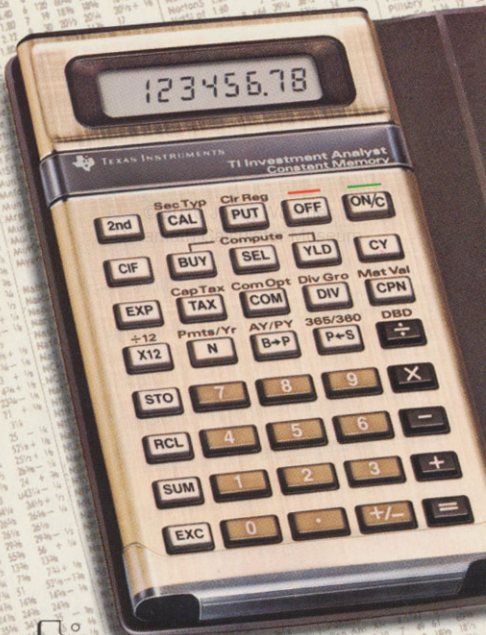


Texas Instruments Slimline Investment Analyst™ electronic calculator



KEY INDEX

This indexed keyboard provides a quick page reference to the description of each key. Second function references appear above the key.

	6,9	8		
	[Sec Typ]	[Clr Reg]		
[2nd]	[CAL]	[PUT]	[OFF]	[ON/C]
6	70	70	5	5,8
	28,54,71	28,54,71	28,54,72	
[CIF]	[BUY]	[SEL]	[YLD]	[CY]
13	27,53,71	28,53,71	28,54,71	29,55
	26,52,69	70	27	53
	[Cap Tax]	[Com Opt]	[Div Gro]	[Mat Val]
[EXP]	[TAX]	[COM]	[DIV]	[CPN]
71	26,52	26,52,70	27	52
13	23,47	27,53,70	23,47	15
[÷12]	[Pmts/Yr]	[AY/PY]	[365/360]	[DBD]
[X12]	[N]	[B→P]	[P←S]	[÷]
13	13,23,47	23,47	23,47,69	11
[STO]	[7]	[8]	[9]	[X]
17,8	7	7	7	11
[RCL]	[4]	[5]	[6]	—
17	7	7	7	11
[SUM]	[1]	[2]	[3]	+
18	7	7	7	11
[EXC]	[0]	[.]	[+/-]	[=]
19	7	7	7	11

TABLE OF CONTENTS

Chapter	Title	Page
I.	INTRODUCTION	1
	Features	1
	Functions	1
	Using this Manual	2
	A Preview of Investment Calculations	3
II.	BASIC OPERATIONS	5
	Turning the Calculator On and Off	5
	Display Indicators	5
	Dual Function Keys	6
	Data Entry	7
	Clearing Your Calculator	8
	Constant Memory™ Feature	9
	Security-Type Selection	9
	APD™ Automatic Power Down	10
	Error Conditions	10
III.	MATHEMATICAL FUNCTIONS	11
	Arithmetic Operations	11
	Interest-Related Calculations	13
	Days-Between-Dates Calculations	15
IV.	MEMORY FUNCTIONS	17
	Memory Store and Recall	17
	Sum to Memory	18
	Memory/Display Exchange	19

IMPORTANT

Record the serial number from the bottom of the unit and purchase date in the space below. The serial number is identified by the words "SER. NO." on the bottom case. Always reference this information in any correspondence.

**TI Investment
Analyst**

Model No.	Serial No.	Purchase Date
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Texas Instruments reserves the right to make changes in materials & specifications without notice.

TABLE OF CONTENTS

(Continued)

Chapter	Title	Page
V.	STOCKS	20
	Introduction	20
	Stock Key Tour	22
	Time Keys	22
	Variable Keys	26
	Basic Keys	27
	Computing Keys	28
	Stock Calculations	29
	Common Stocks	30
	Preferred Stocks	37
	Convertible Preferred Stocks	38
	Buying and Selling on Margin	40
	Selling Short	43
VI.	BONDS	45
	Introduction	45
	Bond Key Tour	46
	Time Keys	47
	Variable Keys	52
	Basic Keys	53
	Computing Keys	54
	Bond Calculations	55
	Corporate Bonds	56
	Municipal Bonds	60
	Callable Bonds	61
	Convertible Bonds	63
	Short-Term Notes	66
	Mortgage Securities	67
VII.	OPTIONS	68
	Introduction	68
	Option Key Tour	69
	Time Keys	69
	Variable Keys	69
	Basic Keys	70
	Computing Keys	71
	Option Calculations—The Buyer	72
	Call and Put Options	73
	Spreads	76
	Option Calculations—The Writer	79

TABLE OF CONTENTS

(Continued)

Chapter	Title	Page
VIII.	OTHER INVESTMENTS	83
	Introduction	83
	Rents and Leases	84
	Capital Expenditure Analysis	85
	Home Mortgage Loans and Annuities	86
	Commodity Contracts	89
	Gold, Silver, and Other Collectibles	90
	APPENDICES	92
A.	SERVICE INFORMATION	92
	In Case of Difficulty	92
	Battery Replacement	93
	Calculator Exchange Centers	94
	If You Need Service Information	94
	For Technical Assistance	95
B.	ERROR CONDITIONS AND PARAMETERS	96
	Error Conditions	96
	Table of Parameters	98
C.	INVESTMENT FORMULAS	101
	Annual Calculations	101
	Ownership Period Calculations	106
	Current Yield	108
	Compound Interest Factor (CIF) Calculations	108
	WARRANTY INFORMATION	back cover

I. INTRODUCTION

Your *Investment Analyst*™ calculator places at your fingertips a new dimension in easy-to-use financial calculating power. Designed for both investment professionals and individuals who wish to make their own investments' analysis, it aids rapid and accurate evaluation, selection, and management of stocks, bonds, options, warrants, commodity futures, gold, silver, stamps, paintings, real estate, and numerous other types of investments. The seemingly endless variations of investment possibilities can now be conveniently and confidently analyzed wherever you go without referring to complicated algebraic formulas.

Features

- Large, easy to read Liquid Crystal Display (LCD).
- Constant Memory™ feature saves data entered into the calculator even when the calculator is turned off.
- APD™ Automatic Power Down provides that if no keys are pressed for 5 to 15 minutes, your calculator automatically turns itself off.
- Over 1000 hours of operation can normally be obtained from a set of batteries.

Functions

- **Mathematical Functions** include:

Arithmetic (+, -, ×, ÷, ×12, ÷12)

Compounded interest factor (CIF)

Days between dates (DBD)

- **Memory Functions** include:

Store in memory

Sum to memory

Recall from memory

Memory/display
exchange

- **Security Capabilities** solve problems involving:

Common Stocks

Put Options

Preferred Stocks

Call Options

Preferred Convertible
Stocks

Straddle Options

Selling Short

Strap Options

Corporate Bonds

Strip Options

Agency Bonds	Spread Options
Government Bonds	Rents and Leases
30/360 Notes	Commodity Contracts
Treasury Bills	Annuities
Actual/360 or 365 Notes	Capital Expenditure Analysis
Convertible Bonds	Stamps and Coins
Callable Bonds	Gold
Mortgage Securities	Silver

And Many Other Investments

• **Accuracy** of the calculator is based on an internal calculating capacity of 11 digits. In mathematical operations the eight-digit number in the display is generally rounded to within ± 1 in the eighth digit. In investment computations, the display is rounded to the nearest tenth. However, internally the computed result is stored to the full capacity of the calculator (up to 11 digits) and this unrounded value is used for further computations. See the *Error Conditions and Parameters* appendix for more information.

Using this Manual

To get the most from your *Investment Analyst* calculator, read this manual and work the examples. The examples have been designed to show you the wide range of calculations possible with your calculator and to illustrate the basics of its use.

The preliminary chapters of this manual are devoted to explaining the mathematical and memory functions of your calculator. It is important to read these chapters first as they provide information which is not repeated elsewhere. Notice, also, that this manual devotes four chapters to investment calculations (*Stocks, Bonds, Options, and Other Investments*) and that certain information is repeated in each chapter. This approach was taken to ensure that all of the information necessary to analyze a particular type of investment is contained within the appropriate chapter. Because the same keys are sometimes used differently in analyzing different types of

investments, be sure to read the appropriate sections of your manual before making investment calculations.

The *Investment Formulas* appendix of this manual supplies the algebraic formulas used by your calculator in making investment calculations.

A Preview of Investment Calculations

You buy a gold coin for \$215 on December 11, 1978, and sell it for \$765 on January 17, 1980. What was your *annual yield*? Your long-term capital gains tax rate is 20% and you pay a 2% commission on buying and selling the coin.

Press

Display/Comments

ON/C	ON/C	0	Turn calculator on and clear display
2nd [Sec Typ] *	A	0	Repeat until "A" appears in left side of display
2nd [Clr Reg]	A	0	Clears memory registers
1211.1978	2nd		
[DBD]	A	1211.1978	Buy date
117.1980	=	402	Number of days the coin was owned
P+S	A	402	Enter 402 days as the length of the investment
2 [COM]	A	2	Commission rate
20 2nd			
[Cap Tax]	A	20	Capital gains rate
215 [BUY]	A	215	Buying price
765 [SEL]	A	765	Selling price
2nd [YLD] †	A	166.1	Annual yield

*Key symbols printed in brackets represent second function keys. To use a second function key, press the **2nd** key followed by the key below the appropriate key code. For example, to use the **[Sec Typ]** key function, press **2nd** followed by **[CAL]**.

The coin investment produced an after-tax *annual yield* of 166.1%. Now determine what the coin would have had to sell for to produce a 200% *annual yield*.

Press

Display/Comments

200 [YLD]

^ 200 Annual yield

[2nd] [SEL] †

^ 880.7 Selling price

If you had sold the coin for \$880.70, your after-tax *annual yield* would have been 200%.

This problem provides a brief preview of your calculator's investment capabilities. As you learn to use your calculator, you will make more difficult investment calculations just as simply and quickly.

†The display may blank for several seconds while computing [BUY], [SEL], or [YLD].

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Datamath Calculator Museum

II. BASIC OPERATIONS

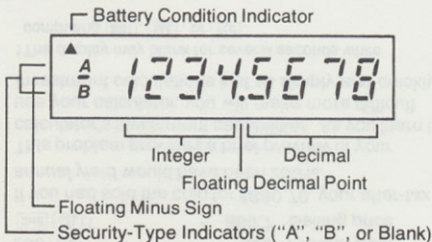
Turning the Calculator ON and OFF

Pressing **ON/C**, the key in the upper right corner of the keyboard, turns your calculator on. When you turn on your calculator for the first time, or after you replace the batteries, completely clear the registers and memory of the calculator by pressing **ON/C**, **ON/C**, **STO**, **2nd** [**Sec Typ**], and **2nd** [**Clr Reg**].

The power-on condition is indicated by the presence of a "▲" in the upper left corner and a "0" in the right side of the display. To turn your calculator off, press the **OFF** key. Turning the calculator **OFF** and then **ON/C** clears the display and any pending calculations.

NOTICE: Pressing any key in the top row of your calculator causes random segments to be displayed. The appearance of these random segments does not affect the normal operation of your calculator. Note, also, that the entire display, including the small "▲" battery condition indicator, is blanked during key entries and calculations. All keyboard entries except **OFF** are ignored when the display is blanked during calculations.

Display Indicators



Battery Condition Indicator. The small “▲” in the upper left-hand portion of the display indicates a “good battery” condition. A dim or absent “▲” indicates weak batteries. However, your calculator will still operate accurately for several hours before becoming erratic. See the *Service Information* appendix for battery replacement instructions.

Security-Type Indicators. The security-type indicators are located on the left side of the display. “A” indicates that the calculator is set for stock calculations. “B” indicates that the calculator is set for bond calculations. The absence of both “A” and “B” indicates that the calculator is set for option calculations. To change security settings, repeatedly press [2nd] [Sec Typ] until the appropriate indicator appears.

Floating Minus Sign. A negative number is displayed with a minus sign immediately to the left of the number.

Dual Function Keys

Many of your calculator's keys have dual functions. The first function is printed on the key. If a key has a second function, it is printed above that key. To perform a function shown on a key, simply press the desired key. To use the second function of a key, first press and release [2nd] in the upper left corner of your keyboard, then press the key immediately below the desired second function. For example, to use the [TAX] function, press [TAX]. To use the [Cap Tax] function, a second function, press the [2nd] key and then the [TAX] key. In this manual, operations involving second functions are indicated with the key symbols in brackets, for example, [2nd] [Cap Tax].

Note that if [2nd] is pressed twice in succession, the [2nd] function operation is cancelled. Also, pressing [2nd] has no effect on keys such as digits which do not have second functions.

Data Entry

For maximum versatility, your calculator operates with a floating decimal point. To enter a number with a decimal part, enter the whole-number portion of the number, press $\boxed{\cdot}$, and then enter the decimal portion of the number. The decimal point appears in the display only after the first digit following the decimal point is entered. Thereafter, it floats with the entered number. If no decimal point is entered, it does not appear in the display and is assumed to be to the right of the number displayed.

A maximum of 7 digits may be entered to the right of the decimal and a maximum of 8 digits may be entered overall. Any digit keys pressed after these limits have been reached are ignored by the calculator.

$\boxed{0}$ through $\boxed{9}$ **Digit Keys**—Enter numbers 0 through 9.

$\boxed{\cdot}$ **Decimal Point Key**—Enters a decimal point. A decimal point is not displayed for integer numbers.

$\boxed{+/-}$ **Change Sign Key**—When pressed after a number entry or a calculation, changes the sign of the displayed number.

Example: Enter -12.61

Press	Display
12.61 $\boxed{+/-}$	-12.61

Clearing Your Calculator

ON/C On/Clear Key—Turns the calculator ON and displays a zero. When the calculator is already ON, pressing **ON/C** clears a number entry or the calculator, depending upon the preceding key sequence. Pressing **ON/C** twice always clears the display and calculator. Values stored in the user memory and security registers are not affected by pressing **ON/C**.

If **ON/C** is pressed once immediately after a number entry, for example, after entering the key sequence 6 **+** 2, only the 2 is cleared from the display. The 6 **+** remains pending in the calculator. You should then key in a new number and continue the arithmetic operation.* Refer to page 12 for an example illustrating the use of **ON/C** to correct a number entry.

If **ON/C** is pressed once after any operation or function key (including **+**, **-**, **X**, **÷**, or **=**), both the display and any preceding key sequence is cleared. For example, pressing **ON/C** after entering the key sequence 6 **+** clears both the 6 and the pending **+** operation.

2nd [Clr Reg] Clear Security Registers Key Sequence—Clears all data stored in the security registers. This sequence does not clear the display or the user memory. It does, however, always set the calculator to the *annual* and 365-day year settings for any subsequent calculation. (See chapters V, VI, and VII for details.)

ON/C [STO] Clear Memory Key Sequence—Clears the user memory by storing a zero. This sequence also clears the display.

*When **ON/C** is used to clear a number after entering a key sequence such as 6 **+** 2, a new number (including zero) **must be entered with the number keys** before performing any other operation or erroneous results may occur.

Clear “Error” Condition. Pressing **ON/C** when “Error” is displayed clears the display and any pending arithmetic calculation. Clearing the “Error” condition does not clear the security registers. See the *Error Conditions and Parameters* appendix for more information.

Constant Memory™ Feature

Your new calculator has two different kinds of memories. The first kind, called in this manual “the user memory” or simply “memory,” is controlled by the store **STO**, recall **RCL**, sum **SUM**, and exchange **EXC** keys. The user memory can be used to store any value and to perform “memory addition.” The second kind of memory is referred to in this manual as a “security register” or simply a “register.” When values such as the buying price, selling price, yield, commission rate, or tax rate are entered into your calculator, they are stored in security registers. These values are then used by the calculator to make the various investment calculations. The Constant Memory™ feature of your calculator saves the values stored in the user memory and the registers even when your calculator is turned off.

IMPORTANT: The Constant Memory™ feature is not maintained if the batteries are discharged or removed.

Security-Type Selection

Your *Investment Analyst* calculator can be set to three different security settings—stocks, bonds, or options—depending upon the type of investment to be analyzed. The stock setting is indicated by the appearance of an “A” in the left side of the display. The bond setting is indicated by the appearance of a “B” in the left side of the display. The option setting is indicated by the absence of either an “A” or a “B” in the left side of the display.

Explanations of the different security settings are provided in later sections of this manual.

To change the security setting, press **2nd** **[Sec Typ]**. The three settings change in the following order: stocks, bonds, and options. Pressing **2nd** **[Sec Typ]** when the calculator is set for options changes the setting back to stocks. Mathematical operations may be performed in any security setting.

It is important to note that data entered in the following security registers are *not* cleared or erased when the security setting is changed: **BUY**, **SEL**, **YLD**, **COM**, **TAX**, **2nd** **[Cap Tax]**, **N**, **2nd** **[Pmts/Yr]**, **B→P**, **P→S**, **2nd** **[365/360]**, **2nd** **[AY/PY]**. For example, if a commission rate is entered while using the stock setting, it remains stored as the commission rate even if the setting is changed to bonds or options.

If your calculation involves using all new values or if you are uncertain what values are already stored in the security registers, be sure to press **2nd **[Cir Reg]** before beginning your calculation to completely clear the registers.**

APD™ Automatic Power Down

If no keys are pressed for a period of about 5 to 15 minutes, the APD feature will cause your calculator to automatically turn off. Any values stored in the user memory or security registers are not cleared or altered by the APD feature.

Error Conditions

The display shows "Error" when a calculated value exceeds the limits of the calculator or when an improper operation or key sequence is attempted. When an "Error" condition occurs, no entry from the keyboard except **OFF** or **ON/C** will be accepted. Pressing **ON/C** clears the "Error" condition and any pending calculation. See the *Error Conditions and Parameters* appendix for a list of the causes of "Error" conditions.

III. MATHEMATICAL FUNCTIONS

All mathematical functions on your calculator can be used in the bond, stock, or option setting.

Arithmetic Operations

[+] **Add Key**—Instructs the calculator to add the next quantity entered to the displayed number.

[-] **Subtract Key**—Instructs the calculator to subtract the next quantity entered from the displayed number.

[X] **Multiply Key**—Instructs the calculator to multiply the displayed number by the next quantity entered. See *Error Conditions* 1 and 2 (pg. 96) for calculator limits involving multiplication.

[÷] **Divide Key**—Instructs the calculator to divide the displayed number by the next quantity entered. Dividing by zero produces an error condition.

[=] **Equals Key**—Completes all previously entered numbers and operations. This key is used to obtain both intermediate and final results of mathematical operations.

To perform simple addition, subtraction, multiplication and division, just key in the problem as it is written. When an arithmetic operation key is pressed, it completes any previously entered operation.

Multiple Operation Entries

If two or more **[+]**, **[-]**, **[X]**, or **[÷]** keys are pressed in a row, each operation key completes any preceding operation using the value in the display as the missing number entry.

For example, the key sequence 2 **[+]** **[+]** **[=]** has two missing number entries: one after the first **[+]** and another after the second **[+]**. The missing number entries are supplied by the value in the display at the time the second **[+]** and the **[=]** keys are pressed. In this example, after pressing 2 **[+]** the value in the display is 2. Pressing the second **[+]** uses the displayed value 2 as the missing number entry and completes the 2 + 2 operation.

The result 4 is displayed and 4 $\boxed{+}$ remains pending in the calculator. Pressing $\boxed{=}$ then uses the displayed 4 as the missing value, completes the $4 + 4$ operation, and displays the result 8.

If the result of a mathematical calculation exceeds the limits of the calculator, an "Error" condition will result. (See Appendix B). If an internal calculation results in a number smaller than 0.0000001, the value stored and displayed is zero.

Example: $37 + 16.9 - 11 = 42.9$

Press	Display/Comments
$\boxed{\text{ON/C}}$	0 Clear display
37 $\boxed{+}$	37 Enter 37
16.9 $\boxed{-}$	53.9 Add 16.9
11 $\boxed{=}$	42.9 Subtract 11

Example: $4 \times (-6.6) - (-17.1) = -9.3$

Press	Display/Comments
4 $\boxed{\times}$	4 Enter 4
6.6 $\boxed{+/-}$ $\boxed{-}$	-26.4 Times -6.6
17.1 $\boxed{+/-}$ $\boxed{=}$	- 9.3 Subtract -17.1

After a result is obtained in one calculation, it may be used as the first number in a second calculation.

Example: $184 + 254 = 438$, then $438 \div 365 = 1.2$

Press	Display/Comments
184 $\boxed{+}$ 254 $\boxed{=}$	438
$\boxed{\div}$ 365 $\boxed{=}$	1.2

The $\boxed{\text{ON/C}}$ key can be used to correct a mistaken entry in a calculation if the $\boxed{=}$ key has not been pressed yet. See *Clearing Your Calculator* for more information.

Press	Display/Comments
9.82 $\boxed{+}$ 17.1	17.1 Instead of 17.1 you had intended 1.71
$\boxed{\text{ON/C}}$ 1.71	1.71 Correct entry
$\boxed{=}$	11.53 $9.82 + 1.71 = 11.53$

Interest-Related Calculations

[x12] Multiply by 12 Key—Multiplies the number in the display by 12 and displays the result. Pressing this key does not complete a pending operation.

Example: $(796 + 118) - (9 \times 12) = 806$

Press	Display/Comments
-------	------------------

796 [+] 118 [-]	914
---------------------	-----

9 [x12]	108
---------	-----

[=]	806
-------	-----

[2nd] [÷ 12] Divide by 12 Key Sequence—Divides the number in the display by 12 and displays the result. Pressing this key does not complete a pending operation.

Example: The interest on a loan is 18% per year. If \$500 is borrowed for seven months, how much interest is charged?

Press	Display/Comments
-------	------------------

500 [X] .18 [=]	90 Interest charged for one year
---------------------	----------------------------------

[2nd] [÷ 12]	7.5 Charge per month
----------------	----------------------

[X] 7 [=]	52.5 Charge for seven months
---------------	------------------------------

[CIF] Compound Interest Factor Key—Calculates the future value of *one dollar* compounded at *i* percent interest per period for *N* number of periods, using the formula:

$$\left(1 + \frac{i}{100}\right)^N$$

The value for *N* is entered using the **[N]** key and *must* be entered prior to placing a value for *i* in the display and pressing the **[CIF]** key.

Compound Interest Example: What will be the value of one dollar invested at 7% interest per period for 10 periods?

Press	Display/Comments
10 N	10 Number of periods
7	7 Interest per period
CIF	1.9671514 Future value is \$1.97

Example: What will be the value of \$696 invested at 6% interest per year for 12 years, compounded monthly?

Press	Display/Comments
12	12 Number of years
X12 N	144 Number of periods (months)
6	6 Annual interest
2nd [+12]	0.5 Interest per month
CIF	2.0507508 Future value of \$1.00
X 696 =	1427.3225 Future value of \$696 is \$1427.32

Note that the interest rate must be the rate per compounding period (one month in this example). The **CIF** key sequence will determine the effective annual interest rate if you know the nominal interest rate.

Example: If the nominal interest rate on a savings account is 5¼%, what is the effective annual interest rate if the account is compounded daily?

Press	Display/Comments
365 N	365 Number of periods
5.25 ÷ 365 =	0.0143836 Interest per period
CIF	1.0538986 Future value of \$1
- 1 =	0.0538986 Interest earned
X 100 =	5.3898631 Effective rate

The effective annual interest rate is 5.3898631%. The **CIF** key can also be used to calculate the effect of a regular decrease in the value of one dollar if a negative interest rate is entered (entering a value less than -100% causes an error condition).

Example: If an asset is depleted at the rate of 10% per year, what is the asset worth after five years on a per dollar basis?

Press	Display/Comments
5 N	5 Number of periods
10 +/-	-10 Decrease per period
CIF	0.59049 Future value is \$0.59

The value of the asset has been reduced to 59 cents per dollar of value.

Days-Between-Dates Calculations

2nd [DBD] Days-Between-Dates Key Sequence

—Calculates the number of days between any two dates within the range of March 1, 1900, to February 28, 2100. Calculations beyond either of these two boundaries may be in error. These calculations are based upon 365 days per year except for leap years which are recognized and properly accounted for by your calculator.

The format for entering dates into the display requires that you enter the number of the month followed by two digits for the number of the day, press **.**, and then enter four digits for the year. The display will show the date as **MMDD.YYYY**. The calculating sequence required is **MMDD.YYYY** **2nd** [DBD] **MMDD.YYYY** **=**. Note that you must always enter a two-digit number for the day of the month. For example, enter January 7, 1981, as 107.1981. You may enter the dates in either order. The same result is produced regardless of the order used.

Your calculator will not reject invalid dates such as January 32. If you enter an invalid date, an erroneous answer will result.

The operation keys \div , \times , $-$, or $+$ can be used to complete the 2^{nd} [DBD] key sequence in place of $=$, but they also store the completing key as a pending operation. If an arithmetic operation is pending prior to pressing 2^{nd} [DBD], that pending operation is cleared by the 2^{nd} [DBD] key sequence.

Example: Calculate the number of days between October 13, 1940, and July 4, 1987.

Press	Display/Comments
1013.1940 2^{nd} [DBD]	1013.194 First date
704.1987 $=$	17065 Days between dates

The number of days between the two dates is 17065. Note that the final zero in the first date disappears on pressing 2^{nd} [DBD]. This occurs whenever the first date entered has a trailing zero or zeros in the year. The calculation is not affected in any way.

IV. MEMORY FUNCTIONS

The memory keys allow data to be stored and retrieved at will for additional flexibility in calculations. Use of the memory does not affect other calculations in progress, so memory operations can be used whenever needed. The user memory of your calculator can only be changed by using the **[STO]**, **[SUM]**, or **[EXC]** keys and is *not* affected by other keys such as **[ON/C]**, **[2nd]** **[Sec Typ]**, **[2nd]** **[Clr Reg]**, or **[OFF]**.

Memory Store and Recall

[STO] Store Key—Stores the displayed value in the memory without removing it from the display. Any previously stored value is lost.

[RCL] Recall Key—Recalls the value stored in the memory to the display without altering the content of the memory. Any value in the display is lost.

Example: Store and recall -3.012

Press	Display/Comments
3.012 [+/-] [STO]	-3.012 Stored value
[OFF]	Blank display
[ON/C] [RCL]	-3.012 Recalled value

Sum to Memory

[SUM] Sum to Memory Key—Adds the displayed number to the memory content. The displayed number and any calculation in progress are not affected.

NOTE: To ensure that any undesired memory content does not affect your calculation when repeatedly using the **[SUM]** key, always use **[STO]** to store the first quantity or use **[ON/C] [STO]** to clear the memory by storing zero.

Example:

$$\begin{array}{rcl}
 173 + 16 & = & 189. \\
 28.3 \times 7 & = & 198.1 \\
 312 - 42 + 7.8 & = & 277.8 \\
 \hline
 \text{Total} & & 664.9
 \end{array}$$

Press	Display	Memory
[ON/C]	0	
173 [+] 16 [=] [STO]	189	189
28.3 [X] 7 [=] [SUM]	198.1	387.1
312 [-] 42 [+] 7.8 [=] [SUM]	277.8	664.9
[RCL]	664.9	664.9

Example: Sum the following values in the memory and recall the result: 102, -70, 15, 12.75, -11.

Press	Display/Comments
102 [STO]	102 Store first value
70 [+/-] [SUM]	-70 Add value
15 [SUM]	15 Add value
12.75 [SUM]	12.75 Add value
11 [+/-] [SUM]	-11 Add value
[RCL]	48.75

Memory/Display Exchange

EXC Exchange Key—Exchanges the memory content with the displayed number. The displayed number is stored in memory and the previous memory content is displayed. The exchange key is very useful when you want to compare the results of two problems without writing one of them down.

Example: You are considering buying a house. One house is 2410 square feet and sells for \$62,000. A second house is 2340 square feet and sells for \$60,840. Which house is the better buy in terms of the price per square foot?

Press	Display/Comments
ON/C	0 Clear display
62000 \div 2410 $=$	
STO	25.726141 Store cost per sq. ft. of first house
60840 \div 2340 $=$	26 Cost per sq. ft. of second house
EXC	25.726141 Compare with first house.

The first house costs less per square foot.

V. STOCKS

Introduction

Profitable buying and selling of stocks requires careful attention to three basic variables: buying price, selling price, and yield. Of course, many related factors such as tax rates, commissions, and dividends influence these variables and must also be considered.

The stock setting of your *Investment Analyst* calculator allows you to rapidly and confidently compute:

- The *annual yield* of a stock if the buying price, selling price, and length of time owned are known.
- The *ownership period yield* of a stock if the buying and selling price are known.
- The buying price of a stock if the selling price and yield (either *annual* or *ownership period*) are known.
- The selling price of stock if the buying price and yield (*annual* or *ownership period*) are known.
- The *current yield* of a stock.

In making these calculations, your calculator will take into account the following important factors:

- Choice of 365- or 360-day year for calculations
- Number of dividends paid per year
- Days between buy date and first dividend payment
- Days between sell date and last dividend payment
- Number of dividend payments received
- Amount of dividends
- Expected growth in dividend payments
- Commission for buying or selling
- Income tax
- Capital gains tax

Three different kinds of yield are discussed in this chapter: *annual yield*, *ownership period yield*, and *current yield*. It is important to understand the differences between the three yields. Two of the yields, *annual yield* and *ownership period yield*,

can either be entered as known variables or computed. *Current yield* can only be computed.

The *annual yield*, as the term suggests, is the percentage return earned by a stock investment on an annual basis. It is based on the buying price, selling price, the amount of income (dividends), and the length of time the investment is owned, less any entered commissions, income taxes, and capital gains taxes. The great advantage of expressing yields in annual terms is that it allows direct comparisons between different investment opportunities. For instance, *annual yield* is comparable to the nominal annual interest paid by a bank on a savings deposit or certificate. You should note, however, that for very short periods of time, *annual yield* may not be as useful as *ownership period yield*.

To calculate an *annual yield*, it is essential to know the length of time that the investment is owned. This information is entered into your calculator using the time keys. © 2010 Joerg Woerner

The *ownership period yield*, as the term is used in this manual, is the percentage of gain or loss made by the investment based only on the buying and selling prices less any entered commissions and capital gains taxes. *Ownership period yield* does not consider the length of time that the investment was owned or any investment income (dividends) that might have been received. Because time is not a factor in computing *ownership period yields*, no time keys are required for this type of calculation.

The *current yield* is obtained by dividing the present annual income (dividends) of the investment by the buying price. It does not consider capital gains, commissions, or taxes.

For more detailed information on how yields are computed, refer to the *Investment Formulas* appendix of this manual.

Stock Key Tour

The financial keys used in the stock setting of your calculator have been divided into four groups: time keys, variable keys, basic keys, and computing keys. This arrangement has been adopted to make it easier to describe the functions of the different keys. Read each section noting the general use of the keys. Pay particular attention to the section on time keys which are extremely important for *annual yield* calculations.

Examples of stock investment problems and their solutions are provided after the last section of the *Stock Key Tour*. Work these problems following the solutions given in the manual. The stock investment problems illustrate the functions of the financial keys and should answer any questions you have about their uses. In working your own problems, use the *Stock Key Tour* section as a quick reference guide for the definition of each key.

Time Keys

The time keys on your calculator must be used when you are entering or computing *annual yield* or *current yield*. Five time keys are available: $\boxed{2nd}$ [Pmts/Yr], $\boxed{2nd}$ [365/360], $\boxed{B \rightarrow P}$, $\boxed{P \leftarrow S}$, and \boxed{N} . If you are interested only in *ownership period yield*, the time keys should be ignored.

NOTE: If time keys are used, the values for $\boxed{2nd}$ [Pmts/Yr] and $\boxed{2nd}$ [365/360] must be entered before values for the $\boxed{B \rightarrow P}$ and $\boxed{P \leftarrow S}$ keys. If you change $\boxed{2nd}$ [Pmts/Yr] or $\boxed{2nd}$ [365/360], be sure to reenter $\boxed{B \rightarrow P}$ and $\boxed{P \leftarrow S}$ or an incorrect answer may result. The value for \boxed{N} can be entered at any time.

[2nd] [365/360] Number of Days per Year Key Sequence—Selects whether a calculation is to be based upon a 365- or a 360-day year. Pressing **[2nd] [365/360]** displays, alternately, 365 or 360. If 360 is displayed after **[2nd] [365/360]** is pressed, the calculator will use a 360-day year. If 365 is displayed after **[2nd] [365/360]** is pressed, a 365-day year will be used. **Note that pressing [2nd] [Clr Reg] always sets the calculator to the 365-day setting although 365 does not appear in the display.**

[2nd] [Pmts/Yr] Number of Payments per Year Key Sequence—Enters the displayed value as the number of dividends paid per year by the stock. For example, if a stock pays dividends quarterly, enter 4 for **[2nd] [Pmts/Yr]**.

In general, it doesn't matter when time values are entered as long as they follow each other in the proper order. But there is one exception. You must enter **[2nd] [Pmts/Yr]** before you enter or compute the *annual yield*.

[B→P] Buy to First Payment Key—Enters the value in the display as the number of days that an investment was owned before the first dividend payment was received.

[P←S] Sell to Last Payment Key—Enters the value in the display as the number of days that an investment was owned after the last dividend payment was received. The **[P←S]** key has a second use; if an investment pays no dividends during the time it was owned, enter the total number of days that the investment was owned using the **[P←S]** key (in this case, enter no value for **[B→P]**).

[N] Number of Payments Received Key—Enters the displayed value as the total number of dividend payments received by the investor during the time the stock was owned.

Figures I through IV illustrate the use of the time keys in problems involving *annual yields*. (Remember, time keys are not used in problems involving *ownership period yields*.) It is assumed in these examples that there are no timing delays associated with buy and sell transactions or declaring and receiving dividends. Of course, there are usually delays involved in all of these actions. In analyzing your investments, you must determine whether you want to enter the sell date as the date you place your sell order with your broker or the date that you actually receive payment. (These figures illustrate the use of the time keys only; to solve actual problems requires the use of some additional keys which are discussed in later sections.)

Figure I illustrates a common stock investment situation. A stock paying quarterly dividends is bought 23 days before a dividend is received and sold 14 days after receiving a dividend as shown in the diagram. In this example, set 2^{nd} [365/360] to 365 and enter 2^{nd} [Pmts/Yr] as 4. Enter 23 for $B \rightarrow P$, 14 for $P \leftarrow S$, and 3 for N .

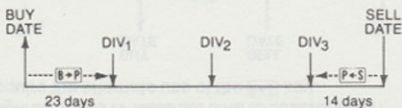


Figure I. General Stock Case with Dividends Received (4 Pmts/Yr, 365-day year).

In Figure II, a stock, again paying quarterly dividends, is bought 45 days before a dividend payment and sold on the day that a dividend is paid. Set 2^{nd} [365/360] to 365. Enter 4 for 2^{nd} [Pmts/Yr], 45 for $B \rightarrow P$, and 2 for N . Because a dividend is received on the day of the sell, enter zero for $P \leftarrow S$.

If the situation had been the reverse of that shown in Figure II, then $B \rightarrow P$ would be entered as zero and $P \rightarrow S$ as 45. If the stock had been bought and sold on dividend payment dates, you must enter zero for both $B \rightarrow P$ and $P \rightarrow S$.

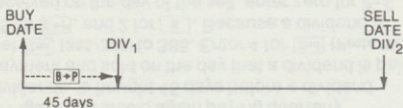


Figure II. Stock Case Where Sell Date and Dividend Date Coincide (4 Pmts/Yr, 365-day year).

Figures III and IV illustrate time situations which require the alternate use of the $P \rightarrow S$ key.

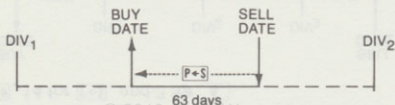


Figure III. Stock Case Where No Dividends Are Received by Investor.

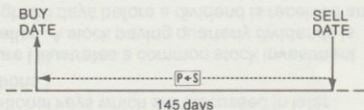


Figure IV. Case Of A Growth Stock Which Pays No Dividends.

In Figures III and IV, no dividends are received by the investor. To calculate an *annual yield* in cases where no dividends are received, begin the calculation by pressing 2^{nd} [Clr Reg] and then enter the number of days that the investment was owned by using the $P \rightarrow S$ key. Enter no values for 2^{nd} [Pmts/Yr], $B \rightarrow P$, or N or an incorrect answer may result. In Figure III, $P \rightarrow S$ is 63; in Figure IV, it is 145.

In summary, first decide if you are computing an *annual yield* or an *ownership period yield*. If you are interested only in an *ownership period yield*, do not use the time keys. If you want an *annual yield*, enter the appropriate time values in the proper order. If no dividends are received, begin the calculation by pressing [2nd] [Clr Reg] and then enter a value for [P+S] only.

The [2nd] [DBD] key sequence provides a fast method of calculating the number of days between two dates. Refer to the *Days-Between-Dates* section of Chapter III for details.

Variable Keys

Many factors, such as your tax rate, commission rate on trades, and the amount of dividends paid by the stock affect investment calculations. The variable keys on your calculator allow you to enter this information.

[TAX] Income Tax Key—Enters the displayed value as the tax rate (percent) paid by the investor on dividend income. For example, an investor in the 30% marginal income tax bracket would enter 30 and press [TAX]. The amount of dividend income is reduced by the tax rate entered before a yield is computed.

[2nd] [Cap Tax] Capital Gains Tax Key Sequence—Enters the displayed value as the tax rate (percent) to be applied to capital gains or losses. You must decide whether a long-term capital gains rate or a short-term capital gains rate is appropriate. If a value is entered for the capital gains tax rate, the amount of capital gain is reduced by the rate entered before a yield is computed. If a capital loss is incurred, the amount of loss is reduced by the rate entered before a yield is computed.

[COM] Commission Key—Enters the displayed value as the commission rate (percent) paid by the investor on stock trades. If a rate is entered using this key, it is applied to both the buying and selling prices.

[DIV] Dividend Key—Enters the displayed value as the dividend (dollars) paid by the stock. This value should be the last dividend paid *prior* to the purchase of the stock if you intend to use this key.

[2nd] [Div Gro] Dividend Growth Key Sequence—Enters the displayed value as the expected rate of increase in dividend payments per dividend period. If a value is entered using this key, the expected increase in dividend payments is applied to all payments received by the investor including the value you enter for **[DIV]**.

NOTE: If a negative value is entered using any of the time or variable keys, the calculator ignores the negative sign.

Basic Keys

To make stock calculations, values for *two of the three* basic keys—**[BUY]**, **[SEL]**, or **[YLD]**—*must be entered* into your calculator.

[2nd] [AY/PY] Annual or Ownership Period Yield Key Sequence—This key selects whether the value entered or computed using the **[YLD]** key is an *annual yield* or an *ownership period yield*. Pressing **[2nd] [AY/PY]** displays, alternately, " \overline{P}_1 " or " \overline{P} " in the right side of the display. If " \overline{P}_1 " is displayed after **[2nd] [AY/PY]** is pressed, the calculator interprets the **[YLD]** key as an *annual yield* key. If " \overline{P} " is displayed after **[2nd] [AY/PY]** is pressed, the calculator interprets the **[YLD]** key as an *ownership period yield* key. **Note that pressing [2nd] [Clr Reg] always sets the calculator internally to the *annual yield* setting, although " \overline{P}_1 " does not appear in the display.**

[BUY] Buying Price Key—Enters the value shown in the display as the buying price of the stock.

Example: Enter a buying price of \$76 $\frac{5}{8}$.

Stock prices are commonly quoted with fractional parts. To enter a price with a fractional part, first convert the fraction to decimal form, and then add the whole number portion of the price. Reversing the order of these two operations produces an incorrect result.

Press

Display/Comments

5 \div 8 $+$ 76 $=$ **BUY** 76.625 Buying price

[SEL] Selling Price Key—Enters the value shown in the display as the selling price of the stock.

[YLD] Yield Key—Enters the value shown in the display as an *annual yield* if the **[AY/PY]** key has been previously set to *annual yield* setting (" $\frac{A}{Y}$ " in right side of display) or as an *ownership period yield* if set to the *ownership period* setting (" $\frac{P}{Y}$ " in the right side of display). If you have any doubt about the yield setting, press **[2nd] [AY/PY]** until you see the setting you want.

NOTE: If you change the **[2nd] [AY/PY]** setting, you must reenter **[YLD]**.

Computing Keys

After values have been entered for two of the three basic variables, the unknown variable can be computed. The value computed is stored internally to 11-digit accuracy, but in the display it is rounded to the nearest tenth.

[2nd] [BUY] Compute Buying Price Key Sequence

—If values have already been entered for **[SEL]** and **[YLD]**, pressing **[2nd] [BUY]** computes and displays the buying price of the stock.

[2nd] [SEL] Compute Selling Price Key Sequence—

If values have already been entered for **[BUY]** and **[YLD]**, pressing **[2nd] [SEL]** computes and displays the selling price of the stock.

[2nd] [YLD] Compute Yield Key Sequence—If

values have been entered for **[BUY]** and **[SEL]**, pressing **[2nd] [YLD]** computes and displays the

annual yield if the calculator has been previously set for *annual yield* calculations or the *ownership period yield* if previously set for *ownership period yield* calculations.

[CY] Current Yield Key—If values have been entered for **[BUY]**, **[DIV]**, and **[2nd] [Pmts/Yr]**, pressing **[CY]** calculates the *current yield* of the stock (annual dividends divided by the buying price). The *current yield* differs from the *annual yield* computed by the **[2nd] [YLD]** key sequence in that it ignores taxes, commissions, and capital gains. The **[CY]** key produces a calculated value only; it is never used to enter a value.

Stock Calculations

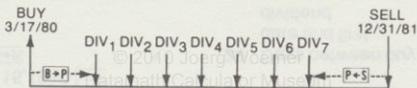
Following is a brief summary of the steps to be followed to solve problems involving stocks and related investments.

1. Set the calculator to the stock setting by pressing **[2nd] [Sec Typ]** until an "A" appears in the left side of the display. Clear the registers by pressing **[2nd] [Clr Reg]** (this automatically sets your calculator to the 365-day year and *annual yield* settings).
2. If you are calculating an *annual yield*, enter the appropriate values for **[2nd] [365/360]**, **[2nd] [Pmts/Yr]**, **[B→P]**, **[P←S]**, and **[N]**. Refer to the *Time Keys* section of this chapter for details if necessary.
3. If you are calculating an *ownership period yield*, press the **[2nd] [AY/PY]** key sequence for a "P" indication on the right side of the display. Time values, dividends, and dividend growth are ignored.
4. Enter values for **[TAX]**, **[2nd] [Cap Tax]**, **[COM]**, **[DIV]**, and **[2nd] [Div Gro]**, if desired.
5. Enter values for *two of the three* basic variables — **[BUY]**, **[SEL]**, or **[YLD]**.
6. Compute the unknown variable by pressing the proper second function key sequence (**[2nd] [BUY]**, **[2nd] [SEL]**, or **[2nd] [YLD]**). The *current yield* can be calculated by pressing the **[CY]** key.

Common Stocks

Example 1: You buy a hundred shares of common stock on March 17, 1980, for $\$18\frac{1}{2}$ per share. The stock pays quarterly dividends on January 15, April 15, July 15, and October 15 of each year. The last dividend paid prior to your buying the stock was $\$0.30$ per share. Dividends are expected to increase by 5% each quarter, beginning with the first dividend you receive. Your income tax rate is 36% and your long-term capital gains tax rate is 14.4%*. The commission rate that you must pay to buy and sell this stock is 1.5%. At what price must you sell the stock on December 31, 1981, if you wish to make an *annual yield* of 25% on your investment? What is the *current yield* of the stock?

Solution: The period of time that the stock is owned is shown in the following diagram.



To solve the first part of the problem, it is necessary that the [AY/PY] key be set to the *annual yield* setting. Clearing the security registers by pressing [2nd] [Clr Reg] automatically sets the [AY/PY] key to the *annual yield* setting and ensures that all registers are cleared of any unwanted values. Clearing the registers also sets the [365/360] key to the 365-day setting, which is the proper setting for this problem.

*Your effective long-term capital gains tax rate can be estimated by multiplying your marginal income tax rate by 40% (if tax laws change, this method of estimating the tax rate may be inaccurate). In this example, it is $36 \times .4 = 14.4\%$.

Press	Display/Comments
ON/C	0 Clear Display
2nd [Sec Typ] A	0 Stock setting*
2nd [Clr Reg] A	0 Clear registers, set to 365-day year and annual yield

*Repeat until stock setting appears in the left side of the display.

The next step is to enter the appropriate time values in the required order. Enter **2nd** **[Pmts/Yr]** first. To determine the number of days between the buying date and the first dividend, use the **2nd** **[DBD]** key sequence. Use the same method to determine the number of days between the selling date and the last dividend payment. The number of dividends received is entered using the **N** key.

Press	Display/Comments
4 2nd [Pmts/Yr] A	4 Dividends per year
317.1980 2nd [DBD] A	317.198 Buy date†
415.1980 = © 2010 Joerg Woerner	
B→P A	29 Days between buy date and first dividend

†NOTE: Pressing the **2nd** **[DBD]** key sequence removes the trailing zero from the display but does not affect days between-dates calculations.

Press	Display/Comments
1231.1981 2nd [DBD] A	1231.1981 Sell date
1015.1981 = P←S A	77 Days between sell date and last dividend received
7 N A	7 Number of dividends received

Now calculate the price at which the stock must be sold on December 31, 1981, to realize a 25% *annual yield*. You may enter the buying and selling prices either on a per share basis or on an actual cost basis. If you enter actual prices, be sure that you do not enter dividends on a per share basis.

Press	Display/Comments
.3 [DIV]	A 0.3 Dividend payment
5 [2nd] [Div Gro]	A 5 Percent growth in dividend payments
36 [TAX]	A 36 Income tax rate
14.4 [2nd] [Cap Tax]	A 14.4 Capital gains rate
1.5 [COM]	A 1.5 Commission rate
18.5 [BUY]	A 18.5 Buying price
25 [YLD]	A 25 Annual yield
[2nd] [SEL] [†]	A 28.7 Selling price
[CY]	A 6.5 Current yield

The stock must be sold for \$28.70 per share to produce an *annual yield* of 25%. The *current yield* is 6.5% per year.

Remember that you can compute either **[BUY]**, **[SEL]**, or **[YLD]** if the other two values are known. For example, in this same problem, if **[YLD]** remains 25% and **[SEL]** is \$28.70, calculate **[BUY]**.

Press	Display/Comments
[ON/C] [BUY]	A 0 Clear buying price*
[2nd] [BUY]	A 18.5 Buying price

Alternately, **[YLD]** can be calculated if **[BUY]** is \$18.50 and **[SEL]** is \$28.70.

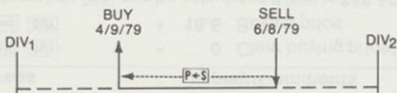
Press	Display/Comments
[ON/C] [YLD]	A 0 Clear yield*
[2nd] [YLD]	A 25 Annual Yield

*It is not necessary to clear this register before computing a new value. It is done here only for emphasis.

[†]The display may blank for several seconds while computing **[BUY]**, **[SEL]**, or **[YLD]**.

Example 2: A common stock was bought on April 9, 1979, for \$76 $\frac{5}{8}$ per share and sold on June 8, 1979, for \$79 $\frac{1}{4}$. The commission was 2%. The stock pays quarterly dividends on March 31, June 30, September 30, and December 31. Your income tax rate is 35%. The stock was not owned long enough to qualify for a long-term capital gains tax rate, so 35% must also be considered the [Cap Tax] rate. What was the *annual yield* of the stock? What was the *ownership period yield*?

Solution: The period of time that the stock was owned is illustrated in the following diagram.



Notice that no dividend payment was made while you owned the stock. Therefore, to calculate the *annual yield* you must first clear the registers and then enter the number of days that the stock was owned using the $P \leftrightarrow S$ key. No values are entered for 2^{nd} [Pmts/Yr], $B \rightarrow P$, or N in this case (refer to Figures III and IV in the *Time Keys* section of this chapter for additional information). It is not necessary to enter a value for TAX because there is no dividend income.

Press		Display/Comments
ON/C	A	0 Check setting
2nd [Clr Reg]	A	0 Clear registers and set to annual yield
409.1979 2nd		
[DBD]	A	409.1979 Buy date
608.1979 =		
P+S	A	60 Days stock was owned
2 COM	A	2 Commission
35 2nd [Cap Tax]	A	35 Capital gains rate
5 ÷ 8 + 76		
= BUY	A	76.625 Buying price
79.25 SEL	A	79.25 Selling price
2nd YLD	A	-2.5 Annual yield

The investment resulted in a negative *annual yield* of 2.5%. Now determined the *ownership period yield*.

Press		Display/Comment
2nd [AY/PY]	A	Ownership period setting
2nd YLD	A	-0.4 Ownership period yield

The *ownership period yield* was -0.4%, which is roughly $\frac{1}{6}$ ($365 \div 60 = 6.08$) of the *annual yield*. Note that if you had received some dividends during the time you owned the stock, this relationship would not hold because *ownership period yields* are based only on capital gains or losses resulting from buying and selling the stock.

To calculate what the *annual yield* would be if capital gains taxes were ignored, change the calculator back to the annual setting, enter zero for **[2nd] [Cap Tax]**, and press **[2nd] [YLD]**.

Press	Display/Comments
[2nd] [AY/PY]	A $\frac{7}{8}$ Annual yield setting
[ON/C] [2nd] [Cap Tax]	A 0 Capital gains rate
[2nd] [YLD]	A -3.8 Annual yield

The *annual yield* is lower when the capital gains tax rate is entered as zero because the tax credit available for capital losses which shields other capital gains is not considered in the calculation.

Example 3: You buy a hundred shares of common stock for $\$31\frac{3}{8}$ per share on August 26, 1980. The stock pays quarterly dividends. Your income tax rate is 30%. You paid a \$118 commission to purchase the stock. You intend to sell the stock on September 30, 1980, the same day that you expect to receive a \$0.45 dividend payment. What must the selling price be if you are to earn a 20% *annual yield* on your investment?

Solution: Use the Days-Between-Dates key to calculate the proper value for **[B→P]**. **[P←S]** is zero because the stock is to be sold on a day that a dividend payment is received. Note that it is necessary to calculate the rate of commission paid to buy the stock. One method of doing so is to divide the total amount of commission for the hundred shares by the buying price per share of stock. It is assumed that the same percent commission is paid to sell the stock.

Press		Display/Comments
ON/C	A	0 Check setting
2nd [Clr Reg]	A	0 Clear registers
4 2nd		
[Pmts/Yr]	A	4 Dividends per year
826.1980 2nd		
[DBD]	A	826.198 Buy date
930.1980 =		
B→P	A	35 Buy to payment
ON/C P+S	A	0 Sell to payment
1 N	A	1 Dividends received
30 TAX	A	30 Income tax rate
2nd [Cap Tax]	A	30 Capital gains rate
.45 DIV	A	0.45 Dividend payment
3 ÷ 8 +		
31 = BUY	A	31.375 Buying price
118 ÷		
31.375 =		
COM	A	3.7609562 Commission
20 YLD	A	20 Annual yield
2nd SEL	A	34.3 Selling price

You must sell the stock for \$34.30 to receive a 20% annual yield. You can determine the *current yield* by pressing the **[CY]** key.

Press		Display/Comments
[CY]	A	5.7 Current yield

Preferred Stocks

Example 4: You want to investigate the profitability of a \$100 par value, 6% preferred stock presently selling for \$92 $\frac{7}{8}$. You believe it will sell for \$105 in a year. Assume you buy it on October 23, 1980, and sell it on October 24, 1981. The stock pays quarterly dividends on January 1, April 1, July 1, and October 1. The commission rate is 1.7%. Your income tax rate is 32% and your long-term capital gains rate is 12.8%. What is the *annual yield* of the investment?

Solution: The annual dividend paid by a \$100 par value, 6% preferred stock is $\$100 \times .06 = \6 . The quarterly dividend is $6 \div 4 = \$1.50$.

Press	Display/Comments
ON/C	A 0 Check setting
2nd [Clr Reg]	A 0 Clear registers
4 2nd	
[Pmts/Yr]	A 4 Dividends per year
N	A 4 Dividends received
1023.1980	
2nd [DBD]	A 1023.198 Buy date
101.1981 =	
B→P	A 70 Buy to payment
1024.1981	
2nd [DBD]	A 1024.1981 Sell date
1001.1981	
= P←S	A 23 Sell to payment
1.5 DIV	A 1.5 Dividend payment
1.7 COM	A 1.7 Commission rate
32 TAX	A 32 Income tax rate
12.8 2nd	
[Cap Tax]	A 12.8 Capital gains rate
7 ÷ 8 +	
92 = BUY	A 92.875 Buying price
105 SEL	A 105 Selling price
2nd YLD	A 12 Annual yield

Convertible Preferred Stocks

Example 5: A share of 7.5%, convertible preferred stock, \$100 par value, can be bought for \$78½. Each share of preferred stock can be converted to 5 shares of common stock at any time during the next five years. Currently the common stock is selling for about \$16. You expect the common stock to go up to \$25 a share in two years. The preferred stock pays dividends on January 22, April 22, July 22, and October 22. The commission rate is 2.9%, your income tax rate is 32%, and your long-term capital gains tax rate is 12.8%. Assuming that you buy the convertible preferred stock on February 8, 1980, convert to the common stock on February 8, 1982, and sell immediately for \$125 (5 shares at \$25), what is your *annual yield*?

Solution: Annual dividend = $\$100 \times .075 = \7.50 .

Quarterly dividend = $\$7.50 \div 4 = \1.875 .

Assuming that there are no conversion charges to convert to common, you can treat this problem as if you buy for \$78½ and sell for \$125. If there were conversions charges involved, you could account for them by adjusting the selling price of the common stock downward.

Press		Display/Comments
ON/C	A	0 Check setting
2nd [Clr Reg]	A	0 Clear registers
4 2nd [Pmts/Yr]	A	4 Dividends per year
8 N	A	8 Dividends received
208.1980 2nd [DBD]	A	208.198 Buy date
422.1980 =		
B→P	A	74 Buy to payment
208.1982 2nd [DBD]	A	208.1982 Sell date
122.1982 =		
P→S	A	17 Sell to payment
1.875 DIV	A	1.875 Dividend payment
2.9 COM	A	2.9 Commission rate
32 TAX	A	32 Income tax rate
12.8 2nd [Cap Tax]	A	12.8 Capital gains rate
78.5 BUY	A	78.5 Buying price
125 SEL	A	125 Selling price
2nd YLD	A	24.1 Annual yield

Buying and Selling on Margin

Stock trades involving margin accounts can be analyzed in two different ways. To compute the *annual yield*, you can either adjust the **BUY** and **SEL** prices prior to entering them into your calculator or you can adjust the yield after it is computed. The first method provides an accurate result. The second method may sometimes be quicker but is less accurate. The following example will illustrate both methods.

Example 6: A stock bought at \$92 on a 50% margin was sold one year and one day later for \$130. The income tax rate is 40%, long-term capital gains tax rate is 16%, commission rate is 2%, and interest on the margin account is 18%. The stock pays no dividends. What is the *annual yield*?

Solution: First solve this problem by adjusting the **BUY** and **SEL** prices prior to entering them. To calculate the adjusted **BUY** price, multiply the buying price by the margin rate to determine the amount of equity and add the commission. Remember, the commission is charged on the full value of the buying and selling price. To adjust the **SEL** price, subtract from it the amount of commission, the amount of money borrowed, the tax-adjusted interest due on the borrowed money, and the amount of capital gains tax. To adjust the amount of interest for taxes, multiply the interest due by the factor $1 - \text{TAX}/100$ (in this case $1 - .4 = .6$). One way to calculate the amount of interest due is to calculate the amount of interest paid per day and multiply by the number of days that the stock was owned (assume simple interest). Because the adjusted buying and selling prices already account for commissions and taxes, enter no value for **COM**, **TAX**, and **2nd** **[Cap Tax]**.

Press

Display/Comments

ON/C	A	0	Check setting
2nd [Clr Reg]	A	0	Clear registers
366 P+S	A	366	Time period owned
92 X .5 = STO	A	46	Equity
92 X .02 =			
SUM	A	1.84	Add commission
RCL BUY	A	47.84	Adjusted buying price
130 - 46 =			
STO	A	84	Selling price less money borrowed
130 X .02 = +/- SUM	A	-2.6	Less commission
RCL - 47.84 =	A	33.56	Amount of capital gain
X .16 = +/-			
SUM	A	-5.3696	Less capital gains tax
46 X .18 =	A	8.28	Interest for one year
÷ 365 X 366 =	A	8.3026849	Interest for 366 days
X .6 = +/-			
SUM	A	-4.981611	Less tax-adjusted interest
RCL SEL	A	71.048789	Adjusted selling price
2nd YLD	A	48.5	Annual yield

An alternate method of accounting for margin trades is to enter commissions and capital taxes and compute the yield using the actual buying and

selling prices. Then adjust the computed yield to account for the margin. *Example 6* is recalculated using the alternate method of approximating *annual yield*. (Do not clear the registers.)

Press	Display/Comments
2 COM	A 2 Commission rate
16 2nd [Cap Tax]	A 16 Capital gains tax
92 BUY	A 92 Buying price
130 SEL	A 130 Selling price
2nd [YLD]	A 30 Unadjusted annual yield

To adjust the yield for the effects of buying on margin, use the following formula. *Annual yield* and interest are expressed as percents; tax and margin are entered as decimals.

$$\text{Margin Adjusted YLD} = \frac{\text{YLD} - \text{INTEREST} (1 - \text{TAX}) (1 - \text{MARGIN})}{\text{MARGIN}}$$

Now apply this formula to the unadjusted yield of 30%:

$$\text{YLD} = \frac{30 - 18 (1 - 0.4) (1 - 0.5)}{0.5}$$

Press	Display/Comments
1 - .4 = [STO]	A 0.6 (1 - TAX)
1 - .5 =	A 0.5 (1 - MARGIN)
[X] [RCL] =	A 0.3
[X] 18 =	A 5.4 Times INTEREST
[+/-] [+] 30 =	A 24.6 Subtract from YLD
[÷] .5 =	A 49.2 Divide by margin to get adjusted yield

Notice that using the formula slightly overstates the actual yield.

Selling Short

Example 7: You want to sell short 100 shares of stock at \$60 per share on November 21, 1980. The margin requirement is 50%. You expect to buy the stock back at \$46 on March 31, 1981. You pay 1.6% commission on trades and accrue a dividend of \$1.15. Your income tax rate and your short-term capital gains tax rate is 45%. What is the *annual yield* on your investment? What is the *ownership period yield*?

Solution: Selling short is selling stock that you do not own and it requires that you post a margin. The posted money is held against the possibility that the price of the stock may go up and you will be forced to buy at a higher price to cover your position. The margin posted plus the commission on the full selling price of the stock (\$60) is paid when the stock is sold short. This is, in effect, the **BUY** price of the stock.

When you cover your position at \$46, you receive the earnings on your investment ($\$60 - 46 = \14) plus the return of your margin ($0.5 \times \$60 = \30), less the accrued dividend (\$1.15) and the commission on the buying price of the stock. (Assume you pay the accrued dividend when you cover your position.) The total of these figures is your cash income and is entered as the **SEL** price.

When you sell short, you receive the full selling price of the stock plus the margin posted. This is the **BUY** price of the stock.

SELL PRICE	✓	30	Commission
BUY PRICE	✓	136	Margin
SELL PRICE	✓	60	Commission
BUY PRICE	✓	18	Dividend
SELL PRICE	✓	5	Commission

When you sell short, you receive the full selling price of the stock plus the margin posted. This is the **BUY** price of the stock.

Because you receive no dividends (the \$1.15 dividend must be returned to the actual owner of the "shorted" stock), use the **[P+S]** key to enter the total number of days that you owned the investment.

Press		Display/Comments
[ON/C]	A	0 Check setting
[2nd] [Clr Reg]	A	0 Clear registers
1121.1980 [2nd]		
[DBD]	A	1121.198 Buy date
331.1981 [=] [P+S]	A	130 Time period owned
45 [2nd] [Cap Tax]	A	45 Capital gains rate
60 [X] .5 [=] [STO]	A	30 Margin (equity)
60 [X] .016 [=]		
[SUM]	A	0.96 Add commission
[RCL] [BUY]	A	30.96 "Buying price" of selling short
60 [-] 46 [+] 30 [=] [STO]	A	44 Gross return
46 [X] .016 [=]		
[+/-] [SUM]	A	-0.736 Less Commission
1.15 [+/-] [SUM]	A	-1.15 Less dividend
[RCL] [SEL]	A	42.114 "Selling price" of selling short
[2nd] [YLD]	A	66.2 Annual yield
[2nd] [AY/PY]	A	Ownership period setting
[2nd] [YLD]	A	19.8 Ownership period yield

VI. BONDS

Introduction

A \$10,000, 10% corporate bond was bought for 96¾. Two years later it is sold for 102. What is the *annual yield*? What is the *current yield*? If the bond matures in three years, what is the *yield-to-maturity*?

The bond setting of your *Investment Analyst* calculator can answer these and related questions for most types of bonds, thereby eliminating the need for complicated arithmetic formulas and bond yield and interest tables. Your calculator will consider the following variables:

- Coupon rate paid by the bond
- Number of coupon payments per year
- Days between buy (settlement) date and first coupon payment
- Days between sell (redemption) date and last coupon payment
- Choice of 365- or 360-day year for calculations of accrued interest
- Number of coupon payments received
- Buying price of the bond
- Selling price of the bond
- Yield (either *annual* or *ownership period*)
- Maturity value of the bond
- Commission for buying and selling
- Income tax
- Capital gains tax

Four types of yield are discussed in this chapter: *annual yield*, *ownership period yield*, *current yield*, and *yield-to-maturity*. The first three terms—*annual*, *ownership period*, and *current yield*—have already been defined in relation to stock investments. They are briefly covered again in relation to bond investments. Refer to the *Investment Formulas* appendix for more detailed information than is provided here.

The *annual yield* of a bond is the percentage return earned on an annual basis if the bond is sold before

maturity. It is based upon the buying price, selling price, term of ownership, and the amount of income (interest) produced by the bond, less any entered commissions, income taxes, and capital gains taxes. *Annual yield* can either be entered as a known variable or computed, but requires that you enter information about the length of time the bond was owned.

The *ownership period yield* is the percentage of gain or loss based only on the buying price and selling price less any entered commissions and capital gains taxes. It ignores interest income and requires no time information. (*Ownership period yield* is not commonly used in bond calculations, but it is available as an option if you wish to use it.)

The *current yield* is the present annual income (interest) divided by the buying price of the bond. Capital gains, commissions, and taxes do not affect the *current yield*.

The *yield-to-maturity* of a bond is the *annual yield* produced by the bond if it is held until maturity. *Yield-to-maturity* takes into account the buying price, maturity value, the length of time until maturity, and the amount of income (interest) produced by the bond, less any entered commissions, income taxes, and capital gains taxes.

Bond Key Tour

The financial keys used in the bond setting of your calculator have been divided into four groups: time keys, variable keys, basic keys, and computing keys. Many of these keys were introduced in the *Stock Key Tour*. You will notice, however, that there are some new keys covered in this section. The use of the time keys in the bond setting differs considerably from their use in stock investment situations. Carefully note the different situations described in the *Time Keys* section (Figures I-V) so that you can properly apply the time keys in analyzing your own bond investment problems.

Time Keys

The time keys used when making *annual yield* or *yield-to-maturity* calculations in the bond setting are: **[2nd] [Pmts/Yr]**, **[2nd] [365/360]**, **[B→P]**, **[P←S]**, and **[N]**. No time keys are required in *ownership period yield* calculations.

NOTE: The order in which time values are entered is important. Values for **[2nd] [365/360]** and **[2nd] [Pmts/Yr]** must be entered before **[B→P]** and **[P←S]** are entered or an incorrect answer may result. **[N]** can be entered at any time.

[2nd] [365/360] Number of Days per Year Key Sequence—This key sequence selects whether accrued interest is to be based upon a 365- or a 360-day year. Pressing **[2nd] [Clr Reg]** always sets the calculator to the 365-day setting, although 365 does not appear in the display.

[2nd] [Pmts/Yr] Number of Payments per Year Key Sequence—Enters the displayed value as the number of coupon payments made per year by the bond. This value must be entered before you enter or compute the *annual yield*.

[B→P] Buy to First Payment Key—Enters the value in the display as the number of days that a bond is owned before the first coupon payment is received.

[P←S] Sell to Last Payment Key—Enters the value in the display as the number of days that a bond is owned after the last coupon payment is received.

[N] Number of Payments Received Key—Enters the displayed value as the total number of coupon payments received by the investor during the time the bond was owned.

The bond examples which follow illustrate the use of the time keys in describing different bond investment situations. Carefully examine these examples to ensure that you apply the time keys properly in analyzing your own investment problems. Improper use of the time keys will prevent your calculator from accurately accounting for accrued interest. (These figures illustrate the

use of the time keys only; to solve problems requires some additional keys which are discussed in later sections.)

The general bond case is shown in Figure I. A bond paying interest twice a year is bought 76 days before a coupon payment and sold 42 days after a payment. The bond owner receives 4 coupon payments and interest for the 76 days before the first payment and the 42 days after the final payment. Following the rule that **[2nd] [365/360]** and **[2nd] [Pmts/Yr]** must be entered first, the number of days per year is set to 360 and payments per year is entered as 2. Enter 76 for **[B→P]** and 42 for **[P→S]**. The number of payments received is 4.

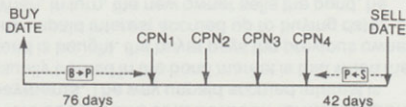


Figure I. General Bond Case with Payments Received (2 Pmts/Yr, 360-day year).

Figure II illustrates the case where the selling date coincides with a coupon payment date. This case is treated much like the equivalent stock case; set **[2nd] [365/360]** to 365, enter 2 for **[2nd] [Pmts/Yr]**, 24 for **[B→P]**, zero for **[P→S]**, and 2 for **[N]**.

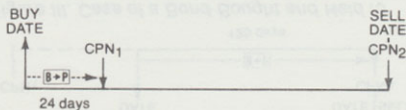


Figure II. Bond Case Where Sell Date and Payment Date Coincide (2 Pmts/Yr, 365-day year).

The example shown in Figure III illustrates the case where a bond is bought shortly before the maturity date and held to maturity, at which time the last coupon payment is received. This case is analyzed like the example shown in Figure II. First set **2nd** **[365/360]** to 365 and enter 2 for **2nd** **[Pmts/Yr]**. Enter 125 for **B→P** and zero for **P→S**. One coupon payment is received, so enter 1 for **N**.

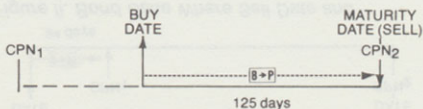


Figure III. Case of a Bond Bought and Held to Maturity (2 Pmts/Yr, 365-day year).

Figure IV illustrates the case where a bond is bought and sold between coupon payment dates. No coupon payment is received. **This investment situation cannot be analyzed like the equivalent stock case because interest, unlike dividend payments, accrues to the owner of a bond even if it is bought and sold between formal coupon payments.** The way unpaid accrued interest is usually treated in the bond market is that when the bond is bought, the buyer pays the previous owner any unpaid interest accrued up to buying date. When, in turn, the new owner sells the bond, he collects unpaid accrued interest due him from the new buyer.

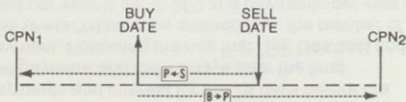


Figure IV. Bond Case Where No Payments are Received (2 Pmts/Yr, 360-day year).

Your calculator will correctly account for any accrued interest paid when you buy or sell a bond if you enter the proper values for $[B \rightarrow P]$ and $[P \leftarrow S]$. To analyze an example like that shown in Figure IV, first enter $[2nd] [365/360]$ and $[2nd] [Pmts/Yr]$. The value that you enter for $[B \rightarrow P]$ is the number of days between the buying date and the next coupon payment date which, in this case, occurs after you sold the bond. The $[P \leftarrow S]$ value is the number of days between the selling date and the immediately preceding coupon payment date which occurred before you bought the bond. The values to be entered for $[B \rightarrow P]$ and $[P \leftarrow S]$ in Figure IV are illustrated by broken arrows. No value is entered for $[N]$ because no payments are received.

If you analyze the case shown in Figure IV as if it were a stock and enter the total time that the bond is owned using the $[P \leftarrow S]$ key, you will get an answer which does not account for the accrued interest paid on buying and selling the bond. (It does account for accrued interest due for the term of ownership.) You may want to use this method, however, when less accurate results are acceptable or when the appropriate payment dates are unknown.

The case of a short-term bond such as a 100-day note which pays interest only at maturity is illustrated in Figure V. Figure V must be treated as a special case of the example shown in Figure IV. Begin the calculation by pressing $[2nd] [Clr Reg]$ and setting $[2nd] [365/360]$ to 360. Enter $[P \leftarrow S]$ as the number of days between the maturity date (considered the sell date) and the issue date. The value entered for $[B \rightarrow P]$ is the number of days between the buy date and a date one year after the issue date. Enter no values for $[N]$ or $[2nd] [Pmts/Yr]$.

The 100-day note does make one interest payment, but because it is not a periodic instrument, no value is entered for **N** or **2nd** [Pmts/Yr]. The calculator interprets this example to be a case where the interest payment received at maturity is accrued interest, not a coupon payment.

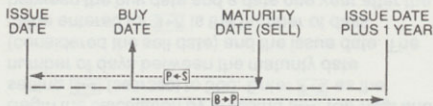


Figure V. Case of a Short-Term Bond Issued for Less Than One Year With Interest Paid at Redemption (100-day note, 360-day year).

To summarize the rules to be followed in using the time keys in the bond setting, first determine if you receive a coupon payment. If you do receive a payment (Figures I-III), enter values for **2nd** [Pmts/Yr], and **2nd** [365/360] followed by **B+P**, **P+S**, and **N**. Enter zero for **B+P** or **P+S** if appropriate.

If the bond made no coupon payment while you owned it (Figure IV), enter values for **2nd** [Pmts/Yr] and **2nd** [365/360], followed by **B+P** and **P+S**. Enter no value for **N**. To determine **P+S**, calculate the number of days between the sell date and the preceding interest payment date. To determine **B+P** calculate the number of days from the buy date to the following interest payment date.

If the bond is a short-term note paying interest only at maturity (Figure V), clear the registers and then enter **B+P** as the number of days from the buy date to a date one year after the issue date. Enter **P+S** as the number of days from the maturity date to the issue date. Enter no values for **2nd** [Pmts/Yr] and **N** in this case.

The **2nd** [DBD] key provides a fast method of calculating the number of days between two dates. Refer to the *Days-Between-Dates* section of Chapter III for details.

Variable Keys

Many factors such as your tax rate, commission rate on trades, and the amount of interest paid by the bond affect bond calculations. The variable keys on your calculator allow you to enter this information.

[TAX] Income Tax Key—Enters the displayed value as the tax rate (percent) paid on interest income. For example, an investor in the 40% marginal income tax bracket would enter 40 and press **[TAX]**. The amount of interest income is reduced by the percentage entered before a yield is computed.

[2nd] [Cap Tax] Capital Gains Tax Key Sequence—Enters the displayed value as the tax rate (percent) to be applied to capital gains and losses. The amount of gain is reduced by the percentage entered before a yield is computed. If a capital loss is incurred, the amount of loss is reduced by the rate entered before a yield is computed.

[COM] Commission Key—Enters the displayed value as the commission rate (percent) paid on bond trades. The value entered for **[COM]** is applied to both the buying and selling prices unless the selling price is equal to the maturity value, in which case the rate of commission is applied only to the buying price.

[CPN] Coupon Rate Key—Enters the displayed value as the coupon rate (percent) of the bond. The coupon rate is the fixed annual interest rate determined when the bond is issued and paid on the par value of the bond.

NOTE: If a negative value is entered using any of the time or variable keys, the calculator ignores the negative sign.

Basic Keys

To make bond calculations, values for **2nd** [Mat Val] and two of the three basic keys — **BUY**, **SEL**, or **YLD** — must be entered into your calculator.

2nd [AY/PY] **Annual or Ownership Period Yield Key Sequence**— This key selects whether the value entered or computed using the **YLD** key is an *annual yield* or an *ownership period yield*. Pressing **2nd** [AY/PY] displays, alternately, " $\frac{1}{1}$ " or " $\frac{1}{2}$ " in the right side of the display. If " $\frac{1}{1}$ " is displayed after **2nd** [AY/PY] is pressed, the calculator interprets the **YLD** key as an *annual yield* key. If " $\frac{1}{2}$ " is displayed after **2nd** [AY/PY] is pressed, the calculator interprets the **YLD** key as an *ownership period yield* key. **Note that pressing 2nd [Clr Reg] always sets the calculator internally to the annual yield setting, although " $\frac{1}{1}$ " does not appear in the display.**

2nd [Mat Val] **Maturity Value Key Sequence**— Enters the displayed value as the value of the bond at maturity. If the value entered for **2nd** [Mat Val] is equal to the value entered for the **SEL** price, then the calculator assumes that the bond is being sold at maturity and computes the *annual yield-to-maturity* when the **2nd** **YLD** key sequence is pressed.

You may choose to enter the maturity value on a per hundred basis, as commonly quoted in financial indices, or as the actual value of the bond, such as \$10,000 or \$100,000. Whatever method of entering the maturity value is chosen, it must be followed consistently throughout the problem to obtain correct results.

BUY **Buying Price Key**— Enters the value shown in the display as the buying price of the bond. This value should not include any accrued interest paid to the previous owner of the bond.

SEL **Selling Price Key**— Enters the value shown in the display as the selling price of the bond. Include no accrued interest in this value.

[YLD] Yield Key—Enters the value shown in the display as an *annual yield* if the **[AY/PY]** key has been previously set to the *annual yield* setting (" \overline{Y} " in the right side of the display) or as an *ownership period yield* if set to the *ownership period yield* setting (" \overline{P} " in the right side of the display). If you have any doubt about the yield setting, press **[2nd] [AY/PY]** until you see the setting you want.

NOTE: If you change the **[2nd] [AY/PY]** setting, you must reenter **[YLD]**.

Computing Keys

After values have been entered for the time keys, related variables, maturity value and two of the three basic variables, the unknown variable can be computed. The value computed is stored internally to 11-digit accuracy, but is rounded to the nearest tenth in the display.

[2nd] [BUY] Compute Buying Price Key Sequence—If values have already been entered for **[SEL]** and **[YLD]**, pressing **[2nd] [BUY]** computes and displays the buying price of the bond.

[2nd] [SEL] Compute Selling Price Key Sequence—If values have already been entered for **[BUY]** and **[YLD]**, pressing **[2nd] [SEL]** computes and displays the selling price of the bond.

[2nd] [YLD] Compute Yield Key Sequence—If values have been entered for **[BUY]** and **[SEL]**, pressing **[2nd] [YLD]** computes and displays the *annual yield* if the calculator has been previously set for *annual yield* calculations or the *ownership period yield* if previously set for *ownership period yield* calculations. To compute the *yield-to-maturity*, alter the time values as appropriate, set the selling price equal to the maturity value, and compute the *annual yield*.

[CY] Current Yield Key—If values have been entered for **[BUY]**, **[2nd] [Mat Val]**, and **[CPN]**, pressing **[CY]** calculates and displays the *current yield* of the bond expressed as a percent (annual interest divided by the buying price). The *current yield* differs from the *annual yield* computed by the **[2nd] [YLD]** key sequence in that it ignores taxes, commissions, and capital gains. The **[CY]** key produces a calculated value only; it is never used to enter a value.

Bond Calculations

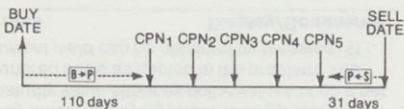
Following is a brief summary of the steps to be followed to solve problems involving bonds.

1. Set your calculator to the bond setting by pressing **[2nd] [Sec Typ]** until "B" appears in left side of the display. Clear the registers by pressing **[2nd] [Clr Reg]** (this automatically sets your calculator to the 365-day year and *annual yield* settings).
2. If you wish to enter or compute an *annual yield*, enter appropriate values for **[2nd] [365/360]**, **[2nd] [Pmts/Yr]**, **[B→P]**, **[P→S]**, and **[N]**. Refer to the *Time Keys* section of this chapter if necessary.
3. To compute the *yield-to-maturity*, assume that you hold the bond until maturity and enter the appropriate time values. Enter the selling price as equal to the maturity value and press **[2nd] [YLD]**.
4. If you wish to enter or compute an *ownership period yield*, press the **[2nd] [AP/PY]** key sequence for a " $\frac{P}{T}$ " indication on the right side of the display. Enter no time values.
5. Enter values for the related variables **[TAX]**, **[2nd] [Cap Tax]**, **[CPN]** and **[COM]**, if desired.
6. Enter values for **[2nd] [Mat Val]** and two of the three basic variables—**[BUY]**, **[SEL]**, or **[YLD]**.
7. Compute the unknown variable by pressing the proper second function key sequence (**[2nd] [BUY]**, **[2nd] [SEL]**, or **[2nd] [YLD]**). The *current yield* can be calculated by pressing the **[CY]** key.

Corporate Bonds

Example 1: You buy a $9\frac{1}{2}$ percent, \$10,000 corporate bond for $98\frac{1}{2}$ on March 27, 1980. The bond matures on July 15, 1995, and pays interest semi-annually on January 15 and July 15. Your income tax rate is 40% and your long-term capital gains tax rate is 16%. The commission on buying and selling the bond is 1.2%. If you sell the bond on August 15, 1982, for 104, what is your *annual yield*? What is the *current yield*? What is the *annual yield-to-maturity*? Note that interest on this bond is calculated on the basis of a 360-day year.

Solution: The period of time that the bond is owned is illustrated in the diagram below.



To find the *annual yield*, it is necessary to set the calculator for *annual yield* calculations. One way to do this is to clear the security registers. Pressing **[2nd] [Clr Reg]** also sets the calculator to the 365-day setting. In this example, you want to use a 360-day year, so press **[2nd] [365/360]** to change this setting. Next, enter values for **[2nd] [Pmts/Yr]**, **B→P**, **P+S**, and **N**. Use the days-between-dates key sequence to determine the values for **B→P** and **P+S**.

Press		Display/Comments	
ON/C		0	Clear display
2nd [Sec Typ]	B	0	Bond setting*
2nd [Clr Reg]	B	0	Clear registers and set to annual yield setting
2nd [365/360]	B	360	Days per year
2 2nd [Pmts/Yr]	B	2	Payments per year
5 [N]	B	5	Number of payments received

327.1980 **2nd**

[DBD] B **327.198** Buy date

715.1980 **=**

[B→P] B **110** Buy to payment

815.1982 **2nd**

[DBD] B **815.1982** Sell date

715.1982 **=**

[P→S] B **31** Sell to payment

*Repeat until bond setting appears in the left side of the display.

Now calculate the *annual yield* of the bond. You may enter the buying price, selling price, and maturity value either as dollar values or on a per hundred basis as quoted in the problem. The *current yield* can be obtained by pressing **[CY]**.

Press		Display/Comments	
100 2nd [Mat Val]	B	100	Maturity value
9.5 [CPN]	B	9.5	Coupon rate
40 [TAX]	B	40	Income tax rate
16 2nd [Cap Tax]	B	16	Capital gains rate
1.2 [COM]	B	1.2	Commission rate
98.5 [BUY]	B	98.5	Buying price
104 [SEL]	B	104	Selling price
2nd [YLD] †	B	6.7	Annual yield
[CY]	B	9.6	Current yield

†The display may blank for several seconds while computing, **[BUY]**, **[SEL]**, or **[YLD]**.

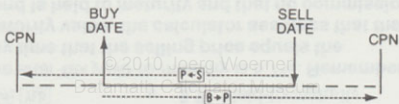
The after-tax *annual yield* of the bond is 6.7%. The *current yield* is 9.6%. To calculate the *yield-to-maturity*, assume that instead of selling the bond on August 15, 1982, you hold it until July 15, 1995, the maturity date. You must change **[N]** to 31 ($15 \text{ years} \times 2 + 1 = 31$) and enter **[P←S]** as zero. You do not need to change **[B→P]** because the number of days between the buying date and the first coupon payment date remains the same. You must change the selling price to 100, the value of the bond at maturity. All other values remain unchanged and need not be reentered.

Press	Display/Comments
31 [N]	B 31 Number of payments received
[ON/C] [P←S]	B 0 Sell to payment
100 [SEL]	B 100 Selling price at redemption
[2nd] [YLD]	B 5.7 Yield-to-maturity

The after-tax *yield-to-maturity* is 5.7%. **Remember, any time that the selling price equals the maturity value, the calculator assumes that the bond is held to maturity and that no commission is paid to redeem the bond.** If you happen to sell a bond at the maturity value on a date other than the maturity date, either enter the selling price as slightly higher or lower than the maturity value (for example as 100.001 when the maturity value is 100) or adjusting the buying and selling prices to include commissions. Finally, note that for a bond held to maturity, the **[2nd]** **[SEL]** key sequence is meaningless. If you compute the selling price of a bond held to maturity, the result will be the selling price which after adjusting for commission will equal the maturity value.

Example 2: An 8.3 percent, \$10,000 corporate bond is bought for 87¾ on February 29, 1980. You want to sell it on April 2, 1980, and make a 25% after-tax annual yield. What must the selling price be? The bond pays interest twice a year on June 30 and December 31. Your income tax rate is 40% and you pay a 1.3% commission on bond trades. Use a 365-day year.

Solution: You receive no coupon payment during the time you own the bond, as shown in the diagram below. To properly account for the accrued interest that you pay when you buy and sell the bond, you must enter $\boxed{B \rightarrow P}$ as the number of days between the buying date and the next coupon payment date, which in this case occurs after the selling date. Enter $\boxed{P \leftarrow S}$ as the number of days between the selling date and the preceding coupon payment date, which occurs before the buying date.



Press		Display/Comments
ON/C	B	0 Check setting
2nd [Clr Reg]	B	0 Clear registers
2 2nd [Pmts/Yr]	B	2 Payments per year
229.1980 2nd		
[DBD]	B	229.198 Buy date
630.1980 =		
B→P	B	122 Buy to payment
402.1980 2nd		
[DBD]	B	402.198 Sell date
1231.1979 =		
P→S	B	93 Sell to payment
8.3 [CPN]	B	8.3 Coupon rate
100 2nd [Mat Val]	B	100 Maturity value
40 [TAX]	B	40 Income tax rate
2nd [Cap Tax]	B	40 Capital gains rate
1.3 [COM]	B	1.3 Commission rate
87.75 [BUY]	B	87.75 Buying price
25 [YLD]	B	25 Annual yield
2nd [SEL]	B	92.5 Selling price

The selling price on a per hundred basis is 92.5. To determine the actual dollar value, multiply 92.5 by 100 (the number of "hundreds" in \$10,000).

Press		Display/Comments
[X] 100 =	B	9250 Dollar selling price

Municipal Bonds

Example 3: A 5% coupon, municipal bond with 10 years to maturity is quoted at a 5.7% *yield-to-maturity*. The bond pays interest every January 1 and July 1. If you ignore taxes and commissions, what is the buying price for a \$5000 face value bond on May 1, 1980, if the maturity date is July 1, 1990? Use a 360-day year.

Solution: Note that this problem is stated so that you know the *yield-to-maturity* that you achieve at the current market (selling) price, but you do not know that market price. This kind of price quotation is common for municipal bonds.

The yield given in this problem is the *yield-to-maturity*; to indicate this fact to the calculator, enter time values describing the bond as held to maturity and set the selling price equal to the maturity value. (When you enter **N**, don't forget that you receive a final coupon payment at maturity.)

Press		Display/Comments
ON/C	B	0 Check setting
2nd [Clr Reg]	B	0 Clear registers
2nd [365/360]	B	360 Days per year
2 2nd [Pmts/Yr]	B	2 Payments per year
21 N	B	21 Payments received
ON/C P+S	B	0 Sell to payment
501.1980 2nd [DBD]	B	501.198 Buy date
701.1980 = B→P	B	61 Buy to payment
5 [CPN]	B	5 Coupon rate
100 2nd [Mat Val]	B	100 Maturity value
[SEL]	B	100 Selling price at redemption
5.7 [YLD]	B	5.7 Yield-to-maturity
2nd [BUY]	B	94.6 Buying price

The buying price of the bond on a per hundred basis should be 94.6. The actual dollar value would be $94.6 \times 50 = \$4730$. You may get the *current yield* by pressing the **[CY]** key ($CY = 5.3\%$).

Callable Bonds

Example 4: You want to analyze a 6.5% coupon, callable bond now selling for 92½. The bond is first callable in five years at 105. Interest payments are

made April 1 and October 1. If you buy the bond on February 18, 1980, and the bond is called on April 1, 1985, what is the *annual yield* on this investment? Your income tax rate is 50%, your long-term capital gains tax rate is 20%, and you pay a 2% commission to buy the bond. No commission is paid if the bond is called. Use a 365-day year.

Solution: Because no commission is paid when the bond is called, it is necessary to adjust the buying price to include the commission. (Remember, if a value is entered for **COM**, that value is applied to both the buying and selling price.) **P+S** is zero, since the bond is called on a coupon payment date.

Press		Display/Comments	
ON/C	B	0	Check setting
2nd [Clr Reg]	B	0	Clear registers
2 2nd [Pmts/Yr]	B	2	Payments per year
11 N	B	11	Payments received
218.1980 2nd [DBD]	B	218.198	Buy date
401.1980 = B→P	B	43	Buy to payment
ON/C P←S	B	0	Sell to payment
6.5 CPN	B	6.5	Coupon rate
50 TAX	B	50	Income tax rate
20 2nd [Cap Tax]	B	20	Capital gains rate
100 2nd [Mat Val]	B	100	Maturity value
105 SEL	B	105	Selling price
92.5 X .02 +	B	1.85	Commission
92.5 = BUY	B	94.35	Buying price
2nd YLD	B	5	Annual yield

The *annual yield* if the bond is called in five years is 5%.

Convertible Bonds

Example 5: On May 1, 1980, you buy a $6\frac{1}{4}\%$ coupon, \$5000 convertible bond at $93\frac{5}{8}$. Each \$5000 bond is convertible to 100 shares of common stock. The bond pays interest every June 1 and December 1. On December 15, 1982, you convert the bond to stock at \$60 per share. What is the *annual yield* on your investment as of December 15, 1982, if you (a) convert the bond and hold the stock, or (b) convert the bond and sell the stock? You pay a 1% commission on all trades, your tax rate is 45% and your long-term capital gains tax rate is 18%. Interest on the bond is accrued on the basis of 360 days per year.

Solution: If you convert on December 15, 1982, you will not pay any conversion charge (commission) and you have a certain yield on paper. If you convert and sell the stock, you pay commission on the sale. It is assumed here that you can convert the bond and sell the corresponding 100 shares of stock at \$60 per share—all on December 15, 1982. To solve part (a) of this problem, enter a buying price that includes the commission (do not use the **COM** key because that would add commission to both the buying and selling price).

Press

Display/Comments

ON/C	B	0	Check setting
2nd [Clr Reg]	B	0	Clear registers
2nd [365/360]	B	360	Days per year
2 2nd [Pmts/Yr]	B	2	Payments per year
6 [N]	B	6	Payments received
501.1980 2nd [DBD]	B	501.198	Buy date
601.1980 = B→P	B	31	Buy to payment
1215.1982 2nd [DBD]	B	1215.1982	Sell date
1201.1982 = P→S	B	14	Sell to payment
45 TAX	B	45	Income tax rate
18 2nd [Cap Tax]	B	18	Capital gains rate
5000 2nd [Mat Val]	B	5000	Maturity value
6.25 CPN	B	6.25	Coupon rate
5 ÷ 8 + 93 =	B	93.625	Buying price on a per hundred basis
X 50 = STO	B	4681.25	Dollar buying price
X .01 = SUM	B	46.8125	Add commission
RCL BUY	B	4728.0625	Buying price
100 X 60 = SEL	B	6000	Dollar selling price
2nd [YLD]	B	11.1	Annual Yield

The *annual yield* of the bond if converted but not sold is 11.1%. This solution could have also been

carried out by entering the maturity value and buying price on a per hundred basis, as shown below.

Press	Display/Comments
100 [2nd] [Mat Val] B	100 Maturity value
5 [÷] 8 [+] 93 [=] B	93.625 Buying price on a per hundred basis
[X] 1.01 [=] [BUY] B	94.56125 Buying price plus commission
100 [X] 60 [÷] 5000 [=] B	1.2 Selling price per dollar
[X] 100 [=] [SEL] B	120 Selling price on a per hundred basis
[2nd] [YLD] B	11.1 Annual yield

The *annual yield* if you do not sell the stock after converting the bond is 11.1%. If you sell the stock, you pay a 1% commission on the sell. To answer part (b) of this problem, you can either reduce the selling price by the amount of commission or enter the commission as 1% and change the buying price to its unadjusted value ($93\frac{5}{8}$). The maturity value can be left at 100 as before.

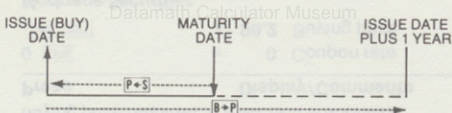
Press	Display/Comments
1 [COM] B	1 Commission rate
5 [÷] 8 [+] 93 [=] [BUY] B	93.625 Buying price
[2nd] [YLD] B	10.8 Annual yield

Notice that the yield for part (b) is lower than for part (a) due to the commission paid on the sale of the stock after the conversion of the bond.

Short-Term Notes, Banker's Acceptances, and Commercial Paper

Example 6: A \$10,000,000, interest-bearing, 100-day note was issued on January 2, 1980, for 98.7. The note has a coupon rate of 9.3%. (a) What is the *annual yield* of the note? (b) If the note did not carry a coupon rate, what would it have to sell for to produce the same *annual yield* as in part (a)? Use a 360-day year.

Solution: Because the term of the note is less than one year, it is necessary to analyze it as indicated in the diagram below. Enter $B \rightarrow P$ as the number of days from the issue date to a date one year after the issue date (360 days since this note pays on a 360-day basis). Enter $P \leftarrow S$ as the number of days from the maturity date to the buy date (100 days in this case as the buy date is the issue date). Enter no values for N or $Pmts Yr$. You could solve this problem by entering the actual dollar buying and selling prices, but using such large numbers is generally not recommended.



Press	Display/Comments
ON/C	B 0 Check setting
2nd [Clr Reg]	B 0 Clear registers
2nd [365/360]	B 360 Days per year
B→P	B 360 Buy to payment
100 P←S	B 100 Sell to payment
2nd [Mat Val]	B 100 Maturity value
SEL	B 100 Selling price
9.3 CPN	B 9.3 Coupon rate
98.7 BUY	B 98.7 Buying price
2nd YLD	B 14.9 Annual yield

The note has an *annual yield* of 14.9%. To solve part (b), set the coupon rate to zero and compute the buying price. The answer gives the discounted buying price required to yield 14.9% annually.

Press	Display/Comments
0 CPN	B 0 Coupon rate
2nd BUY	B 96.2 Buying price

Mortgage Securities

Mortgage bonds and securities issued by government agencies such as the Federal National Mortgage Association (Fannie Mae), Government National Mortgage Association (Ginnie Mae) and Federal Home Loan Mortgage Corporation (Freddie Mac) can be analyzed in a similar fashion as the bonds discussed above. Yields of pass-through type securities can be obtained in the stock setting by entering the selling price as zero and the monthly payment as a monthly dividend.

VII. OPTIONS

Introduction

An option is a negotiable contract that gives the holder the right to buy or sell a stated number of shares of a particular stock, called the underlying stock, at a fixed price within a predetermined time period. The party that originally sells the option is known as the "writer" of the option. The price that the buyer of the option pays the writer, known as the premium, is the payment the writer receives to enter into the option contract. The contracted price at which the writer agrees to sell or buy the stock is known as the exercise or striking price.

The two most common types of options are "calls" and "puts". A call option gives the holder the right to buy the underlying stock at the contracted exercise price. A put option gives the holder the right to sell the underlying stock at the exercise price.

Investors can buy or sell a combination of calls and puts on the same stock. For example, a straddle is a put and call on the same security at the same exercise price. A strip is two puts and one call at the same exercise price. A strap is two calls and one put at the same exercise price. Such combinations, often collectively called spreads, may be exercised or sold as separate options.

The stock setting of your *Investment Analyst* calculator allows you to make call and put option calculations rapidly and confidently. Your calculator will consider the following variables:

- Buying price (premium) of the option contract
- Market price of the underlying stock
- *Annual yield or ownership period yield*
- Exercise price
- Commission for buying or selling the underlying stock
- Commission for buying or selling the option
- Capital gains tax rate
- Length of time the option is owned

Option Key Tour

The financial keys used in the option setting of your calculator have been divided into four groups: time keys, variable keys, basic keys, and computing keys. Following the last section of the *Option Key Tour* are examples of option problems and their solutions.

Time Keys

The only time key used in the option setting when making *annual yield* calculations is the $\boxed{P \leftrightarrow S}$ key. The $\boxed{2nd} \boxed{[365/360]}$, $\boxed{2nd} \boxed{[Pmts/Yr]}$, \boxed{N} , and $\boxed{B \leftrightarrow P}$ keys are operative in the option setting, but would not normally be used. Be sure that these registers are cleared before making an option calculation by pressing $\boxed{2nd} \boxed{[Clr Reg]}$. If making an *ownership period yield* calculation, no time keys are required.

Figure I illustrates the use of the $\boxed{P \leftrightarrow S}$ key in the option setting. Begin the calculation by pressing $\boxed{2nd} \boxed{[Clr Reg]}$ and then enter the total number of days that the option is owned using the $\boxed{P \leftrightarrow S}$ key. Use no other time keys.

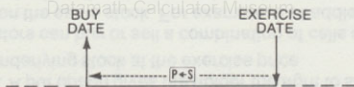


Figure I. Option Case Where Option Is Exercised.

The $\boxed{2nd} \boxed{[DBD]}$ key sequence provides a fast method of calculating the number of days between the buy date and the exercise date. Refer to the *Days-Between-Dates* section of Chapter III for details.

Variable Keys

Many factors such as taxes and commissions affect option calculations. The variable keys on your calculator allow you to enter this information.

$\boxed{2nd} \boxed{[Cap Tax]}$ **Capital Gains Tax Key Sequence**—Enters the displayed value as the tax rate to be applied to capital gains or losses. If a value is

entered for the capital gains tax rate, the amount of gain or loss is reduced by the entered percentage before a yield is computed.

[COM] Commission Key—Enters the displayed value as the commission rate paid to buy or sell the underlying stock when the option is exercised.

[2nd] [Com Opt] Options Commission Key Sequence—Enters the displayed value as the commission rate paid to buy or sell the option.

NOTE: If a negative value is entered using any of the time or variable keys, the calculator ignores the negative sign.

Basic Keys

[2nd] [AY/PY] Annual or Ownership Period Yield Key Sequence—This key selects whether the value entered or computed using the **[YLD]** key is an *annual yield* or *ownership period yield*. Pressing **[2nd] [AY/PY]** displays, alternately, " $\frac{Y}{T}$ " or " $\frac{P}{T}$ " in the right side of the display. If " $\frac{Y}{T}$ " is displayed after **[2nd] [AY/PY]** is pressed, the calculator interprets the **[YLD]** key as an *annual yield* key. If " $\frac{P}{T}$ " is displayed after **[2nd] [AY/PY]** is pressed, the calculator interprets the **[YLD]** key as an *ownership period yield* key. Note that pressing **[2nd] [Clr Reg]** always sets the calculator internally to the *annual yield* setting, although " $\frac{Y}{T}$ " does not appear in the display.

[CAL] Call Price Key—Enters the value shown in the display as the price paid for the call option, the call premium. **When analyzing a call, enter the [CAL] price before the exercise and sell price or an incorrect answer may result.**

[PUT] Put Price Key—Enters the value shown in the display as the price paid for the put option, the put premium. **When analyzing a put, enter the [PUT] price before the exercise and buy price or an incorrect answer may result.**

[EXP] Exercise Price Key—Enters the value shown in the display as the contracted exercise price at which the underlying stock can be sold in the case of a put option or bought in the case of a call option. **This value must be reentered if you change from a put to a call or from a call to a put even if the exercise price remains the same.**

[BUY] Buying Price Key—Enters the value shown in the display as the buying price of the stock if the put option is exercised. If the **[BUY]** key is used after the **[CAL]** key has been pressed, an "Error" condition will result.

[SEL] Selling Price Key—Enters the value shown in the display as the selling price of the stock if the call option is exercised. If the **[SEL]** key is used after the **[PUT]** key has been pressed, an "Error" condition will result.

[YLD] Yield Key—Enters the value shown in the display as an *annual yield* if the **[AY/PY]** key has been previously set to the *annual yield* setting (" \overline{Y} " in the right side of the display) or as an *ownership period yield* if set to the *ownership period yield* setting (" \overline{P} " in the right side of the display).

NOTE: If you change the **[2nd] [AY/PY]** setting, you must reenter **[YLD]**.

Computing Keys

After values have been entered for the appropriate basic variables, the unknown variable can be computed. The value computed is stored internally to 11 digits, but is rounded in the display to the nearest tenth.

[2nd] [BUY] Compute Buying Price Key Sequence—If values have been entered for **[PUT]**, **[EXP]**, and **[YLD]**, pressing **[2nd] [BUY]** computes and displays the market (buying) price of the underlying stock required to make the entered yield.

[2nd] [SEL] Compute Selling Price Key Sequence—If values have been entered for **[CAL]**, **[EXP]**, and **[YLD]**,

pressing **[2nd] [SEL]** computes and displays the market (selling) price of the underlying stock required to make the entered yield.

[2nd] [YLD] Compute Yield Key Sequence—If values have been entered for either **[BUY]** and **[PUT]** or **[SEL]** and **[CAL]**, pressing **[2nd] [YLD]** computes and displays the *annual yield* of the option contract if the calculator has been previously set for *annual yield* calculations or the *ownership period yield* if previously set for *ownership period yield* calculations.

Option Calculations—The Buyer

The buyer of an option is speculating that the stock on which he has the option will move in a way beneficial to his position. For example, if the option is a call, the holder has the right to buy the underlying stock from the writer at the exercise price at any time prior to the expiration of the option contract. If the price of the stock rises above the exercise price of the option, the holder of the option can profit in two ways. He can buy the stock at the exercise price from the writer and sell at the higher market price. Or, because an option is negotiable, he can sell the now more valuable option to another buyer. The profit in either case need not be equal. Your *Investment Analyst* calculator can help you make the calculations necessary to decide which is the better alternative.

Option calculations involving cases where the buyer chooses to *sell the option* are made using the *stock setting* of your calculator. In this case, buying and selling the option is like buying and selling a stock which pays no dividends and is analyzed as such using your calculator.

Option calculations involving cases where the buyer chooses instead to exercise his right to force the writer to buy or sell at the contracted exercise price are made using the option setting of your calculator. The examples in this chapter illustrate both types of option calculations.

Following is a brief summary of the steps to be followed in making calculations when the option is exercised.

1. Set the calculator to the option setting by pressing **[2nd] [Sec Typ]** until neither "A" nor "B" appears in the left side of the display.
2. Press **[2nd] [Clr Reg]** and choose the desired setting for the **[2nd] [AY/PY]** key sequence. Clearing the registers always sets the calculator to the *annual yield* setting.
3. If making an *annual yield* calculation, enter the number of days that the option is owned using the **[P+S]** key (no other time key is required). Ignore the time keys if making an *ownership period yield* calculation.
4. Enter values for **[COM]**, **[2nd] [Com Opt]**, and **[2nd] [Cap Tax]**, if desired.
5. Enter either the **[CAL]** or **[PUT]** premium, as appropriate, to prepare your calculator for call or put calculations.
6. Enter values for the appropriate basic variables (**[SEL]** or **[BUY]**, **[EXP]**, and **[YLD]**).
7. Compute the unknown variable by pressing the appropriate second function key sequence (**[2nd] [BUY]**, **[2nd] [SEL]**, or **[2nd] [YLD]**).

Call and Put Options

Example 1: You paid a 1.5% commission to buy a 9-month call option on a stock on May 19, 1980, for \$8-15/16. The exercise price is \$40 per share. By July 31, 1980, the price of the stock has moved up to \$52¾ and your option is worth \$13¼. You can either sell the option or exercise the option. What are your *annual* and *ownership period* yields in either case? If you sell the option, you pay 1.5% commission as before, but if you exercise the option, you pay 1% commission on buying and selling the stock. Your short-term capital gains rate is 35%.

Solution: If you sell the option, your transaction is no different from buying and selling a stock which pays no dividends. To solve this part of the problem, set your calculator to the stock setting, clear the registers, and enter the total number of days that the option was owned by using the **[P+S]** key. Enter as **[COM]** the rate paid to buy and sell the option contract.

Press		Display/Comments
[ON/C]		0 Clear display
[2nd] [Sec Typ]	A	0 Stock setting*
[2nd] [Clr Reg]	A	0 Clear registers
519.1980 [2nd]		
[DBD]	A	519.198 Buy date
731.1980 [=]		
[P+S]	A	73 Days option was owned
1.5 [COM]	A	1.5 Commission rate
35 [2nd] [Cap Tax]	A	35 Capital gains rate
15 [÷] 16 [+] 8		
[=] [BUY]	A	8.9375 Buying price of option
13.25 [SEL]	A	13.25 Selling price of option
[2nd] [YLD] †	A	250.6 Annual yield
[2nd] [AY/PY]	A	Ownership period setting
[2nd] [YLD]	A	28.5 Ownership period yield

*Repeat until stock setting appears.

†The display may blank for several seconds while computing **[BUY]**, **[SEL]**, or **[YLD]**.

Selling the option contract gives you an *annual yield* of 250.6% and an *ownership period yield* of 28.5%. To calculate the yields if the option is exercised, set the calculator to the option setting. Be sure to begin by clearing the registers.

Press	Display/Comments
ON/C	0 Clear display
2nd [Sec Typ]	0 Option setting*
2nd [Clr Reg]	0 Clear registers
73 P+S	73 Days option was owned
1.5 2nd [Com Opt]	1.5 Option commission
1 COM	1 Stock commission
35 2nd [Cap Tax]	35 Capital gains rate
15 ÷ 16 + 8 =	
CAL	8.9375 Call premium
40 EXP	40 Exercise price
52.75 SEL	52.75 Selling price of stock
2nd YLD	145.9 Annual yield
2nd [AY/PY]	7 Ownership period setting
2nd YLD	19.7 Ownership period yield

*Repeat until neither "A" nor "B" appears in the left side of the display.

Your yield is higher if you sell the option contract on the market rather than exercise it.

Example 2: You buy a 9-month put option for $\$3\frac{1}{8}$ on March 3, 1980. The exercise price is \$60 per share. If you pay an \$18 commission to buy the option and a 1.3% commission to trade the underlying stock, what must the stock price be 90 days later, if you are to make a 50% *annual yield*? Your short-term capital gains tax rate is 30%.

Solution: Note that the option commission is not given as a percentage. To enter it into your calculator you can either calculate the rate of commission ($\$18 \div 3\frac{1}{8} = 5.76\%$) and enter it using the **2nd** **[Com Opt]** key sequence or you can add \$0.18 ($18 \div 100 = 0.18$) to the per share cost of the option contract.

Press	Display/Comments
ON/C	0 Check setting
2nd [Clr Reg]	0 Clear registers
90 P+S	90 Days option was owned
5.76 2nd [Com Opt]	5.76 Option commission
1.3 COM	1.3 Stock commission
30 2nd [Cap Tax]	30 Capital gains rate
1 ÷ 8 + 3 = PUT	3.125 Put premium
60 EXP	60 Exercise price
50 YLD	50 Annual yield
2nd BUY	54.7 Buying price

If the stock falls to \$54.70 in three months, your investment yields 50% on an annual basis. The same result can be obtained by entering the option commission as zero and the put premium as $\$3.125 + 0.18 = \3.305 .

Press	Display/Comments
ON/C 2nd [Com Opt]	0 Option commission
3.305 PUT	3.305 Put premium
2nd BUY	54.7 Buying price

Spreads

Example 3: You can buy a 6-month straddle on a stock for $\$9\frac{1}{2}$. The exercise price is $\$70$ and the stock is currently trading at $\$72\frac{3}{4}$. If you buy the straddle on April 7, 1980, what must be the selling price of the stock on August 29, 1980, if you are to make a 50% *annual yield* on exercising your option? The commission rate paid on options is 2.2% and on stocks is 1.3%. Your short-term capital gains tax rate is 45%.

Solution: A straddle is one call and one put contract, so if the stock price moves sufficiently in either direction, you profit. If the stock moves up,

the call is exercised; if the stock moves down, the put is exercised. First, calculate the selling price of the stock required to return a 50% *annual yield* on the call contract.

Press	Display/Comments
ON/C	0 Check setting
2nd [Clr Reg]	0 Clear registers
407.1980 2nd [DBD]	407.198 Buy date
829.1980 = P+S	144 Days option was owned
2.2 2nd [Com Opt]	2.2 Option commission
1.3 COM	1.3 Stock commission
45 2nd [Cap Tax]	45 Capital gains rate
9.5 CAL	9.5 Call premium
70 EXP	70 Exercise price
50 YLD	50 Annual yield
2nd SEL	84.8 Selling price

Now calculate the buying price of the stock required to return a 50% *annual yield* if the put is exercised.

Remember, when changing from a put to a call, or the reverse, you must reenter the exercise price.

Press	Display/Comments
9.5 PUT	9.5 Put premium
70 EXP	70 Exercise price
2nd BUY	55.6 Buying price

If the stock drops to \$55.60 or rises to \$84.80, you make an *annual yield* of 50%. It should be noted that purchasing a straddle creates a "band" around the exercise price, above which and below which the investor profits. To determine the break-even stock prices for this straddle, enter the yield as zero and recalculate the buying and selling stock prices.

Press

Display/Comments

ON/C YLD

0 Annual yield

2nd BUY

58.6 Buying price

9.5 CAL

9.5 Call premium

70 EXP

70 Exercise price

2nd SEL

81.7 Selling price

The break even points are \$58.60 and \$81.70.

Example 4: A very volatile stock is selling on June 23, 1980, for \$39 $\frac{1}{8}$. You believe the stock is probably over-valued and more likely to fall than rise. However, you decide to buy a strip for \$11 $\frac{1}{2}$ (two puts and one call) because it gives you some protection if the stock moves up. The exercise price of the strip is \$40 and you pay a 3% commission to buy the strip. The strip expires on August 15, 1980. If the stock is selling for \$25 on the expiration date, what would your *ownership period yield* be if you exercise the two puts? You pay a 2 $\frac{1}{2}$ % commission on stock trades and your short-term capital gains tax rate is 33%. © 2010 Joerg Woerner

Solution: In this problem you know the total price of the strip but not the individual costs of the two put options and the call option. On the expiration date, only the put portion of the strip is profitable. The call expires worthless and its cost must be considered part of the cost of the puts. You can calculate the *ownership period yield* if you exercise the two puts in two ways: you can divide the cost of the strip by two to get the cost of each put and enter **EXP** as \$40 and **BUY** as \$25 or you can enter **PUT** as \$11 $\frac{1}{2}$, **EXP** as \$80 (\$40 \times 2), and **BUY** as \$50 (\$25 \times 2). In either case, enter commissions and taxes the same.

Press	Display/Comments
ON/C	0 Option setting
2nd [Clr Reg]	0 Clear registers
2nd [AY/PY]	<input checked="" type="checkbox"/> Ownership period setting
3 2nd [Com Opt]	3 Option commission
2.5 COM	2.5 Stock commission
33 2nd [Cap Tax]	33 Capital gains rate
11.5 PUT	11.5 Put premium
40 X 2 = EXP	80 Exercise price
25 X 2 = BUY	50 Buying price
2nd YLD	84.3 Ownership period yield

If the stock drops to \$25 the *ownership period yield* on your strip would be 84.3%. With a few additional keystrokes, you can determine what the stock price would have to be to make the same *ownership period yield* on the call portion of the strip.

Press	Display/Comments
11.5 CAL	11.5 Call premium
40 EXP	40 Exercise price
2nd SEL	69.5 Selling price

Option Calculations—The Writer

Calculations involving the writing of options can be analyzed with the *Investment Analyst* calculator using the stock setting. If you have a “covered” position, the **BUY** price is the price paid for the stock less the option premium. The **SEL** price is the exercise price of the option. If you pay commissions on your stock and option trades, add those values to the **BUY** and **SEL** prices before entering them. Do not use the **COM** key unless the commission rates for both stock and option trades are equal.

If your position is not "covered," the values entered for **BUY** and **SEL** must be based upon your best judgment of what those values will be.

Example 5: You buy 100 shares of stock at \$30 on January 21, 1980. You do not expect the stock to move above \$40, so you decide to write a call option on the stock with an exercise price of \$40. You receive a \$2½ premium. You pay a 1.2% commission on stock trading and a 2% commission on option trading. Your income tax rate is 30%. The stock pays dividends of \$0.25 on January 31, April 30, July 31, and October 31. On June 20, 1980, the stock price moves up to \$45 and your call option is exercised.

- (a) What does your investment yield on an *annual* basis?
- (b) What would the *annual yield* have been if you had not written the call but had sold your stock at \$45?
- (c) What *annual yield* would you have received if you had written two call options instead of one? In this case, you have one covered and one uncovered call option.

Solution: To calculate options from the point of view of the writer, set your calculator to the stock setting. To answer part (a) of this problem, you must adjust the **BUY** and **SEL** prices for commissions. Your **BUY** price is \$30 plus the 1.2% commission, less the difference between the option premium and the option commission. The **SEL** price is the exercise price less the commission. No commissions are entered using the **COM** key.

Press

Display/Comments

ON/C		0	Clear display
2nd [Sec Typ]	A	0	Stock setting
2nd [Clr Reg]	A	0	Clear registers
2 [N]	A	2	Payments received
4 2nd [Pmts/Yr]	A	4	Payments per year
121.1980 2nd [DBD]	A	121.198	Buy date
131.1980 =			
B→P	A	10	Buy to payment
620.1980 2nd [DBD]	A	620.198	Sell date
430.1980 =			
P←S	A	51	Sell to payment
30 TAX	A	30	Income tax rate
2nd [Cap Tax]	A	30	Capital gains rate
.25 DIV	A	0.25	Dividends
30 STO	A	30	Buy price of stock
[X] .012 = SUM	A	0.36	Plus stock commission
2.5 +/- SUM	A	-2.5	Less option premium
[X] .02 = +/-			
SUM	A	0.05	Plus option commission
RCL BUY	A	27.91	Buying price
40 STO	A	40	Sell price of stock
[X] .012 =			
+/- SUM	A	-0.48	Less commission
RCL SEL	A	39.52	Selling price
2nd YLD	A	69.4	Annual yield

The *annual yield* on your investment is 69.4%. To calculate the answer to part (b), enter the buying price as \$30, selling price as \$45, and commission as 1.2%.

Press		Display/Comments
1.2 COM	A	1.2 Commission rate
30 BUY	A	30 Buying price
45 SEL	A	45 Selling price
2nd YLD	A	76.4 Annual yield

If you had written two calls instead of one, you would have to buy one hundred shares at \$45 per share plus commissions to cover the "naked" call. Your initial **BUY** price in this case would be \$30 plus the 1.2% stock commission, less the difference between twice the option premium and the option commission. The **SEL** price would be twice the exercise price, less the commission, less the net cost of buying one share of stock at \$45. Enter zero using the **COM** key to erase the previous value stored there.

Press		Display/Comments
0 COM	A	0 Commission rate
30 STO	A	30 Buy price of stock
X .012 = SUM	A	0.36 Plus commission
2.5 X 2 X	A	5 Twice call premium
.98 = +/- SUM	A	-4.9 Less option commission (2%)
RCL BUY	A	25.46 Buying price
40 X 2 = STO	A	80 Twice exercise price
X .012 = +/-		
SUM	A	-0.96 Less stock commission
45 +/- SUM	A	-45 Less stock price
X .012 = SUM	A	-0.54 Less stock commission
RCL SEL	A	33.5 Selling price
2nd YLD	A	54.3 Annual yield

VIII OTHER INVESTMENTS

Introduction

The preceding chapters have illustrated the use of your *Investment Analyst* calculator to analyze investments involving stocks, bonds, and options. You are not limited, however, to just these investment possibilities. The stock setting of your calculator can help you analyze almost any type of investment—for example, annuities, commodity futures, warrants, gold, silver, coins, stamps, paintings, and real estate. In short, your calculator can analyze any investment in which you can determine the amount of money spent on the investment, the amount of money returned by the investment, and the length of time that the investment was owned.

1. To analyze an investment other than a bond or an option, set your calculator to the stock setting by pressing **[2nd] [Sec Typ]** until "A" appears in the left side of the display. Clear the registers by pressing **[2nd] [Clr Reg]** (this automatically sets your calculator to the 365-day year and *annual yield* settings).
2. If you are calculating an *ownership period yield*, press the **[2nd] [AY/PY]** key sequence for a " \overline{P} " indication in the right side of the display. Enter no time values.
3. If calculating an *annual yield*, ensure that the calculator is set to an *annual yield* setting by clearing the security registers or by pressing **[2nd] [AY/PY]** for a " \overline{Y} " indication in the right side of the display. To determine how to enter the time values, you must decide whether the investment produces any income between the buying and selling dates. If the investment makes regular, periodic payments, analyze it using the **[2nd] [Pmts/Yr]** and **[2nd] [365/360]** keys followed by the **[B→P]**, **[P←S]**, and **[N]** keys. If the investment makes no periodic payments, enter the total number of days the investment is owned using the **[P←S]** key (use no other time keys).

4. If the investment produces regular income, enter that value using the **[DIV]** key. If the amount of income is expected to increase at a constant rate, enter the rate of increase (percent) using **[2nd]** **[Div Gro]**.

5. Enter values for **[COM]**, **[TAX]**, and **[2nd]** **[Cap Tax]**, if desired.

6. Enter values for *two of the three* basic variables — **[BUY]**, **[SEL]**, or **[YLD]**.

7. Compute the unknown variable by pressing the proper second function key sequence (**[2nd]** **[BUY]**, **[2nd]** **[SEL]**, or **[2nd]** **[YLD]**).

Rents and Leases

Example 1: A machine bought for \$30,000 is leased for \$1500 per month, beginning in 30 days. The salvage value of the machine after two years is \$6000. Ignoring taxes and commissions, what is the *annual yield* of the investment?

Solution: The **[BUY]** price is \$30,000 and the **[SEL]** price is \$6000. The investment pays \$1500 twelve times a year. The total number of payments received is 24. **[B→P]** is 30 days (one month) and **[P←S]** is zero. Use a 360-day year for this calculation.

Press		Display/Comments
[ON/C]		0 Clear display
[2nd] [Sec Typ]	A	0 Stock setting*
[2nd] [Clr Reg]	A	0 Clear registers
[2nd] [365/360]	A	360 Days per year
12 [2nd]		
[Pmts/Yr]	A	12 Payments per year
30 [B→P]	A	30 Buy to payment
[ON/C] [P←S]	A	0 Sell to payment
24 [N]	A	24 Payments received
1500 [DIV]	A	1500 Monthly payments
30000 [BUY]	A	30000 Cost
6000 [SEL]	A	6000 Return
[2nd] [YLD]	A	30.5 Annual yield

*Repeat until stock setting appears.

Any investment which generates regular income (rent, lease, or cost savings) can be analyzed like Example 1. Rent or lease increases can be entered using the **[2nd] [Div Gro]** key sequence.

Capital Expenditure Analysis

Example 2: Your corporation buys a machine for \$20,000 to be used for five years during which time you intend to depreciate it on a straight-line basis using a salvage value of \$5000. At the end of the fifth year you expect to sell the machine for \$6000. While you own the machine, it generates an annual cost savings of \$4000. Your corporation pays a 40% tax on income (cost savings) and a 16% tax on long-term capital gains. What is the *annual yield* of this investment?

Solution: The annual after-tax cash flow from this investment consists of two parts, (a) cash savings and (b) depreciation. Both values must be adjusted for taxes before you enter them into your calculator. The annual cash flow from cost savings is \$4000. To adjust cost savings for taxes, multiply the amount of the annual savings by the factor $(1 - \text{tax rate}/100)$. The annual depreciation is $\$20,000 - \$5000 \div 5 = \$3000$. To adjust depreciation for taxes, multiply the amount of annual depreciation by the income tax rate expressed as a decimal. In this example, the after-tax cost savings is $\$4000 (1 - .4) = \2400 and the after-tax depreciation is $\$3000 \times 0.4 = \1200 . The total annual cash flow is $\$2400 + \$1200 = \$3600$. Enter this value using the **[DIV]** key.

At the end of five years you have a capital gain of $\$6000 - \$5000 = \$1000$ on which you pay 16% tax. Therefore, the tax-adjusted selling price is $\$6000 - (\$1000 \times .16) = \$5840$. Enter no values for **[TAX]**, **[2nd] [Cap Tax]**, or **[COM]**.

Press

Display/Comments

ON/C	A	0	Check setting
2nd [Clr Reg]	A	0	Clear registers
365 [B→P]	A	365	Buy to payment
ON/C [P→S]	A	0	Sell to payment
5 [N]	A	5	Payments received
3600 [DIV]	A	3600	Annual cash flow
20000 [BUY]	A	20000	Buying price
5840 [SEL]	A	5840	Selling price
2nd [YLD]	A	5.2	Annual yield

Home Mortgage Loans and Annuities

Example 3: You want to buy a new house. The prevalent interest rate for home loans is 11%. You figure you can afford to pay \$300 a month for 30 years. What is the most you can borrow ignoring closing costs and taxes?

Solution: In this problem you know the **[SEL]** price (zero), the **[DIV]** payments (\$300/month), and the annual **[YLD]** (11%). You need to compute the **[BUY]** price. The number of days between the buy date and the first payment is one month and the days between the sell date the last payment is zero. Use a 360-day year.

Press		Display/Comments
ON/C	A	0 Check setting
2nd [Clr Reg]	A	0 Clear registers
2nd [360/365]	A	360 Days per year
12 2nd [Pmts/Yr]	A	12 Payments per year
30 B→P	A	30 Buy to payment
ON/C P←S	A	0 Sell to payment
30 X12 N	A	360 Payments received
300 DIV	A	300 Monthly payments
ON/C SEL	A	0 Selling price
11 YLD	A	11 Annual yield
2nd BUY	A	31501.9 Buying price

You can afford to borrow approximately \$31,500. It is also possible to use your calculator to find the approximate monthly payment on a loan which you pay off on a declining balance basis, as illustrated in Example 4.

Example 4: You borrow \$46,000 to buy a house at 11.5% annual interest. You agree to repay the loan in monthly payments over a 30-year period, beginning in 30 days. What is the approximate monthly payment? Use a 360-day year.

Solution: Enter the buying price as \$46,000 and the *annual yield* as 11.5%. Take a guess at the approximate monthly payments and enter that value using **DIV**. Then compute the selling price; when the selling price approaches zero, you have guessed the *approximate* monthly payment.

Press		Display/Comments
ON/C	A	0 Check setting
2nd [Clr Reg]	A	0 Clear registers
12 2nd [Pmts/Yr]	A	12 Payments per year
2nd [365/360]	A	360 Days per year
30 B→P	A	30 Buy to payment
ON/C P←S	A	0 Sell to payment
30 X12 N	A	360 Number of payments
46000 BUY	A	46000 Buying price
11.5 YLD	A	11.5 Annual yield
460 DIV	A	460 First guess
2nd SEL	A	-13974.3 460 too large
450 DIV	A	450 Second guess
2nd SEL	A	17316.6 450 too small
455 DIV	A	455 Third guess
2nd SEL	A	1671.1 455 too small
455.5 DIV	A	455.5 Fourth guess
2nd SEL	A	106.6 Approximate monthly payment is \$455.5

The approximate monthly payment is \$455-456. It is possible to reduce the selling price further, for instance by entering the dividend as 455.53406, but such detail is beyond the accuracy of this method of computing a payment. In making your guesses, if the selling price is negative your guess was too large. If the selling price is positive, your guess was too small.

Commodity Contracts 89


Example 5: A commodity contract for 40,000 lbs. is quoted at \$0.75 per pound. If you buy the contract, hold it for 1 week, and sell it at \$0.775 per pound, what is the *ownership period yield*? The margin requirement is 4%. Your income tax rate is 35% and the commission is \$0.001 per pound paid when you sell the contract.

Solution: Analyze this example like a stock purchase on margin. The buying price is 4% of the contract. The selling price is the gain on the transaction plus the margin less the commission.

Press	Display/Comments
ON/C	A 0 Check setting
2nd [Clr Reg]	A 0 Clear registers
2nd [AY/PY]	A <input checked="" type="checkbox"/> Ownership period setting
35 2nd [Cap Tax]	A 35 Capital gains rate
40000 [X] .75 [=]	A 30000 Contract price
[X] .04 [=] BUY	A 1200 Margin required
40000 [X] .775 [=]	A 31000 Contract selling price
[-] 30000 [=] STO	A 1000 Gain on sell
40000 [X] .001 [=]	A 40 Commission
+/- SUM	A -40 Subtract commission
1200 SUM	A 1200 Add margin
RCL SEL	A 2160 Selling price
2nd YLD	A 52 Ownership period yield

Gold, Silver, and Other Collectibles

Example 6: You bought a kilogram bar of gold bullion on August 18, 1976, for \$114 per troy ounce. On January 20, 1980, you sell the gold for \$842 per troy ounce. Assuming you paid no storage charges, what were your pre-tax and after-tax *annual* and *ownership period* yields? Your long-term capital gains tax rate is 20%. 1 kilo = 32 troy ounces.

Press		Display/Comments
ON/C	A	0 Check setting
2nd [Clr Reg]	A	0 Clear registers
818.1976 2nd		
[DBD]	A	818.1976 Buy date
120.1980 = P+S	A	1250 Days gold was owned
32 X 114 =		
BUY	A	3648 Buying price
32 X 842 =		
SEL	A	26944 Selling price
20 2nd [Cap Tax]	A	20 Capital gains rate
2nd YLD	A	69.7 Annual yield
2nd [AY/PY]	A	 Ownership period setting
2nd YLD	A	510.9 Ownership period yield

The after-tax *annual* and *ownership period* yields were 69.7% and 510.9%. To determine the pre-tax yields, enter **2nd** **[Cap Tax]** as zero and recalculate the two yields.

Press	Display/Comments
ON/C 2nd [Cap Tax]	A 0 Capital gains rate
2nd [YLD]	A 638.6 Ownership period yield
2nd [AY/PY]	A $\frac{7}{1}$ Annual setting
2nd [YLD]	A 79.4 Annual yield

The pre-tax yields were 638.6% and 79.4%. If instead of buying the gold, you had invested the \$3648 in a savings account paying 9½% annually, what would the approximate value of the investment have been on January 20, 1980? Assume that the savings were compounded monthly.

Press	Display/Comments
1250 [÷] 30 [=]	A 41.666667 To estimate months owned
42 [N]	A 42 Number of months invested
9.5 2nd [÷ 12]	A 0.7916667 Interest rate per month
[CIF]	A 1.3926254 Future value of \$1.00
[X] 3648 [=]	A 5080.2976 Future value of \$3648

APPENDIX A

SERVICE INFORMATION

In Case of Difficulty

1. If the battery indicator fails to appear on the display, check for improperly inserted or discharged batteries. See *Battery Replacement* instructions in this appendix.
2. Check that the proper security type setting has been selected. Review operating instructions including *Error Conditions and Parameters* appendix to be certain that calculations were performed correctly.
3. When batteries are inserted into the calculator and the display does not reset, pressing **OFF** then **ON/C** should reset the display and prepare the calculator for use.

If none of the above procedures corrects the difficulty, return the calculator PREPAID to the applicable SERVICE FACILITY listed on the back cover.

NOTE: The P. O. box number listed for the Lubbock Service facility is for United States parcel post shipments only. If you desire to use another carrier, the street address is:

Texas Instruments Incorporated
2305 University Ave.
Lubbock, Texas 79415

For your protection, the calculator should be sent insured; Texas Instruments cannot assume any responsibility for loss of or damage to uninsured shipments.

Please include information on the difficulty you experienced with the calculator, as well as return address information including name, address, city, state and zip code. The shipment should be carefully packaged and adequately protected against shock and rough handling.

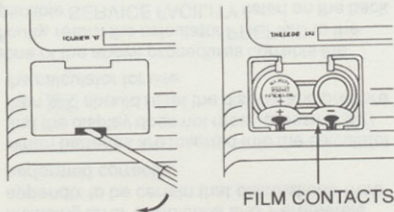
Out-of-Warranty Service. Because our Service Facility serves the entire United States, it is not feasible to hold units while providing repair estimates. For simplicity of operation, we have established flat-rate charges for all out-of-warranty repairs. To obtain the correct charges for a particular model, call our toll-free number listed in this section.

Battery Replacement

NOTE: Your calculator cannot hold data in its user memory or registers if the batteries are removed or become discharged.

Your calculator uses two of any of the following batteries: For up to 1000 hours operation, use Panasonic LR-44 or Ray-O-Vac RW-82. For up to 2500 hours operation, use Mallory 10L14, Union Carbide (Eveready) 357, Panasonic WL-14, or Toshiba G-13.

1. Turn the calculator off. Place a small screwdriver, paper clip, or other similar instrument into the slot and gently lift the battery cover.



2. Remove the discharged batteries and install new ones as shown. Be careful not to crease the film contacts while installing the new batteries. Be sure the film contacts are positioned to lay on top of the batteries after the batteries are installed.

3. Replace the cover, top edge first; then gently press until the bottom of the cover snaps into place.
4. Press **ON/C**, **ON/C**, **STO**, **2nd** [**Sec Typ**], and **2nd** [**Clr Reg**] to completely clear the calculator.

Caution: Do not incinerate old batteries.

Calculator Exchange Centers

If your calculator requires service, instead of returning the unit to your dealer or to a service facility for repair, you may elect to exchange the calculator for a factory-reconditioned calculator of the SAME MODEL (or equivalent model specified by TI) at one of the exchange centers which have been established across the United States. No charge will be made for the exchange with proof-of-purchase during the first 90 days. The exchanged unit will be in warranty for the remainder of the original warranty period or for 6 months, whichever is longer. A HANDLING FEE WILL BE CHARGED FOR EXCHANGE AFTER 90 DAYS FROM THE DATE OF PURCHASE.

Out-of-warranty exchanges will be charged at the rates in effect at the time of the exchange. Write or call the Consumer Relations Department for further details and the location of the nearest exchange center.

If You Need Service Information

If you need service information for your calculator, write Consumer Relations at:

Texas Instruments Incorporated
P.O. Box 53
Lubbock, Texas 79408

or call Consumer Relations at 800-858-1802 (toll-free within all contiguous United States except Texas) or 800-692-1353 (toll-free within Texas). If outside contiguous United States call 806-747-3841 (We regret that we cannot accept collect calls at this number).

For Technical Assistance

For technical questions relating to specific calculator applications, you can call 806-747-3841. We regret that this is not a toll-free number and we cannot accept collect calls. As an alternative, you can write to the Consumer Relations Department at the address given in the *If You Need Service Information* section.

Because of the number of suggestions which come to Texas Instruments from many sources, Texas Instruments will consider such suggestions only if they are freely given to Texas Instruments. It is the policy of Texas Instruments to refuse to receive any suggestions in confidence. Therefore, if you wish to share your suggestions with Texas Instruments or if you wish us to review any calculator applications which you have developed, please include the following in your letter:

"All of the information forwarded herewith is presented to Texas Instruments on a nonconfidential, nonobligatory basis; no relationship, confidential or otherwise, expressed or implied, is established with Texas Instruments by this presentation. Texas Instruments may use, copyright, distribute, publish, reproduce, or dispose of the information in any way without compensation to me."

APPENDIX B ERROR CONDITIONS AND PARAMETERS

Error Conditions

The display shows "Error" when an error condition occurs or when an improper operation or key sequence is attempted. When an "Error" condition occurs, no entry from the keyboard except **OFF** will be accepted until **ON/C** is pressed. Pressing **ON/C** clears the "Error" condition and any pending operation. It does not clear the user memory or any security registers.

"Error" is displayed for the following reasons:

1. An internal calculation resulting in a number greater than 99,999,999.999 or an attempt to display a computed number larger than 99,999,999.499 causes "Error." This applies to the **2nd** **BUY**, **2nd** **SEL**, **2nd** **YLD**, and **CIF** key sequences as well as problems involving arithmetic operations.
2. Multiplying a positive or negative number greater than 10,000,000 by another number may cause an "Error" condition even when the result does not exceed the display limit of 99,999,999. If this occurs, the correct result can be obtained by clearing the display and entering the problem again with the larger number as the second entry. For example:
50000000 **X** 0.3 **=** "Error"
ON/C 0.3 **X** 50000000 **=** 15000000
3. Dividing by zero.
4. Entering non-integers or an absolute value larger than 99,949,999 for **N** and **2nd** **[Pmts/Yr]**.
5. Entering certain combinations of values for different variables can result in "Error." For example, entering zero for both **BUY** and **SEL** and computing **YLD** causes "Error." Also, entering large values for **N** may result in "Error." See the *Table of Parameters* for a common range for each variable.
6. Entering zero for **2nd** **[Pmts/Yr]** will cause

subsequent *annual yield* calculations to result in "Error."

7. Pressing [CAL], [PUT], [EXP], [2nd] [Com Opt] [CPN], or [2nd] [Mat Val] in the stock setting causes "Error."

8. Pressing [CAL], [PUT], [EXP], [2nd] [Com Opt], [DIV], or [2nd] [Div Gro] in the bond setting causes "Error."

9. Pressing [CY], [DIV], [2nd] [Div Gro], [CPN], or [2nd] [Mat Val] in the option setting causes "Error." Also, pressing [BUY] or [2nd] [BUY] after [CAL] and [SEL] or [2nd] [SEL] after [PUT] in the option setting causes "Error."

10. Entering a value smaller than -100 for interest rate per period using the [CIF] key sequence.

11. If the internal variables $1-j^*$ or k^* become larger than 99949999.999 , an "Error" will result. If the internal variable Y_P^* is ever less than or equal to -100 in *annual yield* calculations, an error will result when you attempt to compute the buying or selling price. A similar situation occurs when [AY/PY] is set to "P" and yield is entered as -100 .

12. For certain negative [YLD] and [2nd] [Cap Tax] combinations an "Error" may result. If so, change [2nd] [Cap Tax] by adding $.0001$ and recalculate the problem.

Notes

1. If a negative value is entered for any of the following variables, the negative sign is ignored:

[COM], [N], [Pmts/Yr], [TAX], [Cap Tax], [Div Gro], [Com Opt], [CPN], [B+P], and [P+S]. For all other variables, the negative sign is accepted.

2. The total *term of ownership** in the *annual yield* setting must be greater than zero, otherwise you get an "Error" condition.

3. If "Error" appears as a result of pressing [2nd] [BUY], [2nd] [SEL], or [2nd] [YLD], you must press [ON/C] and [2nd] [Clr Reg] to completely clear the calculator.

4. Performing investment computations with unrealistic values will usually produce an "Error" condition. However, in certain isolated cases, the calculator does not detect unrealistic values and an incorrect answer may result.

5. If an internal calculation results in a number smaller than 0.0000001, the value stored and displayed is zero.

*See *Investment Formulas* appendix for definition.

Table of Parameters

Listed below are the number of significant digits stored internally and common ranges for each of the variables on your calculator. Entering a value exceeding these ranges may reduce the accuracy of your calculations. Note also the number of significant digits stored for each variable. The table shows that the variable **[N]** is stored to three significant digits, which means that if you enter 1234 for **[N]**, it is rounded to 1230 before being stored internally. If you enter 1235, it is stored as 1240. The variables showing 11 significant digits are accurate to the full calculating power of the calculator.

Variable	Significant Digits Stored	Common Range of Values
[BUY]	11	0 to 99,999
[SEL]	11	0 to 99,999
[YLD]	11	-99.9 to 999
[N]	3	0 to 999
[Pmts/Yr]	3	1 to 365
[B→P]	3	0 to 365
[P+S]	3	0 to 36,500
[CAL]	11	0.01 to 99
[PUT]	11	0.01 to 99
[EXP]	11	0 to 999
[TAX]	3	0 to 99.9
[Cap Tax]	3	0 to 99.9
[COM]	3	0 to 99.9
[Com Opt]	3	0 to 99.9
[DIV]	11	0 to 9999
[Div Gro]	3	0 to 99.9
[CPN]	3	0 to 99.9
[Mat Val]	11	100 to 10000

Notes:

1. It is possible to enter values between -99,999,999 and 99,999,999 for all variables except **[N]** and **[Pmts/Yr]**. For **[N]** and **[Pmts/Yr]** it is possible to enter values between -99,949,999 and 99,999,999. If you enter values larger than the common ranges suggested by the table, an "Error" condition may result or your answer may be inaccurate. Staying within the ranges listed does not guarantee that all possible combinations of values are meaningful; the table is provided merely as a guide to indicate values which are common and reasonable.
2. If you wish to analyze situations involving values in the tens of thousands or millions, it is a good practice to scale the problem down by using units of 10,000, 100,000, or 1,000,000. If you do scale a problem down, be sure that you scale all appropriate values with the problem.
3. Several variables are stored internally in common registers in the different security settings. Listed below are the variables which are stored in registers shared by other variables and the security setting in which this occurs.

	Stock	Bond	Option	
			Call	Put
Register A	[DIV]	[Mat Val]	[CAL]	[PUT]
Register B	[BUY]	[BUY]	[EXP]	[BUY]
Register C	[SEL]	[SEL]	[SEL]	[EXP]
Register D	[Div Gro]	[CPN]	[Com Opt]	[Com Opt]

This list shows why it is necessary to reenter **[EXP]** if changing from a call to a put. If the **[EXP]** price is not reentered, it is assumed to be either the **[BUY]** price in a put option or the **[SEL]** price in a call option.

4. Clearing the security registers by pressing **[2nd]** **[Clr Reg]** stores zero for all variables except the **[Pmts/Yr]** variable which is stored as one. As noted in the *Investment Formulas* appendix, **[Pmts/Yr]** must be equal to or greater than one in all financial calculations.

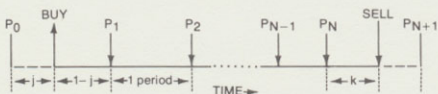
5. The value entered as **[YLD]** is stored internally as Y_P as discussed in the *Investment Formulas* appendix. To avoid some computational problems when you press **[2nd]** **[SEL]** or **[2nd]** **[BUY]**, the sixth significant digit of Y_P is changed to 2 if it was zero originally. In some cases, in analyzing large numbers this discrepancy will reduce slightly the accuracy of computed buy and sell prices. This inaccuracy will not be noticeable if you scale values down to within the common ranges given in the table.

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APPENDIX C INVESTMENT FORMULAS

Annual Calculations

All *annual yield* calculations in the stock, bond, or option settings are based upon the cash flow model shown in the diagram below:



The up arrow in the model represents the initial investment (BUY) required to acquire an asset and the large down arrow represents the return received when the asset is sold. The symbols P_0 , P_1, \dots, P_{N+1} represent periodic cash flows (dividends, coupon payments). Cash flows occurring before BUY (P_0) and after SELL (P_{N+1}) are not accounted for by the model. However, the partial time periods represented in the diagram by $1-j$ and k are included in computations.

If values are entered for **TAX**, **[Cap Tax]**, **COM**, and **[Com Opt]**, cash flows are adjusted for these values before computations are made. All commissions and taxes are assumed to be paid at the time the related cash flow occurs. For example, commissions on buying and selling are paid at the time you buy and sell the asset; income tax is paid when you receive a payment inflow; capital gains taxes are paid when you sell the asset. If you do not wish the calculator to adjust for these values, ensure that zero is stored in these registers before computing a value.

In the bond setting, the calculator also automatically accounts for interest accrued for partial periods of time that the asset is owned (1-j and k). These amounts are assumed to be paid and received at the time the cash flow occurs. Interest due the previous bond owner, determined by the value j in the model, is automatically considered part of the cash outflow at **BUY**. When the bond is sold, interest due the seller (determined by k) is considered part of the **SEL** inflow.

Given below is the equation used for all calculations in the *annual yield* setting. This formula equates the present value (PV) of all future cash flows (after adjusting for taxes and commissions) to the commission adjusted initial investment. The present value of a future cash flow is determined by discounting the cash flow at the rate Y_P per period of time that the investment is owned. The value Y_P is the yield for one period of time, which is defined below. PMT is the periodic payment (dividend or coupon) represented in the model as P_1 to P_N . The symbols N, Pmts/Yr, **B+P**, **P+S**, CPN, Div Gro, Mat Val, EXP, BUY, SELL, and YLD represent the values entered in the calculator using the equivalent keys.

$$PV = PMT (1 + Y_P)^j \sum_{n=1}^N \left\{ \frac{1 + (\text{Div Gro}/100)}{1 + Y_P} \right\}^n + \frac{FV}{(1 + Y_P)^{N+k-j}}$$

Where:

PV = BUY' for stocks

PV = BUY' + (j × PMT) for bonds

BUY' = BUY × (1 + COM/100) for stocks and bonds.

PV = CAL × (1 + Com Opt/100) for calls

PV = PUT × (1 + Com Opt/100) for puts

PMT = DIV × (1 – TAX/100) for stocks

$$PMT = \frac{\text{Mat Val} \times \text{CPN}/100}{\text{Pmts/Yr}}$$

× (1 – TAX/100) for bonds

PMT = 0 for options

$$Y_P = \frac{\text{YLD} \div 100}{\text{Pmts/Yr}} \quad (\text{Pmts/Yr} \geq 1)$$

N = Number of payments received

$$j = 1 - \frac{[B \div P] \times \text{Pmts/Yr}}{365 \text{ or } 360}$$

$$k = \frac{[P \div S] \times \text{Pmts/Yr}}{365 \text{ or } 360}$$

FV = SEL' – (SEL' – BUY') × (Cap Tax/100)
for stocks and options

FV = SEL' – (SEL' – BUY') × (Cap Tax/100) +
(k × PMT) for bonds

SEL' = SEL (1 – COM/100) for stocks and bonds

SEL' = SEL (1 – COM/100) – EXP (1 +
COM/100) for calls

SEL' = EXP (1 – COM/100) – BUY (1 +
COM/100) for puts

BUY' = PV for calls and puts

Term of ownership = N + K – j

If a bond is sold (redeemed) at maturity, you must enter SEL = Mat Val and [P ÷ S] = zero (SEL' = SEL is substituted automatically). Then the *annual yield* computed is the *yield-to-maturity*.

This formula can be rearranged algebraically to compute the BUY or SELL price if all other variables are known. The value of Y_P is computed iteratively by the calculator, however, because the equation, in general, does not have a closed form solution for Y_P . Note that the value entered for YLD is stored internally as the value Y_P which is related to YLD as follows:

$$Y_P = \frac{YLD \div 100}{Pmts/Yr}$$

Where $Pmts/Yr$ must always be equal to or greater than one (clearing the registers sets $Pmts/Yr = 1$). This same equation is used to compute and display the *annual yield* of an investment.

Also, note that no compounding is done to convert Y_P to the *annual yield* as shown by this relationship. However, one consequence of the formula used to calculate Y_P is that Y_P is a compounded value itself when you own an asset for less than one period. To clarify this point, consider the following example:

Example: You buy a share of stock for \$100 and sell it 30 days later for \$110. The stock pays quarterly dividends, but you do not receive any dividends while you own the stock. Use a 360 day year for simplicity. Ignoring taxes and commissions, what is your *annual yield*?

Press		Display/Comments
ON/C	A	0 Check setting
2nd [Clr Reg]	A	0 Clear registers
4 2nd [Pmts/Yr]	A	4 Payments per year
2nd [365/360]	A	360 Days per year
30 P+S	A	30 Days owned
100 BUY	A	100 Buy price
110 SEL	A	110 Sell price
2nd YLD	A	132.6 Annual yield

To verify this result, substitute the following values in the model formula:

$$j = 0$$

$$k = \frac{30 \times 4}{360} = 1/3$$

$$PV = 100$$

$$FV = 110$$

$$PMT = 0 \text{ since } DIV = 0$$

$$100 = \frac{110}{(1 + Y_P)^{1/3}}$$

$$(1 + Y_P) = (110/100)^3 = 1.331$$

$$Y_P = 0.331 \text{ (33.1\%)}$$

To obtain the *annual yield*:

$$YLD = Y_P \times 100 \times \text{Pmts/Yr}$$

$$= 0.331 \times 100 \times 4$$

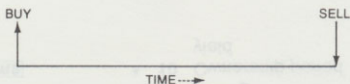
$$= 132.4\%$$

Because iterative procedures are used to compute yields, a difference may exist between the exact yield value and that computed by the calculator. In this case, the value computed by the calculator is off 0.2% ($132.6\% - 132.4\% = .2\%$).

Observe that once Y_P (the period yield) is computed, the annual yield is obtained simply by multiplying Y_P by the number of periods per year; no compounding is done. However, if an asset is owned for less than one period the value Y_P itself is a compounded figure. In this example, you made 10% on your \$100 investment in 30 days (1 period = 90 days). This is translated by the calculator as a 33.1% period yield (Y_P) which is 10% compounded three times since $30 \text{ days} \times 3 = 90 \text{ days}$. Thus the compounding effect is in the calculation of Y_P and not in translating it to an annual rate. This compounding is inherent in the definition of Y_P only when the term of ownership is less than one period.

Ownership Period Calculations

All *ownership period yield* calculations in the stock, bond, or option setting are based on the following model:



This model is different from the one used for *annual yield* calculations in two major respects: (a) it does not consider the length of time between BUY and SELL, and (b) it ignores any periodic payments.

In the *ownership period yield* setting, the model formula is defined as follows:

$$YLD = \left(\frac{FV}{PV} - 1 \right) \times 100$$

Where:

PV = BUY (1 + COM/100) for stocks and bonds

PV = CAL (1 + Com Opt/100) for calls

PV = PUT (1 + Com Opt/100) for puts

FV = SEL' - (SEL' - PV) × (Cap Tax/100)

SEL' = SEL (1 - COM/100) for stocks and bonds

SEL' = SEL (1 - COM/100) - EXP (1 + COM/100) for calls

SEL' = EXP (1 - COM/100) - BUY (1 + COM/100) for puts

Note that this model does consider commissions and tax on capital gains (losses). This model allows you to analyze an investment strictly in terms of buying and selling price (plus commissions and taxes) regardless of how long you own the investment. This model is useful in determining the profitability of an investment ignoring periodic payments or for investments where annualizing a yield is not meaningful.


Example: You buy an option for \$10 and sell it in ten days for \$11. You can compute the *annual yield* as follows (assume 360-day year):

Press	Display/Comments
ON/C 2nd [Clr Reg]	A 0 Clear registers
2nd [365/360]	A 360 Days per year
10 BUY	A 10 Buying price
11 SEL	A 11 Selling price
10 P+S	A 10 Term of ownership
2nd [YLD]	A 2982.9 Annual yield

The *annual yield* is approximately 2982.9% which assumes that you can repeat your 10-day performance for the entire period of one year (360 days). You can check this result with the **[CIF]** key as follows:

Press	Display/Comments
36 N	36 Number of periods
10 [CIF]	30.912681 Future value of \$1

The *annual yield* on \$1 is $(30.912681 - 1) \times 100 = 2991.3\%$ which is approximately the same as computed by **2nd** **[YLD]**. Note that when *annual yields* are high (in thousands), the answers obtained via the compute yield key sequence may be slightly inaccurate. Such high *annual yields* are not meaningful if they are the result of holding an asset for a short period of time. In such cases, it is more meaningful to compute an *ownership period yield*.

Press	Display/Comments
2nd [AY/PY]	A  Ownership period setting
2nd [YLD]	A 10 Ownership period yield

Current Yield Calculations

The *current yield* for stocks and bonds is defined as follows:

$$CY = \frac{DIV \times Pmts/Yr}{BUY} \times 100 \text{ for stocks}$$

$$CY = \frac{Mat Val \times CPN}{BUY} \times 100 \text{ for bonds}$$

The *current yield* is an annual figure based on the current level of periodic payments and BUY price. It does not consider taxes or commissions.

Compound Interest Factor (CIF) Calculations

This key calculates the future value of \$1 invested for N periods at i% interest per period using the following formula:

$$CIF = \left(1 + \frac{i}{100} \right)^N$$

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Notes

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$$CIR = \left(1 + \frac{100}{n} \right)^n$$

Compound Interest Factor (CIR)

How much money will you have after 1 year if you invest 1000 Euro at an interest rate of 5% per year? The answer is 1050 Euro.

Compound Interest Factor (CIR)

How much money will you have after 1 year if you invest 1000 Euro at an interest rate of 5% per year? The answer is 1050 Euro.

$$CIR = \frac{1000}{1000 \times 1.05} \times 100 \text{ percent}$$

$$CIR = \frac{1000}{1000 \times 1.05} \times 100 \text{ percent}$$

Answer:

The compound interest factor is 1.05.

Compound Interest Factor (CIR) 109

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