DISPLAY LOCATIONS

KEYBOARD NOTES:

- To access the keyboard's numeric keypad, the Num Lock key must be activated.
- Optionally, the extended numeric keys 10-15 can be entered via the numeric keypad. With Num Lock key activated, use the Alt key in conjunction with numeric digits 0-5 to enter them.
- The Deg, Rad & Grad option buttons can be changed by using the Page Up or Page Down keys.
- Note, that in the DMS & FIS modes the decimal point and exponent keys are disabled. Also, while in the DMS mode the DRG key will be disabled. In the DEC & MET modes the 10-15 keys are disabled. When disabled, these keys will appear grayed and will be inaccessible.
- Note, when QuickListDialog or the Conversion Database Dialog is activated and their respective listboxes are selected certain keystrokes will be trapped at the listbox level. The keystrokes are HOME, END, UP-DOWN-LEFT-RIGHT ARROW, PAGEUP & PAGEDOWN keys. The main calculator window will not respond to the above keystrokes when these listboxes are selected. By selecting (clicking) another control (deselecting the listbox) all keystrokes will be sent again to the main calculator window.

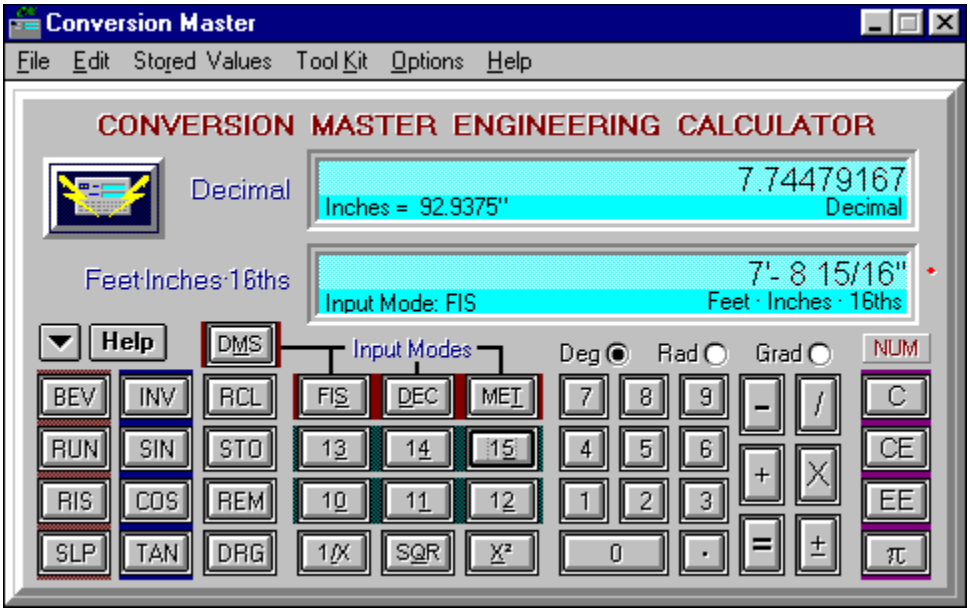
Conversion Master Pictorial Reference

CALCULATOR KEY DESCRIPTION

Calculator Usage Examples Menu Hot Keys Keyboard Interface View all

ToolKit

CLICK THE PART OF THE CALCULATOR YOU WANT TO KNOW MORE ABOUT.



 Popup Menus

POPUP MENUS

Quicker access to needed menu options are available in some sections of Conversion Master. Popup Menus are activated by clicking the right mouse button when the mouse pointer is over certain objects (i.e. Buttons, Display windows, Calculator Background, etc...). These sections are as follows.

Stored Values Menu Item:	Activated when over the **STO, RCL, +, -, X** or **/** keys.
Tool Kit Menu Item:	Activated when over the Calculators background (any area that does not have a control).
Edit Menu Item:	Activated when over the Calculators Main display windows, QuickList or Database Dialogs Display windows.
Options Menu Item: (accuracy settings)	Activated when over the decimal point key (**.**) when in the DEC & MET input modes.

KEYBOARD EQUIVALENTS

Close

Menu Hot Keys Keyboard Notes

CALCULATOR KEYS	KEYBOARD EQUIVALENTS
BEV	Shift F1
RUN	Shift F2
RIS	Shift F3
SLP	Shift F4
INV	Shift F5
SIN	Shift F6
COS	Shift F7
TAN	Shift F8
RCL	Shift F9
STO	Shift F10
REM	Shift F11
DRG	Shift F12
DMS	Alt M
FIS	Alt S
DEC	Alt D
MET	Alt T
10	Alt 0
11	Alt 1
12	Alt 2
13	Alt 3
14	Alt 4
15	Alt 5
1/X	Alt /
SQR	Alt Q
X²	Alt X
0-9 & +, -, ×, ÷, =	Numeric key pad
±	Alt + OR Alt -
C	Home
CE	End
EE	Insert
	Alt P
Deg, Rad, Grad	PageUp or PageDown

CALCULATOR HOT KEYS	CALCULATOR FUNCTION
Ctrl - L	Load a Conversion Category (Dialog)
Ctrl -E	Edit a Conversion Category (Dialog)
Ctrl -B	Backup Tables (Dialog)
Ctrl -C	Copies Main Display to Clipboard
Ctrl -A	Copies Alternate Display to Clipboard
Ctrl -R	Copies Conversion Resultant to Clipboard
Ctrl S-	Copies Conversion Constant to Clipboard
Ctrl -V	Pastes Contents of Clipboard to Display
Ctrl -Q	Displays QuickList (Dialog)
Ctrl -D	Displays Conversion Database (Dialog)
Ctrl -T	Displays Temperature Conversion (Dialog)

Ctrl -O	Displays Oblique Triangle Solver (Dialog)

Alt M

THE DMS MODE KEY

The **DMS** Key allows input in Degrees, Minutes & Seconds. In this mode the active input display is Main Display Area #2. When entering a value in this mode the decimal equivalent is displayed in Main Display Area #1. This is the value all math is performed upon. Only valid entries will be converted to their decimal equivalents (i.e. values less than 60 in minutes & seconds). 24°·71'·66" has no meaning to the calculator but 66°·11'·33" does. When leaving this mode the calculator expects to return to a certain mode. If your previous mode was the MET mode then you will return to the MET mode. If your previous mode was DEC or FIS then you can return to the DEC or FIS mode. The calculator will alert you to which mode you can return to by disabling the mode buttons that are not allowed. See Calculator Display Areas.

Keyboard Equivalent

ALT S

THE FIS MODE KEY

The **FIS** Key allows input in Feet, Inches and Sixteenths format. In this mode the Extended Numeric Keys are activated. Calculations performed in this mode will be displayed in their lowest terms (i.e. 1' - 6 8/16" will become 1' - 6 1/2" etc...) with the exception of main display area two, which will always display Feet, Inches and Sixteenths in the FIS mode. When switching between modes **FIS**, DEC & MET the display and the Memory pull down menu values will automatically convert to the new mode format while the Constant pull down menu values will remain the same. Upon exiting Conversion Master, the last mode change can be retained when initialization file is updated. See also DMS mode key

Keyboard Equivalent

ALT T

THE MET MODE KEY

The **MET** mode treats all input as Meters. In this mode the Extended Numeric Keys are deactivated. When switching between modes FIS, DEC & **MET** the display and the Memory pull down menu values will automatically convert to the new mode format while the Constant pull down menu values will remain the same. Upon exiting Conversion Master, the last mode change can be retained when initialization file is updated. See also DMS mode key

Keyboard Equivalent

ALT D

THE DEC MODE KEY

The **DEC** key treats all input as feet. In this mode the Extended Numeric Keys are deactivated. When switching between modes FIS, **DEC** & MET the display and the Memory pull down menu values will automatically convert to the new mode format while the Constant pull down menu values will remain the same. Upon exiting Conversion Master, the last mode change can be retained when initialization file is updated. Although the calculator views input in this mode as decimal of feet you can view the units as whatever you like. See menu option toggle second display. See also DMS mode key

Keyboard Equivalent

ALT 0 - 5

THE EXTENDED NUMERIC KEYS

The **Extended Numeric Keys** (10-15) allow for input values of 10 & 11 when inputting inches and values 10-15 when inputting sixteenths in the FIS mode. When inputting inches and sixteenths, always use a single key stroke. The extended numeric keys are deactivated when the calculator is in the DMS, DEC or MET modes.

Keyboard Equivalents

SHIFT F11

THE REM KEY

When performing division in the FIS mode there may be a remainder or an overage because the calculator will round to the nearest Specified Fractional Accuracy. A positive value signifies a remainder and a negative value denotes an overage. This value can be determined by the **REM** key. In order to alert the user the **REM** key will be highlighted in red when a remainder or an overage occurs. Also See Options Menu to set display accuracy

Keyboard Equivalent

SHIFT F9

THE RCL KEY

The **RCL** key allows you to recall numeric values from 18 different memory locations. These locations are accessed by clicking the **RCL** key and then from the resulting popup menu select a location 1 to 9 from either the memory or constant menu item. Clicking a value will place it in the main calculator display.

These memory and constant locations can optionally be recalled from the Stored Values pull down menu on the menu bar. Also, the **RCL** key can be used to recall the last bevel, run, rise or slope value of a solved right triangle (See BEV, RUN, RIS & SLP keys). This recall option is available on the popup menu only when a right triangle has been solved.

Keyboard Equivalent

SHIFT F10

THE STO KEY

The **STO** key allows you to store numeric values in 18 different memory locations. These locations are accessed by clicking the **STO** key. From the resulting popup menu select a location 1 to 9 from either the memory or constant menu items Upon clicking a location the calculators display value is placed at that location.

Keyboard Equivalent

SHIFT F1

THE BEV KEY (SOLVING RIGHT TRIANGLES)

The **BEV** key is used to enter the bevel of an acute angle of a right triangle. The bevel can be further defined as the amount of rise in inches over one foot (i.e. the pitch on a roof) or the tangent of the angle. The Bevel/Tangent can be calculated when any two sides of a right triangle are known Run/Side Adjacent, Rise/Side Opposite or Slope/Hypotenuse. The Bevel can be entered as a FIS, DEC or MET number. When the bevel and any other side of the right triangle are known the INV **BEV** key combination can be used to simultaneously display the Bevel, Run, Rise, Slope and the Angle in degrees, minutes and seconds. A conversion can be performed at any point by pressing FIS, DEC or MET key for the desired mode change. See BEV, RUN, RIS and SLP key overview.

Keyboard Equivalent

SHIFT F2

THE RUN KEY (SOLVING RIGHT TRIANGLES)

The **RUN** key is used to enter the amount of run of a right triangle (i.e Side Adjacent). This value can be entered in all three modes.
See BEV, RUN, RIS and SLP key overview.

Keyboard Equivalent

SHIFT F3

THE RIS KEY (SOLVING RIGHT TRIANGLES)

The **RIS** key is used to enter the amount of rise of a right triangle (i.e Side Opposite). This value can be entered in all three modes. See BEV, RUN, RIS and SLP key overview.

Keyboard Equivalent

SHIFT F4

THE SLP KEY (SOLVING RIGHT TRIANGLES)

The **SLP** key is used to enter the amount of slope of a right triangle (i.e. Hypotenuse). This value can be entered in all three modes.
See BEV, RUN, RIS and SLP key overview.

Keyboard Equivalent

THE BEV, RUN, RIS AND SLP KEYS (SOLVING RIGHT TRIANGLES)

The BEV, RUN, RIS and SLP keys are used to solve right triangles. Upon entering any two values, the calculator calculates the other two. The Calculator uses the last two input values (Bevel, Run, Rise or Slope) to solve the triangle.

You can force the calculator to view the Bevel, Run, Rise or Slope as its last input by pressing the RCL key and then selecting bevel, run, rise or slope from the popup menu (these menu items will only appear when a triangle has been solved). This is useful when one of these stored values are needed to solve another triangle. The recalled value is placed in the calculator's main display for viewing. The next value you enter will be use in conjunction with the your recalled value to solve the another triangle.

When any two values are known the INV BEV key combination can be used to simultaneously display the Bevel, Run, Rise, Slope and the Angle in degrees, minutes and seconds.

Your last entered data and the solved triangles results will be save upon existing Conversion Master. To reset these values to zero click twice in succession on the cancel button.

SHIFT F12

THE DRG KEY

Clicking the **DRG** key changes the calculator angle mode to Degrees, Radians or Grads without doing a conversion on the displayed value. Using INV **DRG** key combination changes the calculator angle mode and performs a conversion to the new mode format. **Note**: This key is disabled when in the DMS mode. See also Degree, Radian & Gradian Option buttons.

Keyboard Equivalent

PAGEUP OR PAGEDOWN

THE DEG, RAD AND GRAD BUTTONS

The **Deg, Rad and Grad Option buttons** change the calculator angle mode to Degrees, Radians or Grads and performs a conversion on the displayed value.
Note: When switching the calcuator to the DMS mode this option is automatically set to **Deg** and the **Rad** & **Grad** options are disabled. See also DRG key.

Keyboard Equivalent

SHIFT F6

THE SIN KEY

The **SIN COS & TAN** keys calculate the Sine, Cosine or Tangent of the displayed value. The Calculator will also simultaneously display the Arc Sine, Arc Cosine or Arc Tangent of the angle along with the angle in Decimal of Degrees, Degrees Minutes Seconds format, Radians and Grads. See also INV & DRG keys.

Keyboard Equivalent

SHIFT F7

THE COS KEY

The **SIN COS & TAN** keys calculate the Sine, Cosine or Tangent of the displayed value. The Calculator will also simultaneously display the Arc Sine, Arc Cosine or Arc Tangent of the angle along with the angle in Decimal of Degrees, Degrees Minutes Seconds format, Radians and Grads. See also INV & DRG keys.

Keyboard Equivalent

SHIFT F8

THE TAN KEY

The **SIN COS & TAN** keys calculate the Sine, Cosine or Tangent of the displayed value. The Calculator will also simultaneously display the Arc Sine, Arc Cosine or Arc Tangent of the angle along with the angle in Decimal of Degrees, Degrees Minutes Seconds format, Radians and Grads. See also INV & DRG keys.

Keyboard Equivalent

SHIFT F5

THE INV KEY

The **INV** key serves three calculator functions. First, it can be used in conjunction with SIN COS & TAN keys to calculate the smallest relative angle of the displayed value (i.e. Arc Sine, Arc Cosine and Arc Tangent). When the **INV** key is used with these trig function keys the Calculator will simultaneously display the Sine, Cosine or Tangent of the relative angle along with the angle in Decimal of Degrees, Degrees Minutes Seconds format, Radians and Grads. Secondly, the **INV** key can be used with the BEV key to display the stored Bevel, Run, Rise Slope and Angle in degrees, minutes & seconds. Lastly, the **INV** key can be used with the DRG.
See DRG key for more details.

Keyboard Equivalent

ALT /

THE 1/X RECIPROCAL KEY

The **1/X** Reciprocal key divides the displayed value of the Calculator X into 1.

Keyboard Equivalent

ALT Q

THE SQR KEY

The **SQR** key calculates the Square Root of the displayed value. See also **X²** key.

Keyboard Equivalent

ALT X

THE X² KEY

The **X²** key Squares (X**x**X) the displayed value.
See also **SQR** key.

Keyboard Equivalent

NUMERIC KEY PAD

THE STANDARD NUMERIC KEYS

The **Standard Numeric Keys** input calculator digits 0 - 9.
See also Extended Numeric Keys.

Keyboard Equivalents

THE DECIMAL POINT KEY

The **Decimal Point** key allows for inputting decimals of feet. This key is deactivated when the calculator is in the FIS mode.

Keyboard Equivalent

THE OPERATOR KEYS

The **Operator keys** perform the various arithmetic functions (**+**, **-**, **×**, **÷**, **=**).

Keyboard Equivalents

ALT + OR -

THE CHANGE SIGN KEY

The **Change Sign key** Changes the sign of the calculator displayed value. It also is can be used for entering negative exponential values.

Keyboard Equivalent

ALT P

THE KEY

The key displays the value of Pi truncated to 13 digits (3.1415926535898). This value can and will be further truncated based on the setting of the decimal accuracy. See Options menu for the setting of calculator accuracys.

Keyboard Equivalent

Home Key

THE CANCEL KEY

The **Cancel Key** cancels all pending Calculator operations and sets the calculator displays to zero. Clicking this key twice in succession will clear the values that were stored by using BEV, RUN, RIS or SLP keys. See also Cancel Entry Key.

Keyboard Equivalent

End Key

THE CANCEL ENTRY KEY KEY

The **Cancel Entry Key** cancels numeric entries and sets the calculator displays to zero. See also Cancel Key.

Keyboard Equivalent

Insert Key

THE ENTER EXPONENT KEY

The **Enter Exponent Key** raises the value of the main calculator display

to power where is the value enter after the **EE** key is pressed. This key is disabled in the FIS mode.

Keyboard Equivalent

NumLock Key

NUM LOCK INDICATOR

Shows the active state of the NumLock key. The NumLocks must be on to use the Keyboard Interface.

Keyboard Equivalent

CONVERSION MASTER TOOLKIT

Clicking this button brings up a popup menu for ToolKit quick access.

For specific tools see:

- **QuickList ListBox**
- **Conversion Database**
- **Temperature Conversion**
- **Oblique Triangle Solver**

CALCULATOR DISPLAY #1

- In DMS mode displays degrees in decimal format.
- In FIS mode displays Feet and Inches in decimal format
- In DEC mode displays feet in decimal format.
- In MET mode displays Meters in decimal format.
- This is the active input display in the DEC & MET modes.
- When a Trig function key is pressed the calculator displays the Angle in decimal, (Arc)sine, (Arc)cosine & (Arc)tangent information in display area number one.
- This display will also alternate Trigonometric information based on which option button is selected.
See Degrees, Radians, or Grads.
- When a BEV, RUN, RIS or SLP key is pressed the calculator displays Bevel, Run, Rise and Slope information in both display areas.
- Display Blocks
-
- Clicking the right mouse button when the mouse pointer is over Main Display Window #1 or #2 will bring up the Edit Popup Menu. See Popup Menus

Display blocks' 1-1 & 2-1 are limited to 26 characters, Display area #2 is limited to 31 characters. Upon occasion, when working with very large numbers, you may receive a **display overflow** message. If this occurs you can view the value by forcing it to the main display. This can be achieved by switching Calculator modes or when dealing with Bevel, Run, Rise, Slop functions, by clicking the RCL key in conjunction with the desired function key.

CALCULATOR DISPLAY #2

- In DMS mode displays Degrees, Minutes & Seconds format i.e. 45°·15'·13".
- In FIS mode displays Feet, Inches & 16ths format i.e. 12' - 4 13/16".
- In DEC mode displays Feet, Inches 16ths & decimal of inches formats.
- In MET mode displays Feet, Inches 16ths & millimeters.
- This is the active input display in the FIS mode.
- When a Trig function key is pressed the calculator displays Radians,

Grads·and Degrees Minutes Seconds (45°·15'·13") data in display area number two.

- When a BEV, RUN, RIS or SLP key is pressed the calculator displays Bevel, Run, Rise and Slope information in both display areas.
- This display area can be deactivated/hidden from view (See **Options**) in the DEC and MET modes. If deactivated, it will automatically reactivate when switching to the FIS mode or when using the BEV, RUN, RIS and SLP functions.
- Display Blocks
-
- Clicking the right mouse button when the mouse pointer is over Main Display Window #1 or #2 will bring up the Edit Popup Menu. See Popup Menus

Display blocks' 1-1 & 2-1 are limited to 26 characters, Display area #2 is limited to 31 characters. Upon occasion, when working with very large numbers, you may receive a **display overflow** message. If this occurs you can view the value by forcing it to the main display. This can be achieved by switching Calculator modes or when dealing with Bevel, Run, Rise, Slop functions, by clicking the RCL key in conjunction with the desired function key.

WEIGHTS

AVOIRDUPOIS WEIGHT - abv. (avdp.) An English and American system of weights in which:

ton	= 2000 pounds
pound	= 16 ounces
ounce	= 16 drams

APOTHECARIES' WEIGHT- abv. (apoth.) System of weight used chiefly by Pharmacists in which:

scruple	= 20 grains
dram	= 3 scruples
ounce	= 8 drams
pound	= 12 ounces

TROY WEIGHT - Systems weights for gold, silver, gem, etc... in which:

Pennyweight	= 24 grains
ounce	= 20 pennyweights
pound	= 12 Ounces
pound	= 480 grams

MEASURES

APOTHECARIES' MEASURE abv. (apoth.) System of measures used chiefly by Pharmacists in which:

fluid dram	= 60 minims
fluid ounce	= 8 fluid drams
pint	= 16 fluid ounces

gallon = 8 pints

COMMON CONVERSION ABBREVIATIONS

IST. - International Steam Table
Int. - International measurement
Brit. - British measurement
US. - United States measurement
mks - Meters Kilograms Seconds
cgs - Centimeters Grams Seconds
SI - International System of Units
apoth. - Apothecaries
avdp. - Avoirdupois

LENGTH AND DISTANCE

STATUE MILE - A unit of linear measure used in the U.S. and Great Britain, equal to about 5,280 feet

NAUTICAL MILE - A unit of linear measure for ships and aircraft, equal to 6,076 feet. Also, called the geographical mile.

TIME DEFINITIONS

CALENDAR YEAR - The conventional calendar year of 365 days can be used in rough calculations only; the modern calendar is based on the Gregorian year of 365.2425 mean solar days, the value chosen by Pope Gregory XIII in 1582. This value requires that a leap-year day be introduced every four years as February 29, except that centennial years (1900, 2000, etc...) are leap years only when divisible by 400. The remaining difference between the Gregorian year (See tropical year below) and the tropical year introduces an error of 1 day in 3300 years.

SIDEREAL YEAR - The sidereal year is the interval in which the earth completes one revolution in its orbit around the sun measured with respect to the fixed stars.

TROPICAL YEAR - The tropical year is the interval between successive vernal equinoxes and has been defined by the International Astronomical Union for noon of January 1, 1900 as 31,556,925.9747 seconds = 365.24219879 mean solar days. The tropical year decreases by approximately 5.3 milliseconds per year.

LUNAR MONTH - The interval from one new moon to the next, equal to about 29.5 days.

LUNAR YEAR - A period of 12 lunar months.

MEAN SUN - A fictitious sun used for time keeping that moves uniformly along the celestial equator and maintains constant rate of apparent motion.

MEAN SOLAR TIME - Time that is based on the motion of the mean sun and that has the mean solar second as its unit -- called also *mean time*.

CONVERSION MASTER REGISTRATION

Print Registration Form

Click here before ordering Program Overview

Conversion Master Engineering Calculator
Version 3.5
Registration Form/Invoice

Telephone Orders: See Telephone Ordering & Registration under the Help Menu Item within Conversion Master.

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Roger Moseby

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Owasso, OK. 74055

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{bmc menu.shg} # CONVERSION TABLE CATEGORY DIALOGS

Menu Hot Keys

Both the Modify Conversion Table and the Load Conversion Table menu items will bring up a dialog box. The **Load Conversion Table Dialog** is used to select a Conversion Table to load into memory from which conversions will be performed. Conversion Tables can be accessed in one of two ways. First, they can accessed by clicking the **Perform Conversion button** on the Load Conversion Table Dialog box. Secondly, they can be accessed through the Options Menu selection **Conversions > Database** (Hot key Ctrl - D). The Modify Conversion Table dialog will allow you to select a Conversion category to edit.

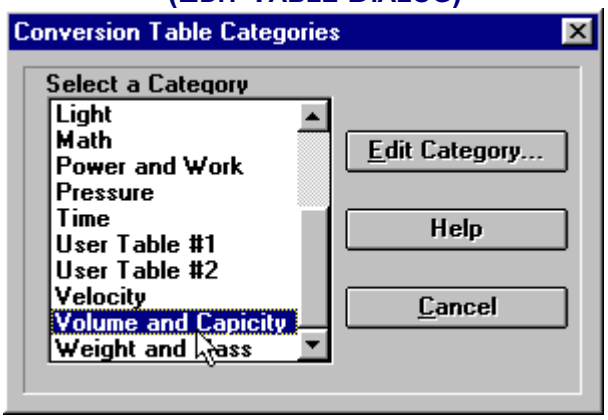
Dialogs for Modifying & Performing Conversions

Menu Hot Keys

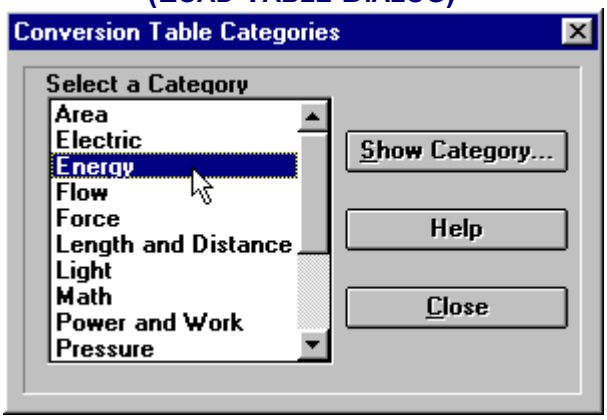
- Category Definitions

Click the part of the Dialog Boxs you want to know more about.

(Edit Table Dialog)



(Load Table Dialog)



- Editing Conversion Tables
- Common Conversion Abbreviations

Category Definitions

- Area
- Electrical
- Energy
- Flow
- Force
- Length & Distance
- Light
- Math
- Power & Work
- Pressure
- Time
- Velocity
- Volume & Capacity
- Weight & Mass
- User Files

Context Sensitive Help

Clicking this button brings up context sensitive help (i.e. this help document).

Exiting Dialog

Clicking this button dismisses this dialog box

Performing Conversions

Clicking this button invokes the Conversion Database with the selected category loaded in memory. This button will not appear if the Perform Conversion Dialog is active.

CATEGORY LISTBOX (PERFORMING CONVERSIONS)

Select from this list box a conversion category to load into memory from which to perform conversions. Doubling clicking a selection will automatically load the category, close this dialog box and go to the Conversion Database for performing conversions. See also Category Definitions

CATEGORY LISTBOX (MODIFYING CONVERSION TABLES)

Select from this list box a conversion category to load into memory for editing. Doubling clicking a selection will automatically load the category, close this dialog box and go to the Modify Conversions dialog for editing. See also Category Definitions

EDIT CONVERSIONS

Clicking this button opens the selected conversion category for editing.

CANCELING OPERATION

Clicking this button cancels the pending operation and dismisses this dialog box

CONVERSION TABLE BACKUP

This menu selection allows you to backup your Conversion Database Tables. A dialog will prompt you for a target directory name (path). Enter the path (i.e. C:\DIM_CALC\MYBACKUP) where you would like the backup files to reside or use the default path. If any older backup files are found in the target directory, you will be prompted to enter another directory or overwrite the older backup files.

AREA

This category contains conversion factors related to an area of land or the surface of an object which is measured in square units. These units result from multiplying the length of the area or object by its width. The square units of both the customary and metric systems are based on units of length and distance.

Sample of customary and metric units for area.

Customary	Metric	Metric	Customary
1 sq. mile	2.5899881 km²	1 sq. hectometer	2.4710538 acres
1 acre	0.40468564 ha	1 sq. dekameter	119.599001 sq. yd.
1 sq. rod	25.29285264 m²	1 sq. meter	1550.0031 sq. in.
1 sq. yard	0.83612736m²	1 sq. decimeter	15.500031 sq. in.
		1 sq. kilometer	0.38610216 sq. mi.
1 sq. foot	0.09290304 m²	1 sq. centimeter	0.15500031 sq. in.
1 sq. inch	6.4516 cm²	1 sq. millimeter	0.0015500031 sq. in.

ELECTRICAL

This category contains conversion factors related to the science or application of electricity.

ENERGY

This category contains conversion factors related to the capacity for doing work and overcoming resistance.
Units common to this category

1 Btu	= 1054.35 joule
1 Calorie	= 1000 cal
1 cal	= 4.1868 joule
1 erg	= 2.3892e-7cal
1 joule	= 1e7 erg

The **joule** (J) is the amount of energy needed to move a mass of one kilogram through one meter with an acceleration of one meter per second per second. The **erg** is the amount of energy needed to move one gram through one centimeter with an acceleration of one centimeter per second per second. The calorie (**cal**) is the amount of energy needed to raise the temperature of one gram of water by one degree Celsius from 14.5° Celsius to 15.5° Celsius. A **Calorie** is equal to 1000 **cals**. The British thermal unit (**Btu**) is the energy needed to raise the temperature of one pound of water from 60° Fahrenheit to 61° Fahrenheit.

FLOW

This category contains conversion factors that relate to the quantity of a substance that flows in a certain period time (i.e. Cubic feet a second, etc....).

FORCE

This category contains conversion factors related to the energy being brought to bear against a mass causing motion or change.

LENGTH AND DISTANCE

This category contains conversion factors that relate to lengths and distances. Lengths and distances are measured from one point to another, usually along a straight line. Length usually refers to the measurement of an object. Distance usually refers to the measurement of the space between two places.

Sample of customary and metric units for length and distance.

Customary	Metric	Metric	Customary
1 inch	2.54 cm	1 nanometer	0.00000003937 in.
1 foot	30.48 cm	1 micron	0.00003937in.
1 yard	0.9144 m	1 millimeter	0.03937 in.
1 rod	5.0292 m	1 centimeter	0.3937 in.
1 furlong	201.168 m	1 decimeter	3.3937 in.
1 mile	1.609344 km	1 meter	39.37 in.
		1 dekameter	393.7 in.
		1 hectometer	328.0833 ft.
		1 kilometer	0.62137 mi.

See category terms

LIGHT

This category contains conversion factors related to the flow of light.

MATH

This category contains conversion factors related to mathematics.

POWER AND WORK

This category contains conversion factors related to work and power. **Power** is a measure of the amount of energy spent over a certain period of time. **Work** is the transference of energy from one body to another resulting in the motion or displacement of the body acted upon.

1 horsepower	= 745.7 watt
1 horsepower (metric)	= 735.499 watt
1 watt	= 0.00134102 horsepower
1 kilowatt	= 1000 watt

PRESSURE

This category contains conversion factors related to Pressure. In physics, pressure is force measured in terms of its distribution over an area of opposing force. This is expressed as force divided by unit area of the surface area to which the force is applied. Pressure usually refers to a force exerted uniformly in all directions. Absolute pressure is pressure measured with respect to zero pressure. Gauge pressure is pressure measured with respect to air pressure (the weight of one atmosphere).

Some of the common units are inches of mercury,(in of Hg) centimeters of mercury (cm of Hg), pounds per square inch (psi), atmospheres (atm), Pascals (Pa), kilopascals (kPa), bars, millibars (mbars), and microbars (dynes).

1 atm	= 14.69595 psi
	= 29.92126 in. of mercury.
	= 76 cm of mercury.
	= 101.325 kPa
	= 1013.25 mbars
1 Pa	= 1 Newton per sq. meter
1 mbar	= 1000 dynes per sq. cm

TIME

This category contains conversion factors related to the measurement of time.

1 second	= 1000 milliseconds	1 solar year	= 365d, 5hr, 48min, 45.51sec
1 minute	= 60 seconds	1 astronomical year	= 365d, 5hr, 48min, 45.51sec
1 hour	= 60 minutes	1 sidereal year	= 366d, 6hr, 9min, 9sec
1 day	= 24 hours	1 lunar year	= 360d
1 week	= 7 days	1 leap year	= 366d
1 year	= 12 months		
1 century	= 100 years		
1 millennium	= 1000 years		

See category terms

VELOCITY

This category contains conversion factors related to the rate of movement in relationship to time.

VOLUME AND CAPACITY

This category contains conversion factors related to volume and capacity. **Volume** refers to the amount of space occupied by an object. **Capacity** is the amount of a substance that a container can hold. **Volume** and **capacity** are both measured in cubic units. Cubic units combine length, width, and depth. The names of many common cubic units, such as liter and quart, do not include the word cubic.

Sample of customary and metric units for volume and capacity.

Customary	Metric	Metric	Customary
1 pint	473.1632 ml	1 kiloliter	264.1794 gal.
1 cubic inch	16.387064 cm^3	1 milliliter	0.06102545 cu. in.
1 cubic foot	0.028316847 m^3	1 centiliter	0.6102545 cu. in.
1 cubic yard	0.7646 m^3	1 liter	61.02545 cu. in.

WEIGHT AND MASS

This category contains conversion factors related to weight and mass. **Weight** is the heaviness or attraction of a material body by gravitational pull toward the center of the earth. **Mass** is the quantity of matter in a body as measured in its relation to inertia. The customary system measures the weight of various materials. The metric system measures mass (amount of material something contains). An object's mass does not change, but its weight decreases with altitude. These two measurement units are equal at sea level on the earth.

Sample of customary and metric units for weight and mass.

Customary	Metric	Metric	Customary
1 grain	0.06479891 g	1 milligram	0.015432358 gr.
1 ounce	28.349523 g	1 centigram	0.15432358 gr.
1 pound	0.45359237 kg	1 gram	15.432358 gr.
1 ton	0.90718474 t	1 kilogram	2.2046226 lb.
		1 metric ton	2,204.6226 lb.

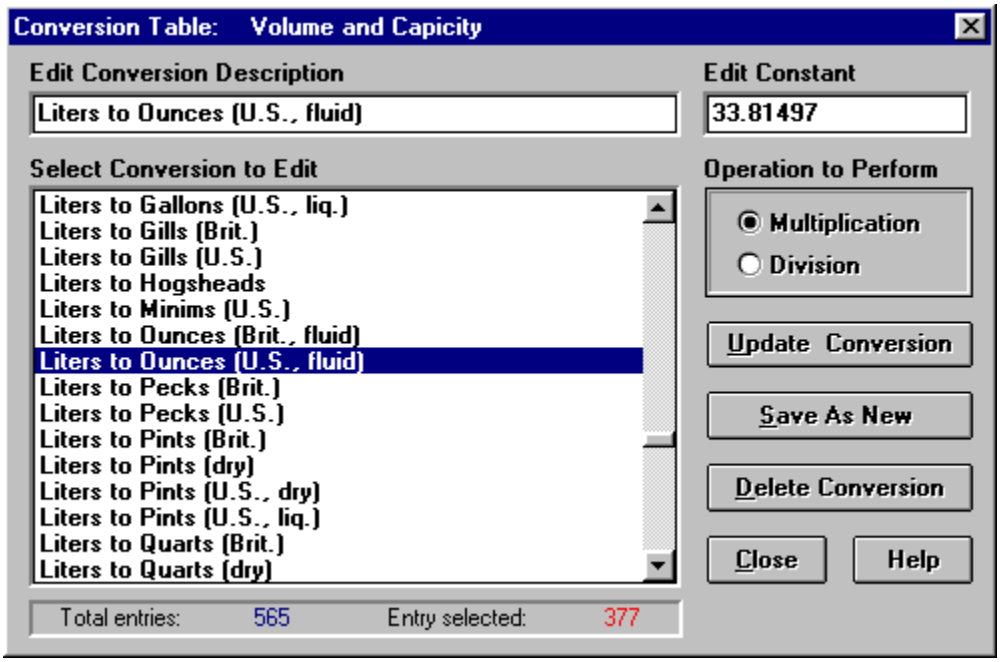
See category terms

- # MODIFYING CONVERSION TABLES

Menu Hot Keys

-
-

CLICK THE PART OF THE DIALOG BOX YOU WANT TO KNOW MORE ABOUT.



Conversion Descriptions

Enter in this location a conversion description that is unique and self explanatory of the conversion to be performed. This description is limited in size to the size of the text box entry area.

Selecting an edit Item

Select from this list box a Conversion Table Item to edit.

Updating Conversions

Click this button to update a previously selected Conversion Table Item.

Saving New Conversions

Click this button to save a new a Conversion Table Item. Note that a table size is limited to 650 items.

Deleting Conversions

Click this button to delete items from the Conversion Table List box.

Selecting an Operator

Select the operation to be performed. This operator will be used to perform a conversion against the calculator main display and a constant value.

Conversion Constant

Enter the conversion constant here - it must be a valid numeric expression. This is the number that will be used in conjunction with the operator and the calculator display to compute a resultant value.

Exiting Dialog

Clicking the close button will dismiss this dialog box and update the Conversion Table.

Table Size and Selected Entry

This area displays the size of the Conversion Table and the number of the selected entry being edited.

Table Category

The window caption bar displays the Conversion Table category name.

Exiting Conversion Master

Conversion Master automatically detects changes in calculator settings. Upon exiting the program Conversion Master updates its settings to its initialization file.

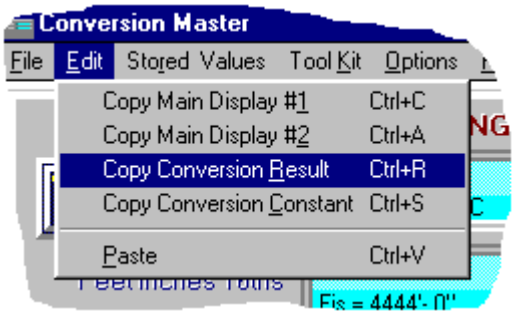
Changes detected are:

- Memory values
- Constant values
- DMS, FIS, DEC & MET Modes
- Display Accuracies
- Alternate Display Settings
- Display Data
- Conversion Categories
- QuickList Dialog
- Conversion Database Dialog
- Temperature Conversion Dialog
- Oblique Solver Dialog
- Right Triangle Data

Note: When you exit Conversion Master and then come back to it you will find that all your settings, data and the calculators appearance is as you left it!!!

Edit Menu

Click on the menu item you would like to know more about.



Note: You can paste numeric expressions from any application

Copying Main Display #1

This menu item copies the value in Main Display #1 to the clipboard. See display locations

Copying Main Display #2

This menu item copies the value in Main Display #2 to the clipboard. See display locations

Copying Conversion Results

This menu item copies the covnersion resultant from the covnerson database window to the clipboard.

Copying Conversion Constants

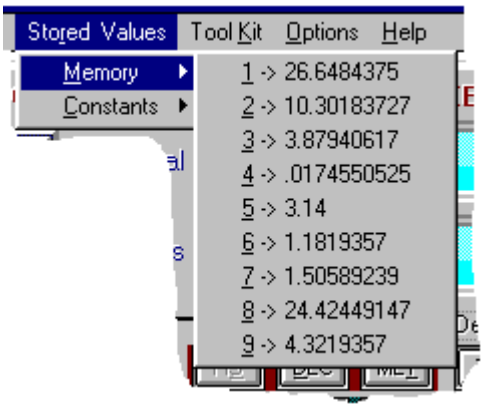
This menu item copies the active conversion constant from the conversion database window to the clipboard.

Pasting Data from the Clipboard

Only valid numeric expressions can be pasted into the calculator. All values are pasted into Main Display area #1. Pasted values can come from any windows application.

Storage Menu

Click on the menu item you would like to know more about.



MEMORY MENU

The Memory Menu item is used to view and retrieve values that were previously stored in memory. This gives you the ability to view before retrieving. Likewise, the RCL key can be used to retrieve memory values. These values are stored by clicking on the STO key and selecting a memory location for storage.

The Memory Menu can be used in the same manner as the RCL key when performing math functions on retrieved values. All values in memory are floating values i.e. they will be converted when the calculator mode is changed (See mode keys DEC, FIS, MET). Use the Constants Menu to access constant values. The last entered memory values will be retained when Conversion Master is exited. Quick access to Memory values are provided through a user sensitive Popup Menu. See Storage Popup Menu.

CONSTANTS MENU

The Constants Menu item is used to view and retrieve values that were previously stored as constants. This gives the ability to view before retrieving. Likewise, the RCL key can be used to retrieve constant values. These values are stored by clicking on the STO key and selecting a memory location for storage.

The Constant Menu can be used in the same manner as the RCL key when performing math functions on retrieved values. These values are labeled constants because, unlike memory values, constants will not change when the calculator undergoes a mode change (See mode keys DEC, FIS, MET). Use the Memory Menu item to access floating values. Constants will be retained when Conversion Master is exited. Quick access to Constant values are provided through a user sensitive Popup Menu. See Storage Popup Menu.

STORAGE POPUP MENU

The Storage Menu Popup provides quicker access to stored memory and constant values. Activate the Popup by clicking the right mouse button when the mouse pointer is over the **+, -, X** or **/** keys. The storage popup is also activated by both right and left mouse clicks when over the **RCL, STO,** keys.

By way of example, enter a number into the calculator display and click **X** key for multiplication. While the mouse pointer is still over **X** key click the right mouse button (Activates Popup Menu). Select from the Popup the desired value and then click the **=** key and you have the subsequent value.

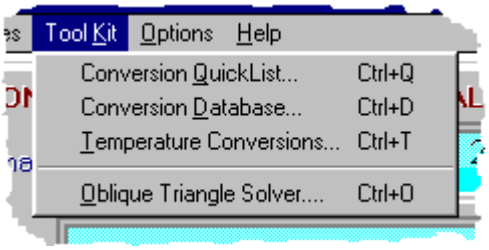
MEMORY & CONSTANT STORAGE LOCATIONS

The Memory & Constant menu items provide storage locations for up to eighteen

values. See also Memory Menu, Constant Menu & Storage Popup Menu

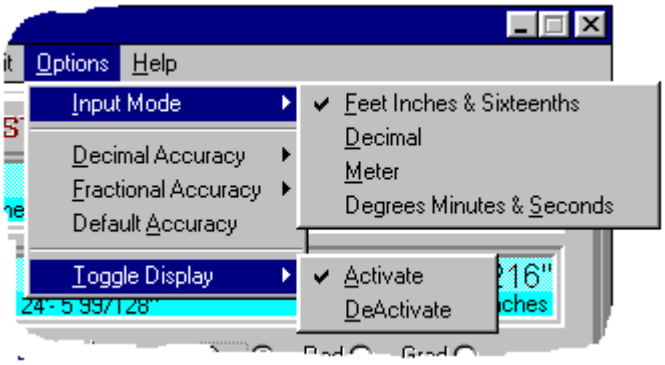
Tool Kit Menu

Click on the menu item you would like to know more about.



Option Menu

Click on the menu item you would like to know more about.



Activating Second Display

Shows Conversion Masters second display window.

Hide Second Display

Hides Conversion Masters second display window.
See also Toggle alternate display.

Degrees, Minutes & Seconds Input Mode

Performs the same function as clicking the **DMS** mode key on the calculator. See DMS key.

Feet, Inches & Sixteenths Input Mode

Performs the same function as clicking the **FIS** mode key on the calculator. See FIS key.

Decimal Input Mode

Performs the same function as clicking the DEC mode key on the calculator. See DEC key.

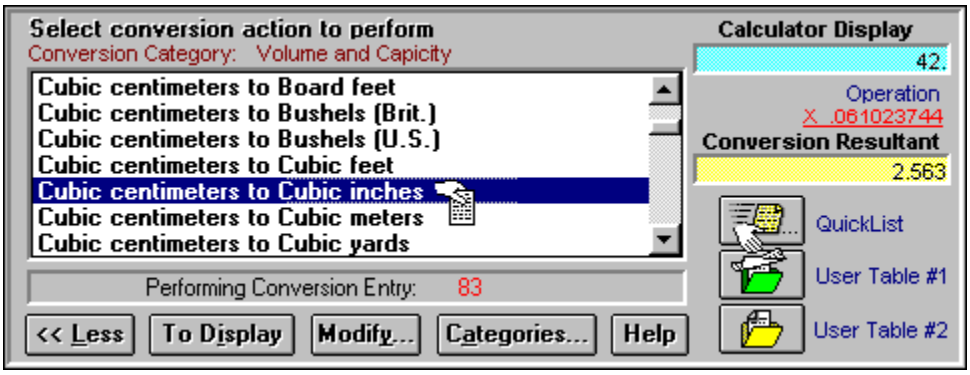
Meter Input Mode

Performs the same function as clicking the MET mode key on the calculator. See MET key.

- # Conversion Database

Menu Hot Keys Common Conversion Abbreviations

CLICK THE PART OF THE DIALOG BOX YOU WANT TO KNOW MORE ABOUT.



- Popup Menus

Conversion Tables allow you to do many different types of conversions simply by choosing from the listbox the conversion action to perform. The resulting conversion can be placed in the calculator display by clicking the To Display button or by double clicking the selected conversion. This action will also add the selected conversion item to the top of the QuickList ListBox (See QuickList). Conversions can also be dragged and dropped onto the QuickList icon or to one of the User File icons. Dragging and dropping adds the selected conversion to the target areas. These Conversion Master features enable you to find your most often used conversions more quickly by not having to search through the conversion database. See also Modifying Conversion Tables.

Using the Conversion Database ListBox

Click this list box to select a conversion to perform. Double clicking transfers the conversion resultant to the main calculator display and adds the selected item to the QuickList. Conversion Master will remember your last selected conversion action and will return you to it when you reenter the conversion database. You can also drag and drop conversions to any of the three target icons to the lower right of this listbox. These Conversion Master features allow you to organize and quickly locate conversions you use most often.

Calculator Display Value

This area displays the value of the calculator main display. The calculator main display is the value which will be acted upon. Clicking the right mouse button over the Calculator Display Window of this dialog brings up the Edit Popup Menu.

Conversion Operation

This is the operation and the constant value that will be performed against the calculator main display. Clicking the right mouse button over the Conversion Operation of this dialog brings up the Edit Popup Menu.

Loading Another Conversion Table

Clicking this button invokes a dialog box that enables the loading of another Conversion Table. See Loading Conversion Tables

Conversion Resultant

This area displays the result of the conversion operation. Clicking the right mouse button over the Conversion Resultant Window of this dialog brings up the Edit Popup Menu.

Conversion Result to Display

Click this button to place the resultant value to the calculator main display.

Conversion Database

Clicking this button takes you to the Conversion Database Dialog.

Temperature Conversions

Clicking this button takes you to the Temperature Conversion Dialog.

The Oblique Solver

Clicking this button takes you to the The Oblique Solver Dialog.

Exiting Conversion Dialog

Click here to dismiss this dialog box.

Active Conversion Category

The active conversion category is displayed here.

ACTIVE CONVERSION ENTRY

This area displays the table entry number of the selected conversion being performed.

USING THE TARGET ICON BUTTONS

The QuickList and User File icon buttons represent target area for dragging and dropping conversions from the listbox. Simply select a conversion from the listbox. Click and hold down the right mouse button (Cursor changes to a hand holding a paper). Drag it to a target icon button (Cursor changes to a hand dropping the paper when over a target icon button) and drop it by releasing the right mouse button. Also, clicking the target icon buttons will bring up a User File category or the QuickList dialog. See QuickList and User Files.

USER FILES DESCRIBED

User files (1 & 2) are similar to the QuickList. Similar in that they can be populated by the drag and drop method from the Conversion Database Dialog. The differences being the QuickList is limited to 50 entries and the User Files (1 & 2) can hold up 650 conversions. User Files are also fully editable from they Modify Conversions Dialog box and the QuickList is not. User files entries are in sorted order in their list boxes. The QuickList entries are not.

EDITING SELECTED CONVERSION

This button invokes the Modify Conversion Dialog and goes to the selected conversion for editing.

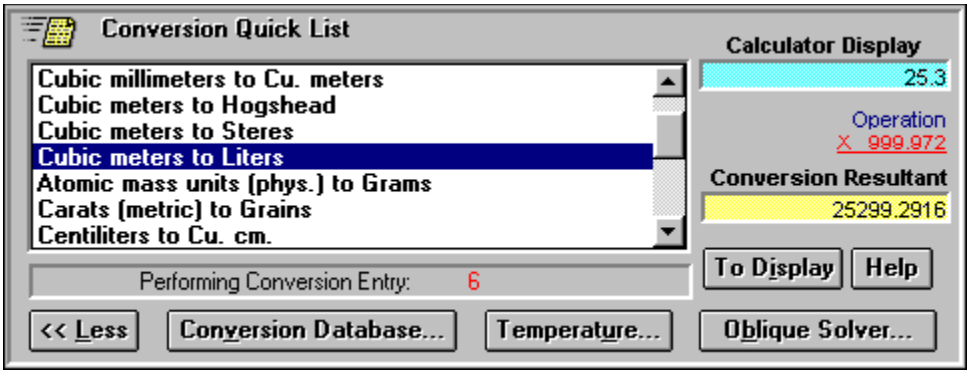
•

QUICKLIST

Menu Hot Keys Common Conversion Abbreviations

•

CLICK THE PART OF THE QUICKLIST YOU WANT TO KNOW MORE ABOUT.



- Popup Menus

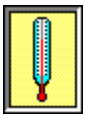
The **Conversion Master QuickList** helps you keep track of your most often used conversions. The QuickList listbox will hold up to 50 conversions. QuickList is populated in one of three ways: First, by dragging and dropping conversions from the Conversion Database Listbox to the QuickList target icon

(See Conversion Database Dialog); Second, by double clicking a conversion item from the Conversion Database ListBox; Third, by clicking the To Display Button from the Conversion Database Dialog. The last conversion you perform or the last item you drop on the QuickList target icon will appear at the top of the QuickList listbox. If more than 50 conversions are added into the QuickList, the last conversion in the listbox will drop off the bottom of the list.

- **USING THE QUICKLIST LISTBOX**

Click an item in this list box to perform a conversion. Double clicking an item transfers the conversion resultant to the main calculator display. Conversion Master will remember your last selected conversion action and will return you to it when you reenter the QuickList.

-

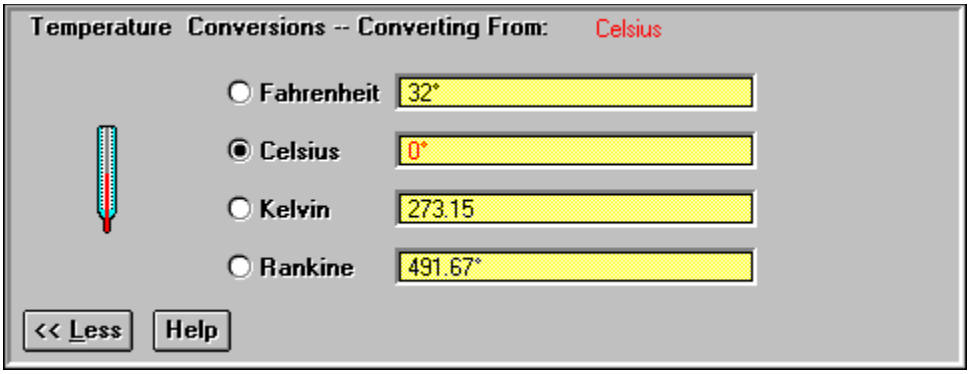


TEMPERATURE CONVERSIONS

Menu Hot Keys Temperature scales defined

-

CLICK THE PART OF THE DIALOG BOX YOU WANT TO KNOW MORE ABOUT.



- Popup Menus

- When moving the cursor over a display window, the cursor changes to a vertical arrow. At this juncture double clicking the mouse will paste the converted value to the calculator window.
- The selected conversion option will cause its related display window to be highlighted in red. The highlighted display (equal in numeric value to the main calculator display) helps you to immediately identify the value from which you are converting.
- Conversion Master will retain your last Temperature Conversion selection.

Temperature Scales

- The **Fahrenheit scale** is a temperature scale still widely used in Britain and the United States (although seldom in scientific work), in which the melting point of ice is specified as 32°F and the normal boiling point of water 212°F.
- The **Celsius scale** is a thermometric scale on which the interval between the freezing point and the boiling point of water is divided into 100 degrees with 0°C representing the freezing point and 100°C the boiling point.
- The **Kelvin scale**, or absolute temperature scale is defined so that 0° K is absolute zero, the coldest theoretical temperature (-273.15°C / -459.67°F), at which the energy of motion of molecules is zero. Each absolute degree is equivalent to a Celsius degree, so that the freezing point of water (0°C / 32°F) is 273.15° K, and its boiling point (100°C / 212°F) is 100 degrees higher, or 373.15°K.
- The **Rankine scale** relates to an absolute temperature scale on which the unit of measurement equals a Fahrenheit degree and on which the freezing point of water is 491.67° and the boiling point is 671.67°.

Viewing input as Fahrenheit

By selecting this option button the Temperature Conversion Dialog views calculator input as degrees Fahrenheit.

Viewing input as Celsius

By selecting this option button the Temperature Conversion Dialog views calculator input as degrees Celsius.

Viewing input as Kelvin

By selecting this option button the Temperature Conversion Dialog views calculator input as degrees Kelvin.

Viewing input as Rankine

By selecting this option button the Temperature Conversion Dialog views calculator input as degrees Rankine.

Fahrenheit Conversion

The value displayed in this window is equivalent to the calculator display value converted to Fahrenheit.

Celsius Conversion

The value displayed in this window is equivalent to the calculator display value converted to Celsius.

Kelvin Conversion

The value displayed in this window is equivalent to the calculator display value converted to Kelvin.

Rankine Conversion

The value displayed in this window is equivalent to the calculator display value converted to Rankine.

Returning to QuickList

This button returns you to the QuickList Dialog.

VIEWING INPUT AS

This area displays how the Temperature Conversion Dialog views input from the calculator (Fahrenheit, Celsius, Kelvin or Rankine).

SET ACCURACIES

These options set the display accuracy. They allow for the setting of **fractional** accuracies from 16ths to 128ths and **decimal** accuracies from 4 to 13 places. Default settings are considered to be 16ths In the FIS mode and 8 decimal places in DEC and MET modes. When exiting Conversion Master, new settings can be retained when initialization file is updated.

TOGGLE ALTERNATE DISPLAY

This option allows the user to turn off the second display when its information is not relevant. This is often useful when you want to view your input units as something other than decimal of feet when in the DEC mode (i.e. use the calculator as a standard calculator). Note that there are certain conditions that will automatically activate the second display:

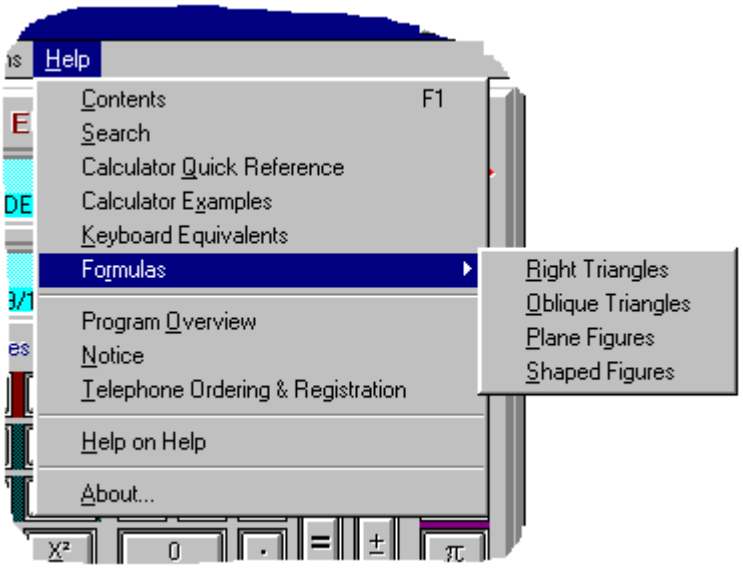
- When the calculator has solved a right triangle using the BEV, RUN, RIS or SLP keys.
- When the calculator is in either the FIS or DMS mode.

HELP MENU

The Help menu invokes various aspects of this help system and the program's About Dialog box. See Help Menu a graphical representation

HELP MENU

CLICK ON THE MENU ITEM YOU WOULD LIKE TO KNOW MORE ABOUT.

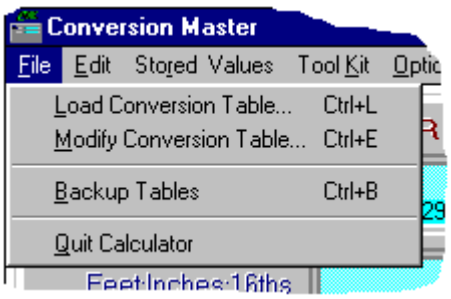


TELEPHONE ORDERING

This menu selection invokes a dialog box that explains the telephone registration process.

FILE MENU

CLICK ON THE MENU ITEM YOU WOULD LIKE TO KNOW MORE ABOUT.

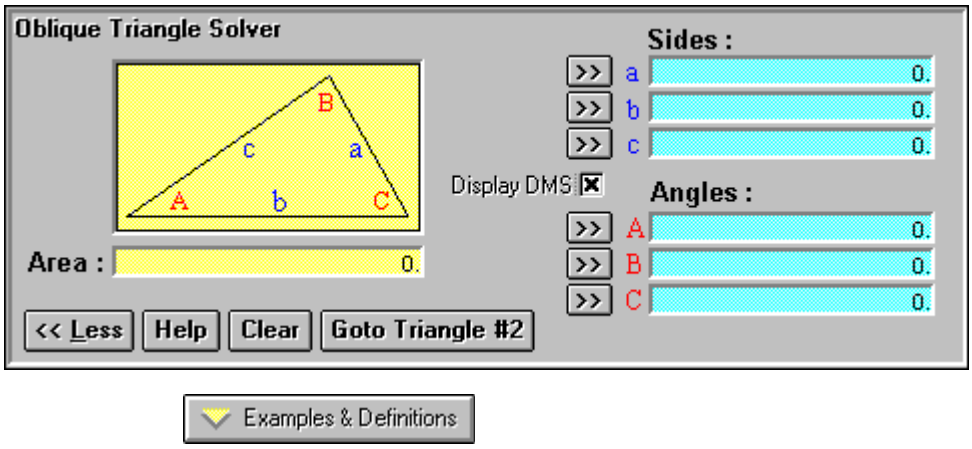


- # OBLIQUE TRIANGLE SOLVER

Menu Hot Keys Solving Right Triangles

-

CLICK THE PART OF THE DIALOG BOX YOU WANT TO KNOW MORE ABOUT.



THE OBLIQUE SOLVER (EXAMPLES & DEFINITIONS)

- Four possible cases in solving
- Solving with three known sides
- Solving with two known sides and an angle
- Solving with two known angles and an side
- The Ambiguous Case

CONVERSION MASTER TOOLS

- **Conversion QuickList**
- **Conversion Database**
- **Temperature Conversions**
- **Oblique Triangle Solver**

See also:

- **Conversion Master Pictorial Reference**

THE OBLIQUE TRIANGLE IMAGE

This image serves two functions. First, it serves as a reference point to the user enabling you to see the side angle relationships. This image does not reflect the correct scaling or orientation of your input data. Secondly, it allows for the transferring of the Oblique Solvers data to the main calculator display. This is accomplished by double clicking on the letter labels of the triangle (mouse pointer changes to up arrow). The transferring of values can also be achieved by double clicking the side, angle and area displays of the Solver.

OBLIQUE TRIANGLE AREA

This is where the calculated area is displayed once an oblique triangle is solved. The displayed units are considered to be in square meters or

square feet depending on the calculator input mode (you can view units as whatever you like in the decimal mode). Conversions between units can be made by utilization of the input mode keys. See FIS, DEC & MET modes.

OBLIQUE TRIANGLE SIDE DISPLAYS

This group of three displays is both the side input and the calculated side result display for the Oblique Triangle Solver. They represent the values of sides **a**, **b** & **c**. Input values are entered via the input buttons to the right of each display window.

Double clicking within a side display window (icon will appear as an up arrow), or on a side letter label within the triangle image will transfer that value to the main calculator display. If the calculator is in the DMS mode when a side value is transferred (one of the side displays is double clicked) the calculator will automatically assume a mode change that matches the transferred value format i.e. if the side values are displayed in the FIS format then the calculator will change to that mode automatically. If the side values were input as meters then mode is automatically switched to the MET mode etc. Click the input buttons to the right for more information on inputting values.

OBLIQUE TRIANGLE ANGLE DISPLAYS

This group of three displays is both the angle input and the calculated angle result display for the Oblique Triangle Solver. They represent the values of angles **A**, **B** & **C**. Input values are entered via the input buttons to the right of each display window.

Double clicking within an angle display window (icon will appear as an up arrow) or on an angle letter label within the triangle image will transfer that value to the main calculator display. If the calculator is in the FIS DEC or MET mode when an angle is transferred (one of the angle displays is double clicked) the calculator will automatically assume a mode change to the DMS mode. Click the input buttons to the right for more information on inputting values.

DISPLAYING ANGLES IN DEGREES MINUTES & SECONDS

Checking this box forces the angle value to be displayed in degrees, minutes and seconds. Leaving it unchecked displays the angle units in decimal format. See also DMS mode key

OBLIQUE SOLVER INTELLISENSE INPUT BUTTONS

This button indicates to the user that the Oblique Solver is ready accept input into the display window. In this button state there is no data in the window and its value is set to zero.

This button indicates that a value has been entered into the display window but the triangle has not been solved. This button also serves as a flag to the user to quickly identify his input values. In this button state the value in the display window can be over written at any time.

Buttons will appear in this state when a triangle has been solved. There will be only three buttons shown when a triangle is solved. The other buttons are hidden from view. In this state the buttons serve two purposes. First, it alerts the user to which data was input vs. which was calculated. Secondly, it allows one to remove an entered value and set the display to zero. This will also cause all other

relevant buttons to reappear allowing you in input into another window.

Notes:
1) Upon entering any two angles into Oblique Solver the third angle input option is taken away from you (button is hidden). A least one side must be known in order to solve the triangle.
2) When inputting triangle **side** values the Oblique Solver will use the same mode format as the calculator i.e. FIS, DEC or MET mode.
3) When inputting **angle** values the Oblique Solver takes on the DEC format unless the Display DMS checkbox is check. When checked angles are displayed in degrees, minutes and seconds.

OBLIQUE SOLVER CLEAR ALL INPUT DATA

Clicking this button will set all the Oblique Solvers input displays to zero and reset the input buttons to there input state.

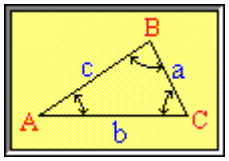
OBLIQUE SOLVER & THE TWO TRIANGLE CONDITION

This button will be normally hidden from view. It will only appear in ambiguous cases where two triangles are found. It is possible under some conditions that the input data could result in more than one triangle. This can occur if the angle entered is not between the two sides entered. (SSA). If the Oblique Solver senses this condition and finds that more than one triangle exists for the input data it displays this button. By clicking the button the Oblique Solver will toggle between each set of calculated data of the two triangles.

THE OBLIQUE SOLVER

SOLVING WITH THREE KNOWN SIDES (SSS)

Given: a = 9' - 4 7/8"
b = 20' - 11 1/4"
c = 22" - 11 7/16"
Find: angle **A, B & C**



For these examples make sure the Oblique Solver is activated by selecting it from the ToolKit on the menu bar.

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
9 4 14	9' - 4 14/16"	# 2	Side a
• Side a entry key	9' - 4 14/16"	Side a display	Side a entered
C	0.	# 2	clear calculator
2 0 11 4	20' - 11 4/16"	# 2	Side b
• Side b entry key	20' - 11 4/16"	Side b display	Side b entered
C	0.	# 2	clear calculator
2 2 11 7	22' - 11 7/16"	# 2	Side c
Select DMS check box	none	Angle displays	degrees, minutes & seconds
• Side c entry key	22' - 11 7/16" 24°·11'·33" 65°·48'·33" 89°·59'·55"	Side c display Angle A display Angle B display Angle C display	side c entered Angle A calculated Angle B calculated Angle C calculated

	98.47167965	Area display	Area calculated

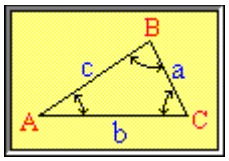
***NOTES:**

- Compare the ease of using the Oblique Solver to solve oblique triangles with the traditional method. See example Solving oblique triangles with three side
- For an overview of the Oblique Solvers features and how to use them see The Oblique Solver (pictorial reference)

THE OBLIQUE SOLVER

SOLVING WITH TWO KNOWN SIDES AND AN ANGLE (SAS)

Given: b = 20' - 11 1/4"
c = 22' - 11 7/16"
A = 30°
Find: side a, Angles **B**&**C**



For these examples make sure the Oblique Solver is activated by selecting it from the ToolKit on the menu bar.

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
2 0 11 4	20' - 11 4/16"	# 2	Side b
• Side b entry key	20' - 11 4/16"	Side b display	side b entered
C	0.	# 2	clear calculator
2 2 11 7	22' - 11 7/16"	# 2	Side c
• Side c entry key	22' - 11 7/16"	Side c display	side c entered
C	0.	# 2	clear calculator
DEC	0.	#1	mode change
unselect DMS check box	none	Angle displays	decimal of degrees
3 0	30.	#1	Angle A
• Angle A entry key	30°	Angle A display	Angle A entered
FIS	30. 11'- 6 5/16" 65.27456747 84.72543253 120.14526369	#1 Side a display Angle B display Angle C display Area display	mode change Side a calculated Angle B calculated Angle C calculated Area calculated

***NOTES:**

- Compare the ease of using the Oblique Solver to solve oblique triangles with the traditional method. See example Solving oblique triangles with two known sides and an angle
- For an overview of the Oblique Solvers features and how to use them see The Oblique Solver (pictorial reference)

SOLVING OBLIQUE TRIANGLES

SOLVING WITH TWO KNOWN ANGLES AND A SIDE (SAA)

Given: a = 9' - 4 7/8"
A = 41° 13 23
B = 78° 58 39
Find: Side **b** & **c**
Angle **C**

For these examples make sure the Oblique Solver is activated by selecting it from the ToolKit on the menu bar.

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
9 4 14	9'- 4 14/16"	# 2	Side a
• Side a entry key	9'- 4 14/16"	Side a display	side a entered
C	0.	# 2	clear calculator
DMS	00° 00 00	# 2	mode change
unselect DMS check box	none	Angle displays	decimal of degrees
4 1 1 3 2 3	41°·13'·23"	# 2	Angle A
• Angle A entry key	41.22305556	Angle A display	Angle A entered
C	00° 00 00	# 2	clear calculator
7 8 5 8 3 9	78°·58'·39"	# 2	Angle B
• Angle B entry key	78.9775	Angle B display	Angle B entered
FIS	78.9775 14'- 0 1/8" 12'- 4 1/16" 59.79944444 56.94893046	#1 Side b display Side c display Angle C display Area display	mode change Side b calculated Side c calculated Angle C calculated Area calculated

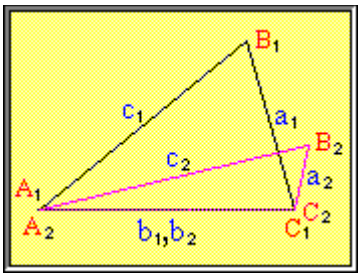
***NOTES:**

- Compare the ease of using the Oblique Solver to solve oblique triangles with the traditional method. See example Solving oblique triangles with two known angles and a side
- For an overview of the Oblique Solvers features and how to use them see The Oblique Solver (pictorial reference)

THE OBLIQUE SOLVER

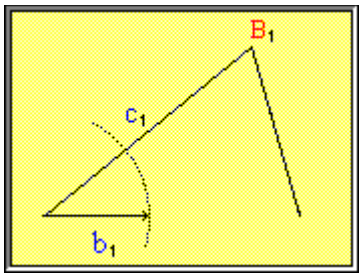
OBLIQUE TRIANGLES & AMBIGUOUS CASES

When solving oblique triangles, it is possible that an ambiguous condition exists. Ambiguous cases exist when entering tw sides and one angle **(SSA)** (The angle entered is not between the two sides). This example shows how there can be two triangles for the input data or that no triangle exists at all.



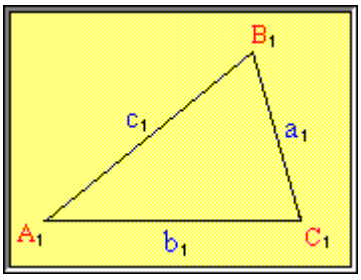
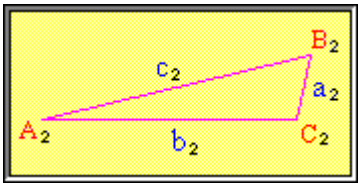
Two Triangles may exist for same input data

$b_1 = b_2$, $c_1 = c_2$ & $B_1 = B_2$



The Triangle may not exist at all

EXAMPLE OF THE TWO TRIANGLE CASE

INPUT DATA	RESULTS	TRIANGLE FIGURE	REMARKS
b_1 = 24' - 11 15/16" c_1 = 26' - 0" B_1 = 69° 00' 00"	a_1 = 15' - 3 3/8" A_1 = 34° 48' 07" C_1 = 76° 11' 53" Area = 185.4526 sq. ft.		There are two triangles that ca meet the input criteria. This is noted by the appearance of th Two Triangle Button within the Oblique Solver
$b_1 = b_2$ = 24' - 11 15/16" $c_1 = c_2$ = 26' - 0" $B_1 = B_2$ = 69° 00' 00"	a_2 = 3' - 4 1/4" A_2 = 07° 11' 53" C_2 = 103° 48' 07" Area = 40.7136 sq. ft.		This is the second triangle that the input data points produce.

CASE WHERE THE TRIANGLE DOES NOT EXIST

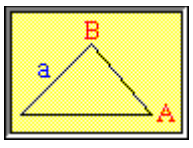
INPUT DATA	RESULTS	TRIANGLE FIGURE	REMARKS
b_1 = 8' - 11 15/16" c_1 = 26' - 0" B_1 = 69° 00' 00"	Cannot be calculated	•	As you can see side b_1 never closes the triangle.

Note: Conversion Master will alert you to these ambiguous conditions when they occur.

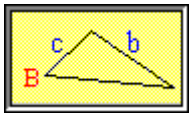
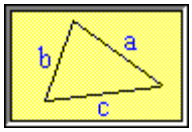
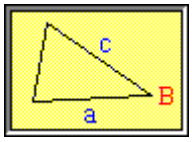
THE OBLIQUE SOLVER

THE FOUR POSSIBLE CASES

There are four possible cases that can occur when solving oblique triangles. The table below summarizes these cases.

Case	Abbreviation	Example	Comments
One side and two angles are known	**SAA**		If two angles are entered first, the third angle input button is hidden from view. It is **not** possible to solve a triangle with three known angles. At least one side must be known

a, B, A known

Two sides and one angle (not included between the two sides) are known	**SSA**	 b, c, B known	Under this case triangle ambiguity can exist. The triangle may not exist or there may be more than one triangle. The Oblique Solver detects ambiguous cases and alerts you to them. **See Ambiguous Cases**
Three sides are known	**SSS**	 a, b, c known	Under this case the sum of any two sides must be greater than the remaining side. The Oblique Solver alerts you to this condition.
Two sides and the angle included between the two sides are known	**SAS**	 a, B, c known	In three of the cases in which angles are entered (i.e. SAA, SSA or SAS) the sum of the entered angles must be less 180°. The Oblique Solver is constantly monitoring all your input data for validity.

Who has measured the water in the hollow of His hand,
And marked off the heavens by the span,
And calculated the dust of the earth by the measure,
And weighed the mountains in a balance,
And the hills in a pair of scales ? ***Isa. 4o:12***

BASIC EXAMPLES
DMS KEY INPUT

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
To enter 22°·37'·12"			
DMS		# 2 (Input area)	mode change
2 2 3 7 1 2	22°·37'·12"	# 2	*See Notes
	22.62	# 1	Decimal of degrees
To enter 22°·00'·12"			
DMS		# 2 (Input area)	mode change
2 2 0 0 1 2	22°·00'·12"	# 2	*See Notes
	22.00333333	# 1	Decimal of degrees
To enter 00°·37'·12"			
DMS		# 2 (Input area)	mode change
3 7 1 2	00°·37'·12"	# 2	*See Notes
	0.62	# 1	Decimal of degrees

***NOTES:**

- The minute & second positions must be input (in two digits) when entering degrees even if those values are zero.
- The minute & seconds positions must be integers less than 60. (i.e. 2°·73'·72" has no meaning to the calculator . This entry would produce a zero value in display #1)
- Notice that entries (integers) are shifted from right to left and the calculator only recognizes those values that meet the above criteria. This can be observed by watching display #1 where the calculator translates entries to their decimal equivalents.

BASIC EXAMPLES
FIS KEY INPUT

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
To enter 14' - 11 15/16". 14 feet, 11 and 15/16 inches.			
FIS		# 2 (Input area)	mode change
1 4 11 15	14' - 11 15/16"	# 2	*See Note
To enter 11 /12/16". 11 and 12/16 Inches.			
FIS		# 2 (Input area)	mode change
11 12	11 12/16"	# 2	3/4 = 12 Sixteenths
To enter 17' - 0".			
FIS		# 2 (Input area)	mode change

1 7 0 0	17' - 0"	# 2	Press 0 twice to shift 17 to the feet position

***NOTES:**

- Use single key entries to enter Inches and Sixteenths.
- If you had entered the digits 1 & 5 for 15/16 you would have entered 1 inch and 5/16.

BASIC EXAMPLES
MULTIPLICATION BY WHOLE NUMBERS

What is the total linear length of 18 spaces equally spaced @ 4' - 7 7/8" apart?

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
4 7 14	4' - 7 14/16"	# 2	14/16 " = 7/8"
X	4' - 7 14/16"	# 2	multiply
1 8 0 0	18' - 0"	# 2	18 as a whole number
=	83' 9 12/16"	# 2	length = 83' - 9 3/4"

BASIC EXAMPLES
MULTIPLICATION BY (FIS) NUMBERS

What is the square footage of a room that is 12' - 7 5/8" wide by 14' - 10 3/8" long.

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
1 2 7 10	12' - 7 10/16"	# 2	room width
X	12' - 7 10/16"	# 2	multiply
1 4 10 6	14' - 10 6/16"	# 2	room length
=	187.820204	# 1	Total area in (ft²)

BASIC EXAMPLES
DIVISION BY WHOLE NUMBERS

If you have a length L = 64' - 0" and you want 15 equal spaces.
How far are the spaces apart (S = ?) and is there a remainder?

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
6 4 0 0	64' - 0"	# 2	Length ' **L** '
/	64' - 0"	# 2	division
1 5 0 0	15' - 0"	# 2	15 as a whole number
=	4' - 3 3/16"	# 2	equals spaces ' **S** '
REM	3/16"	# 1	3/16" Remainder

- See also, **Calculating stair risers example** for further explanation of the **REM** key

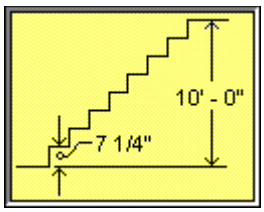
BASIC EXAMPLES
DIVISION BY (FIS) NUMBERS

You have added up a linear wall length of 178' - 10" and you want to calculate how many 2 x 4 studs it will take to build the wall on 16" centers.

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
1 7 8 10 0	178' - 10"	# 2	wall length
/	178' - 10"	# 2	division
1 4 0	1' - 4"	# 2	1' - 4" = 16" (spacing)
=	134.12500033	# 1	134.125 studs required

BASIC EXAMPLES
CALCULATING STAIR RISERS

The overall height of the stairs is 10' - 0".
You want each stair riser to be 7 1/4" in height.
How many risers are there?



KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
1 0 0 0	10' - 0"	# 2	Overall height of stairs
STO 1	10' - 0"	# 2	Store height of stairs
/	10' - 0"	# 2	division
7 4	7 4/16"	# 2	Desired height of risers
=	16.55172405	# 1	Number of risers required
RCL 1	10' - 0"	# 2	Recall height of stairs
/	10' - 0"	# 2	division
1 7 0 0	17	# 1	Number of risers rounded 17 entered as whole #
=	7 1/16"	# 2	Height of each riser See *Note 1
REM	-1/16"	# 1-1	The neg. 1/16 indicates an overage See *Note 2

NOTES:

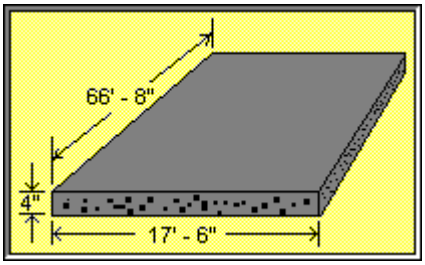
- After doing FIS division note the status of the REM key. It will be highlighted in red if an overage or a remainder has occurred. In this case, an overage.

- The REM key informed us that an overage occurred since 7 1/16" X 17 = 10' - 0 1/16", hence an overage of 1/16".
- Suppose you had desired risers of 7 11/16" each over a span of 9' - 0". You would have needed 14 risers. Dividing 14 into 9' - 0" would have produced a remainder of 3/8" since 7 11/16" X 14 = 8' - 11 5/8".

BASIC EXAMPLES

CALCULATING CONCRETE SLABS IN CUBIC YARDS

How may cubic yards of concrete are in a slab 17' - 6" Wide, 66' - 8" Long and 4" Thick? There are 27 cubic feet in a cubic yard.



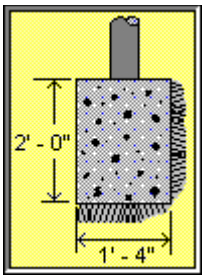
KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
1 7 6 0	17' - 6"	# 2	slab width
X	17' - 6"	# 2	multiply
6 6 8 0	66' - 8"	# 2	slab length
X	1166'- 8"	# 2	multiply
4 0	4"	# 2	slab thickness
=	388.88888502	# 1	total cubic feet of concrete
/	388.88888502	# 1	divide
DEC	388.88888502	# 1 (Input area change)	change mode
2 7	27	# 1	*See Note below
=	14.40329204	# 1	Total cubic yards needed

NOTE:
There are 27 cubic feet in a cubic yard. Although this value was keyed in, it is simpler to let the Conversion Master remember your conversion constants for you. Conversion constants can be retained through the use conversion tables and called up at any point in time by Selecting **Options** and then **Conversion > Database** (Hot Key Ctrl - D) from the menu. Many commonly used conversions come with the Conversion Master, including this one.

BASIC EXAMPLES

CALCULATING FOOTINGS IN CUBIC YARDS

You have 175 linear feet of concrete footing to pour.
How may cubic yards of concrete are needed for this footing?
There are 27 cubic feet in a cubic yard.



KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
2 0 0	2' - 0"	# 2	footing height
X	2' - 0"	# 2	multiply
1 4 0	1' - 4"	# 2	footing width
X	2'- 8"	# 2	multiply
1 7 5 0 0	175' - 0"	# 2	Linear feet
=	466.6666655	# 1	Cubic feet
/	466.6666655	# 1	divide
DEC	466.6666655	# 1 (Input area change)	change mode
2 7	27	# 1	*See Note Below
=	17.28395057	# 1	Total cubic yards needed

NOTE:
There are 27 cubic feet in a cubic yard. Although this value was keyed in, it is simpler to let the Conversion Master remember your conversion constants for you. Conversion constants can be retained through the use of conversion tables and called up at any point in time by Selecting **Options** and then **Conversion > Database** (Hot Key Ctrl - D) from the menu. Many commonly used conversions come with the Conversion Master, including this one.

USING CONVERSION TABLES

CALCULATING THE VOLUME OF A CYLINDER

Formulas: Area of circle = p ´ radius^2
Volume = Height ´ Area of Circle

How many gallons of water will this barrel hold?

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
2 7 0	2' - 7"	# 2	diameter of barrel
/	2' - 7"	# 2	divide
DEC	2.58333333 (Dec. of ft.)	# 1 (Input area change)	mode change
2	2	# 1	divide by 2

=	1.29166666	# 1		barrel radius
X²	1.66840276	# 1		radius squared
X	1.66840276	# 1		multiply
π	3.14159265	# 1		value of π
X	5.24144185	# 1		multiply
FIS	5.24144185	# 1		mode change
4 6 14	4' - 6 14/16"	# 2	(Input area change)	height of barrel
=	23.96867681	# 1		Total cubic feet

From the calculator menu select Options **Conversion** > **Database** (Hot Key Ctrl - D). The Conversion category **Volume and Capacity** must be loaded before converting to gallons. After that category is loaded select **Cubic feet to Gallons (U.S., liq.)** from the listbox. The result (179.29815419) will appear in **the Conversion Resultant Display**. If desired, the resultant can be transferred to the calculator display by use of the **To Display** button or double clicking the selection from the listbox.

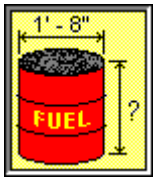
ANSWER: The barrel will hold 179 gallons of water

USING CONVERSION TABLES

USING VOLUMES TO CALCULATE CYLINDER LENGTHS

Formulas: $\text{Area of circle} = p \cdot \text{radius}^2$

$$\text{Length} = \frac{\text{Volume}}{\text{Area of Circle}}$$



A fuel tank is needed that will hold 55 gallons of diesel fuel.
This fuel tank is to be made out of a cylinder 1' - 8" in diameter.
What is the length in feet of fuel tank?

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
DEC		# 1 (Input area)	mode change
5 5	55	# 1	size in gallons

From the calculator menu select Options **Conversion** > **Database** (Hot Key Ctrl - D). The Conversion category **Volume and Capacity** must be loaded before converting gallons to cubic feet. From the listbox select action to perform: **Gallons (U.S., liq.) to Cubic feet.** The result (7.35243052) will appear in the **Conversion Resultant Display**. Copy this result to the Clipboard by selecting **Edit** > **Copy Conversion Resultant.**

FIS		# 2	(Input area change)	mode change
1 8 0	1' - 8"	# 2		diameter
/	1' - 8"	# 2		divide
DEC	1.66666667	# 1	(Input area change)	mode change

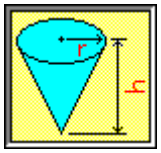
2	2	# 1	divide by 2
=	.83333333	# 1	radius
X²	.69444444	# 1	radius squared
X	.69444444	# 1	multiply
π	3.14159265	# 1	

				value of
=	2.18166155	# 1		equals bottom area
STO 1	2.18166155	# 1		store bottom area
Menu **Edit Paste**	7.35243052	# 1		paste volume in cu/ft
/	7.35243052	# 1		divide
RCL 1	2.18166155	# 1		divide by area of bottom
=	3.37010593	# 1		equals
FIS	3' - 4 7/16"	# 2	(Input area change)	length of cylinder

ANSWER: The cylinder will need to be 3' - 4 7/16" in length.

USING CONVERSION TABLES
FINDING THE VOLUME OF A CONE

Given: r = 2 7/8", h = 8"
Find the Volume V:
in Ounces of U.S. liquid
in Cubic inches
in Milliliters



Formula: $V = \frac{\pi r^2 h}{3}$

Load Conversion category **Volume and Capacity** from the menu to solve this problem. Next, select **Perform Conversions** button. From the listbox select action to perform: **Cubic feet to Ounces (U.S., liq.).**

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
π	3.14159265	# 1	

				value of
X	3.14159265	# 2		multiply
2 14	2 14/16"	# 1		radius of cone
X²	.05740017	# 1		radius squared
X	.05740017	# 2		multiply
8 0	8"	# 1		height of the cone

=	.12021864	# 1		equals
/	.12021864	# 1		divide
DEC	.12021864	# 1	(Input area change)	mode change
3	3	# 1		divide by 3
=	.04007288	# 1		volume in cubic feet

The result (38.37004267) will appear in the **Conversion Resultant Display** of the Conversion dialog. Press **To Display** button to place this conversion in the calculator main display area.

	38.37004267	# 1	Volume in Ounces of U.S.,liq.

Next, from the listbox select action to perform: **Ounces (U.S., fluid) to Cubic inches.** The result (69.24593638) will appear in the **Conversion Resultant Display** of the Conversion dialog. Press **To Display** button to place this conversion in the calculator main display area.

69.24593638	# 1	Volume in cubic inches

Next, from the listbox select action to perform: **Cubic inches to Milliliters.** The result (1134.77893102) will appear in the **Conversion Resultant Display** of the Conversion dialog. Press **To Display** button to place this conversion in the calculator main display area.

1134. 77893102	# 1	Volume in milliliters

SOLVING OBLIQUE TRIANGLES

SOLVING WITH THREE KNOWN SIDES

Given: a = 9' - 4 7/8"
b = 20' - 11 1/4"
c = 22" - 11 7/16"
Find: angle **A**

- Formulas: $(Cos\frac{A}{2})^2 = \frac{S^2 - Sa}{bc}$ $S = \frac{a+b+c}{2}$

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
9 4 14	9' - 4 14/16"	# 2	side **a**
+	9' - 4 14/16"	# 2	add
2 0 11 4	20' - 11 4/16"	# 2	side **b**
+	30' -4 2/16"	# 2	add
2 2 11 7	22' - 11 7/16"	# 2	side **c**
=	53' - 3 9/16"	# 2	equals perimeter
/	53' - 3 9/16"	# 2	division
DEC	53.296875	# 1 (Input area change)	mode change
2	2	# 1	divisor
=	26.648437	# 1	equals **S**
STO 1	26.648437	# 1	Store **S** @ location 1
X^2	710.13922	# 1	**S^2**
-	710.13922	# 1	subtract
RCL 1	26.648437	# 1	Recall **S** @ location 1

X	26.648437	# 1		Multiply
FIS	26' - 7 13/16"	# 2	(Input area change)	mode change
9 4 14	9' - 4 14/16"	# 2		side **a**
=	459' - 5 12/16"	# 2		equals (**S² -Sa)**
/	459' - 5 12/16"	# 2		Division
2 0 11 4	20' - 11 4/16"	# 2		side **b**
/	21' - 11 5/16"	# 2		Division
2 2 11 7	22' - 11 7/16"	# 2		side **c**
DEC	22.953124	# 1	(Input area change)	mode change
=	.9560871	# 1		equals (**S² -Sa)/bc**
SQR	.9777970	# 1		square root
INV COS	12.09621	# 1		Arc Cosine
X 2 =	24.192432	# 1		Angle **A** in degrees
COS	24°·11'·33"	# 2		Angle **A** in Deg.·Min.·Sec.

SOLVING OBLIQUE TRIANGLES

SOLVING WITH TWO KNOWN SIDES AND AN ANGLE

Given: b = 20' - 11 1/4"
c = 22' - 11 7/16"
A = 30°

Formula: $a^2 = b^2 + c^2 - 2bc \cos A$

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA		REMARKS
FIS		# 2	(Input area)	change mode
2 0 11 4	20' - 11 4/16"	# 2		side **b**
X²	438.37890	# 1		**b²**
+	438.37890	# 1		add
2 2 11 7	22' - 11 7/16"	# 2		side **c**
X²	526.84594	# 1		**c²**
-	965.22484	# 1		subtract
DEC	965.22484	# 1	(Input area change)	change mode
2	2	# 1		subtract 2
X	2	# 1		multiply
FIS	2	# 1		mode change
2 0 11 4	20' - 11 4/16"	# 2	(Input area)	side **b**
X	41' - 10 8/16	# 2		multiply
2 2 11 7	22' - 11 7/16"	# 2		side **c**
X	961.1621	# 1		multiply
DEC	961.1621	# 1	(Input area change)	mode change

3 0	30	# 1	angle **A**
COS	.8660254	# 1	cosine of angle **A**
=	132.83402	# 1	equals **a²**
SQR	11.525364	# 1	square root of **a²**
FIS	11' - 6 5/16"	# 1# 2 (Input area)	side **a**

SOLVING OBLIQUE TRIANGLES

SOLVING WITH TWO KNOWN ANGLES AND A SIDE

Given: a = 9' - 4 7/8"
A = 40°
B = 80°

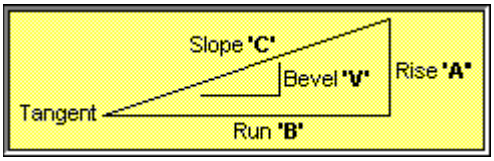
• **Formula :** $b = \frac{\quad}{\text{Sin A}} (\text{Sin B})$

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS	0	# 2 (Input area)	mode change
9 4 14	9' - 4 14/16"	# 2	**side a**
/	9' - 4 14/16"	# 2	division
DEC	9.4062499	# 1 (Input area change)	mode change
4 0	40	# 1	Angle **A**
SIN	.6427875	# 1	Sine of **A**
X	14.633527	# 1	multiply
8 0	80	# 1	Angle **B**
SIN	.9848077	# 1	Sine of **B**
=	14.411211	# 1	equals
FIS	14' - 4 15/16"	# 2 (Input area change)	**b**

SOLVING RIGHT TRIANGLES

USING BEV & RUN KEYS WITH KNOWN BEVEL AND RUN

Given: V = 6 15/16", B = 21' - 11 15/16"
Find:
Slope 'C'
Rise 'A



KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
6 15	6 15/16"	# 2	Bevel **V**
BEV	6 15/16"	# 2	Bevel entered
2 1 11 15	21' - 11 15/16"	# 2	Run **B**
RUN	Run = 21' - 11 15/16"	# 2	Run entered
	Run = 21.99479167	# 1	Run in Dec. of feet
	Rise = 12' - 8 9/16"	# 1-1	Rise result **'A'**
	Bevel = 6 15/16"	# 1-2	Bevel previous entry

Slope = 25' - 4 7/8" # 2-1 Slope result **'C'**

SOLVING RIGHT TRIANGLES
USING RIS & SLP KEYS WITH KNOWN RISE AND SLOPE

Given: A = 4' - 8 7/16", C = 11' - 5 3/16"

Find: Bevel 'V'
Run 'A'
Convert Tangent to Degrees, Minutes & Seconds

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
4 8 7	4' - 8 7/16"	# 2	Rise **'A'**
RIS	4' - 8 7/16"	# 2	Rise entered
1 1 5 3	11' - 5 3/16"	# 2	Slope **C**
SLP	Slope = 11' - 5 3/16"	# 2	Slope entered
	Slope = 11.43229167	# 1	Slope in Dec. of feet
	Run = 10' - 5 1/16"	# 1-1	Run result **'A'**
	Bevel = 5 7/16"	# 1-2	Bevel result **'V'**
	Rise = 4' - 8 7/16"	# 2-1	Rise previous entry
INV BEV	Bevel = .45135243	# 1	Bevel result in dec. ft.
	Run = 10' - 5 1/16"	# 1-1	Run result
	Rise = 4' - 8 7/16"	# 1-2	Rise previous entry
	Slope = 11' - 5 3/16"	# 2-1	Slope previous entry
	Angle 24°·17'·32"	# 2	Angle result

SOLVING RIGHT TRIANGLES
USING RIS KEY WITH KNOWN ANGLE AND RISE

Given: A = 12' 11 3/4", ϥ = 30°

Find: Bevel 'V', Run 'B' and Slope 'C'
Change: A = 10' - 6" Recalculate Run and Slope

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
DEC		# 1 (Input area)	mode change
3 0	30	# 1	
			Angle
TAN	.57735027	# 1	Bevel **'V'** Result Bevel/Tangent of 30°
BEV	.57735027	# 1	Bevel entered
	6.92820324"	# 2	Bevel in dec. of inches

FIS	.57735027	# 2	Bevel previous entry
	6 15/16"		Bevel inches & 16ths
1 2 11 12	12' - 11 12/16"	# 2	Rise **A**
	12.97916667	# 1	Rise in dec. of feet
RIS	Rise = 12.97916667	# 1	Rise in dec. of feet
	Run = 22' - 5 3/4"	# 1-1	Run result **'B'**
	Bevel = 6 15/16"	# 1-2	Bevel previous entry
	Rise = 12' - 8 9/16"	# 2	Rise entered
	Slope = 25' - 11 1/2"	# 2-1	Slope result **'C'**
1 0 6 0	10' - 6"	# 2	New Rise
	10.5	# 1	
RIS	Rise = 10.5	# 1	Rise in dec. of feet
	Run = 18'- 2 1/4"	# 1-1	Run new result **'B'**
	Bevel = 6 15/16"	# 1-2	Bevel previous entry
	Rise = 10' - 6"	# 2	New Rise entered
	Slope = 21'- 0"	# 2-1	Slope new result **'C'**

SOLVING RIGHT TRIANGLES

USING RIS AND RUN KEY WITH KNOWN RISE & RUN

Given: Run 'B' = 5.333 meters, Rise = 'A' = 3.667 meters

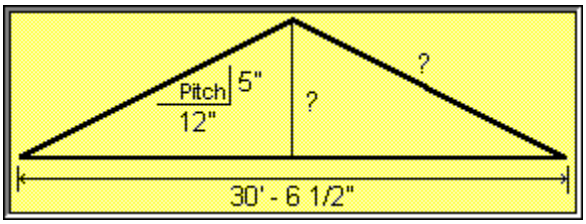
Find: Bevel 'V', and Slope 'C'
Find: Rise 'A' when Run 'B' = 1.750 meters
Convert all values to FIS

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
MET		# 1 (Input area)	Change to Meter mode
5 . 3 3 3	5.333	# 1	Run in Meters
	5333	# 2	Run in millimeters
RUN	5.333	# 1	Run entered
	5333	# 2	
3 . 6 6 7	3.667	# 1	Rise in Meters
	3667	# 2	Rise in millimeters
RIS	Rise = 3.667	# 1	Rise entered
	Run = 5.333	# 1-1	Run previous entry
	Bevel = .6876	# 1-2	Bevel result
	Rise = 3667	# 2	Rise in millimeters
	Slope = 6.4721	# 2-1	Slope result
RCL BEV	Bevel = .68760548	# 1	View bevel as last input
	Run = 5.333	# 1-1	bevel to be retained
	Rise = 3.667	# 1-2	new run to be entered
	Bevel = 687.60548	# 2	
	Slope = 6.4721	# 2-1	
1 . 7 5	1.75	# 1	Run in Meters
	17500	# 2	Run in millimeters
RUN	Run = 1.75	# 1	New run entered
	Rise = 1.2033	# 1-1	New rise result

	Bevel = .6876	# 1-2	Bevel previous entry
	Run = 1750	# 2	Run in millimeters
	Slope =2.1238	# 2-1	New slope result
FIS	Run = 5.74146982	# 1	Values convert to FIS mode
	Rise = 3' - 11 3/8"	# 1-1	
	Bevel = 8 1/4"	# 1-2	
	Run = 5' - 8 14/16"	# 2	
	Slope = 6' - 11 5/8"	# 2-1	

SOLVING RIGHT TRIANGLES

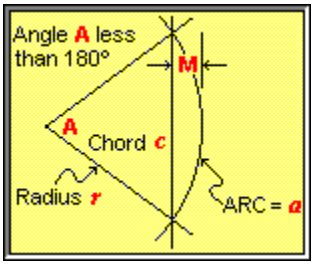
CALCULATING ROOF RISE & SLOPE WITH KNOWN PITCH AND RUN



Given: Half of overall span 15' - 3 1/4"
Find: Length of the ridge rafters (Slope) and total Rise and the angle of slope.

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS		# 2 (Input area)	mode change
5 0	5"	# 2	Bevel\Pitch\Tangent
BEV	5"	# 2	Bevel entered
1 5 3 4	15' - 3 4/16"	# 2	Run
RUN	Run = 15' - 3 4/16"	# 2	Run entered
INV BEV	Bevel = .41666667	# 1	Bevel result in dec. ft.
	Run = 15' - 3 1/4"	# 1-1	Run previous entry
	Rise = 6' - 4 3/8"	# 1-2	Rise result
	Slope = 16' - 6 1/2"	# 2-1	Slope result
	Angle 22°·37'·12"	# 2	Angle result

CALCULATING CIRCULAR SEGMENTS



r = 11' - 11 15/16'
A = 30°

Formulas: $a = \frac{A}{180} p\ r$ $\frac{c}{2} = r(SIN \frac{A}{2})$ $M = r(1 - COS \frac{A}{2})$

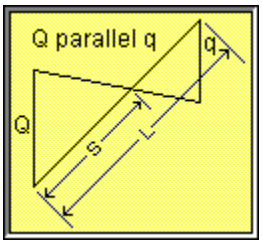
All examples assume default accuracy settings

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS

FIS		# 2 (Input area)	mode change
1 1 11 15	11' - 11 15/16"	# 2	radius '***r*** '
STO 1	11' - 11 15/16"	# 2	store radius
X	11' - 11 15/16"	# 2	multiply
	3.14159265	# 1	
			value of
X	37.68274935	# 1	multiply
DEC	37.68274935	# 1 (Input area change)	mode change
3 0	30	# 1	angle ' **A** '
/	1130.48248046	# 1	divide
1 8 0	180	# 1	divide by 180
=	6.28045822	# 1	equals arc ' ***a*** ' in decimal
FIS	6' - 3 6/16"	# 2 (Input area change)	mode change equals arc ' ***a*** ' in FIS
C	0	# 2	clear calculator
DEC	0	# 1 (Input area change)	mode change
3 0	30	# 1	angle ' **A** '
/	30	# 1	divide
2	2	# 1	divide by 2
=	15	# 1	equals one half angle '**A**'
SIN	.2588189	# 1	Sine 1/2 angle '**A**'
X	.2588189	# 1	multiply
RCL 1	11.99479167	# 1	recall radius '***r*** '
=	3.10448058	# 1	equals
X	3.10448058	# 1	multiply
2	2	# 1	multiply by 2
=	6.20896116	# 1	equals
FIS	6' - 2 8/16"	# 2 (Input area change)	change mode chord ' ***c*** ' = 6' - 2 8/16"
C	0	# 2	clear calculator
DEC	0	# 2 (Input area change)	mode change
1 5	15	# 1	one half angle '**A**'
COS	.96592583	# 1	cosine 1/2 angle '**A**'

±	-.96592583	# 1	change sign
+	-.96592583	# 1	add
1	1	# 1	add 1
=	.03407417	# 1	equals
X	.03407417	# 1	multiply
RCL 1	11.99479167	# 1	radius '***r***'
=	.40871257	# 1	equals
FIS	4 14/16"	# 2 (Input area change)	**M** = 4 7/8"

COMBINED TRIANGLES



Formula: $S = \frac{Q}{Q+q}(L)$ **Given:** Q = 10' - 5 5/8", q = 4' - 8 7/16", L = 11' - 5 3/16"

All examples assume default accuracy settings

KEYS PRESSED	DISPLAY RESULT	DISPLAY AREA	REMARKS
FIS	0	# 2 (Input area)	mode change
1 0 5 10	10' - 5 10/16"	# 2	length **Q**
STO 1	10' - 5 10/16"	# 2	store length **Q**
+	10' - 5 10/16"	# 2	add
4 8 7	4' - 8 7/16"	# 2	add length **q**
=	15' - 2 1/16"	# 2	equals
STO 2	15' - 2 1/16"	# 2	store **Q + q**
C	0	# 2	clear calculator
RCL 1	10' - 5 10/16"	# 2	recall length **Q**
/	10' - 5 10/16"	# 2	divide
RCL 2	15' - 2 1/16"	# 2	recall **Q + q**
X	8 4/16"	# 2	multiply
1 1 5 3	11' - 5 3/16"	# 2	length **L**
=	7' - 10 11/16"	# 2	length **S**

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Expand Examples

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AB

A prefix attached to the names of the practical electric units to indicate the corresponding unit in the c.g.s. electromagnetic system (emu), e.g. abampere, abvolt.

ABCOULOMB

The abcoulomb, the emu of charge, is defined as the charge which passes a given surface in one second if a steady current of one abampere flows across the surface.

$1 \text{ abcoulomb} = 2.99793 \times 10^{10} \text{ statcoulomb}$

ABVOLT

The c.g.s. electromagnetic unit of potential difference and electromotive force. It is the potential difference that must exist between two points in order that one erg of work be done when one abcoulomb of charge is moved from one point to the other.

$1 \text{ abvolt} = 10^{-8} \text{ volt}$

ABSOLUTE ZERO

Equals the centigrade temperature plus 273°.

ABSOLUTE TEMPERATURE

-273° C; at this temperature all molecular motion ceases.

ACCELERATOR KEY

A menu or menu item containing an underlined letter indicates that the menu or menu item can be accessed using a keystroke combination. For example, most Windows applications display the File menu when you press Alt+F. Once a menu is displayed, pressing the key corresponding to an underlined letter in a menu item executes that menu item.

ACTIVE WINDOW

The currently selected window, which appears on top of all other windows. The title bar of the active window is a different color or intensity than the title bar of an inactive window.

ANGLE

The shape made by two straight lines or plane surfaces that meet. Usually measured in degrees minutes and seconds, radians or grads. Conversion Master can solve right triangles for you with two given values.

ANGSTROM UNIT (Å)

The unit used to measure the length of electromagnetic waves

$(1\text{Å} = 10^{-8} \text{ cm}) = (\frac{1}{10{,}000} \text{ m})$

APOTHECARIES' MEASURE

abv. (apoth.) System of measures used chiefly by Pharmacists in which:

fluid dram	= 60 minims
fluid ounce	= 8 fluid drams
pint	= 16 fluid ounces
gallon	= 8 pints

APOTHECARIES' WEIGHT

abv. (apoth.) System of weight used chiefly by Pharmacists in which:

scruple	= 20 grains
dram	= 3 scruples
ounce	= 8 drams
pound	= 12 ounces

APPLICATION

A computer program used to perform certain tasks Conversion Master is an application.

AREA

The surface of an object which is measured in square units. These units result from multiplying the length of the area or object by its width. The square units of both the customary and metric systems are based on units of length and distance.

Sample of customary and metric units for area.

Customary	Metric	Metric	Customary
1 sq. mile	2.5899881 km²	1 sq. hectometer	2.4710538 acres
1 acre	0.40468564 ha	1 sq. dekameter	119.599001 sq. yd.
1 sq. rod	25.29285264 m²	1 sq. meter	1550.0031 sq. in.
1 sq. yard	0.83612736m²	1 sq. decimeter	15.500031 sq. in.
		1 sq. kilometer	0.38610216 sq. mi.
1 sq. foot	0.09290304 m²	1 sq. centimeter	0.15500031 sq. in.
1 sq. inch	6.4516 cm²	1 sq. millimeter	0.0015500031 sq. in.

AVOIRDUPOIS WEIGHT

abv. (avdp.) An English and American system of weights in which:

ton	= 2000 pounds
pound	= 16 ounces
ounce	= 16 drams

BACKUP

Conversion Master data tables can be backed up via the menu selection Backup Tables from the File Menu This action copies the data files from the program directory to a backup directory.

BAR

International unit of pressure

10^6 dyne / cm^2.
1 bar = 0.987 atmosphere.

BROWSE
The browse buttons **<<**, **>>** within the Conversion Master Help window allow you to cycle through related topics.

BEVEL
Bevel can be defined as the amount of rise in inches over one foot or the tangent of the angle. Conversion Master can solve right triangles for you with two given values. The calculator views angle and side relationships as the bevel (tangent of the angle), run (side adjacent), rise (side opposite) and slope (hypotenuse).

BTU
The British thermal unit is the energy needed to raise the temperature of one pound of water from 60° Fahrenheit to 61° Fahrenheit.

CALCULATOR DISPLAYS
Conversion Master has six display locations in its dual display windows. Various user information is displayed in these windows based on the calculator mode and function keys used. See Display locations

CALENDAR YEAR
The conventional calendar year of 365 days can be used in rough calculations only; the modern calendar is based on the Gregorian year of 365.2425 mean solar days, the value chosen by Pope Gregory XIII in 1582. This value requires that a leap-year day be introduced every four years as February 29, except that centennial years (1900, 2000, etc...) are leap years only when divisible by 400. The remaining difference between the Gregorian year and the tropical year introduces an error of 1 day in 3300 years.

CALORIE
The calorie (**cal**) is the amount of energy needed to raise the temperature of one gram of water by one degree Celsius from 14.5° Celsius to 15.5° Celsius. A **Calorie** is equal to 1000 **cals**. By definition, 1 **cal** = 4.184 Joule (exactly).

CANDLEPOWER (CP)
Unit for measuring the rate at which light is emitted.

CELSIUS
Celsius is a thermometric scale on which the interval between the freezing point and the boiling point of water is divided into 100° with 0° representing the freezing

point and 100° the boiling point.

CENTIPOISE
A standard unit of viscosity, equal to 0.01 poise, the c.g.s. unit of viscosity. Water at 20ºC has a viscosity of 1.002

CONSTANTS
Numbers that have a fixed numeric value. These values are considered not to change. Conversion Master allows you to store up to 9 constant values in memory.

CONVERSION
The converting from unit of measure to another through the use of a numeric constant or formula. Feet to Meters, Liters to Gallons, Fahrenheit to Celsius etc. Conversion Master has over 3,200 conversions ready to access along with its dimensional capabilities.

COULOMB
Unit quantity of electricity--one ampere flowing of one second.

DATABASE
Collection of data organized for rapid search and retrieval. The Conversion Master database has 14 conversion categories with over 3,200 conversions.

DECIMAL
The base 10 representation of a number, or a number displayed to the right of a decimal point.

DEGREES
Used in Conversion Master to reference the 360th part of the circumference of a circle and the units of measure of heat in Fahrenheit, Celsius, Kelvin or Rankine.

DENSITY
The weight (mass) per unit volume of a substance Density = Weight / Volume.

DRAG
To hold the primary mouse button down (left button) while moving the mouse in a given direction.

DRAG AND DROP
This feature is supported within Conversion Master. From the Conversion Database Dialogs Listbox you can drag and drop conversions to user files or to the Conversion Master QuickList. This feature allows you to organize your most often used conversions for quicker

access.

DYNE

A unit of force necessary to give a mass of one gram an acceleration of one centimeter per second per second.

EDITING CONVERSIONS

Conversion Master allows you to add to and edit its conversion categories through easy to use dialogs.

EDIT MENU

The Calculator Main Display #1, Main Display #2, Conversion Table Resultant or Conversion Table Constant can be copied to the clipboard from the **Edit menu**. Any valid numeric expression can be pasted to the calculator main display.

EXAMPLES

Conversion Master has plenty of on line examples to illustrate some of the many possible uses of its features. These examples are located within the help file documentation.

EXITING THE APPLICATION

Conversion Master keeps track of the way you use the calculator and will automatically detect changes in calculator settings. Upon exiting the program, you will be prompted to update the initialization file if modifications to settings are detected.

ENERGY

The capacity for doing work and overcoming resistance.
Sample of units:

1 Btu	= 1054.35 joule
1 Calorie	= 1000 cal
1 cal	= 4.1868 joule
1 erg	= 2.3892e-7cal
1 joule	= 1e7 erg

See Btu, calorie, erg and joule

ERG

The amount of energy needed to move one gram through one centimeter with an acceleration of one centimeter per second per second.

EXPONENTS

Numbers	Powers of ten	Prefixes	Symbols
1,000,000,000,000	10e12	*tera*	T
1,000,000,000	10e9	*giga*	G
1,000,000	10e6	*mega*	M
1,000	10e3	*kilo*	k
100	10e2	*hecto*	h
10	10	*deka*	da
.1	10e-1	*deci*	d
.01	10e-2	*centi*	c
.001	10e-3	*milli*	m
.000001	10e-6	*micro*	u
.000000001	10e-9	*nano*	n
.000000000001	10e-12	*pico*	p
.000000000000001	10e-15	*femto*	f
.00000000000000000 1	10e-18	*atto*	a

FAHRENHEIT

Fahrenheit is a temperature scale still widely used in Britain and the United States (although seldom in scientific work), in which the melting point of ice is specified as 32° and the normal boiling point of water 212°.

FARADAY

Unit quantity of electricity equal to 96,500 coulombs.

FEET INCHES & SIXTEENTHS

This is one of three input modes supported by Conversion Master. In this mode digits are entered into the second display. The keystroke sequence 1 2 10 15 (four keystrokes) would produce 12' - 10 15/16" (Reads twelve feet and ten fifteen sixteenth inches).

FILE MENU

Within Conversion Master this menu item allows for loading of the 14 different conversion categories in memory for the purpose performing and editing conversions. The File Menu also, allows for the backing up of the conversion database and quitting the application.

FLOW

Relates to the quantity of a substance that flows in a certain period time (i.e. Cubic feet a second, etc....).

FORCE
Related to the energy being brought to bear against a mass causing motion or change.

GRAD
A mathematical unit used to specify angular measurements. One Grad is equivalent to 1/400th of a circle.

GRAM
Basic unit of weight in the metric system.

HIDDEN DISPLAY
The secondary calculator display window can be hidden from view via the options menu selection when not in the FIS calculator mode.

HORSEPOWER
Unit to measure the power developed by machines; 1hp = 33,000 ft-lb/min or 550 ft-lb/sec.

INITIALIZATION FILE
A file used by most commercial windows applications. An initialization file contains information needed by a program for proper startup. These files usually end with the file extension of (.ini).

JOULE
The amount of energy needed to move a mass of one kilogram through one meter with an acceleration of one meter per second per second. The joule has been adopted internationally as the unit of mechanical, electrical, and thermal energy.

JUMP
Text and/or Graphics (hot spot) within a help file that link to other topics or to more information about the current topic

KELVIN
Kelvin, or absolute temperature scale is defined so that 0° K is absolute zero, the coldest theoretical temperature (-273.15°C / -459.67°F), at which the energy of motion of molecules is zero. Each absolute degree is equivalent to a Celsius degree, so that the freezing point of water (0°C / 32°F) is 273.15° K, and its boiling point (100°C / 212°F) is 100° higher, or

373.15°K.

KILOWATT
Unit of electrical energy; equal to 1,000W.

LENGTH AND DISTANCE
Lengths and distances are measured from one point to another, usually along a straight line. Length usually refers to the measurement of an object. Distance usually refers to the measurement of the space between two places.

Sample of customary and metric units for length and distance.

Customary	Metric	Metric	Customary
1 inch	2.54 cm	1 nanometer	0.00000003937 in.
1 foot	30.48 cm	1 micron	0.00003937in.
1 yard	0.9144 m	1 millimeter	0.03937 in.
1 rod	5.0292 m	1 centimeter	0.3937 in.
1 furlong	201.168 m	1 decimeter	3.3937 in.
1 mile	1.609344 km	1 meter	39.37 in.
		1 dekameter	393.7 in.
		1 hectometer	328.0833 ft.
		1 kilometer	0.62137 mi.

LUNAR MONTH
The interval from one new moon to the next, equal to about 29.5 days.

LUNAR YEAR
A period of 12 lunar months.

MASS
Quantity of matter contained in an object.

MATTER
That which has mass and occupies space.

MEAN SOLAR TIME
Time that is based on the motion of the mean sun and that has the mean solar second as its unit -- called also *mean time*.

MEAN SUN
A fictitious sun used for time keeping that moves uniformly along the celestial equator and maintains constant rate of apparent motion.

METER
The basic unit of length in the metric system.

METRIC SYSTEM

System of measurements based on multiples of 10.

NAUTICAL MILE

A unit of linear measure for ships and aircraft, equal to 6,076 feet. Also, called the geographical mile.

NUMLOCK INDICATOR

An indicator just above the Clear key within Conversion Master. It shows the active state of the keyboard NumLock key. The NumLocks must be on to use the Keyboard Interface.

OHM

Unit used to measure the amount of resistance to the flow of electricity.

OPTIONS

Conversion Master comes with many options. Most of these options are set and accessed through the Option Menu. See the Options Menu

POWER AND WORK

Power is a measure of the amount of energy spent over a certain period of time. **Work** is the transference of energy from one body to another resulting in the motion or displacement of the body acted upon.

1 horsepower	= 745.7 watt
1 horsepower (metric)	= 735.499 watt
1 watt	= 0.00134102 horsepower
1 kilowatt	= 1000 watt

PRESSURE

In physics, pressure is force measured in terms of its distribution over an area of opposing force. This is expressed as force divided by unit area of the surface area to which the force is applied. Pressure usually refers to a force exerted uniformly in all directions. Absolute pressure is pressure measured with respect to zero pressure. Gauge pressure is pressure measured with respect to air pressure (the weight of one atmosphere).

Some of the common units are inches of mercury (in of Hg), centimeters of mercury (cm of Hg), pounds per square inch (psi), atmospheres (atm), Pascals (Pa), kilopascals (kPa), bars, millibars (mbars), and microbars (dynes).

1 atm	= 14.69595 psi
	= 29.92126 in. of mercury
	= 76 cm of mercury
	= 101.325 kPa
	= 1013.25 mbars

1 Pa = 1 Newton per sq. meter
1 mbar = 1000 dynes per sq. cm

QUICKLIST

The Conversion Master **QuickList** helps you keep track of your most often used conversions. The QuickList listbox will hold up to 50 conversions. The last conversion you perform or the last item you drop on the QuickList target icon will appear at the top of the QuickList listbox. If more than 50 conversions are added into the QuickList the last conversion in the listbox will drop off the bottom of the list.

RADIAN

A unit of plane angular measurement that is equal to the angle at the center of a circle subtended by an arc equal in length to the radius.
(1 rad = $1/2\pi$ of a circle or 57.296°)

RANKINE

The Rankine scale relates to an absolute temperature scale on which the unit of measurement equals a Fahrenheit degree and on which the freezing point of water is 491.67° and the boiling point is 671.67°.

RUN

The amount of run of a right triangle (i.e side adjacent). Conversion Master can solve right triangles for you with two given values. The calculator views angle and side relationships as the bevel (tangent of the angle), run (side adjacent), rise (side opposite) and slope (hypotenuse).

RISE

The amount of rise of a right triangle (i.e side opposite). Conversion Master can solve right triangles for you with two given values. The calculator views angle and side relationships as the bevel (tangent of the angle), run (side adjacent), rise (side opposite) and slope (hypotenuse).

SIDEREAL YEAR

The sidereal year is the interval in which the earth completes one revolution in its orbit around the sun measured with respect to the fixed stars.

SLOPE

The amount of slope of a right triangle (i.e hypotenuse). Conversion Master can solve right triangles for you with two given values. The calculator views angle and side

relationships as the bevel (tangent of the angle), run (side adjacent), rise (side opposite) and slope (hypotenuse).

SPECIFIC GRAVITY

(also specific weight)--The ratio of the mass of a body to the mass of an equal volume of water at 4ºC or other specified temperature.

STATUE MILE

A unit of linear measure used in the U.S. and Great Britain, equal to about 5,280 feet.

STATCOULOMB

A unit of electric charge in the metric system.

3×10^9 statcoulombs = 1 coulomb.

STOKE

See Viscosity

STOKES LAW

Gives the rate of fall of a small sphere in viscous fluid. When a small sphere falls under the action of gravity through a viscous medium it ultimately acquires a constant velocity,

$$V = \frac{2ga^2(d_1 - d_2)}{9\eta}$$

where *a* is the radius of the sphere, *d* the densities of the sphere and the medium respectively, and η the coefficient of viscosity. *V* will be in cm per sec if *g* is in cm per sec², *a* in cm, *d* in *g* per cm³ and η in dyne-sec per cm² or poises.

TIME

The measured or measurable period during which an action, process, or condition exists or continues.

second	= 1000 milliseconds
minute	= 60 seconds
hour	= 60 minutes
day	= 24 hours
week	= 7 days
year	= 12 months
century	= 100 years
millennium	= 1000 years

solar year	= 365d, 5hr, 48min, 45.51sec
astronomical year	= 365d, 5hr, 48min, 45.51sec
sidereal year	= 366d, 6hr, 9min, 9sec
lunar year	= 360d
leap year	= 366d

TROPICAL YEAR

The tropical year is the interval between successive vernal equinoxes and has been defined by the International Astronomical Union for noon of January 1, 1900 as 31,556,925.9747 seconds = 365.24219879 mean solar days. The tropical year decreases by approximately 5.3 milliseconds per year.

TROY WEIGHT

System weights for gold, silver, gem, etc... in which:

Pennyweigh t	= 24 grains
ounce	= 20 pennyweights
pound	= 12 Ounces
pound	= 480 grams

UNIT

Specific magnitude of a quantity, set apart by appropriate definition, which is to serve as a basis of comparison or measurement for other quantities of the same nature.

VELOCITY

Time rate of motion in a fixed. direction. C.g.s. units,--one centimeter per second.

Dimensions, $[m\ l^{-1}\ t^{-1}]$.

If *s* is space passed over in time *t*, the velocity,

$$v = \frac{s}{t}$$

VISCOSITY

Resistance to the flow of a liquid. All fluids possess a definite resistance to change of form and many solids show a gradual yielding to forces tending to change their form . This property, a sort of internal friction, is called viscosity; it is expressed in dyne-seconds per cm² or poises.

Dimensions, $[m\ l^{-1}\ t^{-1}]$.

If the tangential force per unit area, exerted by a layer of fluid upon one adjacent is one dyne for a space rate of variation of the tangential velocity of unity, the viscosity is one poise.

Kinematic viscosity is the ratio of viscosity to density. The c.g.s. unit of kenematic viscosity is the stoke.

Flow of liquids through a tube; where *l* is the length of the tube, *r* its radius, *p* the difference of pressure at the ends, η the coefficient of viscosity, the volume escaping per second,

$$v = \frac{p\pi r^4}{8\eta l}$$ (Poiseuille).

The volume will be given in cm³ per second if *l* and *r* are in cm, *p* in dynes per cm² and η in poises or dyne-seconds per cm².

VOLT

Electrical pressure to make current of one ampere flow through a resistance of one ohm.

VOLUME AND CAPACITY

Volume refers to the amount of space occupied by an object. **Capacity** is the amount of a substance that a container can hold. **Volume** and **capacity** are both measured in cubic units. Cubic units combine length, width, and depth.

The names of many common cubic units, such as liter and quart, do not include the word cubic.

Sample of customary and metric units for volume and capacity.

Customary	Metric	Metric	Customary
1 pint	473.1632 ml	1 kiloliter	264.1794 gal.
1 cubic inch	16.387064 cm^3	1 milliliter	0.06102545 cu. in.
1 cubic foot	0.028316847 m^3	1 centiliter	0.6102545 cu. in.
1 cubic yard	0.7646 m^3	1 liter	61.02545 cu. in.

WATT

Unit used to express electrical power; power (watts) = volts X amperes.

WINDOW

The framed area in which you can run an application to perform certain tasks. Application windows can be opened, closed, resized and moved.

WINDOW FRAME

The four sides of a window that define its borders.

WEIGHT AND MASS

Weight is the heaviness or attraction of a material body by gravitational pull toward the center of the earth. **Mass** is the quantity of matter in a body as measured in its relation to inertia. The customary system measures the weight of various materials. The metric system measures mass (amount of material something contains). An object's mass does not change, but its weight decreases with altitude. These two measurement units are equal at sea level on the earth.

Sample of customary and metric units for weight and mass.

Customary	Metric	Metric	Customary
1 grain	0.06479891 g	1 milligram	0.015432358 gr.
1 ounce	28.349523 g	1 centigram	0.15432358 gr.
1 pound	0.45359237 kg	1 gram	15.432358 gr.
1 ton	0.90718474 t	1 kilogram	2.2046226 lb.
		1 metric ton	2,204.6226 lb.

WORK

When a force acts against resistance to produce motion in a body the force is said to do work. Work is measured by the product of the force acting and the distance moved through against the resistance. C.g.s. units of work,-- the erg, a force of one dyne acting through a distance of one centimeter.

The joule is 1×10^7 ergs.

Dimensions $[m\ l^2\ t^{-2}]$.

The foot-pound is the work required to raise a mass of one pound a vertical distance of one foot where $g = 32.174$ ft./sec². The foot-poundal is the work done by a force of one poundal acting through a distance of one foot. The International joule, a unit of electrical energy, is the work expended per second by a current of one International ampere flowing through one International ohm. The kilowatt-hour is the total amount of energy developed in one hour by a power of one kilowatt.

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A

Abbreviations
AB
Abcoulomb
Abvolt
Absolute Temperature
Absolute Zero
Accelerator Keys
Active Window
Angle
Angstrom Unit
Apothecaries measure
Apothecaries' weight
Application
Area
Avoirdupois weight

B

Backup
Bar
Bevel
Browse
Btu

C

Calendar year
Calculator Displays

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

- Velocity
- Viscosity
- Volt
- Volume & Capacity

W X Y Z

- Watt
- Weight & Mass
- Window
- Window frame
- Work

PROGRAM OVERVIEW

Conversion Master Order Form

THE CONVERSION MASTER ENGINEERING CALCULATOR VERSION 3.5

Thank you for purchasing the Conversion Master Engineering Calculator, the most powerful dimensional and conversion calculator you will find for your computer. By far it is the most useful and versatile calculator you can own and at a price that any household can afford. The Conversion Master has a comprehensive help file system loaded with examples, how tos and explanations to get you up to speed quickly on its potential.

The Conversion Master will accept input in Degree Minute & Seconds, Decimal, Meters or Feet-Inches-Sixteenths format. Conversion Master can convert between Decimal, Feet-Inches-Sixteenths and Meters at the click of a button! You can input data in any format then change to a different format in the middle of an operation. Conversion Master can solve right or oblique triangles discerningly! Conversion Master has over 3200 different unit conversions built in. Conversion Master gives you the ability to add your own conversions if you cant find the conversions you need in its database. Conversion Master will remember the last 50 conversions used in its QuickList for easy recall. Conversion Master will also perform temperature conversions displaying results in Fahrenheit, Celsius, Kelvin & Rankine all concurrently. When exiting Conversion Master all of your entered data is retained. When you return your data is just as you left it.

Dimensional calculations can be performed without the need of charts or tables, thereby increasing accuracy and production. The Conversion Master also gives the user the ability to define his own conversion tables to accomplish almost every conversion imaginable.

The Conversion Master allows access to more information at one time than any other calculator through its use of Dual Displays which can utilize any of its six display blocks. For example, when working with Degrees, the Conversion Master will display Degrees-Minutes-Seconds, Decimal of Degrees, Radians and Grads all concurrently. In the Feet Inches Sixteenths input mode, the Conversion Master will continue giving the input value in Decimal of Feet, Decimal of Inches and Feet Inches Sixteenths in three of its display block areas. When solving right triangles the Conversion Master will simultaneously display the Bevel, Run, Rise, Slope and the angle in Degrees, Minutes and Seconds when any of two values are known.

Although the Conversion Master is designed as a dimensional calculator, it can also be used as a standard calculator. The second display can be hidden from view while working in the Meter and Decimal modes through the options menu. The second display will automatically reactivate when in the Feet Inches Sixteenths mode, Degree Minute Seconds mode or when a right triangle is solved.

The Conversion Master has four basic input modes

- Feet-Inches-Sixteenths Mode (**FIS** key)
- Decimal Mode (**DEC** key)
- Metric Mode (**MET** key)
- Degrees Minutes & Seconds Mode (**DMS** key

These modes can be switched at any time during or before entering operators or operands.

The Conversion Master has a uniquely designed key pad layout that makes dimensional calculations easy. Unlike a standard calculator the numeric keys are numbered from 0-15. The extended numeric keys (10-15) allow Inches and Sixteenths input with a single keystroke.

The Conversion Master Calculator will be extremely useful to anyone working in the Construction Industry.

Contractors - Engineers - Architects - Draftsmen - Detailers - Carpenters - Fitters - Fabricators - Surveyors and anyone linked to the Building and Construction Trades Industry .

The Conversion Master will save you time and money and prevent costly mistakes.

RELEASE HISTORY

- **FIRST RELEASE** (Version 1.0 Beta/Evaluation Copy)

- **SECOND RELEASE** (Version 1.1 Beta/Evaluation Copy)

  Improvements:

  Help file enhanced

  Conversions Categorized

  Over 2000 conversions added

  Feet, Inches and Sixteenths display added in MET mode

- **THIRD RELEASE** (Version 2.0 Beta/Evaluation Copy)

  Fixes:

  Fixed some minor problems with the help file:

  Help file was improperly called when the math category radio button was clicked and then the F1 key was pushed.

  Some of the help file popups were not displayed properly.

  Fixed the problem of the Perform Conversions button on the Conversion Categories dialog. This button sometime would hide itself from view before the Perform Conversions dialog was activated.

  Improvements:

  Several useful formulas were put on-line in the help file system

- **FOURTH RELEASE (VERSION 2.01)**

  Fixes:

  Fixed random problem with the reoccurring nag screen.

- **FIFTH RELEASE (VERSION 3.0)**

  Improvements:

  Temperature Conversions added

  QuickList added for easy tracking of conversions (remembers last 50 conversions)

  A more intuitive interface (User interface greatly enhanced)

  Drag and drop features added to the Conversion Dialog

  Task sensitive PopUp Menus added

  Two user conversion file categories added (build your own table)

  New smart tracking brings you back to your last used conversions

  Backup ability added for your conversion tables

  Conversion Master help system greatly enhanced now much easier to navigate

  Glossary full of useful information added

  Fixes:

  Fixed minor problem FIS entry. If values greater than 11 inches were

entered they were incorrectly shifted to the feet position. The Calculator still correctly converted the value when this happened.

- **SIXTH RELEASE (VERSION 3.0a)**

  Fixes:

  Fixed Conversion Masters QuickList - it incorrectly multiplied conversion factors when division was indicated.

  Made minor corrections to the online help system (mostly spelling)

- **SEVENTH RELEASE (VERSION 3.5)**

  Fixes:

  Fixed problem the EE key when entering negative exponents with negative values

  Improvements:

  Added feature allows for inputting Degrees, Minutes & Seconds.

  Conversion Master remembers all your last calculated values. Conversion Master appears just as you left when restarting the program.

  This version of Conversion Master (3.5) accepts a comma as decimal separator in foreign countries that use it. Version 3.0 would drop off the decimal portion of a numeric value in foreign countries that use a comma as their decimal separator

  CM now has the ability to solve oblique triangles using its Oblique Solver. This is a nice addition to the calculator which already has the ability to solve right triangles. The Oblique Solver automatically solves an oblique triangle when any three values are known; calculating all unknown sides & angles of the triangle along with its area. The Oblique Solver will detect ambiguous cases where there may be no triangle at all for the input data or there may actually be two triangles that satisfy the input data. Its intellisense input buttons serve as flags to the user showing what values were input, what areas are available for input and which were calculated.

  More popups have been added to speed calculations. Left mouse click over the RCL key invokes popup menu for recall of all stored values. Left mouse click over the STO key invokes popup menu for storage location input. Right mouse click over the decimal point button brings up popup menu for accuracy settings

  Help documentation expanded and enhanced. CM gives you a graphical walkthrough of its features along with many examples on solving practical problems.

LOOKING FORWARD

- Ideas for future releases (Give me yours)

KNOWN BUGS & LIMITATIONS VERSION 3.5

- I need your feedback on this one. If the program does not operate as described in the help file or if you think you have located a bug please contact me. Before contacting, take time to reproduce the problem and then document it.

- Although care was taken in creating the conversion tables that come with Conversion Master there is always a possibility of human error. In beta version 1.1, conversions were placed into categories to enable easier access. Please report any inconsistencies with regard to category placement and conversion inaccuracies.

- The maximum number of conversion table entries per category is 650.

- This version of Conversion Master (3.5) has corrected the decimal point problem of version 3.0. That version would drop off the decimal portion of a numeric value in foreign countries that use a comma as their decimal separator.

- A large portion of Conversion Masters source code has been touched in this upgrade. As a result new bugs could have been introduced. I have done my utmost to eliminate all of them through extensive testing but there is always that chance I could have missed one. Please let me know if you think the software is not functioning as documented.

- A few people (less than .005%) have reported problems with the setup program. I have not received enough information to isolate this but seems to be possibly a hardware problem.

- Ive heard very little feedback on any problems with previous versions which would indicate to me that all is going well. If you have a problem please report it because chances are someone else may have had the same problem. This will enable me to diagnose the problem and find a solution. By contacting me when problems arise I can possibly help you and the knowledge I gain can be used to help others.

Contact me directly at: Roger L. Moseby
11802 E. 79th N.
Owasso Ok. 74055

Other contact points:
CompuServe: 73144,1744
InterNet: 73144.1744@Compuserve.com
Voice & Fax: (918)-2725572

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Conversion Master Order Form

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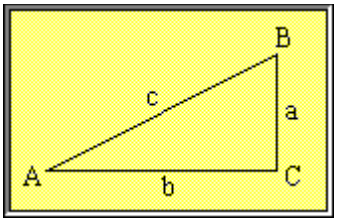
COMMENTS ON CONVERSION MASTER

If you have any questions, criticisms or ideas for future updates, give me your input. Contact me at:

Fax	(918) 272-5572
Voice	(918) 272-5572
CompuServe	73144,1744
InterNet	73144,1744@CompuServe.com

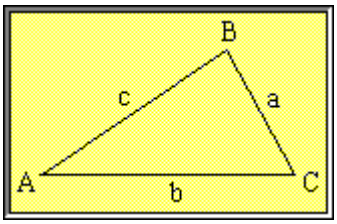
FORMULAS FOR SOLVING RIGHT TRIANGLES



Required angle or side

Known	A	B	a	b	c	Area
a,b	–	–	_____	_____	√	–
a,c	–	–	_____	√	_____	√
A,a	_____		_____		–	_____
A,b	_____			_____	–	_____
A,c	_____				_____	_____

- # FORMULAS FOR SOLVING OBLIQUE TRIANGLES

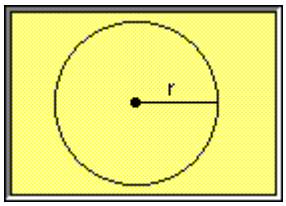
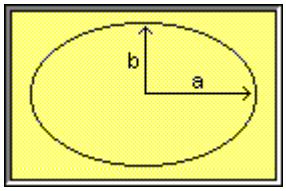
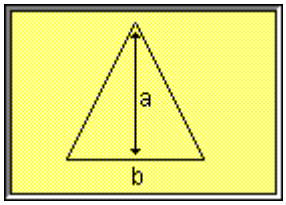
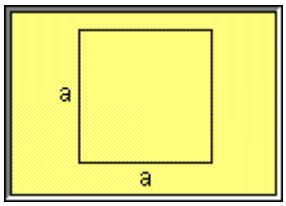
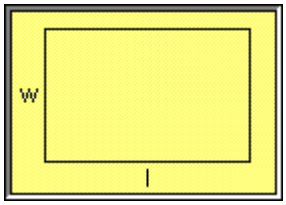


Required angle or side

Known	A	B	C	b	c
a,b,c	– √	– √	– √	_____	_____
a,A,B	_____	_____		–	–
a,b,A	_____	_____	_____	_____	_____

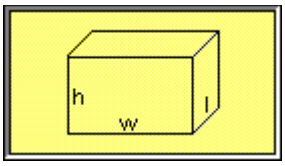
a,b,C

- # FORMULAS FOR PLANE FIGURES

Plane Figures	Area
 *Circle*	area = πr^2 circumference = $2\pi r$
 *Ellipse*	area = πab
 *Triangle*	area = $\frac{1}{2}ab$
 *Square*	area = a^2
 *Rectangle*	area = lw

- # FORMULAS FOR SHAPED FIGURES

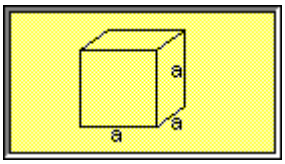
Shaped Figures	(Surface) Area	Volume



Rectangular Prism

$l \cdot w \cdot h$

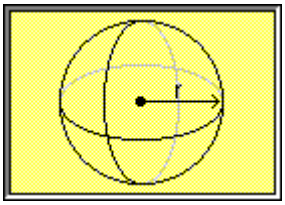
$2hw + 2hl + 2lw$



Cube

$6a^2$

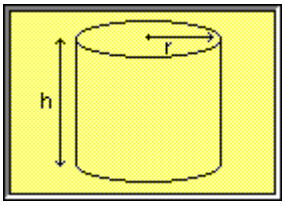
a^3



Sphere

$4\pi r^2$

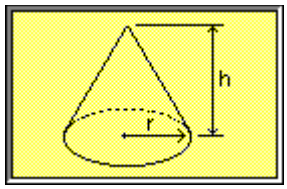
$\frac{4}{3}\pi r^3$



Cylinder

$2\pi rh + 2\pi r^2$

$\pi r^2 h$



Cone

$$\frac{\pi r^2 h}{3}$$

$$\pi r\sqrt{r^2 + h^2}$$

(πr^2 if you add the base)