

Network Time

The clock setting program for TCP/IP networked Apple Macintosh computers.

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Network Time is a combination Control Panel and Startup document for setting your Macintosh computer's clock. The program uses the TCP/IP network protocol to contact a network "timeserver" to get the exact time of day. Every time you restart your computer, and at times you specify thereafter, *Network Time* will reset the Macintosh clock as accurately as you need it, as well as automatically readjusting for daylight savings time. After the initial set up, you should never need to worry about it again.

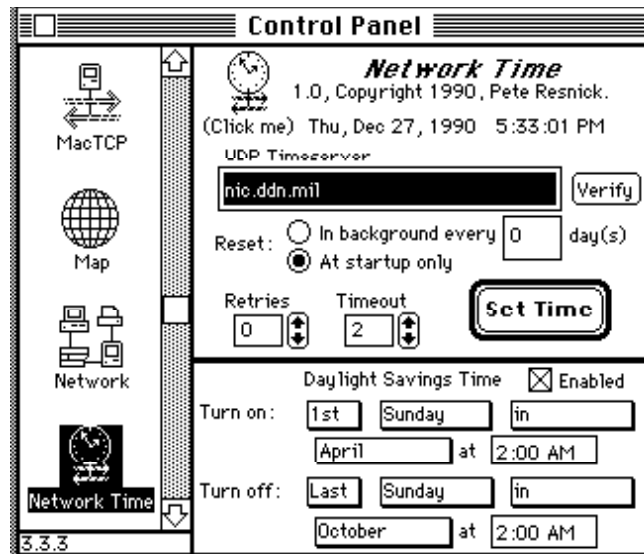
There are two preliminary steps that you must complete before you can run *Network Time*. First, you must make sure that MacTCP network software (available from Apple Computer) is set up properly on your Macintosh. MacTCP is required for your computer to communicate with the machine that will tell your Macintosh what time it is (the "timeserver"). Consult your network administrator or the *Apple MacTCP Administrator's Guide* for assistance. In addition to the network software, you will also need to properly set the Map utility in the Control Panel desk accessory. Since the time of day is always given in Greenwich Mean Time on the network, *Network Time* will need to know where in the world your computer is by checking with Map. See the *Macintosh Utilities User's Guide* for information on how to set your machine location using Map. *Network Time* requires at least a Macintosh Plus with system software version 6.0.3 or greater.

Now follow these steps to install the *Network Time* program:

1. Make sure that your Macintosh has been started using the startup disk containing the MacTCP and Map programs.
2. Make sure both the System Folder and the *Network Time* program are visible on the desktop.
3. Copy *Network Time* into the System Folder by dragging the icon of *Network Time* onto the System Folder of the startup disk.

Once the program is in the System Folder:

1. Choose Control Panel from the Apple menu.
2. If the *Network Time* icon is not in view, scroll down until it is.
3. Click on the *Network Time* icon to open it.

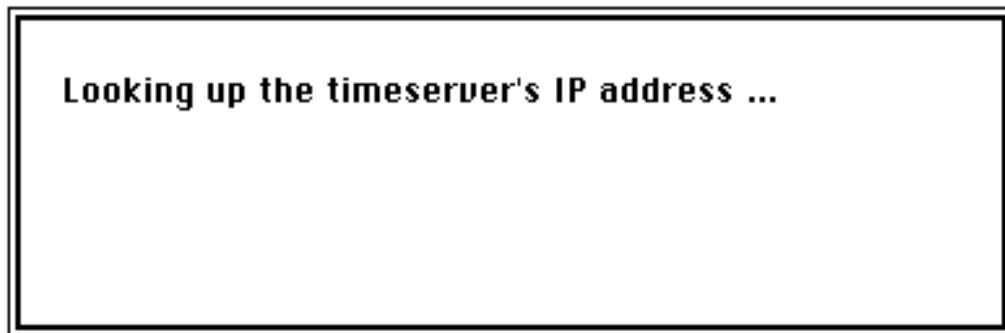


Changing the settings

The top portion of the window contains information on how *Network Time* will set the time using the network. The bottom portion of the window contains information on how to adjust for daylight savings time. Let's start with the top portion.

The most important thing to set up on the top portion of the *Network Time* window is the UDP Timeserver. The timeserver is the machine on the TCP/IP network which will tell your Macintosh what time it is. "UDP" is the particular protocol (network language) that the timeserver must use to talk to your computer. Determine from your network administrator which machine on your network acts as the UDP timeserver. You will then want to type that machine's network address into the "UDP Timeserver" box. The address may either be a valid domain name, like "nic.ddn.mil" (the Network Information Center's server computer) or in dotted-decimal address notation (for example, nic.ddn.mil has the dotted-decimal address 192.67.67.20).¹ The initial setting is to the nic.ddn.mil computer.

If you type a name and you want to check that it is a valid machine address, click on the "Verify" button next to the timeserver name. *Network Time* will contact the Domain Name Server to check the address and will return to you the official host name of the address you have typed if it can find one. While the address is being looked up, the following is displayed:



If there is a problem either with the Domain Name Server or the network, the lookup may take up to 20 or so seconds. Be patient. It does take some time for the Macintosh to realize that there is a problem, but it will surely quit after a little while. When the lookup is complete, a box will be displayed either with the official name of the address you had typed:



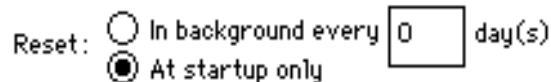
¹Make sure that the MacTCP Domain Name Server information is set up properly. Check with your network administrator or the *Apple MacTCP Administrator's Guide* for assistance.

or with one of several error messages which might look like this:



If you get an error message, you may have to change the timeserver name that you typed in. As usual, you may use the commands in the Edit menu to change information in the *Network Time* configuration box as well. *Network Time* also checks the timeserver name when you exit the Control Panel, so you may also get this kind of error message at that time. In this case, you must re-open the Control Panel to change the timeserver name. A full list of error messages is at the end of this document.

Once the timeserver is set up properly, you can decide whether you want *Network Time* to operate in “Startup Only” mode or in “Background” mode by clicking one of the two buttons in the Control Panel:



In “Startup Only” mode, *Network Time* will set the time only when your Macintosh is restarted or when you click the “Set Time” button in the Control Panel. In “Startup Only” mode, *Network Time* will wait until the time setting operation is done before the Macintosh can go on to perform other tasks. In “Background” mode, not only will *Network Time* set the time at startup and when you click the “Set Time” button in the Control Panel, but will also reset it every few days, specified in the box next to the “In background” button. To set the number of days between resets, just click in the box and type the number you wish. If “0 days” is specified, *Network Time* will only reset the time at startup or when “Set Time” is clicked in the Control Panel. Also, in “Background” mode, once the request has been made at startup or in the Control Panel, *Network Time* will immediately allow the Macintosh to go on with other tasks while the time is set in the background. You will almost certainly want to use background mode unless your Macintosh is extremely squeezed for memory. *Network Time* only uses about 16 kilobytes of memory, so you would have to be in dire straits not to use it.

You can set the accuracy with which the time will be set in the “Retries” and “Timeout” settings. The number in the “Retries” box will be the number of times to resend a request to the timeserver if the initial request fails. It starts out set to 0, which means that *Network Time* will only attempt to request the time once from the timeserver. The maximum value is 2 retries. The number in the “Timeout” box is the number of seconds to wait for a response from the timeserver before *Network Time* gives up. The minimum value is 2 seconds and the maximum timeout is 10 seconds. Both of these can be set by clicking on the small arrows next to the box, either to toggle the value up or down.



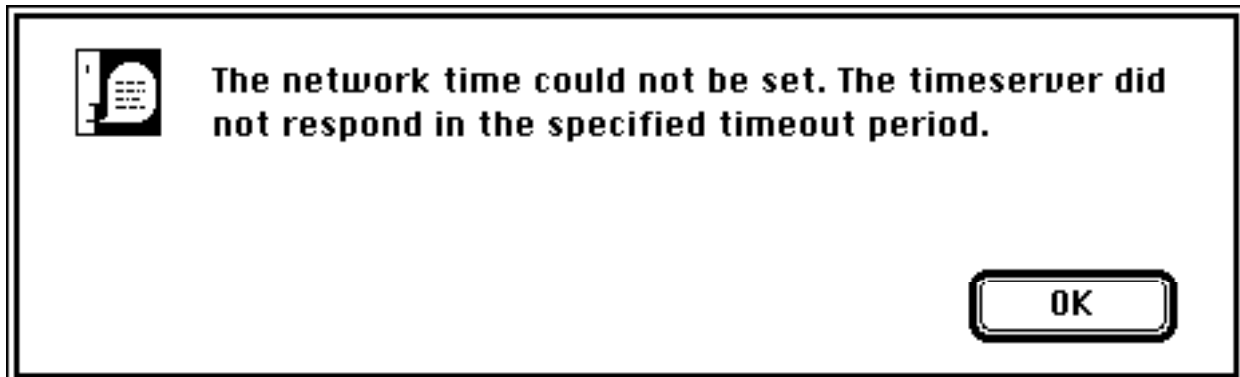
The accuracy that Network time can set your Macintosh clock to depends on a combination of the retry and timeout values. With 0 retries and a 2 second timeout, the best accuracy *that can be guaranteed* for the time of day is within 2 seconds. The worst accuracy you can set is with 2 retries and a 10 second timeout, or 30 seconds. Of course, if the timeserver answers in less than the specified timeout and retry period, the time on your Macintosh clock will be more accurate.

▲ **Important** When *Network Time* is in “Startup Only” mode and “Retries” and “Timeout” are both set to high values, the Macintosh may be “hung” for as much as 30 seconds if the timeserver does not respond. Though this will cause no damage, it can be very annoying. ▲

The only other items in the top portion of the Control Panel are the “Set Time” button, which simply requests that *Network Time* set the time immediately, and the icon in the upper left hand corner, which displays some information about the program. You can just click each button, or hit the Return key for the “Set Time” button. Clicking the “Set Time” button or hitting Return will cause *Network Time* to verify the timeserver name and then set the time. If an error occurs in “Startup Only” mode, you may see a message like this:



In “Background” mode, error messages may appear at any time while you are using your Macintosh and will look something like this:



As stated above, a complete list of error messages is provided at the end of this document.

The bottom half of the Control Panel is used to tell *Network Time* when to change to and from daylight savings time. The upper boxes in this part of the Control Panel specify the date to turn on daylight savings time (that is, add an hour to standard time); the lower boxes specify when to return to standard time. There are several way to specify the daylight savings date; all of them depend on the third box, which is labeled “in” in the diagram below.

Daylight Savings Time				<input checked="" type="checkbox"/> Enabled
Turn on:	1st	Sunday	in	
	April	at	2:00 AM	
Turn off:	Last	Sunday	in	
	October	at	2:00 AM	

When the box says “in,” it indicates that the date is a certain day of the week in a specified month. You can specify which day by clicking and holding on the second box (the one that now says “Sunday”). Clicking and holding on this box will give you a “pop-up menu” of the days of the week.

Daylight Savings Time				<input checked="" type="checkbox"/> Enabled
Turn on:	1st	+ Sunday	in	
	April	at	2:00 AM	
Turn off:	Last	Monday	in	
	October	Tuesday	in	
		Wednesday	in	
		Thursday	in	

Move the cursor to the day you wish to select and release the mouse button. That day will appear in the box. By clicking and holding on the first box you can select whether you want the first, second, third, fourth, or last of the selected day for the month. In the example above, it is the first Sunday of the month specified. You can then choose which month by clicking and holding the fourth box, just as you do with the other boxes.

If the daylight savings rules for your home are not in this format, but instead specify a certain day of the week before or after a specific date, click and hold on the third box. If your daylight savings rules say, for example, to turn off daylight savings on the Sunday after June 30 (i.e. the first Sunday in July), you will first need to click and hold the third box and select “after” from the menu.

Daylight Savings Time				<input checked="" type="checkbox"/> Enabled
Turn on:	1st	Sunday	in	
	April	at	2:00 AM	
Turn off:	Last	Sunday	in	
	October	at	2:00 AM	

+ after

on or after

before

on or before

exactly on

in

The first box will change to the word “The” and the fourth box will show a month and date, so that it reads “The Sunday after October 1.” Now when you click and hold on the month box, a second menu will pop-up to allow you to choose the date. Move your cursor up to June, then over into the menu of numeric dates, and then down until you get to 30.

Now that all of the settings are done, you can close the Control Panel and let *Network Time* do its thing!

Network Time at startup time

At startup time, *Network Time* will first display its icon on the screen. Then, it will either attempt to set the time immediately if in “Startup Only” mode, or if it is in “Background” mode, *Network Time* will install itself in the background and start the time setting process. If an error occurs, a large “.” will be drawn on top of the icon. If the time was set in “Startup Only” mode, the hands of the clock will move to noon. If the background process was started, the icon will be surrounded by a white field.



Any errors that occur in “Background” mode will be reported after the startup has completed, as described above.

Error Messages

As described above, error messages may be displayed in two instances: when an error occurs while you are using *Network Time* in the Control Panel or at any time an error occurs while *Network Time* is doing background processing. All of the error messages tell you what you need to do, if anything can be done, to correct the problem. Follow those instructions. Provided below is an extensive list of error messages; you will probably see only a few of them ever, but just in case, a simple explanation is provided where it might be necessary. There are some error messages which say “Please report this number to the author: XYZ.” If you get one of these, please do send a letter to the address provided at the end of this document, including the full text of the message and a brief description of what you were doing when it happened. The number is a Macintosh error code that *Network Time* did not expect to see; you will contribute greatly to the software effort by writing and explaining what happened. Now, the error messages:

Time setting messages

The network time could not be set.	This is the first line of every error message that occurs when setting the time. The text that follows gives some sort of explanation of the exact problem.
The timeserver did not respond in the specified timeout period.	These are the most common problems. Your timeout value or number of retries may be too low for the network, the timeserver may not be working, or there may be a network problem.
The timeserver is not responding to connection attempts.	
No gateway was available to the timeserver.	
There are too many network connections currently open.	Other MacTCP programs are using the network. <i>Network Time</i> will work when the other programs are done.
There are too many outstanding network messages to be sent.	
The network connection is not open.	Another MacTCP program interfered with <i>Network Time's</i> attempt to set the time. It would be nice if you would report these to the author, including what programs you use.
The network connection was terminated.	
The network connection is in use.	
The settings have not been properly initialized.	
The Macintosh® clock could not be written to properly.	This may be a problem with the clock on your Macintosh. If it happens repeatedly, you may wish to bring your Macintosh in for repairs.
The Macintosh® clock could not be read for verification.	
A request to set the time is currently in progress.	This occurs in the Control Panel when you click “Set Time” while background processing is already in progress. Wait a little bit and try again.
There is not enough memory to receive a response from the timeserver.	This indicates a pretty dire memory situation. You will probably never see this.

The network request sent to the timeserver was corrupt (too large).
The receive buffer for the timeserver response is in use.
There is no buffer to receive a response from the time server.
The request sent to the timeserver was corrupt (too many buffers or NIL).
The network request sent to the timeserver was corrupt (couldn't be fragmented).

The background process currently in memory is a different version from the Control Panel program. Click "Startup Only" and then "In Background" to refresh it.

Please report this error number to the author:

These messages mean something pretty horrible happened in memory. Maybe another program is being nasty to *Network Time*. You should report these messages to the author, including what other programs you use.

You had to do some pretty nifty things to get this. Follow the directions given in the message, or restart your Macintosh to be safe.

Please write to the address at the end of this document describing when the error occurred and including the error number.

Domain Name Server messages

The host name you entered for the timeserver was unknown by the Domain Name Server. The domain name for the timeserver does not exist.	The host name that you typed into the Control Panel for the timeserver is not in the Domain Name Server's database of host names. It should be changed in the Control Panel.
You entered an invalid IP address for the timeserver. The timeserver host name was not in valid IP address syntax.	In the Control Panel, this means that the host name or address you typed into the Control Panel was not in the correct format and should be changed. If you get these messages from the background, it probably means that the <i>Network Time</i> resource file is corrupt.
No Domain Name Server could be contacted to resolve the timeserver host name.	This error occurs in the Control Panel. It may mean that none of the Domain Name Servers are responding, there may be a network problem, or the Domain Name Server for the specific address you entered is not working.
The domain name query for the timeserver timed out. None of the name servers responded to lookup the timeserver address.	No Domain Name Server responded in a reasonable amount of time. Probably a problem with the network.
The domain name query for the timeserver could not complete.	You should never see this error. If you do, replace <i>Network Time</i> ; it may be corrupt.
No nameserver could be found for the timeserver host name.	The Domain Name Server for the specific address you entered is not working.
The domain name server returned an error looking up the timeserver address.	No problem with the Macintosh; something is wrong with the Domain Name Server. Could be anything.
There is not enough memory to lookup the timeserver address.	Self-explanatory. You shouldn't see this too often.
The domain name server could not be opened to lookup the timeserver address.	MacTCP may not be installed properly, there could be a disk problem, or a memory problem. If this happens repeatedly, re-install MacTCP.
An unknown error occurred while looking up the timeserver address. Report this error number to the author:	Please write to the address at the end of this document describing when the error occurred and including the error number.
Attempting to set the time using IP address ###.###.###.###.	When a Domain Name Server error occurs in the background, the message will be posted to the screen and <i>Network Time</i> will attempt to set the time using the last valid address that was saved in the Control Panel. That address is displayed in the message for your information.
Please change it or select Undo from the Edit menu. You must re-open the Control Panel to change it. Please re-enter it in dotted decimal notation (that is, W.X.Y.Z) or select Undo from the Edit menu.	These are instructions for how to proceed in the Control Panel.

Background process Control Panel messages

The Network Time background process could not be started. You will need to Restart your Macintosh to begin background processing.	Could be a memory problem or a disk error. You might try clicking on the "In background" button again, but most likely you will have to restart.
The Network Time background process could not be started. The resource file may be corrupt and should be replaced.	Self explanatory.
The Network Time background process could not be killed. It still has some tasks to complete. The process will remain operational.	Network Time is in the process of setting the time. It will remain in "Background" mode until you next restart your Macintosh.
The Network Time background process could not be killed. It did not appear to be running.	Please write to the author if this happens. No major problem, but it would be good to know what happened.
Please report this error number to the author:	Please write to the address at the end of this document describing when the error occurred and including the error number.

Credits

There are plenty of people who contributed to this piece of software, especially since this started out as "a simple program to figure out how to write a cdev/INIT/DRV.R." There are bound to be people missing from this list (if I only had all of the names from comp.sys.mac.programmer!). Apologies to anyone I have missed.

Programming help

Dave Allcott - Symantec Corporation
 Melanie Anderson - Beckman Institute at the University of Illinois at Urbana-Champaign
 Günther Blaschek - University of Linz
 Mike Crawford - Oddball Enterprises
 Steve Dorner - C.S.O. at the University of Illinois at Urbana-Champaign
 Mark Y. Geschelin - Symantec Corporation
 Christine Gressley - Southern Illinois University at Carbondale
 Jeremy Grodberg - Applied Biosystems
 Mark Johnson - Apple Computer
 Tom Johnson - U.C. Los Angeles
 Mike Lake - Beckman Institute at the University of Illinois at Urbana-Champaign
 Michael Libes - Carnegie-Mellon University
 Martin Minow - Digital Equipment Corporation
 Russell Mosemann - University of Nebraska, Lincoln
 Eran Reshef - Ben-Gurion University of the Negev
 Phil Shapiro - Symantec Corporation
 Andrew D. Sonenblick - Occidental College
 Maurice Volaski - SUNY at Buffalo
 and others who I may have missed from the comp.sys.mac.programmer Usenet group.

Beta Testers

Mike Bell - DuPont Electronic Imaging
 Dan Brabander - Brown University
 A. K. Burton - Massey University
 Randall Cotton - C.S.O. at the University of Illinois at Urbana-Champaign
 Rahul V. Garg - Wayne State University
 Chris 'Face' Janton - University of Arizona
 Jim Kateley - Apple Computer
 Dan Magorian - University of Maryland
 Chris McNeil - University of New Brunswick

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Network Time is an implementation Request For Comments 868, Time Protocol, by J. Postel, ISI, and K. Harrenstien, SRI, Network Working Group, May, 1983.

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Shareware Information

If you use *Network Time*, I do ask that you **send your shareware fee**. I am a poor starving graduate student and could use the money. As always, this is on the honor system, but worse things happen to people who don't pay their shareware fees than to people who don't send along chain letters. I am asking US\$5 for each copy. If you wish to use over 100 copies, I am asking US\$100 per 100 copies you use. Please send all comments, bug reports, and shareware fees to:

Pete Resnick
614 West Church Street
Champaign, IL 61820

If you have access to electronic mail, I am on the Internet. My e-mail address is:
resnick@cogsci.uiuc.edu
Please send bug reports and comments this route, if you can.

Thank you and **Enjoy *Network Time* !!**