CoBox

Network Time Server

Installation Guide

CONTENTS

8   SERIAL AND ANTENNA INTERFACE

9   ANTENNA

10   LED STATUS AND ERROR CODES

11   MONITOR MODE AND FIRMWARE UPLOAD

12   TECHNICAL DATA

APPENDIX A

APPENDIX B

APPENDIX C

WARRANTY AND DECLARATIONS

1 Description of the Network Time Server (NTS)

The Network Time Server (NTS) is a compact, standalone unit which receives standard world time information from a reliable source (GPS or DCF-77) and makes this information available to computers, controllers and other equipment needing the correct time. This data is distributed over the network interface. The NTS supports the most popular time distribution protocols, NTP, time/UDP, plus an easy-to-integrate proprietary protocol that supports broadcasting.

The NTS controller needs an external GPS or DCF-77 receiver, which can be connected via a serial link and mounted away from the unit.

NOTE: *Network Time Server will be abbreviated as NTS in this manual.*

2   Reliable Clock Sources

Depending on where the NTS will be used, the following clock sources are available:

2.1   Global Positioning Satellite (GPS) System

GPS is a satellite system operated by the US Department of Defense that is used as a position determination aid. GPS can also be used to provide world-wide coverage for accurate standard time information. A GPS antenna is typically mounted with free "view" of the sky.

2.2   DCF-77 LF Radio Transmitter

A DCF-77 low frequency transmitter is located near Frankfurt, Germany. This transmitter is operated by the Physikalisch-Technische Bundesanstalt in Braunschweig. It modulates the German standard time on its carrier (77.5 kHz).

DCF-77 receivers work normally within about 1500 km radius around Frankfurt, but reception can be disturbed by mountains, buildings, railroads, power stations etc. Accurate positioning of a DCF-77 is often necessary to achieve reliable reception conditions.

2.3   WWVB Radio Transmitter

WWVB radio transmitter is a low frequency transmitter located in Boulder, Colorado, USA at the NIST Boulder Laboratories. NIST maintains the primary frequency standard and also develops and operates standards of time and frequency for the United States.

3 Hardware Installation Requirements

3.1 Controller

The controller can be installed anywhere in the network and must be connected through the appropriate interface and cables.

The external Ethernet and Token Ring models come with a power supply. The OEM board and the 19-inch rack mount versions need a regulated DC power supply.

3.2 Antenna

The GPS antenna works best when mounted with a free view of the sky. The DCF-77 antenna should be as far away as possible from monitors, power lines and other low-frequency radiation sources. The DCF antenna installation must be carefully done to avoid reception problems.

 NOTE: *In most cases, reception behind shielded windows or in computer rooms is not possible.*

3.3 Antenna Cable

Depending on the antenna type, the cable can be up to 150 feet in length. LED status indicators on the controller can help finding the best installation place (see "LED status and error codes," page 10-1).

4   Controller (NTS) Setup

The controller must be configured before initial LAN installation. Configuration should be made through its serial port and terminal (or terminal emulation software) on a PC. The NTS can be configured locally or remotely. To configure locally, access the first (or only) serial port by an ASCII terminal or terminal emulation; configuring over the network uses a PC or other computer with a Telnet client.

The NTS configuration is stored in nonvolatile memory (with option 9) and is retained without a power supply. The configuration can be changed at any time. The NTS resets after the configuration has been modified and stored.

4.1   Network Configuration

To configure over the network, a Telnet connection to port 9999 must be established.

4.2   Factory IP Address

The NTS products are shipped with the following default IP addresses:

Factory IP Address	NTS Type
194.039.078.254	Ethernet External Version
194.039.079.254	Token Ring External Version
194.039.078.253	Ethernet Mini Version
194.039.079.253	Token Ring Mini Version

Figure 4-1

4.3   Initial IP Address Setting

If the IP address of the NTS is unknown or undefined, the following sets a temporary IP address:

a)   Set a static ARP with the desired IP address using the hardware address of the NTS, which is printed on the product label. The address can also be calculated from the serial number (see Network Interface). Below is the command example for WinNT/Win95, using the DOS prompt, when the hardware address of the NTS is 00-20-4A-02-64-0B.

NOTE: *In order for the ARP command to work in Windows, the ARP table on the PC must have at least one IP address defined other than its own. Type "`ARP -A`" at the DOS command prompt to verify that there is at least one entry in the ARP table. If there is no other entry beside the local machine, ping another IP machine on your network to build the ARP table. This has to be a host other than the machine that you're working on. Once there is at least one entry in the ARP table, use the following commands to ARP an IP address to the NTS.*

arp -s 191.12.3.77 00-20-4A-02-64-0B

The command example for most **Unix** systems is:

arp -s 191.12.3.77 00:20:4A:02:64:0B

b) Open a telnet connection to port number 1. This connection will fail, but the NTS will change its IP address to the desired one in that step.

telnet 191.12.3.77 1

c) Open a telnet connection to port 9999 and set all required parameters.

telnet 191.12.3.77 9999

NOTE: *The temporary IP address is reverted after every power reset of the NTS. Be sure to enter the configuration and store the parameters to make the changes permanent.*

4.4   Serial Configuration

An ASCII terminal or PC with a terminal emulation can be connected to the first serial port of the NTS. The terminal (or PC) should be configured to 9600 Baud, no parity, 8-bit, 1- or 2-stop bits.

The power must be cycled on the NTS (powered off and back on) to enter its configuration mode. The self-test begins after power-up. About a half-second later the red LED start blinking. Now send three lowercase 'x' characters to the NTS. These characters must all be sent within one second to start configuration mode.

> **NOTE:** *The easiest way to enter configuration mode is to hold down the 'x' key at the terminal(emulation) and then powering the NTS. This will ensure that the x characters will arrive in time*

4.5 Configuration Parameters

After configuration mode is entered (confirm with <CR>), the parameters can be changed; default values can be confirmed with the enter key. The parameters must be stored, and the CoBox does a reset.

4.6 Basic Parameters

To change the basic parameters, type '0'. The following values can be set/changed:

4.6.1 Ethernet Interface

This parameter is used to select the network port on the External Ethernet Model (10BaseT or AUI).

4.6.2 Token Ring Interface

The Token Ring network interface speed is set by a switch and cannot be set with software (see "Network Interface," Appendix A).

4.6.3 Locally Administered Hardware Address

The Token Ring locally administered hardware address can be set here. This parameter should not be changed without consulting the system administrator of your Token Ring LAN.

4.6.4 IP Address

The IP address must be set to a unique value in your network. Please refer to the literature mentioned in "Appendix C - IP Addresses, Netmask, etc." if you are not familiar with IP addresses.

If the NTP is set to an address which is already in use, it will display an error code with the LEDs (see "LED Status and Error Codes") and will not connect to the network.

4.6.5 Gateway IP Address

The router/gateway address is needed to communicate to other LAN segments. The default gateway must be set to address the router that connects these segments.   This address must be within the local network. If in doubt, consult the network administrator.

4.6.6   Netmask

A netmask defines how many bits from the IP address are to be taken as the
network section and how many bits are to be taken as the host section
(reminder: Standard class A 8/24 (net/host), class B 16/16, class C 24/8
bits). If set to 0, the standard appropriate netmask for the actual IP address
is used. Appendix B covers the calculation of the right value in detail.

The NTS prompts for the number of host bits, and then calculates the
netmask. It is shown in standard format "255.255.xxx.xxx" when
parameters are displayed.

4.6.7   Telnet Config Password

The Telnet configuration password can be set to disable unauthorized
access to the setup menu through a Telnet connection to the setup port
(9999).
For the setup through the serial port, it is not necessary to enter the
password.
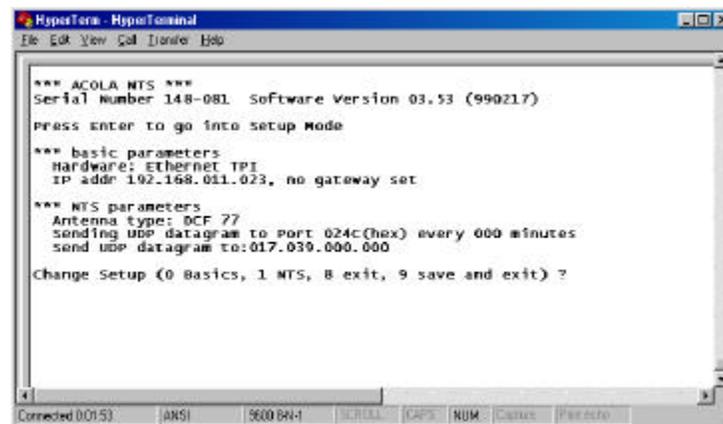
Figure 4-2

The controller can be configured over a Telnet connection to port 9999
(assuming the network parameters are set correctly and the NTS is
connected to the network, see Figure 4-2 above).

5 Network Clock Parameters

The network operations of the server are controlled by various parameters.

5.1 Antenna Type

Antenna Type (0=DCF77, 1=Trimble, 2=TRAK, 3=Hopf 6021)

The antenna type offers DCF-77, GPS (Trimble, TRAK, Hopf 6021), NMEA (DeLorme Tripmate, not supported at the time of printing this document)

5.2 UDP-Port

The UDP port selects the port number for the NTP proprietary protocol. It should be set to 77FF (hexadecimal) to be compatible with PC software and KABA Benzing Terminals,

5.3 Send Block Every n Minutes

This parameter determines how often the data block should be sent.

5.4 Send UDP-Broadcast

If the time information should be sent to all devices connected to this LAN (broadcast), set this parameter to "Y" = yes.

5.5 UDP-Target Address

This parameter determines the target addresses to which the data block should be sent. The data block can be sent over a Gateway or other devices to another part of the network. The maximum number of defined addresses is eight.
NTP and UDP/time port numbers are fixed to the values defined in RFC-37 and RFC-123 respectively.

If the authentication option is enabled, up to seven MD5 or DES keys can be entered (key numbers 1..7). All key input must be done in hexadecimal format; MD5 key length is limited to eight characters.

When leaving the setup mode – after selecting function 9 – all parameters are stored in a nonvolatile memory and the NTS resets.

6   Time Distribution Formats

After the NTP receives valid time information, it distributes the standard time via different services to systems connected to the LAN.

6.1   NTP

The NTS operates as in server mode—symmetric operation modes are not supported. It understands NTP Version 1, 2 and 3 frames, and optionally supports authentication via DES and MD5 cryptographic checksums. If authentication is not used, the NTS can be used for hundreds of clients without overloading it.

Authentication requires 40ms for checking and generating the cryptograms, which is covered and averaged out by the protocol. The NTS supports full SNTP and all NTP functions required for reliable server operation. Functions not required for server operation are not implemented.

6.2   UDP/time

This outdated protocol has a resolution of one second, and is used by older UNIX systems, some PCs and technical equipment.

6.3   Lantronix Proprietary

This has been developed to ease the setting of KABA Benzing Terminals and Network Time Servers that are connected to networks with BETA and BETOR network adapters. Also suitable for Windows 3.1, 3.11 PCs and other systems which do not support NTP. A simple C-program sample source (available from our website) works on UNIX and VMS systems and can easily be ported to others.

In central Europe, it can be used to facilitate automatic daylight savings switching, as the NTS knows the CET rule (and DCF-77 provides an indicator).

This protocol simply sends out a UDP block in a programmable interval as broadcast or direct to targets. The port number can be set, but it is necessary to set it to 77FF(hex) for operation with KABA Benzing equipment and the provided software.

UDP Block contents:

UDP Data offset	Contents	
00…14	**ASCII string, containing CET/CST**	
00…01	Year	(00…99)
02…03	Month	(01…12)
04…05	Day	(01…31)
06…07	Hour	(00…23)
08…09	Minute	(00…59)
10…11	Seconds	(always 00)
12	day of week	(1-Mo, 2-Tue, …)
13	DST enabled	(0-no, 1-yes)
14	String termination, '\0'	
15	Reserved (always 00)	
16…19	**CET/CST Time on UNIX Format** 32bit value, network byte order seconds since 1/1/1970	
20…23	**GMT Time on UNIX Format** 32bit value, network byte order seconds since 1/1/1970	
24…31	**Reserved**	**(always 00)**

Figure 6-1

This data can be used to synchronize to approximately one-second accuracy because the block is sent out at the beginning of the first second of every minute. This interval can be changed.

7   Network Connectors

The NTS features 10BaseT and AUI connectors. Active connection selection is performed by software.

The transceiver interface can supply 12V, up to 300 mA. If more power is needed (i.e. for a fiberoptic transceiver), an external transceiver power supply must be used.

8 Serial and Antenna Interface

The setup menu and potential antenna connection is available only on the first serial port of the (NTS DB5 connector.)

Pinouts of the DB25 female connector (DCE) are as follows:

PIN	Name	I/O	Function
1	Shield		Protective ground
2	TxD	I	Transmit data TO controller
3	RxD	O	Receive data FROM controller
4	RTS	I	Request To Send, not used
5	CTS	O	Clear To Send, active for RS-232
6	DSR	O	Data Set Ready, always active
7	GND		Ground for power and data
8	DCD	O	Data Carrier Detect, not used
9	PWR	O	+12V power for antenna
14	REF	O	+4V reference for antenna input
20	DTR	I	Data Terminal Ready, not used
21	RxL	I	Antenna input Low
22	RxH	I	Antenna input High

Figure 8-1

9 Antenna

9.1 GPS Receiver

GPS receivers are usually connected through a standard RS-232 interface; a 1pps signal is also used. Most models of the NTS feature a DB25 connector for the serial interface (female, DCE pinning). The 19'' rack version uses a RJ-45 connector, while the OEM module has a TTL level interface. +12V regulated power for the receiver (max. 200mA) is available at the DB25 connector only.

9.2 DCF-77 Antenna

DCF-77 antennas commonly feature a 1pps (1 second pulse) interface which carries the coded data (100ms pulse = 0, 200ms pulse = 1). Most types with a positive or negative pulse can be interfaced, although some external components may be necessary. The active pulse must be indicated to the NTS by raising RxH above RxL or lowering RxL below RxH to achieve a differential voltage level of min. 300mV.

The antenna must supply the DCF signal with a short pulse length of 80-120ms and a long pulse length of 170-230ms for proper decoding and reception.
The input pins of the controller are clamped at 8V. For antennas supplying a +12V pulse, a current limiting resistor has to be put in line (typically 1k Ohm).

9.2.1 Input pulse of the DCF-77 source
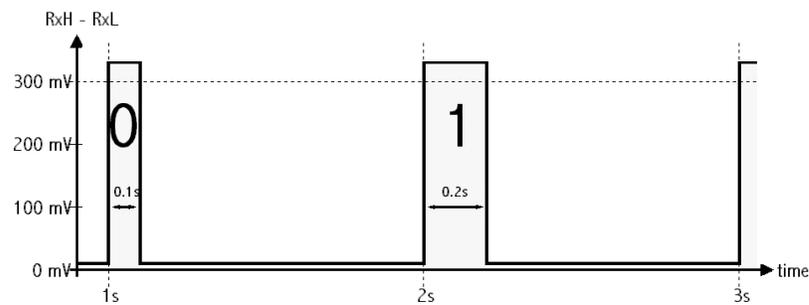
Figure 9-1

9.2.2 **Antennas with positive pulse output**

Connect the antenna signal to RxH (Pin 22) and install a connection between REF (Pin 14) and RxL (Pin 21).

Example:
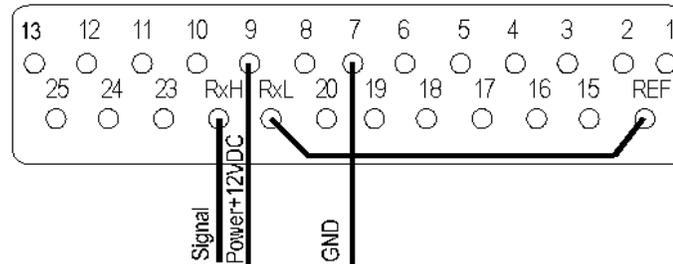
Figure 9-2

9.2.3 **Antennas with negative pulse output**

Connect the antenna signal to RxL (Pin 21) and install a connection between REF (Pin 14) and RxH (Pin 22).

Example:
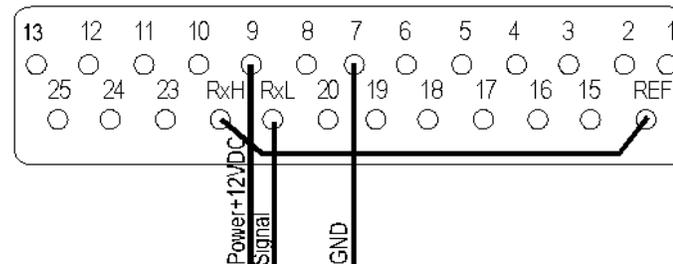
Figure 9-3

9.2.4   Antennas with open collector outputs

Put a current limiting resistor between the input pin and the antenna signal, and connect a pull-up resistor between PWR (Pin 9) and the antenna signal (typically 4.7k). Make sure that the antenna supports the current load (2.5mA with 4.7k Pull-up @12V).

Example

positive pulse output   negative pulse output
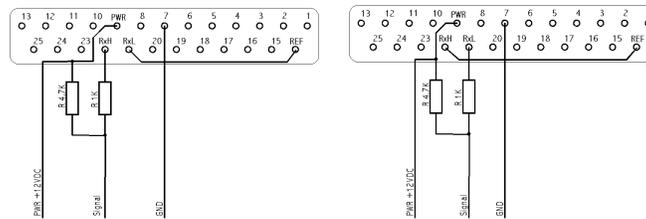
Figure 9-4

10 LED Status and Error Codes

The LEDs indicate the status of the NTS. After the initial self-test phase all status LEDs should be lit.

10.1 Green LED on

Synchronized to the time signal, correct reception of time data.

10.2 Green LED flashing 50% duty cycle

Some correct information received, but synchronization is not yet reliable. With the DCF-77 antenna, the controller demands three minutes of correct reception before becoming a synchronization source. Every reception dropout restarts this phase for security reasons. GPS can take up to twenty minutes until correct synchronization is established (depending on the antenna position, type and other parameters).

10.3 For connected DCF-77 only

The yellow LED shows the pulse signal from the antenna, while short flashes of the red LED indicate timing errors (or second 59).

10.4 Red LED

If the red LED is on or blinking, the green LED will give a diagnostics code. There is a fatal error, and the NTS is not working.

10.4.1 Red LED stable on, green LED blinking:

1x:	EPROM-checksum error
2x:	RAM-error
3x	Network controller error (Token Ring)
4x:	E²PROM checksum error or bad
5x:	IP address already used on network

10.4.2 Red LED blinking, green LED blinking:

4x:	The network connection is faulty. This code should only appear after power up. Even though the NTS is going into operation mode, the problem will potentially persist.
5x:	No DHCP response was received.

11 Monitor Mode and Firmware Upgrade

11.1 Monitor Mode

To enter monitor mode, use the same steps as setting parameters (see Serial Configuration). However, instead of entering three "x" keys, key in "x x 1". The NTS will respond with a special prompt.

Network functions are needed for some diagnostics commands; it may take up to 20 seconds until the network part of the NTS is initialized and the prompt is displayed. This is especially true if a TokenRing is empty or a ring simulator is used. For a simple ring simulator, see the Appendix. To start the monitor mode without network functions, enter "x x 2" (new function from Version 2.05 up).

> **NOTE:** *A Token Ring NTS needs a working network connection to enter monitor mode.*

11.2 Monitor Commands

The following commands are available in monitor mode. Many commands have an IP address as an optional parameter (x.x.x.x). If it is given, the command is applied to a remote controller with that IP address (x.x.x.x). If no IP address is given, the command is executed locally.

All commands must be given in capital letters; only blanks are accepted as white space between parameters

DL	Firmware download to the NTS
SF x.x.x.x	Send firmware to NTS with IP x.x.x.x
VS x.x.x.x	Query software header record (16-byte).
GC x.x.x.x	Get configuration as HEX records
SC x.x.x.x	Set configuration from HEX records
PI x.x.x.x	Check with ping if x.x.x.x is alive and reachable.
QU	Quit—exit diagnostics mode

11.2.1 Command Result Codes

0	OK, no error
1	No answer from remote device
2	Cannot reach remote device or does not answer
8	Wrong parameter(s)
9	Invalid Command

11.3 Firmware Download Serial

Downloading is done in monitor mode. Once in monitor mode, send the "DL" command. The NTS now waits for the firmware image in HEX format, which must be sent as an ASCII-file through the serial interface. When the end record is received, the controller checks the integrity of the firmware image and then programs the new firmware in the Flash prom. The NTS resets after complete reprogramming,.

WARNING: *A loss of power while reprogramming will result in a defect program image and a nonfunctional NTS.*

The following figure shows a typical screen shot during reprogramming of the downloaded firmware.
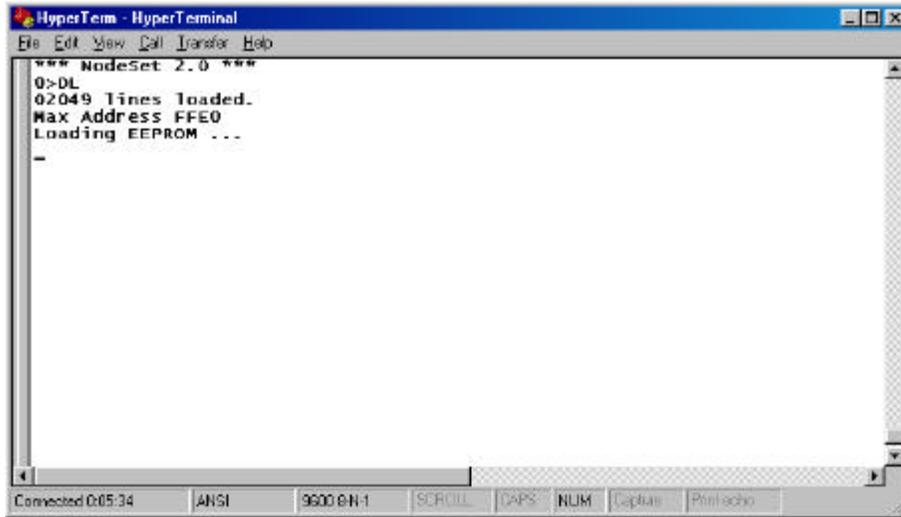

```
HyperTerm - HyperTerminal
File  Edit  View  Call  Transfer  Help
*** NodeSet 2.0 ***
0>DL
02049 lines loaded.
Max Address FFE0
Loading EEPROM ...
_
```
```
Connected 0:05:34    ANSI    9600 8-N-1    SCROLL    CAPS    NUM    Capture    Print echo
```

Figure 11-1

11.4 Distribute Firmware

To distribute the firmware from one NTS to others, use the "SF" command. After entering monitor mode on the NTS, simply send the firmware with the "SF" command to the other devices. Be sure to check the version of the other devices after reprogramming to make sure the reprogramming was a success.

11.5 Firmware Download from Host

To download new firmware from a computer to a NTS, you much have a send a binary file from a TFTP client. The parameters to send the firmware are:

Target filename: **3Q**
Transfer mode: **binary123**

NOTE: *The file to be downloaded must be the .ROM (binary) image, not the hex version! File size should be 32768 or 65536 bytes.*
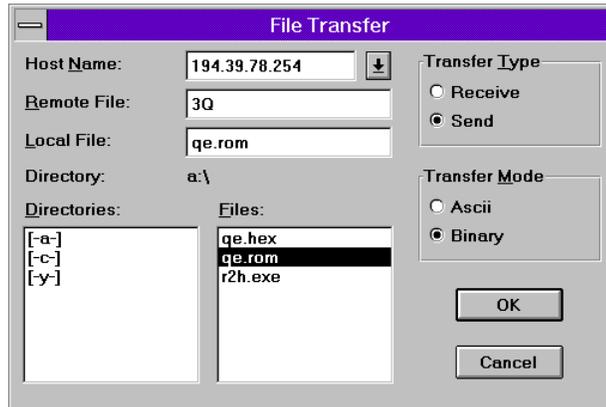
Figure 11-2

Typical command line of the Windows NT's own TFTP client, running in a MS-DOS window:

```
C:\WINNT\system32>tftp

Transfers files to and from a remote computer running the TFTP
service.

TFTP [-i] host [GET|PUT] source [destination]

   -i   Specifies binary image transfer mode (also called
octet). In binary image mode the file is moved literally, byte
by byte. Use this mode when transferring binary files.
   host Specifies the local or remote host.
   GET  Transfers the file destination on the remote host to the
        file source on the local host.
   PUT  Transfers the file source on the local host to the file
        destination on the remote host.
   source      Specifies the file to transfers
   destination Specifies where to transfer the file.


C:\WINNT\system32\tftp -i 194.39.78.254 PUT c:\qe.rom 3Q


```

Figure 11-3

With the command line above, the firmware QE.ROM will be sent to the device with the IP-Address 194.39.78.254, by the TFTP client of Windows NT.

12 Technical Data

Some values are for standard external models only.

12.1 CPU, Memory, Controllers

V.40 CPU, 10MHz clock
Z85C30 SCC Serial Controller
National Semiconductor DP839xx Ethernet Controller or TMS340 chipset,
for Token Ring version.
128kByte RAM, 128k-512kByte Flash PROM
256 Byte E²PROM for parameter storage

12.2 Serial Interface

	External	19'' Rack	OEM module
Connector	SubD25	RJ-45	pin strap
Speed	38400	38400	19200
RS-232/485 sw	software	jumper	TTL level only

12.3 Network Interface

15-pin AUI interface (External Ethernet only) for transceiver connection to:
      Thick Wire Ethernet,
      Thinwire Ethernet
      Fiber optics
Integrated 10-BaseT port (RJ-45 connector)

12.4 Power Supply

Power plug (supplied), or 15-30 Volt DC, max. 800mA

12.5 Power Consumption

max. 9 Watt

12.6 LEDs

Three LEDs for channel status display
Four LEDs for network interface status (Ethernet)

12.7 Case

Aluminum case with removable mounting brackets

12.8 Dimensions

180 x 155 x 40 mm

12.9 Weight

approx. 500g without AC power adapter

A- Token Ring Specific

A.1 Additional Information for Token Ring Versions

The following information describes differences for Token Ring versions.

A.1.1 Token Ring Insertion Process Needs Time

When the NTS attempts to enter the ring, extensive tests of the ring physical interface are done before opening the loop. These tests take a few seconds. After opening the ring, the NTS waits for a token from a ring master. If there is no other device in the ring, it may take up to 30 seconds until the ring insertion process is completed (and the red LED stops blinking).

A.2 Network Interface

The Token Ring version of UTS has a standard D-Shell 9pin female connector (STP) to be connected to standard Token Ring drop cables and an RJ-45 connector (UTP) to be connected to an UTP Token Ring MAU. The used connector will be automatically detected. The ring interface speed is configured by a jumper to prevent accidental configuration. The jumper can be set through a hole in the back of the case. The factory setting of this jumper is 16Mbit.

A.3   Token Ring Simulator

The following schematic defines a simple Token Ring simulator that can be used to test the NTS Network interface without a MAU.
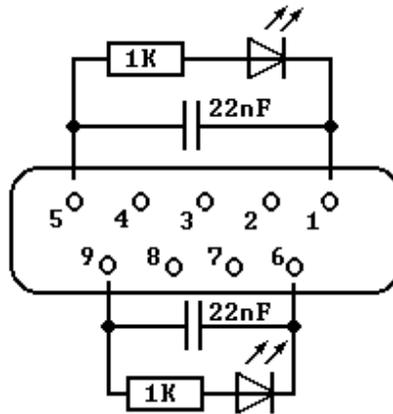
Figure A-1

B- IP Addresses, Netmask etc.

B.1 IP Addressing

An IP address is a 32-bit value, divided into four octets of eight bits each. The standard representation is four decimal numbers (in the range of 0..255), divided by dots.
Example: 192.2.1.123

This is called decimal-dot notation.

The IP address is divided in two parts: network and host. To support different needs, three "network classes" have been defined. Depending on the network class, the last one, two or three bytes define the host, while the remaining part defines the network. In the following, 'x' stands for the host part of the IP address:

B.2 Class A Network

IP address 1.x.x.x to 127.x.x.x

Only 127 different networks of this class exist. These have a very large number of potential connected devices (up to 16,777,216)
Example: 10.0.0.1, (network 10, host 0.0.1)

B.3 Class B Network

IP address 128.0.x.x to 191.255.xxx.xxx

These networks are used for large company networks. Every network can consist of up to 65,534 devices.

Example: 172.1.3.2 (network 172.1, host 3.2)

B.4 Class C Network

IP address 192.0.0.xxx to 223.255.255.xxx

These network addresses are most common and are often used in small companies. These networks can consist of a maximum number of 254 hosts.
Example: 192.7.1.9 (network 192.7.1, host 9)

The remaining addresses 224.x.x.x - 239.x.x.x are defined as "class D" and are used as a multicast addresses.

The addresses 240.x.x.x. - 254.x.x.x are defined as "class E" and are reserved addresses.

B.5   Network Address

The host address with all host bits set to "0" is used to address the network as a whole (in routing entries, for example).

B.6   Broadcast Address

The address with the host part bits set to '1" is the broadcast address, meaning "for every station".

Network and Broadcast addresses must not be used as a host address (e.g. 192.168.0.0 identifies the entire network, 192.168.0.255 identifies the broadcast address).

B.7   IP Netmask

The netmask is used to divide the IP address differently from the standard defined by the classes A, B, C. A netmask defines how many bits from the IP address are to be taken as the network section and how many bits are to be taken as the host section.

B.7.1   Standard IP Network Netmask:

	Network Bits	Host Bits	Netmask
Class A	8	24	255.0.0.0
Class B	16	16	255.255.0.0
Class C	24	8	255.255.255.0

Figure B-1

The number of host bits is entered; the NTS then calculates the netmask. The netmask is displayed in standard decimal-dot notation.

B.7.2   Netmask Examples

Netmask	Host bits
255.255.255.252	2
255.255.255.248	3
255.255.255.240	4
255.255.255.224	5
255.255.255.192	6
255.255.255.128	7
255.255.255.0	8
255.255.254.0	9
255.255.252.0	10
255.255.248.0	11
.	.
.	.
255.128.0.0	23
255.0.0.0	24

Figure B-2

B.7.3   Private IP Networks and the Internet

If your network is not connected to the Internet and there are no plans to make such a connection you may use any IP address you wish.

If you are not connected to the Internet and have plans to connect, or you are connected to the Internet and want to operate your NTSes on an Intranet you should use one of the sub-networks below. These network numbers have been reserved for such networks. If you have any questions about IP assignment consult your Network Administrator.

```
Class A    10.x.x.x
Class B    172.16.x.x
Class C    192.168.0.x
```

B.7.4   Network RFC's

For more information regarding IP addressing see the following documents.
These can be located on the World Wide Web using one of the directories
or indices:

RFC 950   Internet Standard Subnetting Procedure
RFC 1700   Assigned Numbers
RFC 1117   Internet Numbers
RFC 1597   Address Allocation for Private Internets

C- Binary to HEX Conversion

Hexadecimal digits have values from 0..15, represented as 0...9, A (for 10),
B (for 11) ... F (for 15). The following table can serve as a conversion chart
bin - dec. - hex:

C.1   Bin/DEC/Hex Table

Decimal	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

Figure C-1

To convert a binary value to a hexadecimal representation, the upper and
lower four bits are treated separately, resulting in a two-digit hexadecimal
number.

Warranty Statement

Lantronix warrants for a period of FIVE YEARS from the date of shipment that each CoBox server supplied shall be free from defects in material and workmanship. During this period, if the customer experiences difficulties with a product and is unable to resolve the problem by phone with Lantronix Technical Support, a Return Material Authorization (RMA) will be issued. Following receipt of a RMA number, the customer is responsible for returning the product to Lantronix, freight prepaid. Lantronix, upon verification of warranty will, at its option, repair or replace the product in question, and return it to the customer freight prepaid. No services are handled at the customer's site under this warranty.

Lantronix warrants software for a period of sixty (60) days from the date of shipment that each software package supplied shall be free from defects and shall operate according to Lantronix specifications. Any software revisions required hereunder cover supply of distribution media only and do not cover, or include, any installation. The customer is responsible for return of media to Lantronix and Lantronix for freight associated with replacement media being returned to the customer.

Lantronix shall have no obligation to make repairs or to cause replacement required through normal wear and tear of necessitated in whole or in part by catastrophe, fault or negligence of the user, improper or unauthorized use of the Product, or use of the Product in such a manner for which it was not designed, or by causes external to the Product, such as, but not limited to, power or failure of air conditioning.

There are no understandings, agreements, representations or warranties, express or implied, including warranties of merchantability or fitness for a particular purpose, other than those specifically set out above or by any existing contract between the parties. Any such contract states the entire obligation of Lantronix. The contents of this document shall not become part of or modify any prior or existing agreement, commitment or relationship

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Warranty claims must be received by Lantronix within the applicable warranty period. A replaced product, or part thereof, shall become the property of Lantronix and shall be returned to Lantronix at the Purchaser's expense. ALL RETURN MATERIAL MUST BE ACCOMPANIED BY A RETURN MATERIAL AUTHORIZATION NUMBER ASSIGNED BY LANTRONIX.

Declaration of Conformity

(according to ISO/IEC Guide 22 and BS 7514)

**Manufacturer's
Name & Address:**   Lantronix
15353 Barranca Parkway, Irvine, CA 92618 USA

Declares that the product:

Product Names: Network Time Server
Device Server

**Model
Name/Number:**   NTP-01/02/03
CoBox-E2-01/02/03

Conforms to the following standards or other normative documents:

Safety: EN60950:1988+A1, A2

**Electromagnetic
Emissions:**   EN55022: 1998 (CISPR 22, Class A: 1993, A1: 1995, A2: 1996)
IEC 1000-3-2/A14: 2000
IEC 1000-3-3: 1994

**Electromagetic
Immunity:**   EN55024: 1998 Information Technology Equipment-Immunity Characteristics
IEC 6100-4-2: 1995 Electro-Static Discharge Test
IEC 6100-4-3: 1996 Radiated Immunity Field Test
IEC 6100-4-4: 1995 Electrical Fast Transient Test
IEC 6100-4-5: 1995 Power Supply Surge Test
IEC 6100-4-6: 1996 Conducted Immunity Test
IEC 6100-4-8: 1993 Magnetic Field Test
IEC 6100-4-11: 1994 Voltage Dips & Interrupts Test

(L.V.D. Directive 73/23/EEC)

**Supplementary
Information:**   *The product complies with the requirements of the
Low Voltage Directive 72/23/EEC and the EMC Directive 89/336/EEC.*

*This product has been verified as being compliant within the class B limits of
the FCC Radio Frequency Devices Rules (FCC Part 15, Subpart B), revised as
of October 1993.*

**Manufacturer's
Contact:**   Director of Quality Assurance, Lantronix
15353 Barranca Parkway, Irvine, CA 92618 USA

General Tel: 949/453-3990
Fax: 949/453-3995