

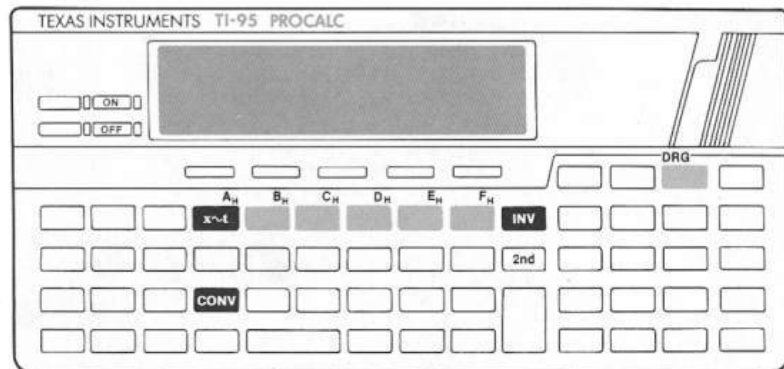
Chapter 4: Conversions

This chapter shows you how to use the calculator's built-in conversion functions. You can perform metric, degree format, angle, polar/rectangular, and base number conversions. By changing the base number mode, you can also perform calculations with octal or hexadecimal numbers.

Table of Contents	Location of the Conversion Keys	4-2
	Using the CONV Key	4-3
	Metric Conversions	4-4
	Degree Format Conversions	4-6
	Angle Conversions	4-8
	Polar/Rectangular Conversions	4-10
	Base Conversions	4-12

Location of the Conversion Keys

The keys used to perform conversions are shown in the figure below. Familiarize yourself with these keys and their location on the keyboard.



Using the **CONV** Key

To perform the conversions described in this chapter, you must begin by pressing the **CONV** key to display the CONVERSIONS menu. Pressing **CONV** redefines the function keys and enables you to select from a variety of conversions.

The Conversions Menu

When you press **CONV**, the **CONVERSIONS** menu is displayed.

CONVERSIONS
MET DMS ANG P-R BAS

- <MET> Metric conversions
- <DMS> Degrees/minutes/seconds to decimal degrees conversions
- INV** <DMS> Decimal degrees to degrees/minutes/seconds conversions
- <ANG> Angle conversions
- <P-R> Polar to rectangular conversions
- INV** <P-R> Rectangular to polar conversions
- <BAS> Base conversions

Metric Conversions

Selecting <MET> from the CONVERSIONS menu displays another menu that enables you to select the type of metric conversion you want to perform. You can convert from English to metric units or (by using the **INV** key) from metric to English units.

Using Metric Conversions

To perform metric conversions:

1. Press **CONV** to display the CONVERSIONS menu.
2. Press <MET> to display the menu for metric conversions.

METRIC
F-C G-L #-K i-m f-M

3. Enter the number you want to convert.
4. Press the appropriate key sequence listed below. The converted value then appears in the display.

<F-C> Fahrenheit to Celsius

INV <F-C> Celsius to Fahrenheit

<G-L> Gallons to liters

INV <G-L> Liters to gallons

<#-K> Pounds to kilograms

INV <#-K> Kilograms to pounds

<i-m> Inches to millimeters

INV <i-m> Millimeters to inches

<f-M> Feet to meters

INV <f-M> Meters to feet

Example

Convert 212° Fahrenheit to Celsius, 284 pounds to kilograms, and 1000 meters to feet.

Procedure	Press	Display
Clear Display	CONV	0.
Select Conversions menu	CONV	CONVERSIONS
Select Metric menu	<MET>	METRIC
Celsius equivalent of 212° F	212 <F-C>	C = 100.
Number of kilograms in 284 pounds	284 <#-K>	K = 128.8202331
Number of feet in 1000 meters	1000 INV <f-M>	ft = 3280.839895

Degree Format Conversions

Selecting <DMS> from the CONVERSIONS menu converts the degree format of the angle in the display to decimal degrees. When angles are measured in degrees/minutes/seconds, you must convert the angles to decimal degrees before you can add them or use them in trigonometric calculations. (This also applies to hours/minutes/seconds versus decimal hours.)

DMS Format In the degrees/minutes/seconds (DMS) format, an angle is expressed as D.MMSSssss.

Diagram illustrating the DMS format: D . M M S S s s s s
 Integer degrees (°) ——— D
 Minutes (') ——— M M
 Seconds (") ——— S S
 Fractional part of a second ——— s s s s

When you enter minutes and seconds, remember to include zeros where needed to place the digits in the proper positions. You do not need to enter trailing zeros. For example, the angle $9^{\circ} 7' 5''$ is entered as 9.0705.

Decimal Degrees Format In the decimal degrees format, an angle is expressed as D.dddddddd.

Diagram illustrating the Decimal Degrees format: D . d d d d d d d d
 Integer degrees ——— D
 Fractional part of a degree ——— d d d d d d d d

You do not need to enter trailing zeros.

Converting Between the Formats

To perform degree format conversions, follow these steps. (Although these angles are expressed in degrees, the calculator does not have to be in the degree mode when you perform the conversions.)

1. Press **[CONV]** to display the **CONVERSIONS** menu.
2. Enter the angle you want to convert.
3. Press the appropriate key sequence listed below. The converted value then appears in the display.

Conversion	Key Sequence
DMS to decimal degrees	<DMS>
Decimal degrees to DMS	[INV] <DMS>

Example 1

Calculate the sum of the angles $42^{\circ} 6' 59.5''$ and $101^{\circ} 54' 0.8''$. Before adding the angles, convert them to decimal degrees. Convert the result back to DMS format.

Procedure	Press	Display
Clear display	[CLEAR]	0.
Select Conversions menu	[CONV]	CONVERSIONS
Enter angle and convert to decimal	42.06595 <DMS>	D.d = 42.11652778
Add other angle after converting to decimal	[+] 101.54008 <DMS>	D.d = 101.9002222
Calculate result	[=]	144.01675
Display result in DMS	[INV] <DMS>	DMS = 144.01003

The result is $144^{\circ} 1' 0.3''$.

Example 2

Calculate $\cos 27^{\circ} 50' 16.2''$. Because you are using a trigonometric function, the calculator must be in the degree mode.

Procedure	Press	Display
Clear display	[CLEAR]	0.
Select Conversions menu	[CONV]	CONVERSIONS
Select degree mode	[INV] [2nd] [DRG]	DEG MODE
Enter angle and convert to decimal	27.50162 <DMS>	D.d = 27.83783333
Calculate cosine	[COS]	.8842728197

Angle Conversions

Selecting <ANG> from the CONVERSIONS menu displays another menu that enables you to select the type of angle conversion you want to perform. You can convert an angle in degrees, radians, or grads to its equivalent angle in any of the other units. Unlike $\boxed{2nd}$ [DRG], these conversions do not affect the current setting of the calculator's angle mode.

Using Angle Conversions

To perform angle conversions:

1. Press \boxed{CONV} to display the **CONVERSIONS** menu.
2. Press <ANG> to display the menu for angle conversions.

ANGULAR
D-R D-G R-G

3. Enter the angle you want to convert.
4. Press the appropriate key sequence listed below. The converted value then appears in the display.

<D-R> Degrees to radians

\boxed{INV} <D-R> Radians to degrees

<D-G> Degrees to grads

\boxed{INV} <D-G> Grads to degrees

<R-G> Radians to grads

\boxed{INV} <R-G> Grads to radians

Example

Convert 90° to radians, grads, and then back to degrees.

Procedure	Press	Display
Clear display	\boxed{CLEAR}	0.
Select Conversions menu	\boxed{CONV}	CONVERSIONS
Select angle conversions	<ANG>	ANGULAR
Degrees to radians	90 <D-R>	Rad = 1.570796327
Radians to grads	<R-G>	Grd = 100.
Grads to degrees	\boxed{INV} <D-G>	Deg = 90.

Polar/Rectangular Conversions

Selecting <P-R> from the CONVERSIONS menu performs polar/rectangular conversions. You can convert a pair of coordinates from the polar coordinate system to the rectangular coordinate system or vice versa. The t-register is used to store one of the two coordinates required for the conversion.

Polar to Rectangular Conversions

To convert from polar (r, θ) to rectangular (x, y) coordinates:

1. Press **CONV** to display the **CONVERSIONS** menu.
2. Use **2nd** **[DRG]** to select the correct angle mode (degree, radian, or grad).
3. Enter the r-coordinate and press **$x \rightarrow t$** to store it in the t-register.
4. Enter the θ -coordinate.
5. Press <P-R> to display the y-coordinate.
6. Press **$x \rightarrow t$** to display the x-coordinate.

Until you enter another number into the display, pressing **$x \rightarrow t$** alternates between the x- and y- coordinates.

Rectangular to Polar Conversions

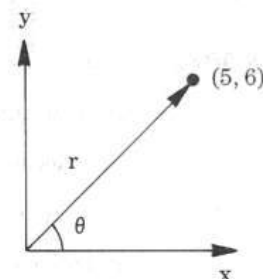
To convert from rectangular (x, y) to polar (r, θ) coordinates:

1. Press **CONV** to display the **CONVERSIONS** menu.
2. Use **2nd** **[DRG]** to select the correct angle mode (degree, radian, or grad).
3. Enter the x-coordinate and press **$x \rightarrow t$** to store it in the t-register.
4. Enter the y-coordinate.
5. Press **INV** <P-R> to display the θ -coordinate.
6. Press **$x \rightarrow t$** to display the r- coordinate.

Until you enter another number into the display, pressing **$x \rightarrow t$** alternates between the r- and θ -coordinates.

Example

Convert the rectangular coordinates $(x = 5, y = 6)$ to polar coordinates.



Procedure	Press	Display
Clear display	CLEAR	0.
Select Conversions menu	CONV	CONVERSIONS
Select degree mode	INV 2nd [DRG]	DEG MODE
Enter x and y	5 $x \rightarrow t$ 6	6
Display θ -coordinate	INV <P-R>	Ang = 50.19442891
Display r-coordinate	$x \rightarrow t$	7.810249676

The rectangular coordinates $(5, 6)$ convert to the polar coordinates $(7.810249676, 50.19442891^\circ)$.

Selecting <BAS> from the CONVERSIONS menu displays another menu that enables you to change the number base used for display. Like the other conversions, <BAS> lets you convert the number in the display. However, after you select one of the base number modes, the calculator displays all results in the selected base.

Using Base Conversions

When you select <BAS> from the CONVERSIONS menu, the following selections are displayed.

BASE CONVERSIONS
DEC HEX OCT 2sC UNF

- <DEC> Decimal number base
- <HEX> Hexadecimal number base
- <OCT> Octal number base
- <2sC> Two's complement notation
- [INV]** <2sC> Signed notation
- <UNF> Unformatted mode

These selections are described on the following pages.

Decimal (Base 10)

Pressing <DEC> converts the displayed number to its decimal equivalent and places the calculator in the decimal mode. (The calculator is in the decimal mode when you first turn it on. You only need to press <DEC> if you have previously pressed <HEX>, <OCT>, or <UNF>.)

The digits 0–9 may be entered in the decimal mode.

Hexadecimal (Base 16)

Pressing <HEX> converts the displayed number to its hexadecimal equivalent, places the calculator in the hexadecimal mode, and lights the **HEX** status indicator in the display.

The digits 0–9 and the letters A–F may be entered in the hexadecimal mode. In hexadecimal mode, special second functions, labeled A_H – F_H , are used instead of the alpha characters A–F for number entries.

Octal (Base 8)

Pressing <OCT> converts the displayed number to its octal equivalent, places the calculator in the octal mode, and lights the **OCT** status indicator in the display.

The digits 0–7 may be entered in the octal mode.

Hexadecimal and Octal Accuracy

The following rules apply to the calculation accuracy of number conversions.

- ▶ The conversion to hexadecimal or octal is made on the rounded integer value of the number entered in decimal mode. This rounding does not affect internal accuracy.
- ▶ A value you enter in the hexadecimal or octal mode must be an integer and not exceed 10 digits.
- ▶ Hexadecimal and octal numbers that are out of range of the display format appear as *****.
- ▶ Hexadecimal and octal results are maintained to 13 decimal digits internally.

(continued)

Two's Complement and Signed Notation

In the hexadecimal and octal modes, you can select how negative numbers are displayed and entered.

- ▶ Pressing <2sC> causes numbers to be displayed in two's complement notation. In this notation, the most significant bit is the sign bit, so the range of numbers that can be displayed in hexadecimal or octal mode is smaller. Negative numbers are displayed without a minus sign, but they can be entered as negative numbers using either of two methods. You can set the most significant bit for a negative number or press the $\boxed{+/-}$ key. If you use the $\boxed{+/-}$ key, it must be pressed after you complete the number entry. When you press the $\boxed{+/-}$ key after pressing <2sC>, the number in the display is immediately converted to its two's complement hexadecimal or octal equivalent (depending on which has been selected).
- ▶ Pressing \boxed{INV} <2sC> causes negative numbers to be displayed as the positive form preceded by a minus sign. (The calculator is in signed notation when you first turn it on. You only need to select this notation if you have previously selected two's complement.) With signed notation, you must use a minus sign when entering negative numbers. Pressing $\boxed{+/-}$ in signed notation displays (or removes) the minus sign.

Unformatted Mode

Pressing <UNF> converts the calculator to the unformatted mode, allowing you to display and enter data-register contents in internal hexadecimal form.

This mode is not convenient for numeric applications. It is useful mainly to programmers because it simplifies the entry of hexadecimal values, such as those used during I/O (input/output) operations involving certain external devices.

For information on using the unformatted mode, refer to Appendix A of the *TI-95 Programming Guide*.

Example 1

Convert the decimal number 4095.6 to its octal and hexadecimal equivalents and then back to decimal.

Procedure	Press	Display
Clear display	\boxed{CLEAR}	0.
Select Conversions menu	\boxed{CONV}	CONVERSIONS
Select base menu	<BAS>	BASE CONVERSIONS
Convert rounded integer portion to octal	4095.6 <OCT>	10000.
Convert to hexadecimal	<HEX>	1000.
Return to decimal mode	<DEC>	4095.6

Example 2

Convert the decimal number 10 to hexadecimal. Next, add FF to the number and convert the result to its two's complement. Then convert the result to its decimal equivalent.

Procedure	Press	Display
Clear display	\boxed{CLEAR}	0.
Select Conversions menu	\boxed{CONV}	CONVERSIONS
Select base menu	<BAS>	BASE CONVERSIONS
Convert to hexadecimal	10 <HEX>	A.
Add FF	$\boxed{+}$ $\boxed{2nd} \boxed{[F_H]}$ $\boxed{2nd} \boxed{[F_H]}$ $\boxed{=}$	109.
Two's complement	<2sC> $\boxed{+/-}$	FFFFFFFE7.
Decimal equivalent	<DEC>	-265.