Downloading and Using the NIST Time Program

Table of Contents:

Section 1: Purpose

- This document provides step-by-step instructions for installing the NISTIME program on computers running Microsoft Windows operating systems. The NISTIME program sets the time on your computer using the NIST Network Time Service, over the Internet.

- This document also provides background information and pointers that may be helpful for installing and running time synchronization software, in general, on a wider variety of computers.

Section 2: Background Information

- Most computers contain a time-of-day clock. This clock also keeps track of the day, month, and year. (A separate "clock" governs the speed of the computer, commonly described in MHz.)

- The time clock in the computer is used to keep track of when documents (files) are created and last changed, when electronic mail messages are sent and received, and when other time-sensitive events and transactions happen.

- In order to accurately compare files, messages, and other records residing on different computers, their time clocks must be set from a common standard. In the best case, their clocks should be set from an accurate national standard.

- It is particularly important that computers which are networked together use a common standard of time. Fortunately, the network also provides a means for setting all their clocks to the correct time, when all the computers are equipped with appropriate software.

- The National Institute of Standards and Technology (NIST) is a U. S. Government agency that maintains an official time scale for commerce in the United States. Certain regulations, for example those that affect the securities industry, require time records to be traceable to NIST. NIST maintains the time scale using atomic clocks, and they coordinated it with the time scales used by other nations and the U.S. military.

- NIST disseminates the time using several methods. For example, NIST broadcasts the time over short-wave and long-wave radio. Two services are offered of particular benefit to computer users. They allow you to set your computer's clock from the atomic clocks. For computers with modems attached, NIST provides a telephone dial-in services (ACTS). For computers on the Internet, NIST provides a Network Time Service (NTS).

- NIST offers to the public free software for using ACTS and NTS. ACTS does not require that you have an Internet Service Provider, but will require a long-distance telephone call through a modem to Boulder, Colorado. NTS does not require long-distance telephone calls, but does require that your computer be connected to the Internet.

- The primary purpose of this note is to give detailed instructions on how to download and install the software to use NTS (the Internet time service) on PCs that run a Microsoft Windows operating system. This is usually the best way for such computers to get the correct NIST time.

Section 3: Obtaining (Downloading) NISTIME

- There are several different versions of Microsoft Windows operating systems (e.g., Windows 95, Windows 98, Windows NT, etc.), and within each version there are multiple ways to accomplish any task. Therefore, it must be left to the reader to verify that the detailed instructions given here are applicable to a specific computer, and to make interpretations and adjustments as necessary.

- Create a new folder named "NIST Time" on the C: disk.

    The NISTIME program is a single file that can reside anywhere on your hard disk, that is, in any folder (directory). However, it is usually convenient to make a descriptive folder for it.

    To do this (2 steps):

    1) Run Windows Explorer
        – Click on the "Start" Button
        – Move the pointer to "Programs"
        – Move the pointer to "Windows Explorer"
        – Click again
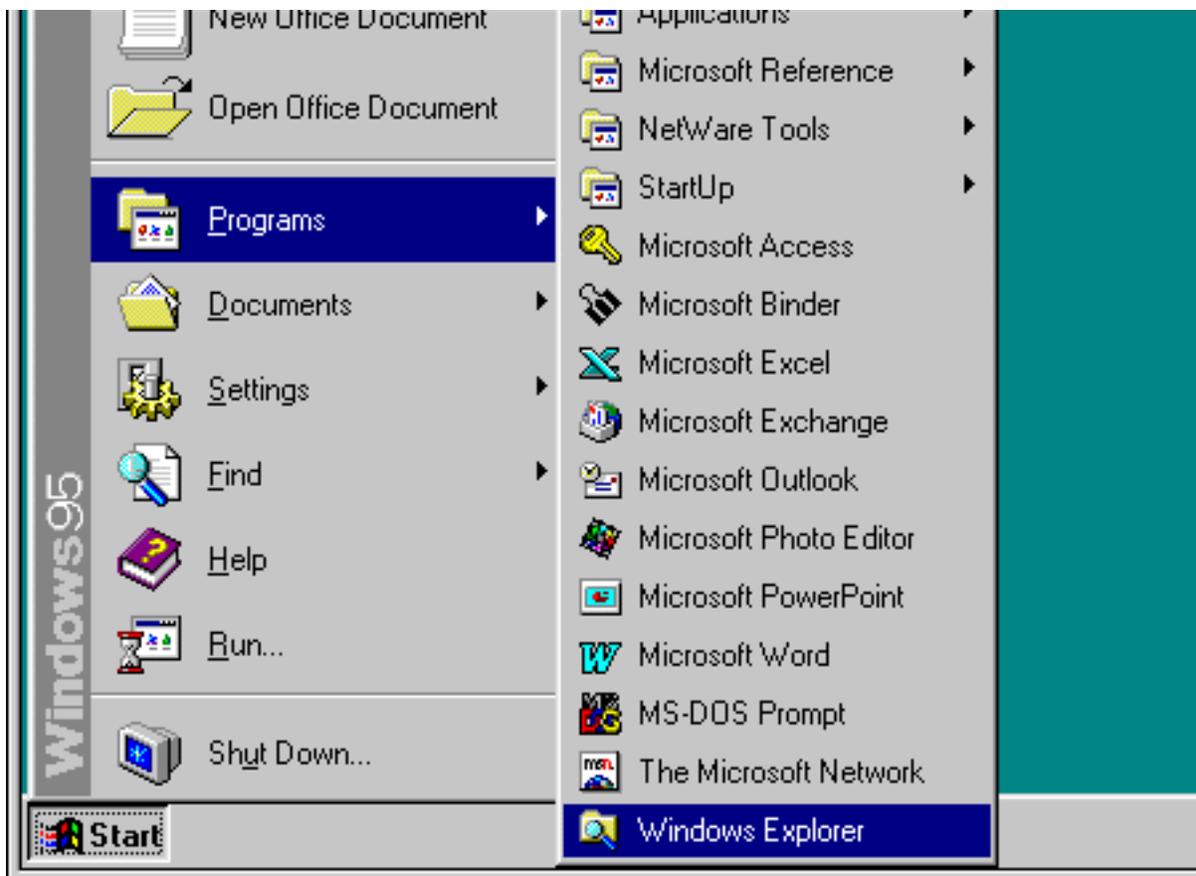
2) Make a New Folder on the C: disk named "NIST Time"
   –   On the left pane of the window, click on the "C:" drive to highlight it.
   –   Under the File menu, select New, then Folder
   –   *Immediately* afterwards, type the words "NIST Time" (without the quotation marks, followed by Return) to name the new folder thus created.
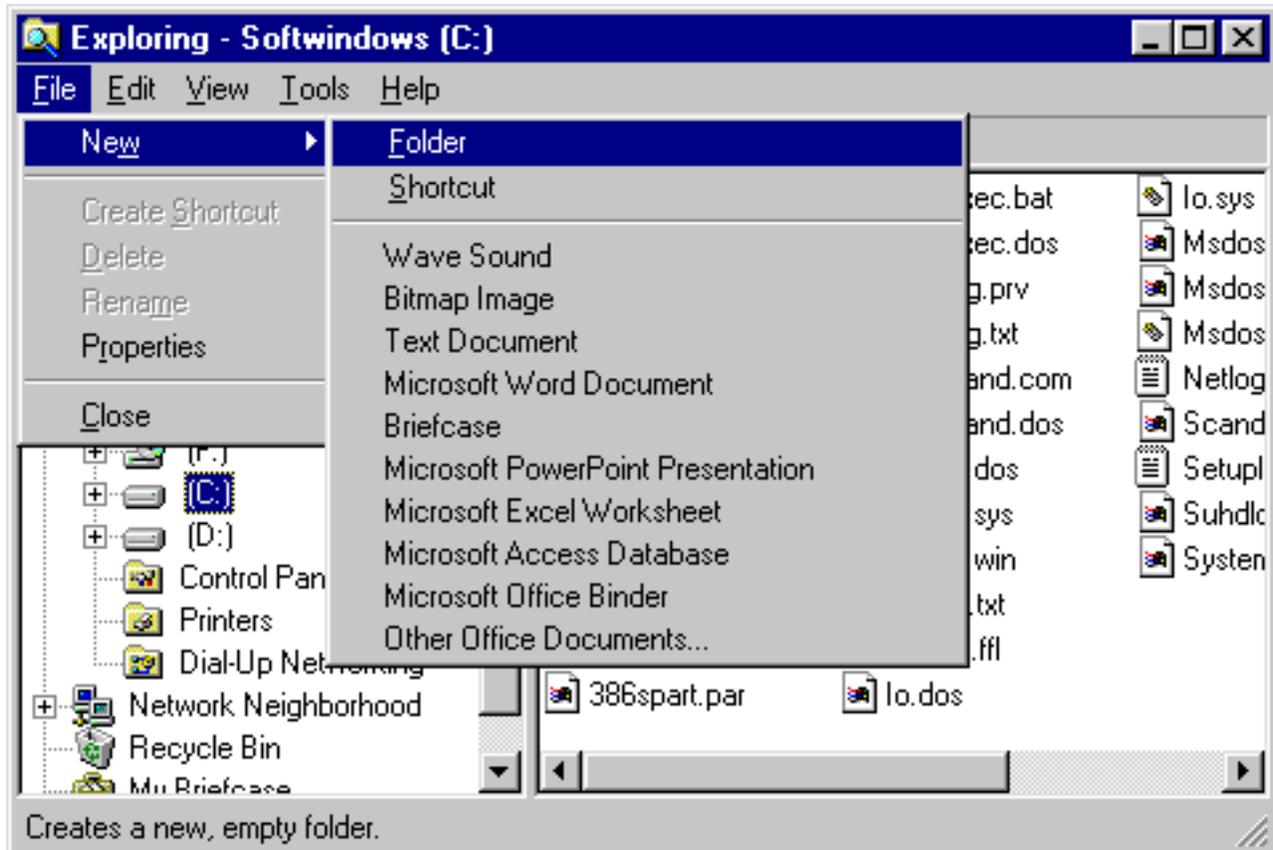
- Choose the version of NISTIME that you need. There are different versions of the NISTIME program for different versions of Microsoft Windows.

  A 16-bit version, named NISTIMEW, may be used with Windows 98, Windows 95, and Windows 3.1 (if a network interface is installed that is compatible with the Winsock standard, v1.1 or later).

  A 32-bit version, named NISTIME-32bit, may be used with Windows 2000 and Windows NT. (It may also be used with Windows 98 and Windows 95.)

  (Other versions of NISTIME are also available for MS/DOS and Unix. See the Other Computers section for additional information.)

  In this document, NISTIME refers to either NISTIMEW or NISTIME-32bit, as appropriate.

- You are free to make a copy of NISTIME from someone who already has it. You may also download it from a NIST server on the Internet.

  To download NISTIMEW (for Windows 98, 95, and 3.1),
      Click Here for ftp://time-b.nist.gov/pub/daytime/nistimew.exe

  To download NISTIME-32bit (for Windows 2000 and NT),
      Click Here for ftp://time-b.nist.gov/pub/daytime/nistime-32bit.exe

  Your web browser will ask you where you want to save the file. Navigate to the desired folder (C:\"NIST Time" in our example), and push "Save."

Save As...   ? ☒

Save in: 📁 NIST Time

File name: nistimew.exe   Save

Save as type: All Files (*.*)   Cancel
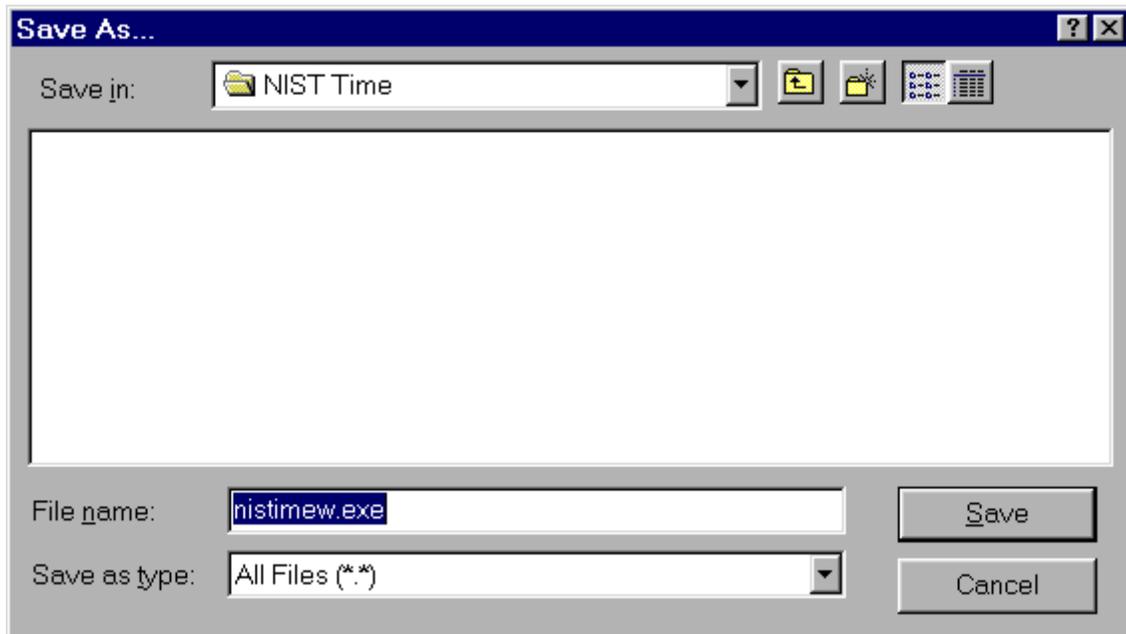
  If all goes well, you will see a download progress box…

Saving Location   ☐ ☐ ☒

Location: ftp://time-b.nist...time/nistimew.exe

Saving   C:\NIST Time\nistimew.exe

Status: Receiving FTP file

Time Left:

Cancel
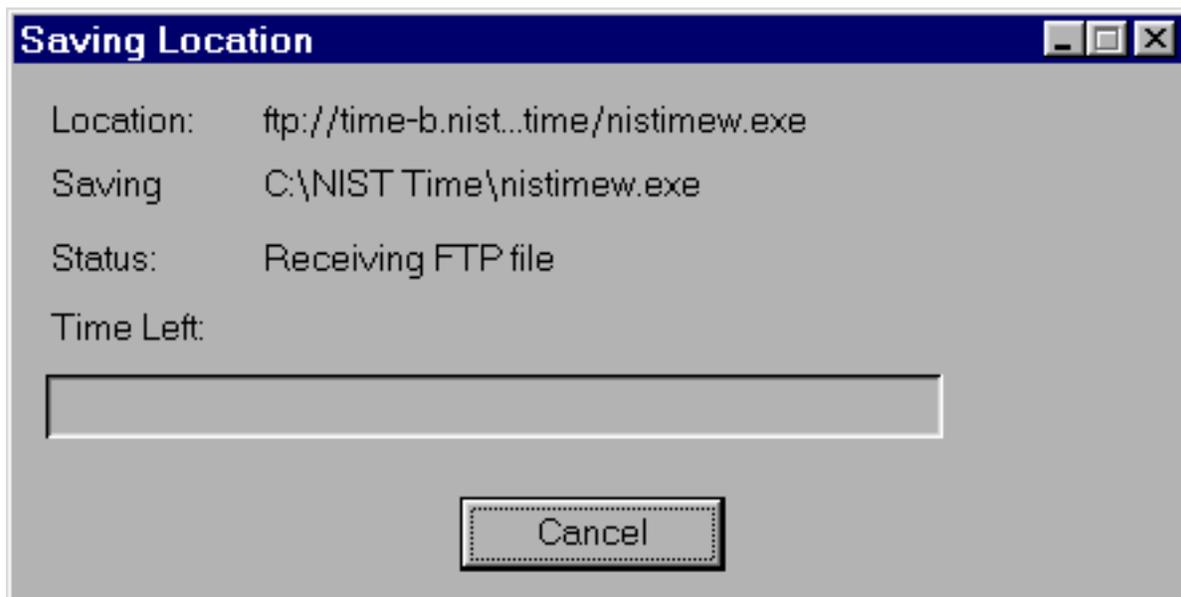
…and an icon such as this will appear in the NIST Time folder (presuming you have set the window to View by Large Icons):
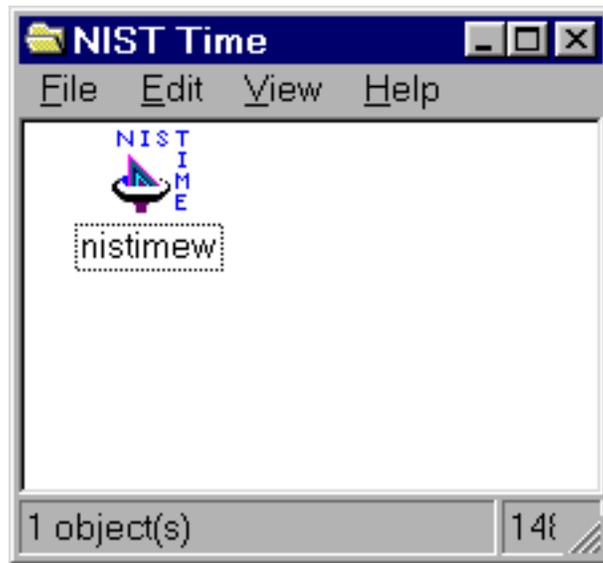
(You would need to open this window to see it. You can do this by opening the "My Computer" icon on the desktop (either by double-clicking on it or by single-clicking the right mouse button and then selecting the Open command), then by opening the (C:) disk icon in this window, and then by opening the NIST Time folder icon in this window.)

- After you have successfully obtaining the program, you should follow the instructions in the next section to learn how to configure and run it.

Section 4: Configuring and Installing NISTIME

- There are several different versions of Microsoft Windows operating systems (e.g., Windows 95, Windows 98, Windows NT, etc.), and within each version there are multiple ways to accomplish any task. Therefore, it must be left to the reader to verify that the detailed instructions given here are applicable to a specific computer, and to make interpretations and adjustments as necessary.

- Start the program NISTIMEW (or NISTIME-32bit).

  To do this, you can run Windows Explorer, as illustrated in the previous section.

  On the left pane, navigate to the C:\"NIST TIME" folder (or to wherever the NISTIME program is on your hard disk). Either double-click on the NISTIME icon in the right pane, or single-click on the NISTIME icon and then choose the Open command in the File menu.

  If all goes well, NISTIME will open up and display a window similar to this one:
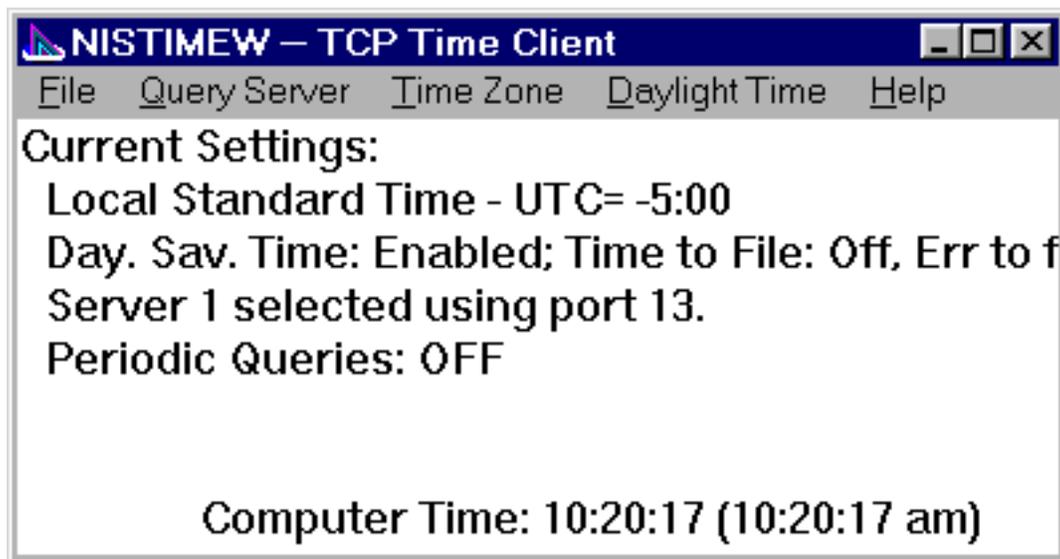
Side Note: If you previously used an older version of NISTIME, you may get an error message saying that you have a problem with your "configuration file." You may dismiss this message by pushing the button. If you follow the instructions in the next few steps, you will recreate a good configuration file. There is no cause for alarm.

- Ensure that NISTIME knows where the newest time servers are.

  Under the File menu, select the "Update server list" command.
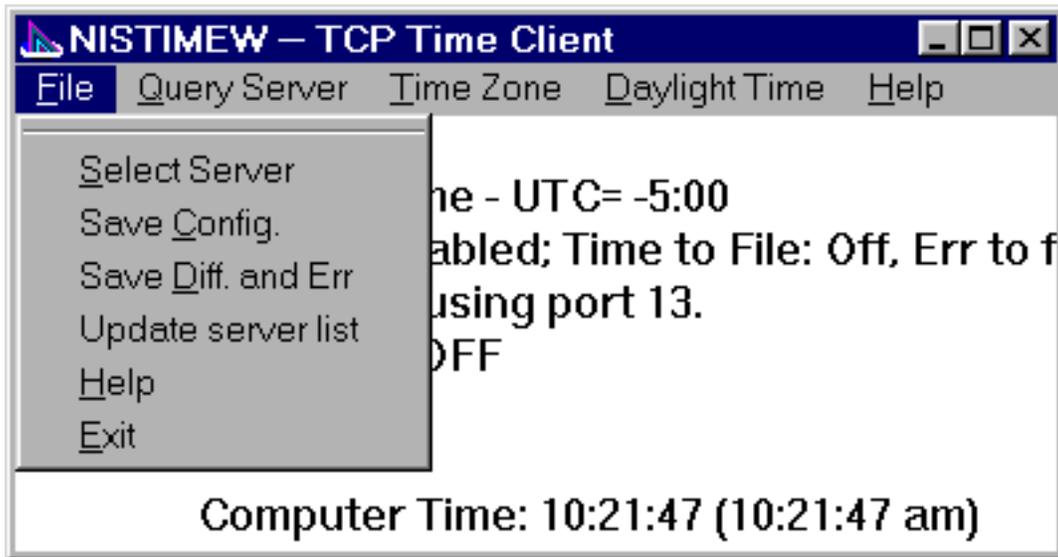
  If all goes well, NISTIME will tell you that it has written a file to your hard disk.
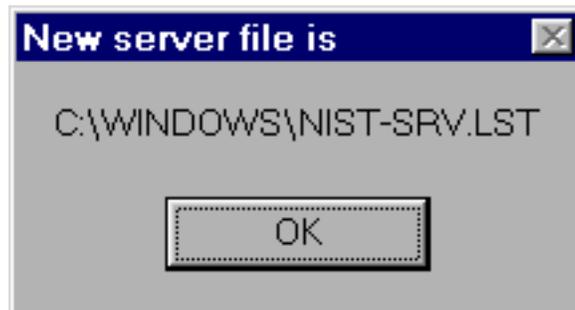
  Answer OK and proceed to the next step.

  Side Note: We suggest that you reconfigure NISTIME periodically, starting at this step. NISTIME remembers the locations of the time servers by their Internet IP addresses, not by their names. Even though the time servers would keep their names, they may change addresses from time to time. When this happens, you would have to Update the server list to find them again. Also, as the servers become more heavily used, new ones may be added. Update will offer you a selection of the least-used servers in order to give you the best performance.

- Select which time server you wish to use.

  Under the File menu, select the "Select Server" command. Push the round button next to the server nearest to you geographically,
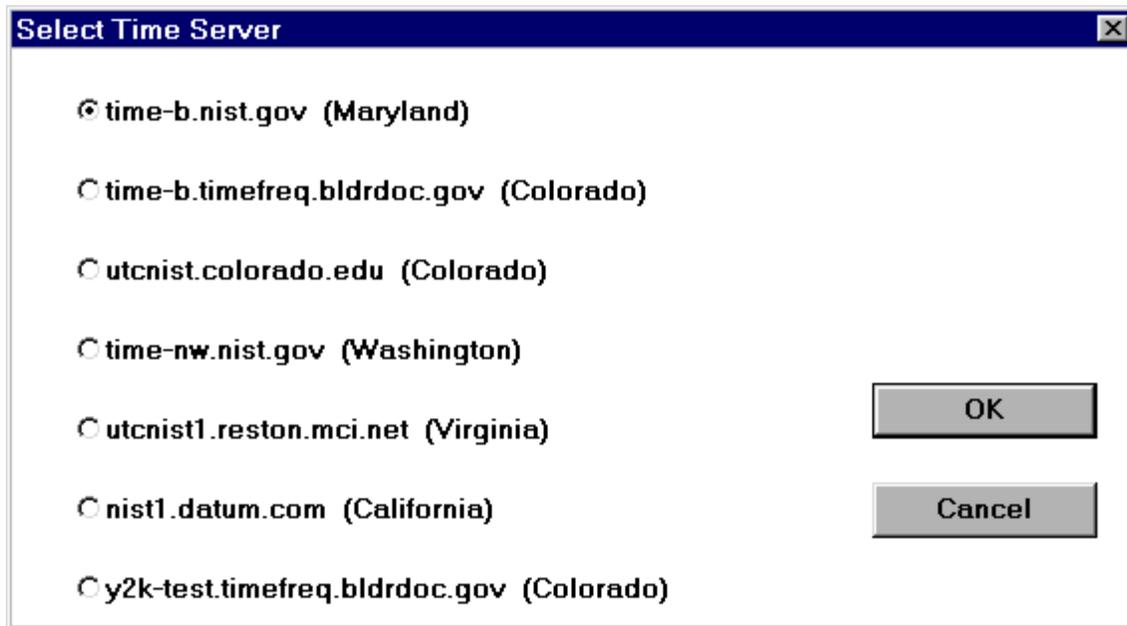
  The last option (Y2K-TEST) is special. Y2K-TEST sets the clock in your computer two years into the future. Its purpose is help you test whether your software will work properly in the year 2001. Unless you are conducting Y2K testing, you do not want to choose this option. (The "Update server list" command will likely replace this option with another one beginning in the year 2000.)

  Among the first six selections, there is no wrong answer. Any of the servers should work, but the closer you are to the selected server, the more accurate the time settings may be. The fluctuations in the time it takes for data to travel over the Internet will lead to slight errors (usually less than one second) in the time setting.

  Please note that TIME-NW is located in the Seattle, Washington area. It is a good choice for West Coast and Pacific Northwest states.

  After you have made your selection, push the OK button and continue with the next step.

- Tell NISTIME what Time Zone you are in.

  Under the Time Zone menu, select time zone where your computer is located.
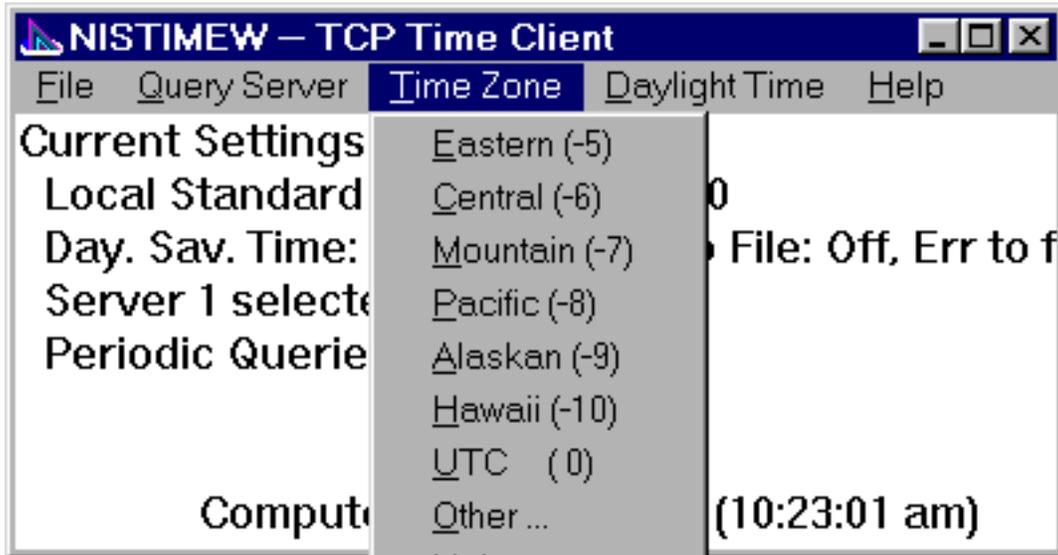
- Tell NISTIME whether your area of the country observes Daylight Savings Time in the summer.

  Under the Daylight Time menu, select Enable if you observe Daylight Time in the summer, or select Disable if you do not.
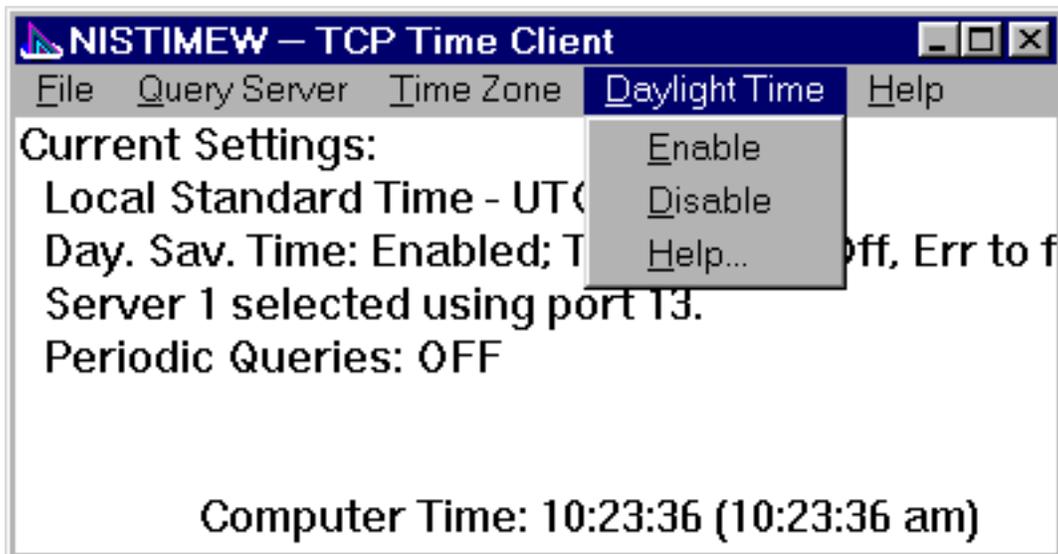
- Tell NISTIME how often to update your computer's clock.

  If you leave NISTIME running for an extended period of time, it can automatically resynchronize your computer to the atomic clock at an interval of your choice.

  Under the Query Server menu, select Periodically.
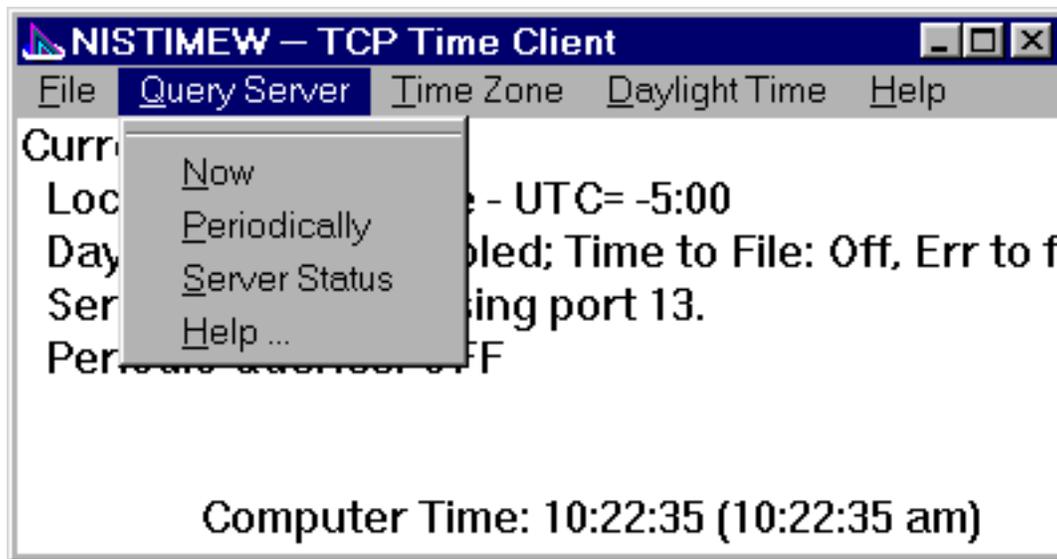
As a rule of thumb, it should not be necessary to reset the clock more than once or twice a day (i.e., every 12 to 24 hours). If you complete these instructions, the clock will also be reset whenever you restart your computer. That, plus the periodic checks every day or so, will keep most computer clocks correct to within a second or two.
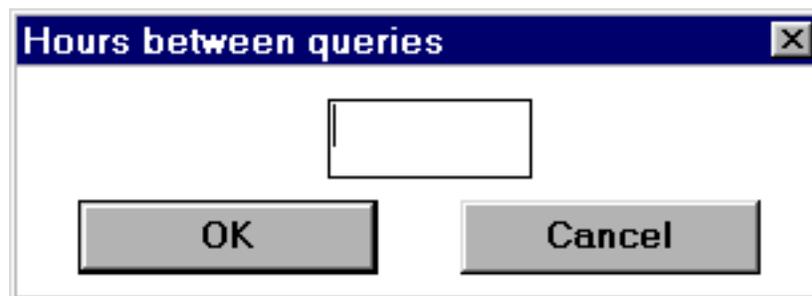
Enter the interval for the automatic queries (a number between 12 and 24 is recommended), and then press OK. (Please help save the cost of additional servers by not making queries too often.)

Side Note: NISTIME allows you to keep track of how fast your computer clock drifts away from the correct time in order for you to determine the optimal number of hours between queries. Under the File menu, the command "Save Diff. and Err" tells NISTIME to make a log file of the differences between the computer clock and the atomic clock each time the time server is queried. Although the details are beyond the scope of this primer, you may use this data to determine how long it takes for the computer clock to drift by, say, two seconds. If you must document traceability to NIST time, you MUST generate this log file and use it to determine how to keep your computer clock within specification (e.g., within two seconds of actual time).

- Save these configuration settings.

At this point, NISTIME's window should show all of the settings you just made. *Before you do anything else*, use the "Save Config." command under the File menu.
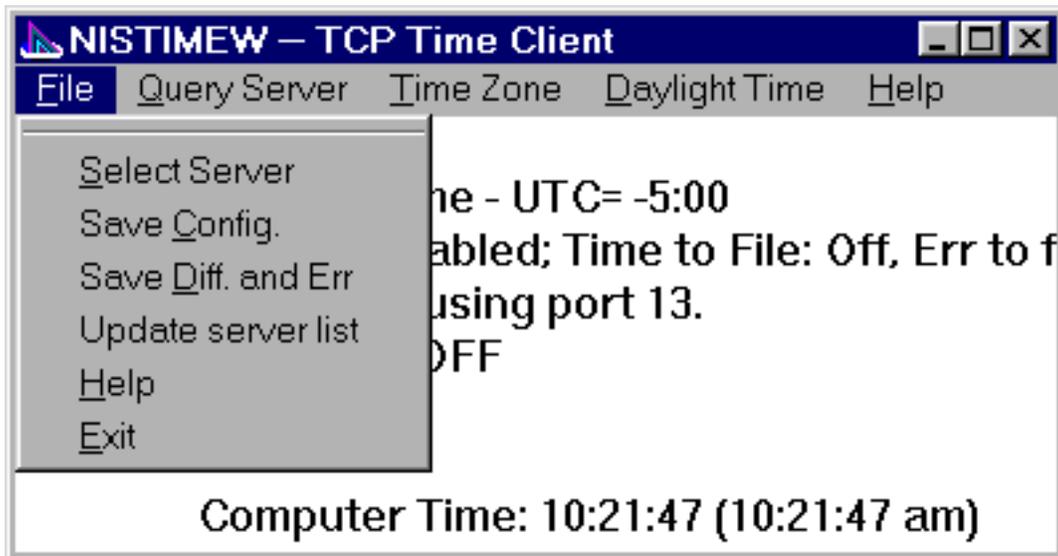
If all goes well, NISTIME will tell you that it has written a file to your hard disk.
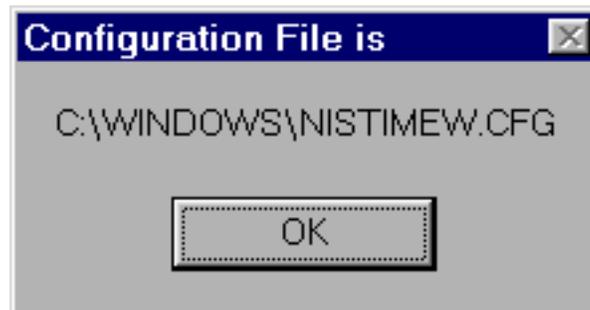
Answer OK and proceed to the next step.

- Run a test.

Under the Query Server menu, select "Now."
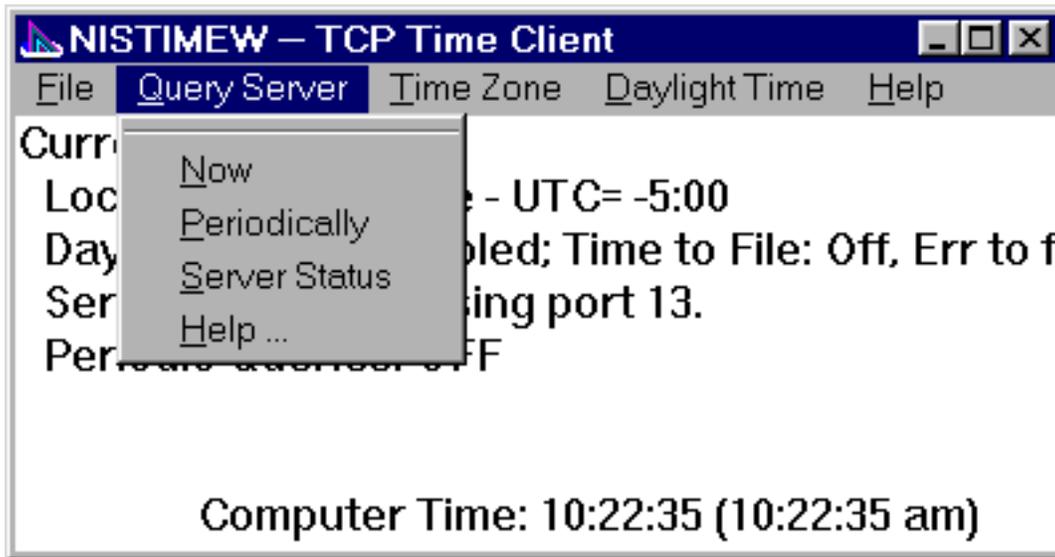
If all goes well, NISTIME will report the accuracy of your computer's clock.
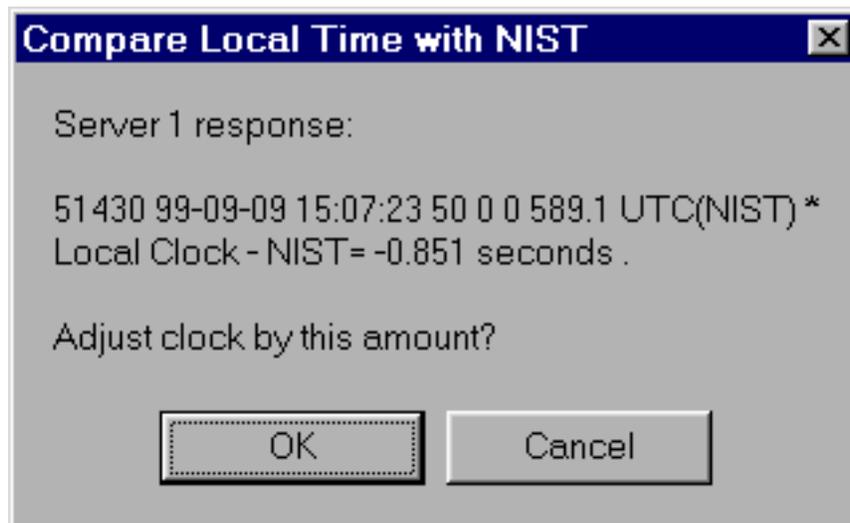
If the difference between your computer clock and NIST is more than half a second, NISTIME will give you the option to adjust the computer clock. Click OK to adjust the clock, or Cancel to leave it alone.

If you adjust the clock, you should get this response.

Answer OK and proceed to the next step.

Side Note: Every time you Query Server Now, you must reselect a server and reconfigure the
  periodic query interval. This is intended. It is also why you must save the configuration *before*
  executing this command.

- Ensure that NISTIME runs each time you start up your computer.

  This final step is a bit more difficult than the rest, but it is very important to do. Having the NISTIME program on your hard disk does you no good unless you run it regularly. This step configures Windows to automatically run NISTIME each time you restart your computer. This is highly recommended if your computer is permanently connected to the Internet, for example, through a local-area network in a work environment.

  Important Note: Since NISTIME requires an active Internet connection, this procedure may not be appropriate for you if you use a modem for temporary dial-up connections to an Internet Service Provider (ISP). Configuring NISTIME in this manner may cause your computer to initiate a telephone call to your ISP each time it starts up. If this is not your preference, modify the procedure as indicated.

  If the NISTIME program is running, select "Exit" under the File menu.

  As previously explained, run Windows Explorer. Navigate to the "NIST Time" folder on the C: drive in the left pane, select the NISTIME program in the right pane, and then select Create Shortcut from the File menu.
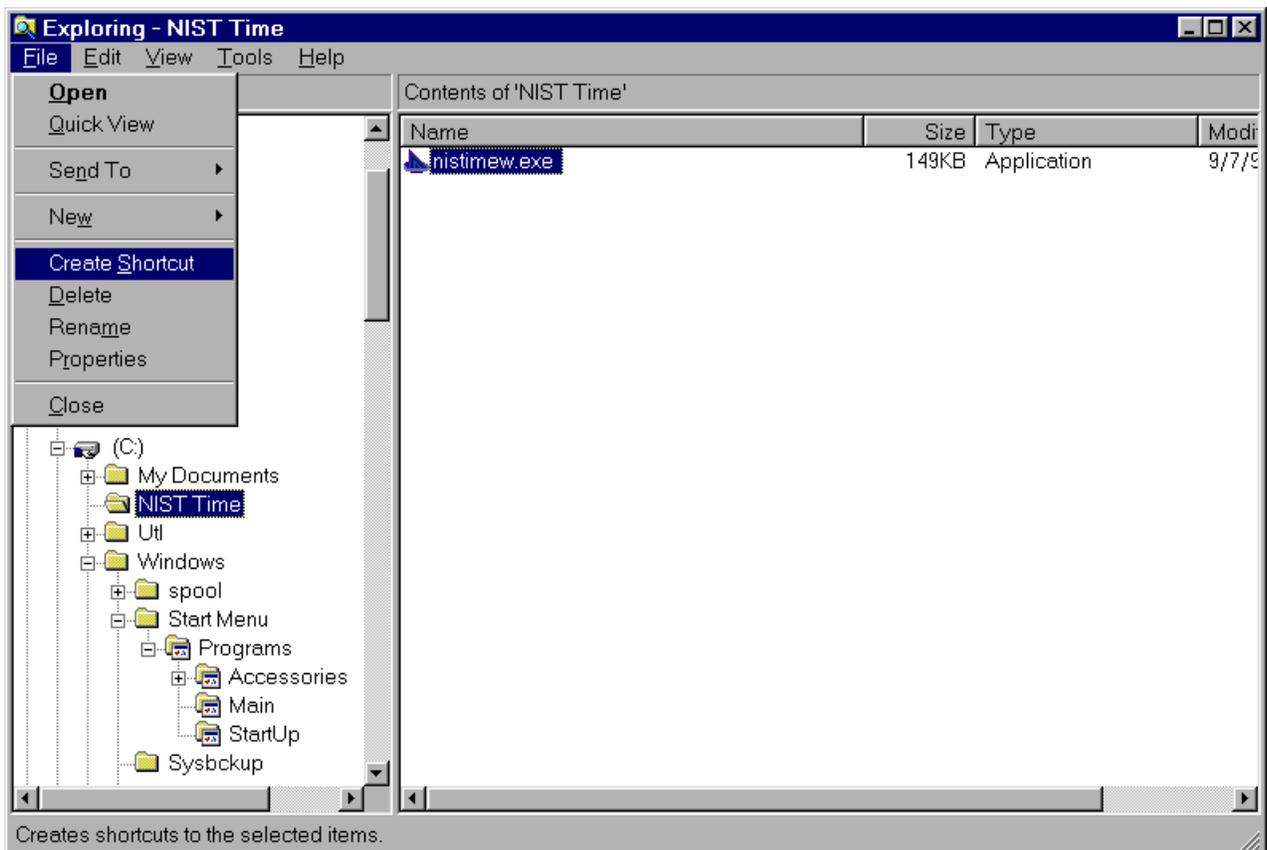
  Next, navigate in the left pane to find the StartUp folder. It is within the Programs folder, within the Start Menu folder, within the Windows folder, also on the C: drive.

Drag the Shortcut that you just created into the StartUp folder.

Note: If you do not want NISTIME to run each time you start your computer, you may drag the Shortcut into the Programs folder instead of the StartUp folder. This will let you easily run NISTIME from the Start Menu, but it will not run automatically.
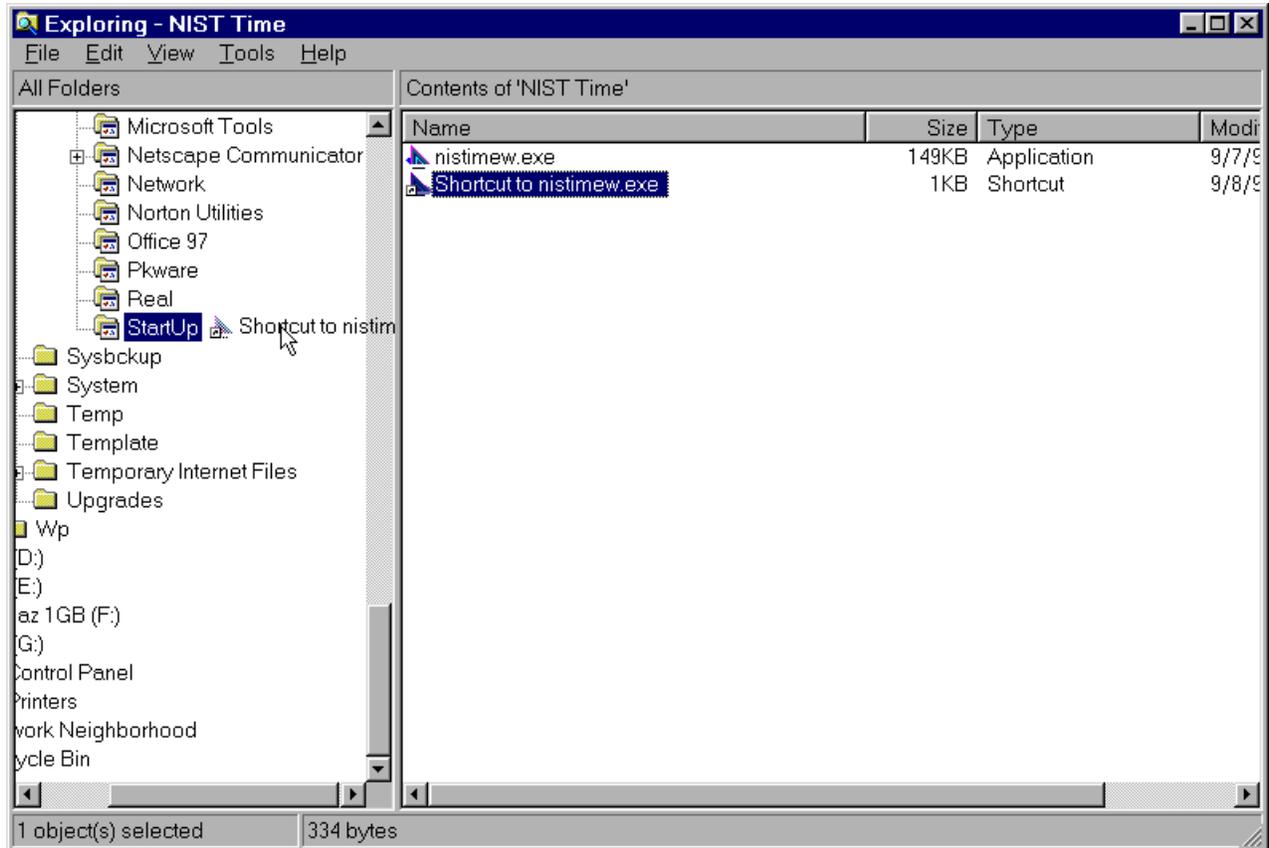
It is best to rename the Shortcut. Select the StartUp folder in the left pane, then the Shortcut you just moved in the right pane. Select the Rename command from the File menu, and then type "NIST Time" (without the quotation marks, followed by Return).
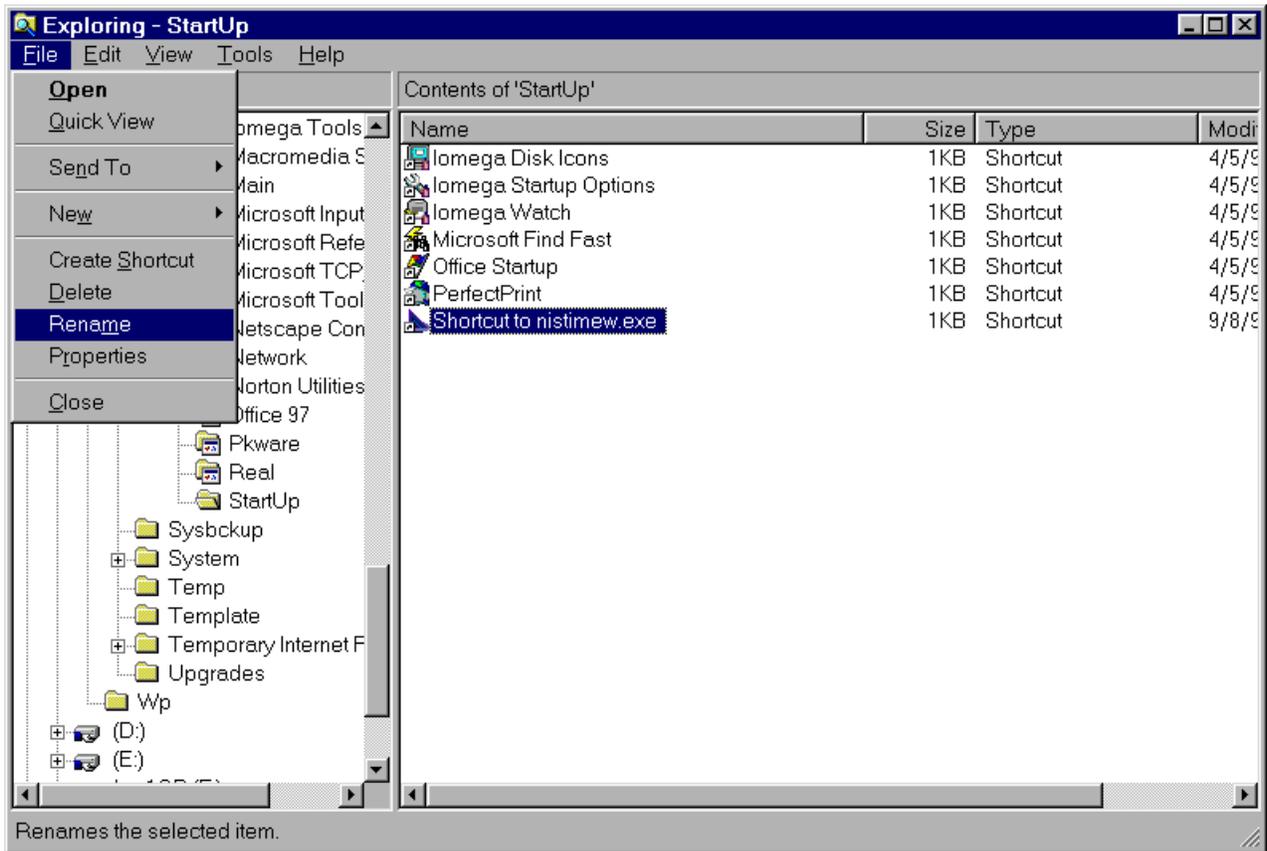
With the (renamed) Shortcut still selected in the right pane, select the Properties Command from the File Menu. Click on the Shortcut tab of the window that appears, and then use the pop-up menu to change from "Normal Window" to "Minimized."
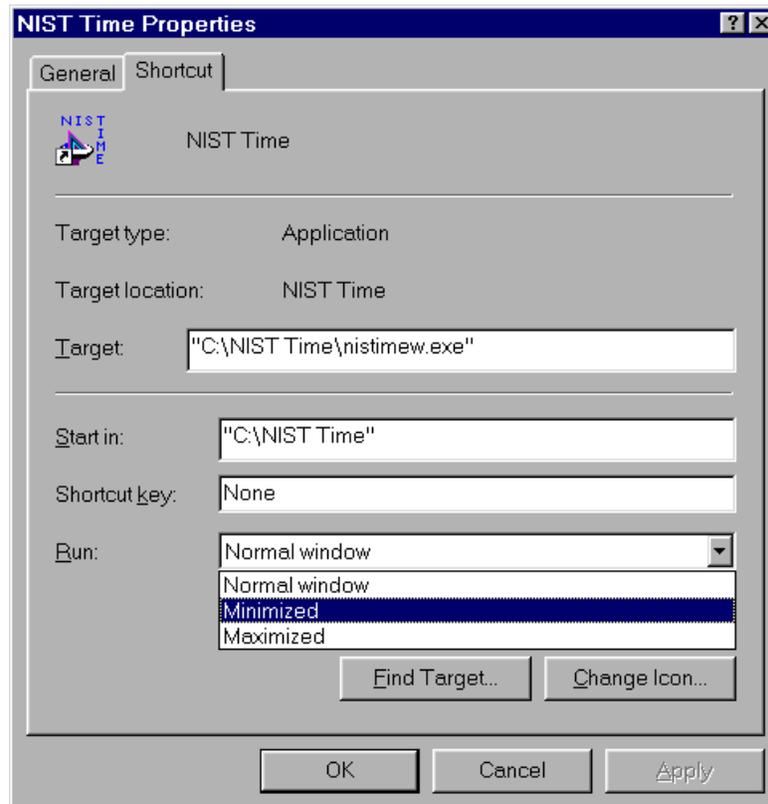
Click OK when done.

In the future, NISTIME will automatically run every time you restart your computer. If you Quit running NISTIME and want to start it up again, you can use the Start Menu as shown below:
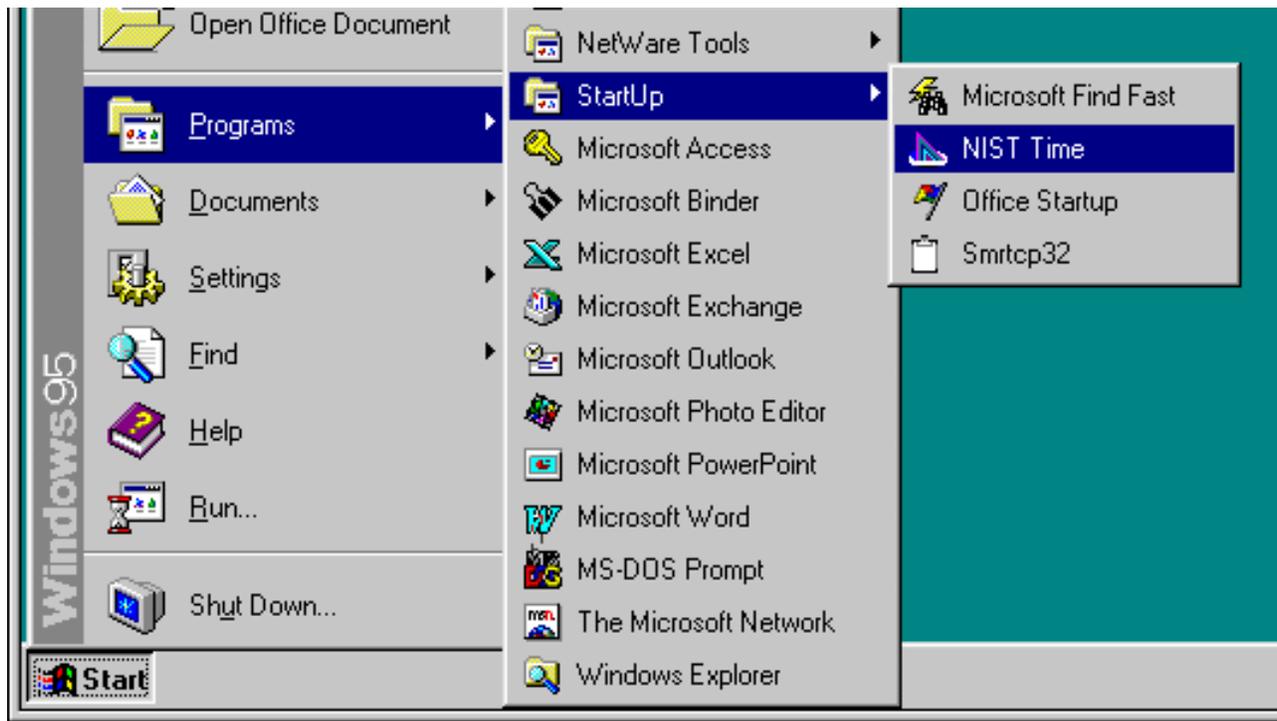
Note: If you did not want NISTIME to run each time you start your computer, you would find the NIST Time program directly in the Programs menu rather than the StartUp sub-menu.

This completes the installation of NISTIME. You may Close (in the File Menu) Windows Explorer, and you may restart your computer to check the installation.

Section 5: Other Computers / Other Software

- Versions of NISTIME are also available for computers running MS/DOS and Unix. The software and documentation is found at ftp://time.nist.gov/pub/daytime.

  These files should be consulted for further information:
  ftp://time.nist.gov/pub/daytime/read.me
  ftp://time.nist.gov/pub/daytime/README.DAYTIME
  ftp://time.nist.gov/pub/daytime/README.UPDATE
  ftp://time.nist.gov/pub/daytime/README.PROXY
  ftp://time.nist.gov/pub/daytime/README.Y2K
  ftp://time.nist.gov/pub/daytime/nistime.man
  ftp://time.nist.gov/pub/daytime/nistimen.man
  ftp://time.nist.gov/pub/daytime/nistimep.man
  ftp://time.nist.gov/pub/daytime/nistimew.doc
  ftp://time.nist.gov/pub/daytime/timeserver.info

- Many other software products are also available for utilizing the NIST time services (both ACTS and NTS). These include commercial, shareware, and freeware products. A list of them may be found at http://gpsmonitor.timefreq.bldrdoc.gov/pdf/timesoftware.pdf.

  Other lists include:
  http://www.microsoft.com/NTServer/nts/exec/vendors/freeshare/IClient.asp#time,
  http://www.microsoft.com/NTServer/nts/exec/vendors/freeshare/ISupport.asp#time,
  http://www.tucows.com/sync95.html (Windows 95/98),
  http://tucows.uzoom.net/syncnt.html (Windows NT),
  http://interpath.allmacintosh.com/timesyncmac.html (Macintosh), and
  http://tucows.rof.net/java/syncjava.html (Java).

  Most computers running Unix operating systems can use the programs xntpd and ntp to utilize ACTS and NTS. More information about these can be found at http://www.eecis.udel.edu/~ntp/.

- At http://www.bldrdoc.gov/timefreq/service/nts.htm you can find the complete list of NIST time servers. These servers respond to the daytime protocol (used by NISTIME), the time protocol, and the Network Time Protocol (NTP) [and its variant, Simple Network Time Protocol (SNTP)] which is the most widely used today.

- The University of Delaware hosts a World Wide Web site that provides additional information on NTP and a list of other NTP servers that are publicly available around the world. In many cases, internet service providers, universities, and other institutions also provide NTP servers for their own communities. NTP servers other than the NIST NTP servers (listed above) may or may not be of comparable accuracy, and may or may not satisfy traceability requirements. For more information, please see http://www.eecis.udel.edu/~ntp/.

- Both Mac OS (version 8.5 and later) and Windows 2000 are able to use NTS without additional software. Instructions for configuring Mac OS can be found at http://www.boulder.nist.gov/timefreq/pubs/macintosh.pdf. Instructions for configuring Windows 2000 will be made available after its final version is widely released.

Section 6: Troubleshooting Hints

- The overall accuracy of the daytime protocol (used by the NISTIME program) is affected by many things, including the distance between you and the server, the load on the network, and any firewalls or proxy servers that your site or Internet provider might have.

- If you experience difficulty your first course of action should be to try another server. However, if the problem is the same for all servers, the source of the problem might be a firewall or proxy server.

- NISTIME uses the "daytime" internet protocol which uses TCP/IP port 13. If there is a firewall or proxy server on your network, outgoing traffic on port 13 may be blocked. You will need to contact your network administrator to determine if this is what is happening on your network. There are two solutions to the problem, both of which need to be done by the network administrator:

    1) Reconfigure the firewall to allow outgoing traffic on TCP port 13.

    2) Set up a local network time server inside of the firewall.

- The accuracy of the daytime protocol may be significantly degraded as a result of asymmetric delays between the incoming and outgoing traffic in a proxy system.

- The time as set by this method may be significantly different than the time as recorded by the local telephone company ("At the tone, the time will be..."). Contrary to popular belief, telephone-company time services need not be accurate.