InterCal Users' Guide

Table of Contents

1. INTRODUCTION

The purpose of InterCal is to permit rapid and convenient comparison of dates in multiple calendar systems. It is thus useful for genealogical research and historical research. InterCal can also be used as a perpetual calendar to determine the day of week of any date, the **approximate** phase of the moon of any date, and the dates of various religious holy days such as Easter, Yom Kippur, the first day of Ramadan, or Chinese New Year's in any year. Researchers please note—when a calendar is supported by InterCal, usually only the most recent version is implemented, and its rules are extrapolated indefinitely backwards and forwards in time. Some modern calendars have undergone rules changes in the past, so researchers need to be careful when comparing dates calculated by InterCal to dates in historical documents. For detailed explanations of the implemented calendar systems, and some definitions of terms (such as *era)*, please see the accompanying document Calendar System Facts.

InterCal is a simple program with (I hope) an intuitive interface. You should be able to familiarize yourself with all the options in a few minutes simply by running the program and playing around. (The only exceptions might be the handling of editing the year field, and controlling the display when the Mayan is the primary calendar.) Nevertheless, this Users' Guide tries to be a complete reference which can be turned to when a question arises.

InterCal defines two special dates, both of which can be manipulated by the user. The *displayed date* controls the month calendar display which dominates the main window. The *selected date* is used to serve as a marker which can be returned to at any time using the **"Jump To Selected"** command under the **Options** menu. The Julian Date window shows its equivalent in all implemented calendar systems. So if you want to know what your birthday is (for example) in all implemented systems, make it the selected date and show the Julian Date window. If the *selectedDate* is not visible in the currently-displayed month, then *displayedDate* is the first day of the displayed month. If *selectedDate* **is** visible, then *displayed date* and *selected date* are equal.

2. STARTUP STATE

InterCal has three windows which can be left permanently open, plus some modal dialogs and Alerts which appear and disappear as they are needed. The main window (described in detail in §3) is always visible. Both its size and position are adjustable. The "date" window (described in §4.4.1) is **not** visible at startup. Its visibility is controlled by the user. Its size is not adjustable but its position is. The "Mayan Correlations" window (described in §4.4.6) is also **not** visible at startup. Its visibility is controlled by the user. Both its size and position are adjustable.

The program tries to draw all windows with exactly the same size and position which they had the last time the program was run. If that cannot be done for any reason, the program reverts to its defaults. The default for the main window is near the

upper left corner of the main screen, with a size which nearly fills it. However, a maximum size is built in so that the window will never exceed the size necessary to display all of its contents at once. The defaults for the date window and the Mayan Correlations window are to be centered on the main screen.

The program starts up with the Primary and Secondary calendar settings the same as they were the last time the program was run. The first time it is run after downloading, the initial primary calendar system is Western Historical and the initial secondary calendar system (see below for definition of a secondary calendar) is "none". The year and month are chosen so that today's date is visible and selected. Since it is selected, it is highlighted using reverse video.

A variety of Christian, Jewish, and Islamic holidays can be highlighted under user control. The program attempts to use the same settings which were in effect the last time the program was executed. If it cannot do so, it reverts to the defaults. The default is to highlight the following religious holidays/holy days: Western Easter, Julian Easter (same as Orthodox Easter), Christmas (Western), Rosh Hashonah, Yom Kippur, first day of Hanukah, Passover, first day of Ramadan, Islamic New Year, Milad-an-Nabi (birthday of the Prophet), and the first day of 'Id al-Fitr (festival after Ramadan is over). (It may seem strange to most people to highlight Christmas, since it is a fixed feast. But it is only fixed in the Gregorian calendar and its relatives! **All** Jewish and Islamic holy days are fixed in their respective calendars. Easter and Pentecost are the only truly movable feasts handled by InterCal.) If the current screen is operating in color mode, Christian holidays are shown in yellow, Jewish in blue, and Islamic in red. I chose these colors from among the basic eight colors provided in the very first version of QuickDraw. If the current screen is monochrome, holidays are highlighted using three of the standard patterns found in the system resource file.

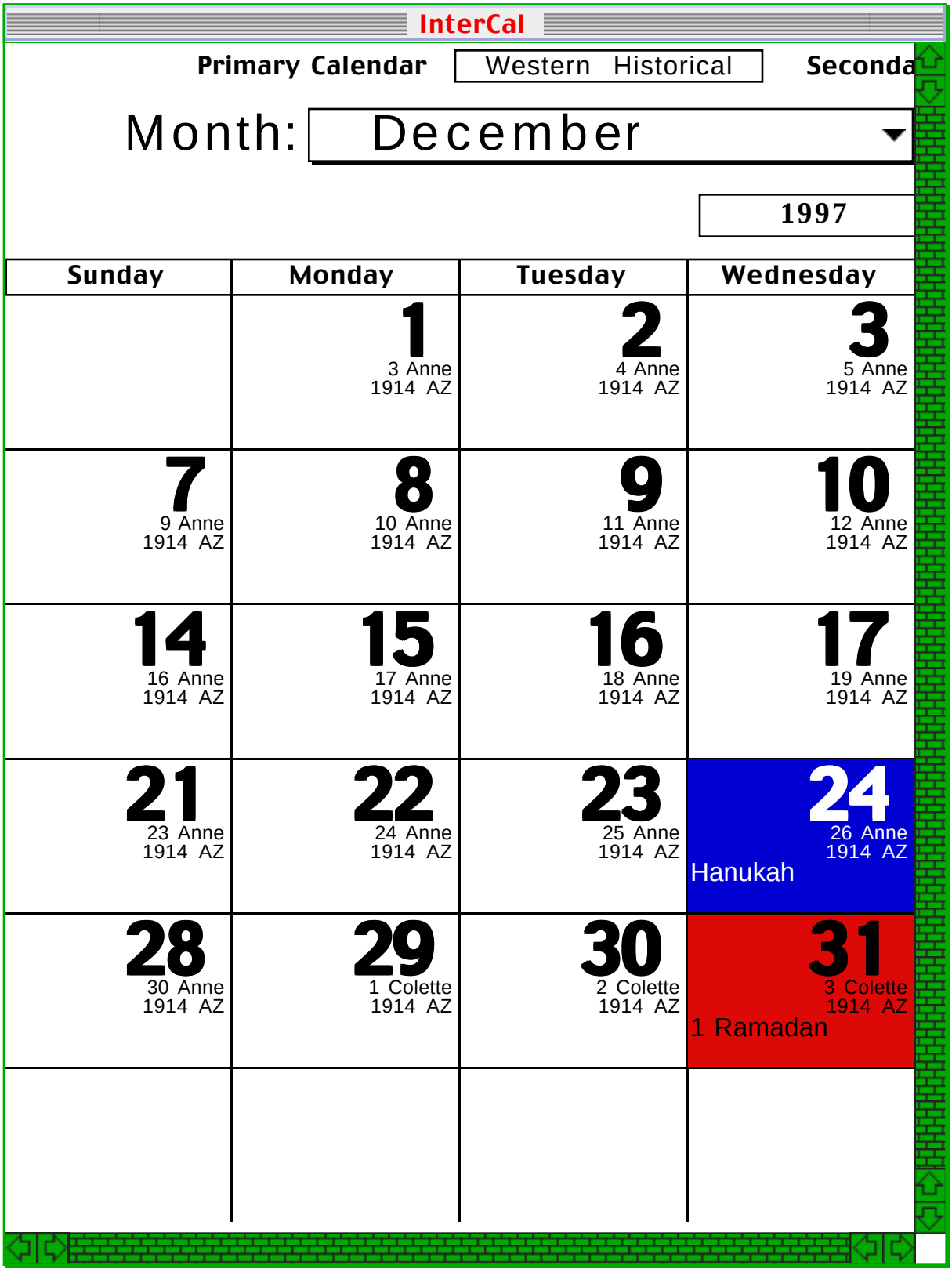
The Mayan correlation last specified by the user and the values of the Mayan controls (described in detail later in this document) are remembered from the last time the program was run. As released, InterCal uses the (unmodified) Goodman-Martinez-Thompson correlation, which has Long Count 0.0.0.0.0 corresponding to Julian Day 584283 (September 6, 3114 B.C. Julian = August 11, 3114 B.C. Gregorian). "Move to future" is on. "Edit together as Calendar Round" is **not** checked.

3. THE MAIN WINDOW

3.1. Static Calendar System Displays

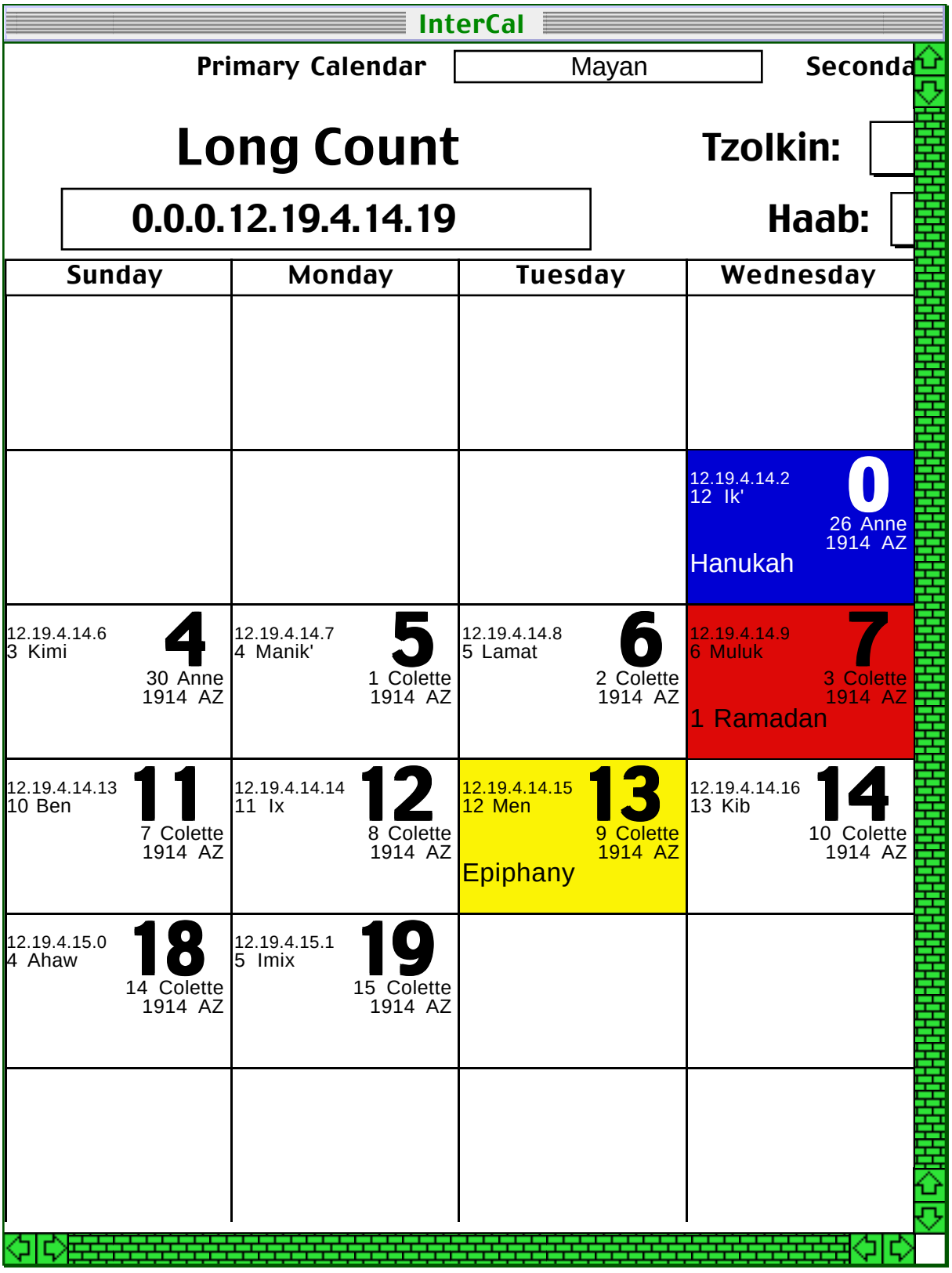
The main window is divided into several panes: the primary and secondary calendar system labels; controls for specifying the displayed date; and the month calendar.

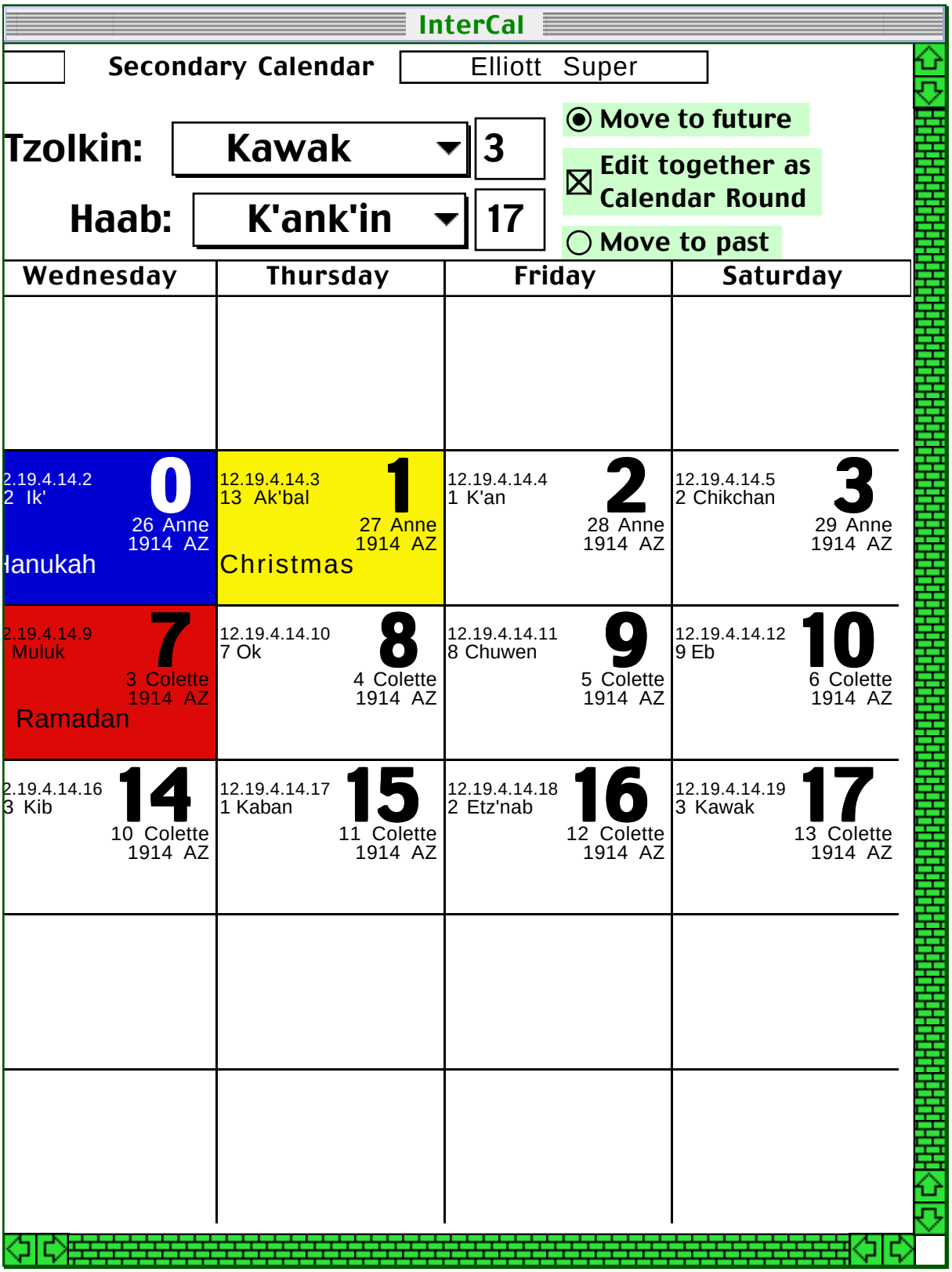
Here is a sample showing a typical linear calendar as the primary:


InterCal
Primary Calendar
Western Historical
Seconda
Month:
December
1997
Sunday
Monday
Tuesday
Wednesday
1
3 Anne
1914 AZ
2
4 Anne
1914 AZ
3
5 Anne
1914 AZ
7
9 Anne
1914 AZ
8
10 Anne
1914 AZ
9
11 Anne
1914 AZ
10
12 Anne
1914 AZ
14
16 Anne
1914 AZ
15
17 Anne
1914 AZ
16
18 Anne
1914 AZ
17
19 Anne
1914 AZ
21
23 Anne
1914 AZ
22
24 Anne
1914 AZ
23
25 Anne
1914 AZ
24
26 Anne
1914 AZ
Hanukah
28
30 Anne
1914 AZ
29
1 Colette
1914 AZ
30
2 Colette
1914 AZ
31
3 Colette
1914 AZ
1 Ramadan


InterCal
Secondary Calendar
Elliott Super
Era:
A.D.
1997
nesday
Thursday
Friday
Saturday
3
5 Anne
1914 AZ
4
6 Anne
1914 AZ
5
7 Anne
1914 AZ
6
8 Anne
1914 AZ
10
12 Anne
1914 AZ
11
13 Anne
1914 AZ
12
14 Anne
1914 AZ
13
15 Anne
1914 AZ
17
19 Anne
1914 AZ
18
20 Anne
1914 AZ
19
21 Anne
1914 AZ
20
22 Anne
1914 AZ
24
26 Anne
1914 AZ
h
25
27 Anne
1914 AZ
Christmas
26
28 Anne
1914 AZ
27
29 Anne
1914 AZ
31
3 Colette
1914 AZ
adan

Here is a sample showing the Mayan calendar as primary:




InterCal
Secondary Calendar
Elliott Super
Tzolkin:
Kawak
3
Haab:
K'ank'in
17
Move to future
Edit together as Calendar Round
Move to past
Wednesday
Thursday
Friday
Saturday
2.19.4.14.2
2 Ik'
0
26 Anne
1914 AZ
Hanukah
12.19.4.14.3
13 Ak'bal
1
27 Anne
1914 AZ
Christmas
12.19.4.14.4
1 K'an
2
28 Anne
1914 AZ
12.19.4.14.5
2 Chikchan
3
29 Anne
1914 AZ
2.19.4.14.9
Muluk
7
3 Colette
1914 AZ
Ramadan
12.19.4.14.10
7 Ok
8
4 Colette
1914 AZ
12.19.4.14.11
8 Chuwen
9
5 Colette
1914 AZ
12.19.4.14.12
9 Eb
10
6 Colette
1914 AZ
2.19.4.14.16
3 Kib
14
10 Colette
1914 AZ
12.19.4.14.17
1 Kaban
15
11 Colette
1914 AZ
12.19.4.14.18
2 Etz'nab
16
12 Colette
1914 AZ
12.19.4.14.19
3 Kawak
17
13 Colette
1914 AZ

On the top line at the left, in a static (not editable) text area, the current choice of primary calendar system is displayed. To its right the current choice of secondary system is shown. **Most of the rest of the window contents refer to dates in the primary calendar system.** The secondary system (if there is one) is used to directly compare dates in one system to the same dates in the other system. See §4.3, "Primary and Secondary Menus", for more details.

3.2. Specifying the Displayed Date

Controls for manipulating the *displayed date* occupy the next few lines in the main window. Two types of calendars, with basically different structures, are implemented by InterCal. Their method of controlling the *displayed date* differs accordingly. Most calendars are linear (as explained in Calendar System Facts). Such calendars have years and (usually) eras. Dates follow a linear progression. All calendars implemented by InterCal **except the Mayan and Chinese** fall into this category. The Mayan is a cyclic calendar and is also really three calendars in one. The controls for determining the *displayed date* in the Mayan calendar look and act completely differently from those for all other implemented calendars. The Chinese, although actually cyclic, is treated as linear by InterCal by counting the cycles and including a cycle number in the year designation. The net result is that the Chinese calendar looks and acts like all the linear calendars **except** that there are no eras (negative cycle numbers are used instead) and the year box contains two integers instead of one. More details are given in the "Year selection" section below.

3.2.1. Typical Linear Calendar Systems

The month, era, and year selection controls appear near the top of the main window whenever a linear calendar is the primary system.

3.2.1.1 Month/Era Selection

The first line in the control area is in larger type. At the left is the name of the month being displayed. At the right is the era of the displayed month. Both the name of the month and the name of the era are actually entries in popup menus. The user can use the menus to switch to a different month in the same year, or to switch eras while keeping the month and the absolute value of the year the same. (Switching eras is not applicable when the Chinese calendar is Primary. In that case the era popup menu is replaced by three non-editable text lines which show the double names of the year, month, and day of the *displayedDate.* See "Calendar System Facts" for more information on these names.) These menus are written using the Avant Garde font, which I believe is available on most Macintosh systems.

Immediately to the left and right of the month name/menu are large arrows. They are blue or dark gray depending on your monitor's color mode. These arrows act like buttons. They can be clicked once, or pressed (click and *hold down* the mouse). The left-pointing arrow decreases the month, while the right-pointing arrow increases the month. When the mouse is released, the rest of the window is redrawn to match the newly-selected month. It is OK to press so long that the months cycle past a year boundary. The program works correctly even if the **era** happens to change while pressing a month-changing button.

Thus there are two alternate ways to change months. The pop up menu might be most convenient for jumping from one end of a year to the other, whereas the arrow buttons might be best for moving a few months at a time.

3.2.1.2. Year Selection

Centered in the next line down, in medium type, is a box displaying the absolute value of the year. To determine the sign of the year, you need to look at the era display. (In the Chinese calendar, two numbers appear—cycle and year-within-cycle. There is no era display but the cycle may be negative but not zero.) The year box is surrounded by two arrow buttons. These buttons act similarly to the month buttons described above, except that they decrement or increment the year. The **down-pointing** arrow at the left decreases the actual value (not the absolute value) of the year. Thus it takes you **towards the past**. The **up-pointing** arrow at the right increases the actual value of the year, taking you **towards the future**.

The arrow buttons are only useful for moving a few years at a time. In order to enable large jumps in time, the year displayed in the box is an **editable** text field. The idiosyncrasies of editing the text field which specifies the year may be confusing. That is the primary reason I felt it was worth writing this Users' Guide.

In the year box, you can select text or place the insertion cursor wherever you want, and then follow normal text editing conventions to adjust the year to almost any value you desire. While you are doing this, the edit menu becomes active, permitting one-step undo/redo, cutting and pasting, and deletion of characters. You signal InterCal that you are finished editing the year by hitting either the **Return** or the **Enter** or the **Tab** key. If you change your mind while editing, the **Escape** key or **Cmd-period** ends your editing session and restores the year to the value it had before you started editing.

(Chinese) Note that when the Chinese calendar is primary, the editable field consists of two numbers—not one as usual. The first is the cycle; the second is the year within the cycle. As explained in "Calendar System Facts", the nature of the calculations forces the range of allowable years in the Chinese calendar to be restricted to about 6000

years on either side of the present. This translates to a valid range for the cycle between -23 and 178 inclusive. **The cycle may not be zero.** The year within the cycle must always be in the range 1 to 60 inclusive.

Editing the year normally leaves the month unaffected. However, luni-solar calendars have years with differing numbers of months and this may force a change of month. For example, if you are in the Jewish calendar displaying Adar I 5755 A.M. and jump to a non-leap-year, such as 5754 A.M., the month will change to Adar. Similarly, jumping from a leap year in the Elliott calendar, while displaying the month of Anthony, to a non-leap-year causes the month to switch to Ericka. **It doesn't matter whether the arrow buttons or the editable text field are used to change years—the same rule applies.**

I wanted the user to be able to jump immediately from any year to any other year (within limits specified below) in a single editing step. This led me to a slight problem—namely, the fact that (in keeping with good calendrical conventions) the box is displaying the **absolute value** of the year (except of course for the Chinese calendar). What if the user wants to jump to a year in the other era? What if he/she doesn't? Of course you could always do the job in two steps, using the era popup and editing the year text box. But that would be inconvenient. I eventually settled on the following rules applicable to all linear calendars (but not the Chinese):

a) If the user simply manipulates the numbers in the year without providing an explicit sign (plus or minus), the era remains the same. As an example, if you are in April 4956 B.C. and edit the year box to read "111193", you will be taken to April 111193 B.C.

b) If the user explicitly enters a sign immediately before the year (no spaces permitted) the era is forced to agree with the entered sign (which will then disappear from the display). For example, if you are displaying April 4956 B.C. and edit the year to read "+111193" you will be taken to 111193 A.D. In either case [a] or [b], the final year display will read simply "111193", but the era display in the two cases will be different, as will (usually) the month calendar itself.

For the Chinese calendar, explicit signs are allowed on the cycle number and signs remain in the year box. There is no era menu. Numbers entered without a sign are **always** treated as positive.

3.2.2. Mayan Calendar Display Controls

The Mayan controls appear whenever the Mayan is the primary system. They show the *displayed date* in each of the three different Mayan Calendars—the Long Count, the Tzolkin cycle, and the Haab cycle. Any of the three can be manipulated to change the *displayed date* as described below. Once one has been changed, the program updates

the entire display so that the dates in all three Mayan calendars (and the month calendar display) agree.

I recommend playing with the Mayan controls before reading this section of the guide. I hope they are intuitively grasped and will be much easier to handle than the following lengthy (but complete) text may make it seem.

3.2.2.1. The Long Count

The Long Count is displayed in large type at the left of the controls pane. It always contains the full 8 vigesimal digits (see Calendar System Facts for details—InterCal uses 8 digits, not the usual five, to cover long time spans). Each digit is separated from the others by a period. The Long Count is an editable text field which behaves much like the year field described in §3.2.1.2 above. The same keys are used to terminate editing and the same editing capabilities are available. If the format of the Long Count is not acceptable when you press **Return, Enter, or Tab** an alert appears and the old value of the Long Count is restored. If the format **is** acceptable, the main window display is updated immediately.

The rules for a valid Long Count are:

1) A sign may optionally precede the first digit. If no sign is present the Long Count is presumed to be non-negative.
2) There must be exactly 8 vigesimal digits separated by exactly seven periods. Leading zeroes, if applicable, **are** required.
3) Each digit must be in the range 0–19 inclusive, except the second digit from the right is restricted to 0–17 inclusive.
4) If the Long Count value is too large another alert will appear. Dates much above 1.17.5.0.0.0.0.0 would cause overflow and lead to garbage results in the calculations.
5) Except for the separating periods and the optional sign before the first digit, non-numeric characters are forbidden.

Note that changing the *displayed date* in this way has no effect whatsoever on the *selected date*.

3.2.2.2. The Tzolkin Cycle, Haab Cycle, and Calendar Round

The Tzolkin date and the Haab date are both displayed at the right of the Long Count. At the **extreme** right of the pane are two radio buttons and a check box. Remember that both the Tzolkin and Haab calendars are cyclic, with no year associated with them. InterCal assumes that when you change a Tzolkin or Haab date you want to go to the next Julian Day having the specified Tzolkin or Haab date. The radio buttons, which can be reset at any time, control whether you go to the next date **in the past** or

the next **in the future**. The check box determines whether you wish to edit the Tzolkin date or the Haab date **in isolation** (when the box is unchecked) or **together** as a Calendar Round date.

The Tzolkin day **name** is actually a pop up menu which can be used to modify the Tzolkin date. The Tzolkin day **number** is an editable text field which permits only unsigned integers in the range 1–13 inclusive. The usual rules for terminating the editing of the text field apply.

The Haab month name is also a pop up menu, used for changing the Haab month. The Haab day is another editable text box, which accepts only unsigned integers in the range 0–19 inclusive (0–4 if the "month" is Wayeb).

Note that, unlike in linear calendars, you have control down to the day (not just month) of *displayed date*. If the Haab displayed date is, for example, 6 Mol, and you change the Haab day from 6 to 7, what happens depends critically on the setting of the past and future radio buttons. If "Move to future" is selected, changing from 6 to 7 has only a slight effect on the main window display. The Haab day text field will change, the Long Count will increment by 1, and the Tzolkin day number and name will increment by one each. But the big month display which fills most of the window will not change. But if "Move to past" is on, changing from 6 to 7 moves you 364 days into the past. The change is especially noticeable if you have a secondary calendar in force. Similarly, accepting a "change" of the Haab or Tzolkin date of zero (no change) transports you one full cycle into the past or future.

Since both Tzolkin and Haab are cycles, it often is not intended to change just one part of a date. For that reason, starting to edit either the Haab or Tzolkin date places the program into a special mode which treats the Tzolkin and Haab controls like a modal dialog. The Long Count and the "Calendar Round" check box are deactivated and will not accept changes. The month display (described later) will not accept clicks. If the date window and/or the Mayan Correlations window (described later) happen to be visible, they temporarily disappear. If the "Calendar Round" check box is **not** checked, **either** the Tzolkin **or** the Haab controls are also deactivated (whichever was **not** modified). Two buttons appear at the immediate left of the Haab controls. One is labeled **OK** and the other is **Cancel**. You can continue to change whichever of the Haab and Tzolkin controls are still active while the rest of the display remains frozen. Clicking on **OK** accepts the changes, updates the entire display, re-shows the date and correlations windows if applicable, and puts the program back into its normal mode. Clicking **Cancel** restores the Tzolkin and/or Haab dates to what they were before you started modifying them, and then acts the same way as **OK**.

Note that it is not possible to make large jumps in time using the Haab/Tzolkin controls. You are limited to jumps of 365 days, 260 days, or (if the Calendar Round check box is checked) about 52 years. Large jumps **can** be made using the Long Count field or by going into the date window, modifying the *selected date*, and then using the

Jump To Selected menu command. (These latter methods are described in detail later in this Users' Guide.)

If the Calendar Round check box was **unchecked** when you started editing, any change to the Haab or Tzolkin date is acceptable. Whichever you did not edit will be updated by the program to agree with the new choice. If the Calendar Round check box was **checked**, it is quite possible you will specify an impossible Haab-Tzolkin combination. In this case a modal dialog window appears and offers you several choices. You can **Try Again**. Pressing that button merely resumes your Calendar Round editing session where you left off. Or you can pick one of six buttons labeled with choices which are guaranteed to result in a valid combination. There are two Haab buttons and four Tzolkin buttons. The two Haab buttons surround the Haab date you specified and are compatible with the Tzolkin date you specified. The four Tzolkin buttons are similar in some way to the Tzolkin you specified, and are compatible with the Haab you specified. (By "similar" is meant: either the day name has changed by the minimum necessary while keeping the day number as you specified; or both the day name and number have changed simultaneously by the minimum amount required for compatibility with the Haab you specified. Note that changing a Tzolkin day number without also changing the day name **cannot** produce a compatible Tzolkin date.)

3.3 The Month Calendar and Day Selection

3.3.1. The Day Boxes

Most of the main window is taken up by a calendar showing the month selected by the user using the methods described above. **For the Mayan calendar, the Haab month is displayed.** Each box in the calendar is either blank or has the day of the month in large bold type in the upper right. If a secondary calendar system has been chosen, there are two lines (small type, right-justified in the box) below the day number showing the date in the secondary system. The first of the two small lines shows the day and month (linear calendars) or the Long Count (Mayan). The second shows the year and era(linear), cycle and year (Chinese), or the Calendar Round date (Mayan). As explained in Calendar System Facts, the Chinese calendar has a more limited range of use than other calendars. It is limited to a period from about 6000 years ago to about 6000 years from now. If the secondary system is Chinese and the *displayedDate* is outside the legal range for a Chinese date in InterCal, a series of asterisks is displayed in place of the Chinese date. **This is not an error situation.**

If the Mayan calendar is the **primary** system, two or three small lines in the upper left of the box show the Long Count and the Tzolkin date for each day. Whenever the Long Count is shown within a day box, whether the Mayan calendar is the primary or secondary system, any leading zeroes are **not** displayed (to eliminate clutter from the

crowded display). When the Mayan calendar is primary, the 8 Long Count digits are shown separately. The first three (which are unique to InterCal) are shown on the top line in the upper left of each day box. The next five digits appear on the second line. If the Long Count is non-negative and if the first three digits are all zero (which will usually be the case) the top line is **not** displayed.

If the Mayan calendar is **not the primary** system, and if the Chinese calendar is either Primary or Secondary, three small lines in the upper left of the appropriate boxes show the solar terms in both Chinese and English. (Solar terms are defined in "Calendar System Facts".) Major terms are in normal style; minor terms are in *italics.* Usually there will be one major and one minor solar term in a month. Sometimes there will be just one solar term and sometimes three.

If the displayed month contains a holiday which the user has designated for highlighting (see §4.4.2 below) the name of the holiday appears on the next line (left justified). It is possible for holidays to collide (for example, Christmas and Hanukah). In such cases more than one name appears in the box. In case of collision, the highlight colors or patterns appear with the following priority: Christian overrides Jewish which overrides Islamic. This ordering merely reflects the order of checking for holidays in the code. Please do not read any ulterior motives into the ordering—there are none.

If the displayed month includes the selected date (see next subsection) or today's date, they are also highlighted—always in black and white. The selected date appears in reverse video. Today's date appears with a light-gray background. **On the screen**, selection overrides all other highlighting—the selected date always appears in reverse video whether or not it is today's date or a highlighted holiday. The "today's date" highlighting overrides holiday highlighting, but not selection. **When printing**, slightly different rules apply, as explained in detail in §4.1.3 below.

3.3.2. Date Selection

The user may select any displayed date by clicking once in its box. He/she may cause there to be no selected date by clicking on any blank box in the month calendar.

Selecting a date serves two functions. The user may want to mark a date to return to later after exploring other months or years (see §4.4.3). Or you may want to see at a glance that date's equivalent in all implemented calendars using the date window (see §4.4.1). Causing there to be no selected date serves no apparent function unless the user finds the reverse video box to be aesthetically unappealing, but I had to decide to either ignore clicks in blank boxes or do something. I chose the latter.

Selecting a date by clicking in a box on the month calendar has the side effect of changing *displayedDate* to equal the newly chosen *selectedDate*. This was done to simplify the task of switching primary calendars without losing the selected date from the

display. If the Mayan calendar is the primary system, you will see the Mayan controls change values. If the Chinese calendar is primary, the name of the day (in the upper right part of the month display where the era menu normally resides) will change to reflect the new *displayedDate.* There is another way to select a date which does not require the date to be in the current month calendar display. It is described in §4.4.1 below.

4. THE MENU BAR

4.1. File Menu

Three commands on the **File** menu are always active— **Quit, Page Setup…, and Print…**. The **Close** command is active when either the Julian Date window or the Mayan Correlations window is in front (active). Other commands are visible but inactive. They are there for desk accessories.

4.1.1 Quit

The **Quit** command saves window size and position information, holiday selections, Mayan correlation choice (see § 4.4.6 below), Primary and Secondary calendar system choices, and print records, then quits the program.

4.1.2 Page Setup Main… or Page Setup JDate…

This command brings up the standard Page Setup dialog for the print manager. InterCal uses and stores two print records, one for each window. (This is done because the main window is best printed in landscape mode, while the date window is best printed in portrait mode.) The name of this command changes depending on which window is active, to remind you of which record you are affecting. If the date window is active, the command reads **Page Setup JDate…**, otherwise it reads **Page Setup Main….** After your initial setting up, it is unlikely you will ever need this command unless you switch printers.

4.1.3 Print Main… or Print JDate…

The **Print…** command's name on the menu is changed to either **Print Main …** or **Print JDate…**, depending on whether the date window is active. The **Print Main…**

command brings up a print dialog which has an added choice. A check box is available which is explained below. What you see on the screen depends on your print driver. Older versions on LaserWriter append the check box to the bottom of the Print dialog box. The Adobe™ print driver does the same thing. But newer versions of LaserWriter have a PopUp menu which says "**General".** Pop the menu and you will see an option "**InterCal"**. If you select that option the check box will appear. I do not know what the ImageWriter driver does.

The main window must be printed in landscape mode in order to fit on one 8.5 by 11 page. Depending on your printer and driver, you may also need to scale the print (using the **Page Setup** command) to 90% or 95% of full size. The **Print JDate…** command brings up the standard print dialog to print the date window.

The added check box, "Color Printer", appears when you select **Print Main…**. (The date window has no color in it, and so InterCal doesn't care whether or not you have a color printer when printing the date window.) Remember that holidays are highlighted in color on a color monitor and using fill patterns on a monochrome monitor. InterCal does the same thing for printers. The problem is that there appears to be no way for an executing program to know whether or not the chosen printer has color capability and is operating in color mode. InterCal relies on the user to specify this information. (Executing programs can detect whether or not the printer driver is color-QuickDraw-aware. If it is **not**, then the printer must be black-and-white or at least operating in black-and-white mode. But if it **is**, the printer might still be black-and-white.)

InterCal stores the user's choices for this check box, and always presents the most recent choice as the default. If you have chosen a different printer between print requests, this may not be appropriate.

The following differences exist between what you see on the screen and what is printed:

1) There is no inversion (equivalent to reverse video on the screen) on many printers, so the rules for highlighting are changed for printing. Instead of having the highest priority (as it does on the screen), selection has the **lowest** priority. Therefore, the selected date will appear in black and white reverse video on the printout **only** if it is not today's date, not a highlighted holiday, **and only** if your printer supports inversion.

2) The month and year incrementing/decrementing arrows are not printed for linear calendars, and the radio buttons and check boxes at the right side of the Mayan controls do not print. I have been unable to figure out how to make them print.

4.2. Edit Menu

The **Edit** menu is normally inactive. It is provided primarily for desk accessories. However, it automatically becomes active when the user edits any of the editable text fields such as the Julian Day in the Date Window. At that time, the standard edit commands are activated.

4.3. Primary and Secondary Menus

The next two menus are labeled **Primary** and **Secondary**. These menus are used to set the calendar systems to be displayed in the main window. The options available in both menus are the implemented calendars, plus a choice of **None** for the secondary system.

You can change the primary system at any time. The presently-selected primary system is deactivated in the menu, but all other choices are available. If you select as the new primary system a calendar which is currently the secondary one, the program obeys your command and automatically resets the secondary system to **"None"**.

When you change primary systems, the entire main window is redrawn with *displayed date* controls updated to reflect the *displayed date* in the new primary system. Of course, *displayed date* will be present somewhere in the new month display. Thus switching primary systems will not transfer you very far in time. Since *selected date* and *displayed date* are equal **if** *selected date* was visible in the month display before switching, *selected date* would still be visible after the switch.

The secondary calendar system can also be changed at any time. If there is a secondary system active, each day of the displayed month has its corresponding date in the secondary system written in its box. **This feature enables direct comparison of dates in two separate calendar systems, and is one of the primary features for which InterCal was written.**

Just as any implemented system can be the primary system, any **other** system can be the secondary system. The program prevents you (by disabling menu choices) from selecting the current primary system or the current secondary system as the new secondary system. [However, see **Reverse Calendars** under the **Options** menu (§4.4.5)].

If the primary system is **not Chinese**, the choice of Chinese on the Primary menu (normally available) is grayed out if *displayedDate* lies outside the range of legal Chinese dates in InterCal. **Similarly, the *ReverseCalendars* and *JumpToSelected* options (see section 4.4 below) are disabled if their selection would result in making the Chinese calendar the primary system while dates outside the legal range are being displayed.**

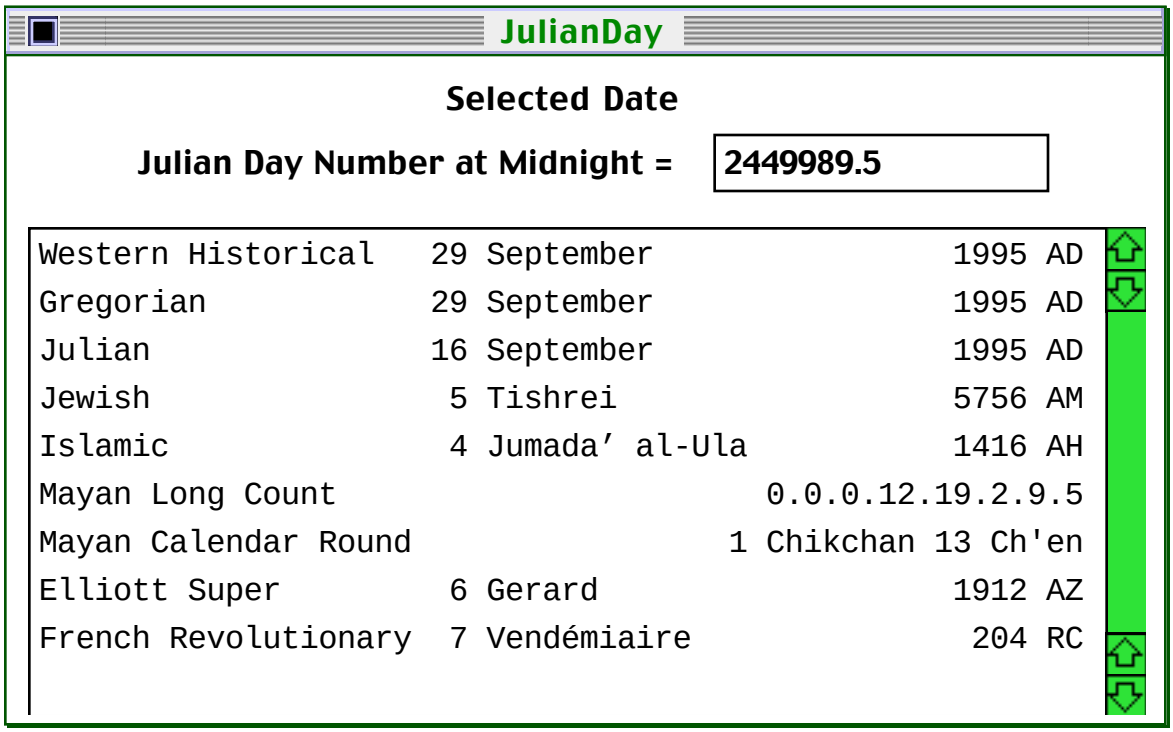
Switching secondary systems does not alter most of the main window. Only the "fine print" in each day's box changes. The user has complete freedom to pick any *displayedDate* even when the Chinese is the secondary calendar. As mentioned previously, if it is out of the valid range for the Chinese calendar, asterisks appear in place of the Chinese date.

4.4. The Options Menu

4.4.1. Show Date Window

This menu option is enabled whenever the date window is not visible, either because it is not open or because it is **completely** hidden behind another window. This window has an editable text field showing the Julian Day of *selected date*. So the user can change the selected date to any value which does not trigger the text verification code. (That code is designed to prevent entering such a large value that arithmetic overflow would occur and invalidate all calculations.) It does not matter whether or not *selected date* is presently being displayed in the main window. While editing the Julian Day field, the **Escape, Return, Tab, and Enter** keys work exactly as in the year text box in the main window.

Below the Julian Day is a table showing the selected date in all implemented calendar systems.


JulianDay
Selected Date
Julian Day Number at Midnight =
2449989.5
Western Historical 29 September 1995 AD
Gregorian 29 September 1995 AD
Julian 16 September 1995 AD
Jewish 5 Tishrei 5756 AM
Islamic 4 Jumada’ al-Ula 1416 AH
Mayan Long Count 0.0.0.12.19.2.9.5
Mayan Calendar Round 1 Chikchan 13 Ch'en
Elliott Super 6 Gerard 1912 AZ
French Revolutionary 7 Vendémiaire 204 RC

Editing the Julian Day field sets or resets the selected date to whatever number you enter. Your entry can be positive, negative, or zero. Here the usual mathematical convention is followed—numbers without an explicit sign are considered to be positive. The new selected date takes effect immediately, and the main window highlighting is updated (if necessary) even though that window is in the background. However, there is no automatic jumping to the new selected date. You still need to use the **Jump to Selected** menu item for that.

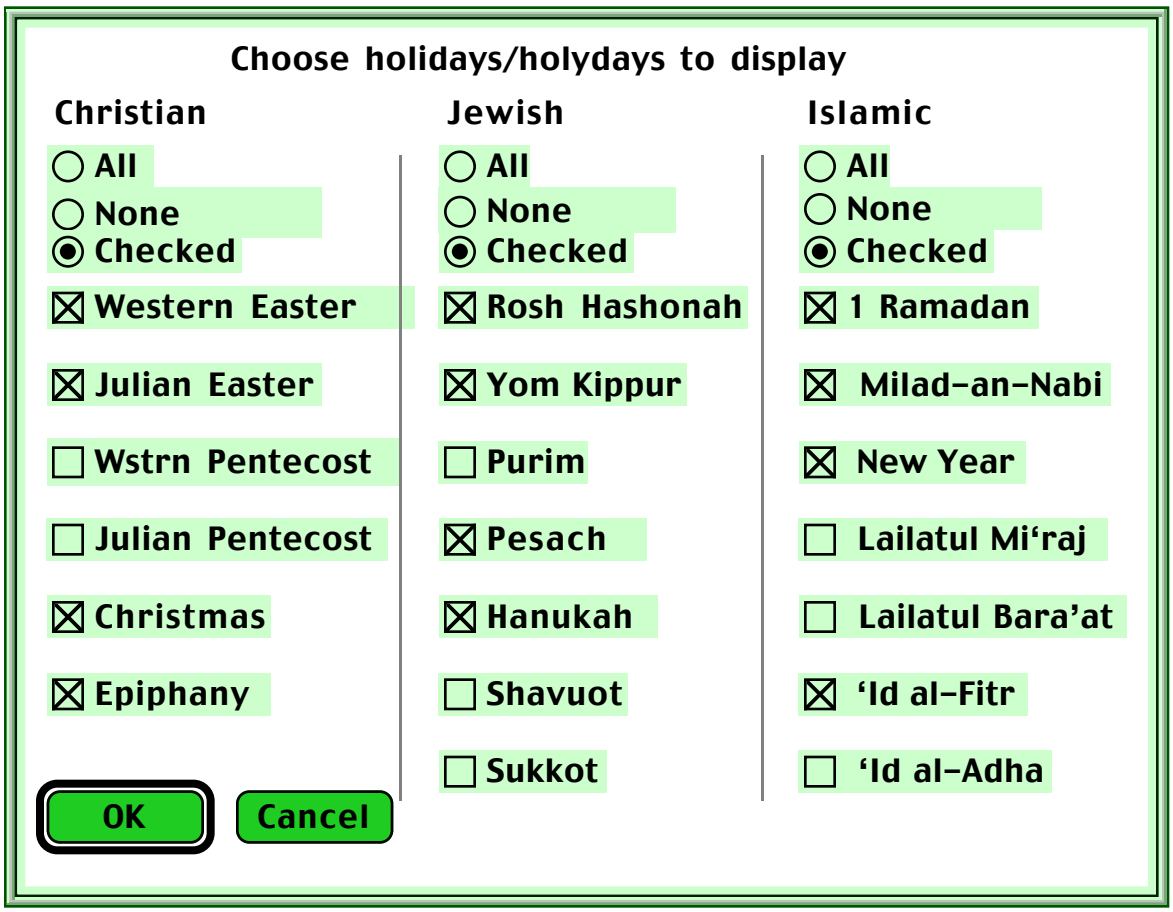
The number you enter for the Julian Day does not have to end in .5 (which corresponds to midnight on the prime meridian). If it does not, the program automatically adjusts your entry to the preceding midnight.

Setting the state of the program such that there is no selected date (by clicking on a blank box in the main window's month calendar pane) has no effect on the date window. Thus it is more accurate to say that the date window shows *the most recently selected* date. I thought about ensuring that the date window is closed when there is no selected date, and also of disabling the **Show Date Window** option in the Options menu. That seemed to me to be the most rational approach. But reading the Macintosh user interface guidelines made me think that such an arrangement violates the guidelines. User feedback on this subject is welcome.

When active, the date window can be closed by clicking on its close box or by using the **Close** command on the **File** menu. If it is entirely surrounded by the main window, it can be hidden by activating the main window.

4.4.2. Holidays…

The **Holidays** option brings up a modal dialog box which lets the user determine which of the implemented holidays should be highlighted. (The highlighting scheme was described earlier.) The dialog box contains three columns (one each for Christian, Jewish, and Islamic). Within each column there are three radio buttons and a group of check boxes. If the "All " button is on, every implemented holiday for that religion will be highlighted. If the "None" button is on, none of them will be highlighted. If the "Checked" button is on, the check box group is active and individual holidays may be selected or deselected for highlighting. Unless the "Checked…" button is on, the check boxes are deactivated and their settings are ignored by the program. Their values are **not** updated by clicking on any radio button. **This behavior differs noticeably from the behavior of the check boxes in InterCal Versions 1.0 and 1.1.** Clicking on **OK** accepts the new settings. **Cancel** closes the box without updating the old set of selections.


Choose holidays/holydays to display
Christian
All
None
Checked
Western Easter
Julian Easter
Wstrn Pentecost
Julian Pentecost
Christmas
Epiphany
Jewish
All
None
Checked
Rosh Hashonah
Yom Kippur
Purim
Pesach
Hanukah
Shavuot
Sukkot
Islamic
All
None
Checked
1 Ramadan
Milad-an-Nabi
New Year
Lailatul Mi'raj
Lailatul Bara'at
'Id al-Fitr
'Id al-Adha
OK
Cancel

Regardless of the user's settings, holidays are **not** highlighted in the following cases:

1) Christian holidays/holy days in the B.C. era;
2) Jewish holidays/holy days in the B.W. era;
3) Islamic holidays/holy days in the B.H. era.

Some holidays/festivals/observances last for several days or, in the case of Ramadan, an entire month. In such cases, only the **first** day is highlighted.

The dates of Christmas and Epiphany are calculated in the Western Historical calendar. That is, the Julian calendar dates and rules are used on or before October 4, 1582 A.D. and the Gregorian calendar dates and rules are used after that date. Thus, if your primary calendar is Gregorian in years before 1582, or the Julian in years after 1582, do not be surprised to see Christmas or Epiphany seeming to fall on dates other than December 25 and January 6. I did not bother to have separate Julian and Gregorian choices for these holidays, since they are fixed. Christmas is December 25 and Epiphany is January 6 (Julian in Orthodox Christian churches; Gregorian otherwise). So, in years after 1582, it is not possible to have Julian Christmas or Epiphany highlighted, but (by setting the secondary calendar system to "Julian") it is still easy to determine when they occur.

I **do** have separate boxes for Julian and Western Easter and Pentecost. "Western" Easter (used by the Roman Catholic and most Protestant churches) uses the old Julian rules for years 1582 and earlier, and the revised Gregorian rules for years 1583 and later. Eastern Orthodox churches are still using the Julian Calendar to determine the dates of **all** holidays. So "Julian" Easter permits you to see when the Orthodox churches will celebrate Easter, no matter what the year (and similarly for "Julian" Pentecost). You will probably also want to use Julian Easter for determining the holiday dates in Protestant countries during the years after 1582 but before your country of interest switched to the Gregorian calendar. In years 1582 and earlier, the holidays **always collide**, so InterCal simply uses one holiday label—"Easter" or "Pentecost" as appropriate.

4.4.3 Jump To Selected

Selecting **Jump To Selected** causes *displayed date* to be reset (if necessary) to *selected date*. If there is no selected date, this menu item is disabled.

4.4.4 Return To Today

Selecting **Return To Today** causes *displayed date* to be reset (if necessary) to today's date.

4.4.5 Reverse Calendars

Selecting **Reverse Calendars** switches the roles of the primary and secondary systems. The former primary system becomes the secondary, and vice versa. This item is disabled if there is no secondary system active. Since the months rarely overlap exactly, there have to be some rules for determining which month in the new primary system is displayed. The same rules are used as when a new primary system is chosen under the **Primary** menu (see §4.3).

4.4.6. Mayan Correlations…

Selecting **Mayan Correlations…** brings up the Mayan correlations window. This is a non-modal dialog which permits the user to select a correlation from among a number of published suggested correlations, or to specify his/her own. (A correlation is a correspondence between Long Count 0.0.0.0.0 and a particular Julian Day.) The dialog box contains a set of radio buttons. Text describes each correlation (name of archaeologist who suggested it; Julian Day number of 0.0.0.0.0, Julian calendar date of 0.0.0.0.0, and Gregorian calendar date of 0.0.0.0.0.) The uppermost radio button, if selected, activates an editable text box in which the user can enter any Julian Day number desired. All Mayan dates active in the program are updated immediately upon the clicking of any radio button, or upon completion of editing of the user-choice field. Note that the Julian day number of the dates is **not** changed—only the derived Long Count, Tzolkin, and Haab dates.

This command is disabled if any part of the window is visible on the desktop, since the window can then be activated simply by clicking on it. The window may be closed when it is active by clicking on its close box or by using the **Close** command on the **File** menu. If it is completely surrounded by the main window and/or the date window, it may be hidden by activating the main window. The window may be re-sized and repositioned.


Mayan Correlations
Select a correlation,
Pick my own
584285
Julian Day
Goodman-Martinez-Thompson
584283
Goodman-Martinez-Thompson (modified)
584285
Smiley
482699
Makemson
489138
Spinden
489384
Thompson
584281
Kreichgauer
626927
Hochleitner
674268
Escalona Ramos
679108
Weitzel
774078


Mayan Correlations
or specify your own:
Julian Calendar
Gregorian Calendar
September 6, 3114 B.C.
August 11, 3114 B.C.
September 8, 3114 B.C.
August 13, 3114 B.C.
July 23, 3392 B.C.
June 26, 3392 B.C.
March 10, 3374 B.C.
February 11, 3374 B.C.
November 11, 3374 B.C.
October 15, 3374 B.C.
September 4, 3114 B.C.
August 9, 3114 B.C.
June 7, 2997 B.C.
May 14, 2997 B.C.
January 17, 2867 B.C.
December 25, 2868 B.C.
April 19, 2854 B.C.
March 27, 2854 B.C.
April 24, 2594 B.C.
April 3, 2594 B.C.

5. LIMITATIONS

5.1. Year and Julian Day Ranges

In order to be accurate, the calendar calculations must be performed using integer arithmetic. Since the basic unit is the day, InterCal is limited to dates for which the integer part of the Julian Day can fit into a signed 32-bit integer. Validity checking is performed on the Julian Day box in the Date Window, the year box in the main window, and various other editable text fields, to try to prevent such dates from occurring. I tried to set the limits a little narrower than actually required. However, the logic is complex in places and the limits on Julian Day numbers and years are not perfectly consistent. Also, it is possible (through use of the arrow buttons on months and years) to defeat the text validation code. If any of these things happens, InterCal should not crash, but will produce some garbage results or may put up an alert box when you don't expect it. The validation code tries not allow the absolute value of Julian Day entries to exceed 2,145,000,000 or the absolute value of year entries to exceed 5,800,000.

Chinese dates are limited to cycles -23 to +178 (with 0 being an invalid cycle).

(irrelevant note) By pure coincidence, the allowable range of years is similar to, but a little larger than, the repetition period of Easter dates. The Easter cycle in the Gregorian rule is exactly 5,700,000 years long.

5.2 Excess Holiday Collisions

On very rare occasions, three holidays (one Christian, one Jewish, one Islamic) all occur on the same day. It is even theoretically possible for four to collide (both Easters plus a Jewish and an Islamic holiday), although I do not know if such a thing actually happens. Since screen space is limited, since I did not want to induce eye strain in the user, and since triple (or greater) collisions are so rare, I decided not to adjust box sizes or fonts to ensure that the names of all holidays would fit into the same box. Instead, when this happens, holiday names overflow into the box below, marring the appearance of the display. If a triple collision occurs on the bottom row of the display, the title of the third holiday will be partially clipped by the window boundary.

6. KNOWN PROBLEMS

6.1. Exceeding the Long Integer Limit

Instead of relying on crude validation limits on the entered year or Julian Day, InterCal ought to check for the overflow, raise an exception, and issue a warning to the user. Then only actual violations would prevent successful execution, and the user would never see an unexpected year alert box when he has just entered a Julian Day. Unfortunately, there appears to be no mechanism on the Macintosh (at least using C++) to detect the overflow.

6.2. Improperly Displayed Popups

Sometimes popup menus in the *displayed date* controls will be truncated at the right. Also, sometimes the popup menus (when activated) appear in 12-point type (the program tries to display then in 24-point). These popup size problems appear to me to be bugs in the Symantec Visual Architect code which initializes the popup menus. At seemingly unpredictable times (but always during startup), it sizes them using the system font instead of the actual font specified in my code. This bug has been reported to Symantec. The problem usually goes away if you simply quit and restart the program. *An attempted work around for this problem was put into Version 1.2. It reduced the frequency of occurrence of this problem, but did not completely eliminate it.*

In OS 8 the month names in the expanded month pop up menu are not fully visible (chopped off at the top and the right) even though there is plenty of room. I do not know the cause of this problem, but it is probably due to some incompatibility between my very old development environment and OS 8.

The mark character, which shows which popup item is currently selected, is not properly displayed. This problem also appears to be either a bug or a feature of the Visual Architect code. I know of no work around.