

# Net • Controller

## User manual



**NET • CONTROLLER**

**NC9008  
NC8900**

**Rev 2.2  
2003-03-12**

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## Reference documents

Internet working with TCP/IP  
TCP/IP Illustrated

Douglas E. Comer, Prentice-Hall International  
W. Richard Stevens, Addison Wesley

### Revision logg

Rev	Date	By	Description
2.0	1999-09-20	JW	Original .
2.1	2000-11-15	JW	WEB server.
2.2	2003-03-12	TL	Replaced and corrected signal figures on page 8. Added 246008 cable on page 29.

### Document

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## Introduction

By using Net Controller, equipment's with serial communication by RS232/RS485, can be connected to a standard Ethernet network with TCP/IP.

The communication is completely transparent. Ethernet with TCP/IP offers a well thought and open architecture for communication on different platforms regarding computers and operating systems. Gives advantage in form of easy integration. By using the network instead of own serial cables and telephone line for modem, it is possible to reduce the costs for installation and maintain

Net Controller is a general standalone product and easy to integrate in systems. Two models is available, table and DIN rail model. Is power supplied With 12/24V AC or 12/24/48V DC. For the table model, an AC adapter is included

Each Net Controller has its own IP address and each serial port has its own TCP-port number.  
Handle subnets with Gateway and Netmask

By Using two Net Controller:S, it is possible to establish a serial link across the network to get point to point RS232 connection.

Net Controller has two serialports, it can be used for different equipment, with separate remote IP-address connection.  
The communication is completely transparent  
RS485 may handle point to point or multi points.

With two Net Controllers, a serial link can be established over the network

In modem mode, it can simulate Modem with AT commands. This function makes it possible to replace a Modem with a Net Controller, and connect is made with IP address instead of telephone number.

Remote control of equipment over the network by using the terminal software Telnet

Configuration of parameters such as IP-addresses, TCP-ports, Serial communication and Timeouts is managed over the network with web browser or via the serial port with utility software, NCsetup

Has Flash memory for easy update of the Net Controller software via the serial port

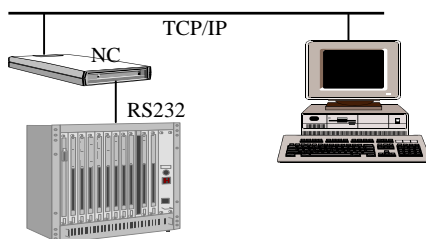
### Net Controller table model



### Net Controller DIN rail model



Figure of a Net Controller connected to a standard PC



## Overview

Each Net Controller has its own IP-address and each serial port has its own TCP-port numbers. Net Controller use Serial server for TCP communication and Web server for home pages.

The two serial ports is used independent, and can be used for different equipment

To transfer data over the network, a connection must be done first and after that the data is transfer. Then the data transfer is completed, a disconnect is done.

Connection can be made local by the first received data or remote by the remote unit.

Disconnection is made in the same two ways, local or remote.

Each serial port is configurable in depended regarding IP address and TCP port for remote connection.

Flow control is handled by two control signals, CTS/RTS.

In AT mode it is possible to connect to different remote Net Controllers, by using AT commands with IP Addresses instead of telephone number. In these mode also two extra Modem signals DTR/DCD is available.

### Net Controller connected to a PC

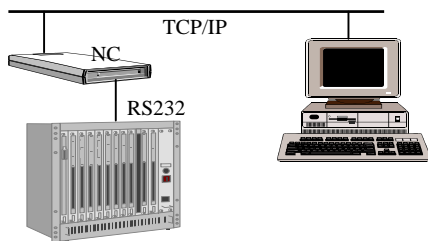
Equipment connected with Net Controller to the network.

In this case the PC network board is used.

By using Telnet on the PC, a remote control of the equipment is possible.

If the equipment is sending messages and the Net Controller is doing the connect, a server services must be running on the PC to accept the connect.

Figure of Net Controller - PC

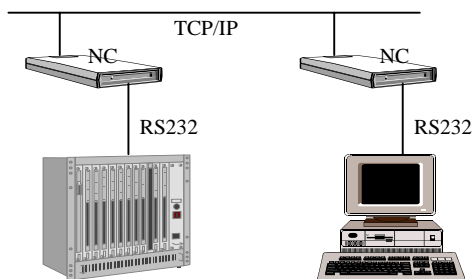


### Net Controller connected to other Net Controller

With two Net Controller, it is possible to have a transparent serial-communication via the network.

In this case a customized program in both ends can be used without any interference by the network.

Figure of Net Controller – Net Controller



## Protocol

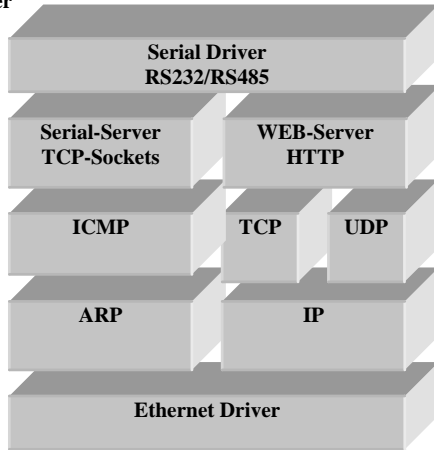
Net Controller supports network Ethernet IEEE 802.3 with TCP/IP and Serial RS232/RS485

Net Controller has two server services for TCP/IP communication.

Serial-server for RS232/RS485 communication.

WEB-server for RS232 and homepages.

### Net Controller



Description for each protocol, see:

- RS232 Serial communication
- Ethernet TCP/IP

**Set button**

With the Set button (by a hole in the case), the Net Controller is reset. The Set button has two functions, a short press make a reset, and a long press, at least in 5 sec, make a reset with set of factory parameters temporary loaded  
With factory parameters it is possible to go back if anything is made wrong

**RS232/RS485 Serial communication**

Net Controller has two serial-ports, SERIAL-1 with RS232/RS485, and SERIAL-2 with RS232  
Each can be setup with data format, speed and flow control. The control signals works differently depending on option.  
The serial communication is complete transparent.  
Signal levels: +12V On, -12V Off

**Trace/Setup Serialport-2**

To do Trace/Setup via the serial port-2, the Net Controller must be in Trace/Setup mode. This mode is normally turned off. To enter Trace/Setup mode, a reset with set must be done, by pressing the Set button in least 5 sec. To store the mode permanently, the Trace level must be set to higher value then 0. In other case the Net Controller is switched back to previous mode, either with store of parameters or by reset by pressing the Set button for a short time.

Se parameter **Option Trace**.

**Termination character**

Received characters is buffered until a defined termination character or a time gap is discovered and thereafter is send via TCP/IP. The time gap is selectable.

Se parameter **Serial-1 Stop character** and **Serial-1 Receive timeout**.

**Flowcontrol RTS**

For flow control the RTS and CTS is used. Normal no flow control is used. With this option the RTS control the flow from Net Controller and CTS control the flow to Net Controller.

Se parameter **Serial-1 RTS Contrl**.

**Connect/Disconnect DTR**

Connect and Disconnect by DTR. Normal the Connect is made on first received message and Disconnected by timeout. With this option the DTR is used. It is also used in AT mode to do disconnect.

Se parameter **Option Con/Dis**.

**AT command**

In AT mode, the Net Controller acts as Modem. Make it possible to connect with AT command and use IP address instead of telephone number (simulate a Modem). In AT command mode two control signals is available, DTR and DCD.

Se parameter **Option AT-C**.

**Disconnect only with DTR**

In AT mode it is possible to disable disconnect by +++ and ATH command. If this option is enabled, only disconnect can be made by control signal DTR.

Se parameter **Option Dis. ATH**.

**V0/1**

With AT command V0 or V1, selects response code in numeric form V0 or text form V1.

Default value for V0/1 is selectable by option

Se parameter **Protocol V0/1**.

**X0/1**

With AT command X0 or X1, selects response code in standard X0 or extended X1.

Default value for X0/1 is selectable by option

Se parameter **Protocol X0/1**.

**Command and data state**

In AT mode the Net Controller is in command or data state. In Command state, it is possible to send instruction , AT commands. In Data state, everything is accepted as data, and transmitted via network

**Command state**

Net Controller is shifted to Command state on power up, disconnect, DTR off and escape sequence +++

**Data state**

Net Controller is shifted to Data state on connect and ATO.

**Commands**

- AT Command prefix. A AT command string must start with this characters except escape (+++).
- DT Connect with IP address. The address must be 12 digits without any dots. All the digits in the group must be filled out with zeros to three digits number. IP Adress 192.168.0.1 will be 192168000001. TCP port number can be added after the IP address, 10001 will be 19216800000110001. Response with CONNECT and set DCD On.
- H0 Disconnect. Response with OK and set DCD Off.
- Vn Verbose response codes. V0= Numeric, V1= Text. Response with OK.
- Xn Extended response codes. X0= Standard, X1/X2/X3/X4= Extended. Response with OK.
- +++ Escape sequence, force Net Controller to command state. Response with NO CARRIER and set DCD Off.
- DTR Off Disconnect and force to command state. Response with NO CARRIER and set DCD Off.
- DTR On Available for command and listen for connect. Response with RING, CONNECT and set DCD On.

**Response code**

Code	Text	X setup
0	OK	0 - 4
1	CONNECT	0
2	RING	0 - 4
3	NO CARRIER	0 - 4
4	ERROR	0 - 4
5	CONNECT 1200	1 - 4
10	CONNECT 2400	1 - 4
11	CONNECT 4800	1 - 4
12	CONNECT 9600	1 - 4
16	CONNECT 19200	1 - 4

**Example on AT strings**

Example on useable AT strings

Init string for extended numerical response codes

```
ATV0X2
OK
```

Connect with IP address 192.168.0.2

```
ATDT192168000002
CONNECT
```

Connect with IP address 192.168.0.2 and TCP port number 10002.

```
ATDT19216800000210002
CONNECT
```

Disconnect

```
+++ATH0
OK
```

Entering Command state and keeping the Data connection

```
+++ AT ATO
OK OK CONNECT
```

**Figure of RS232 table model NC9008**

Signal names defined with Net Controller as DCE, Data Communication Equipment.

<b>RJ45 connector for serial ports (Net Controller is DCE)</b>	
Serial port-1 RS232	Serial port-2 RS232
1. <DTR (Modem)	3. GND
2. >DCD (Modem)	4. >RD
3. GND	5. <TD
4. >RD	7. <RTS
5. <TD	8. >CTS
6. >DSR	
7. <RTS	
8. >CTS	
Serial port-1 RS485 4-wire/2-wire (Serial port-2 available)	
4. T+	
5. T-	
7. R+	
8. R-	

**Figure of RS232 DIN rail model NC8900**

Signal names defined with Net Controller as DCE, Data Communication Equipment.

<b>RJ45 connector for serial ports (Net Controller is DCE)</b>	
Serial port-1 RS232	Serial port-2 RS232
1. GND	7. GND
2. >RD	8. >RD
3. <TD	9. <TD
4. >DSR	
5. >CTS	
6. <RTS	
Serial port-1 RS232 Modem (Serial port-2 not available)	
1. GND	
2. >RD	
3. <TD	
4. >DSR	
5. >CTS	
6. <RTS	
8. >DCD (Modem)	
9. <DTR (Modem)	
Serial port-1 RS485 4-wire/2-wire (Serial port-2 available)	
2. T+	
3. R+/T+	
5. T-	
6. R-/T-	



**RS485**

Net Controller, with RS485 is a special version with this interface supplied for Serialport-1. Selectable for two wire with half duplex or four wire with full duplex, and for point to point or multipoint. Selectable on data format and speed. Signal levels: Mark "1" T/R- T/R+ (idle), Space "0" T/R+ T/R-.

**RS485 Interface**

For DIN rail model, the option for RS485 must be set. Se parameter **Option RS485 Interf.**

**Multipoint**

Activate *Transmit* in none-active state (free) when data's not transmitted. Used for multipoint. When point-to-point is used, *Transmit* is always active. Se parameter **Option RS485-Multipoint.**

**Halfduplex**

When half duplex is set, *Receive* is closed during transmission. When full duplex is set, *Receive* is always active. Se parameter **Option RS485-Halfduplex.**

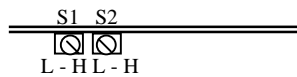
**Switch low/high impedance**

The termination can be selected to a high (12 k ohm) or to low (120 ohm) impedance. With point-to-point a low impedance is used and for multipoint a high impedance is used, except for the endpoints, where low impedance is used. For table NC9008 Se switch **S1** and **S2**. For DIN rail NC8900 Se parameter **Option Terminate Send** and **Option Terminate Rec.**

**Switch S1 och S2**

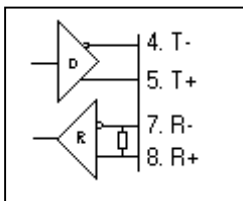
Koppling	S-1	S-2	Option-halfduplex	Option-Multipoint
Point + full-duplex	ON	OFF	0	0
Point + half-duplex	ON	OFF	1	0
Multipoint + full-duplex	OFF*	OFF*	0	1
Multipoint + half-duplex	OFF*	OFF	1	1

\*) S1= Receive, S2= Transmit

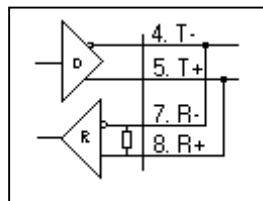


**Figure of RS485**

4-wire full duplex

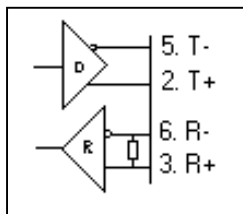


2-wire half duplex

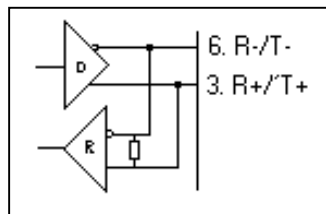


**Figure of RS485**

4-wire full duplex



2-wire half duplex



## Ethernet TCP/IP

Communication protocol for the network is TCP/IP.

### Has support for the following protocols:

- ARP, Address Resolution Protocol.
- IP, Internet Protocol.
- ICMP, Internet Control Message Protocol.
- TCP, Transmission Control Protocol.
- HTTP, Hyper Text Transfer Protocol

## IP

IP *Internet Protocol* is a network protocol which handles the transmission of data packages with IP-addresses in an TCP/IP network.

The addressing scheme is integral to the process of routing IP datagrams through an internet work. Every host on the network must have a unique IP address.

An IP address is 32 bits in length, divided into either two or three parts. The first part designates the network address, the second part (if present) designates the subnet address, and the final part designates the host address. Subnet addresses are only present if the network administrator has decided that the network should be divided into subnetworks. The length of the network, subnet and host field are all variable.

IP addresses are written in dotted decimal format, for example 192.168.0.1

IP networks can also be divided into smaller units, called subnets. Subnets provide extra flexibility for the network administrator to subdivide the network using subnetting. To specify how many bits are used, IP provide the subnet mask.

## Gateway

Gateway is a routing devices in the Internet and are organized hierarchally. If the network part and the subnet part of the destination IP address compared with it's own IP address not match in a datagram, a routing take place and routes the datagram through the default gateway.

## TCP

TCP *Transport Control Protocol*. TCP provides fullduplex, acknowledged, and flow controlled services to upper upper layer protocols. It moves data in a continues, unstructured byte stream where bytes are identified by sequence numbers.

TCP allows multiple application programs on a given host to communicate concurrently, by using protocol port number to identify the ultimate destination within a host.

TCP uses the connection as its fundamental abstraction, connection are identified by pair of endpoint. Endpoints is defined as pair of integers (host, port), where host is the IP address and port is the TCP port number.

## HTTP

HTTP is a protocol to handle client-server communication for Hypertext documents (homepages).

## Installation

### Contents included for table model NC9008

1. Net Controller
2. Getting started
3. CD with utility Ncsetup and User manual
4. AC Adapter 230V
5. Serial cable D-SUB-9

The Set button is located via a hole on the side, marked Set.

### Contents included for DIN rail model NC8900

1. Net Controller
2. Getting started
3. CD with utility Ncsetup and User manual

The Set button is located via a hole on the front, marked S.

### IP address

To connect the Net Controller to the TCP/IP network, it must have a unique IP address. The Net Controller has as default the IP-address, 0.0.0.0. The IP address can be configured over the network or via the serial port. Other parameters as TCP port number, data format, timers is configured if it is necessary.

For RS485 the Net Controller must be supplied with RS485 interface.

The Set button have two functions, reset or reset with set of factory parameters.

- Short press gives reset
- Long press gives reset with set. Must be pressed in least 5 sec

With factory parameters is it possible to go back if anything is made wrong.

If two Net Controllers is used to build a communication link, the IP address for local and remote shall be set opposite to each other. That means, the Net Controller 1 remote address shall correspond against Net Controller 2 local address and vice versa.

### To install the utility Ncsetup

If configuration via the serial port-2 is used, the Ncsetup must be installed.

Install:

1. Insert CD into your CD-Recorder.
2. From Start menu, select Run
3. Type d:\setup (or the appropriate device letter)
4. Follow the installation instructions on the screen

The utility Ncsetup is ready for use. Connect the PC cable to Serial port-2.

## 5. Install the Net Controller

Before to use the Net Controller you must have an IP address from network manager.  
You also need the hardware (MAC) address of the Net Controller. This is printed on a label, outside of the Net Controller.  
It is possible to do configuration over the network or via the serial port.

1. Connect the TP to the network.
2. Connect the serial port-1 to your equipment.
3. Connect power supply.

### Configure over the network

Set a static IP-address with the Net Controller address, by using the ARP command. Example with IP-address 192.168.0.1 and the Net Controller with address 00-02-B8-00-00-01

1. **ARP -S 192.168.0.1 00-02-B8-00-00-01**
2. Start the web browser and use the IP-address in the address field to address to the Net Controller  
**http://192.168.0.1**  
The start page is showed
3. Set the password **control** in the password field and click on **Ok**  
The menu and address page is showed
4. Check the IP-address and click on **Ok**  
The response text **Parameters changed** is showed
5. Select **Store** on the menu  
The store page is showed
6. Set **yes** in the confirm field and click on **Ok**  
The text **Parameters stored** is showed  
and the Net Controller performed a Reset

Net Controller has assigned an IP-address. Change any other necessary parameters.

### Via serial port

You have to install the utility software NCrsetup first. The utility is supplied on the CD.

1. Connect the PC to serial port-2 (Trace/Setup)
2. Start the utility NCsetup
3. Make a reset with set on Net Controller, by pressing the Set button in least 5 sec.
4. A print out is made on the Trace window
5. Select **File, Options**  
The option window is showed
6. Set Net Controllers IP address in **Local IP** field and click on **Apply**

Net Controller has assigned an IP-address. Change any other necessary parameters.

## Test

To verify the Net Controller is correct configured for the network, two standard program can be used, **ping** to test IP address and **telnet** to test TCP port and serial communication.

### IP address

The IP addresses 192.168.0.1 is used as example

1. Run **ping** with the Net Controller IP address, the Net Controller is responding if the settings is right.  
**PING 192.168.0.1**

### TCP port

2. To verify the TCP port number and serial communication for the Net Controller, the utility **telnet** is used.  
Run **telnet** and on connect to the Net Controller by select remote IP address and TCP port number.  
Run **TELNET**, select **Remote connect**.  
On the Remote window set the Hostname to **192.168.0.1**, same as the Net Controller Local IP address, and the port number **10001**, same as Net Controller local TCP port-1. Click **Connect**  
On connect the IP address is showed in the title  
All the entries characters in the telnet window is now transmitted out via the Net Controller serial port, and all the received characters on the Net Controller serial port is showed on the telnet window.

### AT Command

3. To verify AT commands the utility HyperTerminal can be used.  
Run **hyper terminal** and choice a communication port with Modem. *You must choice a Modem for hyper terminal. It will not work if you press letter for letter.*  
If no Modem is installed, you have to install it. You can select a standard Modem 9600.
4. Enter IP address instead of telephone number in phone number field, click on **connect**.  
On connect the status connected is showed.  
Every entered keys is now send it via the Net Controller.  
Use **disconnect** to close.

The Net Controller is now ready for use.

## Unix telnet

Verifying the Net Controller with ping and telnet under Unix.

1. Run **ping** with the Net Controller IP address, the Net Controller is responding if the settings is right  
**/usr/user> ping 192.168.0.1**
2. Run telnet to verify the Net Controller TCP port number and communication.  
All the entries characters under telnet is now transmitted out via the Net Controller serial port, and all the received characters on the Net Controller serial port is showed on the screen  
**/usr/user > telnet**  
**telnet > open 192.168.0.1**           Open command  
Trying192.168.0.1  
Connected to 192.168.0.1  
Escape character is '^]'  
  
**telnet > ^]**                   Escape character, enter command mode  
**telnet > close**               Close command  
Connection closed  
**telnet > quit**               Quit command  
**/usr/user >**

## Net Controller setup

The Net Controller is configured over the network with web browser or via serial port with utility software NCsetup. The Ncsetup utility is communicated with the Net Controller via serial port-2, so this port must be connected to the PC with the NCsetup utility running on.

**Imported**, if serialport-2 is used for communication, the Trace/Setup is turned off. You have to turn it on by pressing the Set button at least in 5 sec, to enter the Trace/setup mode temporary, and after that you are able to use serialport-2 for configuration.

If Net Controller will be permanent in Trace/Setup mode, the trace level must be set to 3, the standard value. After the setup is completed or by pressing the Set button, the Net Controller is turned back to the previous mode.

### Settings for Net Controller

#### Ethernet address

Net Controllers own physical Ethernet address MAC. This address is unique for every Net Controller and should not be changed, set by factory.

#### Gateway

If IP-routing via Gateway is selected, you have to set IP address for the default Gateway and the subnet mask. The Gateway is set to 255.255.255.255 if no Gateway is used.

#### Netmask

Is used for subnets. If it used a Gateway must also be selected. For 256 users it is set to 255.255.255.0

#### Local IP address

Net Controllers own IP address.

Default set to 192.168.0.1

#### Local TCP-1 port

Net Controllers own TCP port number for serial-1 port. Use number higher then 5000.

Default set to 10001.

#### Local TCP-2 port

Net Controllers own TCP port number for serial-2 port. Use number higher then 5000.

Default set to 10002

#### Remote IP-1 address

IP Address for the remote connection for serial-1 port. Is the host the Net Controller is connected to on data received on serial-1 port.

Default set to 192.168.0.2

#### Remote TCP-1 port

TCP port number for the remote connection for serial-1 port. Is the host the Net Controller is connected to on data received on serial-1 port. Use number higher then 5000.

Default set to 10001

#### Remote IP-2 address

IP Address for the remote connection for serial-2 port. Is the host the Net Controller is connected to on data received on serial-2 port.

Default set to 192.168.0.2

#### Remote TCP-2 port

TCP port number for the remote connection for serial-2 port. Is the host the Net Controller is connected to on data received on serial-2 port. Use number higher then 5000.

Default set to 10002

#### Option Trace

Activate and set level of trace output and monitoring by the utility. Lets you now that Net Controller is doing and help you resolve any problems. The trace use serial-2 port to output data and this is set to zero if the serial-2 port is used for user communication.

0= Not activated.

1= Errors level.

2= Basic level.

3= Application level.

4= TCP/IP level.

#### Option Encryption

Activate 64 bits encryption with the algorithm SAFER-64.

#### Option Dis ATH

Turn off disconnect by ATH command. The Net Controller is only disconnect by control signal DTR, in other case the +++ and ATH is used to disconnect.

Is used together with Option AT-C.

#### Option Dis. WEB

Disable the WEB interface. Is activated default by the Set button or configuration via the serial port.

#### Option RS485 Interf

Activate RS485 interface. Is only for NC8900 with RS485 interface, and shall for that model always be set.

**Option Con/Disc**

Activate connection control with control signal DTR. By set the DTR On, the Net Controller Connect and on successful connection the CTS goes on, and by set DTR Off, the Net Controller Disconnect and the CTS goes Off.

**Option Dis D Ack**

Turn off the delayed ACK. No delay on TCP-Ack on received TCP-Message. Normal the TCP protocol waits 200 MS before an Ack is made. In some cases this can slow down the communication.

**Option AT-C**

Activate AT commands and the Net Controller acts as a Modem. All command strings must start with the prefix AT. DTR must be On and on a connection the DCD goes ON. The line goes disconnected by set the DTR Off.

**Option Dis. Rem. Con.**

Disable the possibility for remote connections. Connection can only be made locally by received characters on serial ports

**Option RS485-Multipoint**

Activate Z-state. The transmit line is in high impedance if nothing has to sent. Used in multipoint environment.

**Option RS485-Halfduplex**

Turn off the receiver. The receiver is turned off if a transmit is going on. Used in half duplex environment. In full duplex mode the receiver is always turned on.

**Option Permission**

Activate permission verify. Then a remote Net Controller or Computer made a connection, Net Controller can verify the IP address for the remote host is the same as the remote IP address set in the Net Controller.

In this way only the remote host in the Net Controller list is allowed to connect.

**Option Dis Auto Conn**

Turn off auto connect. No connection is made on received characters on serial port. Connection can only be made by remote host.

**Option Terminate Send**

Activate the termination to low impedance. Select between high 12k ohm or low 120 ohm for send.

**Option Terminate Rec**

Activate the termination to low impedance. Select between high 12k ohm or low 120 ohm for receive.

**Serial-1**

Select the Speed for serial-1 port. Baud rate 600-19.2 K.

**Serial-1 Odd, Even, None Parity**

Select the parity for the serial port-1 between odd, even or none parity bit.

**Serial-1 8/7 Data bits**

Select the number of data bits for the serial port-1 between 7 or 8. Marked means 8 data bits.

**Serial-1 2/1 Stop bits**

Select the number of stop bits for the serial port-1 between 1 or 2. Marked means 2 stop bits.

**Serial-1 RTS Control**

Activate the flow control for serial-1 port. On flow control the control signal RTS is used for data from Net Controller, and CTS is used for data to Net Controller.

**Serial-2**

Select the Speed for serial-2 port. Baud rate 600-19.2 K.

**Serial-2 Odd, Even, None Parity**

Select the parity for the serial port-2 between odd, even or none parity bit.

**Serial-2 8/7 Data bits**

Select the number of data bits for the serial port-2 between 7 or 8. Marked means 8 data bits.

**Serial-2 2/1 Stop bits**

Select the number of stop bits for the serial port-2 between 1 or 2. Marked means 2 stop bits.

**Serial-2 RTS Control**

Activate the flow control for serial-2 port. On flow control the control signal RTS is used for data from Net Controller, and CTS is used for data to Net Controller.

**Start Character**

Not used.

**Stop Character**

Set the terminating character for received messages. The received characters is buffered until a termination character or a time gap obtained.

**Protocol V0/1**

Sets the default value for AT command Verbose response codes. Marked means V1 text codes, otherwise V0 numeric codes.

**Protocol X0/1**

Sets the default value for AT command Extension response codes. Marked means X1/X2/X3/X4 extended codes, otherwise X0 basic codes.

**Protocol Proto-3, 4**

Not used.

**Protocol C12**

Sets the response code for connect for AT command, Marked means always response with CONNECT 1200.

**Protocol Proto-6, 7, 8**

Not used.

**Connect Timeout**

Sets the time for disconnect on idle line. If the communication is hold longer then the selected time, the line is disconnected.

**Activity timeout**

Sets the time for restart on idle activity. If the communication is hold longer than the selected time, the Net Controller is reset.

**Serial-1 Receive Timeout**

Sets the time for received time gap for serial port-1. The received characters is buffered until the time gap occurred. The message is terminated and send via network.

**Serial-2 Receive Timeout**

Sets the time for received time gap for serial port-2. Se parameter Serial-1 Receive Timeout.

**Identity**

Identity by 8 characters. Used to give every Net Controllers it's own Id. Used by the WEB browser to login to get access to configuration.

**Password**

Password by 8 characters. Used to give every Net Controllers a password. Used by the WEB browser to login to get access to configuration.

**Encryption key**

Encryption key by 8 characters. 64 Bits encryption for data messages.

**Security Service**

Enable the possibility to set the Option Test and Ethernet address. Only for factory.

**Security Reset**

Enable Reset of Net Controller. The Net Controller is reset and the factory setup of parameters is done.

**Switch High/Low Impedance**

RS485, switch between high/low impedance for receive. For point to point connection should be set low. For multipoint connection, the master and terminating slaves should be set to low and all th other to high.



## Net Controller Statistic

Gets the statistics on the communication for the Net Controller. By using this function it is possible to see if it is any problem on the network.

Statistics on:

No of packets in:	No of received packets
No of packets out:	No of transmitted packets
No of bytes in:	No of received bytes
No of bytes out:	No of transmitted bytes
No of errors in:	No of received errors, as crc, overrun etc.
No of errors out:	No of transmitted errors as timeouts, collisions etc.
No of packets lost:	No of lost packets, as out of handlers etc.
Net Error:	Last net error code.
State Socket-1:	State for port-1, as open, close etc.
State Socket-2:	State for port-2, as open, close etc.

## Net Controller Download

Download of new software to upgrade the Net Controller.

The software file type is **\*.hex**.

The download take around five minutes.

### **IMPORTED**

**Do not stop the load by exit the loadprogram or turn of the power to the Net Controller until the download is finished.**

## Net Controller Trace

To monitoring what the Net Controller is doing, the trace output is used.  
How much the Trace output shall show is selected by Trace level, see **Option Trace**.

### Startup

```
0001 Srtartup   NC 0200      3248
0002 Restarts  No           0
0003 Ethernet  002098010000
0004 Gateway   255.255.255.255
0005 Netmask   255.255.255.0
0006 Local IP  192.168.0.1
0007 Local TCP Port-1      10001
0008 Remot TCP Port-2      10002
0009 Remot IP  192.168.0.2
0010 Remot TCP Port-1      10001
0011 Remot TCP Port-2      10002
0012 Serial-1  9600,8,1,0
0013 Serial-2  9600,8,1,0
0014 Port-1    Closed      0
0015 Port-2    Trace
```

### Connect

```
0016 Port-1    Connected
```

### Send/Recive

```
0017 Send Message      1
0018 Receive Message   1
```

### Disconnect

```
0019 Port-1    Closed
0020 Closed     Done
```

### AT Commands

```
0021 AT        AT           Connect
0022 AT        Response 0
0023 AT        ATE0V1
0024 AT        Response 0
0025 AT        ATDT192168000001
0026 AT        Response 1

0027 AT        ATH           Disconnect
0028 AT        Response 0
```

**TCP/IP Trace level**

Trace level 4 includes TCP/IP internal errors

**Trying to find unit with IP address 192.168.0.10 by using ARP protocol**

```
tc_arp_to - retries left = 3
tc_arp_to - IP addr arping = = 192.168.0.10
tc_arp_to - retries left = 2
tc_arp_to - IP addr arping = = 192.168.0.10
tc_arp_to - retries left = 1
tc_arp_to - IP addr arping = = 192.168.0.10
tc_arp_to - retries left = 0
tc_arp_to - IP addr arping = = 192.168.0.10
tc_arp_qpurge - giveup retry
to_proc - stop retrying; return listen state: lasttime,sincetime=1997
```

**Retransmit**

```
timeout - retrans - state,out.contain = 4 0
          retrans - lasttime,sincetime = 195a 195a
          port->out.nxt_to_send, port->out.nxt = 4b86000 4b86000
          remote window size = 16d0
reset_nxt_to_send - new window size after update, nxt_to_send=16d0
ERROR REPORT: socket number = 5
ERROR REPORT: TCP RETRY
```

**Closing connection**

```
ERROR REPORT: socket number = c
ERROR REPORT: TCP CONNECTION CLOSING
```

**Net Controller Reset/Service**

Reset all parameters to factory setup and performe diagnostic test of Net Controller.

After reset, all the parameters which was customized, must be setup again, se **Installation**.

**Reset**

```
0001 Srartup   NC 0200      3100
0002 Test NC   Service
0003 Memory   Size kb    128
0004 Code     Checksum  3248
0005 Serial-1 Loopback  0
0006 UM9008 Found
```

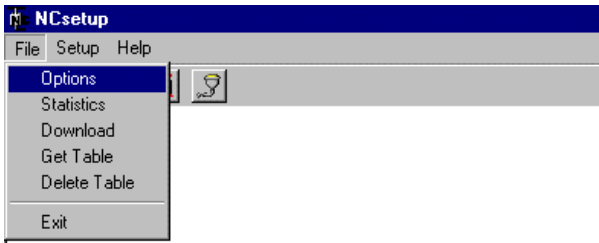
## Ncsetup Win/NT

To install the utility, see **Installation**.

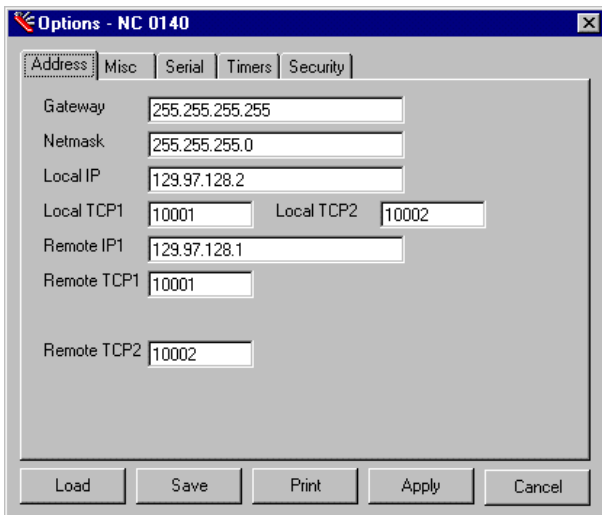
**Imported**, if serialport-2 is used for communication, you have to start the Net Controller by pressing the Set switch at least in 5 sec. That means the Net Controller is entered setup mode temporary to make you able to use serialport-2 for configuration. After the setup is completed the Net Controller is turned back to communication mode.

### Options

Get/Set Options



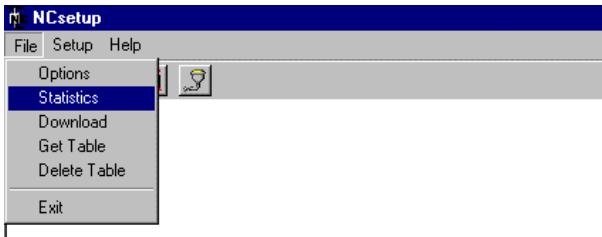
The Options is loaded from the Net Controller and showed. Click Apply to store the Options to the Net Controller.



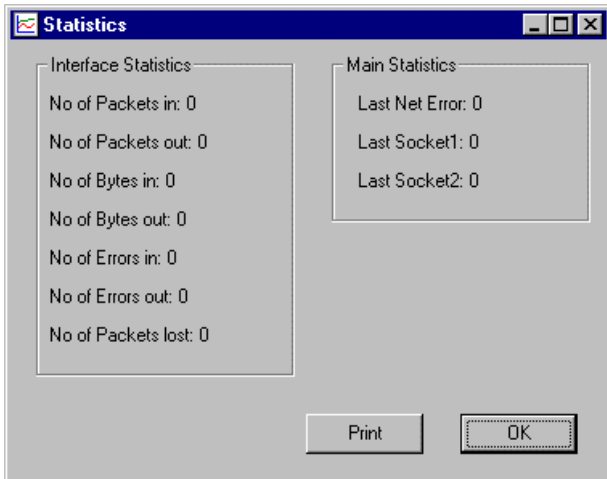
The Options can be stored to or loaded from a file. To printout click Print.

**Statistics**

Get Statistics



The Statistics is loaded from Net Controller and showed.



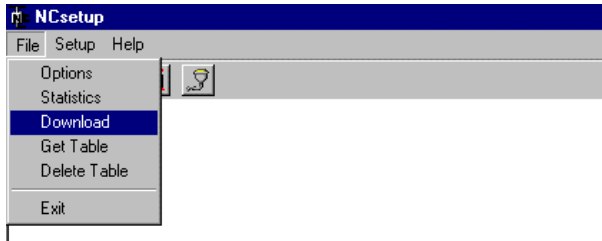
To printout the statistics click Print.

**Download**

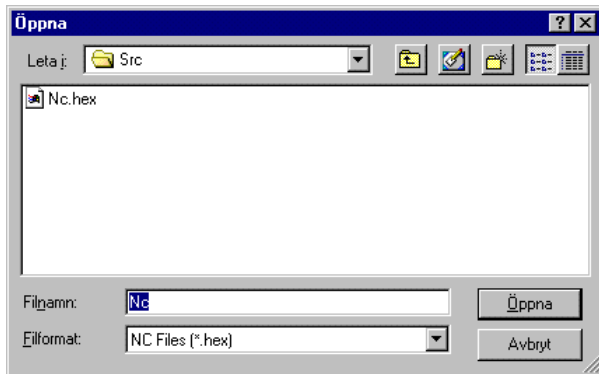
Download of new software to upgrade the Net Controller.

The download take around five minutes and it is imported to not stop the load by exit the loadprogram or turn of the power to the Net Controller until the download is finished.

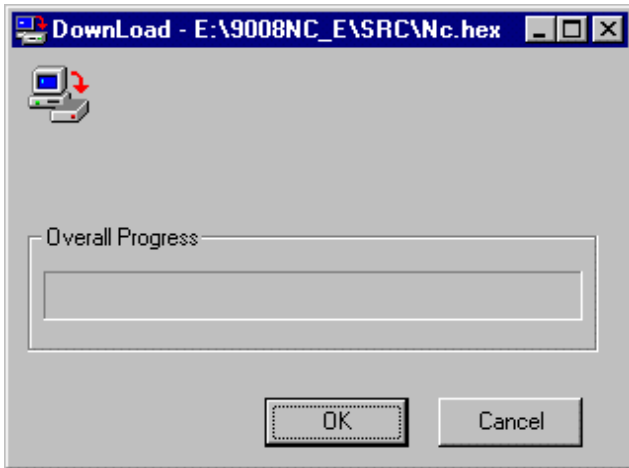
Download of new software upgrade to the Net Controller



Select the download file (type \*.hex) and click Open.

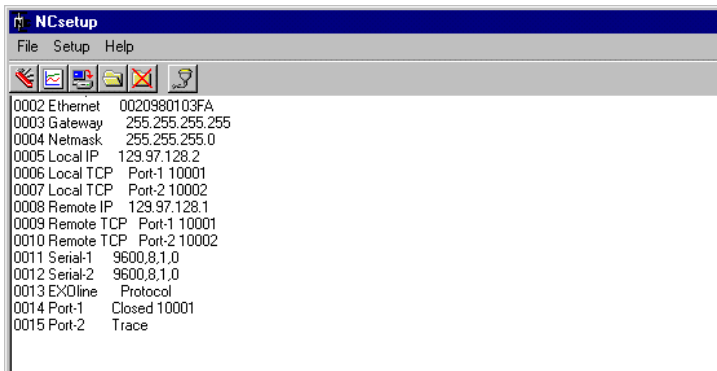


To start the download click OK.



### Trace

Monitoring of Trace output.



## Ncsetup DOS

To install the DOS version, copy the file d:/DOS/ncsetup.exe to a directory.

**Imported**, if serialport-2 is used for users equipment, you have to start the Net Controller by pressing the Set switch at the same time the Net Controller is powered up by connecting the power cable to the Net Controller power input port. That means the Net Controller is entered setup mode to make you able to use serial port-2 for configured. After the setup is completed the Net Controller is turned back to communication mode.

The function keys are used to select different functions.

- F5, Get Options, loads the option from the Net Controller.
- F6, Set Options, store the options to the Net Controller.
- F7, Download software upgrade to Net Controller.
- F8, Get statistics from Net Controller.
- Monitoring Trace output on the screen.

### Get Options F5

Load Options from Net Controller. Press F5 key.

```

NC Version= NC 0200
NC Status= 0
Ethernet address= 00:20:98:01:00:00
Gateway= 255.255.255.255
Netmask= 255.255.255.0
Local IP address= 192.168.0.1
Local TCP port-1= 10001
Local TCP port-2= 10002
Remote IP address-1= 192.168.0.2
Remote TCP port-1= 10001
Remote IP address-2= 192.168.0.2
Remote TCP port-2= 10002
Option= 0003
Serial-1= 0c
Serial-2= 0c
Start char= 00
Stop char= 00
Protocol= 00
Connect= 10
  Activity= 0
  Receive = 2

```

### Set Options F6

Store Option to the Net Controller. Press F6.

The Options is first loaded from the Net Controller and showed line by line. If no changes only press Enter without any entries and the line is skipped.

At the end of set option sequence the options is stored to the Net Controller.

To break the store option sequence, press ! and Enter.

Set Options to Net Controller. Press F6 key.

First parameter is shown. Change it or press only Enter to step thru.

Go thru all the parameters and on the last one the parameters is stored into the Net Controller.

Parameters:

```

NC Version= NC 02.00

NC status= 0
(0=Reset): Resets the Net Controller

Ethernet address= 00:20:98:01:00:00
(nn:nn:nn:nn:nn:nn): Physical ethernet address, dont change

Gateway= 255.255.255.255
(nnn.nnn.nnn.nnn): Gateway address (255.255.255.255=none)

Netmask= 255.255.255.0
(nnn.nnn.nnn.nnn): Netmask

Local IP address= 192.168.0.1
(nnn.nnn.nnn.nnn): NC Local IP address

Local TCP port-1= 10001
(nnnnn): Local TCP port-1 number for serial-1, (10001-65535)

Local TCP port-2= 10002
(nnnnn): Local TCP port-2 number for serial-2, (10001-65535)

```



```

Remote IP address-1= 192.168.0.2
(nnn.nnn.nnn.nnn): Remote IP address-1

Remote TCP port-1= 10001
(nnnnn): Remote TCP port-1 number for serial-1,(10001-65535)

Remote IP address-2= 192.168.0.2
(nnn.nnn.nnn.nnn): Remote IP address-2

Remote TCP port-2= 10002
(nnnnn): Remote TCP port-2 number for serial-2,(10001-65535)

Option= 0003
(npra hmco sdwe 0ttt): Option
    t= Tracelevel (0-7)
    e= Encryption
    w= Dis. WEB
    d= Dis ATH
    s= Service, only factory.
    o= En Con/Dis
    c= AT Command
    m= 485-Multipoint
    h= 485 Half duplex
    a= Dis. D. Ack.
    r= Dis. Rem. Con.
    p= Permission
    n= Dis. Auto Con.

```

Example on options

Option	With trace	No trace
AT-C	03 03	03 00
ATC+D.Ack	13 03	13 00
2-wire RS485	0C03	0C00
1 port	00 03	00 00
2 ports	----	00 00

```

Serial-1= 0c
(fpps dbbb): Flow + Parity + Data + Speed
    f= Flow control (0=None, 1=with RTS/CTS)
    pp= Parity (0=None, 1=Odd, 2=Even)
    s= Stop bits (0=1 stop, 1=2 stop)
    d= Data bits(0=7 databits, 1=8 databits)
    bbb= Speed (0=600,1=1200, 2=2400, 3=4800, 4=9600, 5=19200)

```

Example on speed and dataformat

Speed	8-bit	8 Evn	8 Odd	7-bit	7 Evn	7 Odd	RTS/CTS
19200	0D	4D	2D	05	45	25	8D - A5
9600	0C	4C	2C	04	44	24	8C - A4
4800	0B	4B	2B	03	43	23	8B - A3
2400	0A	4A	2A	02	42	22	8A - A2
1200	09	49	29	01	41	21	89 - A1
600	08	48	28	00	40	20	88 - A0

```

Serial-2= 0c
(fpp0dbbb): Flow + Parity + Data + Speed Se Serial-1

```

```

Start char= 00
(00-1F): Start-character (00=None)

```

```

Stop char= 00
(00-1F): End-character (00=None)

```

```

Protocol= 00
(000f 00xv): AT command setup:
    v= Verbose response codes, 1= V1 text, 0= V0 numeric.
    x= Extended response codes, 1= X1/X2/X3/X4 extended, 0= X0 basic.
    f= Fix response codes, 1= Always CONNECT 1200, 0= Standard.

Connect= 10
(0-255): Time, Timeout for connect, in seconds(0=None)

Activity= 0
(0-255): Time, Timeout for activity, in minutes(0=None)

Receive-1= 2
(0-255): Time, Timeout for time gap, in millisecond(0=None)

Receive-2= 2
(0-255): Time, Timeout for time gap, in millisecond(0=None)

Identity= NC8900
(aaaaaaaaa): Id, 8 characters

Password= control
(aaaaaaaaa): Password, 8 characters

Encryption key= 12345678
(aaaaaaaaa): Encryption key, 8 characters

```

**Get Statistics F8**

Get Statistics from the Net Controller. Press F8 key.

Se Net Controller Statistic

**Download F7**

Download software upgrade to the Net Controller.

The download file must be on same directory as the DOS utility software and renamed to **nc.hex**.

The download take around five minutes

**Imported**

**Do not stop the load by exit the load program or turn of the power to the Net Controller until the download is finished.**

**Download of new software upgrade to the Net Controller**

Press F7.

The warning text is showed.

```
Start Download (n/j)
```

Start the download by press **J** and **Enter**.

The load text is showed.

```
Download to NC
- Erase
```

```
- Download completed
Check the build!
```

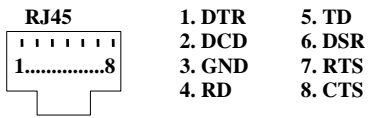
The Download is ready

## Connections Table model NC9008

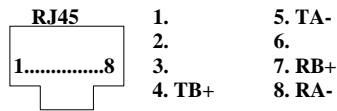
### Serialport SERIAL-1

Serialport-1 connector is used both for RS232 and RS485

- RS232, RJ45



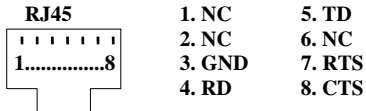
- RS485, RJ45



### Serialport SERIAL-2

Serialport-1 is for RS232

- RS232, RJ45



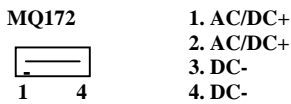
### Integrated Power Supply PWR

Integrated Power Supply for AC or DC.

For AC use pins 1 and 2

For DC use pins 1 for +V and 4 for -V

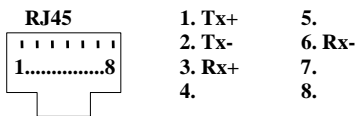
- AC/DC Power, MQ172



### Ethernet TP

Twisted pair 10BaseT.

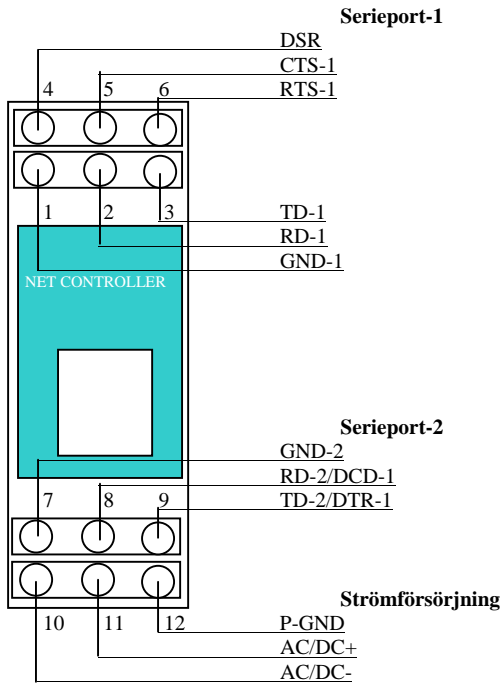
- 10BaseT Twisted pair, RJ45.



**Connections DIN rail model NC8900**

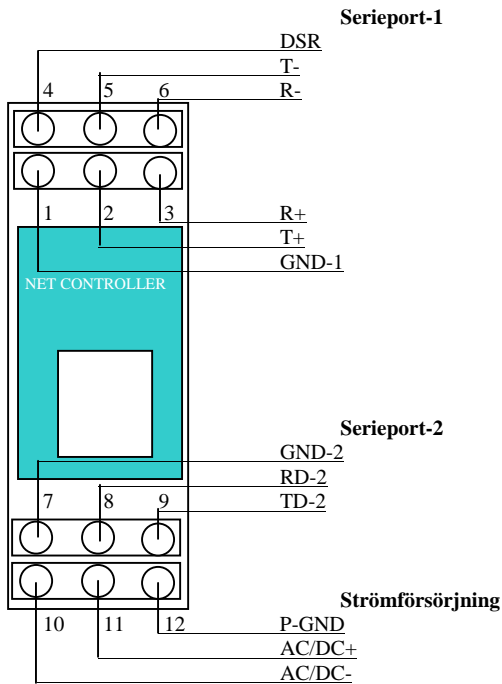
Serieport-1 RS232

Serieport-2 RS232



Serieport-1 RS485

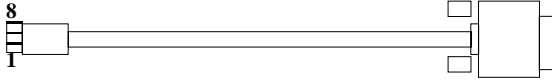
Serieport-2 RS232



**Cable Table model NC9008**

**24 60 01 RS232 cable NC-PC/AT 9-pins DSUB F**  
Serial cable for RS232 to PC, 9-pins DSUB Female.

RJ45		DSUB-9F
1.	<DTR white/orange	4.
2.	>DCD orange	1.
3.	GND white/green	5.
4.	>RD blue	2.
5.	<TD white/blue	3.
6.	>DSR green	6.
7.	<RTS white/brown	7.
8.	>CTS brown	8.

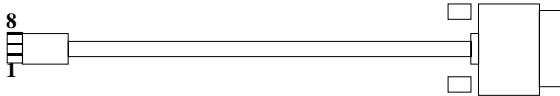


**24 60 05 RS232 cable NC-MODEM 25-pins DSUB M**  
Serial cable for RS232 to PC, 25-pins DSUB Male.

RJ45		DSUB-25M
1.	<DTR white/orange	8.
2.	>DCD orange	20.
3.	GND white/green	7.
4.	>RD blue	2.
5.	<TD white/blue	3.
6.	>DSR green	
7.	<RTS white/brown	5.
8.	>CTS brown	4.

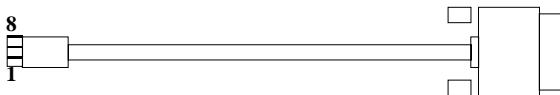
**24 60 02 RS232 cable NC-PC/XT 25-pins DSUB F**  
Serial cable for RS232 to PC, 25-pins DSUB Female.

RJ45		DSUB-25F D
1.	<DTR white/orange	20.
2.	>DCD orange	8.
3.	GND white/green	7.
4.	>RD blue	3.
5.	<TD white/blue	2.
6.	>DSR green	6.
7.	<RTS white/brown	4.
8.	>CTS brown	5.



**24 60 07 RS232 cable NC-DUC 25-pins DSUB M**  
Serial cable for RS232 to DUC, 25-pins DSUB Male.

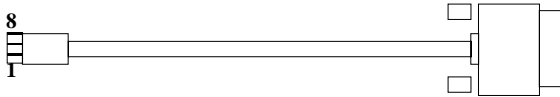
RJ45		DSUB-25M DUC
1.	<DTR white/orange	20.
2.	>DCD orange	8.
3.	GND white/green	7.
4.	>RD blue	3.
5.	<TD white/blue	2.
6.	>DSR green	6.
7.	<RTS white/brown	4.
8.	>CTS brown	5.



**24 60 08 NC-PLC-2 RS232 cable DSUB-9M**

Serial cable for RS232 to PLC, 9-pins DSUB Male.

RJ45 DCE			DSUB-9M PLC	
1.	<DTR	white/orange	6.	
2.	>DCD	orange	NC	
3.	GND	white /green	5.	
4.	>RD	blue	3.	
5.	<TD	white /blue	2.	
6.	>DSR	green	4.	
7.	<RTS	white /brown	8.	
8.	>CTS	brown	7.	



**24 60 03 RS485 connection for Table model NC9008**

Serial cable for RS485. For 2-wire the T is connected with R.

Select by option multipoint and half duplex and terminate with low or high impedance.

RJ45			4-wire	
4.	>T+	Blue	Transmit B	
5.	>T-	Blue/White	Transmit A	
7.	<R+	Brown/White	Receive B	
8.	<R-	Brown	Receive A	

RJ45			2-wire	
4.	>T+	Blue	Transmit B, Receive B	
5.	>T-	Blue/White	Transmit A, Receive A	
7.	<R+	Brown/White		
8.	<R-	Brown		

**24 60 04 Power Cable NC-None MQ172**

Power cable for own connections.

MQ172		28AWG	32AWG	None
1.	AC/DC+	svart	röd	
2.	AC/DC+	brun	gul	
3.	DC-	röd	grön	
4.	DC-	orange	blå	

## Cable DIN rail model NC8900

### 32 60 01 RS232 Cable NC-PC/AT-2 DSUB-9F

Serial port-1 without modem signals, 9-polig DSUB Female.

SERIAL PORT-1			DSUB-9F
1.	GND	vi/grön	5.
2.	>RD	blå	2.
3.	<TD	vi/blå	3.
4.	>DSR	grön	6.
5.	>CTS	brun	8.
6.	<RTS	vi/brun	7.

Serial port-2 without control signals, 9-polig DSUB Female.

SERIAL PORT-2			DSUB-9F
7.	GND	vi/grön	5.
8.	>RD	blå	2.
9.	<TD	vi/blå	3.

### 32 60 02 RS232 Cable NC-PC/XT-2 DSUB-25F

Serial port-1 without modem signals, 25-polig DSUB Female.

SERIAL PORT-1			DSUB-25F
1.	GND	vi/grön	7.
2.	>RD	blå	3.
3.	<TD	vi/blå	2.
4.	>DSR	grön	6.
5.	>CTS	brun	5.
6.	<RTS	vi/brun	4.

Serial port-2 without control signals, 9-polig DSUB Female.

SERIAL PORT-2			DSUB-25F
7.	GND	vi/grön	7.
8.	>RD	blå	3.
9.	<TD	vi/blå	2.

### 32 60 07 RS232 Cable NC-DUC DSUB-25M

Serial port-1 without modem signals, 25-polig DSUB Male.

SERIAL PORT-1			DSUB-25M
1.	GND	vi/grön	7.
2.	>RD	blå	3.
3.	<TD	vi/blå	2.
4.	>DSR	grön	6.
5.	>CTS	brun	5.
6.	<RTS	vi/brun	4.

Serial port-2 without control signals, 9-polig DSUB Male.

SERIEPORT-2			DSUB-25M
7.	GND	vi/grön	7.
8.	>RD	blå	3.
9.	<TD	vi/blå	2.

Serial port-1 with modem signals, 9-polig DSUB Female.

SERIAL PORT-1			DSUB-9F
1.	GND	vi/grön	5.
2.	>RD	blå	2.
3.	<TD	vi/blå	3.
4.	>DSR	grön	6.
5.	>CTS	brun	8.
6.	<RTS	vi/brun	7.
8.	>DCD	orange	1.
9.	<DTR	vit/orange	4.

Serial port-1 with modem signals, 25-polig DSUB Female.

SERIAL PORT-1			DSUB-25F
1.	GND	vi/grön	7.
2.	>RD	blå	3.
3.	<TD	vi/blå	2.
4.	>DSR	grön	6.
5.	>CTS	brun	5.
6.	<RTS	vi/brun	4.
8.	>DCD	orange	8.
9.	<DTR	vit/orange	20.

Serial port-1 with modem signals, 25-polig DSUB Male.

SERIAL PORT-1			DSUB-25M
1.	GND	vi/grön	7.
2.	>RD	blå	3.
3.	<TD	vi/blå	2.
4.	>DSR	grön	6.
5.	>CTS	brun	5.
6.	<RTS	vi/brun	4.
8.	>DCD	orange	8.
9.	<DTR	vit/orange	20.

**RS485 Connection for DIN rail model NC8900**

Serial port-1 for RS485, 2-wire or 4-wire.

SERIAL PORT-1	4-wire
2. >T+	Transmit B
3. <R+	Receive B
5. >T-	Transmit A
6. <R-	Receive A

SERIAL PORT-1	2-wire
3. T+/R+	Transmit B, Receive B
6. T-/R-	Transmit A, Receive A

**Power kablage DC**

Connection for DC.

POWER	DC
10. AC/DC-	0V
11. AC/DC+	+12-48V
12. P-GND	Protected ground

**Power kablage AC**

Connection for AC.

POWER	AC
10. AC/DC-	~12/24V
11. AC/DC+	~12/24V
12. P-GND	Protected ground



## Technical data NC9008

MicroController 20MHz 80C186EB

Code memory 512 Kbytes Flash for easy update of software

Data memory 256 Kbytes SRAM for stack and buffers

Ethernet/IEEE 802.3 10Mb/s twisted pair 10BaseT, RJ45

Serial port-1 RS232 with signals RD, TD, CTS, RTS, DSR, DTR, DCD

Serial port-1RS485 with signals T+, T- R+, R-, 4-wire or 2-wire with Transmit and Receive, high 12k $\Omega$  or low 120 $\Omega$  impedance selectable

Serial port-2 RS232 with signals RD, TD, CTS, RTS

Watchdog for program execution and restart on fault

Status indicator ST with red LED to indicate power +5V and started.

Traffic indicator TR with green LED to indicate network communications

Connect indicator P1, P2 with yellow LED to indicate TCP connections, one for each port

Integrated power supply with external AC adapter

Compact Power Connector MQ172

TCP/IP-protocol with support for protocols ARP, IP, ICMP, TCP and HTTP

Physical dimensions 140 x 90 x 25mm

Weight 0,39 kg

Power requirements 9-17V AC/ 12-24V DC, 110mA

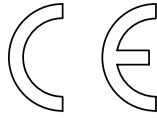
Ambient temperature 5-50°C/normal, -40-80°C/stock

Relative humidity 5-95% none-condensing

Assembled with case feet

CE, confirms the requirements for Electromagnetic Compatibility according to EMC-directive

<b>NET CONTROLLER</b>	
<b>Type NC9008-TP-01</b>	<b>RS232</b>
12V AC, 12/24V DC; max 110mA <b>CE</b>	
Manufactured by WHI Konsult AB	
Serieno	<input type="text"/>

**Manufacturers declaration of conformity****WHI • KONSULT****DECLARATION OF CONFORMITY**  
according to the EMC directive

The following harmonised European standards have been applied:

Standards	:	EN 50081-1
	:	EN 50082-1
Type of equipment	:	Net Controller
Model	:	NC9008-TP-01, RS232
	:	NC9008-TP-02, RS485
Company name	:	WHI konsult AB Byängsgränd 6 120 40 Årsta Sweden

As manufacturer we declare under our sole responsibility, as far as our tests show, that the equipment follows the provisions of the standards stated above.

**WHI Konsult AB**

Place : Stockholm

Date: March 30, 1999

Jan Wester

## Technical data NC8900

MicroController 20MHz 80C186EB

Code memory 512 Kbytes Flash for easy update of software

Data memory 256 Kbytes SRAM for stack and buffers

Ethernet/IEEE 802.3 10Mb/s twisted pair 10BaseT, RJ45

Serial port-1 RS232 with signals RD, TD, CTS, RTS, DSR

In modem mode control signals DTR, DCD

Serial port-1RS485 with signals T+, T- R+, R-, 4-wire or 2-wire with Transmit and Receive, high 12k $\Omega$  or low 120 $\Omega$  impedance selectable

Serial port-2 RS232 with signals RD, TD

Watchdog for program execution and restart on fault

Status indicator P with green LED to indicate power +5V and started.

Traffic indicator T with yellow LED to indicate network communications

Send/receive indicator 1, 2 with yellow LED to indicate serial communication

TCP/IP-protocol with support for protocols ARP, IP, ICMP, TCP and HTTP

Physical dimensions 110 x 75 x 23mm

Weight 118 g

Power requirements 9-46V AC or 12-56V DC, max 150mA

Ambient temperature 5-50°C/normal, -40-80°C/stock

Relative humidity 5-95% none-condensing

Assembled with DIN rail snap

CE, confirms the requirements for Electromagnetic Compatibility according to EMC-directive

