

# **Technical Description**

NTP driver for Windows NT  
NTP



### **Safety information**

The safety regulations and technical data are important for the smooth running of the devices and the protection of people and equipment. Strict compliance with these regulations is required. In case of non-compliance with these regulations the guarantee and warranty claims for the device and possible consequential damage expire.

### **Safety of the Devices**

The production of this device follows the latest technological standards and safety regulations.

The device must not be assembled by anyone but trained personnel. Please make sure that all the connected cables are laid and fixed properly. The device is to be run with the supply voltage stated on the identification plate only.

Only trained personnel or specialists may operate the device.

Repair on opened devices must not be carried out by anyone but specially trained staff or by the **hopf** Elektronik GmbH company.

If the maintenance work requires the opening of a device or if a fuse needs changing the device must be separated from all voltage supplies.

If there are reasons to believe that the operational safety can no longer be guaranteed the device must be taken out of service and labelled accordingly. The safety may be impaired when the device does not operate properly or if it is obviously damaged.

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## 1 Introduction

The Network-Time-Protocol is used to synchronise computers in TCP/IP networks. Client- or Server-computers can be synchronised highly accurately. An accuracy of less than  $\pm 5$  msec can be achieved depending very much on the implementation onto the target computer.

There are two types of computers under NTP: Time-Clients and Time-Server, but a client can also be a server and vice versa. This is basically due to the structure of the synchronisation with NTP in the network. To avoid overloading a computer in large networks if all the computers take the time from this single one, NTP synchronises different levels. The top level (Stratum 1) is the computer which is equipped with a time synchronisation by a radio controlled clock. For redundancy reasons there may also be several computers which control each other. The client may preferably take the time information from a time server. If it fails or if the installed radio controlled clock is no longer synchronous the time clients automatically receives the time information from the other i.e. redundant time server. Stratum 1 computer provide the source of time for the computers on the second level (Stratum 2), which are again time servers for the next level down. This mechanism permits up to 15 levels.

The **hopf** Elektronik company has translated this NTP-driver for the WinNT-operating system. Therefore NTP is described in connection with WinNT.

## 2 Supported Boards

The NTP multifunctional software for Windows NT replaces the old NTP-driver, which used to support only ISA-boards 6036 and 6038. It also serves as a replacement for the TimeServ-driver which was so far required for the synchronisation of a WinNT computer via serial interface. Now WinNT computers can be synchronised via the following **hopf** clocks.

- PCI-boards 6039 DCF77/GPS,
- All the boards which support the following special NTP string via their serial interface

The serial interface of the clock must be configured as follows:

- standard data string **hopf** 6021
- 9600 baud
- 8 data bit
- no parity
- 1 stop bit
- transmit UTC
- with control characters STX/ETX
- LF/CR
- advance
- transmission every second
- control character on the second change

## **3 Installation**

### **3.1 System Requirements**

The operation of the NTP process requires the installation of TCP/IP in the respective system.

### **3.2 Installation of the Board**

If the boards 6039 GPS/DCF77 is already installed in the WinNT computer the start of the **hopf** synchronisation process must be changed under "service" from "automatic" to "deactivated" to avoid conflict of drivers. After that the still active service must be stopped. Alternatively the PC can be rebooted.

If the board is installed for the first time, the appropriate driver disc must be used to install the board, following the instructions of the board. After a restart of the computer the above described **hopf** synchronisation process must be deactivated.

The deactivating of the **hopf** synchronisation process is not required if the synchronisation is to be done via serial interface or for an installation on a Time Client computer.

### **3.3 Installation of Driver**

The NTP-driver is zipped in a ZIP-file. In a network it must be installed on every computer involved in the synchronisation process. When the file is unzipped "INSTALL.BAT" must be called up. This file installs the NTP driver on the respective computer.

During the installation of the NTP-driver the executable files NTPQ.EXE and NTPD.EXE are copied into the directory system32. The configuration file NTP.CONF is created in the directory WinNT-Root. In this file the source(s) of the time code is/are selected by choosing different IP-addresses, i.e. it determines if a computer is synchronised as time server via a board 6039 or a serial data string and whether it receives as time server its synchronisation via the network. Several IP addresses and therefore sources of the time code may be selected. Unwanted sources can be excluded by placing a '#' before the respective line.

To illustrate such a structure an example of a NTP.CONF file is shown below, where in line 16 the **PCI-board 6039** is selected as source of time.

<p><b>Please Note:</b> THE NUMBERING IS NOT ACTUALLY PART OF THE NTP.CONF FILE BUT ONLY SERVES EXPLANATION PURPOSES.</p>
--------------------------------------------------------------------------------------------------------------------------

```
1. # NTP configuration file (ntp.conf)
2. #
3. # This is for a server clock with hopf 6021 or PCI board 6039.
4. # It defaults to stratum 0
5. # copy this file to %windir%
6. #
7. # To select a time source (e.g. board 6039) please delete the '#' and the following 'space'
8. # at the beginning of the according line. IMPORTANT: If the serial interface or the
9. # board 6036/38 is going to be selected please note that also the '#' at the beginning
10. # of the line 'fudge' must be deleted!
11. #
12. # -----
13. # ----- Board 6039
14. # -----
15. #
16. server 127.127.39.1                # hopf 6039 PCI board
17. #
18. # -----
19. # ----- Synchronisation via serial interface
20. # -----
21. #
22. # server 127.127.38.1                # hopf serial clock
23. # fudge 127.127.38.1 timel 0.020    # Set packet delay
24. #
25. # -----
26. # ----- Synchronisation of client
27. # -----
28. #
29. # server [ip-adresse server 1]
30. #
31. # -----
32. # ----- The following entries are necessary to synchronise clients in a
33. # ----- redundant network (with two time sources):
34. # -----
35. #
36. # server [ip-adresse server 1]
37. # server [ip-adresse server 2]
38. #
39. # peer [ip-adresse server1] prefer    # local clock driver
40. # peer [ip-adresse server2] minpoll 4 maxpoll 5 # another server
41. #
42. #           # The Server (client-mode) or Peer (symmetric active mode)
43. #           # settings are listed in one line:
44. #           # minpoll 4: Difference between time requests is at 2^4 = 16 sec
45. #           # maxpoll 5: -//- 2^5 = 32 limiting the time requests,
46. #           # as soon as clock is synchronous and controlled
47. #
48. # -----
49. # ----- Miscellaneous stuff
50. # -----
51. driftfile %windir%\ntp.drift        # path for drift file
52. # statsdir c:\_NTP_Dev\ntpstats\    # directory for statistics files
53. # filegen peerstats file peerstats type day enable
54. # filegen loopstats file loopstats type day enable
55. # filegen clockstats file clockstats type day enable
```

- Line 16: If this entry, as shown in this example, it is activated, the board can be synchronised via the board 6039 GPS/DCF77.
- Lines 22/23: This allows the synchronisation via serial interface. The fourth number (.1) names the number of the COM of the PC, here COM1.
- Lines 36/37: If for redundancy reasons two time servers are used, "prefer" will select the time server from where the synchronisation is preferably to start. The according IP address is to be entered here. In line 17 the IP address of the second, redundant time server is entered. If the clock in the preferred server fails or is no longer radio synchronous the network is synchronised by the second time server.

If the clock is to be synchronised via serial interface the lines 22 and 23 must be activated as follows :

```

:
:
:
17. #
18. # -----
19. # ----- Synchronisation via serial interface
20. # -----
21. #
22. server 127.127.38.1                # hopf serial clock
23. fudge 127.127.38.1 time1 0.020    # Set packet delay
24. #
:
:
:

```

**Please Note:** WHEN THE INSTALLATION IS COMPLETED THE SYSTEM MUST BE REBOOTED.

#### 4 The Synchronisation Process

During the booting process the computer clock is reset hard once. That means that the clock is reset abruptly from its current time to the radio controlled time. After that the WinNT computer / WinNT-network are continuously adjusted to UTC time. Time zones and possible changeovers of daylight saving time and standard time must therefore be selected by means of the time/date menu of the operating system. The continuous synchronisation avoids leaps in time which may cause error messages in some programmes. In case of large deviations between computer clock and the time information received via NTP there may be adjustments of 30 minutes and more. A hard reset occurs only if the computer time is set manually or if, after an extended failure of the synchronisation of the radio controlled clock, there is a large deviation between the computer clock and the synchronised radio controlled clock.

It is also possible to synchronise a Win95/98-computer via a WinNT-server, which requires driver "NTP Sync-Client". It only needs to be installed in the respective Win95/98 computers.