

**Let's communicate!**



# **Communication adapter RS232 over the Ethernet**



# **ELO E221**

## **User manual**

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# 1.0 Introduction

Ethernet as a communication medium becomes widely used not only in commercial domain, but becomes more popular in industry automation too. A RS232 interface is intended to connect two devices with maximal cable length 15 meters. An adapter E221 allows to integrate the RS232 devices into the Ethernet network thereby bridge long distances.

Bellow described adapter allows to connect two RS-232 devices over the Ethernet network; it also allows to connect more devices to a single network gateway (i.e. computer).

## 1.1 Application

This communication device altogether with supplied software allows setting up following profiles:

- 1) **Real Port** profile. Adapter allows to connect a device with RS232 interface straight to computer via Ethernet protocol with virtual port application installed on,
- 2) **Serial Bridge** profile. Adapter connects two devices with RS232 interfaces like they were connected by cable; it is technique so called “serial tunnelling”
- 3) **TCP socket** profile. Configured as TCP client or TCP server, establishes connection among these devices
- 4) **UDP socket** profile. Configured as UDP client or UDP server, establishes connection among these devices.
- 5) **Custom** profile. Experienced user can access all settings both network and serial interfaces.

Furthermore, there is possibility to create GPIO port (general purpose input/output) with five output and/or input binary channels

to control or diagnose remote device. This GPIO maintain  $\pm 12V$  levels. It can be configured to aware (e.g. by an e-mail) based on states of those binary inputs.

## 2.0 How does it works?

The adapter converts RS232 signalling to the Ethernet interface. It transfers all signals of the RS232 except RI. RS232 interface is presented with DB9M (D-SUB, Canon), whereas Ethernet is lead out via standard Ethernet RJ-45 socket.

Adapter can operate with full duplex with maximal bitrate 230kbps. The Ethernet layer can communicate with 10 and 100Mbps.

## 3.0 Installation

This chapter describes the adapter E221 installation process. The process is divided to sub-process software and hardware installation.

### 3.1 Ethernet connection

Adapter meets IEEE 802.3 specification and is to be plugged in to the network with straight UTP cable. When configured as **Serial Bridge**, the cross-over cable should be used instead.

For the first time, the adapter is configured to acquire IP address from DHCP server, so in the network must be such a service to dedicate IP address (e.g. AP – access point, router..). It can be later changed to the fixed IP address.

### 3.2 RS-232 connection

A DB9M (D-SUB 9 pin Male) connector is wired as DTE, it means that device with the same connector (DB9M), wired as DTE, must

be connected to the adapter with cross-over cable (null modem) with DB9F (Female) connectors terminated. Device terminated with DB9F can be connected straight to the adapter or over the straight cable. All signals, TXD, RXD, RTS, CTS, DTR, DSR, DCD are transmitted. Rx and Tx activity is indicated by LED indicators.

### 3.3 Power supply

The adapter can be powered with DC voltage source (range 9 to 24V) with DC connector (outer/inner diameter is 5.5/2.1 mm), inner pin should have positive polarity. The adapter can be powered via RS-232 connector too – positive is pin No.9, negative (ground) is pin No.5. Powered status is indicated with green LED. The adapter is secured against the polarity change.

### 3.4 Driver installation

The adapter's configuration software can operate on computers under Operation systems both MS Windows and Linux/Unix, but only Windows software is enclosed. Supported are version from Win 98 to Vista. Unix/Linux software can be downloaded from following address:

<http://www.digi.com/support/productdetl.jsp?pid=2469&osvid=0&s=54&tp=1>

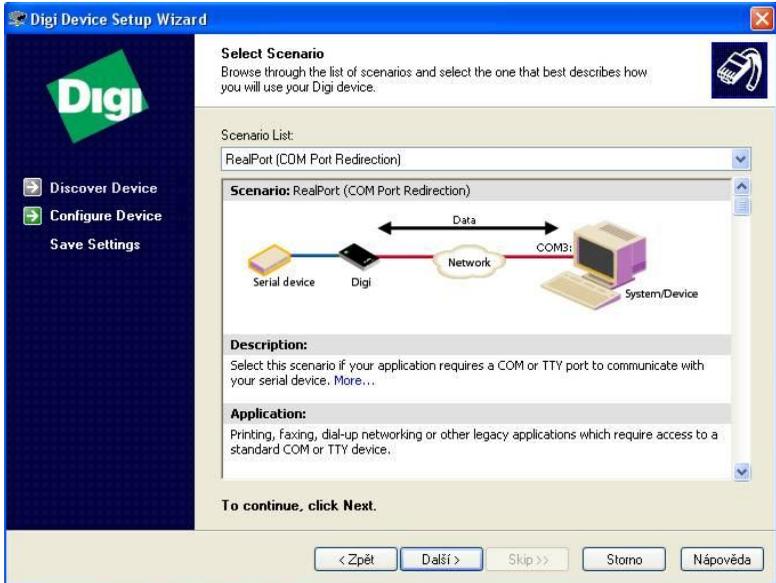
A **RealPort** drivers you can find on supplied CD-ROM in **E220\_drivers** directory. The drivers can be downloaded from web pages [www.elo.cz](http://www.elo.cz) too. If virtual COM port on PC is applicable, it is necessary to install the RealPort application. In other cases, utilities **DigiConf** and **DigiWiz** would be used instead.

### 3.5 Virtual COM port installation

When connected to the network, and link device to a PC is required, it is necessary to install **Virtual Port** application. Bellow described process is for Windows XP, for other Windows version

the procedure is similar.

- 1) Start the **DigiWiz** application on the dedicated computer, which will guide through all installation process; computer must be connected to the network and capable to reach IP address of the adapter.
- 2) The „*Welcome to the Digi device Setup Wizard*” screen will appear. Click “Next”
- 3) On the next screen “*Discover Device*” the adapter with IP and MAC address should be seen. If not, check power, cabling and DHCP service, and click “*Refresh*” then. Check off the adapter and click “*Next*”.
- 4) Window “*Configure Network Settings*” appears. Leave DHCP or set fixed IP address, mask and gateway. Click “*Next*”.
- 5) In window “*Select scenario*” from a scroll menu choose “*RealPort (COM port redirection)*”. Click “*Next*”.



- 6) In the window “*Configure RealPort Settings*” choose “*Install Digi RealPort on this computer*” and click “*Next*”.
- 7) These settings can be verified in following window “*Verify configuration*” eventually corrected by clicking “*Next*”. To acknowledge, click “*Next*”
- 8) On the screen “*Save settings*” is saved configuration and started installation of “**Serial adapter Digi Connect ME**” and “**COM port Digi Connect ME (COMx)**”; these device can be found in Device Manager of the computer.
- 9) Successful installation ends with screen “*Congratulation!*” with report about end of the installation. Click “*Finish*”, and wizard ends.

### 3.6 Virtual Port settings

User can change settings in Device Manager. There should be “**Multiport serial adapter**” caption, under the “**Digi connect Wi-ME**” device. Select “*Properties*”, tab “*Advanced*”, button “*Properties*”. Here user can change a device name, COM port, IP address and port (assign device with IP address to the COM port; you can list all devices in the network by clicking “*Browse*”), enable ciphering.

Caption “**Digi Connect Wi-ME (COMx)**” allows to change proprietary communication protocol (speed, parity and so on), but usually it is not necessary as application overrides these settings.

### 3.7 Uninstalling the adapter drivers

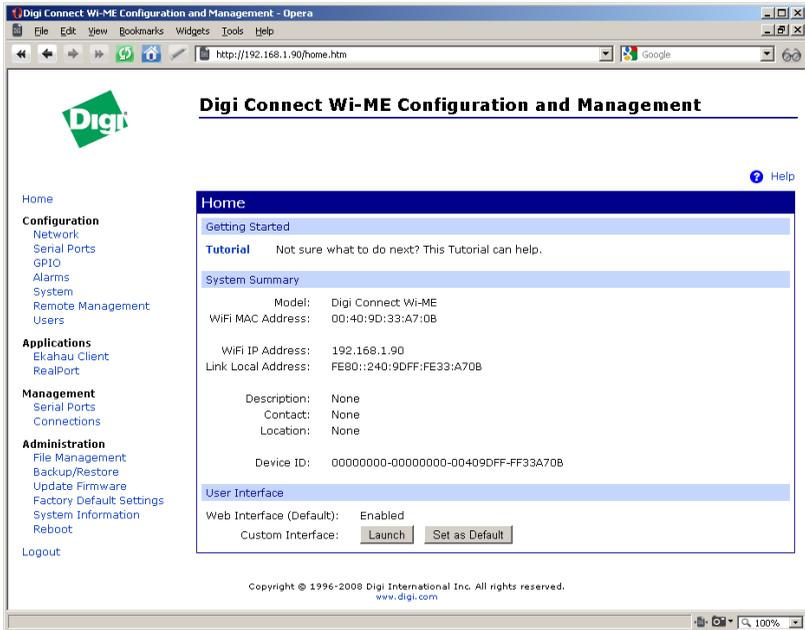
Driver can be uninstalled in Device Manager, caption „**Multiport serial adapter**” right click on device “**Digi connect Wi-ME**”, in menu select “*Uninstall*”. After this procedure the devices “**Digi connect ME**” from captions “**Ports (COM & LPT)**” and “**Multiport serial adapter**” disappear.

### 3.8 Adapter configuration over the web interface

The adapters network layer (Ethernet) can be configured either with web browser or by an utility. It can be accessed by a Telnet too. Bellow described is the web-interface. Notice, that entries may differ version by version.

1. Start configuration utility **DigiConf**. Here user can see the configuration, change settings, start Telnet or web session and restart the adapter. Double click the device or click “*Open web interface*”  
or put the interface's IP address straight to the address line of the web-browser.

- Fill the name and password (default is: root/dbps).Then configuration window appears.



- Startup window “**Home**” offers overview of the settings and there is link to tutorial too.
- A “*Network*” section contains:
  - IP Settings – IP address assignment
  - Network Services Settings – offers some network services
  - Advanced Network Settings – other settings

Every settings change must be confirmed with “*Apply*” button.

- A “*Serial Ports*” section allows to set up device profile as described in chapter 3.9. User can choose among **RealPort**, **TCP/UDP sockets**, **Serial bridge** and others.

6. In a “[GPIO](#)” section user can configure all five pins of the General Purpose port as Input/Output/RS232 Control signal. When some of them are configured as input, it is possible to enable sending alarms by an e-mail.
7. “[Alarms](#)” can be set if either any GPIO inputs state combination comes or required pattern in serial data flow appears.
8. “[System](#)” section stores network ID strings – adapter's name, administrator contact..
9. “[Remote management](#)” enables the remote configuring the adapter with Connectware Manager
10. In a “[Users](#)” section can be managed user approved to login and configure the adapter and assigned different rights for every user.
11. A “[Management](#)” section shows active configuration and allows some changes to that. It depends on chosen profile.
12. “[Administration](#)” section allows to customize web interface, update firmware, backup profile settings, factory reset, settings overview and remote reboot.

The configuring should be finished by clicking “[logout](#)”.

### 3.9 Serial Port profiles

As mentioned in chapter 1.1, the adapter can operate in different modes. In the configuration window of the web interface, section “*Configuration \ Serial ports*” can be chosen the proper mode by clicking the “[port n](#)” link. The “*Serial Port Configuration*” window appears. Click the “[Change Profile...](#)” link, and choose the right

profile. Additional info can be found under the link “[More...](#)”:

1. **RealPort** – maps serial port over the Ethernet (COM port redirection).
2. **Console management** – allows to access a device's console port (such as routers, switches.) over a network connection.
3. **TCP Sockets** - the TCP Sockets Profile allows a serial device to communicate over a TCP network
4. **UDP Sockets** - the UDP Sockets Profile allows a serial device to communicate using UDP
5. **Serial Bridge** - the Serial Bridge Profile configures one side of a serial bridge. A bridge connects two serial devices over the network as if they were connected with a serial cable – so called *Serial tunnelling*. As it is commonly used configuration, installation procedure follows:
  - a) Under the Configuration heading, select [Serial Ports](#), then select the port to be configured.
  - b) Select [Change Profile....](#)
  - c) On the Select Port Profile page, select *Serial Bridge* and click the “*Apply*” button.
  - d) Check *Initiate serial bridge to the following device*.
    - Enter the *IP Address* of the other Digi device server.
    - In the *TCP Port* box, type the Raw TCP port number for the destination serial port. If the serial port is the first or the only port on the device server, the value is

2101.

- e) Check *Allow other devices to initiate serial bridge*. The default *TCP Port* rarely needs to be changed.
  - f) Click *Apply* to save the configuration.
  - g) Configure the *Basic Port Settings* to match the settings of the attached serial device and click *Apply* to save the configuration.
  - h) Follow the same steps to configure the other Digi device server of the bridge, specifying the IP address of the first Digi device server.
6. **Local Configuration** - the Local Configuration Profile allows you to connect standard terminals or terminal emulation programs to the serial port in order to use the serial port as a console to access the command line interface.
  7. **Modem Emulation** - the Modem Emulation Profile allows you to configure the serial port to act as a modem.
  8. **Custom** - the Custom Profile is an advanced option to allow full configuration of the serial port.

**Keep in mind, once you configure the adapter to the Serial Bridge, you will be able to configure the adapter No More!!**

**If needed so, the *factory reset* must be done!**

## 4.0 Testing

Plug the adapter to the Ethernet network. Power up the adapter. After a second should light up an orange indicator LNK (close to the Ethernet socket).. In a minute should LNK indicator (orange) light on. If not, the cable may be defective or improper wired (when connecting to the endpoint like PC – you should use cross-over UTP cable, in other cases use straight UTP cable) or power supply is not good or module might be damaged. In a while the green indicator ACT starts blinking indicating a network traffic. Make sure drivers are installed (see chap. 3.5). Start **DigiWiz**. application from supplied CD-ROM and click “*Next*” to discover the adapter. If it appears in the window, installation was successful. Finish the **DigiWiz application** (click “*Next*”). See the port number in Device Manager. Connect loopback to the RS232 port (connecting Tx and Rx together) and run the **Autotest** application from the installation CD-ROM. Fill up the port number and click “*Start data transfer*”. If everything is O.K, the message “Data transfered successfully” appears; while if not, the error message “Timeout on Device Read” will be seen.

For testing purpose can be helpful a HyperTerminal, which is part of the operating system MS Windows.

## 5.0 Troubleshooting

| <b>Symptom</b>                                    | <b>Solution</b>  |
|---|--|
| The LNK indicator does not come up                | Check power supply polarity, voltage<br><br>Check Ethernet status and cable  |
| LNK lights, but cannot locate adapter in computer | Check PC network settings  |
| Everything works but serial connection            | Check a serial cable<br><br>Check if the serial port installed in Device Manager<br><br>Check adapter configuration, especially serial interface |

## 6.0 Ordering info

Ordering code is ELO E221

The Adapter is delivered with installation CD-ROM and this manual. Serial cable with DB9 connectors is an optional accessory and must be ordered separately. Please include the cable length and connector type in the order then.

## 7.0 Technical info

### Ethernet interface

|                       |   |
|-----------------------|---|
| Standard              | IEEE 802.3  |
| Connector             | RJ-45 socket UTP                                  |
| Transmission speed    | 10/100 Mbps, automatic                            |
| Modulation            | CCK / DQPSK / DBPSK                               |
| Operation             | full duplex, half duplex                          |
| IP address assignment | static, DHCP, auto IP                             |
| Supported protocols   | TCP, UDP, DHCP, SNMP, HTTP, SMTP, ARP, ICMP, IGMP |
| Security              | SSL v3.0 / TLS v1.0, AES 128bit                   |

### RS-232 interface

|                     |   |
|---------------------|---|
| Connector           | DB9 male  |
| Transmission speed  | max. 230 kb/s                                       |
| Transmitted signals | TXD, RXD, RTS, CTS, DTR, DSR, DCD                   |
| Flow control        | HW or SW (Xon / Xoff)                               |
| GPIO                | general I/O with RS232 voltage levels ( $\pm 12V$ ) |

### Others

|                       |   |
|-----------------------|---|
| Configurability       | over web interface (HTTP/HTTPS)               |
| Ethernet indicators   | LNK – orange (Link)<br>ACT – green (Activity) |
| RS-232 indicators     | Tx – orange (Trasmit)<br>Rx – green (Receive) |
| Power indicator       | PWR – green                                   |
| Power supply          | 9-24V DC                                      |
| Current consupt.      | 150mA at 12V                                  |
| Dimensions (WxLxH):   | 80 x 120 x 25 mm                              |
| Storage temperature   | - 10 .. +55 °C                                |
| Operating temperature | + 0 .. +50 °C                                 |
| Humidity              | 0 – 95% (non-condensing)                      |

