

GreekKeys 2015

USER GUIDE

(Revised June 2018)

by Donald Mastronarde

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<https://classicalstudies.org/publications-and-research/greekkeys-2015-support>

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Acknowledgments

It is about 15 years since I took over support and development of GreekKeys, and I expect this 2015 revision to be, more or less, the end of my involvement. I am very grateful for the advice and assistance I have received over this period from Director Maria Pantelia and other staff of the Thesaurus Linguae Graecae, Dr. Deborah Anderson of the Script Encoding Initiative, and people at Apple (especially Lee Collins and Peter Edberg) and Microsoft (particularly Michael Kaplan of Microsoft Windows International Division), as well as to users who pointed out problems or needs. The Berkeley Language Center (at UC Berkeley) helped me more than once by giving access to virtual machines running various versions of Windows. I also want to express my thanks to the producers of the software that has been essential to my work: BBEdit from BareBones Software, FontLab Studio 5 from FontLab, Apple Developer Tools and FontToolsX, and Microsoft Keyboard Layout Creator.

Donald Mastronarde, June 2015

Revision June 2018 to reflect SCS address change and changes in Mac installation instructions.

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Part I: Introduction

1. What is GreekKeys 2015 ?

GreekKeys 2015 is the latest revision of a custom polytonic Greek keyboard program (and the accompanying fonts) useful to many scholars, teachers, and students of the ancient and medieval Greek worlds.

The original GreekKeys keyboard and fonts were created by George B. Walsh shortly after the introduction of the Macintosh computer in the 1980s. The original fonts were encoded in a unique way, as required by the technology of that time. After Walsh's death, GreekKeys was donated to the American Philological Association (now the Society for Classical Studies) and maintained by Jeffrey Rusten until 2001. From 2001 to 2015 GreekKeys was maintained and revised by Donald Mastronarde. In particular, the keyboards and fonts were upgraded to take advantage of the Unicode standard, and in the 2008 version keyboards were included for Windows OS as well as Mac OS X.

GreekKeys 2015 maintains the keyboard pattern well known to users of the earlier versions and provides, for new users who have not already habituated themselves to the pattern of another polytonic Greek keyboard, an easy-to-learn method for typing polytonic Greek.

2. System Requirements and Contents of Package

2.A. SYSTEM REQUIREMENTS

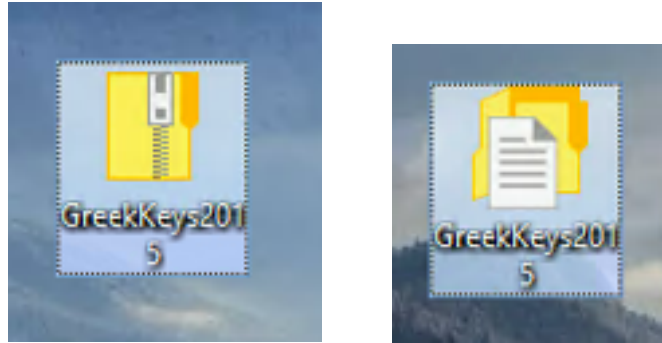
The Mac OS X installer requires version 10.5.x or higher. Manual installation is possible on version 10.3.x or 10.4.x.

The Windows keyboard installers have been tested in Windows 7, 8, and 10 preview, and probably work in Windows XP as well.

The GreekKeys Unicode fonts for polytonic Greek work in Word 2004 and higher in Mac OS X and in Word 2003 and higher for Windows. OpenType substitution features in the GreekKeys Unicode fonts work in Word 2008 and higher in Mac OS X and in Word 2003 and higher for Windows.

2.B. CONTENTS OF THE GREEKKEYS 2015 PACKAGE

The download will either be a compressed ZIP archive, **GreekKeys2015.zip**, or a folder with the name **GreekKeys2015** (if your OS automatically decompresses the ZIP archive). If your Windows system is set up not to show file extensions, you can recognize the difference by the icon: the compressed version has a zipper on the icon, the uncompressed version appears as an ordinary folder.



LEFT: icon for ZIP archive RIGHT: icon for decompressed folder

GK2015 Documentation is the folder containing useful documentation:

Please read the relevant QuickStart document before running the installers, especially if you are upgrading from GreekKeys 2008.

QuickStartMacRev2018.pdf and **QuickStartWindows.pdf** provide very brief instructions on how to install the keyboards and fonts.

GK2015UserGuideRev2018.pdf (this document) provides full instructions on how to install the keyboards and fonts and how to use them, as well as how to work around problems.

Subfolder **GK2105 Keyboard Charts Mac** contains PDFs with keyboard charts showing the layout of the various keyboards, including the Unicode code point of the character on each key.

Subfolder **GK2105 Keyboard Charts Windows** contains PDFs with keyboard charts showing the layout of the various keyboards, including the Unicode code point of the character on each key.

Subfolder **GK2015 Licenses** contains the various licenses applying to the keyboards and the fonts in the package.

ArchiveToCDInstructions.pdf tells you how to create an archive CD [if that is your chosen backup method for your download] on either platform that will be readable on both platforms.

GK2015 Mac Installer is the folder containing the single Mac OS X installer and related items:

Standard Mac OS X installer package named **GK2015MacRev2018.pkg**.

An Automator app **RevealGKUbundles.app** that, if applicable, will open in the Finder the folder or folders where the 2008 version of the keyboards has been installed.

An Automator app **RevealGKFonts.app** that, if applicable, will open in the Finder the folder or folders where any versions of the GreekKeys fonts have been installed.

Subfolder **GK2015 Mac Bundles** contains the components needed for manual installation and should not be needed by most users.

GK2015 Windows Installers is the folder containing keyboard installers for Windows:

Nine subfolders contain the nine separate installers for localized GKU2015 keyboards (each user will normally run only one of the nine) and two subfolders contain installers for two keyboards to input special symbols used by Greek scholars.

GK2105 Font Files is the folder containing the fonts:

Subfolder **NAU5_005** contains the freeware font New Athena Unicode in four versions—regular, italic, bold, bold italic; a document detailing the revision history of the font (**AboutNAUfont_v5_005.pdf**).

Subfolder **OtherSCSFonts** contains the licensed (not freeware) fonts AttikaU, KadmosU, BosporosU, each in four versions—regular, italic, bold, bold italic. Also present is the document **SCSFontsRevisionHistory.pdf**.

Two documents that will help find specific characters in the font New Athena Unicode: **FindCharacterNAU.pdf** and **NAU5cmap.txt**.

Note that fonts must be installed manually under Windows. The default under OS X is that the fonts are installed as part of the Standard Install option in the GK2015Mac Installer. Manual installation is also possible in OS X if a user has a particular reason to prefer manual installation.

3. Archiving the GreekKeys 2015 Download

While SCS members will be able to redownload GreekKeys if they need to, non-member purchasers should safeguard their access to the package by archiving a copy in a safe location and medium, so that it will be available after a total computer failure or loss or replacement. It is safest to save a copy on a cloud drive, or to burn a copy on a CD (see the document **ArchiveToCDInstructions.pdf**), if you expect that you will still have access to a CD drive for your computer in the future.

Saving the downloaded package on a portable USB flash drive (FAT32 format so that it can read by both Windows and Mac computers) is the best way to distribute it to users under a departmental license and the extended license for students. Such drives are not, however, ideal for archiving, since they are easily lost and can be made useless if they suffer a drop.

4. What is Unicode?

4.A. UNICODE

Unicode is an international standard for encoding of characters and other symbols used in writing systems and printing throughout the world. The standard is overseen by a consortium, and the major manufacturers of computers and operating systems cooperate with others in its implementation. For more information, visit <http://www.unicode.org>. Each character or symbol accepted into the Unicode standard has a unique **code point** or digital identification. This is usually represented in hexadecimal notation, with the hexadecimal digits (0-9 and a-f) preceded by U+. Most characters are in the range represented by four hexadecimal digits (Basic Multilingual Plane = BMP = Plane 0), U+0000 through U+ffff; but some are now in the Supplementary Multilingual Plane (= SMP = Plane 1) with five digits. Thus lowercase alpha is U+03b1, the combination of lowercase alpha with acute accent and iota subscript is U+1fb4, and the Greek acroponic Attic symbol for one hundred staters is U+10152.

Before widespread support of Unicode, representation of polytonic Greek on computers depended on a number of different and incompatible schemes, depending on the operating system and the software being used. Casual users had great difficulty in moving files containing

Greek from one application to another or from one platform to another. This confusion of incompatible and custom encodings is avoided with Unicode. There is no longer any reason for anyone to use any of the old, incompatible, non-standard encodings.

While Unicode Greek is a wonderful advance, it is not perfect or free from problems, especially if one needs to push the limits of typography in the more specialized areas of scholarship. First, the initial design of the Greek block was imperfectly conceived. Second, the theory behind Unicode character construction (by the combination of a base character and one or more modifications, such as diacritics) is forward-looking and anticipates developments in fonts, operating systems, and software that are not yet broadly enough or well enough implemented. And this theory also sets high technological requirements on future scholarly fonts, so that it is more difficult for scholars to develop their own advanced fonts, while there is little motivation for the commercial vendors to meet the specialized needs of a relatively small group of users.

4.B. THE PROBLEM OF KEYBOARDING

Having a font with the needed characters encoded as Unicode is only half of the battle for users. The other half is having a convenient means to type the needed characters, one that will operate at a systemwide level and thus be available in all modern applications. GreekKeys 2015 provides such a means for Mac OS X and for Windows 7, 8, and 10. There are other keyboards available (some of them free), but most of them will not satisfy all the needs of scholarly writing and typesetting.

4.C. THE PROBLEM OF PRECOMPOSED VS. DECOMPOSED

Ancient Greek as used by scholars in modern printing and word-processing employs not only the plain letters of the Greek alphabet, but also letters that have been modified by diacritic or editorial marks of various kinds, such as breathing signs, accents, diaeresis, macron or breve symbol, and sublinear dot. Theoretically, if you want an omega with rough breathing, this is represented by two characters: U+03c9 (lowercase omega) and U+0314 (combining rough breathing). A combining character has no width of its own, but places itself in the same space as the previously entered character. Similarly, if you want a dotted lowercase beta, then this needs to be entered as two codepoints, U+03b2 (the beta) and U+0323 (the combining dot below diacritic). Or, if you want alpha with macron and smooth breathing and acute accent, this entails four Unicode characters: U+03b1 (alpha), U+0304 (combining macron), U+0313 (combining smooth breathing), U+0301 (combining acute accent). All of these are examples of composition of a complex character from several code points; such input is called decomposed. If you actually enter these codepoints with many fonts and applications, the result will often be unattractive or worse: the breathing might not be centered over the omega; the dot might not be centered under the beta or might intersect the descender; the diacritics over the alpha might overlap or be stacked vertically; in some fonts a diacritic may even appear incorrectly in its own space after the letter.

The solution to this difficulty is the definition of precomposed complex characters in Unicode, as an interim measure until decomposed representation is better supported. Unfortunately, only the first example, omega with rough breathing, is recognized in the Unicode standard: the code point U+1f61 supplies this precomposed character. For the other two, the choice is between

assigning a Private Use Area (PUA) code point for the precomposed character (which entails that there may be conflicts in the code point selected and that most fonts will lack that character anyway) or trying to work with the decomposed input. Both choices present disadvantages. The first requires that only certain fonts be used, namely, those that contain the needed PUA characters. The second also requires that only certain fonts be used, since the correct appearance of the combinations depends on substitution instructions that can optionally be incorporated in a font.

Because of the differences between Windows and Mac OS X, it has not been possible to make the keyboarding of the more specialized characters completely consistent in the two varieties of GreekKeys. In particular, in OS X one can “chain” deadkeys to enter more complex combinations of diacritics before entering the vowel, whereas in Windows complex combinations can be entered only by using the alternative approach with combining characters typed after the vowel. Despite these differences in method of input, documents nowadays should be transferrable from one platform to the other, if the computers involved have access to the same fonts.

4.D. THE PROBLEM OF DUPLICATE CODE POINTS

Because at an early stage the Unicode standard provided only for monotonic Greek and the characters for polytonic Greek were added later, the current standard contains duplication of a number of characters on the now-abandoned assumption that the tonos printed on modern Greek vowels is distinct from the acute accent printed on ancient Greek vowels. (There have in fact been some fonts that make these two accents appear slightly differently.) This is now a deprecated distinction, and it has been recommended that the duplicate characters be unified under the code point in the Greek block and that the duplicate code points in Greek Extended not be used. When consistency of typography really matters, it is advisable to avoid the use for Greek of fonts in which there is a visible difference between tonos and acute.

Similarly, punctuation symbols have been unified, so that use of the specifically Greek middle dot and Greek question mark are now deprecated, with the standard code points in the first two blocks of Unicode preferred.

In GreekKeys 2015, as already in GreekKeys 2008, the recommended codepoints have been used instead of the deprecated ones. This is the same practice followed by the Thesaurus Linguae Graecae.

Character	Duplicate Code Point: deprecated	Preferred Code Point
lowercase alpha + acute	1F71	03AC
uppercase alpha + acute	1FBB	0386
lowercase epsilon + acute	1F73	03AD
uppercase epsilon + acute	1FC9	0388
lowercase eta + acute	1F75	03AE
uppercase eta + acute	1FCB	0389
lowercase iota + acute	1F77	03AF
uppercase iota + acute	1FDB	038A
lowercase omicron + acute	1F79	03CC

uppercase omicron + acute	1FF9	038C
lowercase upsilon + acute	1F7B	03CD
uppercase upsilon + acute	1FEB	038E
lowercase omega + acute	1F7D	03CE
uppercase omega + acute	1FFB	038F
lowercase iota + diaeresis + acute	1FD3	0390
lowercase upsilon + diaeresis + acute	1FE3	03B0
Greek question mark (Latin semicolon)	037E	003B
Greek colon or high dot (Latin middle dot)	0387	00B7
Greek combining diaeresis with tonos/acute	0344	0308 + 0301

Part II: GreekKeys 2015 for Mac OS X

5. Installation and Activation of GreekKeys (Mac OS X)

5.A. IF YOU ARE UPGRADING FROM THE GREEKKEYS 2008 VERSION

1. To avoid anomalies, it is advisable to disable the GreekKeys keyboard that you currently have enabled before running the installer. Do this in Keyboard System Preference (Input Sources pane) by selecting the keyboard and clicking on the minus sign.

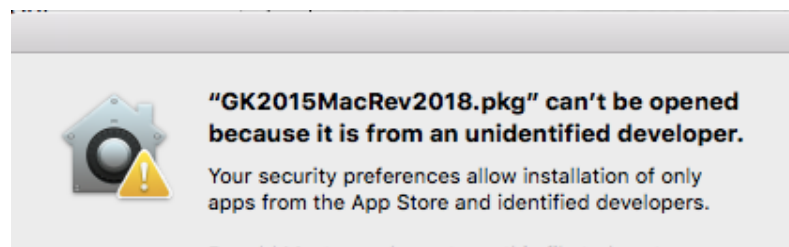
2. Once the old keyboard is disabled, it is also advisable (though not absolutely necessary) to remove the source file, **GKUall.bundle**. Since there are two locations¹ where that file might be located, you can use the Automator app **RevealGKUbundles.app** (found in the same folder as the installer), which will open the folder containing that bundle (as well as **GKUdcmp1.bundle** and/or **GKUdcmp2.bundle** if those are present). You can then move the old bundle(s) to the Trash or to another location outside the Keyboard Layouts folder.

3. If you do not remove the old bundle(s), then the installer will overwrite it if it is in the top-level Library folder, but leave it in place if it is in *username/Library/Keyboard Layouts*.

5.B. RUNNING THE INSTALLER

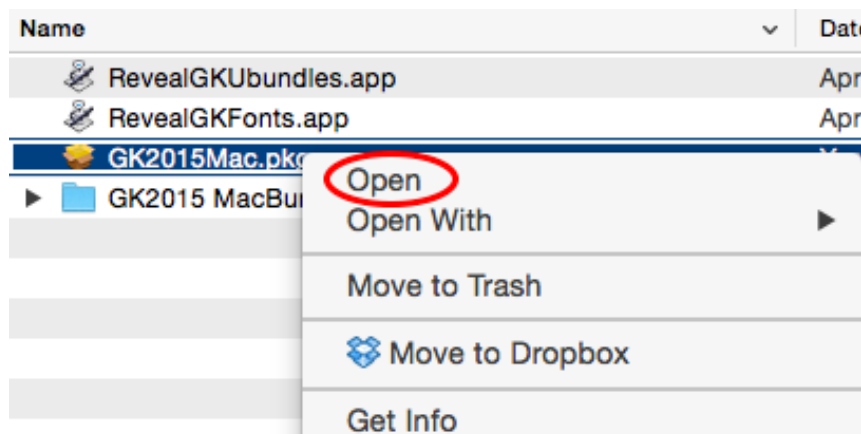
Installation is easily performed by a standard Mac OS X Installer package entitled **GK2015MacRev2018.pkg**. This is located in the folder **GK2015 Mac Installer**.

1. Save your work in other applications and quit them. The installation will be on the startup volume; you will need to restart (manually) when the installer finishes.
2. Because the installer does not contain a security certificate, you will NOT be able to open it (for the first time after downloading) by double-clicking on its icon (if you do, you will see a warning that provides unhelpful advice). (There will be a URL in the alert message, erased from this picture.)

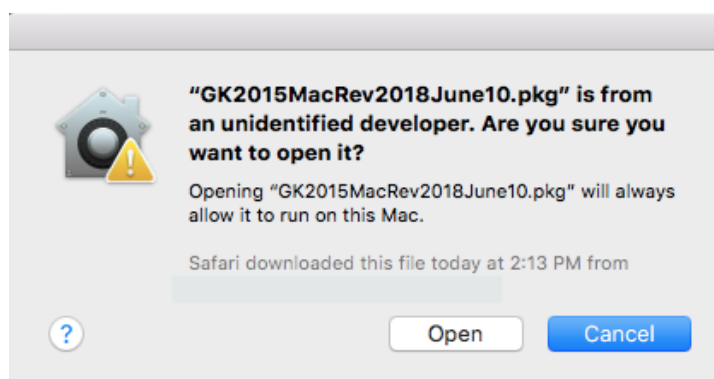


Instead, right-click or control-click on the icon to bring up a contextual menu, from which you should select Open.

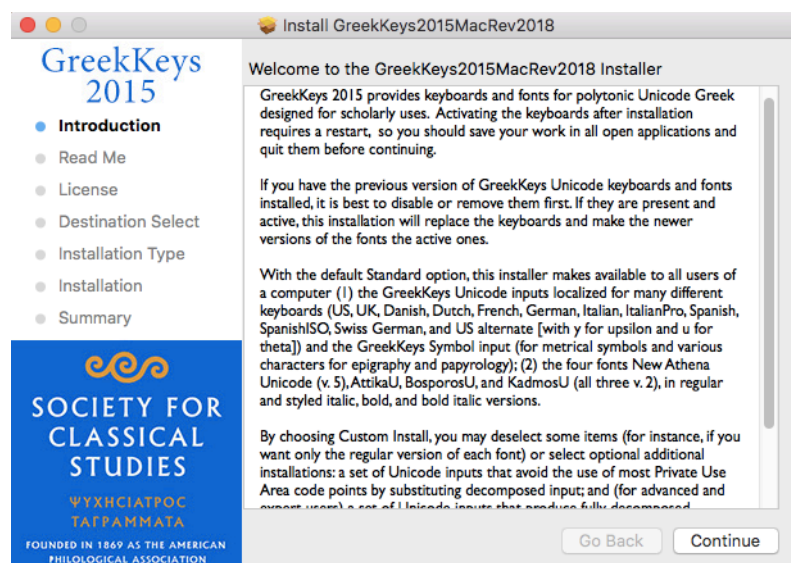
¹ The GreekKeys 2008 keyboards may be installed on your computer for use by all users (in Keyboard Layouts within the top-level Library folder) or installed just for the particular user (in Keyboard Layouts within the Library folder that is within your user directory).

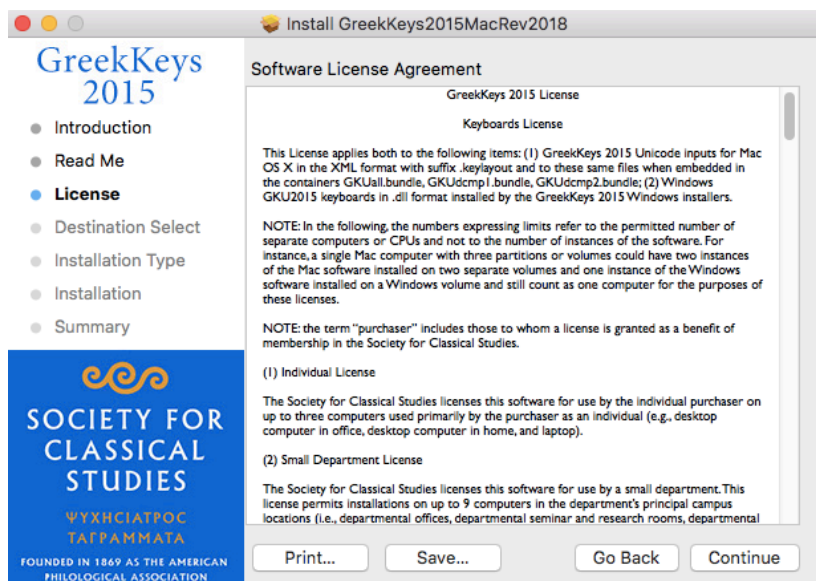
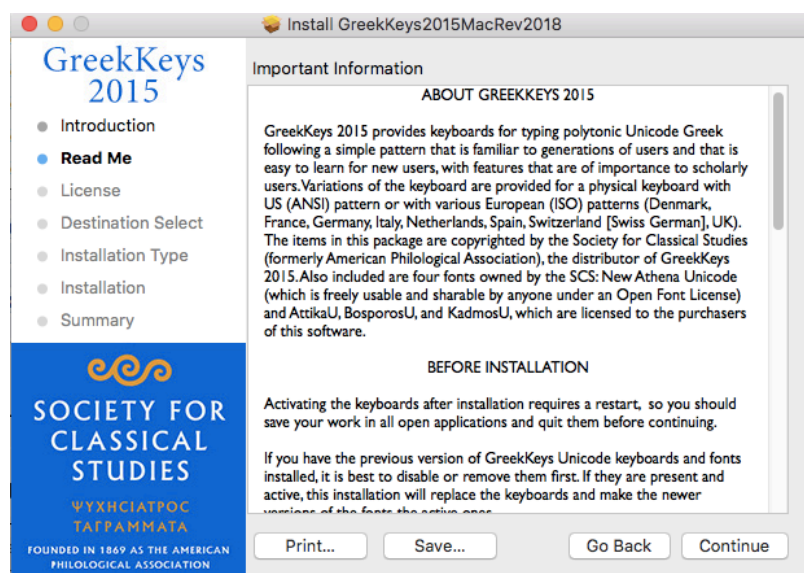


When you see a dialog like the following (the name of the .pkg will differ), click on Open. (There will be a URL in the alert message, erased from this picture.) (If you do not see this alert and thus still cannot open the installer, please refer to Appendix B for a more complicated workaround.)



3. Proceed through the steps of the installer and agree to the license.

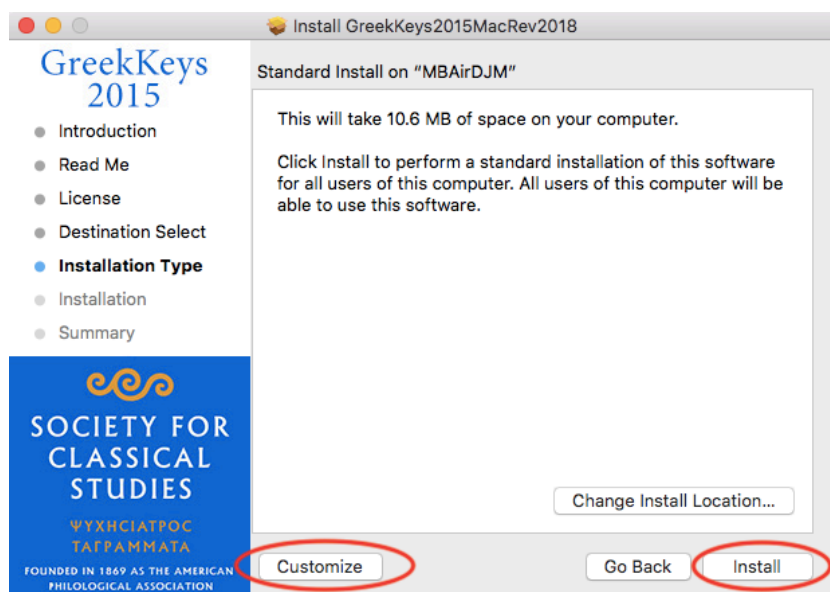




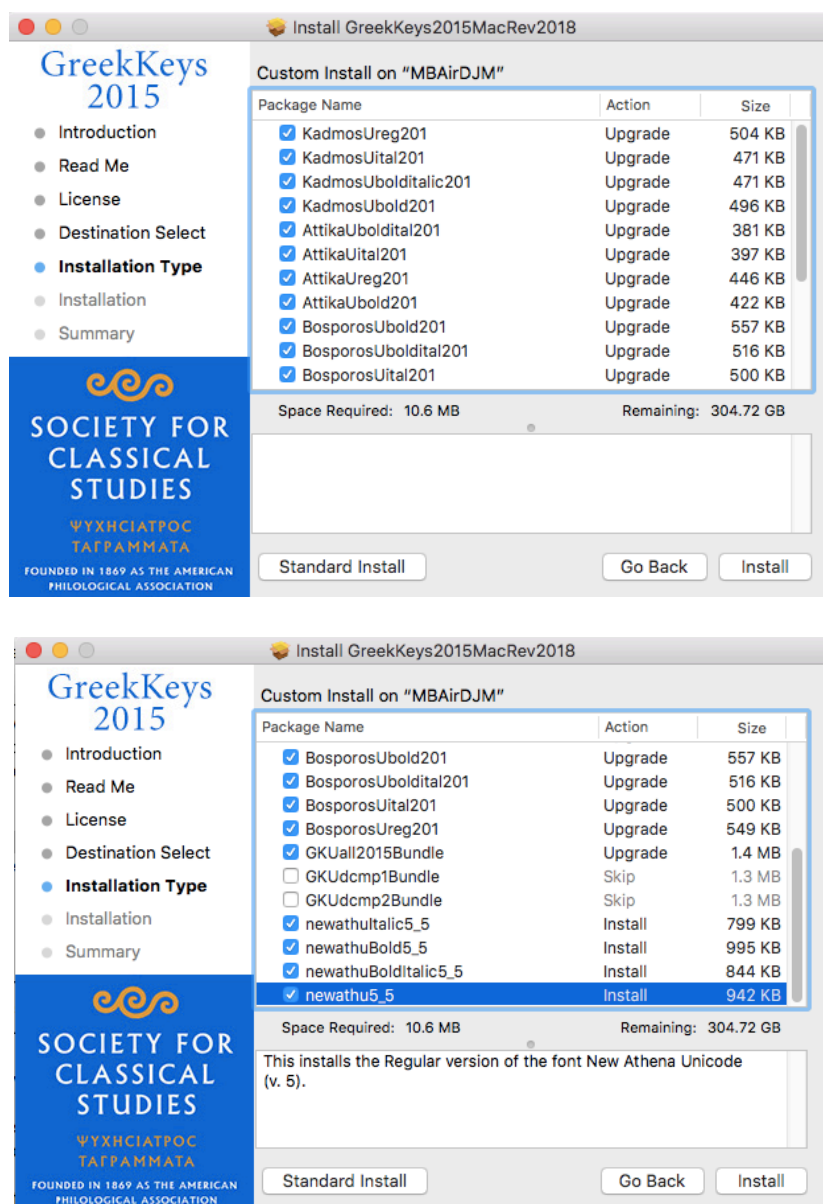
4. For many users, the installer will skip the Destination screen and move right on to 5. Note that if the Destination screen does appear, you sometimes have to wait a while to click on the message in the main panel in order to make the Continue button active.



5. The default Standard installation includes the regular GreekKeys keyboards and the four fonts, each in all four styles. You may select Customize to make changes or select Install for the Standard components.



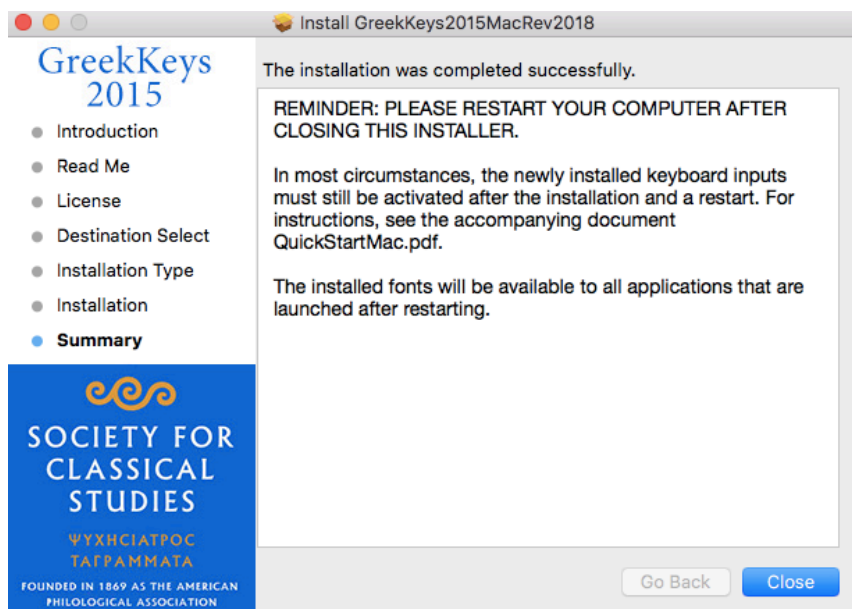
6. (OPTIONAL) With Customize you can add installation of the GKU decomposed inputs, or deselect some or all of the fonts (for instance, if you don't want the styled versions as well as the regular version).



7. An administrative password is required for the installation:



8. After successful installation, close the installer and restart:

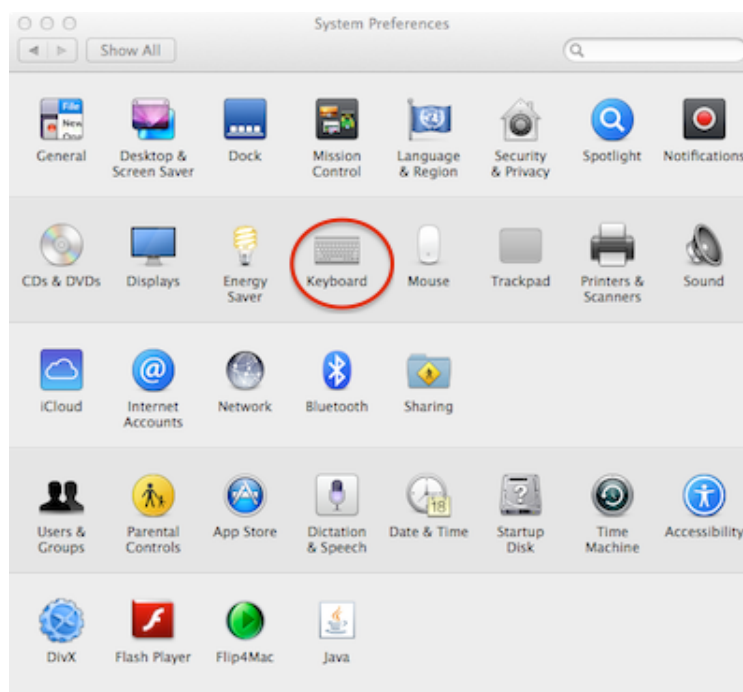


9. To use the keyboards, you must still take the steps for ACTIVATION, given below.

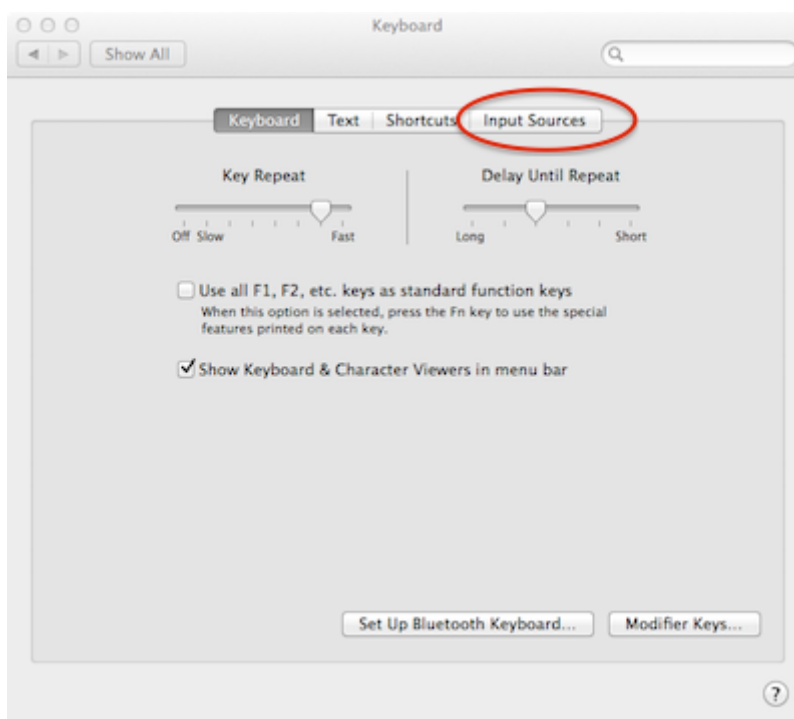
5.C. ACTIVATION OF GREEKKEYS UNICODE INPUT

NOTE: if you had the 2008 keyboard enabled and did not disable it before installation, the keyboard may already be active and present in the keyboard menu after installation, but the system may not read the new version into memory until you restart.

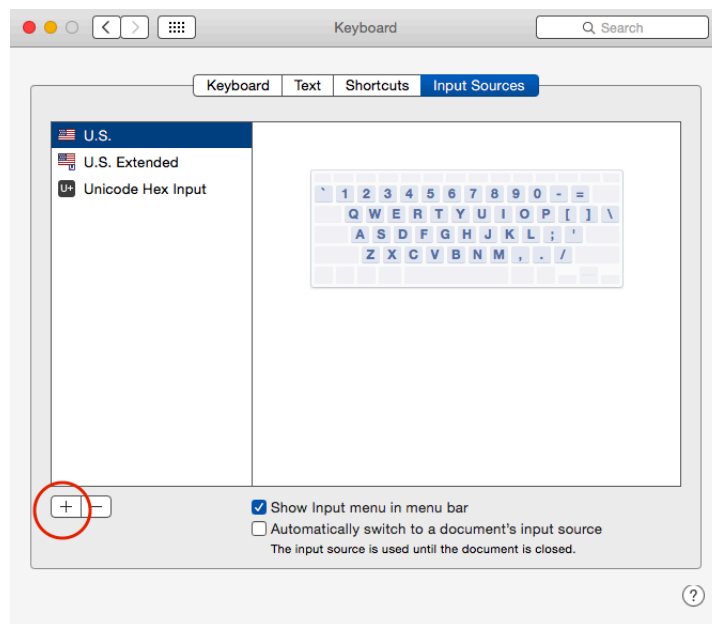
1. Open System Preferences and select Keyboard.



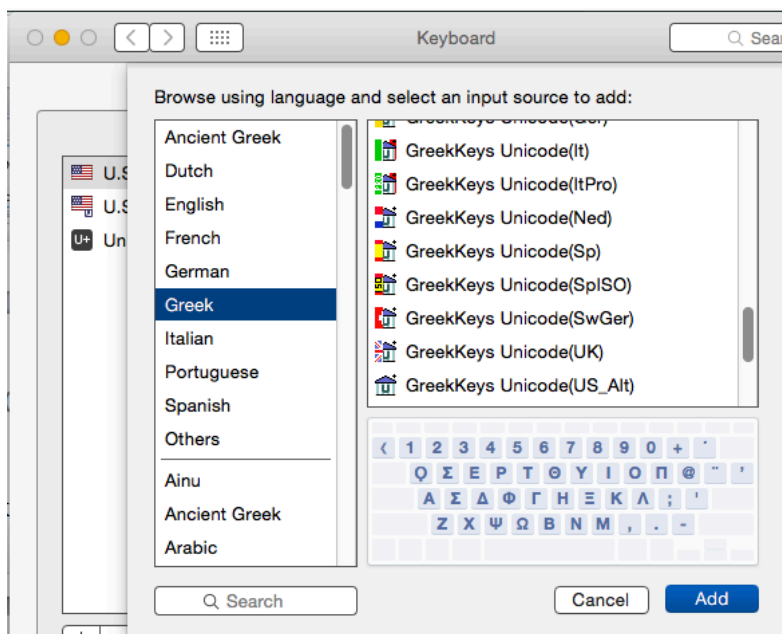
2. Select the Input Sources tab.



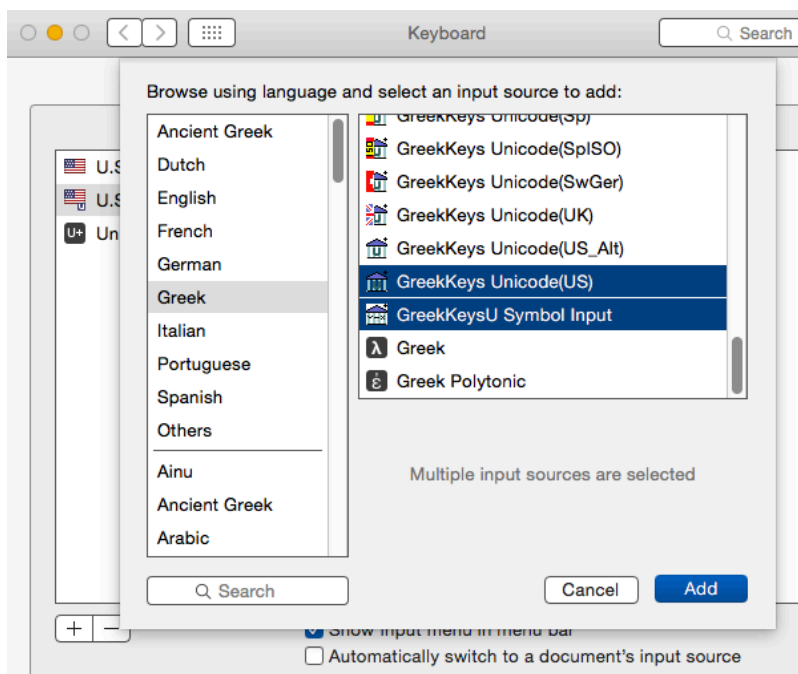
3. Make sure that “Show input menu in menu bar” is checked, and click on the + sign to add a keyboard that is not already shown as active.



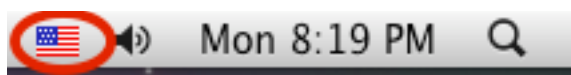
4. Select Greek on the left side in order to see a scrolling list of the GreekKeys Unicode keyboards:



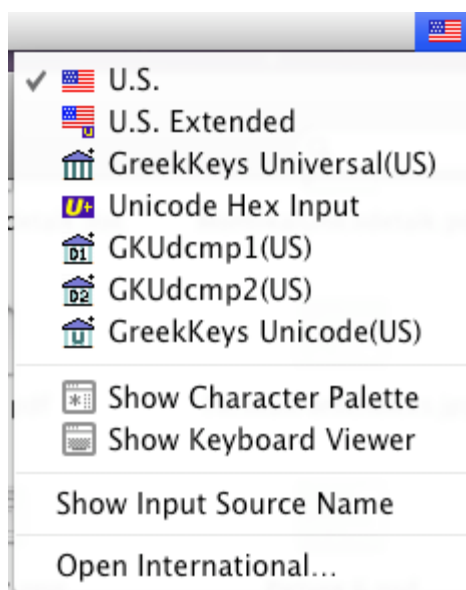
5. Select the items you want from the scrolling list and click on Add.



6. Close System Preferences. You should now see an input menu among those at the right side of the menubar.

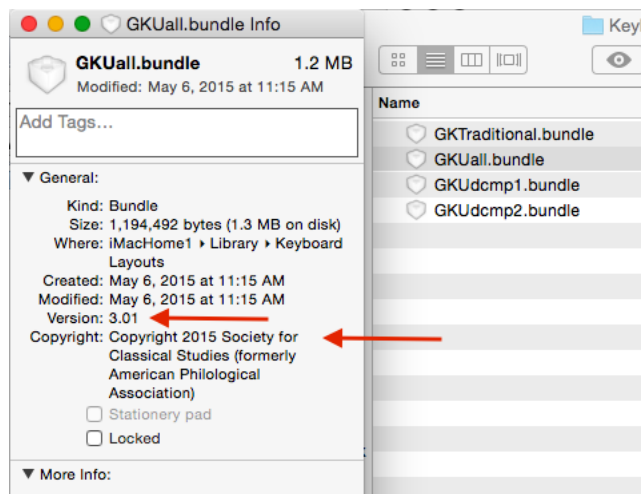


If your main language is US English, you will see a US flag, and if you open the menu you will see other choices, such as the Greek temple icon with superimposed U for GreekKeys Unicode(US).



5.D. (OPTIONAL) VERIFYING THE INSTALLED VERSION OF THE KEYBOARDS BUNDLE

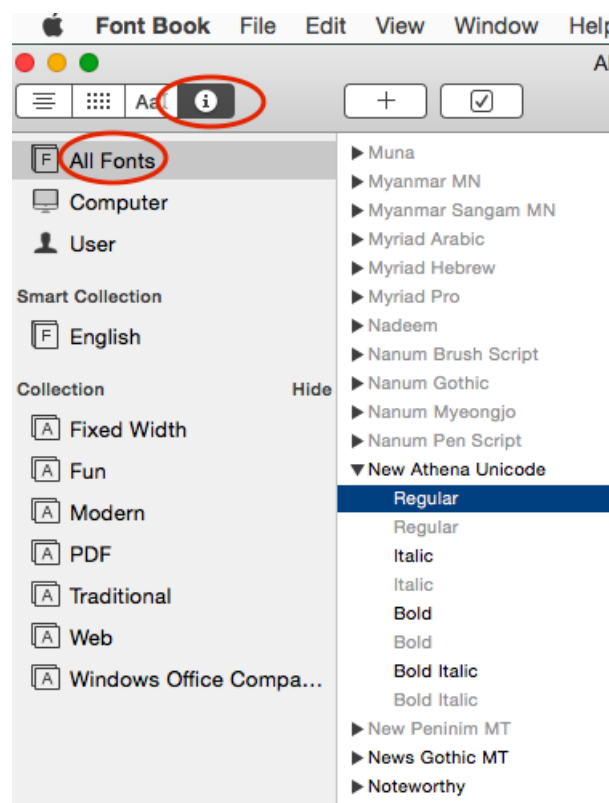
If there is any need to verify that the 2015 version has replaced the 2008 version, use the Automator app named **RevealGKUbundles.app**, which will open the folder containing any GreekKeys Unicode bundles. The date shown for creation or modification of the bundle may in some circumstances be misleading (an apparent bug in Finder), but the Get Info panel will indicate the version number (3.01 or higher; 2.01 or higher for the special dcmp bundles) and the copyright year (2015), which will always make clear which version you have.



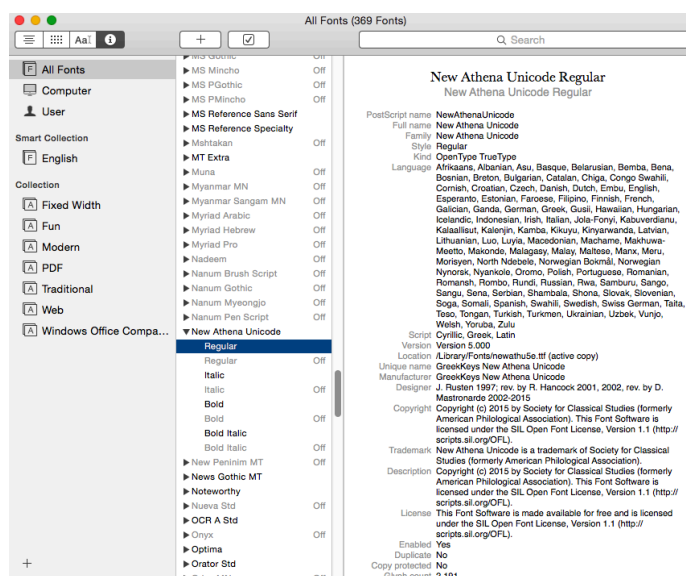
5.E. (OPTIONAL) CHECKING THE FONT INSTALLATION

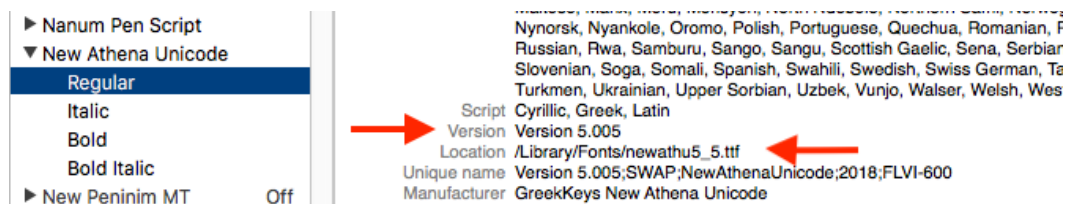
If this is the first time you have installed GreekKeys fonts, they will be available to any application that is launched or relaunched after the installer has run and you have restarted. If you are installing the new versions over old versions, the old versions may still be cached in memory or in a program's font cache if you fail to restart the computer. If it becomes necessary to verify that the newest versions are the active ones, follow these steps.

1. Open Font Book.app and in the left panel click on All Fonts to see a complete list of the fonts on your system. And click on the circled i button so that font information is shown.

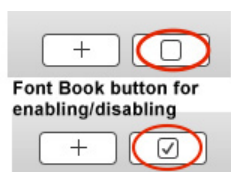


2. Locate each of the GreekKeys fonts (New Athena Unicode, AttikaU, BosphorosU, KadmosU) and see whether there are multiple copies and whether the active copy is the latest (with the revised 2018 installer, v. 5.005 of New Athena Unicode, v. 2.001 of the others).





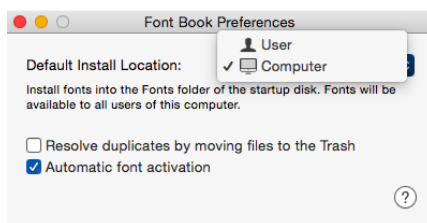
3. If you find that the newest copy is not the active copy, then select the active copy and disable it by clicking in the checked Disable/Enable button at the top of the Font Book window. Then select the newer version and use the same button to enable it.



Alternative methods are to use the Remove command on the old version, available under the Font Book File menu or in a contextual menu (right-click or control-click over the item), or to use the Disable (or Enable) command, available under the Font Book Edit menu or in a contextual menu (right-click or control-click over the item).

5.F. MANUAL FONT INSTALLATION

It is also possible to install fonts manually by double-clicking on the .ttf font files. With this method of installation, the fonts will go to the location that is specified in the Preferences of the application Font Book, where there is a choice between Computer (location `/Library/Fonts`) and User (location `username/Library/Fonts`).



Or with Font Book open you can add fonts using the + button or the command “Add fonts...” under the Font Book File menu.

6. TYPING WITH GREEKKEYS UNICODE INPUT (MAC OS X)

6.A. INTRODUCTION

Most users will be typing in two languages and scripts, their native modern language and polytonic Greek. You must change the selected input in the Input Menu every time you switch from one script to the other (you do not always have to change the font, but it is often a good idea to do so: see below). It is far more efficient to use a keyboard shortcut to switch inputs than to make the change in the Input Menu with the mouse. For details about the use of the keyboard shortcuts, see the Section 8 below, Working with Unicode Input.

In order to avoid incompatibilities with Microsoft Word, GreekKeys keyboards now contain a language identification as Greek (not Ancient Greek). In some applications, this will entail that when you enter characters with the GreekKeys keyboard, whatever you type will automatically have the language set to Greek. This is helpful in some ways, but entails unwanted consequences as well: see Section 8 below, Working with Multiple Inputs and Unicode in Mac OS X.

For reference and ease of learning, it may be helpful to print out the keyboard chart for the input you use: these are located in the folder **GK2015 Keyboard Charts Mac** in the GreekKeys 2015 package.

6.B. PLAIN GREEK CHARACTERS

The plain Greek letters are arranged as on a modern Greek keyboard, except that upsilon is “u” and theta is “y” [but the input with suffix (USalt) maps upsilon to “y” and theta to “u”]. Most other equivalences are obvious, such as alpha at “a” and beta at “b.” The less obvious items are final sigma at “w,” psi at “c,” xi at “j,” and omega at “v.”

The diacritics are arranged across the top row of the regular keyboard (ignoring the function keys), starting from the key on which the numeral 1 is located. Diacritics are entered as “deadkeys”: that is, they are typed before the vowel to which they belong. They all involve the option key or the option key together with the shift key. On some non-US keyboards, there are additional locations for some deadkey diacritics.

6.C. DEADKEYS: COMBINING ELEMENTS TO BE TYPED BEFORE THE VOWEL

option-1	acute (´)
option-2	grave (`)
option-3	circumflex (˘)
option-4	smooth breathing (ˊ)
option-5	rough breathing (ˋ)
option-6	smooth and acute (ˊ˘)
option-7	rough and acute (ˋ˘)
option-8	smooth and grave (ˊ˘)
option-9	rough and grave (ˋ˘)
option-0	smooth and circumflex (ˊ˘)
option-hyphen	rough and circumflex (ˋ˘)
option-=	breve (˘)
option-shift- =	macron (ˉ)

option-shift-1	diaeresis (¨)
option-shift-2	diaeresis with acute (´¨)
option-shift-3	diaeresis with grave (`¨)
option-shift-4	diaeresis with circumflex (^¨)

NOTE 1: The breathing signs may be used with rho as well as with vowels.

NOTE 2: Multiple deadkeys may be entered before typing the vowel. Thus **option-1** followed by **option-4** followed by **a** produces alpha with smooth and acute (and the same results from **option-4** followed by **option-1** followed by **a**); or **option-5** followed by **shift-option-=** followed by **a** produces alpha with macron and rough breathing (and the same results from **shift-option-=** followed by **option-5** followed by **a**).

6.D. ADDITIONAL DIACRITICS AND SPECIAL CHARACTERS

The following are consistent across all the localized versions of the input.

option-a	alpha with iota subscript α [U+1FB3]
option-shift-a	capital alpha with iota adscript ΑΙ [U+1FBC] or (after other deadkeys) with diacritics, e.g. Αι²
option-h	eta with iota subscript η [U+1FC3]
option-shift-h	capital eta with iota adscript ΗΙ [U+1FCC] or (after other deadkeys) with diacritics, e.g. Ηι
option-v	omega with iota subscript ω [U+1FF3]
option-shift-v	capital omega with iota adscript ΩΙ [U+1FFC] or (after other deadkeys) with diacritics, e.g. Ωι
w	final sigma ς [U+03C2]
shift-w	archaic sampi ϝ [U+03E1]
option-w	digamma (vau) Ϝ [U+03DD]
option-shift-w	capital digamma (vau) Ϝ [U+03DC]
option-s	lunate sigma Ϸ [U+03F2]
option-shift-s	capital lunate sigma Ϸ [U+03F9]
q	archaic koppa Ϡ [U+03D9]
shift-q	capital archaic koppa Ϡ [U+03D8]
option-q	archaic san Ϻ [U+03FB]
option-shift-q	capital archaic san Ϻ [U+03FA]
option-g	archaic heta Ϟ [U+0371]
option-shift-g	capital archaic heta Ϟ [U+0370]
option-k	stigma Ϸ [U+03DB]
option-j	yot Ϸ [U+03F3]
option-shift-j	capital yot Ϸ [U+037F]
option-shift-k	kai symbol ϻ [U+03D7]
option-t	obelus † [U+2020]

² Different fonts will offer different treatments of iota adscript with capital vowels.

< and > (shift-, and shift-.) left and right angle brackets ‹ and › [U+27E8-9]³

The following apply to the US version (the same characters are available in non-US versions, but the key assignments may differ: see the Keyboard Charts):

shift-option-u	capital archaic sampi λ [U+03E0]
option-shift-i	capital stigma Ϛ [U+03DA]
option-shift-p	modern/numeric Greek koppa ϙ [U+03DF]
option-shift-o	capital modern/numeric Greek koppa Ϟ [U+03DE]
apostrophe (single straight quote)	curved apostrophe (right single quote) [U+2019]
option-shift-n	left half-bracket (⌊)[U+230A]
option-shift-m	right half-bracket (⌋)[U+230B]
option-shift-comma	less-than sign (<)[U+003C]
option-shift-period	greater-than sign (>)[U+003E]
option-[left guillemot («)[U+00AB]
option-]	right guillemot (»)[U+00BB]
option-shift-[left double-bracket (⌈)[U+27E6]
option-shift-]	right double-bracket (⌋)[U+27E7]
option-l (letter)	capital Kai abbreviation (Ϟ) [U+03cf]
semicolon	Greek question mark (English semicolon) (;) [U+003B]
shift-semicolon	Greek colon (single mid-line dot) (·) [U+00B7]
option-shift-semicolon	Greek dicolon (English colon) (:)[U+003A]
option-n	left single curly quote [U+2018]
option-m	straight apostrophe (straight single quote) [U+0027]
option-'	left double curly quote [U+201C] ⁴
option-shift-'	right double curly quote [U+201D]
option-comma	modifier letter apostrophe (non-combining smooth breathing) ' [U+02bc] ⁵
option-z	section symbol § [U+00A7]
option-c	Greek numeral sign (ϛ) [U+0374]
option-shift-c	Greek numeral sign (lower) (Ϟ) [U+0375]
option-b	Greek beta symbol β [U+03D0]
option-shift-7	metrical longum – (non-combining) [U+2012] ⁶
option-shift-8	metrical breve ˘ (non-combining) [U+23D1]
option-shift-9	metrical anceps × [U+00D7]

³ These are true brackets for editorial purposes, recommended by Unicode, but not present in many fonts; the mathematical greater than and less than symbols are provided at option-shift - comma and option-shift-period.

⁴ To work with modern versions of MS Word, GreekKeys Unicode input has to declare itself as Greek, and if you allow Word to process “smart quotes” automatically, it may insert a form of quote that you do not want. See below, section 8.

⁵ This is different from U+2019 (on the ' key in GreekKeys), which is recommended by TLG and the Unicode Consortium to express the normal apostrophe as well as the right single curly quote.

⁶ A fuller collection of metrical symbols is included in the GreekKeys Symbol input.

option-shift-e	metrical catalexis (omission caret) \wedge [U+EC3D]
option-shift-r	metrical caesura symbol (dotted vertical) $\dot{\vdash}$ [U+003A]
option-shift-t	metrical inverted breve (brevis in longo) \sim [U+2312]
option-shift-y	metrical period-end (double bar) \parallel [U+2016]
option-p	\approx [U+2248]
option-\	broken vertical bar $\ $ [U+00A6]
option-shift-hyphen	em dash [U+2014]
option-shift-\	en dash [U+2013]
shift-option-grave	combining dot above [U+0307] (needed with iota and upsilon for some medieval palaeographic purposes)

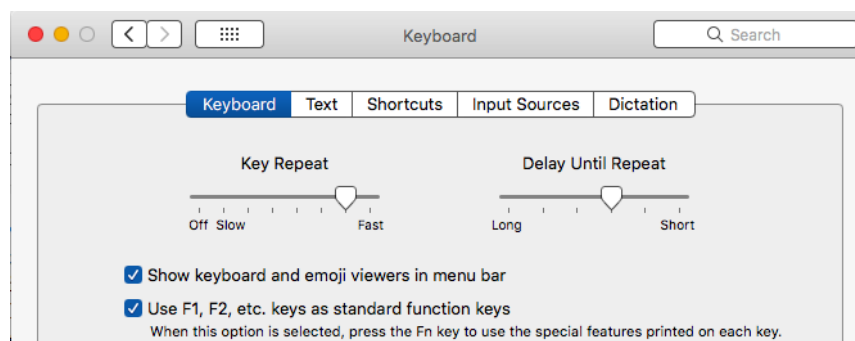
Three items are to be typed AFTER the character to which they apply:

option-period	sublinear dot ⁷ ($\alpha\beta\iota$) [U+0323]
option-y	overline above previous letter ($\overline{\alpha\beta\gamma}$) [U+0305]
option-i	iota subscript (alternative method) ⁸ (ι , α η ω) [U+0345]

6.E. USING THE CHARACTER VIEWER OR UNICODE HEX INPUT

The Character Viewer with which longtime users of OS X are familiar is now revealed by the command Show Emojis and Symbols (under the Input menu) rather than by the sensible former command Show Character Viewer.

The Character Viewer can be activated in System Preferences: Keyboard: Keyboard tab:



⁷ Positioning of the dot or overscore may not be ideal in some fonts or some applications. GreekKeys fonts have automatic substitutions that place the dot or overscore nicely. With many other fonts, many applications will place the dot or overscore “literally” so that it may not be centered and may overlap a descender or ascender.

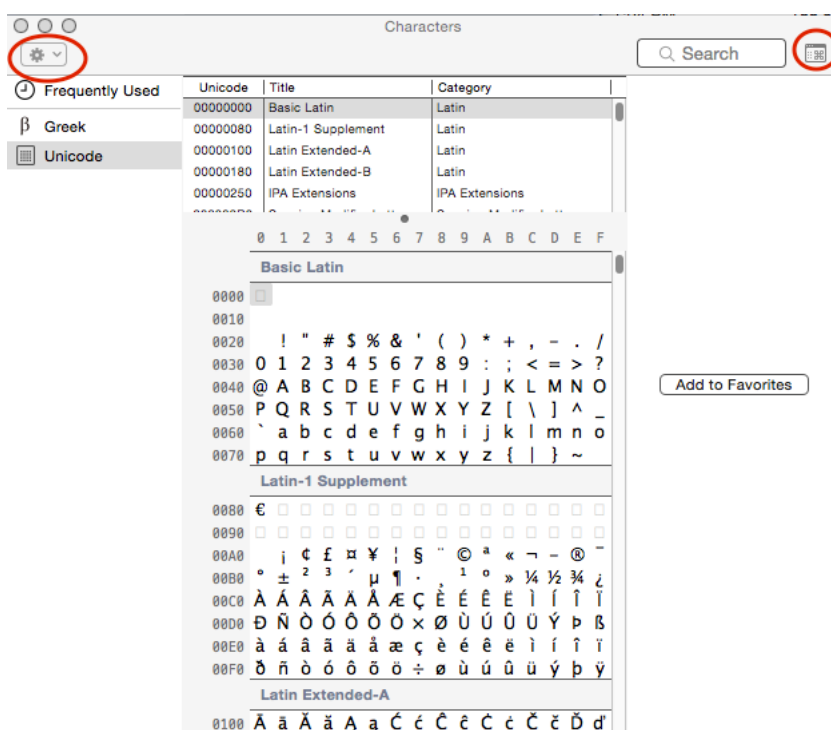
⁸ This method of inputting iota subscript is present for those who need decomposed input for some reason. Better results will normally be obtained by using option-a, option-h, and option-v. The option-i method will, however, work well with the fonts that contain the needed ligature definitions.

The capabilities of the Character Viewer have varied in different versions of OS X. The most serious lack in the latest version as of 2018 is its failure to display the Private Use Area characters that are available in installed fonts.

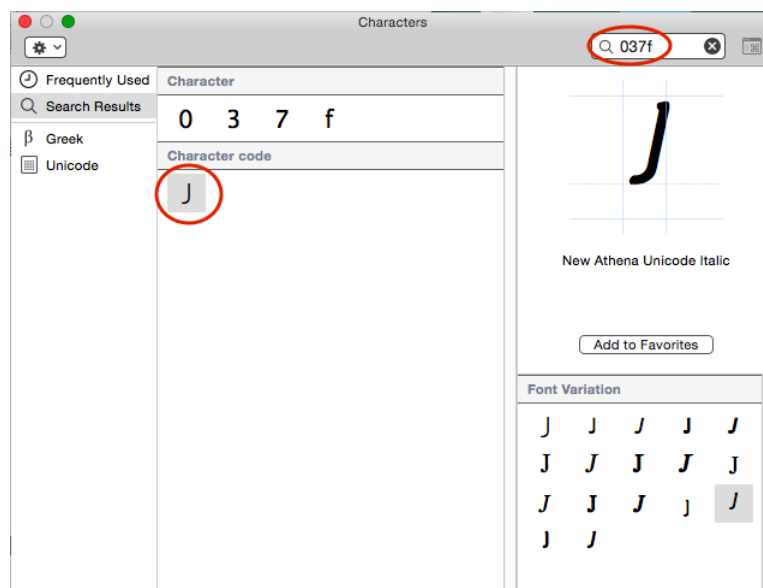
If the Character Viewer opens in its useless miniature form, click on the icon in the upper right corner in order to see the real Viewer.

You can determine which ranges are accessible directly from the left column by using the dropdown gear icon in the upper left corner.

You can use the search field if you know the Unicode code point for a character or symbol you want. You can also search by part of the character's name, if you know how it is described in Unicode, and then locate the desired character in the Related Characters area. This will allow you to determine what fonts contain the character (under Font Variation), and then you can insert it at the insertion point in the active document by double-clicking on the character.



For instance, the new Unicode character capital Jot has the code point U+037f, so searching for 037f in the Character Viewer will indicate which fonts, if any, contain it. In the search result, click on the item under Character Code to see the Font Variation display.



Another way to enter a character when you know the Unicode code point is to use the Unicode Hex input that comes with OS X. Activate this input in System Preferences: Keyboard: Input Sources. To use it in a document, change to Unicode Hex in the input menu, and then hold down the option key while typing the four hexadecimal digits of any BMP code point. You cannot enter SMP (five-digit) code points as such with Unicode Hex. You can enter them by using the two four-digit surrogates instead, but to discover those, you need to find the character in Character Viewer, in which case you may as well enter the character from there. The surrogates are in parentheses after the SMP codepoint. Note that when you do not use the option key, Unicode Hex behaves more or less like a US English input.



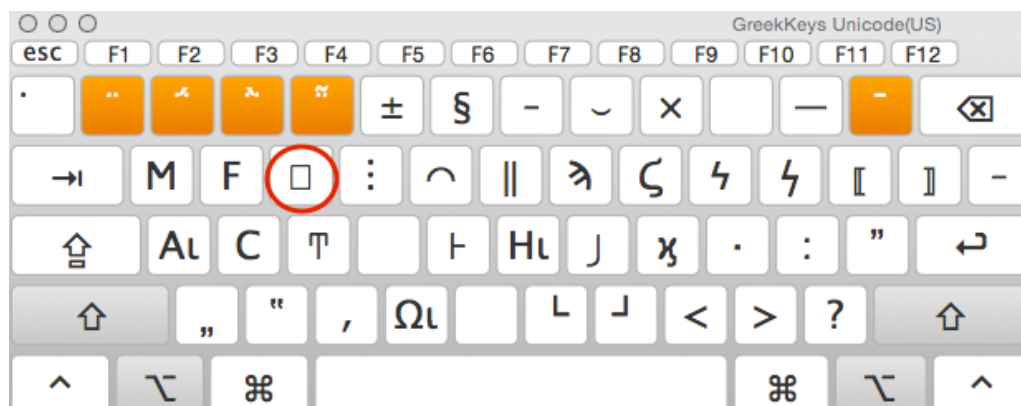
A complete list of characters in New Athena Unicode font is provided through the combined use of two documents that accompany the font: **FindCharacterNAU.pdf** explains how to use the cmap listing (**NAU5cmap.txt**) that catalogues all the glyphs that have a Unicode code point, whether official or in the Private Use Area (PUA); and this document also lists (and explains

how to enter) the 348 glyphs that are not in the cmap listing (precomposed glyphs for various combinations).

6.F. USING THE KEYBOARD VIEWER

The Keyboard Viewer is enabled along with the Character Viewer in System Preferences: Keyboard: Keyboard tab (see above. 6.E). It can then be displayed by selecting the item (with the mouse only) in the Input menu in the menu bar. See the illustration on the next page. The palette rides above the window of your frontmost application. Set the input with the Input menu. Under 10.3 and 10.4 the Keyboard Viewer had the excellent feature of allowing the user to select the font; this useful capability was removed in 10.5 and later. As a result, some keys will not display the relevant character, since it is not in the system font that Keyboard Viewer employs (in the third image below, the shift-option-e key shows a generic box, since GreekKeys here uses a Private Use Area character for the metrical omission caret, and this is not present in the system font). The Keyboard Charts provided in the download provide a workaround for this inconvenience. You can see the pattern of keys and click on a key to type it in the frontmost application window. With GreekKeys 2015 (as already for GreekKeys 2008), Keyboard Viewer does show (with orange background) the deadkeys for GreekKeys Unicode input.





6.G. IF YOU ARE IN TRANSITION FROM PRE-UNICODE GREEK ENCODINGS

For those who have used Traditional GreekKeys or other pre-Unicode encodings of polytonic Greek, there are a few differences to be noted.

Most important, you may have to adjust to changing both the input and the font when switching back and forth between English and Greek. (It is possible to change only the input, but see the caution in the Section 8.B below.)

Smooth breathing can be used with lowercase rho, as this is a combination found in some texts and is accepted in Unicode: option-4 followed by rho. The same is available for uppercase rho, but with a Private Use Area code point (or via OpenType ligature for advanced users).

The apostrophe key always produces a curved apostrophe (U+2019), as this is the only form proper in Greek typography. With traditional GreekKeys the apostrophe appeared unattractively as the straight single quote.

Diacritics and capital letters in Unicode form a single precomposed character. In traditional GreekKeys the diacritic and the capital letter occupied separate spaces, and thus could be separated from each other by a line break in some situations. Such separation does not occur in Unicode fonts that use precomposed characters.

Using shift-option with a, h, or v produces precomposed capital with iota adscript (one character, not two). In New Athena Unicode v. 2 and higher, the iota adscript is a normal-sized lowercase iota when a diacritic is also present, but when no diacritic is present the iota is also a capital, as this combination would occur only in “all caps” where diacritics are omitted.

The Unicode standard has shown at different times actual subscripts under capitals and reduced-size iotas beside capitals (reflecting different choices found in medieval palaeography and early printed books): if you have reason to use either of those forms, they are present as alternatives in New Athena Unicode with PUA code points. Use the document **NAU5cmp.txt** to discover the proper code point. They are also defined as alternative forms in OpenType, but few programs exploit this typography option and allow the user to select which variant to use consistently.

7. For Advanced Users: Decomposed Inputs for Mac OS X

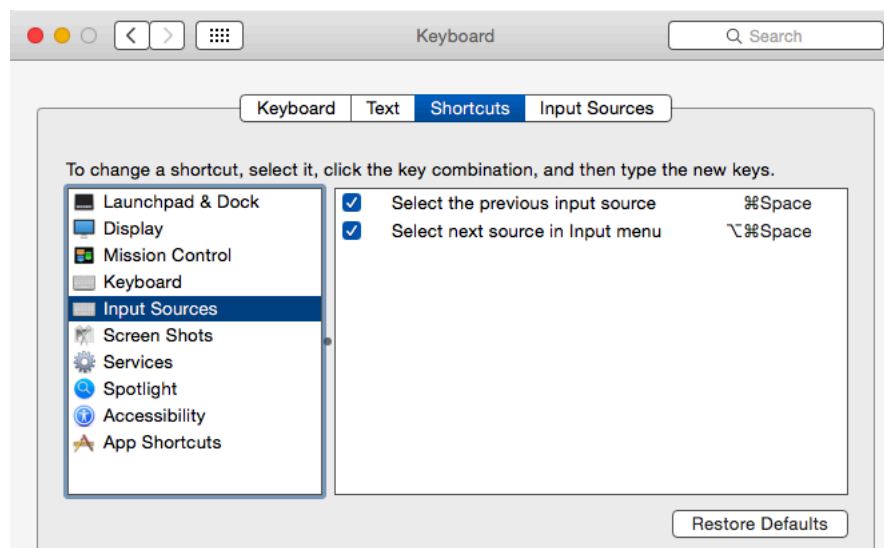
Optional choices in the OS X Installer for GreekKeys 2015 provide for the installation of two additional sets of GreekKeys Unicode inputs. The standard GreekKeys Unicode inputs enter the Private Use Area (PUA) code points for specialized combinations not recognized in the Unicode standard (such as alpha with a macron and also diacritics). By contrast, the inputs with “dcmp1” in their name (in the bundle **GKUdcmp1.bundle**) eschew the use of PUA code points and instead enter the decomposed Unicode codepoints that represent specialized combinations (such as epsilon with circumflex or alpha with macron and acute); the standard precomposed Greek characters of the Greek Extended block are still used in these inputs. Therefore, these inputs are suitable for anyone who has a particular need to avoid the PUA code points which are valid in only a limited set of fonts. On the other hand, users of dcmp1 inputs need to be aware that the text so entered may not appear well in some applications, although by this date most applications can deal with such input, and with GreekKeys 2015 the compositions are defined in ccmp tables instead of liga tables, so that the substitution of the precomposed character is normally automatic.

Even more experimental are the inputs which have “dcmp2” in their name (in the bundle **GKUdcmp2.bundle**). These eschew not only the PUA code points, but the precomposed code points of Greek Extended. All combinations are entered with the plain characters of the Greek block followed by combining diacritics. In this type of input the order of precedence adopted for multiple combining characters that follow the Greek letter is: (1) macron (U+0304) or breve (U+0306), if any; (2) breathing sign (U+313 smooth, U+0314 rough), if any; (3) accent (U+0301 acute, U+0300 grave, U+0342 circumflex), if any; (4) iota subscript (U+0345), if present. These inputs are suitable for anyone experimenting with completely decomposed Greek input, in anticipation of the (probably still long-distant) day when the Greek Extended block will be deprecated.

8. Working with Multiple Inputs and Unicode in Mac OS X

8A. SWITCHING KEYBOARDS

Long-time Mac users may be familiar with two keyboard shortcuts that have traditionally worked for the Keyboard or Input Menu: these are command-spacebar and option-command-spacebar. The former toggles between the two most recently selected keyboards (e.g., between US and GreekKeys Unicode(US)), while the latter moves down the list of activated keyboards in the order they appear. At a certain point Apple chose these familiar keys as the defaults for invoking Spotlight and left the shortcuts for the Input Menu deactivated. If you are already used to using command-spacebar and option-command-spacebar with the Input Menu, then you can still use the old key assignments by opening System Preferences: Keyboard: Shortcuts pane and selecting Input Sources. There is a checkbox for enabling or disabling a shortcut, and you can double-click on the shortcut definition to enter a new key combination. You can redefine the Spotlight shortcuts as well, if you wish.



8B. SWITCHING FONTS AND OTHER FONT ISSUES

Strictly speaking, it is not necessary to change fonts when you transition from Greek to Roman typing or vice versa, if you are using a Unicode font that contains a large range of Roman characters as well as all the Greek characters you need. The GreekKeys Unicode fonts contain Roman as well as Greek characters, and so do several other fonts supplied with OS X or installed along with MS Word. But if you are preparing a work for publication in a journal or by a press, or if your work contains very frequent alternation of Greek and Roman fonts (as in a commentary), it may at some point be very important to be able to distinguish easily between what is entered in Greek and what it not, so that a global search and replace of all Greek is possible. Some journals and presses will request that the English be in one particular font and the Greek in another particular font, to ensure that they are able to process the file easily through their production software. Global replacement of one or both types of font is very easy in Microsoft Word (and other programs) as long as the Greek and Roman are in distinct fonts. Similarly, if you will be exchanging your document with a Windows user, it is much safer to have the Greek in a different font, so that a global substitution will be easy.

If you are committed to using distinct fonts, the easiest setup for typing mixed Roman and Greek is to create keyboard shortcuts in MS Word for your chosen Roman font and for your chosen Unicode Greek font. (Use the Customize Toolbars/Menus... command under Tools, and click on the Keyboard... button to set up your own commands.) Then you will have a two-command sequence to use at each transition from Roman typing to Greek typing: one for changing the input and one for changing the font. Some users report that they accomplish both commands with a single keyboard shortcut through a third-party program, but compatibility with GreekKeys is often a problem for such programs.

Since GreekKeys 2015 now causes MS Word to apply the language Greek to what is typed with the GreekKeys Unicode keyboards, it might be expected to be practical to use a single font and still be able to do an easy global replacement by (advanced) searching with the Format set to Language: Greek. This is, however, unreliable in Word 2011, as the language setting seems to

apply to portions that are not in Greek if the document features frequent alternation of Greek and non-Greek words.

8C. OTHER ANNOYANCES

More system fonts (and Microsoft fonts) contain the characters for monotonic Greek than contain the characters needed for polytonic Greek, and sometimes there are older and more recent versions of the same font that differ in this regard. Sometimes a font that is common on Windows systems has more characters in it than the font apparently of the same name in OS X. As a result you may receive a file from someone that looked fine on their computer, but has lots of boxes for Greek characters when you open it on yours. Normally, if you select the boxy Greek and change the font to one you know has full polytonic Unicode, it will become readable and correct. A global substitution of the font may solve the problem quickly. If not, you may need to obtain the font used in the document, or work through making many individual changes of font.

Sometimes you may input a Unicode character while typing in a font that does not contain it. You may then see just a box, or the application may change the font automatically to supply that Unicode character. Unfortunately, the application may not do this very intelligently, and you may need to select the characters and change the font to one you prefer.

9. Workarounds for Users of MS Word for Mac OS X

9A. THE PROBLEM OF SMART QUOTES

Now that MS Word interprets the Greek you enter as Greek in language, it also makes the false assumption that you want your double quotation mark to be in the form of guillemots « » rather than the “ ” you probably want. This occurs when you have the AutoCorrect setting for substituting smart quotes for straight quotes. There is no good workaround for this, until MS Word (or OS X) allows the user to specify which form of quotation marks to use with which language (in the way OS X allows one to set number and date formats by language). (1) You can train yourself to use the keys for direct input of the desired quotation marks: in GreekKeys Unicode(US) the keystroke for the left curly double quote is option-apostrophe, and the right is option-shift-apostrophe. (2) You can do a global substitution for « and » later. (3) You can change to US input when you type a quotation mark within Greek text. (4) You can use straight quotes (turn off the AutoCorrect feature for smart quotes) and laboriously fix them later.

9.B. DEALING WITH MS WORD'S CONFLICTING SHORTCUT ASSIGNMENTS

MS Word for Mac OS X has a great many unnecessary and annoying predefined keyboard commands for various formatting actions, but they are usually less intrusive in OS X than in Windows because of OS X's conventions regarding modifier keys. You may find it necessary or desirable to disable a number of these so that they do not interfere with Greek input or produce surprising actions if you accidentally hit the wrong key. Also, you may want to assign a shortcut

for particular fonts. To add, change, or remove shortcut keys in Word 2011 or 2016, follow these steps:

1. Under Word's Tools menu select Customize Keyboard...
2. Under Categories scroll down and select All Commands.
3. In Word 2011 you will may need to hunt for the command whose shortcut you want to modify, but in Word 2016 there is a search field that simplifies the process. For example, searching for "smart" will help find the command "ToolsAutoCorrectSmartQuotes" (which toggles the setting for automatic smart quotes).
4. Under Current keys:, you can select an existing keyboard shortcut and then click Remove; or you can use the field under Press new keyboard shortcut: to enter a new keyboard combination, and then click Assign.
5. If you are not certain of the name of the command that is causing a conflict or an annoyance, see the advice below.

If you do not know which command is causing the annoyance, but know which key combination is troublesome, then use the same dialog to try to assign the troublesome key combination to any other command. You should get a message telling you the combination is already assigned to a particular command. Cancel your attempt, and then go to the command specified as already using the troublesome combination and try to remove that keyboard shortcut. There are some commands, however, that Word will not allow you to change or remove.

9.C. DEALING WITH MS WORD'S CONFLICTING AUTOCORRECT FEATURES

Some AutoCorrect features can be annoying or troublesome when you type Greek and many will want to turn them off. To change the AutoCorrect settings in Word 2011 or 2016, click on AutoCorrect... under the Tools menu. You may need to make changes both on the AutoCorrect tab and on the AutoFormat As You Type tab.

Options to pay most attention to:

Ordinals (1st) with superscript (AutoFormat As You Type): oddly enough, this causes a plain sigma at the end of a word to change to final sigma; but the change also occurs when sigma is followed by apostrophe in an elided ending, which is incorrect.

Capitalize first letter of sentences (Auto Correct): sentence-opening capitalization is not conventional in modern presentation of ancient Greek texts.

Capitalize first letter of table cells (Auto Correct): this option may be as unwanted in typing a modern language as it is for ancient Greek

10. Converting from Older Encodings to Unicode

If you have legacy documents containing Greek in pre-Unicode encodings (Traditional GreekKeys or any other), you may want to convert them into a form that works with modern applications. Lucius Hartmann has produced a program called GreekKeysConverter, which provides filters for converting between various pre-Unicode fonts and between those fonts and Unicode. For a modest shareware fee you may register this program and unlock its full potential. Download the program at <http://www.lucius-hartmann.ch/programme/gkconver.php>. Licensed users are also allowed to use the online version of the converter on his web site.

The steps for using GreekKeysConverter are provided on the online help site.

11. GreekKeys Symbol Input for Mac OS X

Only one version of this input is supplied, and it may be used with US (ANSI) or European (ISO) keyboards. This input has a fuller complement of symbols for creating sophisticated metrical schemes. It also allows direct access to the acrophonic numerals used in epigraphy, which have recently received Unicode code points, and to other symbols for papyrological and editorial use.

Look in the **GK2015 Keyboard Charts Mac** folder for PDFs showing the layout of this input together with the Unicode code points of the characters.

Part III: GreekKeys 2015 for Windows

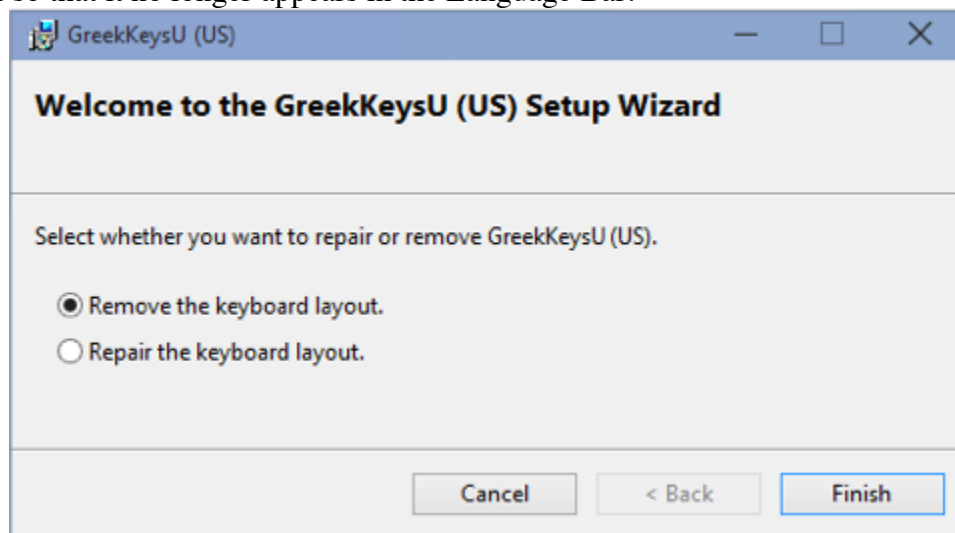
12. Installation and Activation of GreekKeys Unicode (Windows)

The steps and illustrations below are applicable to Windows 8 and Windows 10. The process for Windows 7 is very similar, but the appearance differs.

You must have administrative privileges on the computer in order to install and activate this keyboard. If not, the installation will fail, but the installer may not tell you this is the reason.

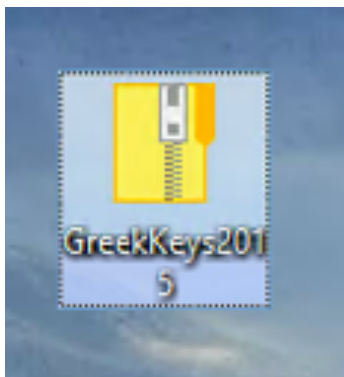
12.A. IF YOU ARE UPGRADING FROM A PREVIOUS VERSION OF GKU FOR WINDOWS

The new versions all have 2015 in the keyboard name and therefore may be installed side by side with the older versions. You have two choices for dealing with the older version. (1) Run the **setup.exe** file from the previous version in order to uninstall it: if a keyboard is installed, the **setup.exe** will (as shown below) automatically give you the choice of removing or repairing (reinstalling) it, and you should choose to remove it. (2) Leave the keyboard installed, but deactivate it so that it no longer appears in the Language Bar.

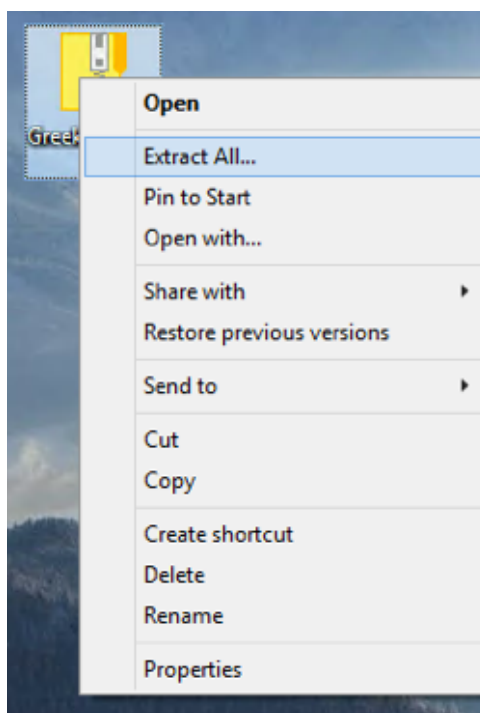


12.B. RUNNING THE INSTALLER

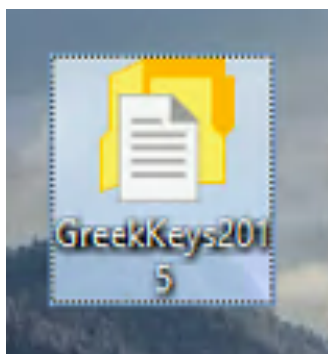
1. If you have not already downloaded GreekKeys 2015, click on the Download link. In some browsers you will be asked what to do; if so, select Save As... and choose the Desktop (or other convenient location) for the download. With other browsers, the zip archive will automatically go to Downloads.



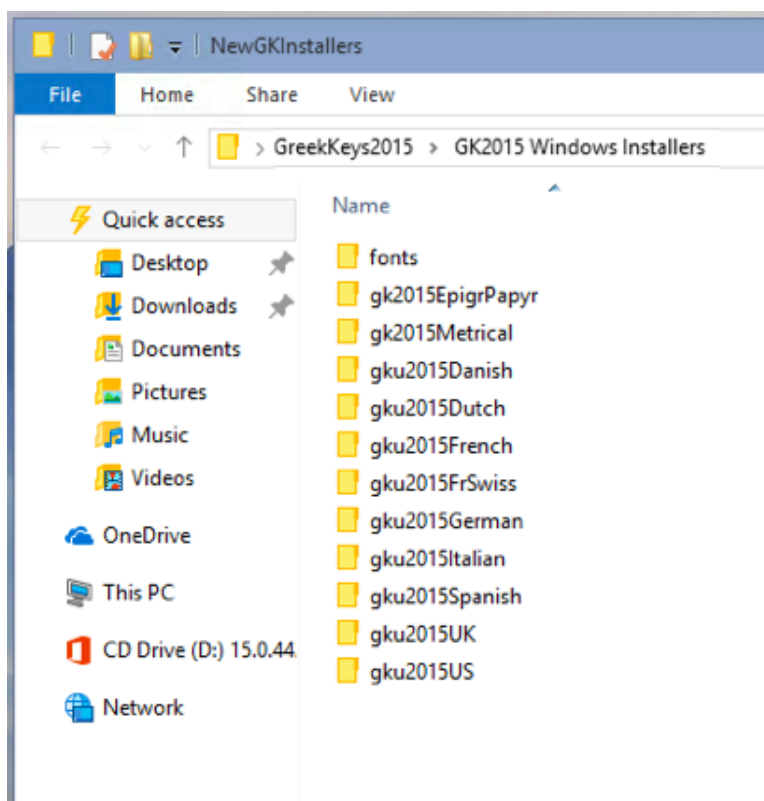
2. Go to whichever location was used for the downloaded file.
3. Select the compressed folder (with the zipper icon), and right-click on it to reveal the contextual menu.



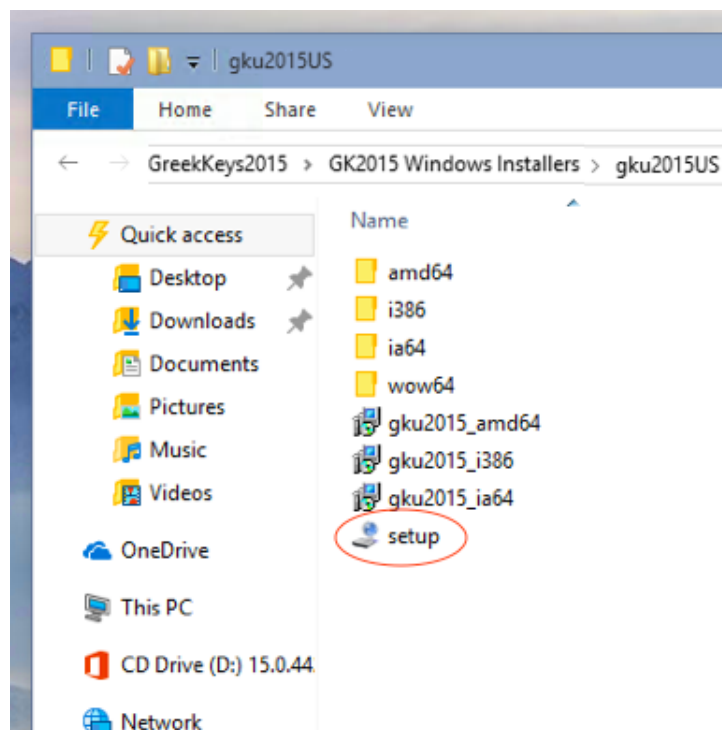
4. Select Extract all... and then in the resulting dialog choose the location for the extracted files (such as the Desktop).



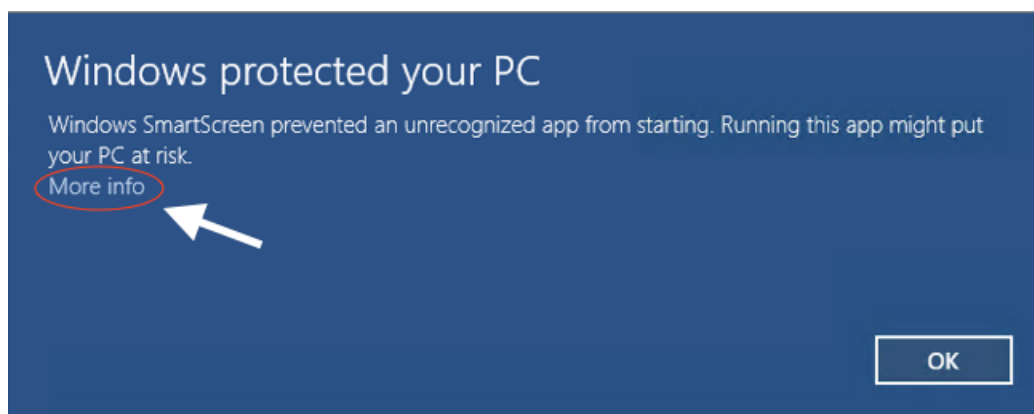
5. Now locate the folder GK2015 Windows Installers.
6. Open it and then open the folder for the localized version of the keyboard you want (or for one of the symbols keyboards).



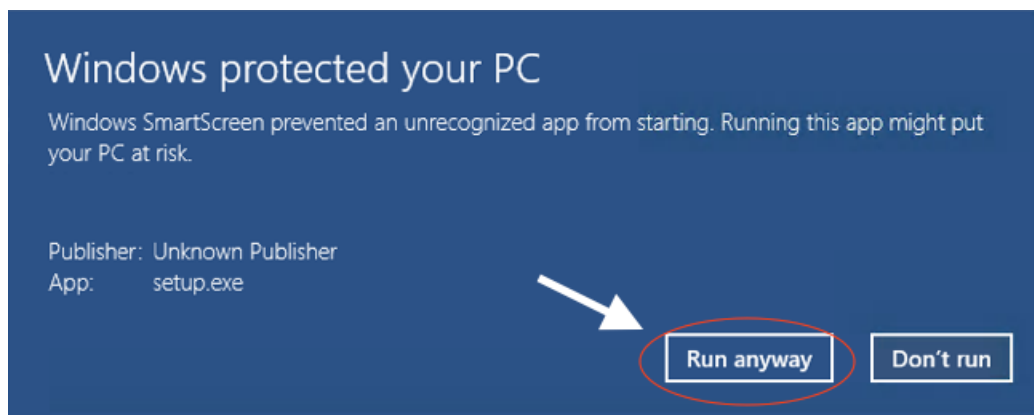
7. Double-click on setup (or setup.exe).



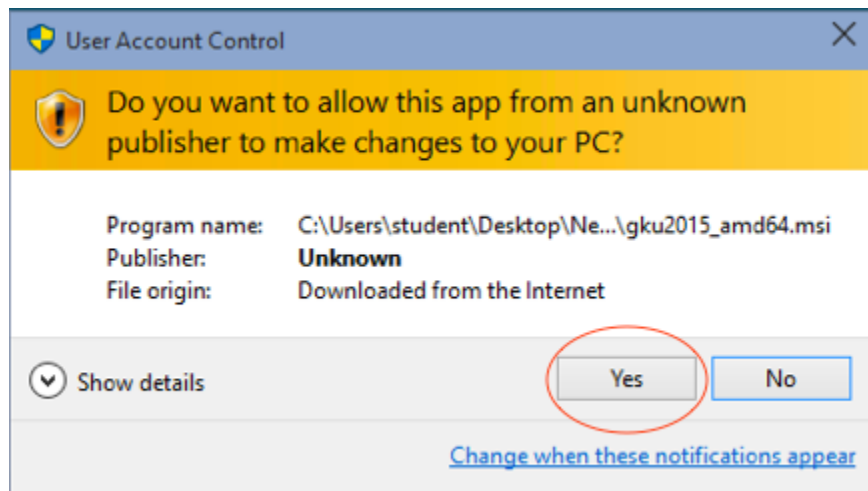
8. Windows will inform you it has blocked installation because the developer is unknown.



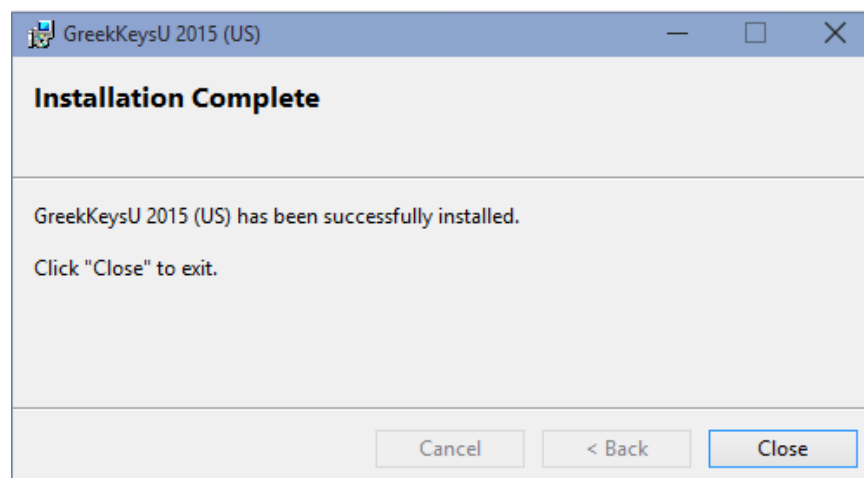
9. Click on More Info, which will reveal the button for Run anyway. Click on that.



10. A small alert saying the installation is beginning will flash by, too quickly to be read.
11. Windows Defender will flash, seeking your attention; Click Yes in the security alert.

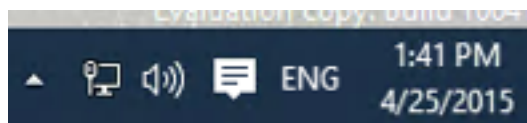


12. The notice of successful installation will appear after a few seconds.

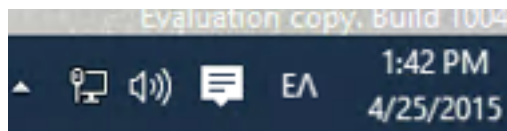


12C. THE WINDOWS LANGUAGE BAR AND ITS SETTINGS

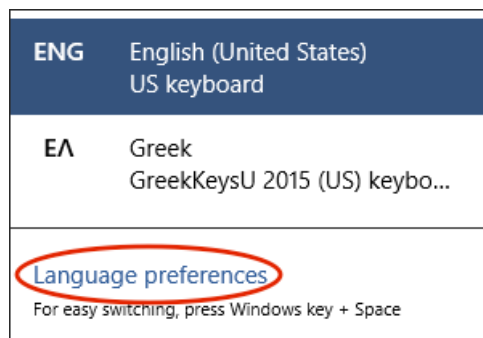
The installed keyboard will automatically be activated in the language bar, and the language bar will be present at the bottom right if it was not present before.



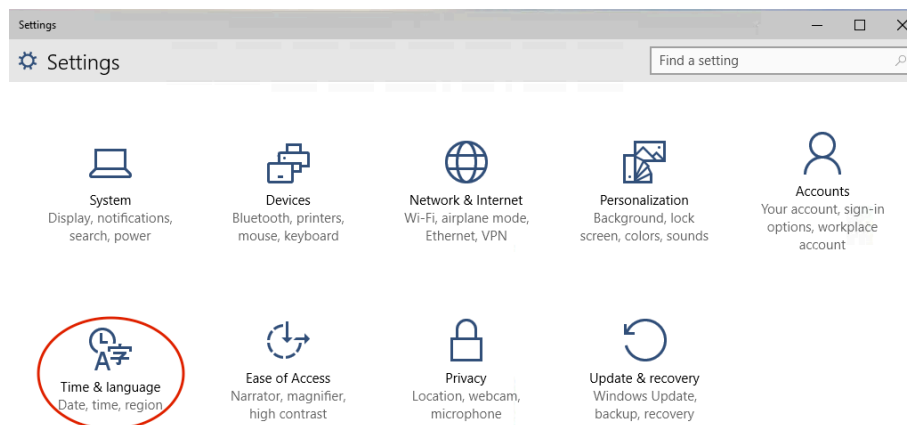
Shifting between e.g. ENG and ΕΛ (or EL) in the language bar may be done with the mouse, or with the keyboard command left-alt+shift in Windows 8 or Windows 10 (Microsoft+spacebar is also supposed to work in Windows 10).



Those are the default settings and you can change the keys assigned in the Settings: Time & Language. You can get there from the link in the Language Bar itself, when you click on the language code:

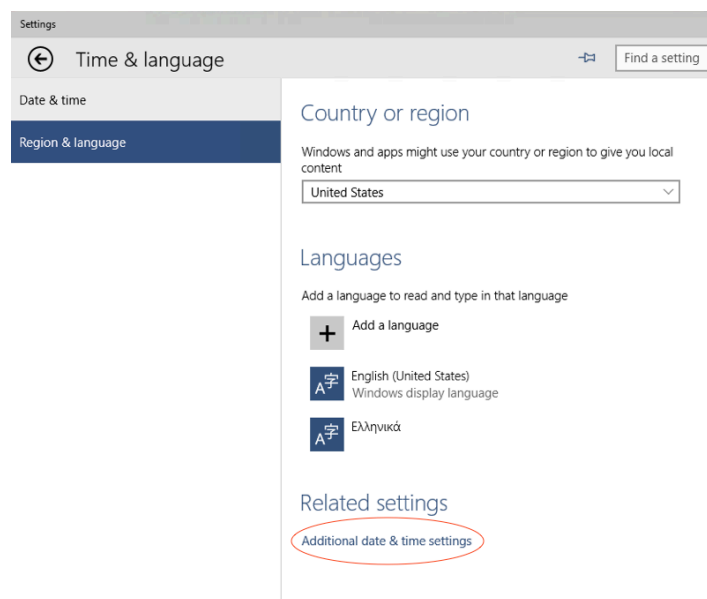


or by opening Settings directly:

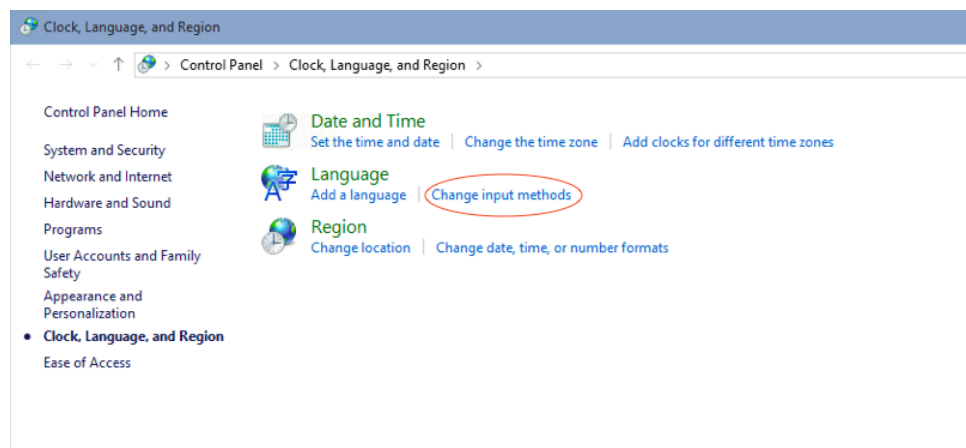


Here is the sequence of clicks to get to the advanced settings, where you finally can bring up the dialog to assign keys. You can bypass steps 1 and 2 if you instead open Control Panel and select Language.

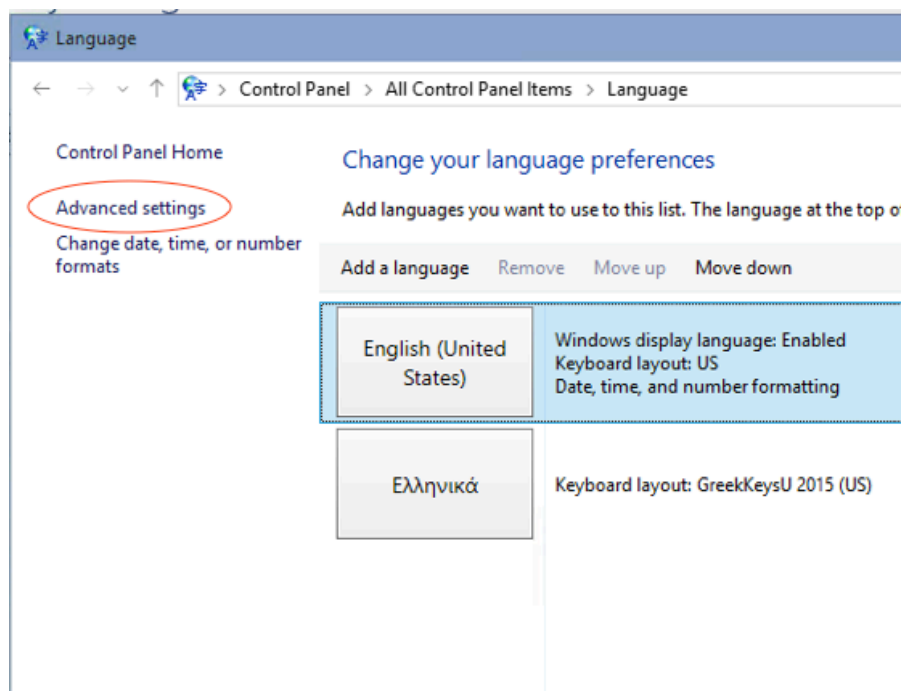
1. In Settings: Time & Language, click on the link Additional date & time settings



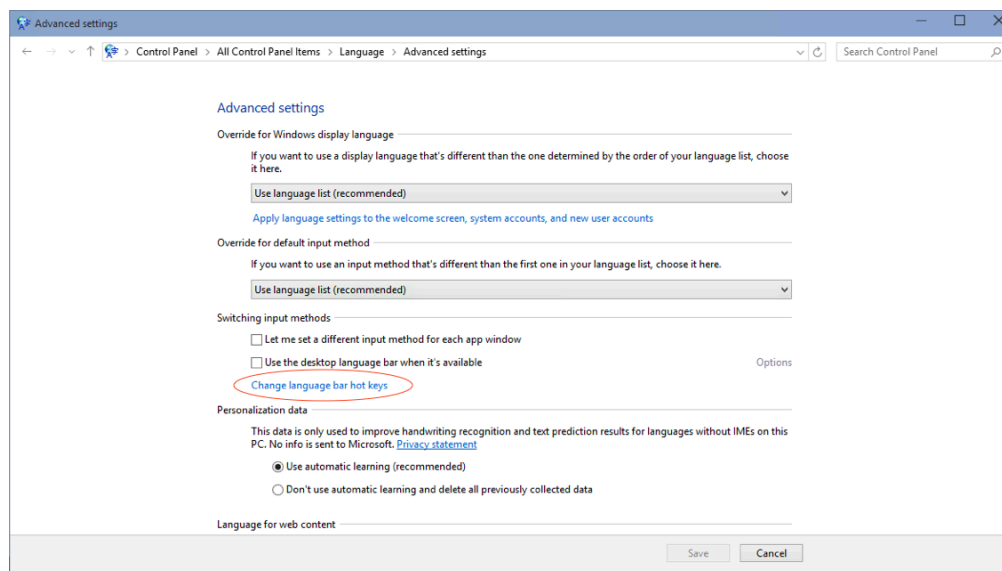
2. In Clock, Language and Region, click on Change input methods.



3. In Language, click on Advanced settings.



4. In Advanced settings, click on Change language bar hot keys.



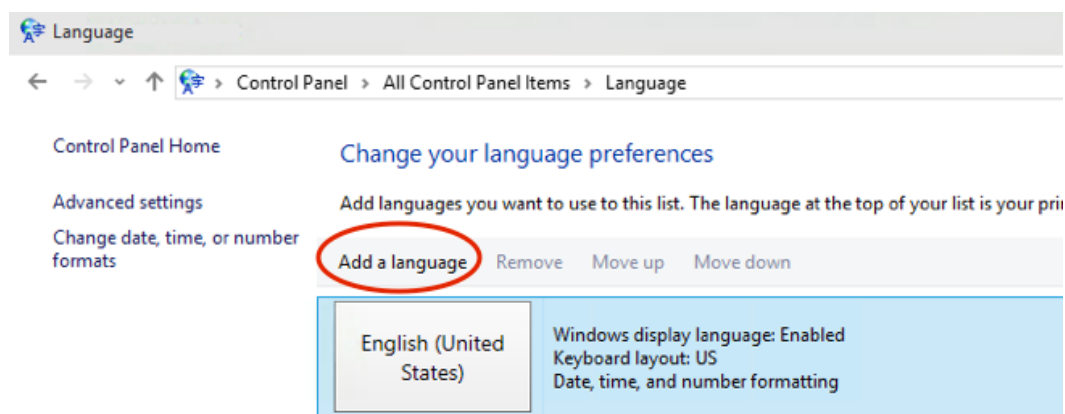
In Windows 7, either (1) make the Language bar visible and click on the little triangle to select Settings from the dropdown menu, and choose the Advanced Key Settings... tab; or (2) open Regional and Language Options, pick the Keyboards and Languages tab, click on Change Keyboards..., select the Advanced Key Settings... tab. Here you can assign shortcuts to particular keyboards, or by clicking on Change Key Sequence... you can choose different shortcuts for toggling between languages or keyboards within a language.

12D. MANUAL ACTIVATION OR DEACTIVATION OF WINDOWS KEYBOARDS

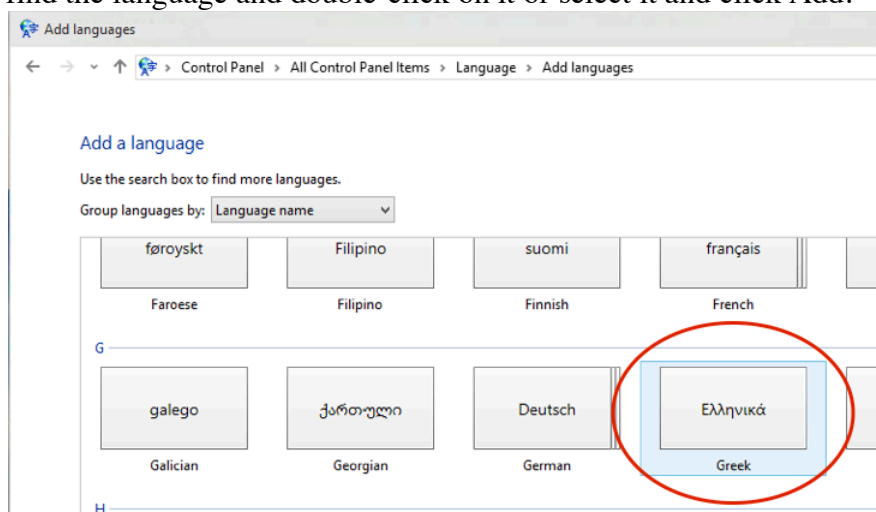
The newly installed keyboard(s) should be activated automatically. If you ever find it necessary to deactivate or activate a keyboard manually, here are the steps.

Once again you need to get to the Control Panel called Language, which can be accessed with from Control Panel or from Settings (see steps 1 and 2 under 12C above).

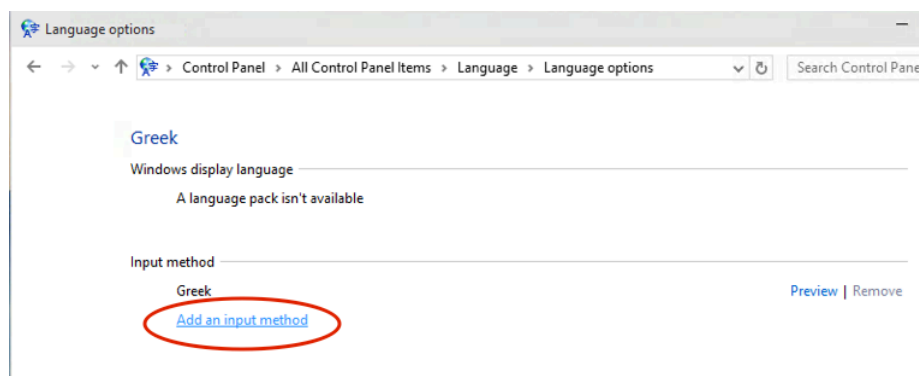
1. Click on Add a language.



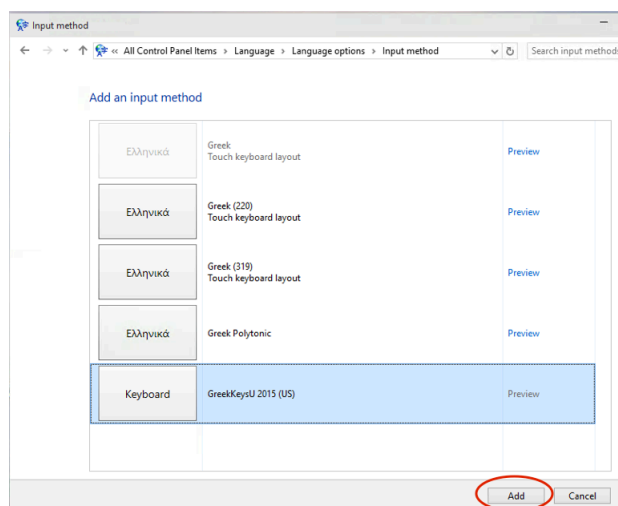
2. Scroll to find the language and double-click on it or select it and click Add.



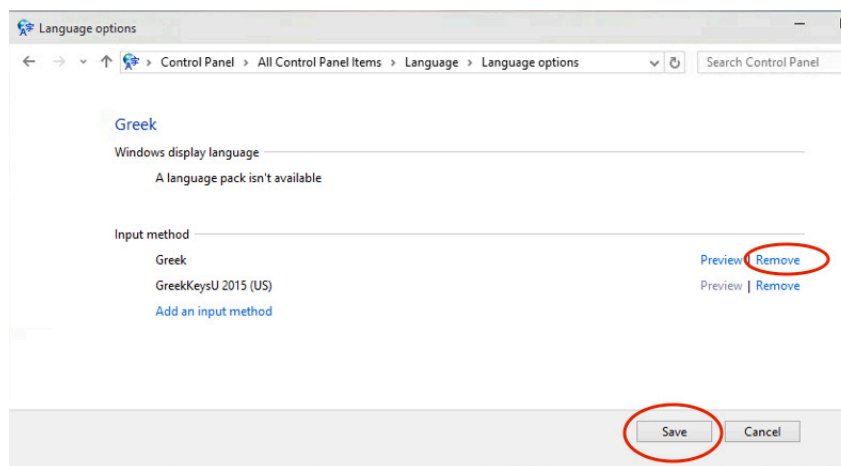
3. Windows will automatically activate the first Greek input in its collection (which is monotonic). To add the GreekKeys 2015 keyboard, click on Add an input method.



4. Select the desired keyboard and click on Add.

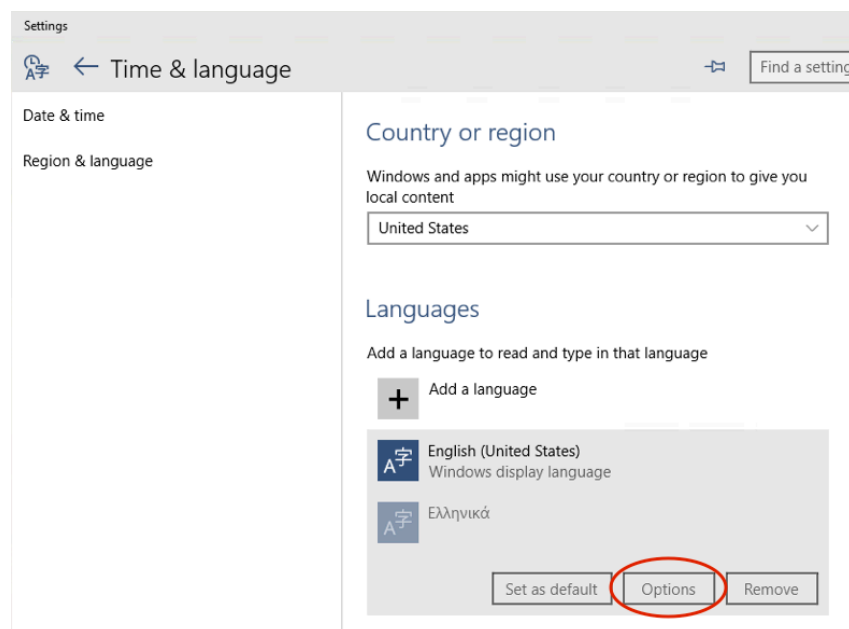


5. On the next screen, you can now click on Remove for the default Greek keyboard, and then on Save to make the desired keyboard active.

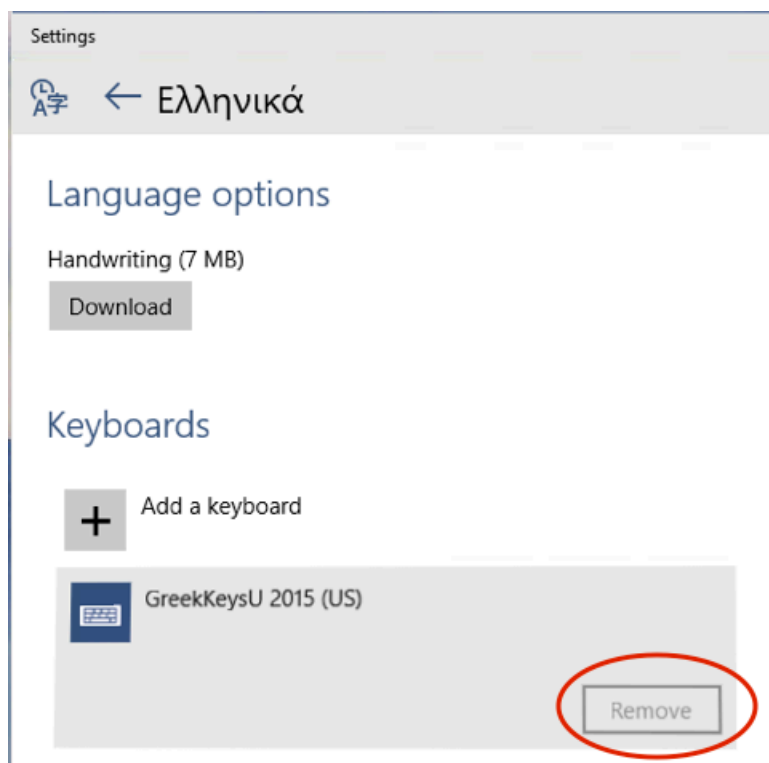


If you need to remove/deactivate a keyboard, then follow these steps.

1. In the Language Control Panel click on the language to reveal the hidden button and then click on Options.



2. In the next pane, click once again on the installed keyboard you want to remove in order to reveal the hidden buttons, and then click Remove.

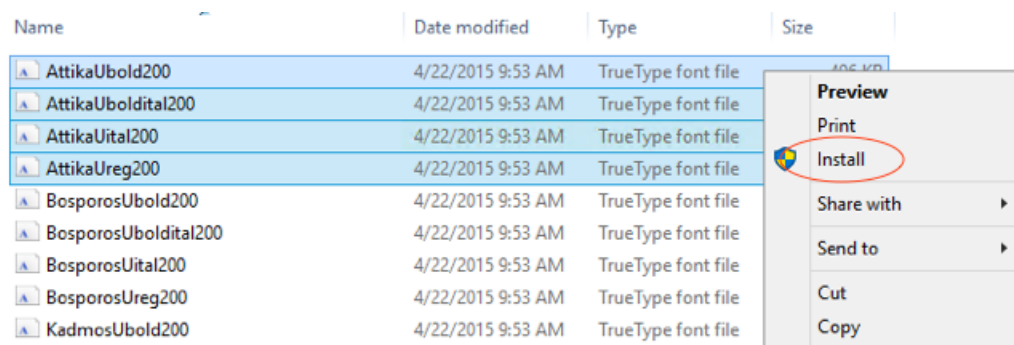


13. FONT INSTALLATION IN WINDOWS

You must have administrative privileges on the computer in order to install or remove fonts. If not, the installation will fail, but you may not receive feedback to tell you this is the reason.

Under Windows, the GreekKeys fonts are installed separately from the keyboards. The most efficient way to install is as follows:

1. Open the folder containing the fonts you want to install.
2. Select the font files you want to install (there are four files for each font; if you don't want the styled versions, you should select the one that has "reg" in the name or a name without Bold, Italic, or BoldItalic).
3. Right-click for a contextual menu, and select Install.



4. If a font is already present, you will be asked whether you want to replace the installed version with the new one.

Another, less efficient method (since it operates only one file at a time), is to double click on a font file: you will see a preview window, with the Install button at the upper left.

14. TYPING WITH GREEKKEYS UNICODE KEYBOARD (WINDOWS)

14.A. INTRODUCTION

Most users will be typing in two languages and scripts, their native modern language and polytonic Greek. You must change the selected language in the Language Menu every time you switch from one script to the other (you do not always have to change the font, but it is often a good idea to do so: see below). It is far more efficient to use a keyboard shortcut to switch keyboards than to make the change in the Language Menu with the mouse. For details about the use of the keyboard shortcuts for the Language Menu, see 18 below; for how to change the shortcut assigned to changing keyboards, see 12.C above.

For reference and ease of learning, it may be helpful to print out the keyboard chart for the input you use: these are located in the folder **GK2015 Keyboard Charts Windows** in the GreekKeys 2015 package.

14.B. PLAIN GREEK CHARACTERS

The plain Greek letters are arranged as on a modern Greek keyboard, except that upsilon is “u” and theta is “y.” Most other equivalences are obvious, such as alpha at “a” and beta at “b.” The less obvious items are final sigma at “w,” psi at “c,” xi at “j,” and omega at “v.”

14.C. DIACRITICS AND SPECIAL CHARACTERS

The GKU keyboards for Windows actually allow two styles of input for letters with diacritics: by deadkey typed before the vowel or rho to invoke the modified letter instead of the plain letter; or by combining diacritic typed after a plain vowel or rho. The resulting input to the file is different in the two cases. The first method produces input for precomposed characters that is far more reliable and far less likely to produce problems when a file is shared across platforms or some Greek text is copied into other programs. Thus, **THE DEADKEY METHOD IS STRONGLY RECOMMENDED.**

The second method is for advanced users with particular needs for special characters or decomposed input. It is discussed separately below. It may not work consistently in all possible configurations of Windows systems.

14.D. DEADKEY METHOD (PRESS KEY BEFORE THE LETTER TO BE MODIFIED)

The deadkey method uses the 12 keys on the top row (ignoring Fkeys, if they are present) from the numeral 1 to the rightmost key (equal sign on US keyboard). These are the same keys

with the same ordering of diacritics as are used in the Mac OS X version. Unlike the Mac OS X version, the deadkeys in Windows (except for combining diaeresis) are not invoked by a modifier key, but either by the unshifted key or the shifted key. If you need, in the midst of your Greek, the character that is actually shown on the key, then type the key followed by space to obtain it. For example typing **1** then **space** inputs **1**, or typing **shift-9** then **space** inputs **left parenthesis**.

The following work with all vowels (and breathings work with rho as well):

1	acute (')
2	grave (`)
3	circumflex (~)
4	smooth breathing (')
5	rough breathing (')
6	smooth and acute (")
7	rough and acute (")
8	smooth and grave (")
9	rough and grave (")
0	smooth and circumflex (˘)
hyphen*	rough and circumflex (˘)

*or the eleventh key, which may not be **hyphen** on non-US keyboards

The following works with the vowels alpha, epsilon, iota, omicron, upsilon:

equal**	breve
---------	-------

or the twelfth key, which may not be **equal on non-US keyboards

NOTE: press spacebar after any of the above deadkeys to input what is shown on the key (numbers 0-9, hyphen, equal). Press any of these keys twice to enter the noncombining (spacing) version of the diacritic.

The following work with alpha, eta, and omega, and (except the first 3) with their capital forms:

shift-1	iota subscript and acute (') [or diaeresis acute with iota or upsilon]
shift-2	iota subscript and grave (`) [or diaeresis grave with iota or upsilon]
shift-3	iota subscript and circumflex (~) [or diaeresis circumflex with iota or upsilon]
shift-4	iota subscript and smooth breathing (')
shift-5	iota subscript and rough breathing (')
shift-6	iota subscript and smooth and acute (")
shift-7	iota subscript and rough and acute (")
shift-8	iota subscript and smooth and grave (")
shift-9	iota subscript and rough and grave (")
shift-0	iota subscript and smooth and circumflex (˘)
shift-hyphen*	iota subscript and rough and circumflex (˘)

*or the eleventh key, which may not be **hyphen** on non-US keyboards

The following works with the vowels alpha, epsilon, iota, omicron, upsilon:

shift-equal**

macron

******or the twelfth key, which may not be **equal** on non-US keyboards

NOTE: press spacebar (or any character that would not take a diacritic) after any of the above deadkeys to input what is shown on the key (punctuation and symbols).

The following works with iota and upsilon:

altgr-u***

diaeresis

IMPORTANT: WHAT DOES ALTGR MEAN?

In key combinations used in GreekKeys for Windows for combining letters, the deadkey for diaeresis, and some rarer characters and symbols, the term “altgr” is a traditional name (from “ALT graphic”) for the righthand ALT key on a Windows keyboard. The lefthand ALT key and the righthand ALT key do not behave the same on a Windows keyboard, and if you try to use the lefthand ALT key for a complex keyboard, it will not work. Theoretically, the righthand ALT is equivalent to CONTROL + (lefthand) ALT; but in reality this is not always true: on some keys it may work, but on others it will not.

14.E. WHAT CANNOT BE ENTERED WITH THE DEADKEY METHOD ALONE

1. Alpha, iota, and upsilon with either breve or macron plus one or more additional diacritics, and epsilon and omicron with macron plus one or more diacritics: see Section 16 with instructions for advanced users. Or for maximum compatibility, enter these as PUA characters using one of the alternative methods discussed in Section 21 below.

2. Note these three combining additions that are entered AFTER the character.⁹

altgr-period

sublinear dot [U+0323] (e.g. $\alpha\beta\gamma$)

altgr-shift-

stroke above a character [U+0305] (as for numbers or citation of a word, $\bar{\alpha}$ $\bar{\epsilon}$ $\bar{\pi}$)

altgr-i

iota subscript [U+345]¹⁰

14.F. OTHER CHARACTERS ACCESSIBLE FROM THE GKU WINDOWS KEYBOARD

The following assignments apply to the US version of the keyboard. Many of them are the same for the various European keyboards, but please refer to the layouts in the folder **GK2015 Keyboard Charts Windows** for precise information.

altgr-a

 α [U+1FB3]

⁹ Depending on the font used, these combinations may not appear well. The GreekKeys fonts have OpenType substitution instructions that make the combinations appear handsomely.

¹⁰ Alternative method for decomposed Unicode input; not recommended for ordinary use.

altgr-shift-a	capital alpha with iota adscript Αἰ [U+1FBC] or (after other deadkeys) with diacritics, e.g. Αἰ ^ι
altgr-h	eta with iota subscript η [U+1FC3]
altgr-shift-h	capital eta with iota adscript Ηἰ [U+1FCC] or (after other deadkeys) with diacritics, e.g. Ηἰ ^ι
altgr-v	omega with iota subscript ω [U+1FF3]
altgr-shift-v	capital omega with iota adscript Ωἰ [U+1FFC] or (after other deadkeys) with diacritics, e.g. Ωἰ ^ι
w	final sigma ς [U+03C2]
shift-w	capital archaic sampi λ [U+03E0]
altgr-w	digamma (vau) Ϝ [U+03DD]
altgr-shift-w	capital digamma (vau) Ϝ [U+03DC]
altgr-s	lunate sigma Ϸ [U+03F2]
altgr-shift-s	capital lunate sigma Ϸ [U+03F9]
q	archaic koppa Ϡ [U+03D9]
shift-q	capital archaic koppa Ϡ [U+03D8]
altgr-q	archaic san Ϻ [U+03FB]
altgr-shift-q	capital archaic san Ϻ [U+03FA]
altgr-y	archaic heta Ϡ [U+0371]
altgr-shift-y	capital archaic heta Ϡ [U+0370]
altgr-e	archaic sampi Ϻ [U+03E1]
altgr-k	stigma Ϸ [U+03DB]
altgr-shift-k	capital stigma Ϸ [U+03DA]
altgr-z	modern/numeric Greek koppa Ϸ [U+03DF]
altgr-shift-z	capital modern/numeric Greek koppa Ϸ [U+03DE]
altgr-c	Greek numeral sign (´) [U+0374]
altgr-shift-c	Greek numeral sign (lower) (,) [U+0375]
altgr-j	yot Ϸ [U+03F3]
altgr-shift-j	capital yot Ϸ [U+037F]
altgr-shift-d	metrical longum (non-combining) [U+2012] ¹²
altgr-shift-f	metrical breve (non-combining) [U+23D1]
altgr-shift-g	metrical anceps × [U+00D7]
altgr-l (letter)	kai symbol (ϣ)[U+03D7]
altgr-;	capital Kai abbreviation (Ϟ) [U+03cf]
altgr-shift-l	metrical period-end (double bar) [U+2016]
altgr-shift-e	metrical catalexis (omission caret) ^ [U+0020,U+0020,U+032D]
altgr-shift-r	metrical caesura symbol (dotted vertical) ∴ [U+003A]

¹¹ Different fonts will offer different treatments of iota adscript with capital vowels.

¹² A fuller collection of metrical symbols is included in the GKU metrical and papyrological symbols keyboard.

altgr-shift-t	metrical inverted breve (brevis in longo) \sim [U+2312]
< and > (shift-, and shift-.)	left and right angle brackets < and > [U+27E8-9] ¹³
altgr-t	obelus † [U+2020]
altgr-[left guillemot («) [U+00AB]
altgr-]	right guillemot (») [U+00BB]
altgr-shift-[left double-bracket [[U+27E6]
altgr-shift-]	right double-bracket] [U+27E7]
altgr-shift-n	left lower half-bracket \lceil [U+230A]
altgr-shift-m	right lower half-bracket \rceil [U+230B]
altgr-backslash	emdash — [U+2014]
altgr-slash	endash – [U+2013]
semicolon	Greek question mark (English semicolon) ; [U+003B]
shift-semicolon	Greek colon (single mid-line dot) \cdot [U+00B7]
altgr-shift-semicolon	Greek dicolon (English colon) (:) [U+003A]
altgr-n	left single curly quote [U+2018] ¹⁴
altgr-m	straight apostrophe (straight single quote) [U+0027]
apostrophe (straight single quote)	curved apostrophe (right single quote) [U+2019]
altgr-apostrophe	left double curly quote [U+201C] ¹⁵
altgr-shift-apostrophe	right double curly quote [U+201D]
altgr-b	Greek beta symbol β [U+03D0]
altgr-shift-comma	less-than [mathematical symbol U+003C]
altgr-shift-period	greater-than [mathematical symbol U+003E]

15. Workarounds for Users of MS Word for Windows

15.A. THE PROBLEM OF SMART QUOTES

If you have “automatic smart quotes” enabled, then when you type the straight double quote [U+0022] (shift-apostrophe), the substitution made by Word may not be what you actually want. Word recognizes the keyboard as Greek and adjusts the form of the quotation mark to guillemots, and there is no way to specify a different choice in Greek text. Similarly, the left single curly quote will not appear if you type the apostrophe key after a space. To insert curly

¹³ These are true brackets for editorial purposes, recommended by Unicode, but not present in many fonts; the mathematical greater than and less than symbols are provided at altgr-shift-comma and altgr-shift-period.

¹⁴ The curly apostrophe or right single curly quote [U+2019] is the recommended form for apostrophe and is entered with the apostrophe key.

¹⁵ Since newer Windows versions and Word versions interpret what you type with a GKU keyboard as Greek in language, the automatic “smart quotes” feature will insert guillemots. If you want ‘ and “, you will need to enter ‘ and “ and ” directly in Greek text. See section 15.A. A few of the non-US keyboards also include the German style double quotation marks, U+201E and U+201F.

quotes in your Greek manually, use **altgr-apostrophe** for left double quote and **altgr-shift-apostrophe** for right double quote. The curly left single quote is **altgr-n** (while the curly right single quote is simply the apostrophe key itself). If you want to turn the smart quote feature on or off in Word 2013 (and probably later), click on Options under the File menu, then choose Proofing in the left panel and click on the button AutoCorrect Options... near the top in the right panel; then choose the AutoFormat As You Type tab to find the setting.

15.B. DEALING WITH MS WORD'S CONFLICTING SHORTCUT ASSIGNMENTS

MS Word for Windows has a great many unnecessary and annoying predefined keyboard commands for various formatting actions. You may find it necessary or desirable to disable a number of these so that they do not interfere with Greek input or produce surprising actions if you accidentally hit the wrong key together with the altgr key. In particular, in Word 2013, you will need to remove or remap Apply Heading 1 (or 2 or 3) if you want to use the keys altgr-1, altgr-2, altgr-3 for decomposed combining accents. Here are the steps for doing so:

Word 2013

1. Under Word's File menu select Options.
2. Select Customize Ribbon...
3. At the bottom of the pane, click on Customize... next to Keyboard shortcuts.
4. Scroll down in the left list to display All Commands.
5. Scroll in the right list to see Apply Heading 1, select the assigned key combination, and click on Remove (if you like this shortcut, you can assign it some other combination of your choice). You may want to do the same to Apply Heading 2 and Apply Heading 3 to remove their control-left-alt + 2 (or 3) settings.
6. If you are not certain of the name of the command that is causing a conflict, see the advice below.

If you do not know which command is causing the annoyance, but know which key combination is troublesome, then use the same dialog to try to assign the troublesome key combination to any other command. You should get a message telling you the combination is already assigned to a particular command. Cancel your attempt, and then go to the command specified as already using the troublesome combination and try to remove that keyboard shortcut. There are some commands, however, that Word will not allow you to change or remove.

Word 2007

1. Click on the Office icon (circular icon at top left) to reveal the menu, and use the Word Options button at the bottom.
2. In the new window that opens, click on Customize in the sidebar.
3. At the bottom left of the main pane, click on Customize... next to the label Keyboard Shortcuts.

4. Select the listing for All Commands.
5. Find the command for which you want to make a change.
6. Select the keyboard command under Current Keys.
7. Click on Remove and then Close.
8. If you are not certain of the name of the command that is causing a conflict, see the advice in the box above.

Word 2003

1. Select Customize... under the Tools menu.
2. Click on the Keyboard... button in the dialog.
3. Select the Commands tab and the listing for All Commands.
4. Find the command for which you want to make a change.
5. Select the keyboard command under Current Keys.
6. Click on Remove and then Close.
7. If you are not certain of the name of the command that is causing a conflict, see the advice in the box above.

15.C. DEALING WITH MS WORD'S CONFLICTING AUTOCORRECT FEATURES

Some AutoCorrect features can be annoying or troublesome when you type Greek and many will want to turn them off. To change the AutoCorrect settings in Word 2013, click on Options under the File menu, then choose Proofing in the left panel and click on the button AutoCorrect Options... near the top in the right panel. You may need to make changes both on the AutoCorrect tab and on the AutoFormat As You Type tab.

Options to pay most attention to:

Ordinals (1st) with superscript (AutoFormat As You Type): oddly enough, this causes a plain sigma at the end of a word to change to final sigma; but the change also occurs when sigma is followed by apostrophe in an elided ending, which is incorrect.

Capitalize first letter of sentences (Auto Correct): sentence-opening capitalization is not conventional in modern presentation of ancient Greek texts.

Capitalize first letter of table cells (Auto Correct): this option may be as unwanted in typing a modern language as it is for ancient Greek

16. For Advanced Users: Combining Diacritic Method (Press Key after the Letter to be Modified)

IMPORTANT: WHAT DOES ALTGR MEAN?

In the key combinations listed below for combining letters (and for the deadkey for diaeresis mentioned in the previous section), the term “altgr” is a traditional name (from “ALT graphic”) for the righthand ALT key on a Windows keyboard. The lefthand ALT key and the righthand ALT key do not behave the same on a Windows keyboard, and if you try to use the lefthand ALT key for a complex keyboard, it will not work. Theoretically, the righthand ALT is equivalent to CONTROL + (lefthand) ALT; but in reality this is not always true.

The combining diacritic method works effectively if you are using a font that contains OpenType substitution definitions and if the application you are using recognizes those particular OpenType features. In this case, the input is decomposed Unicode, but the font substitutes a precomposed combined character on which the diacritics are well placed. As of 2015, many applications do perform the substitutions correctly, but most commercial fonts (even if they include polytonic Greek characters) do not contain the needed definitions, so that with decomposed input the diacritics are sloppily or incorrectly placed. The unevenness of support in common fonts compels caution in using decomposed Unicode at this time. In general, it should be used only where unavoidable or by an advanced user who is fully aware of the issues involved.

To produce decomposed input, you type the combining diacritic after entering the vowel. You can type more than one combining diacritic after a vowel, but it is important to type the breathing first and then the accent, if both are to be added. (In decomposed input the order of precedence to be followed for multiple combining characters that follow the Greek letter is: (1) macron (U+0304) or breve (U+0306), if any; (2) breathing sign (U+0313 smooth, U+0314 rough), if any; (3) accent (U+0301 acute, U+0300 grave, U+0302 circumflex), if any; (4) iota subscript (U+0345), if present.) In an application that processes OpenType ligatures and with a font that contains the proper instructions, you can use these with a simple vowel or with a modified vowel you have already entered by the deadkey method. That is, you can add breathing and/or accent to a plain alpha, or you can add an accent to an iota with diaeresis, or a breathing and/or accent to upsilon with macron, or an iota subscript to an eta with rough and circumflex.

altgr-1 or altgr-6 ¹⁶	combining acute [U+0301]
altgr-2	combining grave [U+0300]
altgr-3	combining circumflex [U+0302]
altgr-4	combining smooth [U+0313]
altgr-5	combining rough [U+0314]
altgr-7	combining breve [U+0306]
altgr-8	combining macron [U+0304]
altgr-9	combining diaeresis [U+0308]
altgr-i	combining iota subscript [U+0345]
altgr-period	combining underdot [U+0323]
altgr-shift-backslash	combining long overstroke [U+0305]

EXAMPLE 1: to enter upsilon with diaeresis and grave accent, there are alternatives: (1) for standard precomposed Unicode: type **shift-2** followed by **u** (because this is precomposed, if you use the delete key, the entire glyph is removed); (2) for fully decomposed Unicode, type **u**, then **altgr-9** [combining diaeresis], then press **altgr-2** to add the combining grave input [if you use the delete key, one piece at a time is removed, so it takes three deletions to remove the character];

¹⁶ The key combination altgr-1 is usurped on some Windows system for another purpose and cannot be reprogrammed. Therefore, in the GreekKeys 2015 version, the altgr-6 location is also available for combining acute.

(3) for partially decomposed Unicode, press **altgr-u** [deadkey] followed by **u** [upsilon with diaeresis appears on screen], then press **altgr-2** to add the combining grave input (if you use the delete key, it takes two deletions to remove this character, since the upsilon with diaeresis is the precomposed form).

EXAMPLE 2: to enter alpha with smooth and acute and iota subscript, the fully decomposed version is **a**, then **altgr-4**, then **altgr-6**, then **altgr-i**, as compared with the precomposed version entered with **shift-6** followed by **a**.

EXAMPLE 3: to enter iota with macron and smooth and acute, (1) for a partially decomposed version, first press **shift-equal**, then **i** [iota with macron appears on screen], then **altgr-4** [breathing appears centered over the macron], then **altgr-1**, or **altgr-6** if there is an OS key conflict [accent appears beside breathing, and the combination is now centered]; (2) for a fully decomposed version, type **i**, then **altgr-8**, then **altgr-4**, then **altgr-1**, or **altgr-6** if there is an OS key conflict.

17. The GreekKeys Symbol Keyboards for Windows

Two symbol keyboards are available for installation in the folder **GK2015 Windows Installers**. The installed keyboards have the names GK Epigr. Symb.15 and GK Metrical Papyr. Symb.15. They are Greek keyboards and thus appear as subchoices of the EA/EL setting of the Language bar.

Consult the keyboard charts for these two keyboards (in the **GK2015 Keyboard Charts Windows** folder) to see the layout and the code points of the symbols available on these keyboards.

Many of the symbols entered by these keyboards are not in standard system fonts, even the default fonts that are supposed to cover a very wide range of Unicode characters. They are present in New Athena Unicode font, and some are also in the other three SCS GreekKeys fonts.

Metrical symbols are intended for the layout of metrical schemes and scansion on a line of their own. These are not the combining characters placed over vowels. Some of the most common metrical symbols are already available in the GK 2015 keyboards, but if you need a more complete set, with combinations like long over short or short over long or extended long over two shorts, then the GK Metrical Papyr. Symbols keyboard is needed. Some papyrological and editorial symbols accepted in Unicode are on the shifted keys of this keyboard.

Both the ancient Greek acrophonic numerals and ancient Greek papyrological numbers are encoded in Unicode 5.0 in a block in the five-digit area of Unicode (SMP) at U+10140 to U+1018A, which may not be accessible in older applications. These symbols are placed on the Epigraphic Symbols keyboard in the order they appear in the Unicode standard.

KNOWN LIMITATION AND WORKAROUND

In some earlier versions of Windows and Word, the use of Unicode characters from the SMP (with five-digit code point) could be difficult because of unwanted automatic font shifts. **This seems not to be an issue any**

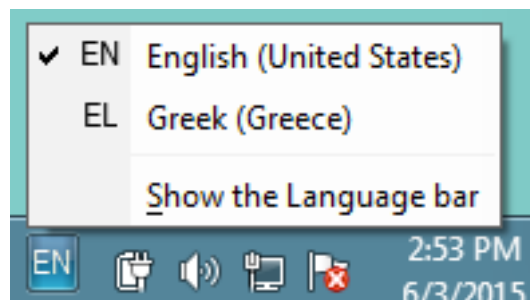
longer, according to testing with Word 2013 under Windows 7 and Windows 10 Preview.

If you have older software, you may find that a Windows application shifts from the chosen font (New Athena Unicode, which contains the desired character) to a default font (Arial or Tahoma, which do not). Usually you can select the empty boxes of these default fonts and change the font back to the New Athena Unicode to see what you want to see. But both the occurrence of this unwanted font-change and the correction of it are not consistent across systems.

The change was especially likely to occur with the first character of a new paragraph or when typing a pipeline character (that is, one recently approved and intended for Unicode 5.1 or 6.0). One workaround was to type a superfluous standard Greek character like alpha before typing the troublesome one(s). You then needed to go back and remove the superfluous character. Sometimes quitting Word and reopening it helped.

18. Typing in Windows with More than One Greek Keyboard

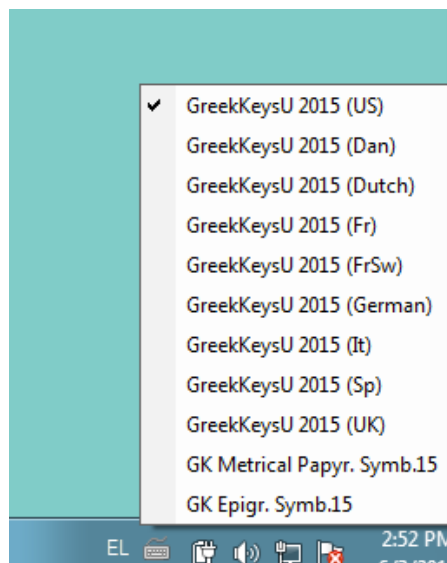
If you install one or both of the symbol keyboards in addition to a version of the GreekKeysU 2015 keyboard, then when you switch the language from EN (for English input) [or another two-letter code for whichever modern language you use] to EL (for Elliniki), there will be more than one Greek keyboard available. A small keyboard icon will appear to the right of the EL icon. The name of the current Greek keyboard will not be shown in the Language menu, but is visible if you show the Language bar. The following pictures are from Windows 7, but Windows 8 and 10 are similar, except that the abbreviation is in Greek, ΕΛ.



Only language symbol EN showing, here clicked to show choices, including Show the Language bar.



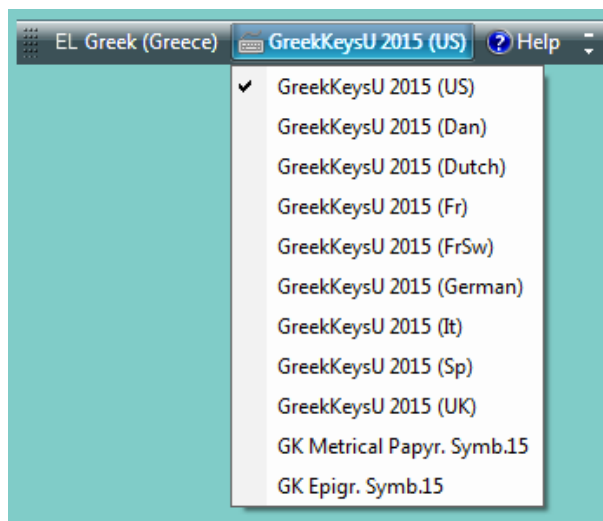
Keyboard added next to EL when more than one Greek input activated.



Clicking on little keyboard icon shows multiple inputs for selection (all varieties activated for testing; this would not be done in ordinary use).



Floating Language Bar, showing current keyboard.



Clicking shows multiple inputs for selection (all varieties activated for testing; this would not be done in ordinary use).

If you simply change to EL/EA, then whichever Greek keyboard was last in use will be the selected keyboard. You can use the Language menu or Language bar to select a different Greek keyboard by holding the mouse down on the small keyboard icon. You can also toggle keyboards within the same language by using a keyboard shortcut. On the way to activate (if needed) or change the shortcuts for these operations, see 12.C above.

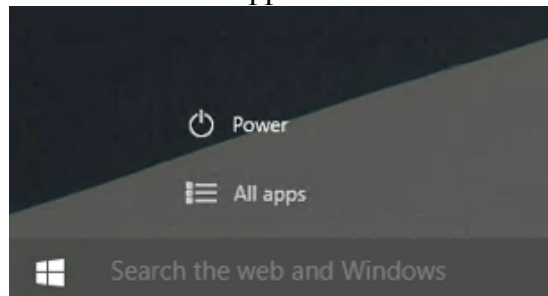
19. Additional Ways to Input Unicode in Windows

19.A. THE ALT-X METHOD (WHEN YOU KNOW THE CODE POINT)

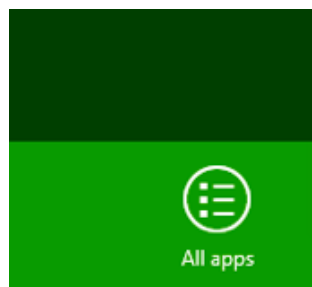
In MS Word (from at least the 2002 version forward) and in WordPad (in Programs:Accessories) you can enter any character for which you know the Unicode hex code point by entering the four or five hexadecimal digits and then pressing ALT-x (that is, the left ALT key). The digits will then convert to the character you want. (The ability to use five-digit codes is a good feature.) This method does not, however, work systemwide (e.g., it works in neither PowerPoint nor Excel, nor in Apache OpenOffice applications).

19.B. THE WINDOWS CHARACTER MAP

Windows includes a small application called Character Map. It is located under Windows 8 or 10 in All Apps:Windows Accessories, or under Windows 7 in Programs:Accessories:System Tools). In Windows 10 there is a link for All Apps on the Start screen:



In Windows 8 it may be obscure how to get to All Apps. In some versions there is a circled arrow in the lower left of the Start screen (visible only when you mouse over it?); in others you need to right-click somewhere in the bottom band of the Start screen and a separate band will appear, with All Apps at the far right:



Character Map is a small application displaying the BMP characters in a font in Unicode code point order. It allows you to set the font. It does not show SMP characters, however, nor does it show the glyphs that have no code point assigned (precomposed forms).

To use it, first set the font, and then select a character, and click the Copy button so that you can paste it into a document of your choice. If you know the code point, you can enable Advanced View and enter the code point to search for the character in the table.

19.C. THE SYMBOL INSERTION MECHANISM

Both Word and Apache OpenOffice Writer have menu commands for inserting unusual characters.

In older versions of Word the command is Symbol... under the Insert menu. In Word 2013 it takes a bizarre path to reach the needed window. You select Insert from the toolbar area, then look for Symbol, and choose Symbol instead of Equation, and finally click on More Symbols... to see the Symbol window. You can make this easier by creating a keyboard shortcut for the Insert Symbol command (this capability is concealed under Options: Customize Ribbon).

The Word Symbol window displays BMP and SMP characters (but again cannot access any glyphs that have no code point). You need to use the Symbols tab (not Special Characters) in the window and then set the font to, for instance, New Athena Unicode.

In Apache OpenOffice (tested 2015 with version 4.1.1), the command is under the Insert menu and is called Special Characters.... To use this tool, set the font to, for instance, New Athena Unicode. The table of characters in OpenOffice will then show all the BMP and SMP code points present in the font (but not precomposed glyphs with no assigned code point). Click on as many characters as you want and the string of characters will be shown at the bottom of the window; when you click OK, the string is inserted in the document and the Special Characters window closes.

Part IV: Fonts

20. The GreekKeys 2015 Fonts

20.A. NEW ATHENA UNICODE

New Athena Unicode is the most extensive font, since it contains all the characters of the other three fonts plus additional more specialized items from Unicode 7.0 (and a few in the pipeline, that is, in the process of approval that follows acceptance by the Unicode Technical Committee). In addition to Greek, the font has many Roman characters with diacritics, the Coptic block (U+2C80 etc.), the Ancient Greek Numbers block (U+10140 etc.), the Old Italic block (U+10300 etc.), and Ancient Greek Musical Notation block (U+1D200 etc.). [For Mycenaean Linear B, not present in New Athena Unicode, the free font Aegean is recommended; it can be found on the internet.] You can see all the glyphs present in the font by using the glyph inventory view in Font Book. For more information about the characters included and how to find and enter them, see the document **FindCharacterNAU.pdf** present in the folder **GK2015 Font Files**. This document contains lists of PUA characters and explains how to use the cmap listing (**NAU5cmap.txt**), which includes all the glyphs that have Unicode code points; it also lists the glyphs that lack code points and are thus not in the cmap listing.

New Athena Unicode is an expansion of the APA GreekKeys non-Unicode font Athenian. Athenian was designed by Jeffrey Rusten, based on various Greek upright fonts illustrated in Victor Scholderer, *Greek Printing Types 1465-1927* (London 1927): that of Nicolaus Jenson (1472, plate 7), the Complutum Greek Testament (ca. 1510), Robert Proctor's "Otter" (1910, plate 59) and Victor Scholderer's "New Hellenic" (1927, plate 58). Rusten produced Athena Unicode as a first experiment with Unicode fonts, and Ralph Hancock made additions and corrections. In 2002 Donald Mastronarde began expansion and enhancements of the font, renaming it New Athena Unicode. The revision history is detailed in the document **AboutNAUfont_v5_005.pdf** that accompanies the font.

Sample:

αβγδεζηθικλμνξοπρσςςτυφχψωφϞϟϠϡ
ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠΡΣΤΥΦΧΨΩΦϞϟϠϡ

ἔφη γὰρ αὐτοὺς τοὺς Ῥωμαίους αἰτίους εἶναι τοῦ μὴ πειθαρχεῖν αὐτοῖς τοὺς Ἕλληνας, ἀλλὰ παρακούειν καὶ τῶν γραφομένων καὶ τῶν παραγγελλομένων. δεῖν γὰρ οὐσῶν αἰρέσεων κατὰ τὸ παρὸν ἐν πάσαις ταῖς δημοκρατικαῖς πολιτείαις, καὶ τῶν μὲν φασκόντων δεῖν ἀκολουθεῖν τοῖς γραφομένοις ὑπὸ Ῥωμαίων καὶ μήτε νόμον μήτε στήλην μήτ' ἄλλο μηθὲν προϋργιαίτερον νομίζειν τῆς Ῥωμαίων προαιρέσεως, τῶν δὲ τοὺς νόμους προφερομένων καὶ τοὺς ὅρκους καὶ στήλας καὶ παρακαλούντων τὰ πλήθη μὴ ῥαδίως ταῦτα παραβαίνειν, ἀχαϊκωτέραν εἶναι παρὰ πολὺ ταύτην τὴν ὑπόθεσιν καὶ νικητικωτέραν ἐν τοῖς πολλοῖς. ἐξ οὗ τοῖς μὲν αἰρουμένοις τὰ Ῥωμαίων ἀδοξίαν συνεξακολουθεῖν παρὰ τοῖς ὄχλοις καὶ διαβολήν, τοῖς δ' ἀντιπράττουσιν τάναντία.

Sample:

αβγδεζηθικλμνξοπρσςςτυφχψωϞϠϡϢ
ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠΡΣΤΥΦΧΨΩϞϠϡϢ

ἔφη γὰρ αὐτοὺς τοὺς Ῥωμαίους αἰτίους εἶναι τοῦ μὴ πειθαρχεῖν αὐτοῖς τοὺς Ἑλληνας, ἀλλὰ παρακούειν καὶ τῶν γραφομένων καὶ τῶν παραγγελλομένων. δυεῖν γὰρ οὐσῶν αἰρέσεων κατὰ τὸ παρὸν ἐν πάσαις ταῖς δημοκρατικαῖς πολιτείαις, καὶ τῶν μὲν φασκόντων δεῖν ἀκολουθεῖν τοῖς γραφομένοις ὑπὸ Ῥωμαίων καὶ μήτε νόμον μήτε στήλην μήτ' ἄλλο μηθὲν προουργιαίτερον νομίζειν τῆς Ῥωμαίων προαιρέσεως, τῶν δὲ τοὺς νόμους προφερομένων καὶ τοὺς ὅρκους καὶ στήλας καὶ παρακαλούντων τὰ πλήθη μὴ ῥαδίως ταῦτα παραβαίνειν, ἀχαῖκωτέραν εἶναι παρὰ πολὺ ταύτην τὴν ὑπόθεσιν καὶ νικητικωτέραν ἐν τοῖς πολλοῖς. ἐξ οὗ τοῖς μὲν αἰρουμένοις τὰ Ῥωμαίων ἀδοξίαν συνεξακολουθεῖν παρὰ τοῖς ὄχλοις καὶ διαβολήν, τοῖς δ' ἀντιπράττουσιν τάναντία.

BosporosU font is an expansion of the non-Unicode GreekKeys-encoded font Bosporos designed by Marc Cogan of Allotype Typographys, who donated the font to the APA in 2004. The Unicode version, with many added glyphs, was produced by Donald Mastronarde.

Sample:

αβγδεζηθικλμνξοπρσςςτυφχψωϞϠϡϢ
ΑΒΓΔΕΖΗΘΙΚΛΜΝΞΟΠΡΣΤΥΦΧΨΩϞϠϡϢ

ἔφη γὰρ αὐτοὺς τοὺς Ῥωμαίους αἰτίους εἶναι τοῦ μὴ πειθαρχεῖν αὐτοῖς τοὺς Ἑλληνας, ἀλλὰ παρακούειν καὶ τῶν γραφομένων καὶ τῶν παραγγελλομένων. δυεῖν γὰρ οὐσῶν αἰρέσεων κατὰ τὸ παρὸν ἐν πάσαις ταῖς δημοκρατικαῖς πολιτείαις, καὶ τῶν μὲν φασκόντων δεῖν ἀκολουθεῖν τοῖς γραφομένοις ὑπὸ Ῥωμαίων καὶ μήτε νόμον μήτε στήλην μήτ' ἄλλο μηθὲν προουργιαίτερον νομίζειν τῆς Ῥωμαίων προαιρέσεως, τῶν δὲ τοὺς νόμους προφερομένων καὶ τοὺς ὅρκους καὶ στήλας καὶ παρακαλούντων τὰ πλήθη μὴ ῥαδίως ταῦτα παραβαίνειν, ἀχαῖκωτέραν εἶναι παρὰ πολὺ ταύτην τὴν ὑπόθεσιν καὶ νικητικωτέραν ἐν τοῖς πολλοῖς. ἐξ οὗ τοῖς μὲν αἰρουμένοις τὰ Ῥωμαίων ἀδοξίαν συνεξακολουθεῖν παρὰ τοῖς ὄχλοις καὶ διαβολήν, τοῖς δ' ἀντιπράττουσιν τάναντία.

20.C. VERTICAL SPACING OF GREEKKEYS FONTS

For legibility of the accents, the SCS GreekKeys fonts have characters that extend vertically up and down farther than most fonts. In some cases, tops or bottoms of characters may appear cut off on the computer screen, although they will print completely. If this happens, you may

want to adjust the paragraph formatting entry for line spacing. In Microsoft Word, for instance, instead of using the setting “single” use the setting “at least” and make the line high 2 or 3 points greater than the font size you are using. That is, if you are typing in 12-point BosphorosU, set the line spacing to at least 14 or 15 points; or if you are typing in 14-point KadmosU, set the line spacing to at least 16 or 17 points.

20.D. SMART FONT FEATURES

All the APA GreekKeys Unicode fonts contain smart font features defined in accordance with the OpenType standard. Two types of features are included.

The **ccmp** (glyph composition/decomposition) feature gives rules for replacing various sequences of decomposed code points for separate glyphs with a single glyph (even though the underlying data will still contain the separate glyphs). The use of ccmp in v. 5 of New Athena Unicode and v. 2 of the other three fonts replaces the use of the similar liga feature of previous versions: substitutions defined by ccmp tables act more automatically, without requiring the user to hunt for a setting to enable ligatures in the document.

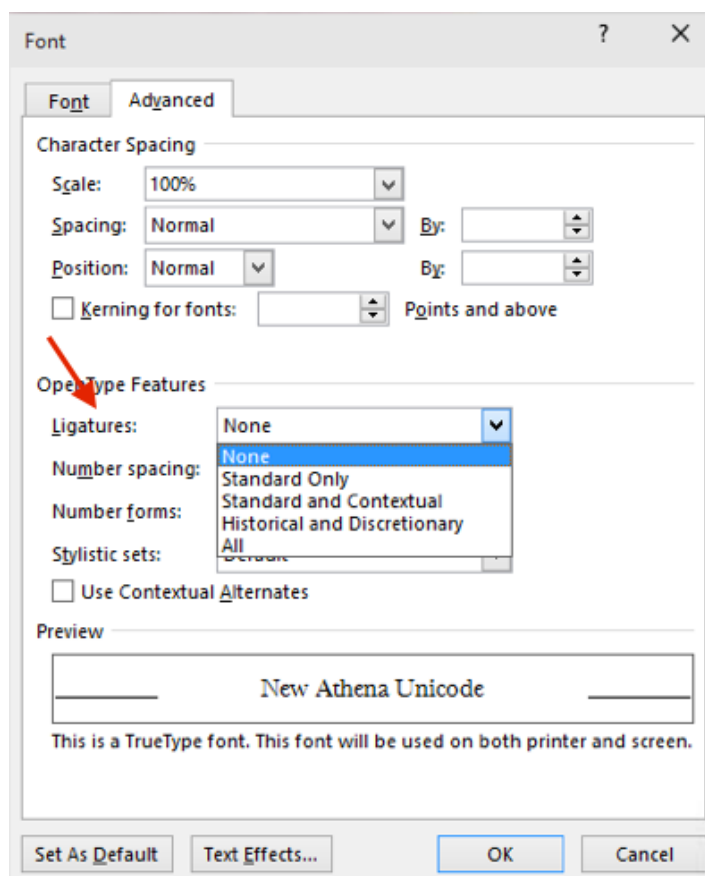
For example, the sequence U+03b1, U+0306, U+0313, U+0301 (alpha, combining breve, combining smooth breathing, combining acute accent), without a substitution, would appear as a jumble of diacritics poorly placed or overlapping on top of small alpha. That is what will appear with most fonts. In the ccmp able, this sequence is defined so to be represented by a single precomposed glyph in which the combining elements are correctly placed. But the four codepoints are still in the textual data, and if you use the delete/backspace key repeatedly, then the glyph will first be replaced by alpha with breve and smooth, then by alpha with breve, then by alpha, and finally will be completely deleted. In contrast, if you input the same precomposed glyph using the PUA code point U+EB0C, then a single use of the delete key will remove the glyph.

As of 2015 you can expect most applications to interpret and act on the ccmp instructions. This is certainly true of the word processor, spreadsheet, and presentation software in the major office suites, such as MS Office for Mac OS X or for Windows 7, 8, 10, and Apache OpenOffice for both platforms. The substitutions also work in most standard modern browsers (that is, provided that the web page specifies the particular font, or the user sets the particular font to be used by default). In addition, they work in Apple TextEdit, MS WordPad, and Mellel word processor and should work in Apple Pages.

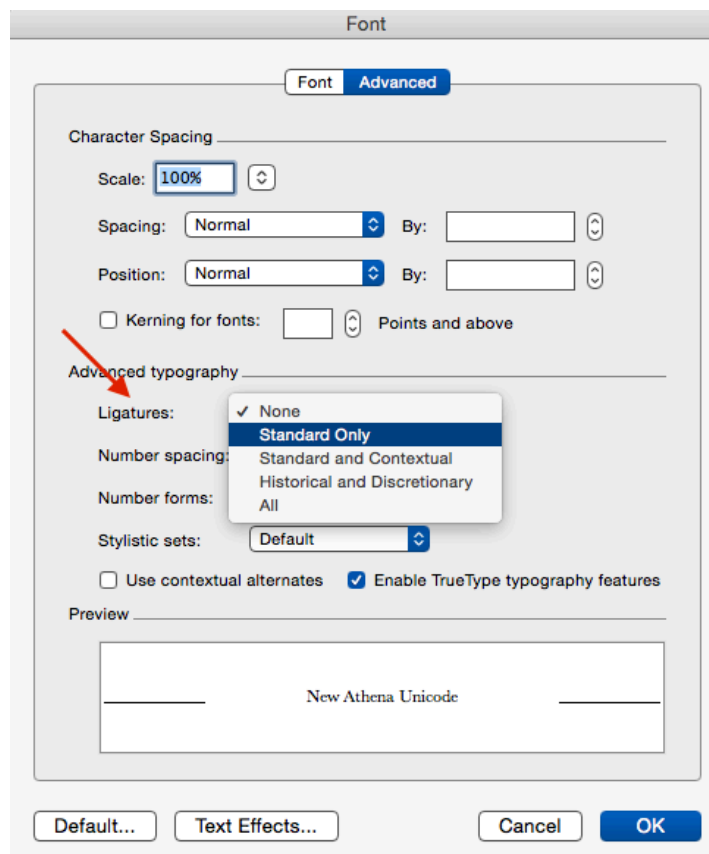
The **aalt** (access all alternatives) feature gives rules for allowing a choice among the various treatments of capital vowels with adscript/subscript iota in the fonts. The fonts present by default the type of glyphs with a full-size small iota adjacent to a capital vowel (or a capital iota adjacent to a capital vowel in the form without any diacritic). An application could provide access to a typography palette in which you can change this default to one of the other choices (capital vowel with subscript or capital vowel with adscript iota of reduced size). Support for this feature is rare in standard applications. (One application in which the choice among versions of iota subscript with capital vowel is accessible is TextEdit: use the Typography... command under the gear icon on the Fonts panel.)

20.E. HOW TO MAKE LIGATURES APPEAR IN MS WORD

A few compositions in the GreekKeys fonts may not work until ligatures are enabled in the document. This applies, for instance, to the entering of the vertical bar three times to produce the substitution for the strophe-end (stanza-end) symbol consisting of three vertical bars. In Word 2011 for OS X, the document generally needs to be saved in docx format before the ligatures are effective, and turning on Standard ligatures in the Font dialog (Advanced tab) is sufficient. In Word 2013 for Windows you also find the setting by invoking the full Font dialog and looking in the Advanced tab, but I have found inconsistent results using a Windows 7 virtual machine. This setting seemed not to work yet under Windows 10 Preview or in OS X Word 2016 Preview. One will need to try again with the released versions.



Word 2013 for Windows, Font dialog, Advanced Tab, Ligature settings



Word 2011 for OS X, Font dialog, Advanced Tab, Ligature settings

The substitutions all work automatically in OpenOffice on either platform, and there is no need to look for a place to enable standard ligatures (such a setting seems to be absent).

20.F. PRIVATE USE AREA (PUA) CODE POINTS IN GREEKKEYS FONTS

Several years ago, a consortium of scholarly font producers who work with Unicode polytonic Greek agreed to use the same Private Use Area (PUA) code points to refer to special characters that are not recognized by Unicode. In addition to the APA/SCS Unicode fonts, this convention is followed in the fonts of Ralph Hancock's Antioch package, in Juan-José Marcos' ALPHABETUM, and in David Perry's Cardo. Because of this agreement, users should be able to shift between the various fonts that comply with this convention. System fonts and commercial fonts will not contain these characters and may contain conflicting characters that use the same PUA code points. Users should be aware that documents containing these PUA characters may not be completely readable for other users who lack a necessary font or for publishers.

Please consult the document **FindCharacterNAU.pdf** for the latest listing of the PUA code points, both those agreed on by the consortium and those used just in New Athena Unicode to satisfy some special requests from users.

Many of these characters can now instead be entered as decomposed Unicode. See above, sections 7 and 16.

20.G. USING DECOMPOSED INPUT VS. USING PRIVATE USE AREA (PUA)

If you are exchanging documents with people you know are also using GreekKeys Unicode fonts (especially the fullest font, New Athena Unicode) but who may be using Macs or Windows computers and may have various versions of MS Word (2004 or 2008 for Mac OS X, 2003—or perhaps earlier—or 2007 for Windows), then you will have the least difficulty if you use precomposed input and enter complex advanced combinations with the PUA codepoints employed in New Athena Unicode and some other fonts.

20.H. FONT CONVERSIONS

The latest version of GreekKeysConverter (not a product of the SCS; see section 10 above) add the capability of converting precomposed Unicode to decomposed Unicode, or just precomposed PUA Unicode to decomposed, or vice versa. Steps and illustrations for the use of GreekKeysConverter 6.x are posted on the GreekKeys 2015 web site.

Appendix A: Roman Vowels with Macron (for Latin)

In the past, many have used customized fonts in order to be able to show long marks on Roman vowels in Latin texts. The traditional GreekKeys font Classical was designed for this purpose. Such customized fonts should no longer be used, since the Unicode standard provides a definition for the needed combined characters and they are now present in a wide range of system fonts for users of Mac OS X or Windows as well as in the GreekKeys fonts (y with macron, however, is in a somewhat smaller subset of fonts).

characters	Unicode code points
Ā ā Ă ă	U+0100, U+0101, U+0102, U+0102
Ē ē Ĕ ĕ	U+0112, U+0113, U+0114, U+0115
Ī ī Ĭ ĭ	U+012a, U+012b, U+012c, U+012d
Ō ō Ŏ ŏ	U+014c, U+014d, U+014e, U+014f
Ū ū Ŭ ŭ	U+016a, U+016b, U+016c, U+016d
Ȳ ȳ ¹⁷	U+0232, U+0233

To type these combinations directly in Mac OS X, activate the US Extended input and type deadkey option-a for macron (or deadkey option-b for breve) before you type the vowel. Or you can use the Character Viewer or Unicode Hex input to enter these characters. In the viewer, simply search for the vowel and find the character in the listing of Related Characters.

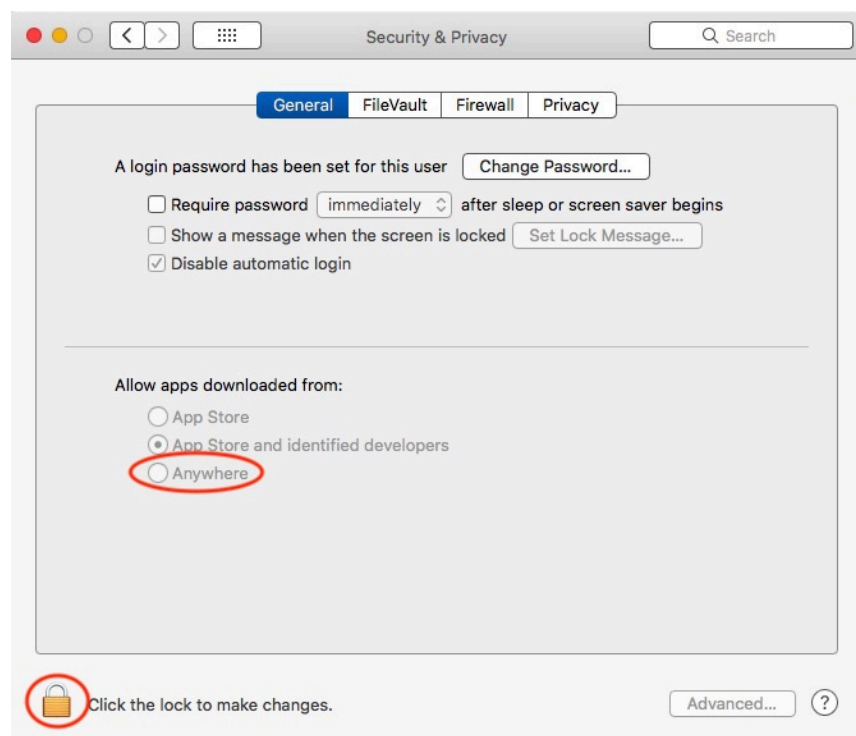
There is no way to type these combinations directly in Windows, but they can be inserted with the ALT-x technique in Word or by using the Character Map or by using the Insert Symbol... command in Word or Insert Special Characters... command in OpenOffice Writer (see Section 21 above).

¹⁷ There are no Unicode code points for y or Y with breve.

Appendix B: Workaround for Security Alert “from an unidentified developer”

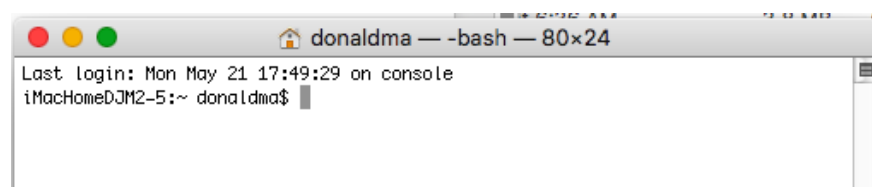
If control-clicking (or right-clicking) on the Mac installer icon does not result in an alert allowing you to choose to open the installer even though it is from an unidentified developer, there is a more cumbersome way to enable opening of the installer.

1. Open System Preferences and open the Security and Privacy Pane.
2. If it looks like the following (except for the added red ovals), with three choices in the bottom half of the pane, skip to step 4. If it lacks the third item (Anywhere), then perform steps 3a-3f.



3a. Close (quit) System Preferences. Open Terminal.app (find it with Spotlight search or open it from the Utilities folder inside the Applications folder).

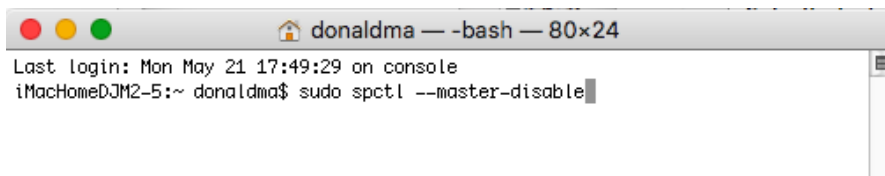
3b. You will see a small window ready to receive the input of a typed command. The computer name and the user name before the prompt will be matched to your computer and account.



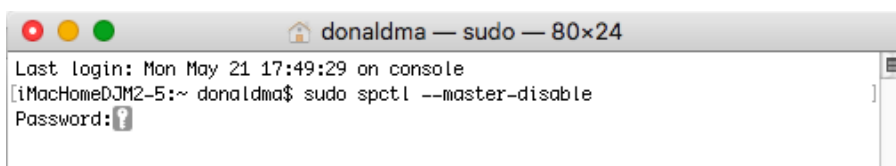
3c. Type in the command

```
sudo spctl --master-disable
```

(after spctl there is one space and two hyphens)



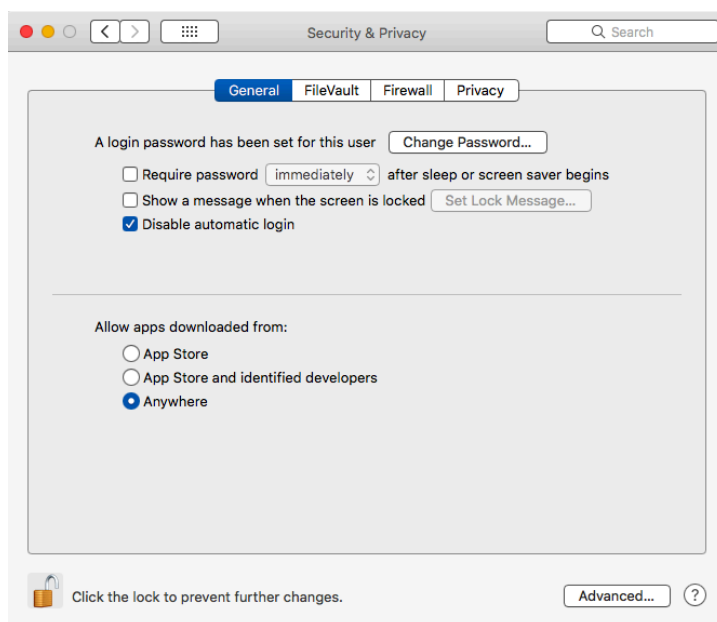
3d. Press the Return key and you will be prompted for the admin password:



3e. Enter the password and Return. (Note that nothing shows on the screen when you type the password, but when you enter Return, Terminal presents a new prompt indicating that the command has been executed.)

3f. Close Terminal and reopen System Preferences Security & Privacy pane, which should now have the third choice seen under step 2.

4. Click on the lock icon in the bottom left of the Security and Privacy pane, authenticate with the admin user name and password, and click on the radio button for Anywhere.



5. Once Anywhere is selected, close the System Preferences and run the GreekKeys installer.
6. For better security, once you have installed GreekKeys, it is best to go back to the Security & Privacy pane and reset it to one of the other two choices instead of Anywhere.
7. If you don't want the Anywhere option to be seen at all, you can follow the steps under 3 but with the change of disable to enable in the command, `sudo spctl --master-enable`