

# WINDOWS 2000/2003/XP NETWORK TIME SYNCHRONIZATION USING A SPECTRACOM NETCLOCK (MODELS 9283, 9289, 9183, 9189, 8189, AND TTS SERIES) OR ETHERNET TIME SERVER (MODELS 9288, 9188, AND 8188)

This Application Note provides detailed information on synchronizing Windows 2000 and Windows 2003 Stand-Alone PCs and Domain Controllers, as well as Windows 2000, XP, NT, 98, and 95 Workstations.

**NOTE:** The following Application Note provides information on using the built-in Windows Time Service (also known as W32Time) to assist you with synchronizing a Windows 2000/2003/XP network. For a complete tutorial on W32Time, refer to <http://download.microsoft.com/download/2/0/f/20f61625-7b2a-4531-b007-1c714f1e51b7/wintimeserv.doc>. This tutorial provides NECESSARY background information on the Windows Time Service, including why time synchronization is critical. It describes how the service works and provides installation and operating instructions. It also contains additional troubleshooting material.

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## SPECTRACOM SALES

If you don't currently have a Spectracom NetClock (with an Ethernet interface) or an Ethernet Time Server, please contact us for more information on our entire line of NTP Time Servers. Please visit our website, <http://www.spectracomcorp.com/>, for more information regarding our network time synchronization equipment and our frequency generation and distribution products. If you have any questions pertaining to our products, please contact our Sales Department at **US +1.585.321.5800**.



## SPECTRACOM TECHNICAL SUPPORT

For technical support on synchronizing computer networks or for assistance with Spectracom equipment, contact Technical Support via phone or email at the address contained herein. Technical Support is available Monday through Friday from 8:00 AM – 5:00 PM EST. Technical Support is also available on-line through our website. The "Support" drop-down menu contains useful information.



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## SECTION 1: CONNECTING THE SPECTRACOM NETCLOCK TO THE WINDOWS 2000/2003 NETWORK

The W32Time Service is pre-installed in Windows 2003 Server as well as Windows 2000 Server, Professional, and Advanced Server editions as a required service. It is also installed on Windows XP. The Spectracom NetClocks (Models 9283, 9289, 9183, 9189, 8189, and the TTSxxx series), as well as the Ethernet Time Servers (Models 9288, 9188, and 8188) can synchronize the Domain Controller (DC) and the Domain Controller synchronizes the Windows NT/XP/2000/2003 PCs on the network. Alternatively, every Windows NT/XP/2000/2003 PC on the network can be configured to synchronize directly to the Spectracom NTP Time Server. Each of these options is a valid configuration and the choice of which configuration to use is based on personal preference. There are advantages and disadvantages to each:

### **1) DOMAIN CONTROLLER SYNCHRONIZES TO THE TIME SERVER AND ALL OTHER SERVERS AND WORKSTATIONS ON THE NETWORK SYNCHRONIZE TO THE DOMAIN CONTROLLER**

In this configuration, the Domain Controller (DC) is steered to the NTP Time Server as the authoritative Time Server and all of the workstations on the network synchronize to the Domain Controller at their next scheduled interval. The advantage to this method is that if the NTP Time Server is disconnected from the network, the network will still have time continuity throughout. The disadvantage to this method is a Windows 2000 DC will be drifting between its scheduled sync intervals and a Windows 2003 DC will likely not be as accurate as the NTP Server. If the workstation synchronizes to the DC between synchronization intervals, the time of each workstation may not be as accurate as it would be if it they were synchronizing directly to the NTP Time Server as the time reference.

### **2) DOMAIN CONTROLLER AND ALL OTHER SERVERS AND WORKSTATIONS ON THE NETWORK SYNCHRONIZE DIRECTLY TO THE TIME SERVER**

In this configuration, the Domain Controller and all other Windows NT, XP, and 2000 clients are configured to use the Time Server as the authoritative Time Server (Windows 95 and 98 workstations will still have to be synchronized to the Domain Controller). The advantage to this method is that all PCs will be accurately synchronized to the correct time at every time synchronization interval (they won't be synchronizing to a reference that may be drifting between synchronization intervals). The disadvantage to this method is that if the NTP Time Server is disconnected from the network, the network will no longer have time continuity throughout. The times on the workstations will be drifting separately from each other.

**NOTE:** Windows NT workstations require a free software download from the Internet. Refer to Section 7. Windows 95 and 98 Workstations utilize the built-in command "Net Time" to synchronize to the DC. Refer to Section 8.

**W32Time does not accept RS-232 data from the Spectracom NetClock.** The only available inputs to W32Time are NTP (Network Time Protocol) and SNTP (Simple Network Time Protocol). The following explains how to obtain NTP/SNTP from the Spectracom NetClock:

- A) **Spectracom Model 9288/9188/8188 Ethernet Time Server** – The Models 9288, 9188, and 8188 connect to the Remote (RS-485) port of any Spectracom NetClock. The Models 9288, 9188, and 8188 synchronize to the Spectracom NetClock and provide an Ethernet connection to an available 10/100BaseT (Models 9288 and 9188) or 10BaseT (Model 8188) Hub or Switch on the Network using standard Network cable. The Models 9288, 9188, and 8188 provide earlier versions of the NetClocks (Such as the Models 8182 and 8183) with an IP address needed to synchronize Windows PCs. The Models 9288, 9188, and 8188 can also be used in conjunction with any of the Time Servers listed below to provide the ability to synchronize two or more separate/isolated networks without the need for multiple GPS antenna connections.

- B) **Spectracom Models 9283, 9289, 9183, 9189, 8189, and TTSxxx series NetClocks** – The Models 9283, 9289, 9183, 9189, 8189, and TTSxxx series are NetClocks that synchronize to the GPS satellite system. These NetClocks provide either an Ethernet connection on the rear panel that connects to an available Ethernet connection on the front panel, which in turn connects to an available 10/100BaseT Hub or Switch on the network (Models 9283, 9289, 9183, 9189, and TTSxxx series), or a 10BaseT Hub or Switch (Model 8189) using standard Network cable.

Contact our Sales Department at US +1.585.321.5800 for more information on any of the products listed herein.

## DIFFERENCES BETWEEN NTP AND SNTP

All Spectracom Time Servers are compatible with NTP (Network Time Protocol) and SNTP (Simple Network Time Protocol). The packets of information sent to and received from the Time Server do not differ between these two modes of operation (the packet structure doesn't vary). The formatting of the time stamp is defined in RFC 2030 (Request for Comments). Refer to <http://www.ietf.org/> for more information on the NTP RFC 2030.

The time client software running on the PC determines whether NTP or SNTP is being used. It makes no difference to the NTP Time Server which mode is running on the PC. The simplified difference between these two operating modes is in the algorithms used for time synchronization and the error checking that occurs. NTP calculates the drift of the PC and then adjusts the drift rate so that the time is always correct. SNTP jumps the time to the correct value at each specified interval. The NTP algorithm provides greater accuracy but is much more complicated to use. Windows 2003 and XP (Service Pack 2) use the NTP algorithms, whereas Windows 2000, XP (prior to Service Pack 2), and NT all use the SNTP algorithms.

For a more detailed description of these two modes of operation, refer to the FAQ section of our website (located under the Support page of our home page): [Time Synchronization & Frequency Control FAQs and Troubleshooting - Spectracom Corp.](#)

## DESIRE TO SYNCHRONIZE TWO OR MORE SEPARATE NETWORKS

Each Time Server can only synchronize one network and subnets of that network via a router. If two or more separate/isolated networks (such as a 10.10.200.xxx network and a 192.168.000.xxx network) must be synchronized, a router must be installed between the networks to make a subnet or a separate Time Server must be installed on each network. A router allows NTP traffic to pass but eliminates network isolation.

The reason a Time Server can't synchronize more than one network without a router is that the Time Server is assigned an IP address that has to match the IP scheme of the network on which it is located. This IP address will only allow communication with other network devices with similar IP addresses. If the same IP address is used on a different network, the network would not be able to communicate with it. They can't get the NTP response from it (for example, a Time Server IP address of 10.10.200.1 can't communicate with a 192.168.0.xxx network). A router enables two or more networks (subnets) to communicate with different IP address configurations. If a router is present on the network, the IP address of the immediate gateway for the router must be enabled in the Time Server.

If network isolation between two or more networks is required, a router between the networks is not a viable solution. The solution is to place either a Spectracom NetClock or a Spectracom Model 9288 Ethernet Time Server on each network. All of the Model 9288s can use the same NetClock's Remote RS-485 output port by daisy-chaining the inputs together. Each Model 9288 is then given a network IP address for its particular network to provide time synchronization to that network. This method of synchronization keeps all of the networks isolated from each other.

## REDUNDANT TIME SERVERS ON THE NETWORK

The W32Time program has been modified in Windows 2003 Server as well as newer versions of XP to allow for redundant Time Servers on the same network. This provides the capability to have more than one Time Server on the network to provide time synchronization even if something were to happen to the first Time Server.

The W32Time program in Windows 2000 and older versions of Windows XP **DOES NOT** support the use of multiple NTP Servers on the same network. If you desire more than one Time Server on the network, contact Spectracom Technical Support for information on other available time synchronization options. Spectracom recommends having more than one Time Server on the Network, especially for applications in which time synchronization is critical. We recommend multiple time servers to maintain network time synchronization in the event of failure of a single unit.

## TIME ADJUSTMENT

Windows 2003 and XP (Service Pack 2 and above only) have a default poll interval of once every 15 minutes. This poll interval is a sampling of the current time compared to the reference time. As it is just a sample of the time and not a direct adjustment to the time, changing the poll interval doesn't affect the accuracy of the time. W32Time in Windows 2003 is running as an NTP client, so the time is only corrected when W32Time is initially started. Once the service has been started, the time no longer jumps to the correct time. The PC's drift rate is slewed so that the time does not have to be corrected again.

Windows 2000 and XP (pre Service Pack 2 only) have a default time synchronization interval of every 45 minutes until the time successfully synchronizes, then every 8 hours thereafter. According to Microsoft, the interval can be changed by editing the system registry. Change the "Period" value using either Freq or SpecialSkew string values (e.g., WeeklySpecialSkew, WeeklySpecialSkew, TriDailySpecialSkew, BidailySpecialSkew). Spectracom has never been able to configure successfully the system registry value to synchronize more often than the default of once every 8 hours. Refer to Section 2, step 3, for the location of this value in system registry. For additional information on editing the system registry, refer to:

<http://www.microsoft.com/WINDOWS2000/techinfo/howitworks/security/wintimeserv.asp>

The target time is the time to which W32Time determines the local time of the PC should be set. If the target time is ahead of the PC's time, the time is immediately changed to the target time. If the target time is behind the PC's time, the local clock is slewed over the next 20 minutes, unless it is more than 2 minutes out of synchronization (in which case the time is immediately set).

## SECTION 2: SYNCHRONIZING A WINDOWS 2003 DOMAIN CONTROLLER OR WINDOWS XP CLIENTS (SERVICE PACK 2 AND ABOVE ONLY) TO THE NTP TIME SERVER

The following section describes the procedure to synchronize a Windows 2003 Server and XP clients to the IP address of the Time Server.

**NOTE:** If a Windows 2003 Server or XP workstation is a member server (not the Domain Controller) AND you want it to synchronize to the Domain Controller, by default it should synchronize to the domain once the PC is started (or when W32Time is stopped and re-started). It should poll the Time Server at its scheduled poll interval without further intervention. If it is a member server and you wish to synchronize it to the Time Server directly, synchronize it as you would a Domain Controller by following the sections that follow.

### STEP 1: STOP THE W32TIME SERVICE

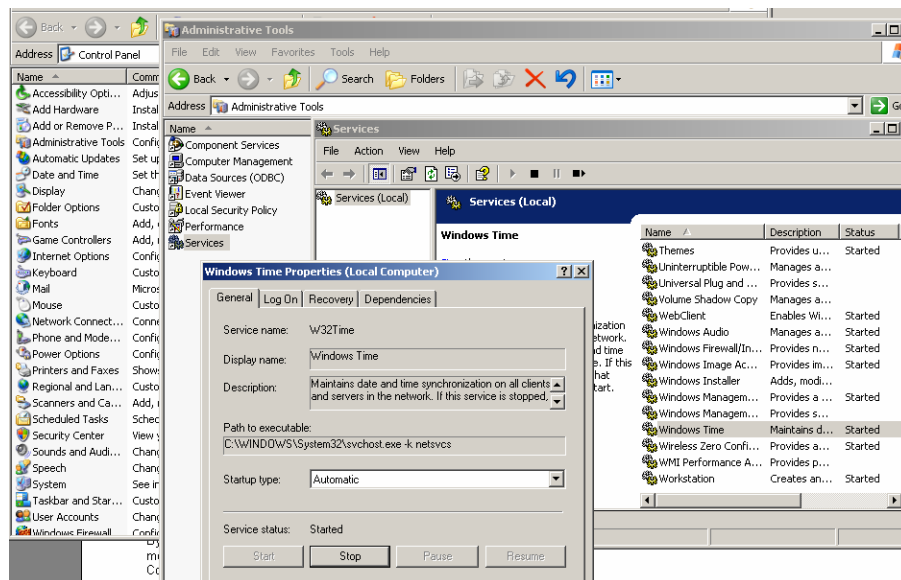
The W32Time service starts automatically at system startup (as long as the service is set to “automatic” in Services). The Windows Time Service should be stopped prior to defining the Authoritative Time Server. Failure to do so could cause an error in the Event Log.

The W32Time service can be stopped two different ways. It can be controlled from “Services” or from the command prompt. Refer to sections “A” and “B” herein for each of these two methods.

#### A. Controlling the W32Time Service from Services

Go to the Start button to Settings, to Control panel, to Administrative Tools, to a shortcut that goes to Services. Select W32Time Service. Press the Stop button. Refer to Figure 1.

**NOTE:** Make sure the time service is set to “automatic.” Having “manual” selected requires the service to be manually started every time the PC is rebooted.



**Figure 1: Controlling W32Time from Services**

## B. Controlling the W32Time Service from the Command Prompt

At the command prompt (for command prompt: Start, to Run, type cmd, press enter), type:

**Net stop w32time** <enter>

**NOTE:** We recommend setting back the time of the Windows 2003 Server or XP workstation by several minutes or hours after the service is stopped, if this is feasible. This will help verify the PC is successfully synchronizing to the Time Server (shortly after the service is restarted, the time should jump to the correct time).

### STEP 2: DEFINE THE AUTHORITATIVE TIME SERVER AND CONFIGURE THE WINDOWS 2003 DOMAIN CONTROLLER OR XP WORKSTATION FOR “CLIENT MODE” OF NTP

The Windows 2003 and XP (Service Pack 2 and above) versions of the W32Time service require an NTP Authoritative Time Server be defined and enabled as the source of external time synchronization. The Spectracom NetClock or Ethernet Time Server installed on the network is the “Authoritative Time Server” for the network.

By default, Windows Server 2003 domain controllers and XP clients (Service Pack 2 and above) are configured as time servers to the rest of the network and use the symmetric active mode to send synchronization requests to the workstations. NTP Time Servers respond only to requests that use the client mode of NTP. Configure the Windows Time Service to use client mode when it synchronizes with the Time Server. To do this, follow these steps:

1. Click Start, click Run, type cmd, and then press ENTER to go to the command prompt.
2. At the command prompt, type the following command and press ENTER:

**w32tm /config /manualpeerlist:xxx.xxx.xxx.xxx,0x8 /syncfromflags:MANUAL**

(Where: xxx.xxx.xxx.xxx is the IP address of the Time Server.)

**NOTE:** All three of the forward slashes (“/”) have a space in front of them.

### STEP 3: RE-START THE W32TIME TIME SERVICE

After the Authoritative Time Server is defined and enabled, the service must be re-started for the changes to be updated. Also, a one-time command must be entered at the command prompt (W32tm /resync). This command only needs to be entered the first time the service is started. Starting and stopping the Time Service can be done subsequently in Services alone.

To re-start the W32Time service, perform the following:

2. If the PC’s time can be changed manually without affecting anything running on the PC, manually change the time to an incorrect value using the Date/Time properties screen in the lower right-hand corner of the screen. Set the time of the PC back by at least 3 minutes but less than 12 hours. Performing this step helps prove that the service is working correctly.
3. Re-start the Windows Time Service. At the command prompt, type:

**Net start w32time** <enter>  
**w32tm /resync** <enter>

If the time was not accurate before re-starting the service, once the Time Service is restarted (within a couple of minutes), the Windows 2003 Server should jump close to the correct time. Windows 2000 and Windows XP workstations under the Domain Controller will synchronize at their next periodic interval(s). Refer to Section 4 for instructions to verify Windows 2000/2003 workstations synchronize to the DC or refer to section 5 for instructions to verify Windows XP workstations synchronize to the DC. If the time doesn't jump to the correct time within a few minutes, refer to Section 9 to troubleshoot the problem.

**NOTE:** If you have difficulty with either initial time synchronization or time synchronization after initial synchronization has occurred, refer to Section 9. Condition 1 in this section describes an issue that may require a Microsoft hotfix be obtained for Windows 2003 and XP SP2.

## SECTION 3: SYNCHRONIZING A WINDOWS 2000 DOMAIN CONTROLLER TO THE NTP TIME SERVER

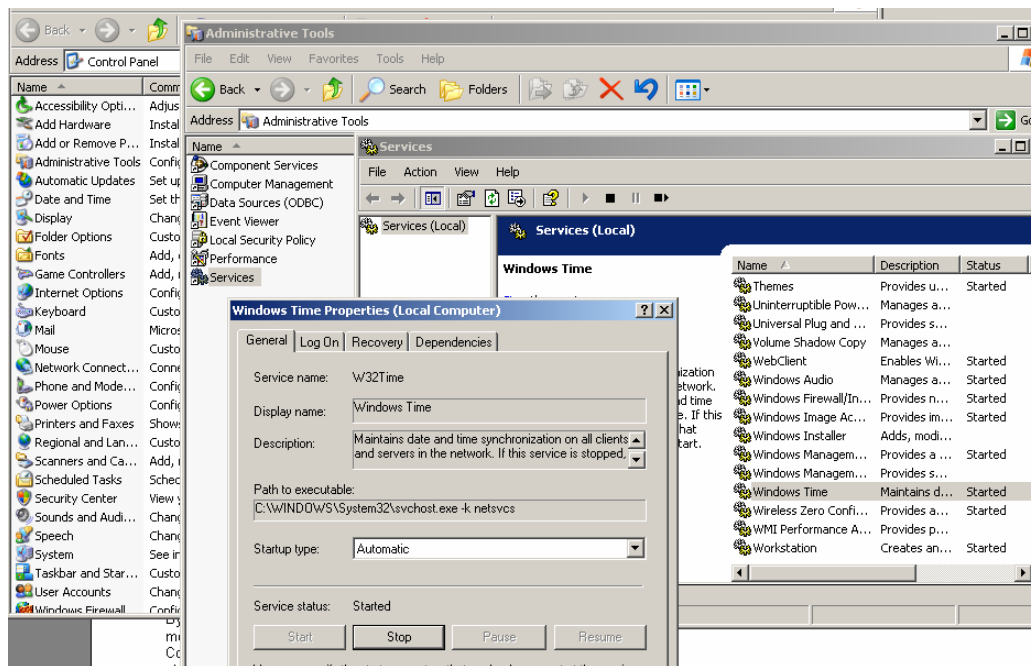
### 1) STOP THE W32TIME SERVICE

W32Time service starts automatically at system startup. The Time Service should be stopped prior to defining the Authoritative Time Server. Failure to do so could cause an error in the Event Log.

The W32Time service can be stopped two different ways. It can be controlled from “Services” or from the command prompt.

#### A. Controlling the W32Time Service from Services

Go to the Start button to Settings, to Control panel, to Administrative Tools, to a shortcut that goes to Services. Select W32Time Service. Press the Stop button. Refer to Figure 2.



**Figure 2: Controlling W32Time from Services**

#### B. Controlling the W32Time Service from the Command Prompt

At the command prompt (for command prompt: Start, to Run, type cmd, press enter), type:  
**Net stop w32time**

### 2) DEFINE THE AUTHORITATIVE TIME SERVER

W32Time service requires an NTP Authoritative Time Server be defined as the source of external time synchronization. The Model 9283, 9289, 9288, 9183, 9189, 9188, 8189, 8188, or TTSxxx series installed on the network is the Authoritative Time Server for the network.

To configure the Time Server as the Authoritative Time Server, at the command prompt of the Primary Windows 2000 server, type:

**Net time /setsntp:xxx.xxx.xxx.xxx** (where x is the IP address assigned to the Ethernet Time Server)

### 3) START THE W32TIME SERVICE

After the Authoritative Time Server is defined, the service must be re-started for the changes to be updated. The W32Time service can be started two different ways. It can be controlled from “Services” or from the command prompt.

1. Manually change the time to an incorrect value using the Date/Time properties screen in the lower right-hand corner of the screen. Set the time of the PC back by a minimum of three minutes.
2. Re-start the Windows Time Service.
  - A. **Controlling the W32Time Service from “Services”**  
Go to the Start button to Settings, to Control panel, to Administrative Tools, to a shortcut that goes to Services. Select W32Time Service. Verify “Automatic” is selected. Press the Start button. Refer to Figure 2 above for navigating to Services.
  - B. **Controlling the W32Time Service from the command prompt**  
At the command prompt, type:  
**Net start w32time**

Once the Time Service is restarted, the Windows 2000 Server should jump to the correct time. Windows 2000, Windows XP workstations, and Windows 2003 member servers under the Domain Controller will synchronize at their next periodic interval. Refer to Section 4 for instructions to verify Windows 2000/2003 workstations synchronize to the DC, or to Section 5 for instructions to verify Windows XP workstations synchronize to the DC. If the time doesn't jump, refer to Section 9.

## SECTION 4: SYNCHRONIZING WINDOWS 2000 WORKSTATIONS TO EITHER THE DOMAIN CONTROLLER OR TO THE NTP TIME SERVER

As described in section 1, Windows 2000 workstations (and other Windows 2000 member Servers) can synchronize to either a Windows 2000/2003 Domain Controller (Default mode) or to the Time Server. If the Windows 2000 workstation is part of the Domain, the PC automatically time synchronizes to the Domain Controller at the next scheduled update (every 8 hours). The 2000 workstation can be re-directed to the Time Server if desired. To redirect the 2000 workstation to synchronize to the Time Server, follow the same procedure as for synchronizing a Windows 2000 Domain Controller to the Time Server. Refer to the steps listed in Section 3. Otherwise, to synchronize the PC to the Domain Controller, no action is required to have this occur.

**NOTE:** Windows 2000 workstations and Servers can't synchronize to a Windows NT Domain Controller that is running the Timeserv program. The Windows NT domain controller must have W32Time installed for clients to synchronize it. Timeserv does not support LocalNTP capability, which is required for workstations to synchronize to the DC.

### **A) To Synchronize a Windows 2000 Workstation to the NTP Time Server**

This process is the same as syncing a Windows 2000 Domain Controller to the NTP Time Server. Refer to [SECTION 3: SYNCHRONIZING A WINDOWS 2000 DOMAIN CONTROLLER TO THE NTP TIME SERVER](#).

**By default, Windows 2000 updates the system clock once every eight hours.** Windows 2000 workstations automatically time synchronize to the Domain Controller at their next scheduled update. You can verify the time synchronize process by following the procedure below.

### **B) To Verify a Windows 2000 Workstation is Synchronizing to Either the Domain Controller or Time Server**

1. Stop the W32Time Service.  
Type **net stop w32time** <enter> (Stops the time service)
2. Manually change the time using the Date/Time properties screen in the lower right-hand corner of the screen (set the time of the PC back by at a minimum of 3 minutes).
3. Re-start the W32Time Service.  
Type **net start w32time** <enter> (Starts the time service)
- 4) Observe the time updates to the correct time.

**NOTE:** You can also stop and start Windows Time Service in Services (Located in Control Panel/Administrative Tools).

If the time is not corrected after restarting the time service, refer to Section 9.

## SECTION 5: SYNCHRONIZING WINDOWS XP WORKSTATIONS (PRE-SERVICE PACK 2 ONLY) TO EITHER THE DOMAIN CONTROLLER OR TO THE NTP TIME SERVER

As described in Section 1, Windows XP workstations can synchronize to either a Windows 2000/2003 Domain Controller (Default mode) or to the Time Server. If the Windows XP workstation is part of the Domain, the PC automatically time synchronizes to the Domain Controller at the next scheduled update. The XP workstation can be re-directed to the Time Server if desired.

**NOTE:** Windows XP workstations can't synchronize to a Windows NT Domain Controller that is running the Timeserv program. The Windows NT domain controller must have W32Time installed for clients to synchronize it. Timeserv does not support LocalNTP capability, which is required for workstations to synchronize to the domain controller.

**The default update interval for XP synchronization is once every 7 days.** Refer to Section 6 for instructions on changing the interval, if desired.

### **A) To Redirect Synchronization of a Windows XP Workstation (Prior to Service Pack 2) to the NTP Time Server (Instead of the Default, Syncing to the Domain Controller):**

This process is the same as syncing a Windows 2000 DC to the Time Server. Refer to Section 3.

### **B) To Verify a Windows XP Workstation (Pre Service Pack 2 only) is Synchronizing to the Domain Controller**

1. Stop the W32Time Service  
Type **net stop w32time <enter>** (Stops the time service)
4. Manually change the time to an incorrect value using the Date/Time properties screen in the lower right-hand corner of the screen (Set the time of the PC back by a minimum of 3 minutes).
5. Re-start the W32Time Service.  
Type **net start w32time <enter>** (Starts the time service)
- 5) Observe the time updates to the correct time.

**NOTE:** You can also stop and start Windows Time Service in Services (located in Control Panel/Administrative Tools).

If the time is not corrected after restarting the time service, refer to Section 9.

**NOTE:** Microsoft has changed the W32Time program in newer versions of Windows XP Service Pack 2. The W32Time program is now the same version of W32Time as the one installed in Windows 2003. Because of this, if you are synchronizing a Windows XP workstation directly to the NTP Time Server instead of to the Domain Controller, and the time of the PC does not correct after re-starting the Windows Time Service, follow the procedures to synchronize a Windows 2003 Server or XP workstation (service pack 2 or higher) in Section 2.

## SECTION 6: CHANGING THE TIME UPDATE INTERVAL OF WINDOWS XP (PRE-SERVICE PACK 2)

**NOTE:** This section only applies to Windows XP PCs that are NOT running Service Pack 2 or higher. Because Windows XP SP2 (or higher) is running NTP instead of SNTP, it does not sync on a scheduled interval. NTP just samples the time at certain intervals. This sample interval should not be changed by the user as it does not increase the accuracy.

**By default, Windows XP (Pre-Service Pack 2) updates the system clock once every seven days.** Because the computer could drift several seconds or even minutes in this time frame, you may wish to change the update interval in the system registry.

### To Change the Update Interval

- 1) Start the Registry Editor.
- 2) Go to **HKEY\_LOCAL\_MACHINE \ SYSTEM \ CurrentControlSet \ Services \ W32Time \ TimeProviders \ NTPClient \**
- 3) Double-click the **SpecialPollInterval** value and change the Base of the **Value data to Decimal**.
- 4) Now change the **Value data** to the time interval you desire, noting that the time is given in seconds. The default value is 604800 seconds, which equals seven days. A typical interval is once-per-hour, or 3600 seconds.
- 5) Close the Registry Editor.

**NOTE:** Because newer versions of XP are using the Windows 2003 version of W32Time, XP computers will synchronize using NTP instead of SNTP. The Update interval will no longer be used. Now, there will be a "sample poll interval" instead of a "synchronization interval." NTP corrects the PC time once, then it controls the PC's drift rate from that point forward so the time should always be close to the correct time.

## SECTION 7: SYNCHRONIZING WINDOWS NT WORKSTATIONS/SERVERS TO A WINDOWS 2000/2003 SERVER OR TO THE NTP TIME SERVER

**NOTE:** Windows NT workstations will not automatically synchronize to a Windows 2000/2003 server or to the Time Server. W32Time Service has to be installed and configured to allow a Windows NT workstation to synchronize to a Windows 2000/2003 Server or to the Time Server. Spectracom cannot supply you with the W32Time program. For Windows NT workstations/Servers, the program can be downloaded, at no cost, from Microsoft. The address is <ftp://ftp.microsoft.com/reskit/y2kfix/>

### 7.1 INSTALL THE W32TIME PROGRAM ON WINDOWS NT WORKSTATIONS/SERVERS

To install W32Time Synchronizing Service:

- 1) Verify there are no other Time Service programs running in the background (such as Net Time, which is a built-in time program that would be loaded in a start-up batch file, the Timeserv program found in "Services," or Clock Update Service, which would be found in "Services"). The Timeserv program and any other time services must be disabled or removed prior to running W32Time. These programs conflict with W32Time and may cause erroneous time jumps.
- 2) Copy the **W32time.exe** files to the %SYSTEMROOT%\SYSTEM32 folder.
- 3) Copy the **W32time.ini** file to the %SYSTEMROOT% folder.
- 4) Edit the W32Time.ini file to configure W32Time. The W32Time.ini file is edited to allow operation from a synchronized Primary Server or to the Time Server. Refer to Section 7.2 to edit w32Time.ini to synchronize Windows NT workstations to the primary server, or to Section 7.3 to edit W32Time.ini. to synchronize windows NT workstations to the Time Server. After the W32Time.ini has been edited from one of these two sections, exit and save the file.
- 5) Reboot the machine. The service should start automatically. You can also manually start and stop the service. Refer to the notes that follow in this section.
- 6) The clock display in the bottom right hand corner should update within a couple of minutes of starting the service.
- 7) To verify everything is correct, stop the service (refer to the notes that follow this section). Manually change the system clock to an incorrect time and go back in and restart the service. The time should jump to the correct time. Go into the Event Viewer. Look at the Application Log and click on the W32Time event. Click on view, then Refresh.

You should get a line stating that time offset is either < or > .5 seconds, indicating the service is operating correctly. The < or > sign depends on the amount of change that occurred from the original setting.

## NOTES

To manually start and stop, go to the Start button to Settings, to Control panel, to Services. Select W32Time Service. Verify Automatic is selected. Press either NetStart or NetStop.

The W32Time program only logs the first time synchronization. All future time synchronizations are not logged. Only errors obtained while running W32Time are logged after the initial time synchronize. Refer to the Event Viewer for help in troubleshooting problems with W32Time service. If the time is not corrected after restarting the time service, refer to Section 9.

### 7.2 EDIT W32TIME.INI TO SYNCHRONIZE WINDOWS NT WORKSTATIONS TO THE DOMAIN CONTROLLER

This section describes how to edit W32Time.ini for enabling Windows NT workstations to synchronize to the Domain Controller. The REM statements and unnecessary changes have been deleted from these sections to simplify this document.

- 1) "Type=" is used to specify as what type of service the computer is working. When the workstation is designated as "Primary", the time is derived from the Primary Server.  
;Type=NTP  
Type=PRIMARY **(Remove the semicolon from this statement.)**  
;Type=SECONDARY
- 2) "Period =" is used to determine the delay between each Time Set. Initially, an attempt to synchronize will occur once every 45 minutes until initial synchronize. Thereafter, two to three times a day by default. The period can be set to a specific number of times per day. For example, "Period=1" for every 24 hours, "Period=2" for every 12 hours, or "Period=3" for every 8 hours.  
Period=3 **(No semicolon. Enter the number of times daily that you desire the service to update the system clock if you have a preference. Using a high value can cause errors. We do not recommend using more than 3 times per day.)**
- 3) "TAsync=" means to use the TimeAdjustment API to disable CMOS synchronization.  
Tasync=no **(No semicolon)**
- 4) "NTPServer=" is the name(s) or numeric address(es) of the Model 8188 or 8189. Since Workstations get their time from the Primary Server, this statement is not used.  
;NTPServer= **(Has semicolon)**
- 5) "Log=yes" places an entry in the Application event log for only the first successful synchronization with an NTP Server. Failures are always logged no matter to what the "Log=" statement is set.  
;Log=no  
Log=yes **(No semicolon)**
- 6) "LocalNTP" indicates whether to start an NTP server on the local machine.  
LocalNTP=no **(No semicolon)**
- 7) "PrimarySource" lists all known Master Time Servers in your network. Because the Workstation synchronizes only to the Primary Server, this line is not used.  
;PrimarySource=\\MYNTPSERVER **(Has semicolon)**

- 8) "RandomPrimary=" is used to randomly choose NTP servers. Because the Workstation synchronizes only to the Primary Server, this line is not used.  
;RandomPrimary=yes **(Has semicolon)**
- 9) "Timesource=" is used to listen for broadcasts by Secondary clients. Because the workstation does not need to listen for broadcasts, set the "timesource=" to "no".  
timesource=no **(Remove the semicolon from this statement.)**  
;timesource=yes
- 10) "SecondaryDomain" tells the workstations which domain to broadcast their time requests to. If this entry is empty or missing, these clients will query the current domain for a Primary Time Server. If the PDC is in another domain, specify it here.  
SecondaryDomain= **(No semicolon. Leave blank if workstation is in same domain as the PDC.)**

### 7.3 EDIT W32TIME.INI TO SYNCHRONIZE WINDOWS NT WORKSTATIONS/SERVES TO THE TIME SERVER

This section describes how to edit W32Time.ini for enabling Windows NT workstations to synchronize to the Time Server. The REM statements and unnecessary changes have been deleted from these sections to simplify this document.

- 1) "Type=" is used to specify as what type of service the computer is working. When the workstation is designated as "NTP", the time is derived from an NTP Server.  
Type=NTP **(Remove the semicolon from this statement.)**  
;Type=PRIMARY  
;Type=SECONDARY
- 2) "Period = " is used to determine the delay between each Time Set. Initially, an attempt to synchronize will occur once every 45 minutes until initial synchronization. Thereafter, it occurs two to three times a day by default. The period can be set to a specific number of times per day. For example, "Period="1" for every 24 hours, "Period="2" for every 12 hours, or "Period="3" for every 8 hours.  
Period=3 **(No semicolon. Enter the number of times daily that you desire the service to update the system clock if you have a preference. Using a high value can cause errors. We do not recommend using more than 3 times per day.)**
- 3) "TAsync=" means to use the TimeAdjustment API to disable CMOS synchronization.  
Tasync=no **(No semicolon)**
- 4) "NTPServer=" is the name or numeric address of the Time Server. Enter the IP address of the Time Server.  
NTPServer= **(Remove the semicolon from this statement. Type in the IP address of the Time Server. For example: NTPServer=xxx.xxx.xxx.xxx where x is the IP address of the Time Server).**
- 5) "Log=yes" places an entry in the Application event log for only the first successful synchronization with an NTP Server. Failures are always logged no matter to what the "Log= " statement is set.  
;Log=no  
Log=yes **(No semicolon)**
- 6) "LocalNTP" indicates whether to start an NTP server on the local machine.  
LocalNTP=no **(No semicolon)**

- 7) "PrimarySource" is supposed to allow the use of multiple Time Servers, but this does not function correctly.  
;PrimarySource=\\MYNTPSERVER **(Has semicolon)**
- 8) "RandomPrimary=" is supposed to allow a list of NTP servers to be selected at random, but does not function correctly  
;RandomPrimary=yes
- 9) Timesource= is used to listen for broadcasts by Secondary clients. Because the workstation does not need to listen for broadcasts, set the "timesource=" to "no".  
timesource=no **(Remove the semicolon from this statement.)**  
;timesource=yes
- 10) SecondaryDomain tells the workstations to which domain to broadcast their time requests. If this entry is empty or missing, these clients will query the current domain for a Primary Time Server. If the PDC is in another domain, specify it here.  
SecondaryDomain= **(No semicolon. Leave blank if workstation is in same domain as the PDC.)**

## SECTION 8: SYNCHRONIZING WINDOWS 95 OR 98 WORKSTATIONS TO A WINDOWS 2000/2003 SERVER

This section describes how to use the Net Time Command to allow Windows 95 and 98 Workstations to synchronize to the Primary Server. The system time will update each time the workstation is re-booted. If you desire to synchronize the Windows 95 and 98 workstations more often than on re-boots, refer to Task Scheduler herein.

- 1) Add the following to the Logon Batch File: **NET TIME \\NTSERVER /S /Y** (where NT SERVER is the name of the Domain Controller). The file is located at **c:\WinNT\System32\Rep\Import\Scripts\Win95.bat**.
- 2) Change the program to automatically close after time synchronization by going into Windows Explorer and selecting Windows. Right click on Net.exe. Click properties. Go to program. Check "close on exit".

### TO VERIFY A WINDOWS 95/98 WORKSTATION IS SYNCHRONIZING TO THE DOMAIN CONTROLLER

- 1) Manually change the time to an incorrect value using the Date/Time properties screen in the lower right-hand corner of the screen.
- 2) At the command prompt window, type **NET TIME \\(Name of server) /SET /S /Y <enter>**.
- 3) Observe the time updates to the correct time.

### TASK SCHEDULER

If you are using Internet Explorer 4.0 or above, there is a program called Task Scheduler that can update the workstation at a user specified schedule so you do not have to reboot or type net time.

- 1) Download the Task Scheduler add-on or obtain it from CD-ROM.
- 2) Double click on Task Scheduler.
- 3) Click on Browse. Double click on Windows.
- 4) Double click on Net.exe.
- 5) Click when you want to schedule a TIME update. Click Next.
- 6) Open advanced properties. Click Finish.
- 7) Change the Run line to C:\\Windows \\Net.exe time \\ (name of your primary server) /s /y.

The time of the workstation will now update the time from the primary server (which is synchronized to the NetClock) based on the schedule you chose. You may see a small flashing indicator on the screen each time the update occurs.

## SECTION 9: TROUBLESHOOTING

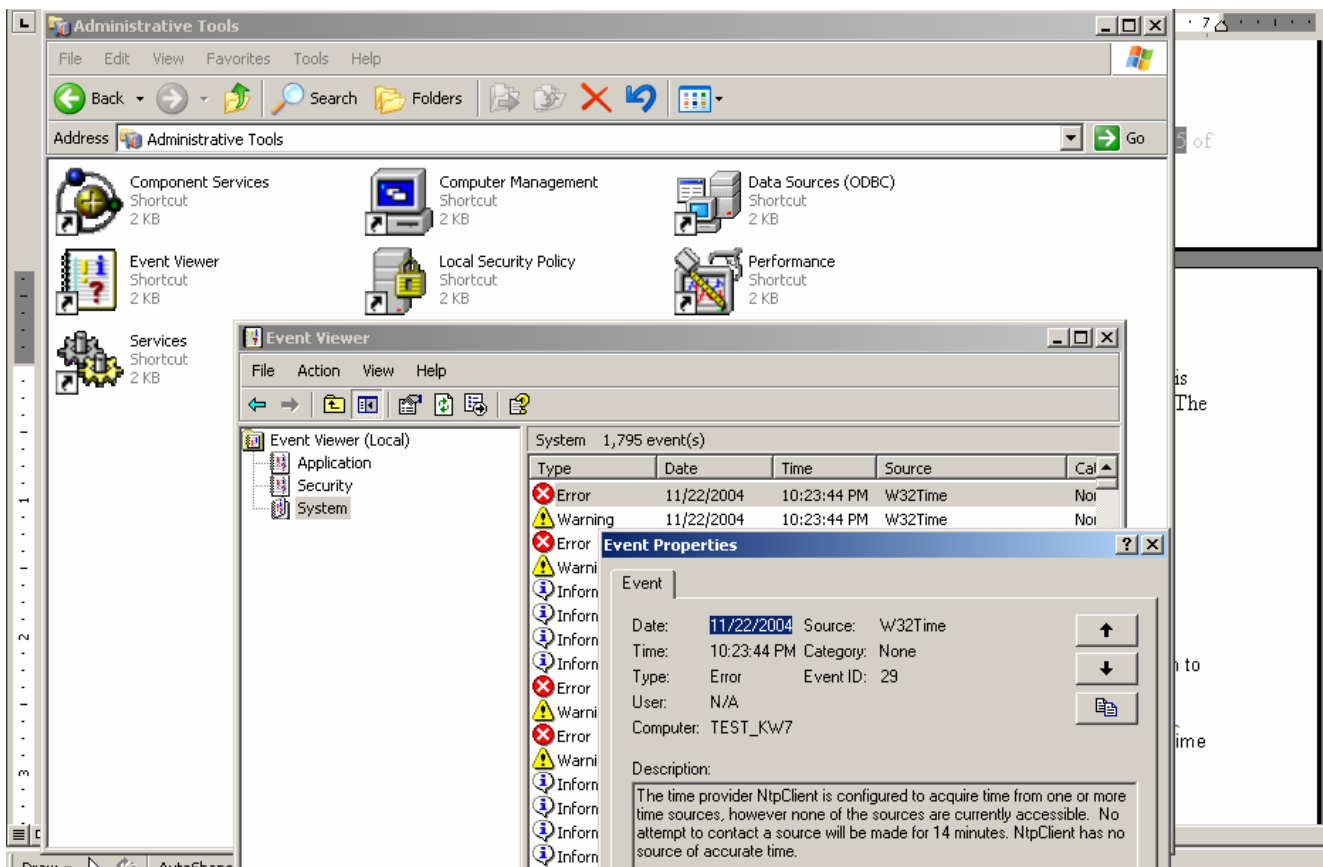
The following are intended for use in troubleshooting a PC or network that does not synchronize correctly. Additional assistance may be required from Spectracom Technical Support or from Microsoft Corporation.

**NOTE:** Windows PCs will not sync to an unsynchronized NTP Server. The PCs will ignore the time from the Spectracom NTP Server if the Sync lamp is not green. If the primary reference (GPS, Modem, etc) has not been connected to the Time Server yet, the reference must be connected and the Sync lamp turned green before the network can be synchronized.

### WINDOWS EVENT VIEWER

The Windows Event Viewer can provide significant assistance in troubleshooting time synchronization problems. Refer to the System log for W32Time entries. These entries often point in the right direction in helping to determine why a PC is not synchronizing.

To access the Event Viewer, go to Start button, to Settings, to Control Panel, to Administrative Tools. Click on Event Viewer. In the left panel, click on System. Scroll through the entries for any W32Time entries in the Source column. Double-click on this event to open the Event Detail. The Event detail will provide a reason for the entry in the Event Viewer log. Refer to Figure 3.



**Figure 3: Event Viewer for Troubleshooting**

## SPECIFIC FAILURE SYMPTOMS

### CONDITION 1

Windows 2003 or XP (Service Pack 2 or above) didn't synchronize when the service was started or synchronized when the service was first started but stopped synchronizing sometime thereafter. The following error message may be displayed:

**Event ID: 47**

**Source: W32time**

**Type: Warning**

**Time Provider NtpClient: No valid response has been received from manually configured peer yourpdc.forestroot.com after eight attempts to contact it. This peer will be discarded as a time source, and NtpClient will attempt to discover a new peer with this DNS name.**

This error message is generated if the NTP mode of operation is not initially changed from the default mode (Symmetric Active) to the client mode of operation. Or, due to a potential software issue that can occur in the W32Time program, the setting resets from client mode back to the default mode of operation. This mode must be changed to Client mode of operation for proper operation. The NTP mode of operation is determined by a value in the system registry.

#### To verify the current mode of operation:

- 1) Go to Start/ Run and type regedit <enter>
- 2) In regedit, browse to the following location:  
"HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Parameters\NtpServer"
- 3) Verify the IP address of the Time Server is correct and that it is followed by ",0x8".
- 4) If the IP address is wrong, change the IP address to the correct value. If the value after the IP address shows "0x1" (or any other number following the "x"), correct the value as ",0x8".

**NOTE:** We have seen a few cases in which Windows 2003/XP PCs seem to stop synchronizing to the Time Server after a period of time (but they synchronized correctly when the service was initially started). This is an issue with the W32Time program. Apparently, in the system registry, the "0x8" extension to the manually defined IP address for the NTP server can be changed intermittently back to the default value of 0x1", preventing the Windows PC from synchronizing.

If this occurs, one work-around is to add a second "0x8" after the first ",0x8" to the manually defined IP address in the system registry. Edit the "NtpServer" IP address value by typing in a second "0x8" with a space between the two "0x8" values (only the first "0x8" should have a comma in front of it). Refer to the example below:

**<ip address of model 918x>,0x8 0x8**

This should prevent the service from ignoring the NTP Time Server in the future.

- 5) Close regedit.

**NOTE:** Windows has a hotfix available for the condition listed above (Windows 2003 and XP lose sync at some point after the initial time sync). Refer to: <http://support.microsoft.com/default.aspx?scid=kb;en-us;830092> for more information regarding this condition and the available hotfix (You need to contact them to obtain it. They don't have it available for download on their website.

Spectracom is also hosting this hotfix on our website for ease in obtaining it. The hotfix can be downloaded from Our website at:

<http://www.spectracomcorp.com/Home/Support/Library/FAQsandTroubleshooting/SynchronizationErrorswithW32Time/tabid/783/Default.aspx>.

**Important Note:** Spectracom is providing the hotfix so that you shouldn't have to contact Microsoft unless assistance is required with the hotfix installation. Spectracom is not supporting the hotfix in any way. Any questions or problems with (or caused by) the hotfix MUST be directed to Microsoft directly.

#### **CONDITION 2**

**The Domain Controller fails to update to the correct hour, but the minutes and seconds are correct.**

The time sent from the Time Server to the DC is always UTC (GMT time). Corrections for Local time (Time Zone Offset) and Auto Daylight-Saving Time adjustment must be set at the Date/Time properties screen of the Domain Controller. Click on the time display in the lower right-hand corner of the screen. Adjust the time for the correct Time Zone and place a check in the DST box if your locality observes Daylight Saving Time.

**NOTE:** Because of the NTP/SNTP specifications, The Time Server cannot provide Local Time to the network. Time from a Time Server to a PC and time from a PC to any other PC is always provided as UTC (no correction for Time Zone Offset or DST). Each computer must be configured for the correct Time Zone and DST rule if local time is desired.

#### **CONDITION 3**

**The Workstation(s) fail to update to the correct hour, but the minutes and seconds are correct.**

The time sent from the Time Server to the workstations or the time from the Domain Controller to the Workstations is always UTC (GMT time). Corrections for Local time (Time Zone Offset) and Auto Daylight-Saving Time adjustment must be set at the Date/Time properties screen of each Workstation. Click on the time display in the lower right-hand corner of the screen. Adjust the time for the correct Time Zone and place a check in the DST box if your State observes Daylight Saving Time changes.

**NOTE:** Because of the NTP/SNTP specifications, The Time Server cannot provide Local Time to the network. Time from a Time Server to a PC and time from a PC to any other PC is always provided as UTC (no correction for Time Zone Offset or auto DST correction). Each computer must be configured for the correct Time Zone and DST rule if local time is desired.

**CONDITION 4****The Domain Controller or any other PC being directed to the Time Server fails to update to the correct hours, minutes, and seconds.**

This indicates the PC is not synchronizing at all to the Time Server. There may be a difference with the IP address assigned in the Time Server and the one entered in Section 2 or 3 to define the Authoritative Time Server. Also, there may be a hardware or wiring problem between the Time Server and the Windows Domain Controller, or the Time Server may not be time synchronized.

- A.** Verify the Time Synchronize status lamp on the Time Server indicates it is time synchronized.
- 1) If the Time Server is synchronized and is GPS Based (Models 8189, 9189, 9183, TTSxxx) proceed to step B.
  - 2) If the Time Server is not synchronized and is GPS based (Models 8189, 9189, 9183, TTSxxx), contact Spectracom Technical Support for assistance.
  - 3) If the Time Server is not synchronized and is not GPS based (Models 8188/9188), verify the NetClock to which it is connected is synchronized. The NetClock must be synchronized for the Time Server to be synchronized. Contact Spectracom Technical Support for assistance.
- B.** Try pinging the Time Server. At the command prompt, type **ping xxx.xxx.xx.xx** (where x is the IP address of the Time Server).

**Results of Ping Test**

If the response is four messages of **“reply from (IP address) bytes=32 time=?ms (time will vary) ttl=64”**, a device having this IP address has been found, but the Domain Controller can't synchronize to the Time Server.

- 1) Verify the IP address specified in Section 2 or 3 matches the Time Server verbatim.  
In the command prompt, type `net time /querysnTP <enter>`. Verify the response is the correct IP address for the Time Server.
- 2) The Time Server may not be synchronized. Verify the time synchronize status of the Time Server.
- 3) Verify the Windows Time Service is started.
- 4) If using a Gateway/Router with a firewall installed, make sure that port 123 (The NTP port) is open.
- 5) If using a Gateway/Router, verify the Gateway IP address specified in the Time Server configuration is correct. (If the Gateway is not configured in the Time Server, ping will work but the NTP data will not be received.)
- 6) Verify this IP address is the actual IP address for the Time Server and not another PC or device on the network. Disconnect the Time Server from the network and ping the address again. If it still responds, the IP address belongs to another device other than the Time Server.

If the response is **“reply from (IP address) “destination host not reachable”**, the Domain Controller will not synchronize to the Time Server. This response occurs when the Host cannot be “reached” over the specified network address. The problem is most likely a hardware or setup issue related to the Time Server.

- 1) The Network portion of the IP address may not be correct in the Time Server (the Host portion does not matter with this response).
- 2) Connect directly to the Time Server with a laptop PC using a cross-over cable. Manually set the IP address of the PC to an IP that matches the IP scheme of the network. If it responds to the ping, the Time Server is okay, but there is a network issue.

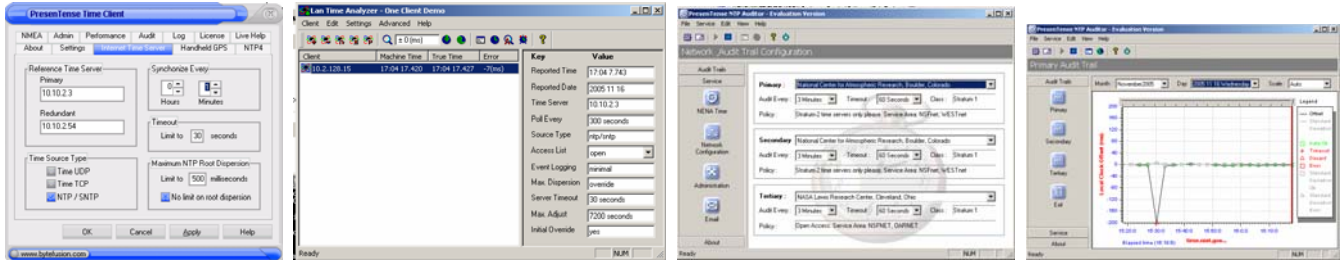
If the response is “**request timed out**”, the Windows 2000 Server will not synchronize to the Time Server. This response occurs when the network can be “reached” but the Host could not be found on the network. The problem is most likely a hardware or setup issue related to the Time Server.

- 1) The Host portion of the IP address may not be correct in the Time Server.
- 2) There may also be a wiring error between the two devices.
- 3) Verify that the “Good Link” lamp on the Time Server and on the network Hub/Switch it is connected to is lit.
- 4) Try to telnet into the IP address of the Time Server. At the command prompt, type: **telnet xxx.xxx.xxx.xxx**  
<enter> (where x is the IP address of the Time Server).
  - A. If it responds with the Spectracom login information, the Time Server can be seen on the network. This verifies that the Time Server is getting through any Gateways that may be present on the network.
  - B. If it responds with “**Could not open connection to the host on port 23: connect failed**”, either the Time Server can’t be seen on the network or telnet is disabled in the configuration menu. If ping was successful but telnet is not successful, the interface between the PC and the Time Server may be getting blocked by a Gateway/Firewall. Verify the network configuration in the Time Server.

Refer to the appropriate Spectracom NetClock, TTSxxx, or Ethernet Time Server instruction manual for further assistance with troubleshooting.

Refer to pages 22-26 of the Windows Time Service tutorial for additional troubleshooting assistance:  
<http://www.microsoft.com/WINDOWS2000/techinfo/howitworks/security/wintimeserv.asp>

## SECTION 10: A BETTER METHOD FOR WINDOWS NETWORK SYNCHRONIZATION



Spectracom offers an alternative to the limited functionality of the Microsoft W32Time program. This software suite, called Presentense, not only synchronizes all of the Windows PCs on the network, but also provides alert notification and audit trail capability not available from the Microsoft W32Time (Windows Time Service). The Presentense Client and Server software is a Graphical User Interface (GUI) based program that can provide a primary and back-up time reference for redundancy.

The Presentense Client software synchronizes the PCs to the Time Server and/or another PC on the network that is running the Server software. If the PC can't reach its Time reference, it can email an alert notification that it can't be synchronized. Presentense LAN Time Analyzer is a network time synchronization administrative tool that monitors the time accuracy of all PCs on the network. If a PC exceeds a user-defined accuracy specification, this program can run any exe-based program and can also open a message on the PC's monitor, alerting to a PC with an error higher than expected and desired.

The Presentense NTP Auditor program provides an audit trail of the PC's time by comparing the PC's time to up to three different NTP Time references. This program can provide a continuous print-out for a hard-copy proof that each PC was synchronized at any given moment in time. It also logs this information in a text file sorted automatically by month and day. The time is sampled at set intervals and the error of the PC's time compared to the reference NTP Time Servers is permanently captured. If the time of the PC is manually set by someone at any time between the scheduled samples, the program automatically triggers an unscheduled sample to permanently log how far off from UTC the PC was manually set and when the event occurred. Once the PC is resynchronized or manually set again, another unscheduled sample occurs again and the time of this occurrence is logged.

For more information on this excellent alternative to W32Time, or to obtain a free 30 day evaluation of these Presentense programs, either contact the Spectracom Sales department at 585-321-5800 or visit our NTP software page on our website at:

<http://www.spectracomcorp.com/Home/Products/NTPSoftware/tabid/389/Default.aspx>

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