ORION TI-36X

TALKING SCIENTIFIC CALCULATOR

Σx^2 $\sin \theta$ π σ 011001 011010

ORBIT RESEARCH

USERS MANUAL

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1. Introduction

This manual is designed to guide you in the use and care of the Orion TI-36X Talking Scientific Calculator. The Orion TI-36X is a specially designed unit, based on the popular TI-36X Solar scientific calculator. The functionality and operation of the Orion are identical in all respects to the standard TI-36X. The only difference is that additional controls and options are provided to adjust the speech output to your preference. We will first start by familiarizing you with the speech controls on the unit and then describe the math functions. You may also refer to the TI-36X Solar guidebook from Texas Instruments.

1.1   Features

Your Orion TI-36X comes with a host of advanced but user-friendly features:

- Over 127 scientific functions including one- and two- variable statistics and trigonometry
- Ergonomically designed for use by the visually impaired
- Small and light weight (pocket size, 11 oz.)
- Dimensions: 6.2 x 3.0 x 1.3 inches
- Clear, high-quality, natural speech
- Each key is spoken when pressed
- Choice of speech modes for quiet or verbose operation

- Unique learning-mode for key identification during operation
- Large, tactile, functionally zoned keys
- Repeat facility to speak display at any time
- Backspace/correction key to delete last digit
- Easy for teachers to help with - LCD display and functionality are the same as TI-36X Solar
- Volume control & earphone
- High capacity rechargeable battery for over 6 hours of continuous operation
- Battery or AC adapter operation
- Easy on/off control, auto power-off
- Protective snap cover
- Included accessories: high quality earphone for private use, AC adapter
- One year limited warranty from Orbit Research

The **scientific functions** available on the Orion TI-36X are as follows:

- 10 digits plus 2 digit exponent (-99 to +99), 12 digit internal accuracy
- One- and two-variable statistics for Linear Regression and trend line analysis
- Fraction entry, operation, and conversion to decimal. Conversion of mixed numbers to improper fractions
- Trigonometric functions in degrees, radians and grads

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- 15 levels of parentheses
- Engineering and scientific notation
- Fixed decimal capability

1.2   Conventions used in this manual

This manual references various functions of the calculator in the following manner:

Key names are enclosed in square brackets. If a function is invoked by multiple keystrokes as is the case for secondary functions of keys, it is enclosed in square brackets and the individual keys that are required to be pressed are all enclosed in round brackets. The position of the key is indicated in round brackets e.g.

(Row 2, Column 1)

Let's take the instance of the $[a^b/c]$ key below:

$[a^b/c]$ Enter Fraction. This is the primary or first function of this key.

[d/c] ([2nd][a^b/c]) Convert between mixed number and improper fraction. This is the second function of the $[a^b/c]$ key and is invoked by pressing the [2nd] and $[a^b/c]$ keys.

[F◄►D] ([3rd][a^b/c]) Fraction Exchange Decimal. This is the third function of the $[a^b/c]$ key and is invoked by pressing the [3rd] and $[a^b/c]$ keys.

Speech output is denoted by enclosing it in quotes e.g. "All Clear".

2. Getting Familiar with your ORION TI-36X Calculator

2.1 Shipping List

You should have received the following items in your Calculator package:

1. Orion TI-36X Talking Scientific Calculator
2. This Users Manual
3. A 3.5 inch floppy disk containing ASCII and Microsoft Word versions of this manual
4. Earphone
5. Battery charger (AC adapter)
6. Audio cassette tape with recorded users manual
7. Warranty Registration card

2.2 Orientation of the unit and its Controls

This section will familiarize you with the location and functions of the primary controls of your Orion TI-36X Talking Scientific Calculator.

First, open the protective snap cover. This cover fits tightly and can be opened by pressing down the upper end of the cover gently with your thumb, and pulling up on the bump at the top of the cover with your fingers. Then, place the unit on a desk or hold it in your hand such that the keypad is on top and facing you. In this position, you should be able to feel the speaker grill and four rubber feet on the bottom of the unit. Orient the unit so that the keys are located on the lower end of the unit (towards you) while the flat LCD display is at the upper end (away from you). This is the normal operating orientation for the unit.

With the unit in this position, on the left hand side of the unit, you will find the volume control thumb-wheel towards the top and the earphone socket towards the middle.

On the right hand side of the unit, towards the top you will find the power socket for inserting the battery charger (AC adapter) plug. Towards the middle of the right hand side, you will find two push-button switches. The upper button, called the LEARN/MODE button, is for entering learning-mode and to select various speech options. The lower button, called the REPEAT/OFF button, repeats the number on the display and turns the power off when pressed for more than 2 seconds.

2.3 Power supply and Charging

Your Orion TI-36X calculator has a built-in re-chargeable battery pack, which gives you the freedom of carrying the calculator and working anywhere and also relieves you from having to replace the batteries frequently.

It can also be powered by the AC adapter provided with the unit, which can be plugged into a standard 110V wall socket. The AC adapter also serves to charge the battery.

CAUTION

Do NOT use any other AC adapter with the Orion TI-36X. This can result in damage and destruction of the unit and will render the warranty void. The accessories (AC adapter/charger and earphone) supplied with the Orion TI-36X have been specially designed for use with the unit. Using the unit with any accessories other than the ones supplied by Orbit Research may result in serious damage or even destruction of the unit. Orbit Research will not be responsible for any direct, indirect or consequential damage or injury resulting from the use of such accessories.

Low battery Indication:

The unit continuously monitors the battery. When it detects a low power level, the unit will speak "Low Battery". Thereafter the unit gives beeps at regular intervals to remind you to insert the AC adapter for charging the battery. If you fail to do so, the unit gives a final warning message "Low Battery, Power

Off" and shuts down. Under these circumstances, any data in memory or on the display will be lost.

Charging:

When you hear the "Low Battery" warning, it is an indication that the batteries have become weak and need to be recharged. Plug in the battery charger (AC adapter) provided with the unit into the power-socket near the top on the right hand side of the unit. The charger can also be plugged in at any time; it will serve to top up the charge on the batteries. Ensure that the adapter is plugged into a live wall-socket when plugged into the power-jack of the unit.

Note that you can continue to use your Orion TI-36X calculator while it is being charged by the battery charger.

Please note that the batteries should be charged for at least 16 hours before using the unit for the first time.

The calculator will operate for several hours or days depending on the extent of use. The life of the battery is over 6 hours of continuous use. It is generally not necessary to change the batteries inside the unit until they have completed at least 500 charge and discharge cycles. At this point they

may become "tired" resulting in a decrease in the duration of use before they need to be recharged.

The batteries in the unit **CAN NOT BE REPLACED BY THE USER**. Please contact Orbit Research for battery replacement.

2.4   Switching on the unit

To switch ON the Orion TI-36X Talking Scientific Calculator press the ON/AC key until you hear a beep and release it immediately. The ON/AC key is located at the top-right corner of the keypad. Make sure that the volume control (described in the next section) is not at the minimum volume setting, since you will not be able to hear speech in that case. When you switch on the unit by pressing the ON/AC key you will hear the unit first give a beep and then say "Power On" after releasing the key. If you do not hear this, please charge the unit for some time and try again. To switch the unit off, press and hold the REPEAT/OFF button (the lower of the two buttons on the right hand side of the unit) for 2 seconds or more. For fast shutdown of the unit, press both the buttons – LEARN/MODE and REPEAT/OFF – simultaneously.

2.5   Volume control

Speech volume can be controlled by the volume control thumb-wheel on the left hand side of the unit. It is easier to set the volume when the unit is on since you can listen to the change. Rotate the volume control thumb-wheel counter-clockwise (with a downward motion) to increase the volume level and clockwise (with an upward motion) to decrease the volume. A high quality earphone is provided with your calculator. To use the earphone, plug the jack into the earphone socket located on the left hand side of the unit, just below the volume control. Plugging in the earphone disconnects the internal speaker and all speech is heard through the earphone to enable comfortable private use.

2.6   Learning-mode

The Orion TI-36X is equipped with a special Learning-Mode designed to help you locate keys and confirm their functionality at any time, even in the middle of a calculation. You can enter Learning-Mode at any time by pressing the LEARN/MODE button (the upper button on the right hand side of the unit) very briefly (less than 1.5 seconds). When the unit is in Learning-Mode the previous state of the calculator remains preserved, i.e. if you were in the middle of an operation, it is not interrupted and the display remains unchanged.

In Learning-Mode, every key that is pressed is spoken out to help you locate a particular key if you do not know its position. Each key pressed by itself speaks out its primary function, and when pressed in combination with various modifying keys, it speaks the secondary functions as set by the

modifying key (this will become clearer in the following sections). When you exit the Learning-Mode by briefly pressing the LEARN/MODE button again, the calculator returns to the speech and operational mode you were using before entering Learning-Mode. It also restores all preferences in use before you entered learning-mode and you can resume operation from precisely the point where you had left it.

Note that when entering Learning-Mode, the unit always reverts to the default Decimal Mode (which is the mode at power-on). If you need to locate key functions in other modes, you can easily enter those modes as described in the following sections.

The keys on the Orion TI-36X have a positive tactile feel and are designed to be sensitive for easy operation. Hence we recommend that while getting familiar with the unit, the user uses Learning-Mode to locate the position of each key sequence listed in the next section.

2.7   Orientation of Keys

The Orion TI-36X has 40 keys arranged in 8 rows and 5 columns. This section will describe the location of each of the keys. We will follow a (row, column) numbering scheme where the position of a key will be specified by its row and column with the bottom left corner key being in row 1 and column 1.

Each key can have several functions, determined by which mode the calculator is in and by the sequence of keys pressed.

When pressed by itself, each key performs its primary function depending on the calculator mode as described below. When pressed immediately after the [**2nd**] key (located in the 7th row and first column), each key performs its secondary function, again depending on the calculator mode. For example, in the Decimal Mode, [1][SIN] calculates the sine of 1, while [1][2nd][SIN] calculates the arcsine of 1. In addition, the [HYP] key, when pressed before a trigonometric function key, generates the hyperbolic equivalent of the function. The [2nd], [3rd] and [HYP] modifiers can be cancelled by pressing these keys again, upon which the unit speaks "Normal" after the key is spoken out.

The Orion TI-36X calculator can be used in six different modes viz. Decimal (the default mode at power-on), Hexadecimal, Octal, Binary, One-Variable Statistics and Two-Variable Statistics. These modes can be selected using the [**3rd**] key. The [**3rd**] key is located in the 8th row and 1st

column. The six modes can be set by pressing the [**3rd**] key followed by other keys as shown below.

Key Sequence	Calculator Mode
[3rd][EE]	Decimal mode
[3rd][X]	Binary mode
[3rd][)]	Octal mode
[3rd][(]	Hexadecimal mode
[3rd][x◄►y]	One-Variable Statistics
[3rd][Σ+]	Two-Variable Statistics

Note: Some operating features such as trigonometric functions are available only in decimal mode and statistics mode. You will hear a warning tone or the word "Error" if you attempt to use a feature that is not available.

Given below are the positions of the keys on the keypad (in row, column format), the functions that the key performs and the sequence of keys required to invoke the function. If a key has a special function in a particular mode other than the default Decimal Mode, e.g. the $[X^2]$ key gives the mean in One Variable Statistics Mode, the mode is shown in round brackets.

(Row 1, Col. 1)

[→]	Back space
[nPr] ([2nd][→])	Permutations
[nCr] ([3rd][→])	Combinations

(Row 1, Col. 2)

[0]	The digit zero
[►°F] ([2nd][0])	Celsius to Fahrenheit
[►°C] ([3rd][0])	Fahrenheit to Celsius

(Row 1, Col. 3)

[.]	Decimal point
[►oz] ([2nd][.])	Grams to Ounces avoirdupois
[►g] ([3rd][.])	Ounces avoirdupois to Grams

(Row 1, Col. 4)

[+/-]	Change Sign
[P►R] ([2nd][+/-])	Polar to Rectangular
[R►P] ([3rd][+/-])	Rectangular to Polar

(Row 1, Col. 5)

[=]	Equals key
[►DD]] ([2nd][=])	Convert to Decimal Degrees
[►DMS] ([3rd][=])	Convert to Degree, Minute, Second

(Row 2, Col. 1)

$[a^b/c]$	Enter fraction
[d/c] ([2nd]$[a^b/c]$)	Convert between mixed number and improper fraction
[F◄►D] ([3rd] $[a^b/c]$)	Fraction exchange decimal

(Row 2, Col. 2)

[1]	The digit one
[►in] ([2nd][1])	Centimeters to inches
[►cm] ([3rd][1])	Inches to centimeters

(Row 2, Col. 3)

[2]	The digit two
[►gal] ([2nd][2])	Liters to U.S. liquid gallons
[►l] ([3rd][2])	U.S. liquid gallons to liters

(Row 2, Col. 4)

[3]	The digit three
[►lb] ([2nd][3])	Kilograms to pounds
[►kg] ([3rd][3])	Pounds to kilograms

(Row 2, Col. 5)

[+]	Addition
[y'] ([2nd][+])	Predicted y value (Stat-2)
[ENG] ([3rd][+])	Engineering Notation

(Row 3, Col. 1)

[RCL]	Recall memory
[SUM] ([2nd][RCL])	Add to memory
[EXC] ([3rd][RCL])	Exchanges displayed and Memory values

(Row 3, Col. 2)

[4]	The digit four
[ITC] ([2nd][4])	Intercept (Stat-2)
[COR] ([3rd][4])	Correlation coefficient (Stat-2)

(Row 3, Col. 3)

[5]	The digit five
[SLP] ([2nd][5])	Slope (Stat-2)
[FLO] ([3rd][5])	Floating Decimal

(Row 3, Col. 4)

[6]	The digit six
[X'] ([2nd][6])	Predicted x value (Stat-2)
[SCI] ([3rd][6])	Scientific Notation

(Row 3, Col. 5)

[-]	Subtraction
[Σxy] ([2nd][-])	Sum of the xy products (Stat-2)
[NOT] ([3rd][-])	Logical NOT (HEX, OCT, BIN)

(Row 4, Col. 1)

[STO]	Store in Memory
[Σx] ([2nd][STO])	Summation X (Stat-1, Stat-2)
[AND] ([3rd][STO])	Logical AND (HEX, OCT, BIN)

(Row 4, Col. 2)

[7]	The digit seven
[Σx^2] ([2nd][7])	Sum of X square (Stat-1, Stat-2)
[OR] ([3rd][7])	Logical OR (HEX, OCT, BIN)

(Row 4, Col. 3)

[8]	The digit eight
[Σy] ([2nd][8])	Summation Y (Stat-2)
[XOR] ([3rd][8])	Logical XOR (HEX, OCT, BIN)

(Row 4, Col. 4)

[9]	The digit nine
[Σy^2] ([2nd][9])	Sum of Y square (Stat-2)
[XNOR] ([3rd][9])	Logical XNOR (HEX, OCT, BIN)

(Row 4, Col. 5)

[X]	Multiplication
[σy$_n$] ([2nd][X])	Population standard deviation (n weighting), Y values (Stat-2)
[BIN] ([3rd][X])	Binary mode

(Row 5, Col. 1)

[Σ+]	Enter data (Stat-1, Stat-2)
[Σ-] ([2nd][Σ+])	Remove data (Stat-1, Stat-2)
[STAT 2] (3rd][Σ+])	Two-Variable Statistics

(Row 5, Col. 2)

[EE]	Enter Exponent
[n] ([2nd][EE])	Number of data points (Stat-1, Stat-2)
[DEC] ([3rd][EE])	Decimal mode

(Row 5, Col. 3)

[(]	Open parenthesis
[ȳ] ([2nd][(])	Mean of Y values (Stat-2)
[HEX] ([3rd][(])	Hexadecimal mode

(Row 5, Col. 4)

[)]	Close parenthesis
[σy$_{n-1}$] ([2nd][)])	Sample standard deviation (n-1 weighting), Y values (Stat-2)
[OCT] ([3rd][)])	Octal mode

(Row 5, Col. 5)

[÷]	Division
[σxn] ([2nd][÷])	Population standard deviation (n weighting), X values (Stat-1, Stat-2)
[π] ([3rd][÷])	Pi
[G] ([3rd][CE/C])	Universal gravitation

(Row 6, Col. 1)

[x◄►y]	Exchange X and Y
[CSR] ([2nd][x◄►y])	Clears all statistical data (Stat-1, Stat-2)
[STAT 1] ([3rd] [x◄►y])	One-variable statistical mode

(Row 6, Col. 2)

[1/x]	Reciprocal
[FRQ] ([2nd][1/x])	Adds or removes multiple occurrences of a data point (Stat-1, Stat-2)
[A] ([3rd][1/x])	Hex digit A (HEX)
[h] ([3rd][CE/C][1/x])	Planck's constant

(Row 6, Col. 3)

[X^2]	Square
[x̄] ([2nd][X^2])	Mean of X values (Stat-1, Stat-2)
[B] ([3rd] [X^2])	HEX digit B (HEX)
[NA] ([3rd][CE/C][X^2])	Avogadro's number

(Row 6, Col. 4)

[√x]	Square root
[σxn-1] ([2nd] [√x])	Sample standard deviation (n-1 weighting), X values (Stat-1, Stat-2)
[C] ([3rd][√x])	HEX digit C (HEX)
[R]([3rd][CE/C] [√x])	Ideal gas constant

(Row 6, Col. 5)

[Y^X]	Universal Power
[x√y] ([2nd][Y^X])	Universal Root
[%] ([3rd][Y^X])	Percentage
[e] ([3rd][CE/C][Y^X])	Electron charge

(Row 7, Col. 1)

[2nd]	Second function key

(Row 7, Col. 2)

[SIN]	Sine
[SIN^{-1}] ([2nd][SIN])	Arcsine
[D] ([3rd][SIN])	Hex digit D (HEX)
[C] ([3rd][CE/C][SIN])	Speed of light

(Row 7, Col. 3)

[COS]	Cosine
[COS^{-1}] ([2nd][COS])	Arccosine
[E] ([3rd][COS])	Hex digit E (HEX)
[g] ([3rd][CE/C][COS])	Gravitational acceleration

(Row 7, Col. 4)

[TAN]	Tangent
[TAN^{-1}] ([2nd][TAN])	Arctangent
[F] ([3rd][TAN])	Hex digit F (HEX)
[me] ([3rd][CE/C][TAN])	Electron mass

(Row 7, Col. 5)

[CE/C]	Clear entry
[FIX] ([2nd][CE/C])	Clear FIX notation
[CONST] ([3rd][CE/C])	Constants mode

(Row 8, Col. 1)

[3rd]	Third function key

(Row 8, Col. 2)

[HYP]	Hyperbolic functions
[DRG] ([2nd][HYP])	Select Angle Unit
[DRG►] ([3rd][HYP])	Change (convert) Angle Unit

(Row 8, Col. 3)

[LOG]	Common Logarithm
[10^x] ([2nd][LOG])	10 power X
[X!] ([3rd][LOG])	Factorial

(Row 8, Col. 4)

[LN]	Natural Logarithm
[e^x] ([2nd][LN])	e power x
[$^3\sqrt{}$x] ([3rd][LN])	Cube root

(Row 8, Col. 5)

[ON/AC]	Power On/All Clear

2.8   Display of results

The display shows entries and results with a maximum of 10 significant digits, a minus sign and a two-digit exponent in scientific and engineering notations. However, the calculator uses a maximum of 12 digits internally. To present additional information about the status of the calculator, special indicators may also appear in the display.

To hear these indicators that may be displayed on the display, you should select the Speech Mode "Speak Special Functions Mode" by pressing [5] in the speech mode menu as described in later sections.

Indicator	Meaning
M	Value other than 0 in memory.
2nd	Calculator will access the 2nd function (printed on top half of the key) of next key pressed.
HYP	Calculator will access hyperbolic function of next key pressed.
BIN	Calculator is in binary number mode.
OCT	Calculator is in octal number mode.
HEX	Calculator is in hexadecimal number mode.
STAT	Calculator is in 1-variable or 2-variable statistics mode.
DEG	The angle units are set to degrees.
RAD	The angle units are set to radians.
GRAD	The angle units are set to grads.
3rd	Calculator will access 3rd function (printed above the key) of next key pressed.
x	x-coordinate of polar to rectangular conversion.

r   r-coordinate of rectangular to polar conversion.

( )   One or more open parenthesis.

2.8.1 Changing the display format

The following key sequences can be used to change the format of the display of your answers.

1. [F◄►D] ([3rd][5]), This key sequence toggles between fraction and decimal displays. It does not cancel the fixed decimal setting. Results in decimal are displayed and spoken in the following range: -9999999999 to -0.000000001, 0, 0.000000001 to 9999999999. If the result is outside this range, it is displayed and spoken out in scientific notation.

2. [SCI] ([3rd][6]), This key sequence selects the scientific notation. Each result is expressed and spoken as a mantissa and an exponent.

3. [ENG] ([3rd][+]), This key sequence selects the engineering notation. This is like scientific notation, except that all exponent values are multiples of three.

4. [EE], This key allows you to enter an exponent in scientific or engineering notation. You can enter a number as small as $\pm 1 \times 10^{-99}$ and as large as $\pm 9.999999999 \times 10^{99}$. To enter such a number

a. Enter the Mantissa. If it is negative, press the [+/-] key.
b. Press [EE]. The unit will say the mantissa with a zero exponent if you press the repeat button at this point. If you have pressed the [EE] without first entering a mantissa, the calculator restores the mantissa to 1 by default.
c. Enter the exponent. Press the [+/-] key if it is negative. If an incorrect key has been pressed, then you can simply re-enter the correct digits - the last two digits you enter are displayed and used for calculations.
d. Press [=] to enter the number. This is not essential and the number will be accepted even if any other operational key is pressed. Then, if necessary, press [SCI] ([3rd][6]) or [ENG] ([3rd][+]) to set the display and speech in the desired format.

5. [FIX] ([2nd][CE/C]), Fixed Decimal key sequence. This key sequence enables you to set the number of decimal places displayed and spoken in a result.
a. To fix the number of decimal places, press [2nd][CE/C] and then press the appropriate digit key (0-9). This will result in the

updated display being spoken to confirm the decimal places selected.

b. To undo the fixed-decimal setting, press [2nd][CE/C][.].

If a result has more than the selected number of decimal places, the displayed result is rounded. If a result has less than the selected number of decimal places, trailing zeroes are inserted.

You can transform the result of a calculation from one format to another. To convert a result, simply press the [2nd][CE/C], [3rd][5], [3rd][6] or the [3rd][+] key sequence, depending on the display format desired.

2.8.2 Converting an entered number

Enter the number. Press [=]. Then press one of the key sequences described above.

2.9   Clearing and correcting

For clearing incorrect entries and correcting them you can use either the [CE/C], [ON/AC] or the [→] key.

[CE/C] This key has the following uses:
1. To clear an incorrect numerical entry, press [CE/C] once.

2. To clear an error condition, indicated by **Error** in the display and spoken as "Error", press [CE/C] once.
3. To clear the display and all pending operations, press [CE/C] twice.

By pressing the [ON/AC] key you can reset the calculator entirely.

The [→] key deletes the last digit you entered. Pressing it repeatedly allows you to correct as many digits as you wish. The display is spoken each time you press the [→] key if numerical keys or the [FLO], [(], [)], [3rd], [HYP], [DRG], [a^b/c], [.], [+/-] or [FIX] key preceded the [→] key. Pressing the [→] key twice also causes the unit to speak out the display.

[x↔y] : Exchange X and Y. This key sequence exchanges:

1. The values of x and y in universal power and root calculations.
2. The minuend and the subtrahend in subtraction.
3. The divisor and dividend in division.
4. The constant value and the value in the display in a constant calculation.

Pressing the REPEAT/OFF button (the lower of the two buttons located on the right hand side of the

unit) briefly at any time will cause the contents of the display to be spoken.

2.10 Speech modes

Your Orion TI-36X Talking Scientific Calculator comes with a host of features that enable you to adjust the speech to your liking. There are three major speech modes and three feature modes.

2.10.1 Selecting Speech Modes

Press the LEARN/MODE button for more than two seconds until you hear "Enter speech mode menu". This indicates that the unit has entered the Speech Mode Menu, which will allow you to select/cancel various speech and feature modes. These modes are selected/cancelled by pressing digit keys while in the Speech Mode Menu, as described in the following sections.

To exit the speech mode menu, press the speech mode button again briefly. You will hear "Exit speech mode". The calculator remembers the selection(s) made by you and returns to the calculations you were performing when you first entered the speech selection mode. You may now continue normal use of the calculator.

2.10.1.1 Verbose Mode

In this speech mode, the key that is pressed is spoken followed by the contents of the screen. For example: If you have entered [4][5], the unit will say

"four", "five", "beep" (a beep indicates that the display is being spoken out), "four", "five" (which are the contents of the display).

Press the digit [1] when you are in the speech mode menu to select this speech mode and the unit will confirm by speaking "Verbose Mode".

2.10.1.2 Answer Mode

There are certain keys in your Orion TI-36X calculator that deliver the answer immediately after they have been pressed. These "Active keys" are, for instance, the [SIN], [X^2] and [LOG] keys. In the "Answer Mode", the unit speaks out the answer as soon as an active key is pressed, after announcing the key-press. Pressing an "Inactive key" such as a digit key, does not cause the display to be spoken out.

For example: If you have entered [0][COS], the unit will say "zero", "cosine", "beep" (meaning that display is being spoken out), "one" (which is the answer to cos(0)).

Press [2] when you are in speech mode menu to select this speech mode and the unit will confirm by speaking "Answer Mode". Then exit the speech mode menu by pressing ON/AC key briefly for the selection to get activated.

2.10.1.3 Quiet Mode

In this speech mode, the key pressed is always spoken but the answer is spoken only when you press the [=] ("equals") key. However, answers to some operations which are not spoken on pressing the equals key are spoken in this mode. These are: The outcome of pressing the [R►P], [P►R] and [x√y] keys, decimal equivalent of an improper fraction and the change in display due to the FIX key.

For example: If you have entered [0][COS], the unit will say "zero", "cosine". Only on pressing the [=] key, you will hear "equals" "one" (which is the answer to cos(0). Of course, the repeat button (the lower of the two buttons located on the right hand side towards the top of the unit) may be used at any time to vocalize the display.

Press [3] when you are in speech mode menu to select this speech mode and the unit will confirm by speaking "Quiet Mode".

Apart from these basic speech modes, the Orion TI-36X has additional feature modes that can be used with all speech modes.

2.10.2 Feature Modes

2.10.2.1 Descriptive mode

Pressing the [4] key once in the speech mode menu invokes this mode and causes the unit to say "Descriptive Mode". In this feature mode, the speech is spoken in a descriptive fashion. For example: 123 on the display will be spoken out as "one hundred twenty three".

Pressing the [4] key again cancels this feature and you will hear the unit speak "Simple Mode".

2.10.2.2 Special Functions mode

Pressing the [5] key once in the speech mode menu invokes this mode and causes the unit to say "Speak Special Functions". In this feature mode, you can hear the special indicators like 2nd, HYP, DEG, RAD, etc. along with the answer each time the calculator speaks out the display. Pressing the [5] key again cancels this feature mode and you will hear the unit speak "Special Symbols not Spoken".

2.10.2.3 Buffered mode / Flush mode

Pressing the [8] key once in the speech mode menu invokes this mode and causes the unit to say "NOT Flush Speech". This indicates that "Buffered Speech Mode" has been turned on. In this mode, if the user presses any key while some other key or display is being spoken out, the new key-press (and

resulting answer) will be spoken out after the ongoing speech is completed. Pressing the [8] key once again turns off the Buffered Speech Mode and any new key-press is immediately spoken out, flushing the ongoing speech. The unit confirms this mode by speaking "Flush Speech".

2.10.2.4   Default Speech Mode

When you first switch it on, the Orion TI-36X operates in Answer Mode with the following Feature Modes: Simple Mode (non-descriptive), Special Symbols Not Spoken, Flush Speech. You can return to these default settings by pressing the [6] key when in the Speech Mode Menu.

2.11 Configuration

If you do not operate the unit for a period of time, it automatically switches off after a pre-selected time period to conserve battery life. You can select this time period (called "Power-Off Time"), to suit your preference. The power-off times available are one, three and ten minutes.

To select power-off time, enter Speech Mode Menu. Press the [7] key; you will hear the unit speak "Automatic Power-Off Time Setting one minute" which means that the present setting is such that if the calculator is left unattended for one minute, it will shut down. Pressing the key [7] again will cycle the setting through three and ten minutes. Exit Speech Mode Menu and the unit will remember the power off setting. Thirty seconds before the calculator shuts down, it gives a "beep" to warn you that you may lose any data in the memory and display if the unit shuts down. You may prevent it from shutting down by pressing any key on the keypad or the REPEAT/OFF or LEARN/MODE buttons. The unit will give two "beeps" 15 seconds before shut down as a final warning, after which it will speak "Automatic Power Off" and shut down. The default power off time is three minutes.

3. Calculator Functions

3.1 Basic arithmetic functions

The [+], [-], [x], and [÷] keys perform the arithmetic operations of addition, subtraction, multiplication and division, respectively. The [=] key completes all pending operations and displays and speaks the result.

The [1/x], [x^2], [√x] and [^{3}√x] keys calculate the reciprocal, square, square root and the cube root of the displayed number, respectively. These are immediate functions (Active keys) that operate on the displayed number, and do not need a second operand.

The key sequence [%] ([3rd][y^x]) performs percentage calculations.

3.2 Number entry, editing and display

The keys [0] through [9] and [A] through [F] are used to enter digits in the display. ([A] through [F] are available only in the hexadecimal mode.) You can enter a maximum of 10 digits and a decimal point. If you attempt to enter more than 10 digits, the unit will sound a warning tone and the digit will be ignored.

The [.] key enters a decimal point in a numeric value.

The [+/-] key changes the sign of the number in the display. To enter a negative number, first enter the number as a positive value, then press [+/-]. If the display shows only zero then on pressing the [+/-] key the unit will speak out "PLUS". In binary, hexadecimal or octal mode, the [+/-] key works as the [NEG] key and calculates the two's complement of the number in the display.

The [→] key clears the last digit of the current numeric entry. Repeatedly pressing this key clears an entry digit-by-digit until the display becomes zero.

The [(], [)] keys open and close a parenthetical expression, respectively. A set of operations enclosed in parentheses is given priority over operations outside the parentheses. You can open a maximum of 15 sets of parentheses.

[π] ([3rd] [÷]). This key sequence enters the value of Pi in the display.

3.3 Trigonometric functions

The [SIN], [COS] and [TAN] keys calculate the sine, cosine and tangent, respectively, of the angle in the display.

The calculator interprets the angle in the units (Degrees, Radians or Grads) selected by the [DRG] or [DRG►] ([3rd][HYP]) key sequence. If you enter an angle in degree/minute/second format, you must first convert it to decimal degrees before using these functions.

Inverse trigonometric functions:

The [SIN^{-1}] ([2nd][SIN]), [COS^{-1}] ([2nd][COS]), and [TAN^{-1}] ([2nd][TAN]) key sequences calculate the angle (in the selected units) whose sine, cosine or tangent is in the display.

[►DD] ([2nd][=] converts an angle from degrees/minutes/seconds format to decimal degrees. Enter the angle as D.MMSSs and press [►DD] ([2nd][=]. Here D represents degrees (0-7 digits), the dot is the decimal point, MM represents minutes (must be 2 digits), SS represents seconds (must be 2 digits) and s is the fractional part of a second.

The [►DMS] ([3rd][=]) key sequence temporarily displays and speaks the current value in degrees/minutes/seconds. Enter the angle as D.ddddddd and press [►DMS] ([3rd][=]).

The [DRG] key cycles the angle-unit setting between degrees, radians and grads without affecting the displayed or spoken angle.

The [DRG►] ([3rd][HYP]) cycles the angle setting between degrees, radians and grads for display, entry and calculation. It also converts the value shown on the display to the new unit selected by the [DRG►] key.

The calculator automatically resets to degree angle units when you press the [ON/AC] key.

3.4   Hyperbolic functions

The [HYP] key, when pressed before a trigonometric function key, enables you to use the trigonometric function keys to access hyperbolic functions. Similarly, the [HYP][2nd] key sequence enables you to perform inverse hyperbolic functions, when pressed before a trigonometric function key.

3.5   Transcendental functions

The [Y^X] (universal power) key raises any positive number to any power (within range of the calculator). The key sequence [$^x\sqrt{y}$] ([2nd][Y^X]) (universal root) calculates any root of any positive number (within range of the calculator).

The [LN] key calculates the natural logarithm (base e) of the number in the display. The [e^x] ([2nd][LN]) key sequence calculates the natural antilogarithm of the number in the display.

The [LOG] key calculates the common logarithm (base 10) of the number in the display. The $[10^x]$ ([2nd][LOG]) key sequence calculates the common antilogarithm of the number in the display.

3.6   Memory functions

The TI-36X has 3 memories. When a memory contains a number other than 0, M is displayed and spoken (in the appropriate speech mode).

The [STO] key stores the displayed number in memory, replacing the previous memory contents. To clear a single memory, press [0] [STO] [1], [0] [STO] [2], or [0] [STO] [3]. [ON/AC] clears all three memories.

The [STO] [n] key stores displayed value in memory n, replacing its current value, where [n] is 1, 2 or 3.

The [2nd][SUM] [n] key adds the displayed value to memory n.

The [3rd][EXC] [n] key exchanges the displayed and memory values.

The [RCL] [n] key recalls, displays and speaks the number stored in memory n, without affecting the memory contents.

3.7   Statistical functions

The TI-36X has 2 statistics modes, One-Variable Statistics and Two-Variable Statistics.

3.7.1 One-Variable Statistics:

To enter into One-Variable Statistics mode press [3rd][x◄►y].

To enter statistical data values:
1. Press [2nd][CSR] to clear all statistical data.
2. Enter a data value and press the [Σ+] key. Continue until all the data values are entered. If you enter an incorrect value, remove it by re-entering the value and pressing [Σ-] ([2nd][Σ+]), then enter the correct value and press [Σ+]. Each time you press the [Σ+] or the [Σ-] ([2nd][Σ+]) keys, the display shows the number of data values currently in the registers. You will be able to hear this if you are in the verbose or default speech modes.

Note: The [Σ+] and [Σ-] keys will be spoken out only in Statistics Mode. In other modes these keys will give an ERROR.

After entering the data values, statistical operations can be performed as shown below:

$[\bar{x}]$	([2nd][X^2])	mean of the entered data.
$[\sigma x_n]$	([2nd][÷])	population standard

		deviation (*n* weighting).
[σx$_{n-1}$]	([2nd][√X])	sample standard deviation (*n-1* weighting).
[Σx]	([2nd][STO])	sum of data values.
[Σx^2]	([2nd][7])	sum of squares.
[n]	([2nd][EE])	number of data values.
[FRQ]	([2nd][1/x])	Adds or removes multiple occurrences of a data point.
[CE/C]		Clears the current entry . Does not affect statistical data or memory.
[ON/AC]		Clears all statistical data, STAT mode and memory.

3.7.2 Two-Variable Statistics:

To enter into Two-Variable Statistics mode press [3rd][Σ+].

To enter statistical data values:
1. Press [2nd][CSR] to clear all statistical data.
2. Enter x data value and press the [x◄►y] key, then enter y data value and press [Σ+] key. Continue until all the data values are entered. If you enter an incorrect value, remove it by re-entering the x value and pressing [x<>y] and then y value and [Σ-] ([2nd][Σ+]) then enter the correct value as above and press [Σ+]. Each time you press the [Σ+] or the [Σ-] ([2nd][Σ+]) keys, the display shows the number of data values

currently in the registers. You will be able to hear this if you are in the verbose or default speech modes.

After entering the data values, statistical operations can be performed as shown below:

[x̄]	([2nd][X^2])	mean of the entered data.
[ȳ]	([2nd][(])	mean of the entered data.
[σx$_n$]	([2nd][÷])	population standard deviation (*n* weighting).
[σy$_n$]	([2nd][X])	population standard deviation (*n* weighting).
[σx$_{n-1}$]	([2nd][√X])	sample standard deviation (*n-1* weighting).
[σy$_{n-1}$]	([2nd][)])	sample standard deviation (*n-1* weighting).
[Σx]	([2nd][STO])	sum of data values.
[Σy]	([2nd][8])	sum of data values.
[Σx^2]	([2nd][7])	sum of squares.
[Σy^2]	([2nd][9])	sum of squares.
[n]	([2nd][EE])	number of data values.
[Σxy]	([2nd][-])	Sum of the *xy* products.
[COR]	([3rd][4])	Correlation coefficient.
[ITC]	([2nd][4])	Intercept.
[SLP]	([2nd][5])	Slope.
[x']	([2nd][6])	Predicted x value.
[y']	([2nd][+])	Predicted y value.
[FRQ]	([2nd][1/x])	Adds or removes multiple

	occurrences of a data point.
[CE/C]	Clears the current entry . Does not affect statistical data or memory.
[ON/AC]	Clears all statistical data, STAT mode and memory.

3.8   Fractions

To enter a pure fraction (such as 1/6) as *a/b*:

1. Enter as many as six digits for *a*.
2. Press [a^b/c]. The unit will say "over" between the values entered for *a* and *b* if the repeat button is pressed to speak out the display.
3. Enter as many as three digits for *b*.

Note: If you attempt to enter more than 3 digits for *b*, the unit will sound a warning tone and ignore the entry.

If you enter an improper fraction, the calculator changes it to a proper fraction when you press an operation key.

To enter a mixed fraction as *a b/c*:

1. Enter as many as three digits for *a*.

2. Press [a^b/c]. The unit will say "over" between the values entered for *a* and *b* if the repeat button is pressed.
3. Enter as many as three digits for *b*.
    Note: If you attempt to enter more than 3 digits for *b*, the unit will sound a warning tone and ignore the entry.
4. Press [a^b/c]. The unit will say "and" between the values entered for *a* and *b* and "over" between the values entered for *b* and *c* if the repeat button is pressed.
5. Enter as many as three digits for *c*.
    Note: If you attempt to enter more than 3 digits for *c*, the unit will sound a warning tone and ignore the entry.

Converting fractions:

To convert between a mixed fraction and an improper fraction, press [d/c] ([2nd][a^b/c]).

To convert a fraction to a decimal value, press [F◄►D] ([3rd][a^b/c]). The decimal equivalent of the fraction will be displayed and spoken out. Pressing [F◄►D] again will display and speak the fraction.

3.9   Rectangular / Polar Conversions

To convert from polar to rectangular:
1. Select the desired angle units.
2. Enter the r-coordinate and press [x◄►y].
3. Enter the theta-coordinate.

4. Press [P►R] ([2nd][+/-]) to convert the coordinates and display the x-coordinate.
5. Press [x◄►y] to display the y-coordinate.

To convert from rectangular to polar, follow the same steps as given above except that in steps 2 and 3 enter the x and y coordinate, respectively. Press the [R►P] key in step 4.

Note: To recall the x or the r-coordinate, press [x◄►y] again. You can use [x◄►y] to alternately display the x and the y-coordinates until you press [CE/C][CE/C], [ON/AC], or [=]. The unit always speaks out the display when the x-coordinate or the y-coordinate is displayed.

3.10 Number-System Modes

The [3rd][EE] key sequence selects the decimal mode. When you press the above sequence, the number in the display is automatically converted to its decimal equivalent.

Note: Normally, you should keep the calculator in the decimal mode. Some of the calculator's operating features are limited in other modes.

The [3rd][X] key sequence selects the binary mode and shows the BIN indicator on the display (which is spoken out when the Special Functions feature

mode is active). In this mode, you can only perform arithmetic operations with binary numbers (integers only).

When you press the key sequence above, the integer portion of the number in the display is automatically converted to its binary equivalent and is spoken out. You can enter positive binary numbers as large as 111111111 (9 digits). Numbers beyond this are interpreted as negative (two's complement) numbers. All keys that are not functional in this mode sound a warning tone.

The [3rd][)] key sequence selects the octal mode and shows the OCT indicator on the display (which is spoken out when the Special Functions feature mode is active). In this mode, you can perform arithmetic operations with octal numbers (integers only).

When you press the key sequence above, the integer portion of the number in the display is automatically converted to its octal equivalent and spoken out. You can enter positive octal numbers as large as 377777777 (9 digits). Numbers beyond this are interpreted as negative (two's complement) numbers. All keys that are not functional in this mode sound a warning tone.

The [3rd][(] key sequence selects the Hexadecimal mode and shows the HEX indicator on the display (which is spoken out when the Special Functions feature mode is active). In this mode, you can perform arithmetic operations with hexadecimal numbers (integers only).

When you press the key sequence above the integer portion of the number, the display is automatically converted to its hexadecimal equivalent and spoken out. You can enter positive hexadecimal numbers as large as 2540BE3FF (9 digits). Numbers beyond this are interpreted as negative (two's complement) numbers. All keys that are not functional in this mode sound a warning tone. To enter the hexadecimal digits A through F, use the following keys:

  [1/x] for [A]
  [X^2] for [B]
  [√x] for [C]
  [SIN] for [D]
  [COS] for [E]
  [TAN] for [F]

3.11 Probability

A **combination** is an arrangement of objects in which order is not important, as in a hand of cards,

[nCr] calculates the number of possible combinations of n items taken r at a time.

A **permutation** is an arrangement of objects in which the order is important, as in a race. [nPr] calculates the number of possible permutations of n items taken r at a time.

The [x!] ([3rd][LOG]) key calculates the **factorial** of the displayed value which must be an integer in the range of 0 to 69.

3.12 Physical Constants

Physical constants can be entered using the following key sequences:

c	[3rd] [CE/C] [SIN]	Speed of light
g	[3rd] [CE/C] [COS]	Gravitational acceleration
Me	[3rd] [CE/C] [TAN]	Electron mass
e	[3rd] [CE/C] [y^x]	Electron charge
h	[3rd] [CE/C] [1/x]	Planck's constant
NA	[3rd] [CE/C] [X^2]	Avogadro's number
R	[3rd] [CE/C] [√x]	Ideal gas constant
G	[3rd] [CE/C] [÷]	Universal gravitation

3.13 English/Metric Conversions

Unit conversions between English and Metric systems are available only in Decimal mode and can be performed with the following key sequences:

►in	[2nd] [1]	Centimeters to inches
►cm	[3rd] [1]	Inches to centimeters
►gal	[2nd] [2l]	Liters to U.S. liquid gallons
►l	[3rd] [2]	U.S. liquid gallons to liters
►lb	[2nd] [3]	Kilograms to pounds
►kg	[3rd] [3]	Pounds to kilograms
►°F	[2nd] [0]	Celsius to Fahrenheit
►°C	[3rd] [0]	Fahrenheit to Celsius
►oz	[2nd] [.]	Grams to ounces
►g	[3rd] [.]	Ounces to grams

4. Care of your ORION TI-36X

Proper care of your Orion TI-36X Talking Scientific Calculator will ensure trouble-free operation.

- When it is not in use, snap the protective cover over the keypad to protect the unit from dust and spills.

- Periodically wipe the unit with a slightly damp, soft lint-free cloth to remove accumulated dust. Do NOT use any detergents, solvents or commercial cleaners as these may damage the finish.

An optional padded carrying case is available from Orbit Research.

5. Warranty

Orbit Research provides a one year limited warranty for the Orion TI-36X Talking Scientific Calculator from the original date of purchase. The warranty covers all manufacturing defects as well as all parts and related workmanship. During this period Orbit Research will repair or, at its discretion, replace the calculator at no cost to the consumer. The consumer will be responsible for shipping of the unit and all accessories to Orbit Research and the cost of postage to Orbit Research. Proper insurance during shipment is strongly recommended.

The provided Warranty Registration Card must be completed and returned to Orbit Research within ten days after purchase to ensure speedy service during the warranty period. It is also incumbent upon the consumer to provide proof of the purchase date (original or copy of the invoice) at the time when a warranty claim is made. Please contact Orbit Research for a Return Authorization Number prior to sending the unit.

The calculator will be sent back to the consumer with the shipping charges prepaid for valid warranty claims.

The warranty is void if the unit has been damaged by accident, misuse, neglect or improper service and does not apply in cases where the unit has been opened or in any way altered by an unauthorized person.

Repair After Expiration of Warranty:

Following the warranty period or in case of breakage, not covered by the warranty, Orbit Research will repair the calculator at a reasonable cost. Shipping charges, both ways, will be borne by the consumer in this case.

Disclaimers:

Orbit Research does not consider itself responsible for any direct or indirect consequences following the utilization of the ORION TI-36X calculator. Orbit Research shall not be responsible for loss of the calculator or consequential cost to the consumer.

Orbit Research reserves the right to change product specifications without notice. Any modifications to products previously sold will be performed solely at the discretion of Orbit Research.

6. Troubleshooting and repair

This section will help you in resolving problems you may experience while using your Orion TI-36X. We recommend that you go through this section before contacting Orbit Research for assistance.

1. You hear two high-pitched beeps when you turn the unit on and the unit does not operate. This can happen if the batteries are weak. Please charge the unit for some time and try again. This can also happen if a key is kept pressed while the unit is being turned on using the [ON/AC] key. Make sure that no keys are pressed, and the [ON/AC] is released quickly after the single turn-on beep is heard. If the problem persists, please contact Orbit Research.

2. On pressing the [ON/AC] key the unit does not switch ON. This can happen when your battery is weak. Recharge the battery for some time and then try again.

3. You are not able to hear any speech. It is possible that the volume was accidentally turned down. Increase the volume by turning the volume control thumb-wheel counter-clockwise (downwards). Also check to make sure that the earphone is not plugged in if you intend to use the built-in speaker.

4. The unit does not switch ON when the adapter is plugged in the unit. Ensure that the adapter is plugged into a wall socket that has been switched ON and try again.

5. Unit does not switch OFF when pressing the OFF button for more than 2 seconds. Check to make sure you are not in Learning Mode. You must exit Learning Mode before attempting to Power Off, or the calculator will not turn off.

Updated troubleshooting hints and answers to Frequently Asked Questions (FAQs) can also be found at our web site: www.orbitresearch.com

If you continue experiencing problems with your ORION TI-36X, please contact ORBIT RESEARCH at the address given below, or via email at support@orbitresearch.com

7. Shipping instructions

If you need to return the calculator for repair, please contact ORBIT RESEARCH first to obtain a Return Authorization Number. Send the unit along with all of the accessories, a copy of your dated sales receipt and with the Return Authorization Number clearly marked on the package, to the address below. Ensure that the unit is packaged properly to avoid damage during shipping. It is also recommended that the package be insured against damage or loss during shipment. If special arrangements need to be made to ship the unit back to you, please include written instructions in the package.

Our shipping address is:

Orbit Research
3422 Old Capitol Trail, Suite 585
Wilmington, DE 19808
U.S.A.