Owners Guide
V12 Financial Calculator

Preface

Congratulations on your purchase of the V12 financial calculator from Victor Technology. Victor has been serving customers since 1918. Today, Victor offers a complete line of printing, handheld, desktop, scientific, and financial calculators. For more information please see our website at www.victortech.com or call us at 1-800-628-2420.

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Table of Contents

Chapter 1: Where to Start

Powering On and Off

Turn the unit on by touching the ON button. To turn the unit off, touch the ON button again. The calculator will automatically power off after 7 minutes if left not used.

When the calculator is experiencing a low battery charge, a battery icon will appear in the top left corner of the display screen.

Controlling screen contrast

To change the contrast of the display screen for optimal viewing, hold down the b button and touch X or ÷ keys until desired contrast is reached.

Keyboard Dynamics

Most buttons perform multiple functions. The primary function is displayed on the center of the button, while alternative functions of the same button are imprinted on the bottom side of the button, below the button, or above the button. Alternate functions are obtainable by using one of two colored prefix buttons prior to entering the function desired. The colors of the prefix buttons match the alternative functions. The prefix buttons are b (blue) and r (red).

Entering Digits

To enter a digit, touch the number buttons and decimal place . button in the same order as they would appear on paper.

Decimal Placement

On the display, digits are separated with commas left of the decimal place. To change the decimal point period icon to a comma and the comma icon to a decimal point, turn the V12 off, touch and hold the decimal point button ., and touch the ON

button. Repeat this process again to reset these placements to the standard display.

Entering Large Amounts
The V12 displays numbers up to 10 digits. Scientific notation allows numbers longer than 10 digits to be entered. To perform this function, enter the number with the decimal point moved to the left. Keep track of how many positions the decimal point moved. Next touch the EEX button and enter the number of positions the decimal point was moved. Touch the ENTER key to complete the entry.

Example
To enter a value of 7,894,300,000,000 the decimal place should move 12 spaces to the left leaving a mantissa of 7.8943 with an exponent of 12.

ENTRIES	DISPLAY
7.8943 EEX 12	7.894300 12 Displays the figure in scientific notation.

These scientific notation numbers can be used in calculations the same as any number.

Entering Small Amounts
Scientific notation allows numbers more than 10 decimal places below zero to be entered. To perform this function, enter the number with the decimal point moved to the right. Keep track of how many positions the decimal point moved. Next touch the EEX button and enter the number of positions the decimal point was moved. Touch the CHS key to make the number negative. Touch the ENTER key to complete the entry. For example, to enter the number .00000000047823456 we move the decimal point 10 positions. We enter 4.7823456, touch EEX, enter 10, touch CHS, and touch ENTER. The display will show 4.782345 -10.

Changing the Sign of a Number
The CHS button allows a changing of the sign of a number. If a negative value is entered, or comes as a solution, touching the CHS button will make it a positive. Likewise, touching the CHS button after a positive value is displayed on the screen will change its sign to a negative.

Using the Clear Function
Clearing replaces the displayed value with zero and replaces the previous instruction with the r GTO 000 instruction when programming. There are many ways of clearing data, outlined here:

BUTTONS	WILL CLEAR
b CLEAR REG	Storage registers, block and last x register, and display screen
b CLEAR FIN	Financial registers
b CLEAR Σ	Statistical registers $(12_1 - R)_1$ block registers and display screen
b CLEAR PRGM	Program memory (when touched in program mode)
CLX	Display screen and x register

ALG and RPN Setting Functions

ALG MODE	RPN MODE
4 ENTER 2 X	4 X 2 =

The ALG method enables calculations for addition, subtraction, multiplication, and division (with or without parentheses) in the standard method.

To select the ALG method. Touch [b] [ALG], and the [ALG] icon will appear.

Sequential Calculations in ALG method
To complete a sequential calculation, touch [=] at the end of your entries and not after every entry.

Example: 5 [X] 2 [+] 3 [–] 4 [÷] 3 [=] 3.00

RPN method
To select the RPN method, touch [b] [RPN], and the RPN icon appears.

With RPN method enabled, you can perform basic calculations with two numbers and with multiplication, addition, division, or subtraction. It is necessary to enter both numbers in the equation, and then select the mathematical operation to be used.

Touching [ENTER] between number entries allows a separation of the different values within the calculator, and after entering the second value, selecting the mathematical operation completes the calculation.

Sequential Calculations in RPN method
Once a solution from a previous entry has been found and is on the display screen, enter the next value and select the mathematical operation to be performed.

Example: 5 [ENTER] 2 [X] 3 [+] 4 [-] 3 [÷] .
Note: The display will show the answer: 3.00

Storage Capacity and Recalling Entered Data
Information entered into the calculator is stored to memory in different registers within the calculator. There are registers for data storage during calculations called blocks (covered later in this manual) and also a LST X register that stores the value last on the display screen before an operation when using the RPN method.

In addition to these storage registers, up to 20 more information registers are available for storing values manually. The registers are called R0 through R9, and R[.] 0 through R[.] 9 (with the decimal point in front of the number). Note: In this manual, [.] represents the decimal point key.

To store numbers into a register, touch [STO], and then touch the register number desired [either (0, 1, 2, 3, 4, 5, 6, 7, 8, or 9), or ([.] 0, [.] 1, [.] 2, [.] 3, [.] 4, [.] 5, [.] 6, [.] 7, [.] 8, [.] 9)].
To recall a previously stored value, touch [RCL], and similarly select the desired stored value number, R0 through R9, and R[.] 0 through R[.] 9.

To delete stored values, enter zero, touch [STO], and select the register to be deleted, R0 through R9, and R[.] 0 through R[.] 9. (Note: Designating a new value instead of 0 also replaces the old value set to the register)

Chapter 2: The First Steps to Financial Functions

Using the Financial Storage Registers

Five specialty registers are used for financial calculations only. These are [n], [i], [PV], [PMT], and [FV] and are located along the top row of buttons. Saving data to these storage registers makes it possible to calculate financial problems such as loan payments.

Saving to a Register

To set the numbers into the registers, enter the number to be stored, and touch the button to which the number is to be stored. To recall the number, touch [RCL] followed by the register you would like to recall ([n], [i], [PV], [PMT], or [FV])

Resetting Saved Data

To replace current financial register values simply enter the new value and press the register key. To clear all financial registers at once, touch [b] clear [FIN]. Financial storage registers are also reset when [b] [REG] is entered, or when the continuous memory is reset.

Basic Interest Calculations

Simple interest can be calculated with either 365-day or 360-day cycles. Either can be displayed and the total amounts of principal plus the accrued interest may be found by touching [+] in RPN method, or [+] [x ↔ y] [=] in ALG method.

To perform this operation on a 365-day cycle, touch [R↓] [x ↔ y] to find and show interest accrued after determining the 360 day interest.

Example

Calculate the simple interest on a 100,000 amount with 12% annual interest for 180 days using the 360 day cycle and the 365 day cycle.

ENTRIES	DISPLAY
100000 [CHS] [PV]	-100,000.00 Displays the amount.
180 [n]	180.00 Displays the number of days for which interest will be calculated
12 [i]	12.00 Displays the annual interest rate
[b] [INT]	6,000.00 Displays the simple interest on a 360 day basis
[R↓] [x↔y]	5,917.81 Displays the simple interest on a 360 day basis

In RPN method, touching [+] after the calculation places the total principal and interest accrued into the display.

To display total principal and interest accrued in ALG method, touch [+] [x ↔ y] [=] .

Example

You take out a loan of $900, which you have 90 days to repay. You are lent the money at 4.3% simple interest, which is calculated on a 360-day cycle. You want to find the total amount of accrued interest you will owe in 90 days, the total amount you will owe including principal.

ENTRIES (ALG)	DISPLAY
900 [CHS] [PV]	-900.00

	Displays the amount.
90 n	90.00 Displays the number of days for which interest will be calculated
4.3 i	4.30 Displays the annual interest rate
b INT	9.68 Displays the simple interest on a 360 day basis
+ x↔y =	909.68 Displays the simple interest plus principal due on a 360 day basis

ENTRIES (RPN)	DISPLAY
900 CHS PV	-900.00 Displays the amount.
90 n	90.00 Displays the number of days for which interest will be calculated
4.3 i	4.30 Displays the annual interest rate
b INT	9.68 Displays the simple interest on a 360 day basis
+	909.68 Displays the simple interest plus principal due on a 360 day basis

Basic Financial Calculations

Before describing Basic Financial Calculations, it is important to review and understand five basic terms and keys used with the V12.

TERM / KEY	DEFINITION
n	The number of periods in the financial loan, often expressed in days, months, or years. The interest rate must be defined per period.
i	The interest rate per period. Often an annual rate is converted to monthly by dividing by 12, weekly by dividing by 52, or daily by dividing by 365.
PV	The initial cash value received or paid or the present value of a series of future payments when discounted at an interest rate.
PMT	The payment made each period.
FV	The final cash value received or paid or the future value of a series of payments assuming an interest rate.

When using the V12, four of these five variables must be known to perform a calculation. The unknown variable can then be solved.

Positive and Negative Cash Flows

When performing financial calculations special care must be taken to enter values with the proper sign. A payment or outflow of cash must have a negative sign. A receipt of cash must have a positive sign. For example, the initial cash received in a loan is a positive amount. The payments are negative amounts.

Payment Function
Payments in compounding periods may be made either at the beginning of a period (such as payments in advance, and annuities due), or at the end of a period (such as regular annuities or payments in arrears).

To select payment type:
Touch r END if the payment will be made at the end of the period.
Touch r BEG if the payment will be made at the beginning of the period.
Most transactions utilize an End of the period payment. Note: This manual will only show examples using End of the period payments.
If the BEGIN icon is not showing on the display, the payment function is set to END.

The special relationship between i and n
In compound interest problems, the interest rate entered into i must correlate to the compounding period n in time (as in years, days, months, etc.)

Determining Interest Rate: Solving for i

- Touch b CLEAR FIN to reset financial registers
- Enter the number of payment periods and touch n
- Enter the present value of the loan and touch PV.
- Enter the payment value per period (a negative number) and touch PMT.
- Enter the future value of the amount owed at the end of the payment periods, touch CHS to make the number negative, and touch FV. Note: If the amount owed at the end of the loan period will be zero, this step can be skipped.
- Touch the i key to calculate the interest rate per period.

Example

ENTRIES (RPN)	DISPLAY
b FIN	0.00 Clears the financial registers.
360 n.	360.00 Enters 360 months for a 30 year loan.
400000 PV	400,000.00 Enters the loan amount of $400,000.
2398.202 CHS PMT	-2,398.20 Displays the monthly payment
i.	---------- The V12 is calculating the value. 0.50 Displays the monthly interest rate.

Example
8 % annual interest, which is compounded quarterly for 3 years:
n is number of quarters (3 * 4=12)
i is interest rate per quarter (8% ÷ 4 = 0.02%)

If interest rate was compounded monthly, n would be 8% ÷ 12 =0.006

Since many financial calculations utilize an annual interest rate compounded monthly, the V12 has two functions to simplify the entry of interest rate and periods. The r 12÷ function will divide an annual interest rate by 12 and enter the result as the monthly interest rate.

Example
24% annual interest which is compounded monthly
24 r 12÷ will enter an interest rate of 2% into the i. register.

The r 12x function will multiply a number of years by 12 and enter the result as the number of monthly periods.

Example
30 year loan which is compounded monthly
30 r 12x will enter 360 periods into the n. register.

Determining Present Value: Solving for PV

- Touch b CLEAR FIN to reset financial registers
- Enter the number of payment periods and touch n
- Enter the interest rate and touch i.
- Enter the payment value per period (a negative number) and touch PMT.
- Enter the future value of the amount owed at the end of the payment periods, touch CHS to make the number negative, and touch FV. Note: If the amount owed at the end of the loan period will be zero, this step can be skipped.
- Touch the PV key to calculate the present value.

Example

ENTRIES	DISPLAY
b FIN	0.00 Clears the financial registers.
360 n	360.00 Displays 360 months for a 30 year loan.
6 r i	0.50 Displays the interest rate of 6% per year or 0.5% per month.
2398.202 CHS PMT	-2,398.20 Displays the monthly payment
PV	---------- The V12 is calculating the value. 400,000.00 Displays the loan amount or present value. Actual amount may vary slightly due to rounding

Determining Payment Amount: Solving for PMT

- Touch b CLEAR FIN to reset financial registers
- Use n or r 12x to enter number of periods or payments
- Use i or r 12÷ to enter periodic interest rate
- Enter values for PV and FV
- Touch r BEG or r END to select payment function
- Touch PMT to calculate the amount of the payment

Example

ENTRIES	DISPLAY
b FIN	0.00 Clears the financial registers.
360 n	360.00 Displays 360 months for a 30 year loan.
6 r i	0.50 Displays the interest rate of 6% per year or 0.5% per month.
400000 PV	400.000.00 Displays the loan amount or present value.
PMT	-2,398.20 Displays the monthly payment

Determining Future Value: Solving for FV

- Touch b CLEAR FIN to reset financial registers
- Use n or r 12x to enter number of periods or payments
- Use i or r 12÷ to enter annual interest rate
- Enter values for PV and PMT

- Touch r BEG or r END to select payment function
- Touch FV to calculate the future value

Example

ENTRIES (RPN)	DISPLAY
b FIN	0.00 Clears the financial registers.
360 n	360.00 Displays 360 months for a 30 year loan.
6 r i	0.50 Displays the interest rate of 6% per year or 0.5% per month.
400000 PV	400.000.00 Displays the loan amount or present value.
2397.202 CHS PMT	-2,397.20 Displays the monthly payment. Notice the amount is reduced by $1 from previous examples.
FV	-1,004.62 Displays the amount still owed at the end of the loan period. In this example, the payments over 30 years did not pay off the entire loan.

Determining Number of Periods: Solving for n

To determine the number of compounding periods and the number of payments:

- Touch b CLEAR FIN to reset financial registers
- Use i or r 12÷ to enter periodic interest rate.
- Enter values for PV(present value), PMT (amount of payment), FV (future value)
- Select payment function by touching r BEG or r END

- Touch n to calculate number of periods or payments

Example

ENTRIES (RPN)	DISPLAY
b FIN	0.00 Clears the financial registers.
6 r i	0.50 Displays the interest rate of 6% per year or 0.5% per month.
400000 PV	400.000.00 Displays the loan amount or present value.
2398.202 CHS PMT	-2,398.20 Displays the monthly payment.
n.	360.00 Displays the number of periods (months) required to pay off the loan.

Loan With a Balloon Payment

A common transaction is a loan with a balloon payment. In this case, the borrower makes a fixed payment each period until the end of the loan term. At the end of the term, the borrower makes one large final payment. The example below illustrates a $400,000 loan, at 6% annual interest paid monthly for 30 years with a balloon payment of $70,000.

Example

ENTRIES (RPN)	DISPLAY
b FIN	0.00 Clears the financial registers.
360 n	360.00 Displays 360 months for a 30 year loan.
6 r i	0.50 Displays the interest rate of 6% per year or 0.5% per month.

400000 PV	400.000.00 Displays the loan amount or present value.
-70000 FV	-70,000.00 Displays the future value required to pay off the loan (the balloon payment)
PMT	-2,328.52 Displays the monthly payment required to reach a $70.000 balloon payment.

Amortization Function

To Amortize is to liquidate a debt, such as a mortgage by installment payments. Amortization is the gradual elimination of a liability, such as a mortgage, in regular payments over a specified period of time. Such payments must be sufficient to cover both principal and interest. With the Amortization Function the V12 can calculate the total amount of principle (liability) and interest paid after a specified number of installments.

The following steps are required to determine the Amortization status of a loan:

- Push b CLEAR FIN first to reset financial registers of previous data
- Using i or r 12÷ , enter periodic interest rate
- Enter the principal using PV
- Enter the periodic payment, then push CHS PMT
- Select r BEG or r END to set the payment function
- Enter the number of payments that will be amortized using n
- Push b AMORT (will display amount from payments that will be applied to interest)
- Push x↔y (will display amount from payments that will be applied to principal)
- Push R↓ R↓ (will display number of payments to be amortized)
- Push RCL PV (will display remaining balance)
- Push RCL n (will display total number of payments amortized

If you repeat the Amortization function after an initial calculation, the V12 picks up where you left off. In other words, after you calculate the interest and principle paid after one year, the V12 resets the present value of the loan to the principle after one year. Calculation of Amortization will start from this point.

A common application of the Amortization function is to determine the amount of interest and principle paid on a mortgage for a given time period. The example below illustrates a 30 year loan with a principle of $400,000, a 6% annual interest rate, and monthly payment of $2,398.20. The task is to determine the interest and principle paid after 5 years or 60 months.

Example

ENTRIES (RPN)	DISPLAY
b FIN	0.00 Clears the financial registers.
6 r i	0.50 Displays the interest rate of 6% per year or 0.5% per month.
400000 PV	400.000.00 Displays the loan amount or present value.
2398.20 CHS PMT	-2,398.20 Displays the payment required to pay off the loan in 30 years (calculated in an earlier example)

60 [b] [AMORT]	-116,109.58 Displays the total interest paid after 60 months.
[x ↔ y]	-27,782.42 Displays the total principle paid after 60 months
[RCL] [PV]	372,217.58 Displays the remaining principle after 60 months of payments
[RCL] [n]	60.00 Displays the number of payments amortized (60 months)
12 [b] [AMORT]	-22,152.81 Displays the amount of interest paid in the next 12 months of payments (after the initial 60 months already amortized)
[x ↔ y]	-6,625.59 Displays the amount of principle paid in the next 12 months of payments (after the initial 60 months already amortized)

Chapter 3: Other Financial Calculations

NPV (Net Present Value)

[b] [NPV] (net present value) represents the value of a series of future cash flows discounted at a specified rate of return to reflect the present value.

- When NPV is positive, financial value increases.
- When NPV is 0, financial value stays the same.
- When NPV is negative, financial value decreases.

Therefore, the greater the value of NPV, the greater the increase in financial value.

To find NPV, add the initial deposit (a negative cash flow) to present value of future cash flow. (Here, i will describe the rate of return, and NPV describes the result of the investment.)

Two keys not yet discussed in this manual are required to perform NPV calculations. The [CFo] key is used to store the initial cash flow. When touched, the contents of the x-register are stored in R_0. The [CFj] key is used to store additional cash flows. When touched, the contents of the x-register are stored in R_1. If used again in the same cash flow problem, the contents of the x-register are stored in first R_2, then R_3, R_4, and so on.

Example

You want to buy a yacht for $23,000 and rent it to a skipper for a share of tour revenue. You expect cash flows of the initial cost ($23,000), ($5000) in the first year for repairs, +$10,000 in the second year from tours, +$15,000 in the third year, $17,000 in the fourth year, and then you expect to sell the yacht in the fifth year for $19,000. Your expected rate of return is 15%.

ENTRIES	DISPLAY
[b] [REG]	0.00 Clears the x register
23000 [CHS] [r] [CF_0]	-23,000.00 Stores the initial cash out flow to buy the yacht
5000 [CHS] [r] [CFj]	-5,000.00 Stores the first year cash flow
10000 [r] [CFj]	10,000.00 Stores the second year cash flow
15000 [r] [CFj]	15,000.00 Stores the third year cash flow

17000 [r] [CFj]	17,000.00 Stores the fourth year cash flow
19000 [r] [CFj]	19,000.00 Stores the final cash inflow at time of sale
[RCL] [n]	5.00 Displays the number of cash flows entered after the initial
15 [i]	15.00 Stores the expected rate of return
[b] [NPV]	9,242.52

Since NPV is positive, this investment would be attractive.

Grouped Cash Flows

It is possible to calculate NPV for 80 unique cash flows using the [CFj] key. In addition, the number of cash flows included in a calculation can go beyond 80 when some of the cash flows are repetitive and consecutive. In these situations, the [Nj] key is invoked by entering the number of repeat cash flows followed by [r] [Nj]. For example, if a cash flow of $1000 occurs 5 times in a row, the entries would be 5000 [CHS] [r] [CFj] 5 [r] [Nj].

Example: A landlord buys and rents a building to a tenant for 8 years. The landlord pays $500,000 for the building and rents the building for a net cash flow of $60,000 for the first year, $100,000 per year for 3 years and $120,000 per year for the next 4 years. In the 9th year, the landlord expects to sell the property for $400,000. The landlord's desired rate of return is 15% per year. What is the NPV of this investment?

Example

ENTRIES (RPN)	DISPLAY
[b] [REG]	0.00 Clears the storage and financial registers.
500000 [CHS] [r] [CFo]	-500,000.00 Displays -$500,000 as the initial cash flow.
60000 [r] [CFj]	60,000.00 Displays $60,000 as the year 1 cash flow.
100000 [r] [CFj]	100,000.00 Displays $100,000 as the year 2 cash flow.
3 [r] [Nj]	3.00 Displays the number of consecutive times the $100,000 cash flow will occur.
120000 [r] [CFj]	200,000.00 Displays $100,000 as the year 5 cash flow.
4 [r] [Nj]	4.00 Displays the number of consecutive times the $120,000 cash flow will occur.
400000 [r] [CFj]	400,000.00 Displays $400,000 as the final cash flow amount
15 [i]	15.00 Displays the 15% desired rate of return
[RCL] [n]	4.00 Displays the number of unique cash flow amounts entered
[b] [NPV]	60,301.37 Displays the net present value of $60,301.37. Since the number is positive, this is an investment that exceeds the desired rate of return.

Replacing Current Cash Flow Value Data
Individual cash flow values stored in the V12 can be replaced. To replace a current cash flow value:

- Enter the amount
- Touch [STO]
- Enter the number of the CF_j register to be replaced

Example
Starting from the previous example (A landlord buys and rents a building to a tenant for 8 years. The landlord pays $500,000 for the building, etc.), the landlord changes his assumptions. He now believes the net cash flow will be only $110,000 per year in years 5 through 8 instead of $120,000 per year.

ENTRIES (RPN)	DISPLAY
110000 [STO] 3	110,000.00 Displays $110,000 as the new cash flow amount stored in the 3rd register CF_3
[b] [NPV]	43,977.94 Displays the revised net present value of $43,977.94.

To replace the number of consecutive equal cash flows, (the N_j of a CF_j):

- Touch [RCL] [n] to recall how many cash flow amounts are stored.
- Save the number of the cash flow value (the j) into the n register
- Enter the revised number of times the value occurs consecutively
- Touch [r] [N_j] to store the revision
- Enter the original number of cash flows back into the n register (otherwise the NPV calculation will be wrong)

Example
Starting from the previous example, the landlord now believes the tenant will rent for 6 years instead of 4 at $110,000 per year (an additional 2 years).

ENTRIES (RPN)	DISPLAY
[RCL] [n]	4.00 Displays the number of unique cash flows entered. (This number will be required later)
3 [n]	3.00 Displays the storage of 3 in the n register (because it is the 3rd cash flow CF_3 for which we will change the frequency)
6 [r] [Nj]	6.00 Displays the new value of N_3.
4 [n]	4.00 Restores the original number of unique cash flows entered into the n register.
[b] [NPV]	74,709.45 Displays the revised net present value of $74,709.45

Determining Values with Depreciation
There are several ways of calculating depreciation including declining-balance, straightline, and sum-of-years numbers.

To calculate based on any of these types:

- Enter beginning cost with [PV]
- Enter salvage value with [FV] (if this value is 0, enter 0 [FV])
- Enter expected life of asset (years) with [n]

- For declining-balance calculations only: enter the percentage rate followed by [i]. For example, 200% declining balance rate (double declining) is entered 200 [i]
- Enter the number of the year for which you wish to calculate the depreciation
- Touch [b] [DB] for declining balance option
- Touch [b] [SL] for straightline option
- Touch [b] [SOYD] for sum of years number option

No matter which depreciation method is used the remaining depreciated value may be displayed by touching [x ↔ y].

Example
Your company purchases a car for $3,500, which depreciates over 6 years. The salvage value is expected to be $900. Find the amount of depreciation and remaining depreciable value 1 year and after 4 years of car ownership using the declining-balance method at double the straight-line rate (200%).

ENTRIES	DISPLAY
3500 [PV]	3,500.00 Stores the purchase price of $3,500 as the Present Value
900 [FV]	900.00 Stores the salvage value of $900 as the Future Value
6 [n]	6.00 Stores 6 years as the number of periods for which depreciation will be calculated
200 [i]	200.00 Stores 200% as the accelerated rate at which depreciation will be calculated.
1 [b] [DB]	1,1667.67

	Displays the depreciation for year one
[x ↔ y]	1,433.33 Displays the amount left to be depreciated after one year
4 [b] [DB]	137.04 Displays the depreciation for year four
[x ↔ y]	00.00 Displays the amount left to be depreciated after four years

Determining Bond Values
To calculate bond price and the interest accrued since its last interest date, as well as its yield to maturity, use [b] [PRICE] and [b] [YTM] functions.

Use these methods to calculate bond price and yield for 30/360 day bonds (municipal bonds, corporate bonds, and bonds with annual coupon payments.

To Calculate Standard Bond Price ([b] [PRICE])
- Enter coupon rate; touch [PMT]
- Enter desired yield to maturity; touch [i]
- Enter purchase date (settlement date); touch [ENTER]
- Enter redemption date; touch [b] [PRICE]

The price displayed is the Bond Price as a percent of Part. This number is now stored to the PV register. The interest accrued since last interest date is also stored, to show this touch [x ↔ y]

To add the interest to the Bond Price in RPN method, touch [+]; in ALG method, touch [+] [x ↔ y] [=]

Example

What Bond Price should you pay on September 17, 2009 for a 4.9% US Treasury Bond that matures on November 2, 2017 if you desire a yield of 6.65%?

ENTRIES	DISPLAY
b REG	0.00 Clears the registers
4.9 PMT	4.9 Enters coupon rate
6.65 i	6.65 Enters yield to maturity
r M.DY	6.65 Sets date format to month-day-year value
9.172009 ENTER	9.17 Enters purchase date
11.022017 b PRICE	89.14 Enters maturity date and calculates bond price (as a % of Par)
+	90.98 Calculates total bond price including accrued interest

To Calculate Bond Yield to Maturity **(** b YTM **)**

- Enter quoted Bond price (asa % of Par); touch PV
- Enter coupon rate; touch PMT
- Enter purchase date; touch ENTER
- Enter redemption date; touch b YTM

Example

Using the Bond described above, what is the Yield to Maturity if the market quote for the Bond is 91.42?

ENTRIES	DISPLAY
91.42 PV	91.42 Enters market quote
4.9 PMT	4.90 Enters coupon rate
9.172009 ENTER	9.17 Enters purchase date
11.022017 b YTM	6.26 Enters Maturity Date and calculates yield to maturity

To Calculate Bond Price and Yield for 30/360 Day Basis Bonds with a semiannual coupon, please reference V12 programming guide at www.VictorV12.com/programs.

To Calculate Price and Yield for Bonds with Annual Coupons, please reference V12 programming guide at www.VictorV12.com.

Percentages

There are three buttons used for solving problems involving percents: Delta Percentage Δ% ,Percentage % and Percent of Total %T.

Delta percentage calculates the percent difference between numbers using the first number as a base. To find the delta percentage Δ% of two values in both RPN and ALG method:

- Enter the base value
- Touch = or ENTER
- Enter the second number
- Touch Δ%

Example

Calculate the percent difference between 100 and 25:

ENTRIES	DISPLAY
100 ENTER/=	100.00 Stores the base value
25 Δ%	-75.00 Displays the result: 25 is 75% less than 100

To find the percentage % of a value in ALG method:

- Enter the base value
- Touch x
- Enter the percentage
- Touch %
- Touch =

Example
In ALG method, calculate 35% of $1,200:

ENTRIES (ALG)	DISPLAY
CLX	00.00 Clears the display and x register
1200	1200 Displays the base number
X 35 %	0.35 Displays the percent multiple
=	420.00 Displays the result

To find the percentage % of a value in RPN method:

- Enter the base value
- Touch ENTER
- Enter the percentage
- Touch %

Example
In RPN method, calculate 35% of $1,200:

ENTRIES (RPN)	DISPLAY
CLX	00.00 Clears the display and x register
1200 ENTER	1200.00 Displays the base number
35 %	420.00 Displays the result

Percent of Total (%T) calculates what percent one number is of a second number using the first number as a base. To find the Percent of Total %T of two values in both RPN and ALG method:

- Enter the base value
- Touch = or ENTER
- Enter the second number
- Touch %T

Example
Calculate the Percent of Total for 200 and 50:

ENTRIES	DISPLAY
200 ENTER/=	200.00 Stores the base value
50 %T	25.00 Displays the result: 50 is 25% less than 200

Calendar Operations

The V12 stores dates using two methods. The first is called Month-Day-Year and is set by touching [r] [M.DY]. To enter a date in Month-Day-Year format:

- Enter the two digits of the month (01 to 12)
- Touch the decimal point key
- Enter the two digits of the day (01 to 31)
- Enter the four digits of the year
- Touch [r] [M.DY]

Example

Invoke the Month-Day-Year mode and enter the date January 5, 2001.

ENTRIES	DISPLAY
01.052001 [r] [M.DY]	1.05 Stores the date

The second calendar method is called Day-Month-Year and is set by touching [r] [D.MY]. To enter a date in Day-Month-Year format:

- Enter the two digits of the day (01 to 31)
- Touch the decimal point key
- Enter the two digits of the month (01 to 12)
- Enter the four digits of the year
- Touch [r] [D.MY]

Example

Invoke the Day-Month-Year mode and enter the date January 5, 2001.

ENTRIES	DISPLAY
05.012001 [r] [D.MY]	5.01 Stores the date

To calculate a date in the future or past:

- Enter the start date and touch [r] [D.MY]
- Enter number of days to be added or subtracted from the start date
- If subtracting days, don't forget to use [CHS]

- Touch [r] [DATE]

Example

You have a time-share vacation starting on July 20, 2008, for 90 days. When will your stay be over? (Using day-month-year function)

ENTRIES	DISPLAY
20.072008 [r] [D.MY]	20.07 Stores the date
90 [r] [DATE]	18,10,2008 6 Displays the result as the 18th day in the 10th month in year 2008 on the 6th day of the week (October 18, 2008 Saturday)

Determining Number of Days Between Dates

To calculate the number of days between a set of dates:

- Invoke your preferred calendar mode by touching [r] [M.DY] or [r] [D.MY].
- Enter the start date and touch [ENTER]
- Enter the end date and touch [ENTER]
- Touch [r] [ΔDYS]
- To display the number of days based on a 360 day year press [x ↔ y].

Example

With month-day-year function, the amount of simple interest accrued from January 15, 2008 through December 25, 2011 can be calculated with either actual amount of days between dates or by the 30-day month date function. You can calculate the amount of days each way.

ENTRIES	DISPLAY
[r] [M.DY]	Puts the calculator in Month-Day-Year mode

01.152008 [ENTER]	1.15 Stores the date January 15, 2008
12.252011 [r] [ΔDYS]	1,440.00 Stores the date December 25, 20011 and displays the days between dates.
[x ↔ y]	1,420.00 Displays the result using a 360 day year

Chapter 4: Other Operational Features

Another function of the V12 calculator is continuous memory of storage registers (financial. LSTx, block, and data), and information on the current status of the current function (display format, payment mode, and date format). Continuous memory is in effect even while the unit is off, and for a short amount of time while the batteries are out, to allow for battery replacement without losing data. Dropping or otherwise damaging the calculator may cause continuous memory to be reset.

Status Icons

There are nine icons on the lower portion of the display that notify calculator status during different operational procedures. RPN, ALG, b, r, BEGIN, D.MY, C, PRGM

Decimal Place Display Settings

To change the number of decimal places shown on the display screen, touch [b] and enter a value (0-9) to specify how many numbers will be displayed after the decimal. However many digits are displayed, they will be rounded for the display yet the entire number will be stored inside the calculator.

Example

ENTRIES	DISPLAY
[b] 2	Sets the calculator to display two digits right of the decimal point
5.7654368 [ENTER]	5.77 Stores the number with two decimal places
[b] 3	5.765

	Displays the figure with three digits to the right of the decimal point
b 5	5.76544 Displays the figure with five digits to the right of the decimal point
b 2	5.77 Displays the figure with two digits to the right of the decimal point

The decimal place setting is kept until continuous memory is reset. Turning the unit off and does not change the decimal place setting.

Scientific Notation Display Settings

With Scientific notation, the first non-zero digit of a value is moved the immediate left of the decimal point and all other digits are moved to the right. The resulting figure is called the mantissa. The number of decimal place movements required is called the exponent. For example, the figure 567.89 can be expressed in scientific notation as 5.6789 2 (with 5.6789 as the mantissa and 2 as the exponent since the decimal point was moved two positions). Likewise, the figure .056789 can be expressed in scientific notation as 5.6789 -2.

To convert a number to scientific notation:

- Enter the number
- Touch b .

To exit scientific notation mode:

- Touch b followed by the number of decimal places you wish to display

Example

Convert 567.89 to scientific notation and then set the display back to 2 decimal places

ENTRIES	DISPLAY
567.89 ENTER	567.89 Displays the initial value
b .	5.678900 02 Displays the figure in scientific notation
b 2	567.89 Displays the value using 2 decimal places

Full Figure Display

To view all ten digits of a figure without decimal points touch b PREFIX and hold down *prefix* as long as you wish to view the numbers.

Example

Convert 567.89 to scientific notation and then view the full figure with no decimal points.

ENTRIES	DISPLAY
567.89 ENTER	567.89 Displays the initial value
b .	5.678900 02 Displays the figure in scientific notation
b PREFIX	5678900000 Displays all 10 digits with no decimal point

Other Display Settings

Error Display
If an improper function or operation is entered the calculator will display ERROR on the screen, followed by a number (0-9). To clear the ERROR message from the display screen, touch any key to return calculator to state before improper command or entry was entered. The Errors are described in the appendix.

PR ERROR
When power to the calculator is disrupted and restored the display shows PR ERROR. This indicates continuous memory has been reset and all data, program and status information have been lost.

Underflow and Overflow Display
If an value is calculated to be greater than 9.999999999 X 10^{99}, the calculation is disrupted and the display will read 9.999999 99 or –9.999999 99 (for either positive or negative values)

If an entered value is less than 10^{-99}, the value of 0 is used in proceeding equations.

Running Display
Some programs and functions need an extended amount of time to complete. During these times --------- will appear in the display.

LST X
To recall a value entered before an operation was executed, the LST X button is appropriate (RPN method only).

Example
You can purchase phone cards that are valid for 250 minutes, 500 minutes, or 1,000 minutes for 3 cents per minute. You can calculate how much each card would cost without re-entering .03.

ENTRIES	DISPLAY
250 ENTER	250.00
	Stores 250 minutes
.03 X	7.50 Displays cost of 250 minutes at 3 cents per minute
500 r LST X	0.03 Stores 500 and recalls the cost of 3 cents per minute
X	15.00 Displays cost of 500 minutes
1000 r LST X	0.03 Stores 1000 and recalls the cost of 3 cents per minute
X	30.00 Displays cost of 1000 minutes

x ↔ y
x ↔ y is the exchange key (RPN method only). It switches the values in the x-register to the y-register and the value in the y-register to the x-register.

Example
You wish to calculate 2,520 ÷ 30 but you mistakenly enter 30 first and 2520 second which would give you the wrong answer. To correct this mistake, use the x ↔ y button.

ENTRIES (RPN)	DISPLAY
30 ENTER	30.00 Displays 30 as the first entry. The value is stored in the x register.
2520	2,520. Displays the second value. At this time, you realize you entered the values in the reverse order for your desired division.
x↔y	30.00

	Displays 30 because the Exchange key has swapped the value in the x-register with the value in the y-register.
÷	84.00 Displays the result of 2520 ÷30

Statistical Features and Functions

Compiling Statistical Data

One and two variable statistical calculations are made possible with the Σ+ button which calculates and saves statistics into storage registers R_1, R_2, R_3, R_4, R_5, and R_6. The six calculations possible and the storage registers used are summarized below:

STATISTICAL VALUE	REGISTER UTILIZED
The number of data pairs entered: n	R_1
Sum of the x values: $\sum x$	R_2
Sum of the square of the x values: $\sum x^2$	R_3
Sum of the y values: $\sum y$	R_4
Sum of the square of the x values: $\sum y^2$	R_5
Sum of the multiplication of x and y: $\sum xy$	R_6

Clearing the statistical registers before entering new data is necessary. Do this by touching
b Σ+ (also resets block registers and the display screen).

One-variable statistical calculations contain only x-values (data points). To enter only x-values, enter the value, and then touch Σ+.

Two variable statistical calculations contain both x and y values (data pairs). To enter these:

- Enter x value
- Touch ENTER
- Enter y value
- Touch Σ+

Every time Σ+ is touched, the calculator will:

- Increase the value in R_1 by one, and display the value
- Add the x value to the number in R_2
- Add the square of the x value to R_3
- Add the y value to R_4
- Add the square of the y value to R_5
- Add the product of both x and y values to R_6

The values stored in the R registers can be retrieved by touching RCL and entering the number of the storage register.

Recovering Incorrectly Entered Statistical Data

The accumulated statistics can be modified if entered incorrectly.

Steps:

- Enter incorrect x and/or y values
- Touch r Σ-
- Enter new (correct) x and/or y values
- Touch r Σ+

Standard Deviation Entries
The button sequence [r] [s] will calculate the standard deviation (a measure of the dispersion around the mean of the X and Y values) for both X and Y values.

Mean Values
The [r] [x] button sequence calculates the mean of the X and Y values. The product of the average (mean) of the X value is shown on the display screen after touching [r] [x]. To show the average of the Y value, touch [x↔y].

Example
A doctor measures the height and weight of 10 children with the same age. What is the standard deviation of the height and what is the standard deviation of the weight? What is the mean of the height and the mean of the weight?

The measurements are summarized below:

Child	Height (Inches) = y-values	Weight (lbs) = x-values
1	48	85
2	51	76
3	36	54
4	39	54
5	40	65
6	47	62
7	42	58
8	41	56
9	39	55
10	43	53

ENTRIES	DISPLAY
48 [ENTER]	48.00 Displays the first y value.
85 [∑+]	1.00 Displays which entry has just been entered … the first data pair.
51 [ENTER]	51.00 Displays the second y value.
76 [∑+]	2.00 Displays which entry has just been entered … the second data pair.
… etc.	… etc. until all 10 data pairs have been entered.
[r] [s]	10.77 Displays the standard deviation for the x values (Weight).
[x↔y]	4.70 Displays the standard deviation for the y values (Height).
[r] [x]	61.80 Displays the mean for the x values (Weight).
[x↔y]	42.60 Displays the mean for the y values (Height).

Note: The above example provides the best estimates of the standard deviation assuming the data provided is a sample of the population and not the entire population.

Linear Estimates for x and y
When two-variable statistical information is stored in the statistical registers, an estimated y value can be calculated using a new x value or an estimated x value can be calculated using a new y value.

To estimate y:

- Enter the new x value
- Touch [r] [y, r]

To estimate x:

- Enter the new y value
- Touch [r] [x, r]

The correlation coefficient, r, can be calculated by touching the [x↔y] key after calculating the estimate.

Example
Using the children's height (y) and weight (x) values from above, estimate the height (y) of a child weighing 64 pounds (x) and determine the correlation coefficient. Note: Do not clear the registers after the prior example.

ENTRIES	DISPLAY
64 [r] [y, r]	43.34 Displays the estimated height of a child weighting 64 pounds.
[x↔y]	0.77 Displays the correlation coefficient (r) of the data pairs.

Weighted Mean Values
A set of numbers and their weighted mean may be determined if you know the weights of the items to be calculated. To do this:

- Touch [b] clear [∑]
- Enter value of item and touch [ENTER]
- Enter items' weight and touch [∑+]
- Repeat until all values are entered, following the item [ENTER] weight [∑+] formula
- Touch [r] [x w] to calculate weighted mean of all values

Example
Over a 6-month period, you buy bricks on many occasions to lay a path through your garden.

- First month: 150 bricks at $0.68 a brick
- Second month: 200 bricks at $0.43 a brick
- Third month: 50 bricks at $0.52 a brick
- Fourth month: 100 bricks at $0.61 a brick
- Fifth month: 250 bricks at $0.49 a brick

Find the weighted mean cost of the bricks.

ENTRIES	DISPLAY
[b] [∑]	48.00 Displays the first x value.
.68 [ENTER] 150 [∑+]	1.00 Displays which entry has just been entered … the first data pair.
.43 [ENTER] 100 [∑+]	2.00 Displays which entry has just been entered … the second data pair.
.52 [ENTER] 50 [∑+]	3.00 Displays which entry has just been entered … the third data pair.
.61 [ENTER] 100 [∑+]	4.00 Displays which entry has just been entered … the fourth data pair.
.49 [ENTER] 250 [∑+]	5.00 Displays which entry has just been entered … the fifth data pair.
[r] [x w]	0.55 Displays the weighted mean for the x values (price).

Mathematical Features and Functions

Most mathematical operations need only one number to be in the calculator (on the display screen) before a function button is touched. Touching the function button displays the result in the display screen in place of the originally entered number.

Fractional Values
Touching r FRAC displays the fractional part of the value (all digits to the left of the decimal point are replaced by a 0.)

The use of r FRAC also changes the number inside the x register. In RPN method, the original number can be viewed again in the display screen by touching r LSTx.

Example

ENTRIES	DISPLAY
99.12 ENTER	99.12 Displays the value.
r FRAC	0.12 Displays the fractional portion of the value.
r LSTx	99.12 Displays the original value.

Integer Values
Touching r INTG will replace the number on the display screen with its integer part (all digits to the right of the decimal point are replaced by 0)

Just like r FRAC, r INTG also changes the number inside the unit. In RPN method, the original number can be viewed again on the display screen by touching r LSTx.

Example

ENTRIES	DISPLAY
99.12 ENTER	99.12 Displays the value.
r INTG	99.00 Displays the integer portion of the value.
r LST X	99.12 Displays the original value.

Rounded Values
To round a number in the display screen to a specified number of decimal places, set the display format to show the exact number of decimal places desired. Each time a calculator function is performed, the value displayed will be rounded automatically. However, the value before rounding is actually stored in the register. To permanently round a value, touch b RND. To see the full value of a number (without rounding) touch b PREFIX.

Example

ENTRIES	DISPLAY
99.1266 ENTER	99.13 Displays the rounded value.
b PREFIX	99.126600000 Displays the entire value for a short pause.
b RND	99.13 Displays the original value.
b PREFIX	99.130000000 Displays the entire value for a short pause after permanent rounding.

Factorial Values

When [r] [n!] is touched, the factorial of the value on the display screen is calculated. (the product of the values of integers 1 to n, being the number on the display screen)

Example

ENTRIES	DISPLAY
6 [r] [n!]	720.00 Displays the factorial value of 6 (1 X 2 X 3 X 4 X 5 X 6).

Exponential Values
When [r] [e^x] is touched, the exponential of the value on the display screen is calculated (raises the base number –e- to the number on the display screen)>

Example

ENTRIES	DISPLAY
3 [r] [e^x]	20.09 Displays the exponential value of 3.

Logarithm Values
When [r] [LN] is touched, the natural logarithm (logarithm to the base of e) is calculated. Subsequently touching 10 [r] [LN] [÷] in RPN and [÷] 10 [r] [LN] = in ALG method calculates the common logarithm (logarithm to the base of 10 of the number on the display screen).

Example

ENTRIES	DISPLAY
9 [r] [LN]	2.20 Displays the natural logarithmic value of 9.
10 [r] [LN] [÷]	0.95 Displays the common logarithmic value of 9 (when in RPN mode)
[÷] 10 [r] [LN] [=]	0.95 Displays the common logarithmic value of 9 (when in ALG mode)

Square Root Values
When [r] [√x] is touched, the square root of the value on the display screen will be calculated.

Example

ENTRIES	DISPLAY
9 [r] [√x]	3.00 Displays the square root of 9.

Squared Values
When [r] [x^2] is touched, the square of the value on the display screen is calculated.

Example

ENTRIES	DISPLAY
9 [r] [x^2]	81.00 Displays the square of 9.

Reciprocal Values
When [1/x] is touched, the number on the display screen is divided into 1 (giving the reciprocal value).

Example

ENTRIES	DISPLAY
5 [1/x]	0.20 Displays the reciprocal of 5.

Power Features in ALG method

[y^x], the power of a value, may be calculated in ALG method as follows:

- Enter the y value
- Touch [y^x]
- Enter the x value (exponent value)
- Touch [=] to calculate number, the power of the value

Example

ENTRIES (ALG)	DISPLAY
2 [y^x] 3 [=]	8.00 Displays 2^3 (2 X 2 X 2 = 8).

Power Features in RPN method

[y^x], the power of a value, may be calculated in RPN method as follows:

- Enter the y value
- Touch [ENTER]
- Enter the x value
- Touch [y^x]

Example

ENTRIES (ALG)	DISPLAY
2 [ENTER] 3 [y^x]	8.00 Displays 2^3 (2 X 2 X 2 = 8).

Chapter 5: The Basics of Programming

Programs are a sequence of button entries that are stored into the calculator. Calculations involving the same sequence of button entries are common, and saving them in a program can save time.

Creating Your Own Program

To create a program, just write it and store it.

- Write out the sequence of operations you will use to calculate the value or values you wish to find.
- Select the function option by touching either [b] [ALG] or [b] [RPN]
- Note: Use programs made in ALG to perform operations while in ALG METHOD only, and programs made in RPN METHOD to perform operations while in RPN METHOD only.
- Touch [b] [P/R] to enable program function. In program mode, operations entered are not executed, but stored into the calculator. The PRGM icon will appear on the display screen while in program mode.
- Touch [b] clear [PRGM] to clear any previous programs stored into the calculator
- Enter the sequence of operations you wrote down in the first step.

Example

Your online business is having a 30% off sale. You can make a program that will find the net price of each item after the discount and the $10.00 shipping and handling fee is added. Find the net price of a $150 item.

ENTRIES (RPN)	DISPLAY
150	150 Displays the regular price of $150 item

ENTER	150.00 Prepares the number for further activity
30 %	45.00 Computes the 30% discount.
-	105.00 Displays the 30% off price plus $10.
10	10 Displays the shipping and handling fee
+	115.00 Displays the 30% off price plus $10.

In ALG method:

ENTRIES (ALG)	DISPLAY
150	150 Displays the regular price of $150 item
-	150.00 Prepares for number for further activity
30 %	45.00 Computes the 30% discount.
+	105.00 Displays amount after discount.
10	10 Displays the shipping and handling charge of $10
=	115.00 Displays the 30% off price plus $10.

After you calculate net cost, you can set the calculator to program function and erase any previously stored programs by:

ENTRIES	DISPLAY
b P/R	Sets the calculator to program function
b PRGM	000 Clears the program memory

To create a program, use the same buttons you used to solve for net cost manually. What is shown on the display screen in the next step will be further explained later.

In RPN method:

ENTRIES (RPN)	DISPLAY
ENTER	001, 36
3	002, 3
0	003, 0
%	004, 25
-	005, 30
1	006, 1
0	007, 0

+	008, 40

In ALG method:

ENTRIES (ALG)	DISPLAY
-	001, 30
3	002, 3
0	003, 0
%	004, 25
+	005, 40
1	006, 5
0	007, 0
=	007, 36

Executing Your Own Program

Touch b P/R to put calculator back in run function.
Enter all required input into the calculator the same as if you were calculating manually. (When a program is executed, the data already entered onto the display and into the registers inside the unit are used.)

Touch R/S to begin executing the program.

Use your program to now calculate the net cost of an $800 item and a $365 item. The program will work the same in both RPN and ALG method.

ENTRIES	DISPLAY
b P/R	Puts the calculator in Run method
800	800.00 Displays the regular price of $800 item
R/S	570.00 Displays the 30% off price plus $10.
365	365.00 Displays the regular price of $365 item
R/S	265.50 Displays the 30% off price plus $10.

Program Memory Basics

Program Memory stores a sequence of entries in calculator memory for re-use at a later time. A *program line* is specific number, function key, or decimal point. For example the ENTER button is a program line. Program lines that start with b, r, RCL, STO, or GTO buttons have two entries because the entry is incomplete without describing what comes after the first button.

When executing a program, all instructions therein are performed—all button sequences are carried out, just like touching the keys manually—and begin with the current program line proceeding through all the rest of the program lines.

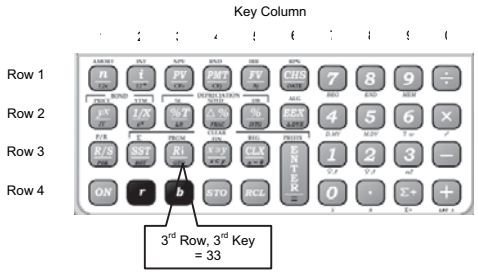
When in program mode, the display screen holds data from the current program line. To the left of the display screen is the number of the program line in the program memory.

The rest of the digits describe a code that tells what instruction is stored within that program line. A program line set to 000 will show no code, because there is no instruction specified.
To display a program line: touch [b], [P/R] to set calculator to program mode instead of run mode, this will display the key code and line number for the calculator's current program line.

To check some (or all) instruction stored within the program memory: touch [SST] (single step) in program mode to go to the next line of program memory and its instructional information. To see the prior line of program memory touch [r] [BST] which will back step the program one line at a time.

Determining Program Line Instructions

All keys besides the number 0-9 keys on the calculator are described by 2-digit key codes that correspond with that specific key's location on the keyboard. The first number in the key code is the number of the key row, with the first row being 1-9, and 0 for the 10th key. The number keys 0-9 have key codes that correspond to their values (the number 3 button's key code is only '3'), therefore storing the [R↓] button to a program as an instruction into program memory displays a line number and key code of 001 33.



The illustration shows the button for the instruction in program line 001 is in the third row of the keyboard and is the third button within that row, the [R↓] button. When the instruction ÷ is entered into the program memory it will be displayed as 002 10. This shows the button for the instruction in program line 2 within the program memory is in the first row and is the tenth key. When the instruction 3 is entered, the key code is displayed only as 3. The button sequences that begin with [b], [r], [RCL], [STO], and [GTO] are stored within one program line, and therefore the display of that line would show key codes for all keys within the button sequence.

Examples

ENTRIES	DISPLAY
[r] [BEG]	xxx, 43 7 Displays the program line number, the position of the first key touched (43) and the position of the second key touched (7)
[STO] 5	xxx, 44 5 Displays the program line number, the position of the first key touched (44) and

	the position of the second key touched (5)
b IRR	xxx, 42 15 Displays the program line number, the position of the first key touched (42) and the position of the second key touched (15)

Program line 000 and the GTO 000 instruction:

The GTO 000 instruction tells the calculator to go to and execute program line 000. Line 000 contains no regular instruction, but holds a default instruction that tells the calculator to stop execution of the program. This means after you run the program, the calculator goes to program line 000 and stops, waiting for you to enter new data and run the program again. The calculator is also set to program line 000 when b, P/R is touched, or by touching b PRGM in run mode. The GTO 000 instruction is stored in every program line before beginning the program and is replaced by the instructions entered and moved into the next program line, all the way up to the 400th (maximum) program line. The calculator is set to hold eight lines of program memory, so if you had eight lines of programming, the calculator would automatically perform instruction GTO 000 after the eighth line was performed. Entering more that eight lines automatically expands to hold the additional instructions and program lines.

To find how many program lines (including r GTO 000) are in program memory, touch r MEM to prompt the display below where xx stands for the number of allocated program lines and yy stands for the number of available registers:

P-xx r-yy

Performing a Program One Line at a Time

SST allows you to run a program a single step at a time and check that the program you wrote matches the program you stored. This does not mean that the program you wrote will correctly calculate your results. (Even skilled programmers' programs don't run correctly at first.)

To ensure your program runs correctly, use the SST button while in RUN mode to move to the next line in the program and display its key code and line number. In RUN mode, releasing the SST button executes the program line instruction that was just displayed, and then displays the result of the execution of that line.

Example

Re-enter the program described earlier in this chapter: Your online business is having a 30% off sale. The program finds the net price of each item after the discount and the $10.00 shipping and handling fee is added. After entering the program, run the program with an initial price of $200 using SST.

ENTRIES (RPN)	DISPLAY
b P/R	000, Sets calculator to program mode
ENTER	001, 36
3	002, 3
0	003, 0
%	004, 25
-	005, 30
1	006, 1
0	007, 0
+	008, 40
	Program is now stored
b P/R	0.00 Sets calculator to run mode

200	200 Enters the initial price
SST (Hold)	001, 36 Displays the first program line
	200.00 Executes the first program line
SST (Hold)	002, 3 Displays the second program line
	3. Executes the second program line
SST (Hold)	003, 0 Displays the third program line
	30. Executes the third program line
SST (Hold)	004, 25 Displays the fourth program line
	60.00 Executes the fourth program line
SST (Hold)	005, 30 Displays the fifth program line
	140.00 Executes the fifth program line
SST (Hold)	006, 1 Displays the sixth program line
	1 Executes the sixth program line
SST (Hold)	007, 0 Displays the seventh program line
	10 Executes the seventh program line
SST (Hold)	008, 40 Displays the eighth program line
	150 Executes the eighth program line

Setting the Calculator to a Specific Program Line

Storing a second program or adjusting an existing program sometimes requires you to go to a specific line of programming. There are three alternative approaches:

1. Use the SST button to cycle through the program lines.
2. In PRGM mode press r GTO . xxx with xxx being the desired program line. The display will next show the program line specified.
3. In run mode press r GTO xxx with xxx being the desired program line. The display will not change however if the R/S key is touched the program will start executing from the specified program line.

Interrupting a Program During Execution

To disrupt a program during execution (to see a result or to enter new information) touch r, PSE (pause) or R/S (run/stop) buttons. Touching r PSE while running a program will stop the program for about one second and then continue. During the pause, the last result calculated before touching r PSE will be displayed. Touching any key during a pause stops the program execution completely. To resume executing the program of the program line following the r PSE instruction, touch R/S.

Example

Create a program that calculates the sale price of an item at both 10% off and 20% off. Display the results with a pause in between each figure. For example, if the regular price is $200, then 10% off would be $180 and 20% off would be $160.

ENTRIES (RPN)	DISPLAY
b P/R	000, Puts the calculator in Program method

b PRGM	Memory program is cleared.
STO 0	001, 44 0 Program will store the entry into register 0 for later use
.	002, 48 Decimal point
9	003, 9 .9 = 90% or 10% off
X	004, 20 Multiply by 90%
r PSE	005, 43 31 Pause
RCL 0	006, 45 0 Recall the original entry
.	007, 48 Decimal point
8	008, 8 .8 = 80% or 20% off
X	009, 20 Multiply by 80%

To run the program, exit the program mode, press b P/R, enter the regular price, and press R/S.

ENTRIES (RPN)	DISPLAY
b P/R	Puts the calculator in Run method
200	200 Displays the regular price of $200
R/S	180.00 Displays the 10% off price
	160.00 After a pause, displays the 20% off price. Note: If the pause is too short, additional pauses can be added by programming r PSE more than once.

Stopping a Program During Execution

Touching R/S during program execution automatically stops execution. To resume running the program from where it was stopped, touch R/S again.

A stop can be inserted into a program just like any other function or key.

Example

Create a program that calculates the sale price of an item at both 10% off and 20% off. Display the results with a stop in between each figure. For example, if the regular price is $200, then 10% off would be $180 and 20% off would be $160.

ENTRIES (RPN)	DISPLAY
b P/R	000, Puts the calculator in Program method
b PRGM	Memory program is cleared.
STO 0	001, 44 0 Program will store the entry into register 0 for later use

.	002, 48 Decimal point
9	003, 9 .9 = 90% or 10% off
X	004, 20 Multiply by 90%
R/S	005, 31 Stop program execution
RCL 0	006, 45 0 Recall the original entry
.	007, 48 Decimal point
8	008, 8 .8 = 80% or 20% off
X	009, 20 Multiply by 80%

To run the program, exit the program mode, press b P/R., enter the regular price, and press R/S.

ENTRIES (RPN)	DISPLAY
b P/R	Puts the calculator in Run method
200	200 Displays the regular price of $200
R/S	180.00 Displays the 10% off price
R/S	160.00 After a stop, displays the 20% off price.

Chapter 6: Branch & Loop Programs

Program instructions typically execute sequentially through program line numbers, but it is possible to transfer or 'branch' to a program line that is not the next line of program memory. Using the GTO instruction in a program will transfer an execution to any program line by using the designated three digit code of that line within the GTO command. After a branch, execution will resume sequentially as normal. For example, if program line 008 contains the command r GTO 004, then program line 004 will be executed after program line 008.

When the GTO instruction describes a lower number program line, the instructions contained within the lines between that line and the GTO instruction will be performed repeatedly. This is called 'looping'.

To terminate the execution of a loop, insert a r x≤y , r x=0 , or R/S instruction within the loop. Also, touching any key while executing the loop will stop the program.

Branching with Conditions

Sometimes you will need to branch to different lines of program memory, conditionally. There are two conditional test instructions used in program of conditional branching.

r x≤y determines whether the value in the x-register is less than or equal to the value in the y-register. The x-register holds the number currently displayed in run mode and the y-register holds the number in the display when you touched ENTER.

(Touching 3 ENTER 9 would store 3 in the y-register and 9 in the x-register.)

r x=0 determines whether the value in the X register is equal to 0.

Using these instructions will either:

- Continue program execution sequentially to the next line of program memory (if the tested condition was true when executed.)

Or

- Skip instruction in the next line of programming and continue with the following line (if the tested condition was false.)

Example

Create a program that determines the amount owed on a credit card after making $100 payments each month. The interest rate is 12% per year or 1% per month. Program a brief pause after showing each monthly amount. Stop the program when the amount owed is less than $0.

ENTRIES (RPN)	DISPLAY
b P/R	000, Puts the calculator in Program method
b PRGM	Memory program is cleared.
1	001, 1 Digit 1 is the first program line
%	002, 25 Multiply by 1% to calculate monthly interest
+	003, 40 Add the 1% interest to the amount owed
1	004, 1 Digit 1 is the fourth program line
0	005, 0 Digit 0 is the fifth program line
0	006, 0 Digit 0 is the sixth program line
-	007, 30 Subtract $100 from the amount owed
STO 0	008, 44 0 Store the value in register 0
r PSE	009, 43 31 Pause
r PSE	010, 43 31 Pause
r PSE	011, 43 31 Pause
r PSE	012, 43 31 Pause
0	013, 0 Digit 0 is the 13th program line
ENTER	014, 36 Digit 0 is entered into the x register
RCL 0	015, 45 0 The value in register 0 is recalled into the x register and the value in the x register (zero) is moved to y register 016, 43 34
r x≤y	If x is less than or equal to y, then perform the next instruction, else skip the next instruction. 017, 43 33 000
r GTO 000	Go to program line 0 (halts program if the debt owed is less than or equal to $0)
r GTO 001	018, 43 33 001

	Go to program line 1 (continues program if the debt owed is greater than $0)

To run the program, exit the program mode, press b P/R, enter the initial credit card debt, and press R/S. In the example below, we will use an initial debt of $300.

ENTRIES (RPN)	DISPLAY
b P/R	Puts the calculator in Run method
300	300.00 Displays the initial debt of $300
R/S	203.00 Executes the program and displays the amount owed after 1 month of interest at 1% and a $100 payment.
	105.03 After a pause, displays the amount owed after the 2nd month
	6.08 After a pause, displays the amount owed after the next month
	-93.86 After a pause, displays the amount owed after the next month. In this case, a $100 payment would create a balance less than zero and the program stops.

Note: With this example, if the program is halted before completion, the registers must be cleared by pressing b REG before running the program again.

Note: With this example, an initial debt of more than $10,000 will result in a growing credit card debt despite the $100 monthly payment.

Storing More Than One Program

More than one program may be created and stored if each program ends with 1) the R/S instruction to halt execution at program end and 2) the GTO instruction looping the program back to the starting line if it is to run again. To run a program that starts at a line other than 001, set the calculator to the first line in the program with a GTO instruction before you touch R/S.

Chapter 7: Editing Your Programs

To change a single instruction in program memory, the following steps are followed:

- Touch b P/R to enter PROGRAM mode
- Touch SST , BST or GTO . buttons to find the program line directly before the specific program line that contains the instruction you wish to change.
- Enter the new instruction.

Example

Re-enter the program described in chapter 5: Your online business is having a 30% off sale. The program finds the net price of each item after the discount and the $10.00 shipping and handling fee is added. After entering the program, change the program to reflect a 50% off sale. This will require a change to program line 002.

ENTRIES (RPN)	DISPLAY
b P/R	000, Sets calculator to program mode
b PRGM	000, Clears all program lines
ENTER	001, 36
3	002, 3
0	003, 0
%	004, 25
-	005, 30
1	006, 1
0	007, 0
+	008, 40
	Program is now stored
b P/R	0.00

	Sets calculator to run mode
b P/R	0.00 Sets calculator to program mode
r GTO . 001	001, 36 Displays the first program line
5	002, 5 Displays the new information for program line 002: 3 has been replaced by 5 to enable the program to calculate a 50% discount instead of 30%.
b P/R	0.00 Sets calculator to run mode

If the program is run with a starting value of 100, the result should now be 60 (50% off of 100 plus 10).

Inserting Instructions Into a Program

To insert new instructions into a program, a branch must be created because the V12 does not have a mechanism to insert new program lines between existing program lines.

Branching will allow you to go to a new instruction added at the end of the program, then branch back and continue with the next program line after the branch.

To add by Branching Method:

- Touch b P/R to enter PROGRAM mode
- Touch r GTO . then the 3-digit program line number directly before the point where the additional instructions will go.
- To specify the line number of the new branch, touch r GTO and the three-digit line number where the branch will start. Suggestion: Use the second line after the end of the program because the first line is reserved for the GTO 000 instruction. Therefore if

the program ends on the 008 line, start the branch at line 010.

- Note: The replaced program line in the original program must be replicated at the end of the new branch.
- Note: The last program line in your new branch must loop back to the original program directly after the point where you wanted to insert the additional instructions. For example, if you branch out of the program in line 004, you must branch back to 005.

Example

Using the prior example for our online business, add a branch that will add 5% sales tax before adding the $10 shipping and handling charge. Program line 006 will be replaced with a branch.

ENTRIES (RPN)	DISPLAY
b P/R	000, Sets calculator to program mode
b PRGM	000, Clears all program lines
ENTER	001, 36
5	002, 5
0	003, 0
%	004, 25
-	005, 30
1	006, 1
0	007, 0
+	008, 40
r GTO 000	009,43,33,000 Instructs program to return to line 000 after execution. This is required if a branch is to follow.
	Program is now stored
b P/R	0.00

	Sets calculator to run mode
b P/R	0.00 Sets calculator to program mode
r GTO . 004	004, 25 Go to and display the fourth program line. As a result, the next key strokes will be recorded on line 005.
r GTO 010	005,43,33,010 Replaces and displays the contents of line 006 instructing the program to go to line 010
r GTO . 009	009,43,33,000 Go to and display the ninth program line. As a result, the next key strokes will be recorded on line 010.
-	010, 30 Places the minus key as the first line of the branch. This performs the function of the old line 005 which was replaced with the GTO function.
5	011, 5
%	012, 25
+	013, 40
r GTO 006	014,43,33,006 Instructs program to branch back to line 006
b P/R	0.00 Sets calculator to run mode

If the program is run with a starting value of 100, the result should now be 62.50 (50% off of 100, add 5% tax, add 10 for shipping and handling). To see the execution one line at a time, use the SST key.

Inserting Instructions at the End of a Program

One or more instructions can be added at the end of a program with the following steps:

- Touch b P/R to enter PROGRAM mode.
- Touch r GTO . and the three-digit line number of the last line in the program.
- Enter new instructions.

Chapter 8: Error Messages

Certain operational procedures prohibit the V12 from completing calculations causing an error message to appear on the display screen, along with a number 0-9 that corresponds with the particular error condition. These errors are summarized below:

ERROR	CAUSE
0	The operation included a zero value that prevented calculation. Example: 1 ÷ 0
1	The result is greater than the maximum possible number of $9.999999999 \times 10^{99}$
2	A zero value is preventing statistical calculation
3	The IRR calculation can not be completed because more than one answer is possible. An estimate of IRR may need to be provided to overcome the error.
4	Memory error caused by an attempt to enter more than the maximum number of program lines or go to a line that does not contain instructions.
5	Error in calculating compound interest caused by entries such as improper values of zero or sets of input that have no solution. Example: n = 0 will not allow calculation of payments.
6	Maximum register capacity has been exceeded or a storage register has been included in an operation that does not exist or is being used for program memory.
7	For the inputs provided, no IRR can be calculated (often created when no negative cash flow is provided).
8	Calendar error due to improper format or specification of dates out of range of the calculator.
9	Service required. Contact Victor.

Victor Technology
V12 Calculator
Limited Warranty

Thank you for purchasing a product from Victor Technology.

This product has been electronically tested. If you have problems using this product, please carefully refer to the instruction manual.

This product, except the battery, is warranted by Victor to the original purchaser to be free from defects in material and workmanship under normal use for a period of two years from the date of purchase. During the warranty period, and upon proof of purchase, the product will be repaired or replaced (with the same or a similar model) at Victor's option, at a Victor Authorized Service Center, without any charge for either parts or labor.

This warranty will not apply if the product has been misused, aboused, or altered. Without limiting the foregoing, battery leakage, bending of the unit, a broken display, a cracked housing, and cracks in the LCD display will be presumed to have resulted from misuse or abuse.

To obtain warranty service you must take or send the product, postage paid, with a copy of your sales receipt or other proof of purchase and the date of purchase, to a victor Authorized Service Center. Due to the possibility of damage or loss, it is recommended when sending product that you package the product securely and send it insured, return receipt requested.

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If your product needs repair, please call 1-800-268-8400 or visit us at www.VictorV12.com.

If for any reason this product is to be returned to the store where purchased, if must be packed in the original package. Thank you.

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