28 LEAD DUAL IN LINE



NOTE:
All Display Calculator circuits offered by General Instrument (except C-6XXD and C-16XXD series) have identical pin functions on all pins except pins 5, 9, 10 and 11. These pins are utilized for the distinctive functions of each calculator circuit model as described on the following pages of this section.

FUNCTION	DESCRIPTION	9V LED	9V FLUOR.	9V LED DIRECT DRIVE		15V FLUOR.	15V LED
8 DIGIT BASIC	4 functions and percent key.	C-683	CF-683	C-683D	C-1683D	CF-583	C-583
	4 functions, percent key, one-key or multi-key memory.	C-685	CF-685	C-685D	C-1685D	CF-585	C-585
8 DIGIT ALGEBRA	4 functions, percent key, x^2 , \sqrt{x} , $1/x$, $+/-$, one-key or multi-key memory, choice of 20 to 29 keys.		CF-687	C-687D	C-1687D	CF-589	C-589
	4 functions, percent key, x^2 , \sqrt{x} , $1/x$, $+/-$, one-key or multi-key memory, brackets, inch-centimeter conversion, choice of 24 to 30 keys.		CF-689	C-689D	C-1689D	CF-689HV	—
9 DIGIT BASIC	4 functions and percent key.					CF-593	C-593
	4 functions, percent key, one-key memory.					CF-594	C-594
	4 functions, percent key, multi-key memory.					CF-595	C-595
9 DIGIT SCIENTIFIC	Basic 4 functions, scientific notation, sin, cos, tan, arc sin, arc cos, arc tan, memory, square root, pi, natural logs, $1/x$, e^x , memory exchange, degrees and radians, exponent range ± 99 , choice of 19 to 35 keys.					CF-596	C-596
	All the above plus: 0 to 10^{99} degree trig range, \log_{10} , y^x , extended digit accuracy of transcendentals, choice of 21 to 38 keys.					CF-598	C-598
	All the above plus: two levels of parenthesis, x^2 , %, $+/-$, choice of 24 to 41 keys.					CF-599	C-599



I THE FOLLOWING APPLY AS NOTED:

A. AUTOMATIC CONSTANT (All circuits)

The answer from any operation is entered automatically as a Constant by the = key without a constant switch. The Constant may then be used with all five functions and the answer from any Constant calculation can be used for further calculations without re-entry. This provides an extremely powerful facility for solving many complex equations without the need for writing down or remembering intermediate results. It is particularly useful for raising to a power, compound interest calculations, nth roots, depreciation calculations, etc. In constant multiplication, the constant is the first entered number (constant multiplicand). In division, addition and subtraction, the constant is the second entered number. The completion of the first operation with the depression of the = key initiates the storage of the constant number. For subsequent operations it is only necessary to enter a number and depress the = key.

B. DECIMAL ALIGNMENT (C/CF-593, C/CF-594, C/CF-595)

The results of addition or subtraction will remain aligned to the preceding number having the most decimal places. This feature allows computation in the dollar and cents mode without suppression of the zeros to the right of the decimal point. If a right shift is needed to keep the eight most significant digits, the least significant digits are lost. The results of multiplication and division will be completely right adjusted such that only the most significant digits are displayed except during overflow.

C. CAPACITY (All except Scientific Circuits)

For the C/CF-580 Series and the C/CF-680 Series, in the case of overflow, the eight most significant digits are displayed (seven digits and minus sign for negative answers) all decimal points are lit and the keyboard is locked out. Only the operation of the clear key will allow continued operation. On depression of the clear key, the decimal point is shifted eight places to the left of its actual position.

For the C/CF-593, 594 and 595, in the case of overflow, the overflow symbol is displayed, and the decimal point shifted eight places to the left of its actual position. Under these conditions, the keyboard is locked out such that only the operation of the clear key will allow continued operation.

In all cases, for an attempted entry requiring more than eight display digits, the most significant digits are protected upon the attempted entry of another digit. The keyboard is not locked out and operations are still able to be performed.

When division by zero is attempted, an overflow condition results and a zero is displayed.

D. PERCENT KEY (all except C/CF-596 and 598)

Multiplies the two preceding entries and divides by 100, and when followed by = gives add-on and discount: $A+B\%$ yields $(AB/100)$; $A+B\%=$ yields $A+(AB/100)$. $A-B\%$ yields $(AB/100)$, $A-B\%=$ yields $A-(AB/100)$.

E. CHANGE NOTATION KEY (Scientific Circuits)

Depression of the CHG NOT key will convert the displayed number to scientific notation, if it is in the "normal" mode, or it will display the 8 most significant digits of a scientific mantissa with the decimal point correctly located (even if it falls beyond the display area) and trailing zeroes shall be blanked. In addition, for numbers less than one, the digits are left shifted until all leading zeroes have been eliminated.

F. EXPONENT KEY (Scientific Circuits)

EEX: This key operates as follows: The EEX key sets the two right most digits to zero, the third digit from the right is blanked and the calculator is conditioned to accept sign and numeral keys to define the exponent value of the number entry. If the mantissa had numbers in any of the last three digit positions, these are retained but not displayed.

G. FUNCTION KEY OPERATIONS

(Used only with dual-function keys)

Depression of the F key sets the calculator in the "Function" mode and the F indicator is lit. The dual function keys will then function as indicated by their upper case designation. Single function keys directly perform the indicated function.

Depression of the second key of the sequence resets the "Function" mode and the F indicator is turned off when the answer is displayed. The "Function" mode can also be reset by a second depression of the F key.

II THE FOLLOWING APPLY AS NOTED TO CIRCUITS WITH MEMORY:

A. MEMORY DESCRIPTION: One-Key memory as provided in C/CF-585, 589, 594, 685, C-685D, 687D, 689D, 1685D, 1687D, 1689D, and CF-689.

M: The Memory key is used in conjunction with other function keys to define a two key sequence which sets a mode of operation associated with the memory register and terminates any immediately preceding entry.

Operation of the M key followed by + adds the contents of the display register to the memory register without altering the contents of the display register.

Operation of the M key followed by - subtracts the contents of the display register without altering the contents of the display register.

Operation of the M key followed by = transfers the contents of the memory register into the display register without altering the contents of the memory register.

Operation of the M key followed by C/CE clears the contents of the memory register.

Operation of the M key followed by the X key performs a memory-display exchange function. The contents of the memory register are brought out to the display register and the contents of the display register are written into the memory register, replacing the previous contents of the memory register.

Operation of the M key followed by any key other than +, -, X, =, or C/CE shall reset the M condition and act upon the subsequent entry as if the M had not been entered.

In addition, two optional keys are provided with the C/CF-594 for operation as follows:

MR, MEMORY READ: Functions identically to the M = sequence above.

MC, MEMORY CLEAR: Functions identically to the M C/CE sequence above.

B. MEMORY DESCRIPTION: Multi-key memory as provided in all algebra, scientific circuits, and C-685D.

MR, MEMORY READ: Functions identically to the M = sequence above.

MC, MEMORY CLEAR: Functions identically to the M C/E sequence above.

M+, MEMORY PLUS: Functions identically to the M+ sequence above.

M-, MEMORY MINUS: Functions identically to the M- sequence above.

MEX, MEMORY EXCHANGE: Functions identically to the MX sequence above.

In addition, the C/CF-589 are provided with a STORE key which transfers the contents of the display to memory without changing the display.

C. MEMORY DESCRIPTION: Multi-key memory as provided in C/CF-585, 595 and 685.

MC, MEMORY CLEAR: clears the memory while leaving the display intact.

MR, MEMORY READ: transfers the data in memory to the display without changing the memory.

M $\bar{=}$, MEMORY EQUALS/PLUS: completes the preceding operation, displays the result, and adds the result to the memory.

M $\bar{-}$, MEMORY EQUALS/MINUS: completes the preceding operation, displays the result and subtracts the result from the memory.

In addition, the C/CF-585 and C/CF-685 are provided with a MEX (Memory Exchange) Key which functions as previously described.

The C/CF-595 is provided with the following additional memory keys:

MR/MC, MEMORY READ/MEMORY CLEAR: this single key operation transfers the memory data to the display on the first depression. When depressed two successive times, the memory data is transferred to the display and the memory cleared.

Σ , SUM KEY: when connected to V_{SS} , this accumulate switch, independent of the keyboard, adds the contents of the display to memory with each depression of the equals key.



ELECTRICAL CHARACTERISTICS

Maximum Ratings*	Fluorescent Display CF-5XX Series	LED Display C-5XX Series	Fluorescent Display CF-6XX Series	LED Display C-6XX/ C-6XXD/C-16XXD Series
V _{CC} supply voltage range ¹	-20V to +0.3V	-20V to +0.3V	-15V to +0.3V	-15V to +0.3V
Clock input voltage range ¹	-20V to +0.3V	-20V to +0.3V	-15V to +0.3V	-15V to +0.3V
Data input voltage range ¹	-32V to +0.3V	-20V to +0.3V	-30V to +0.3V	-15V to +0.3V
Applied output voltage range ¹	-32V to +0.3V	-20V to +0.3V	-30V to +0.3V	-15V to +0.3V
Maximum power dissipation at +25°C ²	500 mW			
Storage temperature range	-20°C to +70°C			
Operating free-air temperature range	0°C to +40°C			
Relative humidity range (no condensation)	0 to 95%			

All inputs and outputs are internally protected against static charge damage during handling consistent with standard industry practices.

*Exceeding these ratings could cause permanent damage. Functional operation of these devices at these conditions is not implied—operating ranges are specified below.

¹ Measured with respect to V_{SS}.

² Derate at 10mW/°C.

Operating Conditions	CF-5XX Series Range			C-5XX Series Range			C/CF-6XX Series Min. Typ. Max.			C-6XXD/C-16XXD Series Min. Typ. Max.		
	V _{SS} , substrate supply	OV			OV			OV			OV	
V _{CC} , gate supply: C/CF-5XXA	-15.0V±5%			-15.0V±5%			—			—		
C/CF-5XXB	-16.0V±5%			-16.0V±5%			—			—		
C/CF-5XXC	-17.0V±5%			-17.0V±5%			—			—		
C/CF-6XXA	—			—			-10.3V -7.5V -6.5V			-9.5V -7.5V -6.5V		
C/CF-6XXB, C-6XXD	—			—			-9.5V -7.5V -6.5V			-9.0V -7.5V -7.0V		
C-16XXD	—			—			—			—		
Characteristics— at typical operating conditions over a 0°C to +40°C range.	CF-5XX/6XX Series Min. Typ. Max.			C-5XX Series Min. Typ. Max.			C-6XX Series Min. Typ. Max.			C-6XXD/C-16XXD Series Min. Typ. Max.		
Keyboard input characteristics-												
Input signal levels: Logic 0	-1.5V — 0V			-1.5V — 0V			-0.5V — 0V			-0.5V — 0V		
Logic 1	V _{CC} — -6.0V			V _{CC} — -6.0V			V _{CC} — -4.0V			V _{CC} — -4.0V		
Keyboard resistance	— — 1K			— — 1K			— — 1K			— — 1K		
Output buffer characteristics-³												
Segment output on-resistance: at -0.5V V _{OUT}	— — —			— — —			— 200Ω 300Ω			— 1K 1.3K ⁴		
at -1.5V V _{OUT}	— 200Ω 600Ω			— 200Ω 300Ω			— — —			— — —		
Digit output on-resistance at -1.5V V _{OUT}	— 200Ω 300Ω			— 200Ω 300Ω			— 200Ω 300Ω			— 30Ω 50Ω ⁵		
Digit and segment off-leakage: at V _{OUT} = -9V	— — —			— — 18μA			— — 18μA			— — 100μA ⁶		
at V _{OUT} = -27V (CF-590, CF-680 Series)	— — —			— — —			— — —			— — —		
or V _{OUT} = -30V (CF-580 Series)	— — 18μA			— — —			— — —			— — —		
Anode and grid supply voltage through 200K resistor: CF-580 Series	-30V -24V —			— — —			— — —			— — —		
CF-590, CF-680 Series	-27V -24V —			— — —			— — —			— — —		
Power (all outputs off)-												
at V _{CC} = -16.0V, C/CF-580 Series	— 75mW 100mW			— 75mW 100mW			— — —			— — —		
at V _{CC} = -16.0V, C/CF-590 Series	— 100mW 125mW			— 100mW 125mW			— — —			— — —		
at V _{CC} = -7.5V, C-680 Series	— — —			— — —			— 15mW 30mW			— 15mW 30mW		

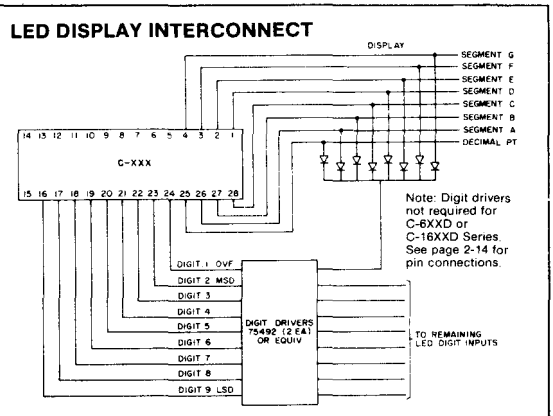
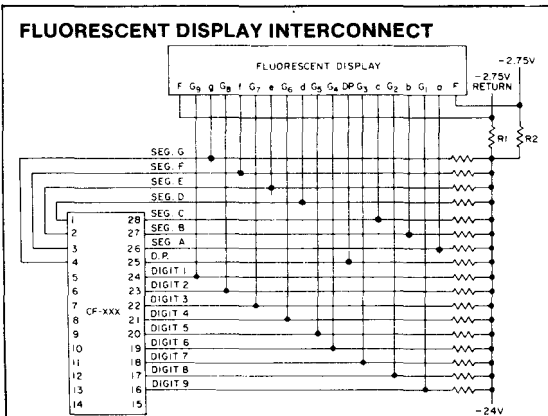
³ All output buffers are open-drain to V_{SS}.

⁴ Typical values are at +25°C and nominal voltages.

⁴ At 4mA.

⁵ At 36mA.

⁶ At -9V



Note: Digit drivers not required for C-6XXD or C-16XXD Series. See page 2-14 for pin connections.



C-583 C-683
CF-583 CF-683

8 Digit / 5 Function Basic Calculator Circuits

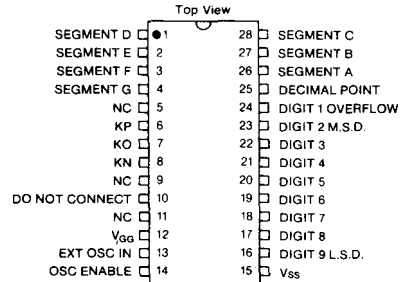
FEATURES

- 8 digit, 7 segment display outputs.
- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).
- Floating negative sign.
- Right-justified entry and result.
- C-583 and C-683: direct LED segment drive.
- CF-583 and CF-683: direct fluorescent display drive.
- All other features listed on the first page of this section.

DESCRIPTION

The C/CF-583 and C/CF-683 circuits are basic five-function circuits which may be used with either eight or nine digit LED or fluorescent displays. They compute and display the results of calculations with numbers up to eight digits (seven for negative). On overflow, the keyboard is locked and all decimal points are lighted. In addition, an overflow symbol will appear in the ninth digit position for those calculators having nine digit displays.

PIN CONFIGURATION 28 LEAD DUAL IN LINE

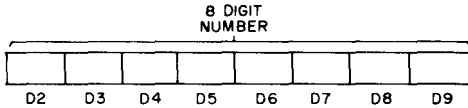


NOTE:

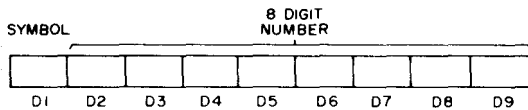
The oscillator is enabled by connecting a resistor from V_{GG} to pin 14 (150K±10% for C/CF-583, 470K±10% for C/CF-683).

DISPLAY

8 DIGIT DISPLAY



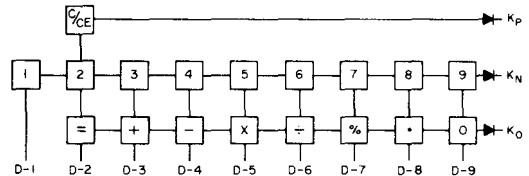
OPTIONAL 9 DIGIT DISPLAY



DISPLAY FONT

0 1 2 3 4 5 6 7 8 9 N E G
0 1 2 3 4 5 6 . 7 8 9 S I G N
- C. E R R O R

KEY MATRIX



Note: Diodes used only for CF-583 and CF-683.

CONSUMER



C-585 C-685
CF-585 CF-685

8 Digit / 5 Function Basic Calculator Circuits With One-Key or Multi-Key Memory

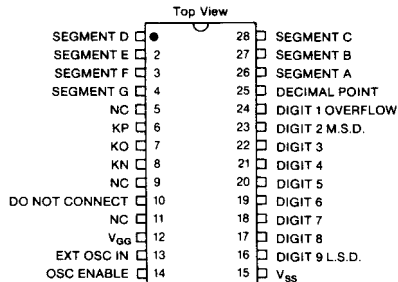
FEATURES

- 8 digit, 7 segment display outputs.
- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).
- Floating negative sign.
- Right-justified entry and result.
- One-key or multi-key memory function (refer to the description at the beginning of this section.)
- C-585 and C-685: direct LED segment drive.
- CF-585 and CF-685: direct fluorescent display drive.
- All other features listed on the first page of this section.

DESCRIPTION

The C/CF-585 and C/CF-685 circuits are basic five-function memory circuits which offer the user the highest degree of functional flexibility in implementing a memory calculator. The circuits include all the features of the C/CF-583 and C/CF-683 circuits with the addition of the memory function.

PIN CONFIGURATION 28 LEAD DUAL IN LINE

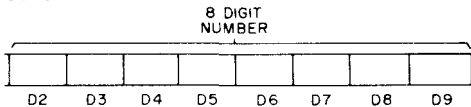


NOTE:

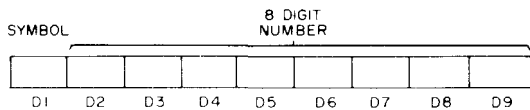
The oscillator is enabled by connecting a resistor from V_{GG} to pin 14 (150K ±10% for C/CF-585, 470K ±10% for C/CF-685).

DISPLAY

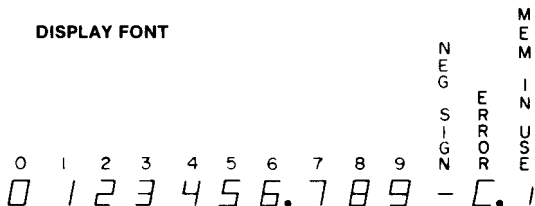
8 DIGIT DISPLAY



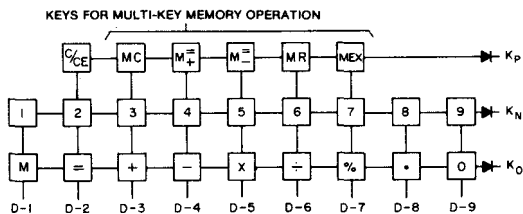
OPTIONAL 9 DIGIT DISPLAY



DISPLAY FONT



KEY MATRIX



Note: Diodes used only for CF-585 and CF-685



8 Digit / 9 Function Algebra Calculator Circuits With One-Key or Multi-Key Memory

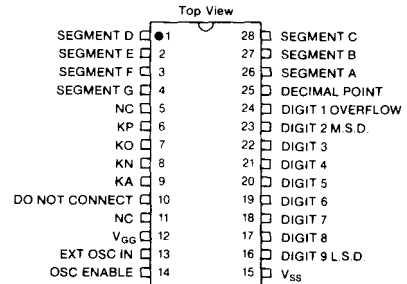
FEATURES

- 8 digit, 7 segment display outputs.
- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).
- Convenience functions (x^2 , \sqrt{x} , $1/x$, +/-)
- Floating negative sign.
- Right-justified entry and result.
- One-key or multi-key memory function (refer to the description at the beginning of this section.)
- C-589: direct LED segment drive.
- CF-589: direct fluorescent display drive.
- All other features listed on the first page of this section.

DESCRIPTION

The C/CF-589 circuits are basic eight-function memory circuits which offer the user the highest degree of functional flexibility in implementing a memory calculator. The circuits include all the features of the C/CF-585 circuits with the addition of the functions x^2 , \sqrt{x} , $1/x$ and +/- . The C/CF-589 circuits may be operated with either single or dual function keys with a keyboard configuration of from 20 to 29 keys.

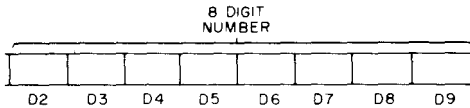
PIN CONFIGURATION 28 LEAD DUAL IN LINE



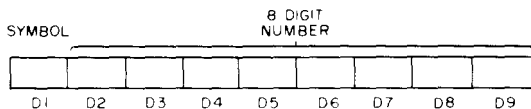
NOTE:
The oscillator is enabled by connecting a 150k ±10% resistor from V_{GG} to pin 14.

DISPLAY

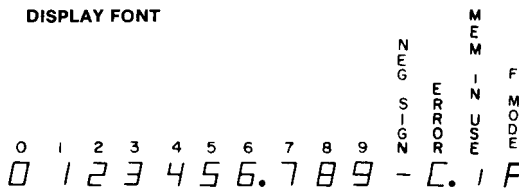
8 DIGIT DISPLAY



OPTIONAL 9 DIGIT DISPLAY

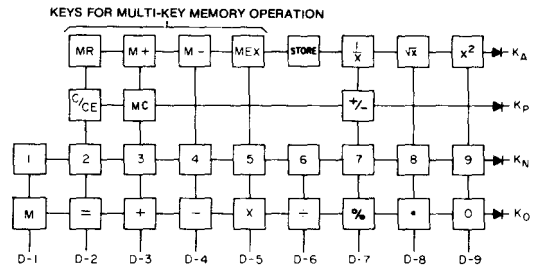


DISPLAY FONT

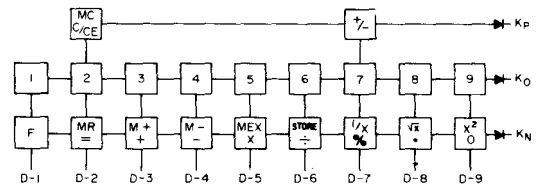


KEY MATRIX

SINGLE FUNCTION KEYS



DUAL FUNCTION KEYS



Note: Diodes used only for CF-589.

CONSUMER



C-593

CF-593

9 Digit / 5 Function Basic Calculator Circuits

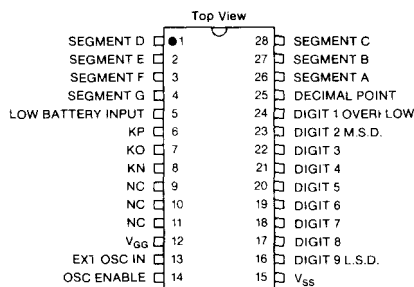
FEATURES

- 8 digit, 7 segment display outputs with ninth digit for sign or symbol.
- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).
- Floating negative sign.
- Right-justified entry and result.
- Results of addition or subtraction remain aligned to preceding number having most decimal places.
- C-593: direct LED segment drive.
- CF-593: direct fluorescent display drive.
- All other features listed on the first page of this section.

DESCRIPTION

The C/CF-593 circuits are basic five-function circuits for use with nine digit LED or fluorescent displays. These circuits enter and compute both positive and negative numbers to an eight digit resolution. On overflow, the overflow symbol is displayed in the ninth digit position, the decimal point is automatically shifted eight positions to the left of its computed position and the keyboard is locked.

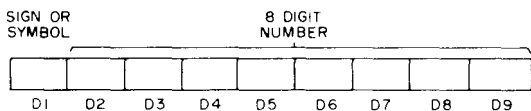
PIN CONFIGURATION 28 LEAD DUAL IN LINE



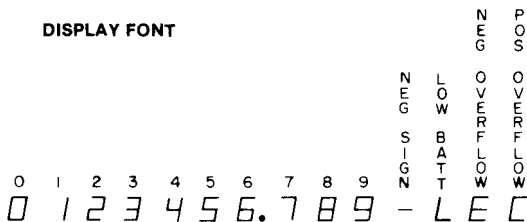
NOTE:
The oscillator is enabled by connecting a 150K \pm 10% resistor from V_{GG} to pin 14.

DISPLAY

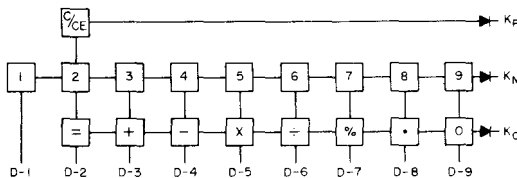
9 DIGIT DISPLAY



DISPLAY FONT



KEY MATRIX



Note: Diodes used only for CF-593.



C-594

CF-594

9 Digit / 5 Function Basic Calculator Circuits With One-Key Memory

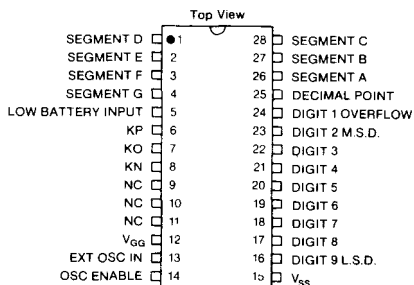
FEATURES

- 8 digit, 7 segment display outputs with ninth digit for sign or symbol.
- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).
- Floating negative sign.
- Right-justified entry and result.
- Results of addition or subtraction remain aligned to preceding number having most decimal places.
- One-key memory operation, with option for two additional memory function keys (refer to the description at the beginning of this section).
- C-594: direct LED segment drive.
CF-594: direct fluorescent display drive.
- All other features listed on the first page of this section.

DESCRIPTION

The C/CF-594 circuits enable a manufacturer to add a memory calculator to his line with the simple inclusion of one additional memory key in the matrix of the C/CF-593 keyboard. All other operations are identical to the C/CF-593.

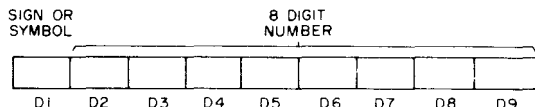
PIN CONFIGURATION 28 LEAD DUAL IN LINE



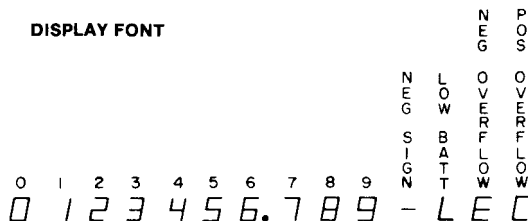
NOTE:
The oscillator is enabled by connecting a 150K \pm 10% resistor from VGG to pin 14.

DISPLAY

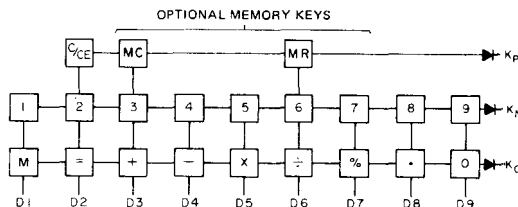
9 DIGIT DISPLAY



DISPLAY FONT



KEY MATRIX



Note: Diodes used only for CF-594.

CONSUMER



C-595

CF-595

9 Digit / 5 Function Basic Calculator Circuits With Multi-Key Memory

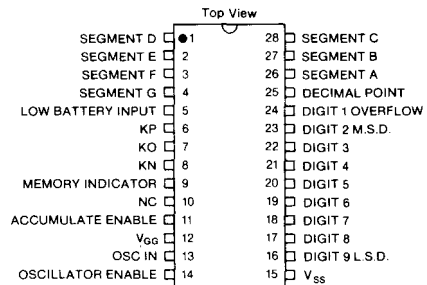
FEATURES

- 8 digit, 7 segment display outputs with ninth digit for sign or symbol.
- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).
- Floating negative sign.
- Right-justified entry and result.
- Results of addition or subtraction remain aligned to preceding number having most decimal places.
- Multi-key memory operation and automatic accumulating memory (refer to the description at the beginning of this section.)
- C-595: direct LED segment drive.
- CF-595: direct fluorescent display drive.
- All other features listed on the first page of this section.

DESCRIPTION

The C/CF-595 circuits add a variety of memory options to the basic C/CF-593 functions. While the basic pin configuration is identical to the C/CF-593, two additional connections are provided for a selectable "memory accumulate" switch and a "memory in use" indicator output.

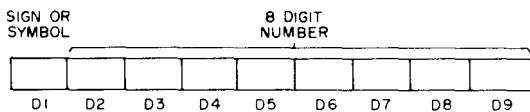
PIN CONFIGURATION 28 LEAD DUAL IN LINE



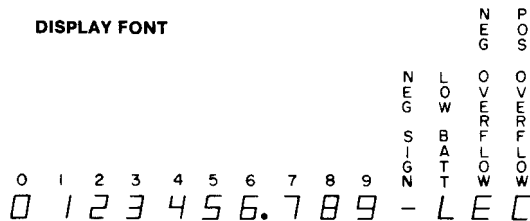
NOTE:
The oscillator is enabled by connecting a 150K ±10% resistor from V_{GG} to pin 14.

DISPLAY

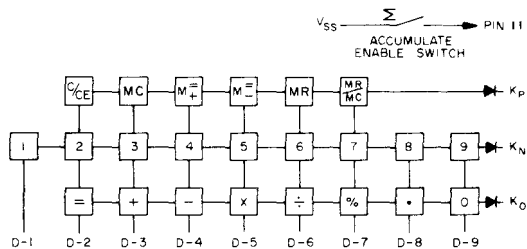
9 DIGIT DISPLAY



DISPLAY FONT



KEY MATRIX



Note: Diodes used only for CF-595.



C-596

CF-596

9 Digit / 15 Function Scientific Calculator Circuits

FEATURES

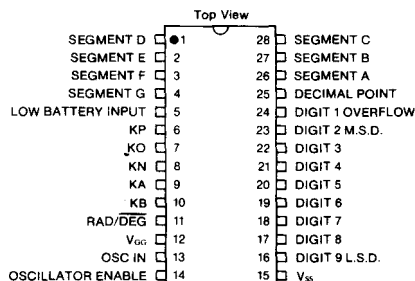
- Number entry in floating point or scientific notation.
- 9 digit output with 5 digits of the mantissa displayed, 2 digits for the exponent, and 2 digits for the sign of the mantissa and exponent.
- 8 digit display and sign for numbers not requiring scientific notation or for the display of the 8 significant digits of a number that is in scientific notation.
- Basic four arithmetic functions (+, -, x, ÷).
- Transcendental functions (sin, cos, tan, \sin^{-1} , \cos^{-1} , \tan^{-1} , $\ln x$ and e^x).
- Convenience functions (\sqrt{x} , $1/x$).
- A separate memory register (refer to the description at the beginning of this section).
- Trigonometric functions are performed in degrees or radians (switch selectable).
- π key to display the value of π .
- Left-justified entry and result.
- User option for single or dual function key operation.
- C-596: direct LED segment drive.
- CF-596: direct fluorescent display drive.
- All other features described on the first page of this section.

DESCRIPTION

The C/CF-596 circuits are fifteen function circuits which offer trigonometric and inverse trigonometric functions, natural logs, e^x , \sqrt{x} , $1/x$ and π as well as the basic four functions and memory.

PIN CONFIGURATION

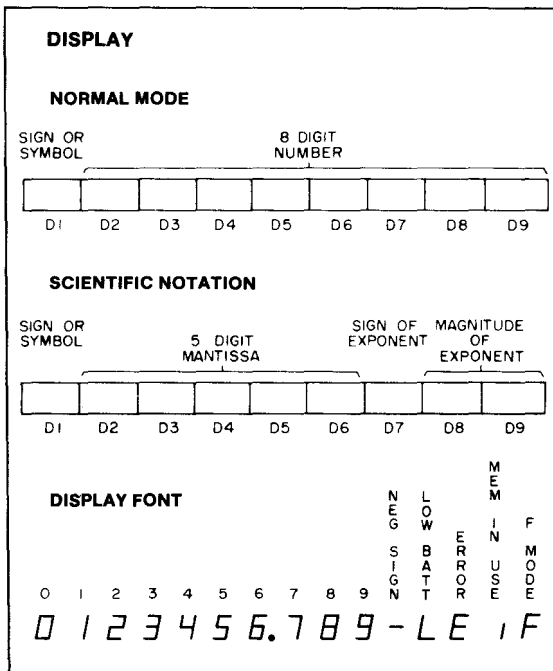
28 LEAD DUAL IN LINE



NOTE:
The oscillator is enabled by connecting a 470K $\pm 10\%$ resistor from V_{GG} to pin 14.

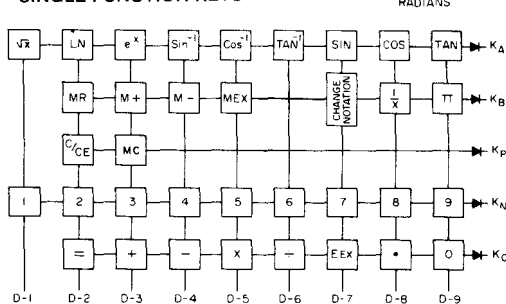
The circuit operates in the normal 8 digit mode until the display capacity is exceeded at which time it converts to the scientific mode of operation.

The C/CF-596 features single or dual function key operation for a keyboard configuration of from 19 to 35 keys.

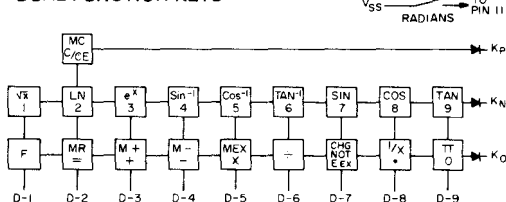


KEY MATRIX

SINGLE FUNCTION KEYS



DUAL FUNCTION KEYS



Note: Diodes used only for CF-596.

CONSUMER



C-598

CF-598

9 Digit / 18 Function Scientific Calculator Circuits

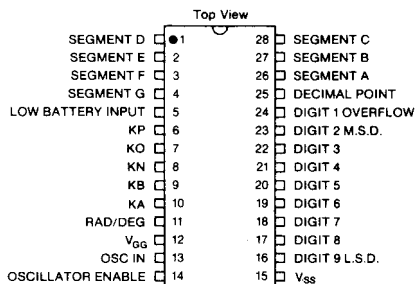
FEATURES

- Number entry in floating point or scientific notation.
- 9 digit output with 5 digits of the mantissa displayed, 2 digits for the exponent, and 2 digits for the sign of the mantissa and exponent.
- 8 digit display and sign for numbers not requiring scientific notation or for the display of the 8 significant digits of a number that is in scientific notation.
- Basic four arithmetic functions (+, -, x, ÷).
- Transcendental functions (sin, cos, tan, sin⁻¹, cos⁻¹, tan⁻¹, ln x, e^x, log₁₀ and 10^x).
- Convenience functions (√x, 1/x, y^x).
- A separate memory register (refer to the description at the beginning of this section).
- Trigonometric functions are performed in degrees or radians (switch selectable).
- π key to display the value of π.
- Left-justified entry and result.
- User option for single or dual function key operation.
- C-598: direct LED segment drive.
- CF-598: direct fluorescent display drive.
- All other features described on the first page of this section.

DESCRIPTION

The C/CF-598 circuits are eighteen function circuits whose operations are identical to the C/CF-596 with the addition of three functions: log₁₀, 10^x and Y^x. Single or dual function key operation is optional with keyboard configurations of from 21 to 38 keys.

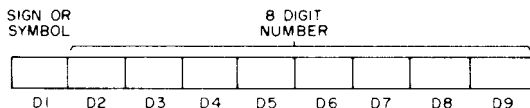
PIN CONFIGURATION 28 LEAD DUAL IN LINE



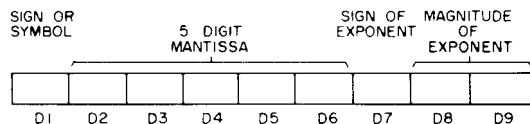
NOTE:
The oscillator is enabled by connecting a 470K ±10% resistor from V_{GG} to pin 14.

DISPLAY

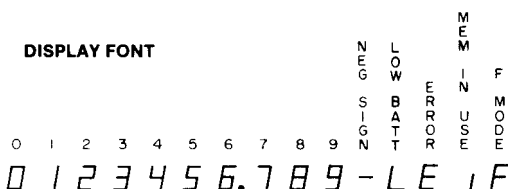
NORMAL MODE.



SCIENTIFIC NOTATION

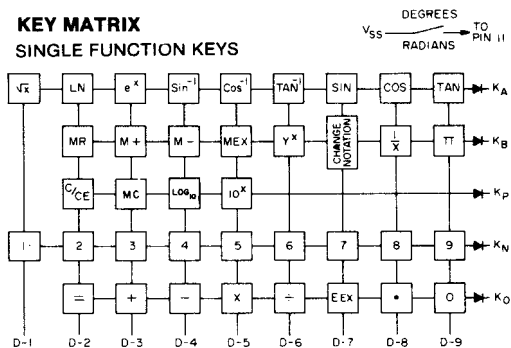


DISPLAY FONT

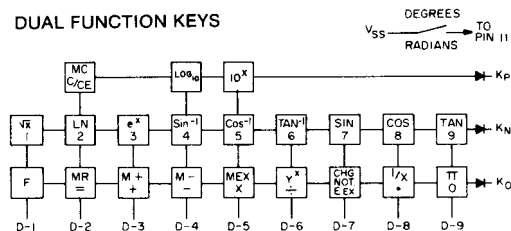


KEY MATRIX

SINGLE FUNCTION KEYS



DUAL FUNCTION KEYS



Note: Diodes used only for CF-598.



C-599

CF-599

9 Digit / 21 Function Scientific Calculator Circuits

FEATURES

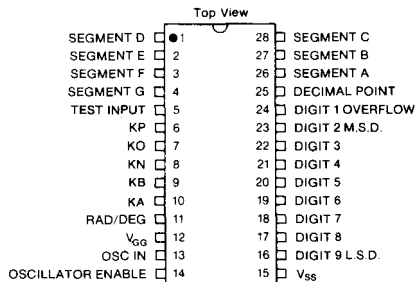
- Number entry in floating point or scientific notation.
- 9 digit output with 5 digits of the mantissa displayed, 2 digits for the exponent, and 2 digits for the sign of the mantissa and exponent.
- 8 digit display and sign for numbers not requiring scientific notation, or for the display of the 8 significant digits of a number that is in scientific notation.
- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount)
- Transcendental functions (sin, cos, tan, \sin^{-1} , \cos^{-1} , \tan^{-1} , $\ln x$, e^x , \log_{10} and 10^x).
- Convenience functions (\sqrt{x} , $1/x$, y^x , x^2 , +/-).
- A separate memory function (refer to the description at the beginning of this section).
- Two levels of parentheses.
- Trigonometric functions are performed in degrees or radians (switch selectable).
- π key to display the value of π .
- Left-justified entry and result.
- User option for single or dual function key operation.
- C-599: direct LED segment drive.
CF-599: direct fluorescent display drive.
- All other features described on the first page of this section.

DESCRIPTION

The C/CF-599 circuits are twenty-one function circuits whose

PIN CONFIGURATION

28 LEAD DUAL IN LINE

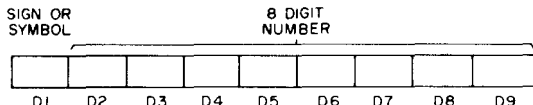


NOTE:
The oscillator is enabled by connecting a 150K \pm 10% resistor from V_{GG} to pin 14.

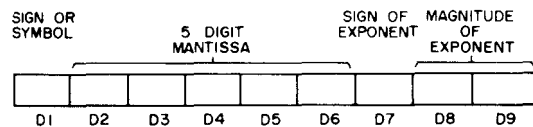
operations are identical to the C/CF-598 with the addition of two levels of parentheses and three functions: x^2 , % and +/- . Single or dual function key operation is optional with keyboard configurations of from 24 to 41 keys.

DISPLAY

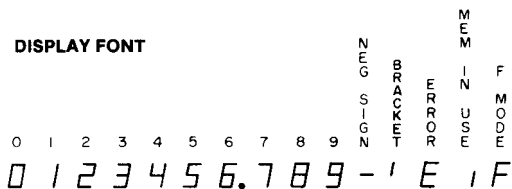
NORMAL MODE



SCIENTIFIC NOTATION

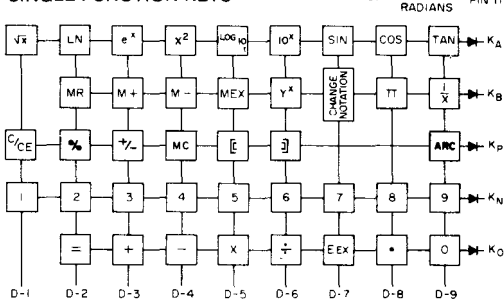


DISPLAY FONT

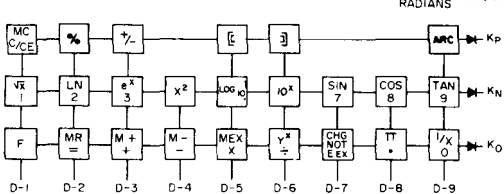


KEY MATRIX

SINGLE FUNCTION KEYS



DUAL FUNCTION KEYS



Note: Diodes used only for CF-599.

CONSUMER



C-680D Series
C-1680D Series

CF-687
CF-689
CF-689HV

8 Digit Direct Drive Algebra Calculator Circuits

FEATURES

- Direct LED segment and digit drive (except CF-687/689/689HV)
- 8 digit, 7 segment display outputs.
- Floating negative sign.
- Right-justified entry and result.
- All other features listed on the first page of this section.

C-683D/1683D: 5 Function

- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).

C-685D/1685D: 5 Function with Memory

- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).
- One-key or multi-key memory function (refer to the description at the beginning of this section).

C-687D/1687D: 11 Function with Memory

- Basic four arithmetic functions (+, -, x, ÷).
- Percent (add-on and discount).
- One-key or multi-key memory function (refer to the description at the beginning of this section).
- Convenience functions (x^2 , \sqrt{x} , $1/x$, +/-, x-y exchange)
- π key to display the value of π .
- User option for single or dual function key operation.

C-689D/1689D: 13 Function with Memory

- All features of the C-687D plus linear metric conversion (inch-cm, cm-inch) and one level of parenthesis.

CF-687: 11 Function with Memory

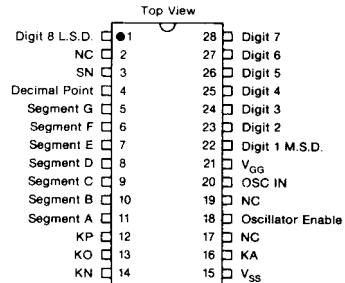
- Same as C-687D except direct fluorescent display drive.

CF-689/CF-689HV 13 Function with Memory

- Same as C-689D except direct fluorescent display drive. Supply voltage: 9V for CF-689, 15V for CF-689HV.

PIN CONFIGURATION

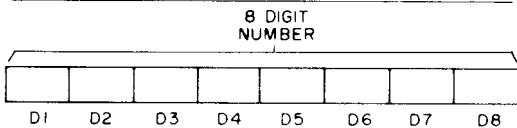
28 LEAD DUAL IN LINE
 (Also available in a 28 Lead Mini-Pak)



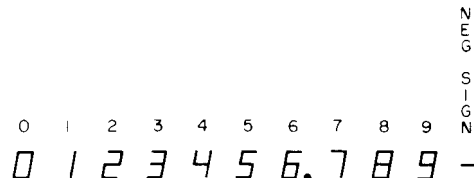
NOTE:
 The oscillator is enabled by connecting a 150K ±10% resistor from V_{GG} to pin 18.

DISPLAY

8 DIGIT DISPLAY

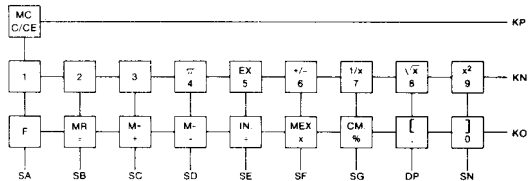


DISPLAY FONT

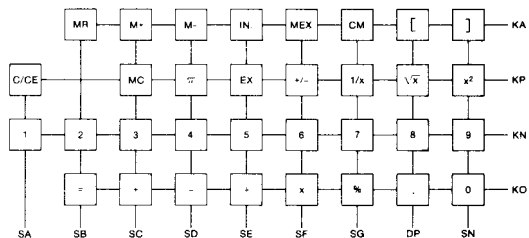


KEY MATRIX (C-689D/1689D shown)

SINGLE FUNCTION KEYS



DUAL FUNCTION KEYS





Printer Calculator Circuits

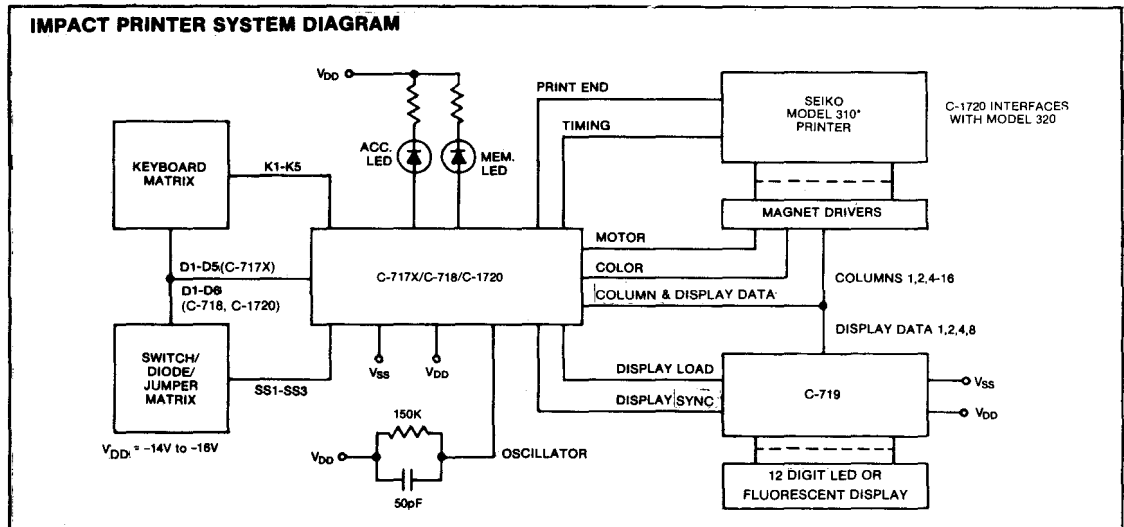
FEATURES

- 5 functions (+, -, x, ÷, %)
- Chain calculations.
- Repeat add/subtract.
- Automatic underflow and reverse underflow.
- Non-add (#)/date key.
- Memory non-zero indicators.
- Overflow indication.
- Automatic constant in multiply or divide.
- Right-justified entries and results.
- Leading zero suppression.
- 2 key rollover operation.
- Internal oscillator and power-on clear.

DESCRIPTION

The C-700 Series is a growing family of circuits for the printing calculator manufacturer which provide the capability for a broad-based, multi-feature business calculator product offering. The C-700 Series currently includes three different calculator circuits (the C-717X, C-718 and C-1720) and a printer-display interface circuit (C-719), each described on the following pages of this section.

FUNCTION	DESCRIPTION	PART NUMBER	PACKAGE	FEATURES
12 DIGIT PRINTING	Basic 4 functions and percent, automatic constant in multiply and divide, repeat add/subtract, decimal select mode, memory-in-use indicator, rounding options, non-add (#) date key, and other features. Interfaces with the Seiko Model 310 impact printer.	C-717X	40 DIP	Accumulator and Grand Total Memories.
		C-718		Accumulator, item counter, and four-key independent memory.
	All features described above, except interfaces with Seiko Model 320 impact printer.	C-1720	40 DIP	Accumulator, item counter, and four-key independent memory.
PRINTER-DISPLAY INTERFACE	Adds display capability to the C-717X, C-718 and C-1720 printing calculator circuits.	C-719	28 DIP	For both LED and fluorescent displays.



CONSUMER



C-717X

12 Digit / 5 Function Impact Printer Calculator Circuit with Accumulator and Grand Total Memory

FEATURES

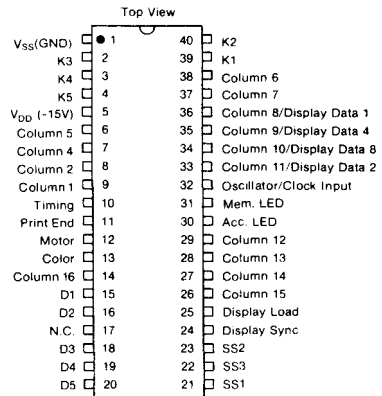
- 12 digit printout plus 2 full right-hand justified audit trail columns.
- Automatic accumulating memory (stores group totals).
- Grand total memory.
- Selectable memory modes: normal (last entry printed); (running subtotal printed); GT (grand total memory access).
- Fully arithmetic operation.
- Decimal select modes: full floating; fixed point (0-6); add mode (with hardwired secondary add mode option for quantity × dollars).
- Rounding options (truncate, 5/4 round off, 1/0 round up).
- Multistage keyboard buffer stores up to 8 keyed entries to allow uninterrupted operation during print.
- Printer and display capability (with the C-719 interface chip).
- All other features listed on the General Information page.

DESCRIPTION

The C-717X is a single MOS/LSI circuit containing all the logic functions required to implement a five-function, two memory general purpose business calculator using a Seiko Model 310 impact printer. The C-717X additionally provides signals for use with the C-719 printer-display interface chip. This allows the addition of a 12-digit fluorescent or LED display to the basic printer.

PIN CONFIGURATION

40 LEAD DUAL IN LINE



KEYBOARD SWITCH MATRIX

	D1	D2	D3	D4	D5
K1	0	5	00	.	=
K2	1	6	000	+	%
K3	2	7	=+	-	*
K4	3	8	=-	×	◇
K5	4	9	# DATE	÷	C/CE

STATIC SWITCH MATRIX

	D1	D2	D3	D4	D5
SS1	DECIMAL SELECT - SEE BELOW				
SS2			ADD MODE OPTION		PRINTER ON/OFF
SS3	◇ MODE	GT MODE	PAPER ADVANCE	TRUNCATE	ROUND OFF

DECIMAL SELECT CHART

The decimal select switch is a four-pole switch with encoded outputs during D1 thru D4 strobe periods. In the chart below, a '1' denotes a switch closure.

DECIMAL POSITION	D1	D2	D3	D4
+	1	1	0	1
F	1	0	0	1
0	1	0	0	0
1	0	1	0	0
2	1	1	0	0
3	0	0	1	0
4	1	0	1	0
5	0	1	1	0
6	1	1	1	0



12 Digit / 5 Function Impact Printer Calculator Circuit with Accumulator, Item Counter and Independent Memory

FEATURES

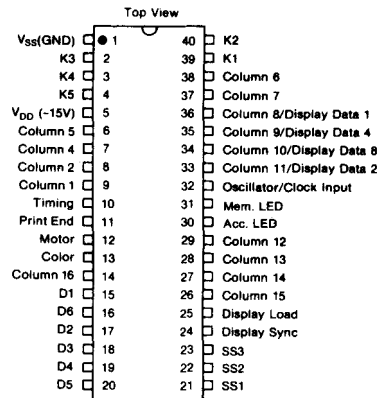
- 12 digit printout plus 2 full right-hand justified audit trail columns.
- Switch-selectable automatic accumulation.
- Three digit item counter.
- Four-key independent memory.
- Arithmetic operation in add/subtract sequences, algebraic in multiply/divide (business logic).
- Decimal select modes: full floating; fixed point (0-6, excluding 5); add mode (automatic decimal 2 in + and -, unit/price mode in ×).
- Non-coded decimal select switch input.
- Rounding options (truncate, 5/4 round off, 1/0 round up).
- Separate clear-all key.
- Full floating accuracy on intermediate results in chain operation.
- Multistage keyboard buffer stores up to 6 keyed entries to allow uninterrupted operation during print.
- Display capability (with the C-719 interface chip).
- All other features listed on the General Information page.

DESCRIPTION

The C-718 is a single MOS/LSI circuit containing all the logic functions required to implement a five-function general purpose consumer calculator with an accumulator, item counter and four-key independent memory. The C-718 has been designed to operate with a Seiko Model 320 16 column impact printer. When used with the C-719 printer-display interface, the C-1720 also provides a 12-digit display capability, using either fluorescent or LED displays.

PIN CONFIGURATION

40 LEAD DUAL IN LINE



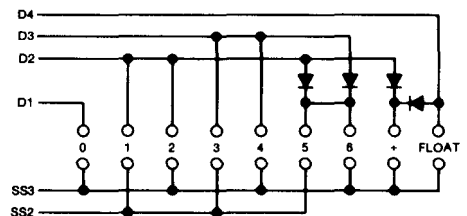
KEYBOARD SWITCH MATRIX

	D1	D2	D3	D4	D5	D6
K1	0	5	00	N	=	C/CE
K2	1	6	.	+	%	M+
K3	2	7	=+	-	*	M-
K4	3	8	=-	×	◇	M*
K5	4	9	# DATE	÷	CA	M◇

STATIC SWITCH MATRIX

	D1	D2	D3	D4	D5	D6
SS1	Σ		PAPER ADVANCE	TRUNCATE	5/4 1/0	PRINTER ON/OFF
SS2	DECIMAL SELECT - SEE BELOW					EXT. P.O.C.
SS3						

DECIMAL SELECTION





C-1720

12 Digit / 5 Function Impact Printer Calculator Circuit with Accumulator, Item Counter and Independent Memory

FEATURES

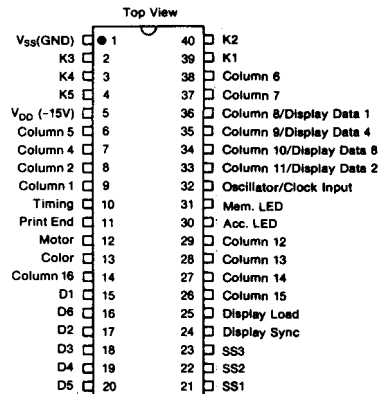
- 12 digit printout plus 2 full right-hand justified audit trail columns.
- Switch-selectable automatic accumulation.
- Three digit item counter.
- Four-key independent memory.
- Arithmetic operation in add/subtract sequences, algebraic in multiply/divide (business logic).
- Decimal select modes: full floating; fixed point (0-6, excluding 5); add mode (automatic decimal 2 in + and -, unit/price mode in ×).
- Non-coded decimal select switch input.
- Rounding options (truncate, 5/4 round off, 1/0 round up).
- Separate clear-all key.
- Full floating accuracy on intermediate results in chain operation.
- Multistage keyboard buffer stores up to 6 keyed entries to allow uninterrupted operation during print.
- Display capability (with the C-719 interface chip).
- All other features listed on the General Information page.

DESCRIPTION

The C-1720 is a single MOS/LSI circuit containing all the logic functions required to implement a five-function general purpose consumer calculator with an accumulator, item counter and four-key independent memory. The C-1720 has been designed to operate with a Seiko Model 320 16 column impact printer. When used with the C-719 printer-display interface, the C-1720 also provides a 12-digit display capability, using either fluorescent or LED displays.

PIN CONFIGURATION

40 LEAD DUAL IN LINE



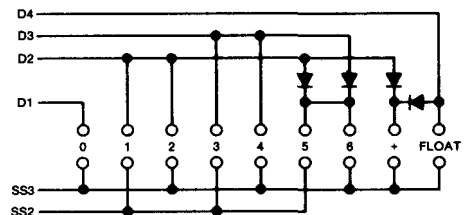
KEYBOARD SWITCH MATRIX

	D1	D2	D3	D4	D5	D6
K1	0	5	00	N	=	C/CE
K2	1	6	.	+	%	M+
K3	2	7	=+	-	*	M-
K4	3	8	=-	×	◇	M*
K5	4	9	# DATE	÷	CA	M◇

STATIC SWITCH MATRIX

	D1	D2	D3	D4	D5	D6
SS1	Σ		PAPER ADVANCE	TRUNCATE	5/4 1/0	PRINTER ON/OFF
SS2	DECIMAL SELECT - SEE BELOW					EXT. P.O.C.
SS3						

DECIMAL SELECTION





C-719

Printer-Display Interface Circuit

FEATURES

- Adds display capability to C-717X and C-718 printer chips.
- Full 12 digit display capability.
- Drives LED or fluorescent displays.

DESCRIPTION

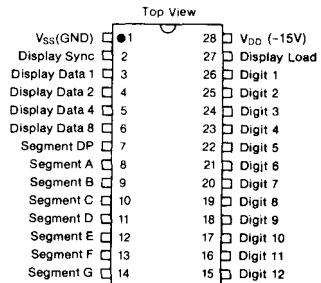
The C-719 is a single MOS/LSI circuit designed to add a 12 digit display capability to General Instrument's C-717X and C-718 printer calculator circuits. Data from the printer calculator chips is transferred to the C-719 interface chip serially and reformulated to drive seven segment multiplexed common cathode displays.

The segment and digit outputs of the C-719 are open-drain and have a breakdown voltage of -30 Volts to enable the driving of fluorescent displays with a minimum of interface components. LED displays may also be driven by the C-719 with direct drive of the segments and the addition of digit-drive buffers.

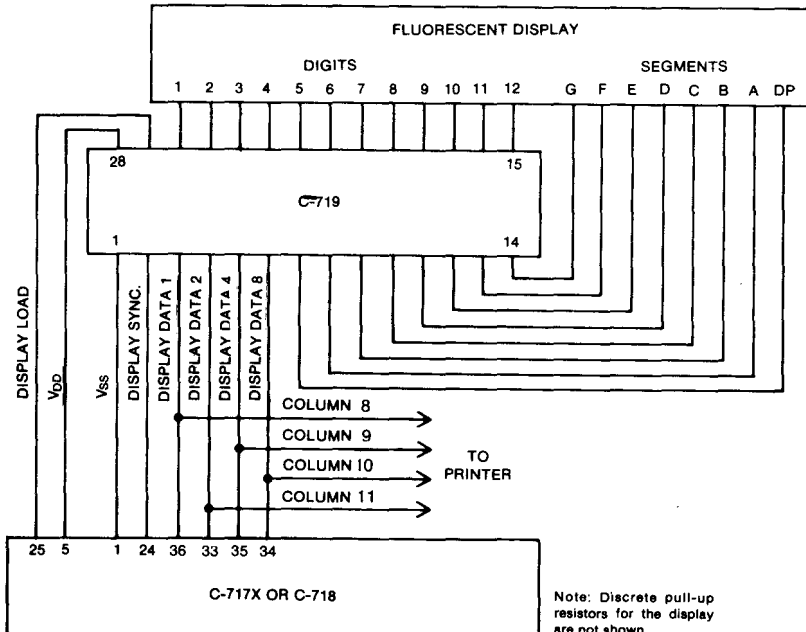
In the display, leading zeroes are suppressed and entries and results are right-justified.

PIN CONFIGURATION

28 LEAD DUAL IN LINE



SYSTEM DIAGRAM



CONSUMER