Users Manual

ECB-1000

Opticon Ethernet Converter

RS232 ↔ Ethernet ↔ Internet / PC / RS232

OPTICON

CAUTION: This users manual may be revised or withdrawn at any time without prior notice.

BY OPENING THE PACKAGE OF THIS PRODUCT YOU AGREE TO BECOME BOUND BY THE LIABILITY AND WARRANTY CONDITIONS.

IN ALL CIRCUMSTANCES THIS MANUAL SHOULD BE READ ATTENTIVELY, BEFORE INSTALLING AND/OR USING THE PRODUCT.

Serial number
A serial number appears on all Opticon products. This official registration number is strictly related to the device purchased. Make sure that the serial number appearing on your Opticon device has not been removed. Removing the serial number might affect the warranty conditions and liability disadvantageously, so please be strict at maintaining the label with serial number on the Opticon product.

Warranty / Warranty period / Liability
Unless otherwise agreed in a contract, all Opticon products are warranted for a period of two years after purchase, covering defects in material and workmanship. Opticon will repair or, at its opinion, replace products that prove to be defective in material or workmanship under proper use during the warranty period. Opticon will not be liable in case the customer made modifications. In such case the standard repair charge will be applicable. The standard charge for repair will also be applicable in cases where no defect is found at all. These rules also apply for products that are still under warranty. Under no circumstance Opticon Sensors Europe BV will be liable for any direct, indirect, consequential or incidental damages arising out of use or inability to use both the hardware and software, even if Opticon has been informed about the possibility of such damages.

Packaging
The packing materials are not harmful for the environment. We recommend that you save all packing materials, as it should be used whenever you need to transport your scanner (e.g. for service). Damage caused by improper repacking is not covered by the warranty.

Trademark
Trademarks used are property of their respective owners.

Version 03-2009

Table of contents

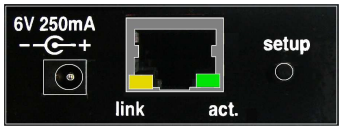
1 Introduction

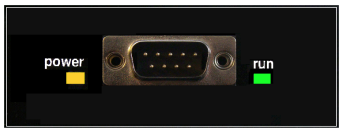
The Opticon Ethernet Converter box makes it possible to connect your Opticon Handheld terminals to the Ethernet and the Internet.

Using the integrated TCP/IP stack it is possible to transmit and receive files from your Opticon Handheld terminal to any local or remote FTP-server, send and receive emails or simply synchronize time by using an NTP server.

Alternatively it is also possible to connect one of more Ethernet Converter boxes to the Ethernet and have all your barcode readers and/or terminals transmit their data to a remote PC that can be located anywhere on your LAN or even somewhere on the Internet

1.1 Detailed view





1.2 Supported Opticon Handheld Terminals

The Ethernet Converter box has been designed as replacement for applications of Opticon Handheld terminal that make use of TCP/IP dialup connections by 56k modems and GPRS/GSM modems without having to change the software of the application itself.

For this purpose the following Opticon Handheld terminals are currently supported:

- OPL97xx
- PHL1700
- PHL1300
- PHL2700
- OPH100x
- H13

To be able to use the TCP/IP capabilities of the Ethernet Converter box you'll need to the following TCP/IP libraries for these terminals:

- OPL97xx: LMAV020Y or higher (or LNAV020Y for IrDA)
- PHL1700: CMWV020Y or higher
- PHL1300: CMWV020Y or higher (or CQWV020Y for IrDA)
- PHL2700: CMWV020Y or higher (or CQWV020Y for IrDA)
- OPH1003: XMAV020Y or higher
- OPH1004: XPAV0306 or higher
- H13: XPAV0306 or higher

Notes

- *Older versions of the TCP/IP libraries will also work, so it is not necessary to rebuild existing applications, however they will work with a slower communication speed.*
- *It is recommended to use the latest TCP/IP library available at all times (= currently v.0307)*
- *The TCP/IP libraries and further info can be found on the 'C-development kit for Opticon Handheld Terminal'*

1.3 Handling Instructions

Temperature conditions

- Do not use in freezing areas.
- Do not use in area's with temperatures higher than 40℃
- Avoid contact with water.

Shock

- Do not expose the scanner to strong impact, do not throw or drop the box from great heights.
- Do not present mechanical shocks to the product.
- Do not leave the bar code data collector in an area where static charge is accumulated or near devices where electromagnetic emission is generated.

Maintenance

- There are no user-serviceable parts inside the scanner. So do not try to take it apart.
- In case of serious malfunction, please consult your local dealer or Opticon.

Recycling & Disposal instructions

- The icon on the product or package indicates that the product should not be thrown in the home waste bin. The product must be recycled as an electronic product. For proper treatment of end-of-life products consult the section for Environmental care on www.opticon.com.

2 Getting Started

2.1 Connecting the cables and power supply

2.1.1 Power supply

Insert the included 6.0V power supply in the power connector. If the converter box is powered the orange power indicator will be on and the green 'run' LED will be blinking.

2.1.2 RS232 Cable

If you want to connect an Opticon Handheld terminal or a barcode reader to the Opticon Ethernet Converter you can use the standard RS232 cable that was included with your Opticon terminal or barcode reader.

Note:
If you want to replace an existing Internet solution, with analog or GSM modems, by the Opticon Ethernet converter, it is possible that you'll need to add/remove a Null-modem to/from the cable that's currently connected to the modem or replace the current cable by a standard RS232 cable.

2.1.3 Ethernet cable

Connect an Ethernet cable between your local network and the Ethernet Converter box. If an Ethernet signal is detected, the orange (link) LED on the connector will be turned on. If any data is received, the green (data) LED on the connector will blink.

3 Configuration of the Ethernet Converter box

Two different kinds of settings can be configured in the Ethernet Converter

- Serial settings — Changing the baud rate (default is 115200bps)
- Network settings — Configuring the local IP, DNS servers, Gateway, Subnet mask and DHCP

If the Ethernet network has a DHCP server (DHCP is enabled by default) configuration is often not even necessary since all required network settings and local IP-address are all received automatically.

If the Ethernet network does not have a DHCP server, you will have to disable DHCP and set the local IP, DNS servers, Gateway and Subnet mask manually.

In total there are 3 different methods to configure the Ethernet Converter. All 3 will be described on the following pages.

3.1 Method 1: Using the System menu via RS232

Connect your Ethernet Converter box to the serial port of a PC or Laptop and open an RS232 monitor (i.e. Hyperterminal or Appload) using the following serial settings:

- **115200 baud (8 data bits, no parity, 1 stop bit)**

Enter the system menu by powering up the Ethernet box with the set-up button pressed. After that, the following menu will be shown:

```
1: Show current settings
2: Set Board Host Name
3: Set default IP address
4: Set default gateway address
5: Set default subnet mask
6: Set default Primary DNS server addr.
7: Set default Secondary DNS server addr.
8: Enable DHCP
9: Disable DHCP
A: Set default serial-over-TCP port
B: Set default serial-over-UDP port
C: Enable Remote Configuration (by HTTP)
D: Disable Remote Configuration (by HTTP)
E: Set Barcode reader Mode
F: Set default remote IP addr.
0: Save & Quit

Enter a menu choice (1-0):
```

While being in the system menu, pressing the corresponding key will give the following results:

1: Show current settings

```
Settings of the RS232-to-Ethernet Converter Box
Version: HACV0200
Board name: OSE_ETHERNETBOX
MAC Address: 00-12-6A-00-00-02
Local IP Address: 169.254.254.254
Gateway Address: 169.254.254.1
Subnet mask: 255.255.0.0
Primary DNS server address: 169.254.254.2
Secondary DNS server address: 169.254.254.3
DHCP: Enabled
Baud rate: 115200
Default serial-over-TCP port: 31313
Default serial-over-UDP port: 31314
Remote configuration: Disabled
Barcode reader Mode: Disabled
Default remote IP address: 0.0.0.0
```

IP addresses shown in the overview above are the default IP-addresses. When using DHCP these addresses will be overruled by the received addresses from the DHCP server, but be aware that the DHCP protocol is not yet executed while still being in this system menu).

2: Change Board Host Name

```
Host Name (OSE_ETHERNETBOX): <enter new host name>
```

3: Set default IP address

```
Default IP Address (169.254.254.254): <enter IP address>
```

4: Set default gateway address

```
Default Gateway Address (169.254.254.1): <enter IP address>
```

5: Set default subnet mask

```
Default Subnet Mask (255.255.0.0): <enter IP mask>
```

6: Set default Primary DNS server address

```
Primary DNS Server Address (169.169.169.2): <enter IP address>

7: Set default Secondary DNS server address
Secondary DNS Server Address (169.169.169.3): <enter IP address>

8: Enable DHCP
DHCP Enabled

9: Disable DHCP
DHCP Disabled

A: Set default serial-over-TCP port
Default serial-over-TCP port: <enter port number>

B: Set default serial-over-UDP port
Default serial-over-UDP port: <enter port number>

C: Enable Remote configuration (by HTTP)
Remote configuration Enabled

D: Disable Remote configuration (by HTTP)
Remote configuration Disabled

E: Set Barcode reader Mode
Barcode reader mode (0=Off; 1=Client; 2=Server): <enter 0,1 or 2>

F: Set default remote IP addr.
Default remote IP Address (0.0.0.0): <enter remote IP address>

0: Save & Quit
Now running application...

Pressing of set-up button for 4 seconds
All settings have been restored to default. Press '0' to cancel, remove power to confirm.
```

3.2 Method 2: Using AT-commands via RS232

It is also possible to configure the Ethernet box by sending modem (AT-)commands via RS232. You can send these commands manually via an RS232 monitor (i.e. Hyperterminal or Appload) or for a quicker setup you can also connect an (RS232) barcode reader and scan configuration barcodes.

The following AT-commands can be send to configure the Ethernet box.

Option	Command	Example + barcode
Default host name	AT+NAME<string 1-16>	
Default IP-address	AT+IP<address>	
Default Gateway IP	AT+GATE<address>	
Default DNS servers IP *Note: configures both the primary and secondary DNS server*	AT+DNS<address>	
Default Primary DNS servers IP	AT+PDNS<address>	
Default Secondary DNS servers IP	AT+SDNS<address>	
Default subnet IP mask	AT+MASK<address>	
Disable/enable DHCP	AT+DHCP<boolean>	 
Baud rate	AT+BAUD<baud rate>	
Remote configuration (by HTTP) *(See Chapter 2.2.2)*	AT+RCONF<boolean> (0: disabled, 1: enabled)	 

Default serial-over-TCP port number *(See Chapter 2.2.4)*	AT+TCPP<port number> (Range: 0 – 32768)	
Default serial-over-UDP port number *(See Chapter 2.2.4)*	AT+UDPP<port number> (Range: 0 – 32768)	
Barcode reader mode *(See Chapter 2.2.5)*	AT+BCRM<0, 1 or 2> 0: Disabled 1: Client mode 2: Server mode	  
Default remote IP addr. *(for a serial-over-Ethernet connection)* *(See Chapter 2.2.5)*	AT+RMIP<IP address>	

Important notes:

- *All commands must be terminated with a carriage return <CR>*
- *Make sure you send the commands at the correct baud rate (default is 115200bps)*
- *To review the current settings use the following command: AT?*
- *If a command is accepted the Ethernet box will respond with <CR><LF>OK<CR><LF>*
- *If a command is not accepted the Ethernet box will respond with <CR><LF>ERROR<CR><LF>*
- *If a command is unknown the Ethernet box will respond with <CR><LF>OK<CR><LF> (for compatibility reasons).*
- *If the Ethernet box does not respond anymore due to an incorrectly configured baud rate, then it's still possible to reset the Ethernet box or change the baud rate using Method 1.*

3.3 Method 3: Using the configuration page of the embedded HTML-server

The Ethernet Converter box contains an embedded HTML-server that can be accessed using any Internet Browser.

Important: By default the settings can NOT be changed using the embedded HTTP server to prevent unauthorized changes to be made remotely. To allow configuring by using the HTTP server use Method 1 or 2 to enable 'Remote configuration'.

To access this HTML-server you need to know the IP-address of the Ethernet box first. You can find the local IP address of the Ethernet converter box:

1) By using the System menu (see Method 1, only works if DHCP is disabled)

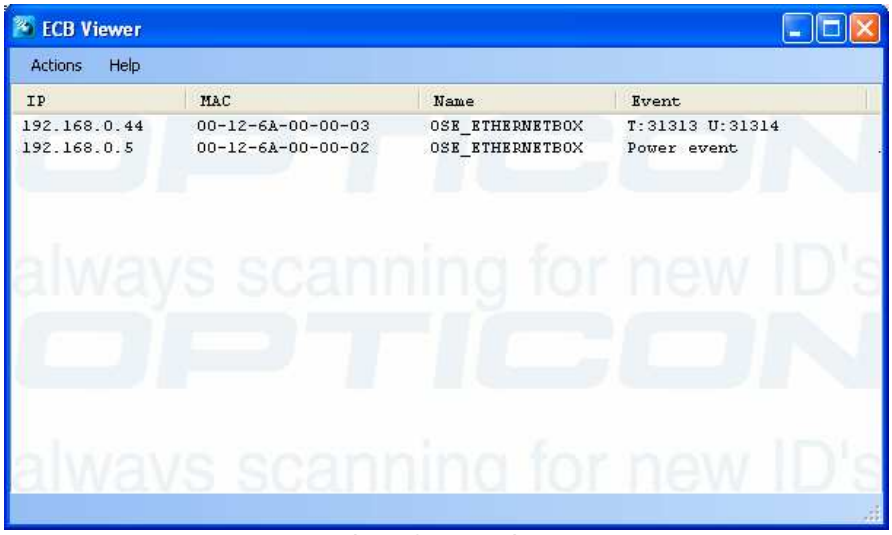
2) By serially sending the 'AT?' modem command (see Method 2)

3) By using an application that listens to UDP port 30303

   An example of such an application is the program 'ECB Viewer'. This program can be downloaded at www.opticon.com at the **'Service & support > Software'** section and selecting the product **ECB-1000.**

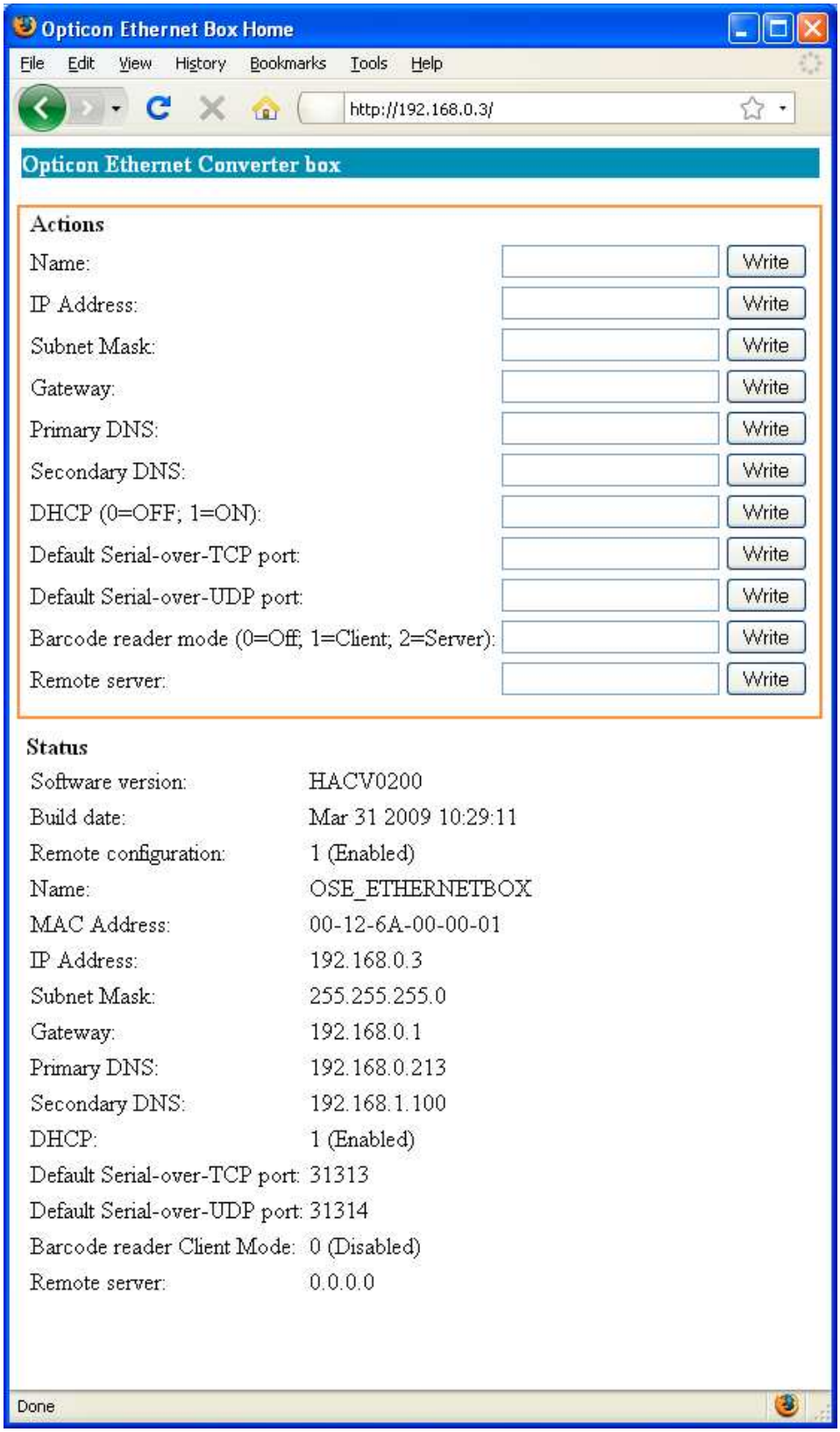
   A power-up event of an Ethernet box will be shown in this application including its name, IP-address and MAC-Address.

   Also a manual discovery can be performed to find all Ethernet boxes that are currently connected to the local network. The boxes will respond with their name, IP-address, MAC-address and their default serial-over-UDP (U:) and serial-over-TCP (T:) port numbers.



Screenshot of 'ECB Viewer'

After retrieving the IP-address (i.e. 192.168.0.3), you can either type the address in your Internet browser to see the following configuration screen or double click on a listed Ethernet converter box in 'ECB Viewer'.



*Screenshot of the embedded web page in an Internet browser**

** Note: The area surrounded by the (virtual) orange line is only visible when 'remote configuration' is enabled.*

To change a configuration value on the web page, type the desired value in the correct input field and press the 'Write' button next to it. After pressing the 'Write' button the current setting should immediately be updated on the bottom half of the screen.

Important notes:

- The MAC address can not be changed
- Any changed IP-addresses or DHCP setting can require the Ethernet box to be restarted before becoming active.
- Entering incorrect IP-addresses can cause the embedded web page to become inaccessible and can cause the Ethernet converter box not to function properly. If this has occurred, use method 1 or 2 to correct these settings.
- If the (local) IP-address of the Ethernet box is changed, be aware that the URL address in your Internet browser needs to be changed as well to be able to view the embedded web page again.

4 Establishing a TCP/IP connection with Opticon handheld terminals

Writing an application for the Ethernet converter box is (almost) identical to writing an application with the TCP/IP library that makes use of a dialup modem.

For more information about writing applications with the TCP/IP library and example applications, please refer to the manuals of the **'TCP/IP library for Opticon Handheld terminals'.**

The Ethernet converter box accepts almost all AT-modem commands. However there are few additional AT-commands that are different or additional:

ATD… or ATDT…	Establish a connection between an Opticon handheld terminal (with TCP/IP library) and an Ethernet Converter box. Response: <CR><LF>CONNECT<CR><LF> <PPP frame><PPP frame> Normally the ATD(T)-command should be made by the connect()-function of the TCP/IP library after which the application continues the TCP/IP session.
ATIx	Returns the current software version
AT?	Shows all current settings
ATV0	Normal response codes: i.e. OK / ERROR
ATV2	Barcode reader response codes, in case an Opticon barcode reader is used to configure the Ethernet box with AT-commands. <ESC>B or <ESC>E that will result in a good or bad read sound.
AT+CPIN?	Returns: +CPIN: READY\r\n\r\nOK\r\n for GSM/GPRS modem simulation
AT+DISCOVERY	Returns the name, IP and MAC addresses and their default serial-over-Ethernet port numbers (U=UDP, T=TCP) of all Ethernet boxes that are connected to the local Ethernet Example response: Searching... 192.168.0.44 00-12-6A-00-00-03 OSE_ETHERNETBOX T:31313 U:31314 192.168.0.5 00-12-6A-00-00-02 OSE_ETHERNETBOX T:31313 U:31314 Done
AT+BAUDxxxxx	Configure a baud rate between 4800 and 230400bps (the OK response might be returned at the new baud rate!)
AT+RESET	Resets the Ethernet-to-RS232 converter box

Note:

- ***Disconnect a connection by sending '+++' with a 1-second pause before and after the command.***

5 Establishing a (virtual) RS232 connection over Ethernet

Using an Ethernet Converter box it is possible to establish a virtual RS232 connection over Ethernet to transmit and receive serial data to and from a remote location as if you're using a very long serial cable.

5.1 Supported protocols

To transmit serial data over the Ethernet two different protocols can be used: UDP and TCP. They both have advantages and disadvantages depending on reliability and maximum throughput.

TCP: uses TCP/IP handshaking, so any lost or incorrectly received packets will be retransmitted. However, because of the handshaking the maximum throughput over the Ethernet is variable, which makes it possible to overflow the serial buffers if too much data is transmitted at once. Therefore when transmitting large blocks of serial data over a TCP connection it is strongly recommended to listen to the CTS signal of the Ethernet box, which indicates whether or the Ethernet box is ready to receive more data or not. Opticon barcode readers support listening to the CTS signal by enabling the **'Modem handshaking' protocol** (Menu option: 'P2') which can be found in chapter 2.1.3 of the universal menu book, including a description on how RTS/CTS signals are used for handshaking.

UDP: UDP uses no handshaking protocol, so data can be lost due to packet loss, since there are no retransmissions using UDP. It is possible to add an extra protocol like Xmodem or NetO to fix this problem of loosing packets. When no additional serial protocol is used it is recommended to use the TCP protocol for a reliable transfer of serial data. The advantage of UDP is that maximum throughput will be higher than with TCP.

This means that if you use the virtual RS232 connection for:
- Transmitting / receiving of small data packages (i.e. barcodes)
  -> TCP is more reliable.
- Transmitting / receiving large quantities of data
  -> TCP in combination with modem handshaking is recommended (when no serial protocol is used)
  -> UDP is recommended when using an additional serial protocol and a higher throughput is needed.

5.2 Finding remote Ethernet Converters

To find other Ethernet Converter boxes the following AT-command is available:

AT+DISCOVERY	Returns IP and MAC addresses of all Ethernet boxes that are connected on the same local Ethernet. Example of the search result: Searching... 192.168.0.2 00-12-6A-00-12-34 OSE_ETHERNETBOX 192.168.0.14 00-12-6A-00-00-12 OSE_ETHERNETBOX2 Done

Also an application like 'ECB Viewer' can be used to listen for power-up event of Ethernet boxes. This program can passively listen to, but also actively discover using UDP port 30303 to retrieve IP-addresses of Ethernet boxes that are located on the same LAN. (See chapter 2.2.3)

More information on how to discover Ethernet boxes using your own application can be found in chapter 2.4.4.2.2.

5.3 Connecting to a remote PC or Ethernet Converter

To establish a virtual RS232 connection the following AT-commands are available:

UDP	ATDudp://xxx.xxx.xxx.xxxx ATDudp://yy-yy-yy-yy-yy-yy	Where xxx.xxx.xxx.xxx is the IP address of the remote PC or Ethernet box Where yy-yy-yy-yy-yy-yy is the MAC address of the remote Ethernet box *
TCP	ATDtcp://xxx.xxx.xxx.xxxx ATDtcp://yy-yy-yy-yy-yy-yy AT+CONNECT	Where xxx.xxx.xxx.xxx is the IP address of the remote PC or Ethernet box Where yy-yy-yy-yy-yy-yy is the MAC address of the remote Ethernet box * (Re)Connect to the currently configured 'default remote IP address', which is also generally the last used IP address

***** *Connecting using a MAC address only works on a local network*

If the command contained a valid IP-address or known MAC address the Ethernet box will respond with:

```
CONNECT xxx.xxx.xxx.xxx (where xxx is the IP-address)
```

If the connection could not be established it will respond with 'ERROR' within 2 seconds after the connect message.

Also when a connection was lost or closed remotely it will respond with 'ERROR' to indicate the connection was lost.

To disconnect an active connection send '+++' with a 1-second pause before and after the command. If send correctly the Ethernet box will respond with 'OK'. (If there was no active connection it will ignore this command.)

5.3.1 Configuring the port numbers

The serial-over-TCP protocol uses port 31313 and serial-over-UDP uses port 31314 by default. However these port numbers can also be changed if desired. This can be done as follows.

1) Using the System menu options (See 2.2.1):

```
A: Set default serial-over-TCP port
Default serial-over-TCP port: <enter port number>

B: Set default serial-over-UDP port
Default serial-over-UDP port: <enter port number>
```

2) Using the following AT-Commands (See 2.2.2)

Default serial-over-TCP port number	AT+TCPP<port number> (Range: 0 – 32768)	AT+TCPP31313
Default serial-over-UDP port number	AT+UDPP<port number> (Range: 0 – 32768)	AT+UDPP31314

3) Using the embedded configuration web page (See 2.2.3)

4) By adding the port number behind the ATD-command separated by a semi-colon.

Examples:

5.4 Connecting serial barcode readers to an Ethernet Converter box

The Ethernet Converter box has a special feature to make it easy and reliable to transmit your barcodes to a remote server using the serial-over-TCP protocol. On the following this feature will be described in more detail.

5.4.1 Configuring your barcode reader

The first step in the process of setting up a network of barcode readers with Ethernet Converter boxes is to configure the barcode readers properly.

Below you'll find a set-up sheet to configure the barcode reader for this purpose.

Scan all bar codes from top to bottom.

OPTICONFIGURE

SET		
Defaults RS232		U2
Baud rate settings 115200 baud		SZ
Handshaking Modem		P2
Handshaking Flow Control time out 400ms		I3
Buzzer settings Buzzer after transmission		VZ
END		

OPTICONFIGURE

Opticonfigure Version = WAAV0101

← Set the reader settings back to default

← Use the default baud rate of the Ethernet converter box

← Use Modem handshaking to prevent data loss and connection status indicator

← Discard barcodes (with an error beep) if they couldn't be transmitted to the Ethernet box within 400ms, so if there's no connection to the remote server the user knows the barcode couldn't be transmitted

← Sound the buzzer AFTER it was succesfully transmitted so the user can not get the false suggestion that the barcode was succesfully transmitted when it wasn't

5.4.2 Client or Server

The second step is determining who controls the Ethernet connection: the barcode reader + Ethernet converter box or the remote PC. So with other worlds, who will be the host and who will be the client.
Below will be explained what this means and how to set-up your Ethernet converter box and the PC depending on your choice for either client or server.

5.4.2.1 Ethernet box as Client (for both LAN & Internet)

If you choose for your Ethernet box + barcode reader to be the client, this means that your Ethernet boxes will establish a connection with the remote PC and reconnect in case the connection is lost.

To configure your Ethernet box as Client change the **'barcode reader mode'** to 1. (See chapter 2.2)

Reading the label above can configure your Ethernet box as Client

When configured as client the Ethernet box will automatically try to (re)connect when the barcode reader indicates it has data to send (by using it's RTS line).

To be able to do so, the IP-address of the remote PC as well as a TCP/IP port (default: 31313) at which it will be listening for data must be configured. How the IP address of the 'remote server' as well as the TCP port number can be configured is described in chapter 2.2.

The remote PC would have to be configured as server, meaning it would have to open a TCP/IP socket that listens to configured TCP port number (default: 31313). An example program that can capture data from a specific TCP/IP port is the 'monitor' of the program ECB Viewer (See chapter 2.2.3).

On the Internet more information can be found how to open a TCP socket and capture its data on a large variety of platforms and using different programming languages or programs. In addition it's also possible to create a TCP-to-serial bridge that can convert the received data to a virtual serial port. Multiple applications can be found on the Internet that can create such a bridge.

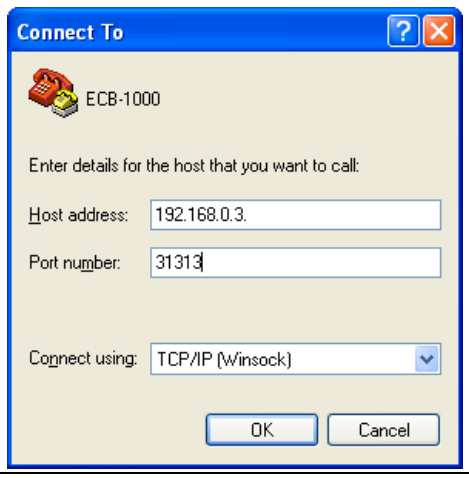
5.4.2.2 Ethernet box as Server (for LAN only)

If you choose your Ethernet box + barcode reader to be the server, this implicates that your Ethernet box will wait and listen for incoming connections from the remote PC. This will take away any hassle from the Ethernet box related to establishing, maintaining and disconnecting the connection with the remote PC. However, this will also mean that the remote PC will have to establish the connection itself by opening a TCP/IP socket that connects to the Ethernet box.

To configure you Ethernet box as Server, change the 'barcode reader mode' to 2. (See chapter 2)

Reading the label above can configure your Ethernet box as Server

An example program that can be used to open a TCP/IP socket that connects to an Ethernet box is Hyperterminal, which is already installed on most Windows PC's.



Even though establishing a TCP/IP connection from a remote to an Ethernet box is relatively easy, there are a few things that can make it more difficult.

- One of these things is that the remote server must know all IP-addresses of all the Ethernet boxes on the network and it must detect whether or not a specific Ethernet box is attached to the network or not.

- Also when using DHCP it's possible that the IP-addresses of the Ethernet boxes change over time and the server would have to know about this as well.

To resolve these problems a few extra things need to be implemented on the remote PC.

- The first thing the server would need to do is to capture all power-events from Ethernet boxes that are newly added to the network. This implicates that the server would have to listen to UDP port 30303 for messages that look like:

```
192.168.0.3 00-12-6A-F0-00-01 OSE_ETHERNETBOX  (Power Event)
```

- Besides listening, the server would have to poll the network for Ethernet boxes to know which boxes are still present on the network, but currently disconnected.

  To do this the server would have to broadcast packets to UDP port 30303 containing the following message:

```
Discovery
```

  All the Ethernet boxes on the network will respond to this message with messages that look like:

```
192.168.0.3 00-12-6A-F0-00-01 STORAGE_2      T:31313 U:31314
192.168.0.8 00-12-6A-F0-00-03 SALES          T:31313 U:31314
192.168.0.4 00-12-6A-F0-00-18 LOGISTICS      T:30000 U:31000
```

  Since all Ethernet boxes will respond nearly simultaneously it is likely that collisions will occur when multiple boxes will respond at the same time. Therefor it is needed to temporarily silence all Ethernet boxes that has just responded successfully and then resent the discovery. To silence an Ethernet box during the next discovery attempt an UDP packet should be send to specific Ethernet box containing the message:

```
Ignore next Discovery
```

  Repeat this process until no Ethernet boxes respond anymore to be sure you have listed all Ethernet boxes in the network.