e.reader
Instruction Manual

Gantner
instruments

Important: Before commencing installation, commissioning, putting into service and before any maintenance work is carried out, it is essential that the relevant warning and safety instructions in this manual are read!

⚠ **General warning and safety instructions:**

Dear customer,

We congratulate you on having selected a product of Gantner Instruments Test & Measurement GMBH. So that our product functions in your installation with safety and to your complete satisfaction, we take this opportunity to familiarize you with the following ground rules:

1. Installation, commissioning, operation and maintenance of the product purchased must be carried out in accordance with instructions, i.e. in accordance with the technical conditions of operation, as described in the corresponding product documentation.

2. Before installation, commissioning, operation or maintenance it is therefore essential that you read the corresponding chapter of this manual and observe its instructions.

3. If there are still some points on which you are not entirely clear, please do not take a chance, but ask the customer adviser responsible for you, or ring the Gantner Instruments Test & Measurement GMBH hot line.

4. Where not otherwise specifically laid down, appropriate installation, commissioning, operation and maintenance of the appliance is the customer's responsibility.

5. Directly on receipt of the goods, inspect both the packaging and the appliance itself for any signs of damage. Also check that the delivery is complete (-> accessories, documentation, auxiliary devices, etc.).

6. If the packaging has been damaged in transport or should you suspect that it has been damaged or that it may have a fault, the appliance must not be put into service. In this case, contact your customer advisor. He will make every effort to resolve the problem as quickly as possible.

7. Installation, commissioning and servicing of our appliances must only be carried out by suitably trained personnel. In particular, correspondingly qualified specialists may only make electrical connections. Here, the appropriate installation provisions in accordance with the relative national Electrical Engineers construction regulations (e.g. ÖVE, [Austrian] VDE, [German]...) must be observed.

8. Where not otherwise stated, installation and maintenance work on our appliances is exclusively to be carried out when disconnected from the power supply. This applies in particular to appliances that are normally supplied by low-tension current.

9. It is prohibited to make alterations to the appliances or to remove protective shields and covers.

10. Do not attempt yourself to repair an appliance after a defect, failure or damage, or to put it back into operation again. In such cases, it is essential you contact either your customer adviser or the Gantner Instruments Test & Measurement GMBH hot line. We will make every effort to resolve the problem as quickly as possible.

11. Gantner Instruments Test & Measurement GMBH accepts no responsibility for any injuries or damage caused as a result of improper use.

12. Although every care is taken and we are continuously aiming for improvement, we cannot exclude completely the possibility of errors appearing in our documentation. Gantner Instruments Test & Measurement GMBH therefore accepts no responsibility for the completeness or the accuracy of this manual. The right is reserved to make alterations, and we may carry out alterations at any time without giving prior notice.

13. Should you discover any fault with the product or in its accompanying documentation, or have any suggestions for improvement, you may confidently approach either your customer adviser or Gantner Instruments Test & Measurement GMBH directly.

14. However, even if you just want to tell us that everything has functioned perfectly, we still look forward to hearing from you.

We wish you a successful application of our appliances. We will be pleased to welcome you as a customer again soon.

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TABLE OF CONTENTS

1. ABOUT THIS MANUAL

This manual describes the installation and setup of the **Data Acquisition and Logging Module e.reader** from Gantner Instruments Test & Measurement GmbH. The e.reader module is a data logging module with integrated measurement capabilities.

The following information can be found in this manual:

- Description of the e.reader system with detailed information on the hardware and module features.

- A start-up guide which describes how the e.reader is put into operation.

- Installation description of the e.reader and how the module is connected to the power supply and bus lines.

- Description of the different types of measurement of the e.reader.

- An introduction on how the e.reader modules are configured with the Configuration Software e.commander. This software has an integrated help including a detailed description of the configuration process.

- Introduction into the software e.con, which is used to define the functionality of an e.reader.

- Technical specifications of the e.reader.

2.   SYSTEM DESCRIPTION

The **Data Acquisition Module e.reader** is a Data Logger, used for the industrial and experimental testing technology, especially for the multi-channel measurement of electrical signals of thermal or mechanical data at test beds and test sites.

The e.reader provides the advantages of a remote structure and at the same time high precision, dynamic and flexible PAC (programmable automation controller) functionality. Eight analog inputs as well as the possibility to define conditioning, combinations, control functionalities, sequencing, mathematical calculations and data logging independently are available. The unit provides six configurable digital in- and outputs for thresholds, alarms, taring, trigger, and two relay outputs as well as an 128 MByte data memory, which can be divided into different memory depths, logging rates and trigger conditions. Additionally this module has an RS485 slave interface to connect additional e.reader E (expansion module) or e.bloxx modules and an Ethernet interface.
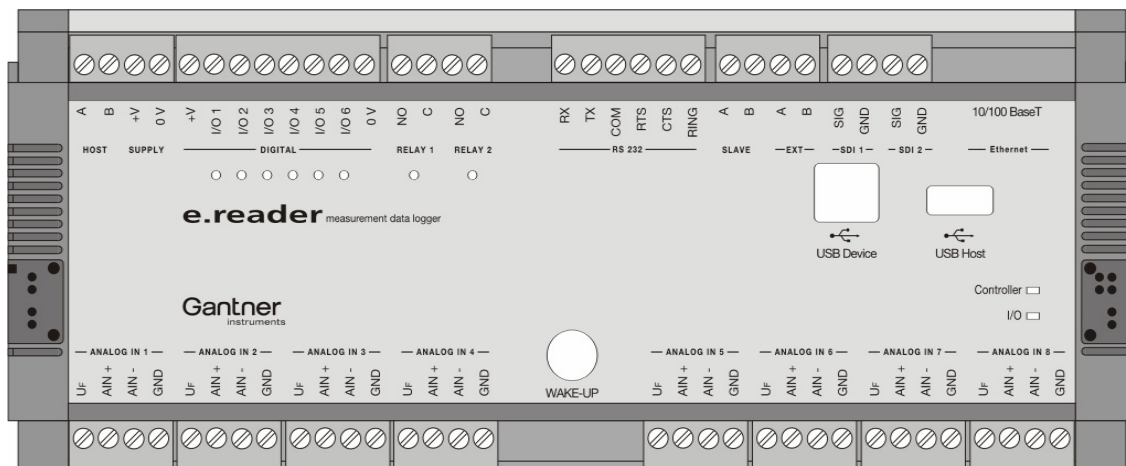
Picture 2.1 - *Front View of the e.reader Module*

The following instruction will show the simple setup of an e.reader system:

1. Installation, chapter 3.1
2. TCP/IP-Setup, chapter 3.4
3. Sensor connection and configuration, chapter 4
4. Read online measurement values, chapter 3.8 and measurement buffer, chapter 3.9
5. e.con application (optional), chapter 3.10

For several applications the system will be connected to a superior system. Therefore the e.reader provides several interfaces such as the Modbus TCP/IP, USB slave, USB master and it can be connected to any SCADA package using one of the standardised interfaces.

For more details on the e.commander software please refer to chapter 3.2

3. START-UP

This chapter describes how the module e.reader is set into operation, the way it is set-up and which way measurement values can be read by using the configuration software e.commander.

The chapter will just give a short introduction so it is possible to check the correct function of the e.reader module. Detailed information on the installation, set-up, the e.commander and e.con software can be found later in this manual.

In order to work with an e.reader module you need the following parts:

- e.reader module
- Configuration software e.commander
- Automation software e.con (optional)
- RS 232 connection cable ICL106 which is delivered with the e.reader module (if the IP address of the e.reader has to be changed)
- Ethernet cable, cross wire for direct connection to PC or normal one for connection to a network

3.1 Supply and Connection of the e.reader

Use the e.reader module only within the allowed environmental conditions (see technical data). The protective system is IP 20 (not water-proof) and the allowed temperature range for operation is -20 up to +60℃.

An e.reader module can be connected either to a local network or directly to a PC/laptop via RS 232 and Ethernet. The standard operation is to connect the e.reader to Ethernet for integration into a local network but a modem connection via the RS 232 interface is very common as well.

After connection the e.reader has to be supplied with a DC voltage in the range of +10 to +30 VDC. The power input of the e.reader is protected with an internal fuse (reversible) against excessive voltage and polarity connecting error. The power supply cables are connected to the screw terminals "10..30V" and "0 V".
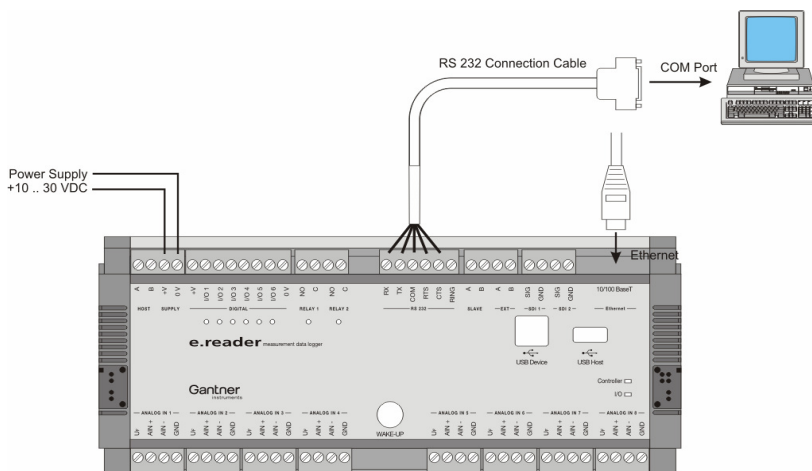

Figure 3.1 - Power Supply and Bus Connection of the e.reader

When turning on the power supply the LEDs of the e.reader will start blinking a few seconds and afterwards the LED "Run/Error" on the front of the e.reader will light up in green color.

3.2 Installation of the Configuration Software "e.commander"

The e.commander software is used to define all settings of an e.reader, like the interface settings and internal settings for the memory (circle buffer), variables (channels), synchronization and life time. This software also includes the Configuration Software ICP 100 for configuration of e.bloxx measurement modules and the visualization tool Green Eye Writer to evaluate measurement data.

Minimal System Requirements for e.commander
- PC with Windows 98 or higher
- Min. 20 MByte of free disc space to store all projects and history data
- Connected Ethernet Interface

Install the e.commander software from the installation CD. The installer will guide you through the process. Afterwards start the e.commander. An icon will be generated on the desktop and the e.commander can also be found in the Start-Menu of Windows, section "Programs" -> "Gantner Instruments".

At the first start-up of e.commander you have to select the language you want to use. The language can be changed later on if required. Therefore edit the e.commander ".ini" file in the e.commander directory and change the number of the language (0=English, 2=German). Now the e.commander software has to be licensed, otherwise the e.commander will work in demo mode. The language selection and licensing has to be done only once when starting this software the first time.

Now the following window will open (this will be the first window when starting the e.commander next time).
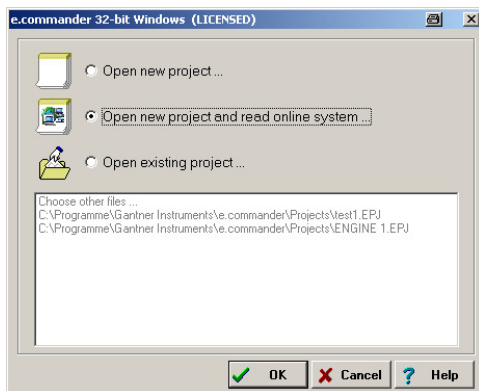
Having connected the e.reader to the local network or to the PC via a cross cable, select the option "Open new project and read online system..." and press "OK". The e.commander will scan the network for connected controllers (see chapter 3.3).

In case you have connected a new e.reader directly to the PC/laptop via the RS 232 interface you can select the option "Open new project" and press the "OK" button to proceed insetting the correct IP address (see chapter 3.4). Otherwise this functionality is being used to define an offline project.

The third possibility (Open existing project…) is being used when changing an existing project offline.

3.3 Network Scan for connected controller

All e.reader units are being delivered with a certain default setting (IP-address). But in some cases it is necessary to handle an e.reader you do not know the settings in detail. Therefore the e.commander provides a very comfortable tool to find the required modules in the network. From the toolbar select Utilities → Controller Network Terminal…
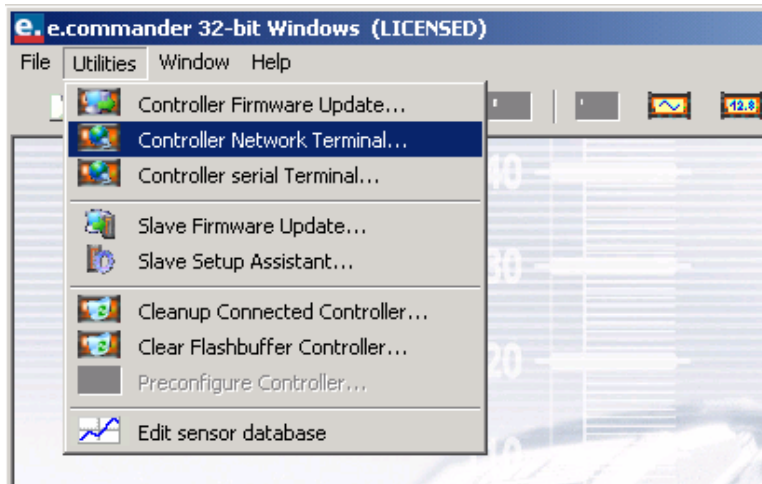
This network scan will find any units being connected to the Ethernet, independent from its IP-Address, its type (e.gate / e.pac / e.reader / e.xact) or if DHCP is activated or not. The scan will provide the following information to be able to adapt the unit for the network it has to be placed into.
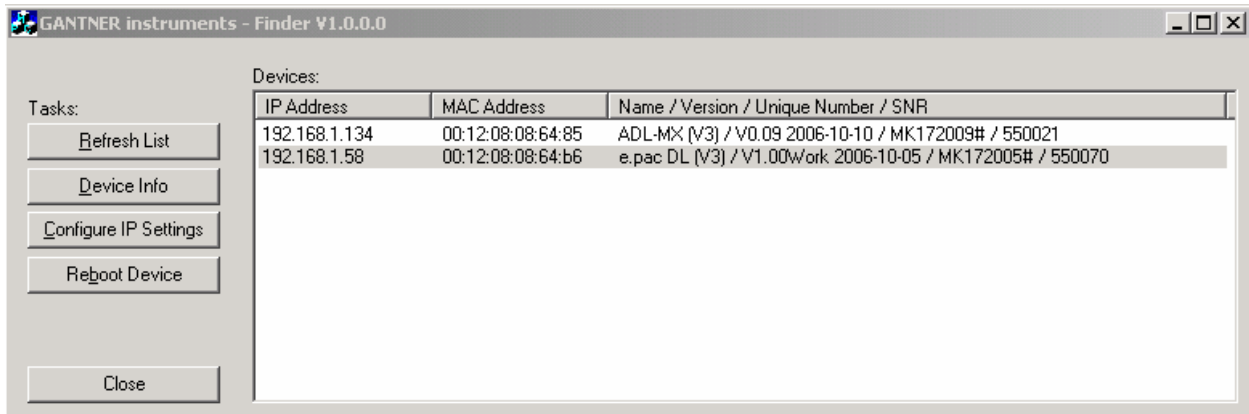
To get the required information on the controller / e.reader select the unit and click the button "Configure IP Settings". The window opening enables the user to activate DHCP or to set the correct IP address:
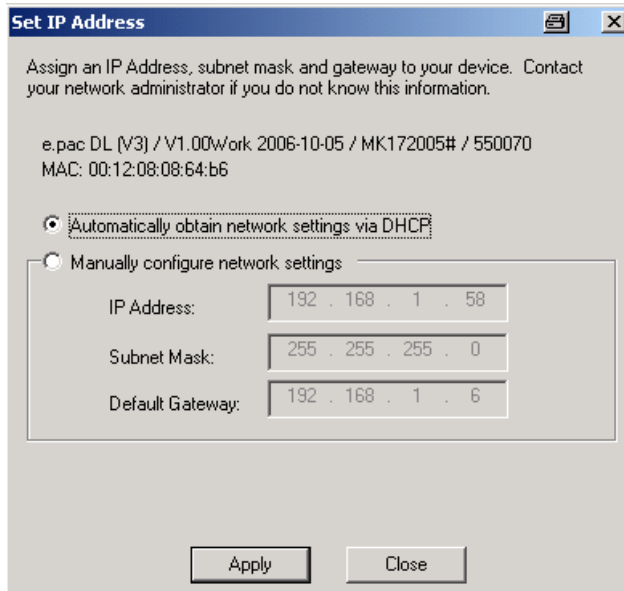
Beside this very comfortable way there is another possibility availble to find an e.reader on the Ethernet. This procedure will be described in the following section:

3.4 Traditional way of finding an e.reader on the Ethernet

Each device on an Ethernet has a unique address. These addresses are used to find and communicate with the corresponding devices. On delivery the address of an e.reader is set to 192.168.1.18 as default, with DHCP set to ON.

After selecting the option field "Open new project and read online system..." in the start-up window the e.commander will search the network for all connected Ethernet devices and show them in a new window.
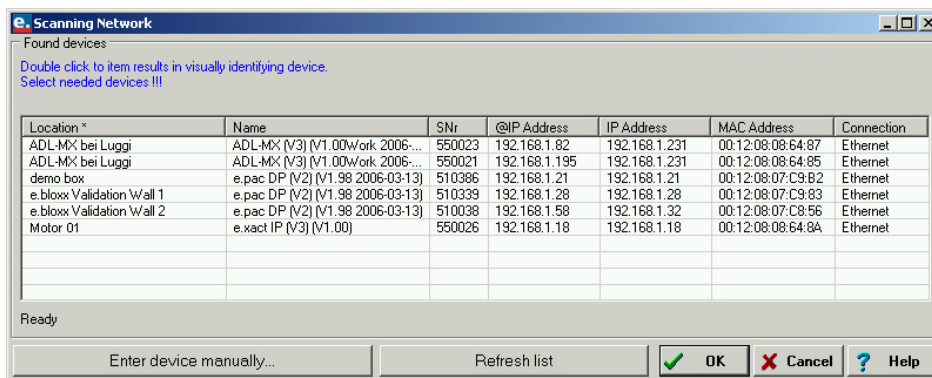
If the e.reader could not be found there might be one of the following problems:

1. Connection problem: Check that the e.reader is connected correctly to the Ethernet and the power is supplied to the module (LED "RUN/ERROR" is on).
2. The IP address of the e.reader does not fit to the network it is connected to.
3. Wrong DHCP settings: By default the DHCP setting of an e.reader is set to ON. In this case the e.reader will wait for a DHCP server in the network to get an IP address assigned. If there is no DHCP server in the network or the e.reader is directly connected to the PC/laptop via an Ethernet cross-cable, then the DHCP setting must be set to OFF (see chapter 3.4).
4. The IP address of the e.reader conflicts with another device on the network: In this case refer to the next chapter 3.4 to change the IP address.

Select the e.reader you have to work with and click "OK". The e.commander will read the configuration of the e.reader module and it will be displayed on the screen (see 3.5).

Note: By double-clicking on an e.reader the "RUN/ERROR" LED of the e.reader will start blinking fast for a few seconds. This indicates if this is the system you are going to work with.

Setting the Ethernet Address of an e.reader Module via the RS232 interface:

An e.reader can be connected directly to a COM port of a PC/laptop via the serial RS 232 interface cable that is included in the scope of supply. This way it is possible to change the IP address and the DHCP setting of the e.reader.

In the e.commander software select the menu item "Concentrator Terminal…" in the menu "Utilities". The following window will open.
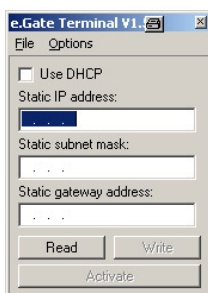
The e.reader, that is connected at the COM port, will be read and the address information of it will be displayed in the window. If no module is found check the interface settings (correct COM-Port) in the "Options" Menu and click on "Read".

The actual settings of the e.reader will be shown in the window. The settings can be changed here. Enter an IP address which is not yet used in the network the e.reader shall be used later on. Also check if the field "use DHCP" is set correctly. If there is a DHCP server in the Ethernet, where the e.reader shall be used, mark this field. Otherwise keep it unmarked. A DHCP server is used to assign an IP address dynamically to the devices in the network.

Note: No leading zeros are to be entered in the IP-address (valid = 192.168.1.18, invalid = 192.168.001.018).

3.5 Read Configuration from an e.reader

To see the configuration of an existing e.reader module add the module to a project. Therefore press the right mouse button in the project window and select "Add Online Concentrators..." from the pop-up menu. The e.commander will search the network and display all e.reader and test controllers on the network in a list as described in the chapter 3.3.

Select the desired e.reader and press "OK".

During the next few seconds the communication between the PC and the e.reader is checked, the configuration of the system is checked to see if the configuration correlates with the hardware, to verify the e.reader, to test the communication aso.

As a positive result of the above mentioned system check the project is displayed in a window with a list of all the defined variables.

e.reader - The red star indicates that the displayed configuration is not yet loaded into the e.reader module

Defined variables of the e.reader
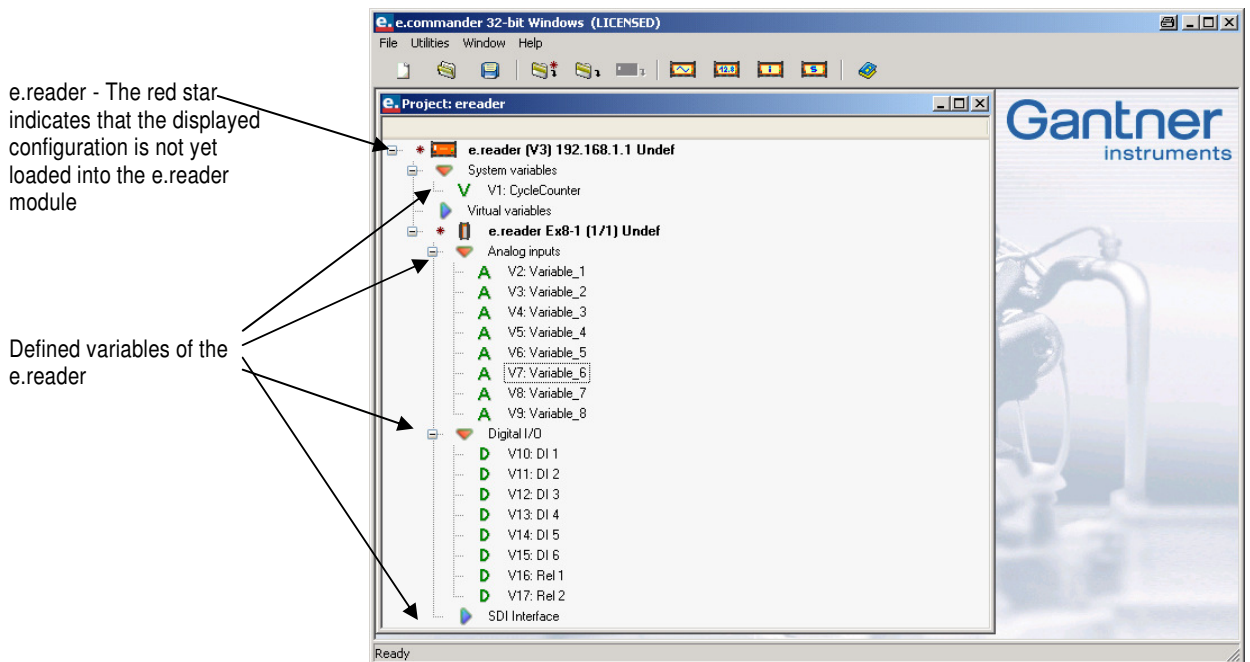
By double-clicking a variable its settings can be changed. See the chapter 5 "Configuration" for more information.

3.6 Edit a Configuration

It will be distinguished between the configuration of e.reader specific settings and the configuration of the variables of an e.reader.

3.6.1 Configuration of e.reader

To configure the settings of an e.reader double-click onto the e.reader module in the project window. A new window like the following one will open.
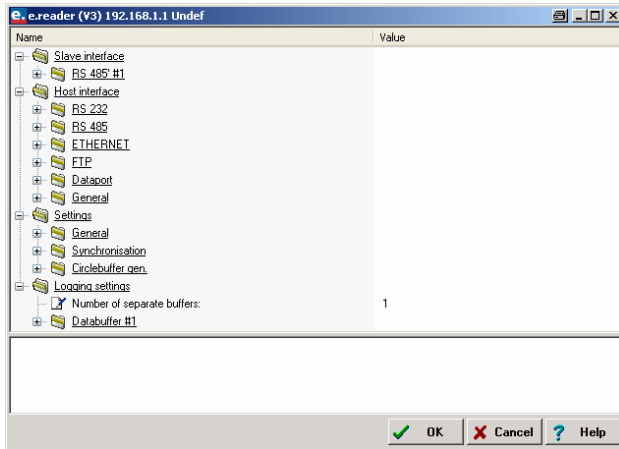
Here all the settings for the e.reader are listed in a tree view. You can change all the settings directly in this window. Beside the interfaces and setting the logging functionalities can be defined as well.

3.6.2 Configuration of Variables

With the e.reader four different types of variables (resp. channels) will be displayed. These are the analog variable, the digital variables, the system variables and the virtual variables. Virtual variables e.g. are being used if one variable should be part of different arithmetic variables,…, a system varialbe e.g. could be cycle counter.

To define all the settings for a variable of an e.reader double-click onto the variable in the project window.

The following configuration window will open:
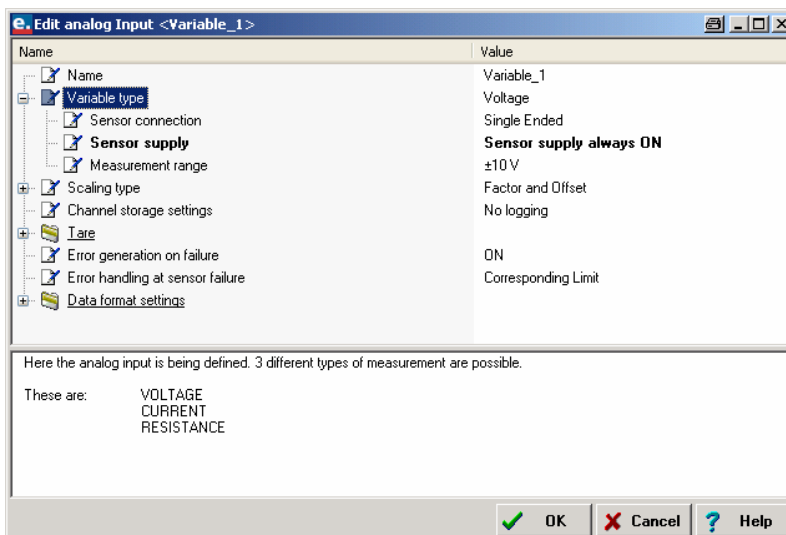
Here you can define the name and the kind of measurement for the variable and make much more settings like the scaling type, how the logging of the variable shall be handled, the error handling, etc..
In the second window the online help for the corresponding setting will be displayed.

3.7   Sensor Connection

The measurement sensors and output circuits are connected to the e.reader via the corresponding screw terminals. This has to be done according to the configuration of the e.reader, so that the configuration corresponds to the actually connected sensors.

8 Digital In-/Outputs

8 Analog Inputs
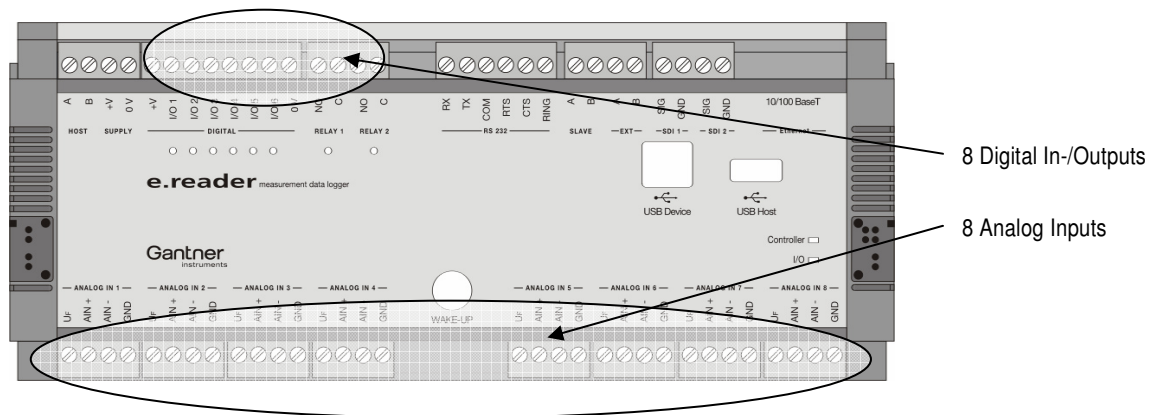
A detailed description how the different types of sensors for the different types of measurement are connected can be found in chapter 4 - "Sensor Connection".

3.8   Display Measurement Values

After configuration and correct sensor connection the actual values of each variable can be displayed and monitored on screen in real time.

To display the real time values click on the icon 🔢 "Read Online Values from Concentrator". The e.commander will scan the network and display all connected test controllers in a window. Select the desired e.reader module and press "OK". The e.reader will be read and the defined variables with their actual values will be displayed in a new window.
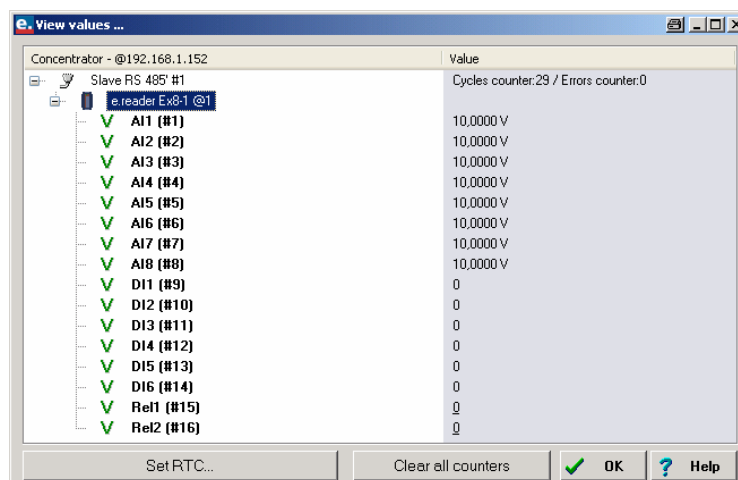
In the left part of the window all defined variables are listed. On the right side you can see the measurement values of each variable.

With the button "Clear all counters" all counter values of the e.reader can be reset to zero.

Each e.reader has an internal real-time clock for timing information. This clock can deviate after longer time of operation. In order to check the clock press the button "SetRTC". A window will open where you see the time of the e.reader and the local time of your PC/laptop.
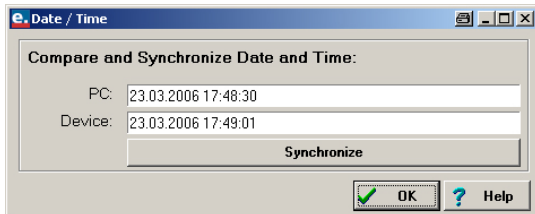
With the button "Synchronize" you can set the clock of the e.reader to the PC/laptop time. Pay attention that this time is set correctly before you set the RTC of the e.reader.

3.9 Read Memory

The e.reader saves all measured values in its internal memory, which is a ring buffer. If some data only have to be logged at a reduced speed this has to be programmed with the e.con software.
In order to read out the buffer of an e.reader click on the icon [icon] "Read Online Buffer from Concentrator". The e.commander will scan the network and display all connected test controllers in a window. Select the desired e.reader module and press "OK". The buffer of the e.reader will be read. If you want to store the data locally on the PC/laptop for later evaluated and processing, select "Yes". You will be prompted to enter a file name for the data. If data have to be displayed only, press "No".

Attention: Reading data from the e.reader deletes all measurement data – data can be read only once! Therefore always store data if you need them for further processing!

To display data the e.commander starts the integrated tool "Green Eye" and displays data in a new window.
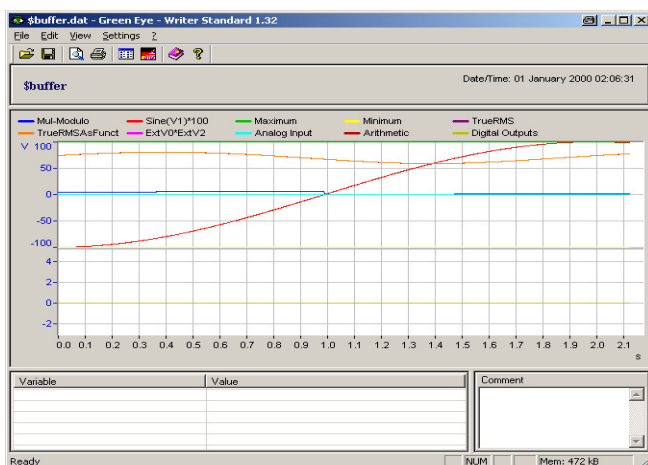
The licensed version of Green Eye Writer provides helpful features such as difference measurement, zoom function, many scaling and design tools etc. With an unlicensed version of Green Eye it is only possible to view the measurement data.

Note: A detailed description about the evaluation of measurement with Green Eye can be found in the description of the e.commander software.

3.10 E.con (optional)

The software e.con is an easy-to-handle graphical programming system to define the functionality of an e.reader module. The programming is done by combining several "function blocks" in certain ways. The whole functionality of these function blocks is defined in the e.reader. The software e.con is just a tool for combining and "wiring" the single blocks.

Programming can be done on a data flow basis (function block language) or by following the control flow (sequences, flow charts). The presentation of graphical blocks follows existing specification and technical languages. Structure blocks permit a hierarchic structure of projects. Linked projects and export mechanisms facilitate the reuse of structure blocks that have been created earlier.

The software e.con combines programming, simulation, testing and running in one tool. Special blocks and additional tools permit online observation of signals and signal tracing as well as run-time measurements.

Detailed information on the e.con software is available in the online help, the e.con introduction manual provides an overview on its possibilities and how to define a project.

The following picture shows a structure for a test cycle.
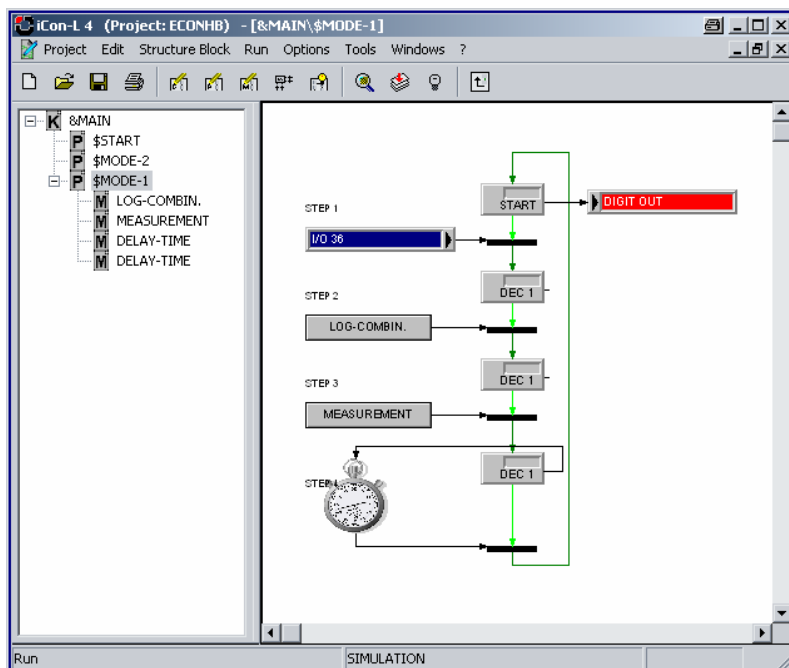
4. SENSOR CONNECTION

4.1 General

The e.reader has integrated measurement functionality which provides all together eight analog inputs, six digital in-/outputs and 2 relay-outputs for measurement of sensor signals. Depending on the type of sensor, which is connected to the analog inputs, various numbers of terminals have to be used. The configuration of the inputs and outputs is done in the configuration software e.commander according to the requirements of the application. The in-/outputs can be configured independently from each other.

4.2 Analog Input

An analog input collects and processes the signals of voltage, current and resistance sensors. Currently data of standardized and proprietary sensors are stored in the e.reader. The user can input further sensor data. The acquisition of various measuring values with these sensors may be reduced to a few principles of measurement, which are:

- Measurement of Voltage
- Measurement of Current
- Measuring a Resistance

For some of these measurements the e.reader offers several types of measurement. Currents up to 0..20mA may directly be measured by the e.reader. Measuring the voltage drop at an external shunt can carry out measurements of currents over 20 mA. Resistance measurements can be carried out directly.

The analog inputs are protected against excess voltages.

Notice: Overloads of more than ±15 VDC will result in false measurement data at the analog input variable.

4.2.1 Measurement of Voltage

Connection Scheme   **Circuit**
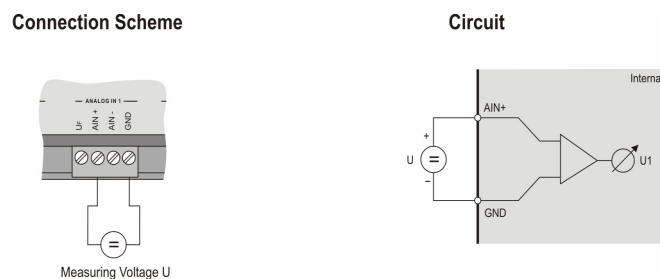
Figure 4.2. - Measurement of Voltage - Single-Ended

With the single-ended type of measurement the voltage to be measured is connected between the terminal "AIN +" and "GND" of an analog input (ANALOG IN 1 .. 8). The measurement voltage may not exceed 10 VDC.

4.2.2 Measurement of Current

Connection Scheme

Circuit
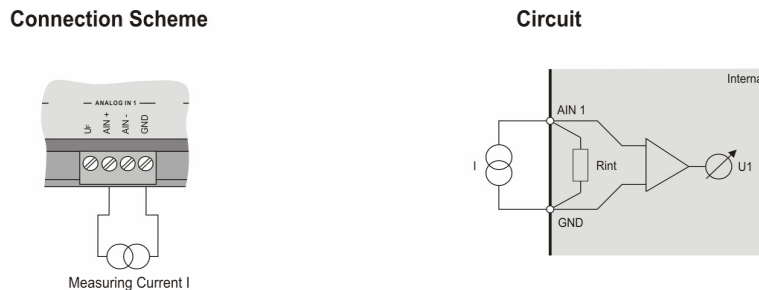
Figure 4.3. - Measurement of Current with Internal Shunt

Connection Scheme

Circuit
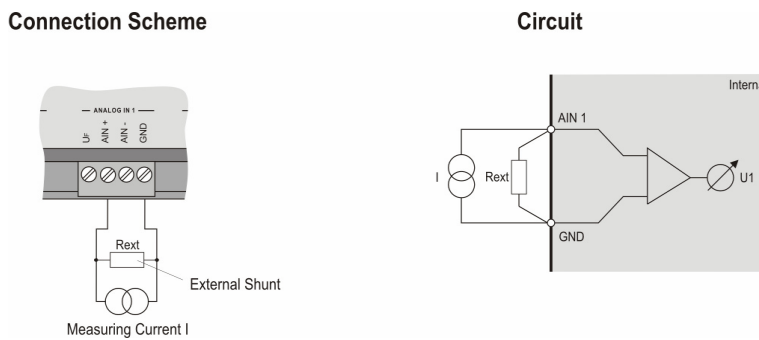
Figure 4.4. - Measurement of Current with External Shunt

For measurements of current with the e.reader the source of electricity is connected to the terminals "AIN +" and "GND" of an analog input (ANALOG IN 1 .. 8). For the measurement, the required load on the current source is regulated by an internal resistor R_{int} with a value of 100 Ω. The maximum power of this shunt is limited to 0.25 W, resulting in a measuring range of up to 20 mA maximum.

If higher currents need to be measured, an external resistor that is connected parallel to the source of current should be used. The power of the external shunt has to be adapted to the source of current to be measured in order to limit the voltage at the analog input to ±10 V. The analog input is configured as voltage input. The voltage has to be divided by R_{ext}.

Notice: The precision of the current measurement with external shunt depends on the accuracy of the resistor that is used.

4.2.3   Measurement a Resistance

Connection Scheme   **Circuit**

Rx = U1/U0 * R0,   △Rx = 2 * RL
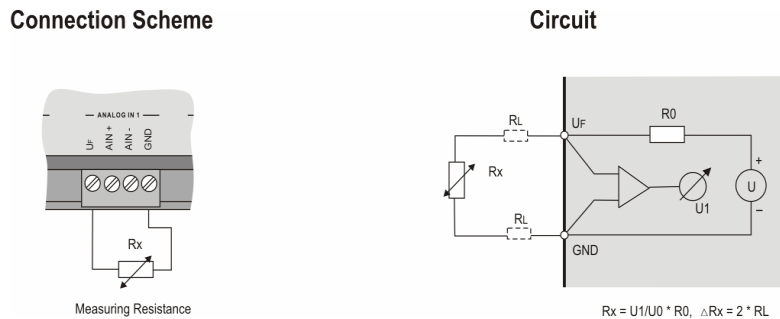
Figure 4.5. - *Measurement by a Resistance in 2-Wire Technique*

Connection Scheme   **Circuit**

Rx = (U2-U3)/U0 * R0,   △Rx = 0
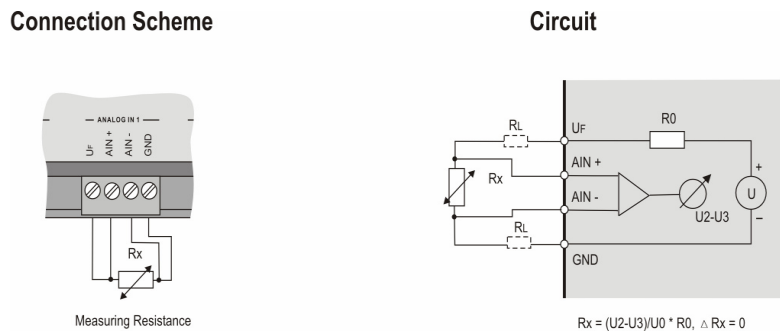
Figure 4.6. - *Measurement by a Resistance in 4-Wire Technique*

Resistance measuring are carried out by means of measurements of voltages at a current-carrying resistor. In this case the occurring fall of potential is measured via the resistance sensor. The feed current required for the resistance measuring provides the internal supply of the e.reader.

For this purpose the e.reader connects a supply point internally with the analog measurement input via a reference resistor R_o. The fall of potential U_o via the resistor R_o is required as a reference for further signal processing by the e.reader. The value of resistance of the sensor can be calculated from the input signals U_i as a multiple of the reference resistor R_o. The measuring range amounts to between 0 and 20 kΩ.

Notice: The e.reader supports resistance measuring in 2- and 4-wire technique. With resistance measuring in 2-wire technique the supply lines cause an additional fall of potential, thus distorting the measuring result and influencing the measuring accuracy. Therefore it is necessary to pay attention especially with resistance measuring

4.3 Digital Inputs / Outputs

4.3.1 Digital Inputs

The digital inputs of the e.reader can be used for trigger functionality, for status signals, counters, interval counter and frequency measurements. The inputs have an excess voltage protection (transil diodes), which comes into action at approx. 33 V. The maximum permissible input voltage amounts to 30 V. Input voltages between 3.5 VDC and 30 VDC are interpreted as logic HIGH ("1"), input voltages lower than 1.0 V as logic LOW ("0"). The maximum fan-in current amounts to 1.5 mA.
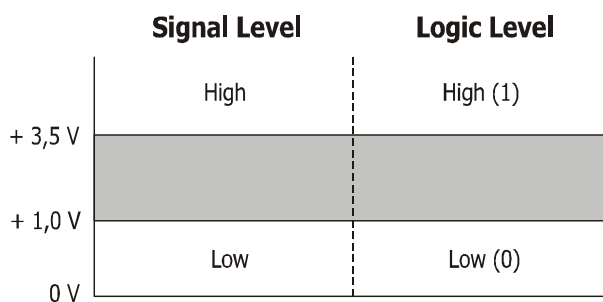
Figure 4.1. - *Definition of Signal Levels and Logic Levels*

4.3.2 Digital Outputs

The Digital Outputs can be used for status signals and alarm variables.

The alarm variables are configured with the e.commander software and can be used to provide signals e.g. in case of a sensor break.

Connection Scheme
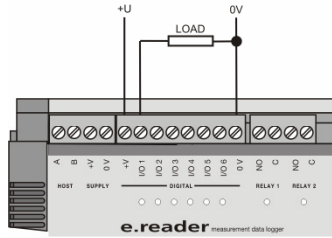
Circuit
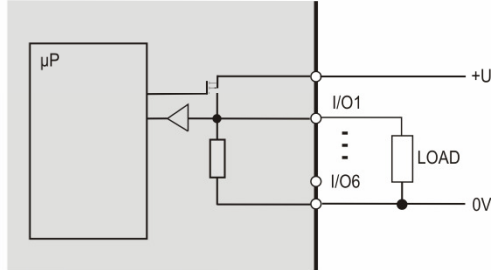
Figure 4.8 - Digital Inputs/Outputs of the e.reader
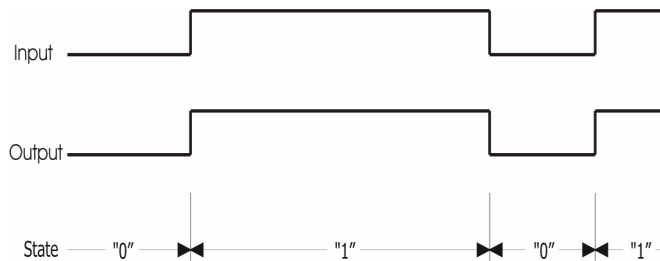
Figure 4.10 - Signal Diagram of Digital Inputs/Outputs

The digital input is set (switch closed) as long as the applied signal voltage remains under the threshold value of 1 V. The digital information can be scanned as 1/0 information via bus.

The status of the digital output can be scanned as 1/0 information via bus.

4.4 Relay Output

Connection Scheme
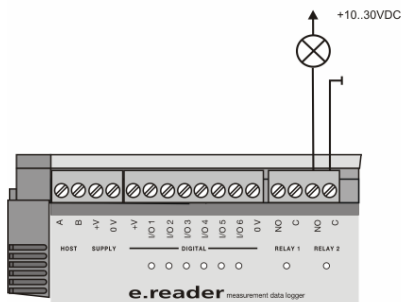
Circuit
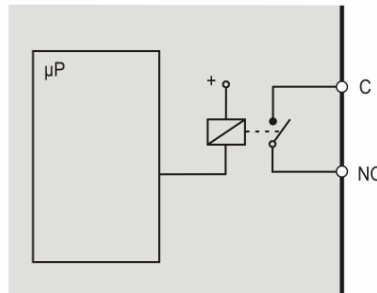
Figure 4.7. - Analog Signal Output

5.   CONFIGURATION

To configure an e.reader and read the measured and logged values from the e.reader the Configuration Software e.commander is used. This chapter will give you an overview on how to configure an e.reader module. A more detailed description about the e.commander software can be found in the e.commander manual.

The configuration can be divided into the following processes:

- Definition of module-specific settings for the interfaces, logging, etc.
- Configuration of the measurement variables
- Definition of the functionality of the e.reader by using the e.con software

There are two possibilities for configuring an e.reader. With the first possibility the settings and configuration of an e.reader will be read from the e.reader, adjusted and transmitted back to the e.reader.
Another possibility is to define the configuration locally on the PC/laptop without the necessity that the e.reader is already connected or present in the network. The configuration can be saved and loaded into the e.reader at any time.

The entire configuration of an e.reader or a whole system of e.readers is saved in a project. Projects can be saved and loaded for further processing.

The standard way of configuring an e.reader module is to connect the e.reader to the Ethernet first. Then the e.reader will be added to a project, which will read out the actual configuration of the e.reader and the configuration is being display on the screen. Now it is possible to reconfigure the module and finally update the e.reader with the new configuration.

5.1   Open a Project

Start the e.commander software. First you have to open a project. Therefore select one of the three options in the window that will be opened after start-up of e.commander.
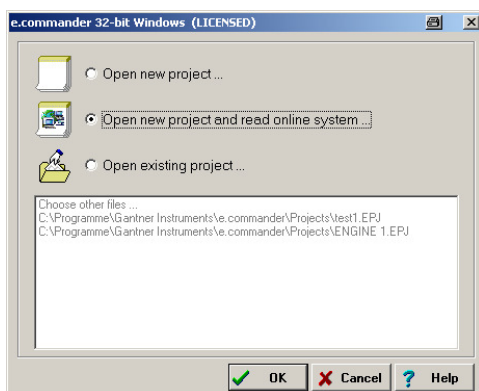
- With "Open new project..." you can open a new, empty project.
- Selecting "Open new project and read online system..." will open a window where e.commander displays all e.readers found on the Ethernet. You can select the e.reader you want to work with and press "OK". This will open a new project and add the selected e.reader with its actual configuration.
- With the option "Open existing project..." you can open a previously saved project.

You can open several projects at the same time as well. Each project will be displayed in a separate project window.
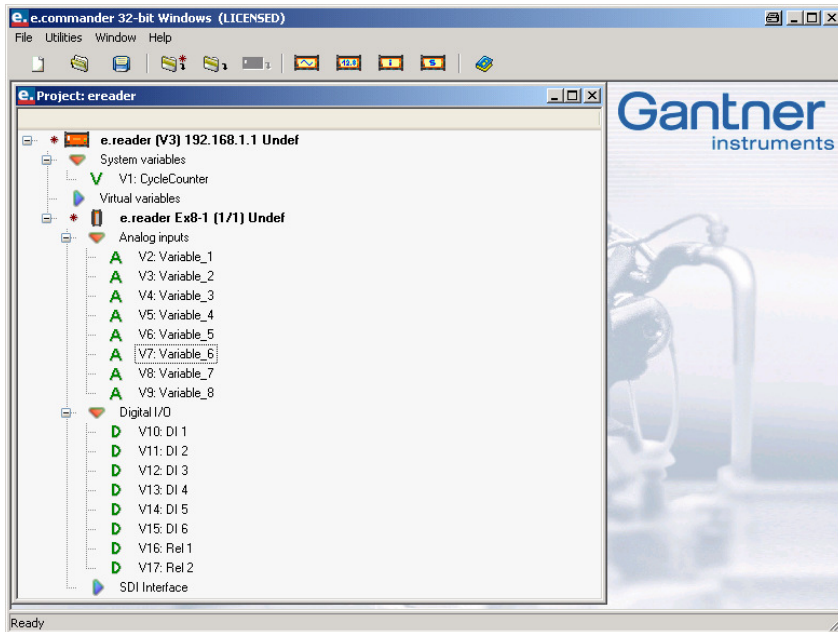
Below each e.reader in a project the variable settings of the in-/outputs of the e.reader and the configuration of the slave modules e.bloxx, which are connected to the e.reader, will be shown in list form. It is possible to add new e.readers and slave modules and to define the variable and device settings.

5.2 Adding an e.reader to a Project

To add an e.reader to a project click with the right mouse button below the last line of the project. A context menu appears.
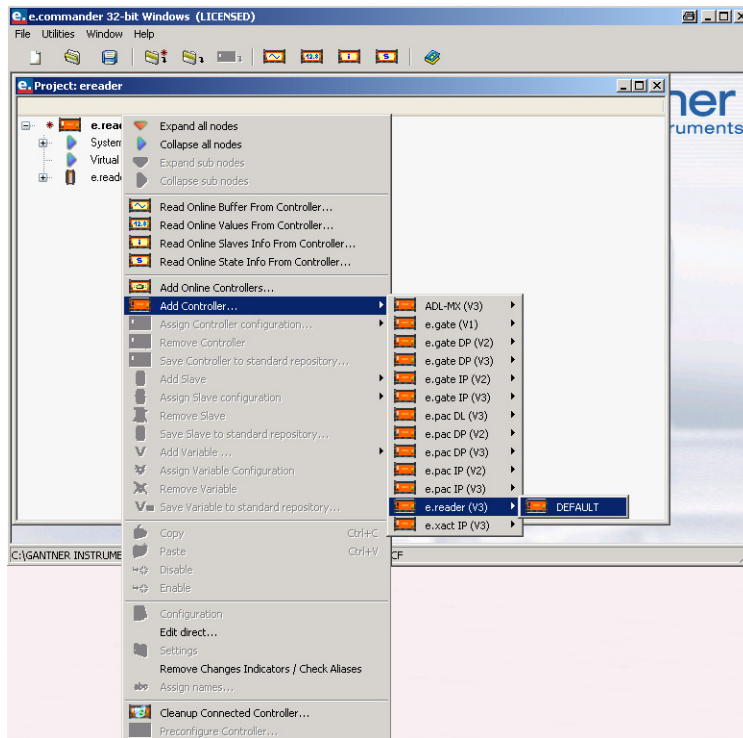
Now you have the possibility to add an e.reader which is already working and present at the Ethernet or to add a new e.reader module which is not available yet but you want to make its configuration already.

- In case you want to add a new e.reader which is not yet available on the Ethernet select the menu item "Add Concentrator..." and select the corresponding type of test controller you want to add (e.g. "e.reader").

- If you want to add an e.reader which already exists on the Ethernet select the menu item "Add Online Concentrators...". The e.commander will then search the network and display all test controllers on the network in a list.
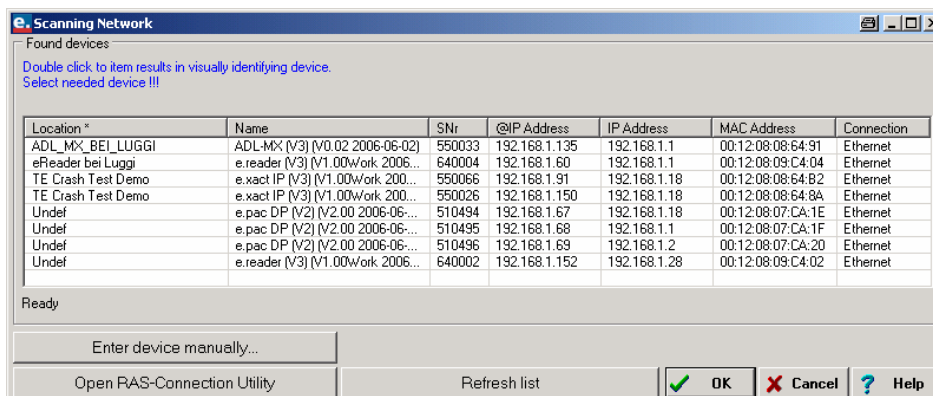
With "Enter device manually..." you can enter the IP-address of an e.reader directly. With "Refresh list" the network will be scanned again and the list of modules will be updated. Double clicking one of the e.reader in the list makes the LEDs of the e.reader blinking for a few seconds. This indicates the position of the e.reader you are going to work with. Mark the desired e.reader and press "OK".

After one of the two possibilities just mentioned the project window will be shown again and the e.reader will be added to the configuration list in that window.

5.3 General controller / e.reader settings

To change the settings of an e.reader double-click the mouse onto the e.reader or click on it with the right mouse button and select "settings" from the context menu. The window to define the settings will be opened.
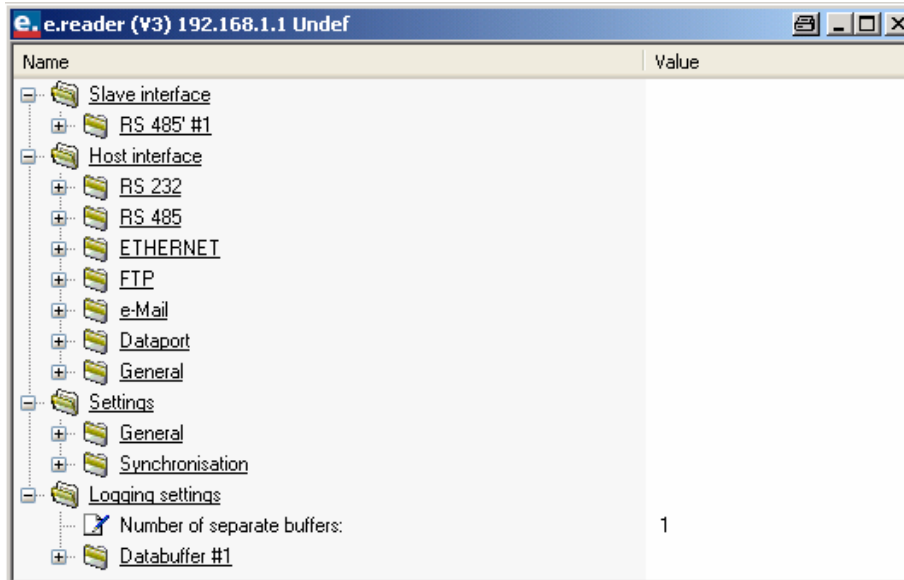
The settings are arranged in a group for the "Slave Interfaces" (connection of e.bloxx sensor modules), the "Host Interface", the e.reader specific settings and the logging settings.

Following is a short overview of the setting possibilities. By clicking with the mouse on a setting a help text for the selected setting will be shown in the lower area of the window.

5.3.1 Slave Interface
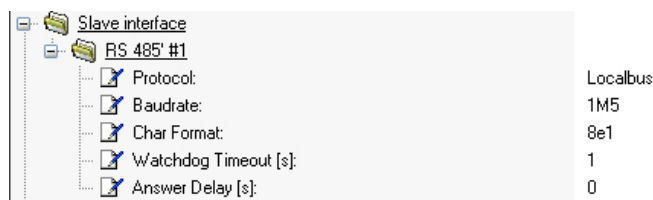
The e.reader provides one slave interfaces for the connection of additional e.bloxx modules via the screw terminals A$_{Slave}$ and B$_{Slave}$ of the e.reader. See chapter 5.5 for information on how to add an e.bloxx to the slave interface. In the following the slave interface is indicated as UART1. The settings like baud rate and delay time are selectable. The protocol is fixed to Localbus, 8e1. This setup will overwrite the setups in the module to ensure a communication.

5.3.2   Host Interface
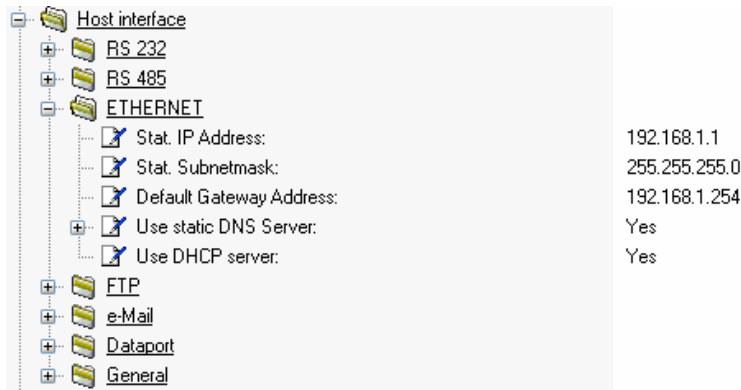
To connect the e.reader to a host there are several interfaces available. The most important interface is the Ethernet.

By using DHCP it is necessary that the Static IP Address and the Default Gateway Address fit together. The actual dynamic IP address can be displayed in the *General* selection.

Within the function *FTP* a password protection can be activated. It is necessary to work without or with all 3 passwords. In case of forgotten passwords please contact Gantner Instruments at office@gantner-instruments.com to unlock the password protection.

Another very interesting way of communication is via e-Mail. This handling is being described later in this manual.

Configuration of RS232 / RS 485:

To transfer data from the e.reader several interfaces are available. If the Ethernet interface will not be used, the RS 232 or RS 485 interfaces are available as well.
To configure these interfaces select the e.reader with the right mouse button in the e.commander and choose "Settings". In the section "Host interfaces" the RS 232 and/or RS 485 interfaces can be selected for configuration. Depending on the application the required protocol has to be selected:
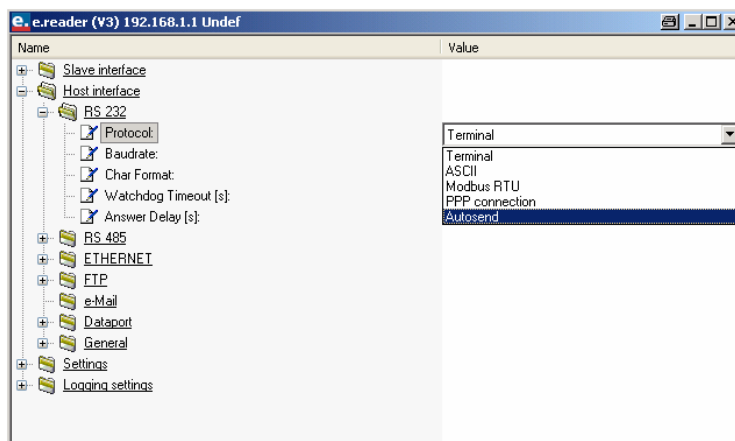
Terminal is being selected to configure the e.reader (e.g. IP-address), for modem communication you e.g. select the PPP connection or if data have to be sent automatically you will select "Autosend".
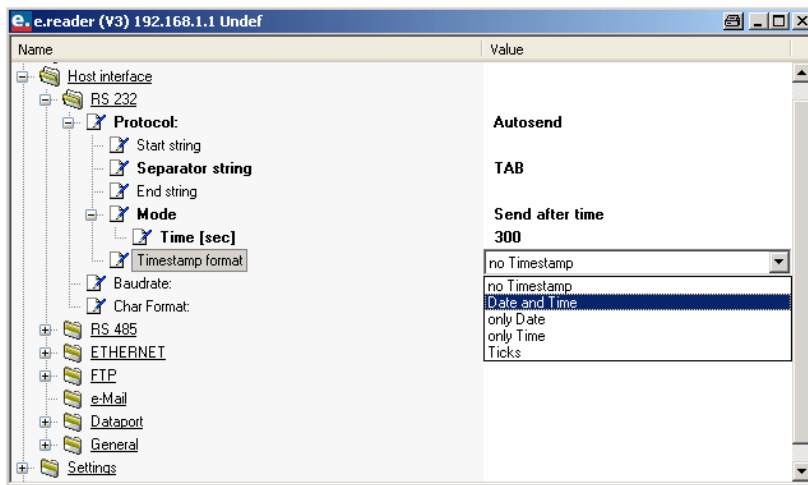
With Autosend the Start- and End-String has to be defined as well as the separator string. Now different modes are available such as "Do not send", "Send all variables", "Send after time" and "Send only buffer". Choosing "Send after time" requires a time in secondes when data have to be sent, e.g. every 300 seconds.

Even for the timestamp format there are different possibilities such as "no Timestamp", "Date and Time", "only Date", "Only Time" and "Ticks".

5.3.3 e.reader Settings

The e.reader settings are separated into 6 sections:
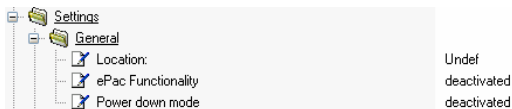
In the section "General" a designation can be assigned to the e.reader. With this name it will be indicated when searching for test controllers on the Ethernet and also in the project window. As default setting the "ePac Functionality" is deactivated. If you require ePac functionality you will need the additional software package e.con. For details on this software tool please refer to chapter 6.

The "Power down mode" is deactivated as a default as well. In this case the e.reader is running all the time, the energy saving functionality is being switched off.

Note: When changing a setting, the setting will be marked in bold text. When closing the setting window the changes will be written to the project file of your PC/laptop. To activate the new configuration in the e.reader the configuration file has to be sent to the e.reader module as well.
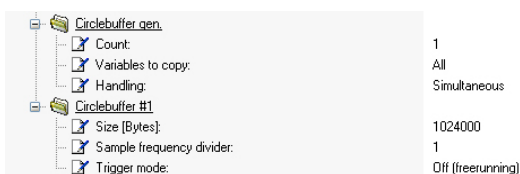
The circlebuffer in the e.reader stores measured values for later read-out and evaluation. It is possible to select the number of circle buffers (1 or 2) and set the number of variables to be stored (simultaneous or sequential storing), the buffer size, sample divider (e.g. a fast and a slow buffer), trigger mode and trigger position (pre-trigger).

5.3.4 Low-Power-Functionality- Power down mode

The e.reader provides 2 different modes, the standard mode and the low-power-mode.

The standard mode is being used if the logger is being connected to a standard power supply, if no reduction in power consumption is required.

With some applications (e.g. power supply via a solar pannel or a battery) a very low power consumption will be required. Therefore the e.reader provides the "Low-Power-Functionality". This functionality has to be defined in the e.reader settings:
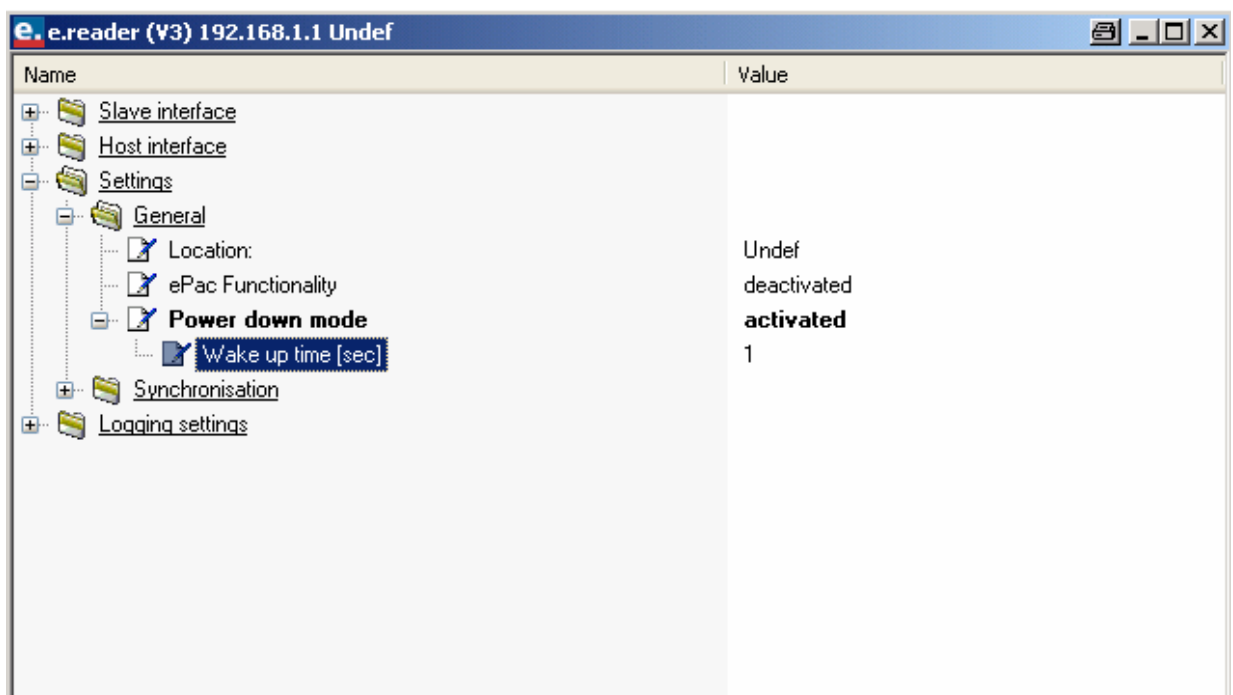
The following section describes the "Low-Power-Funcationality" in more detail:

If the "Power down mode" is activated, the cpu of the e.reader will be "switched off". Only the data acquisition part will be active during that time. This will result in the following handling of acquired data:

- no arithmetic calculations will be done
- do digital I/O will be active during that time if they depend on e.g. a threshold function.

After the defined "Wake up time" the cpu will wake up and handle the acquired data, e.g. do mathematical calculations, store data to the flash memory, switch digital I/Os.

In general there are 3 possibilities to wake up the cpu board:

- by the defined "Wake up time"
- if you connect to the e.reader e.g. via a modem
- if you press the wake up button on the front part of the e.reader

Remark: If a "Wake up time" of less than 20 seconds is being defined, the low power mode makes no sense, you will not save any energy. It is strongly recommended to activate the Low-Power-Functionality only if the application requires a very low power consumption!

The following table provides an idea on the power consumption depending on the samplerate:

Samplerate	Power Consumption	Remark
< 20 seconds	approx. 4 W	the "Low-Power-Functionality" makes no sense as mentioned above
1 minute	approx. 200mW	
10 minutes	approx. 100mW	

5.4 Configuration of the Variables of an e.reader

To change the configuration of the measurement variables of the e.reader double-click on the variable in the project window or click the variable with the right mouse button and select "Configuration". A window like the example below will be opened, where you can see the actual settings of the variable. The information in the window depends on the type of variable (analog, digital, input, output).
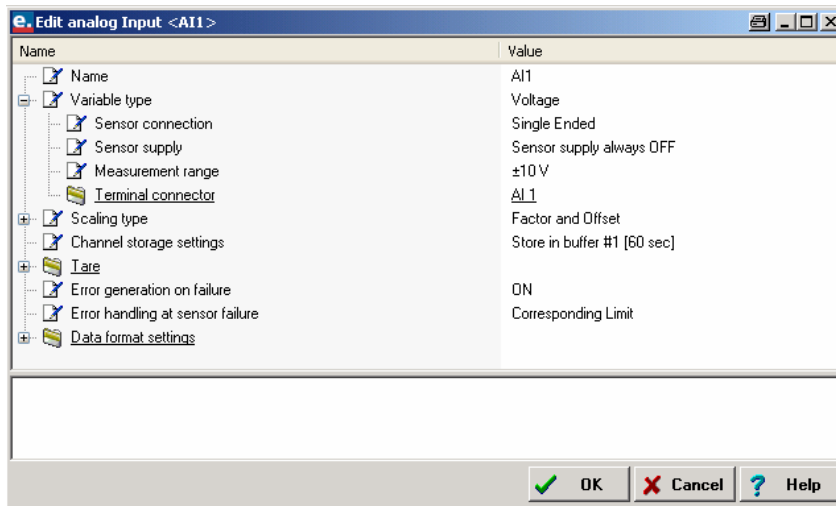
The variable name (has to be unique for every variable in case you will work with the e.con software), the variable type, scaling and range settings, the tare functionality, the error handling and data format settings for the selected variable are indicated here. Click on a "Value" field if you want to change one of the settings.

Note: All the settings having been changed and not yet written into the e.reader will be marked in bold text.

When you confirm with "OK" all changes (highlighted in bold font) will be saved and written to the e.reader. The project window will be shown again.

Note: Pay attention that the physical sensor connection corresponds to the defined configuration.

Following is a short overview of the setting possibilities. By clicking with the mouse on a setting a help text for the selected setting will be shown in the lower area of the window.

5.4.1 Variable Type

Here you can define the type of measurement for the variable. Depending on the variable type (analog, digital, input, output) different types of measurement are available. The field "sensor connection" lists all measurement functions of the selected variable type.

If there is a sensor connected which requires a supply voltage from the e.reader you can select if the supply shall be on always, off or optimized (on if required).

The range of measurement can also be defined. Adjust this to the predictable maximum and minimum measurement value.

5.4.2 Scaling Type

It is possible to transform the measured value of a variable into another unit, which is called scaling. First select the type of scaling with the list field behind "Scaling Type". With "Factor and Offset" you can enter the factor (multiplication of the measured value) and offset (shifting the conversion curve) for the calculation of the measurement value. With "2 Point Calibration" enter the values of 2 measurement points one time in the measured unit and one time in the conversion unit. For example to calculate the temperature from the measured resistance given by a PT 100 temperature sensor enter two resistance values in Ohm and the corresponding temperature values in °C or °F.

5.4.3 Error Handling

It can be selected if the I/O LED on the front of an e.reader shall be switched on red in case of an error (measurement range exceeded, communication interruption etc).

Also it is possible to define how the e.reader shall react on a sensor failure (e.g. line break). So in case of a sensor failure the value of the variable can be set either to a limit value, stay on the last measured value or set to a certain default value.

5.4.4 Data Format Settings

With these fields you can define the data format in which the measured values shall be transmitted via bus. Select the format of the variable (integer, floating real value, boolean, etc.), the field length and the precision. Precision indicates the number of digits after the comma and the field length is the total number of digits before and after the comma.

Data Direction defines if the value is an input or output value but it is possible to set it as input/output as well. Defined as empty the value of this variable will not be transferred, the variable is deactivated.

5.5 Configuration of Communication

The e.reader provides serveral possibilities for communication. The general setting have to be defined in the e.reader settings, additional information have to be added in the arithmetic channels of the e.reader which are available via the virtual variables. Detailed information on how to configure the e-mail communication is part of the e.commander online help.

The following picture provides an overview on different ways of communication:
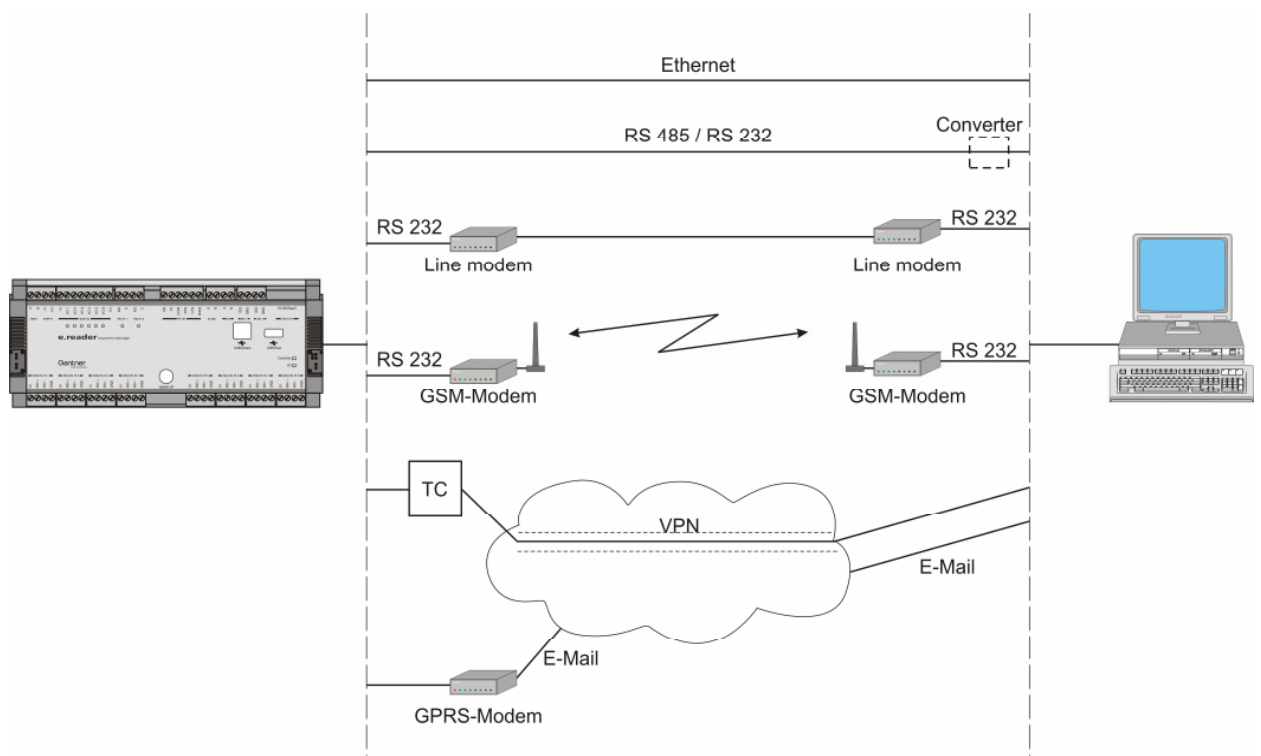
5.5.1 E-mail

First of all, the required information (messages, e-mail-addresses,…) have to be defined within the e.reader settings. Click the e.reader in the system tree with the right mouse button, select "Settings", "Host Interfaces" and "e-Mail". There you have to add all required information. The following picture shows you an example:
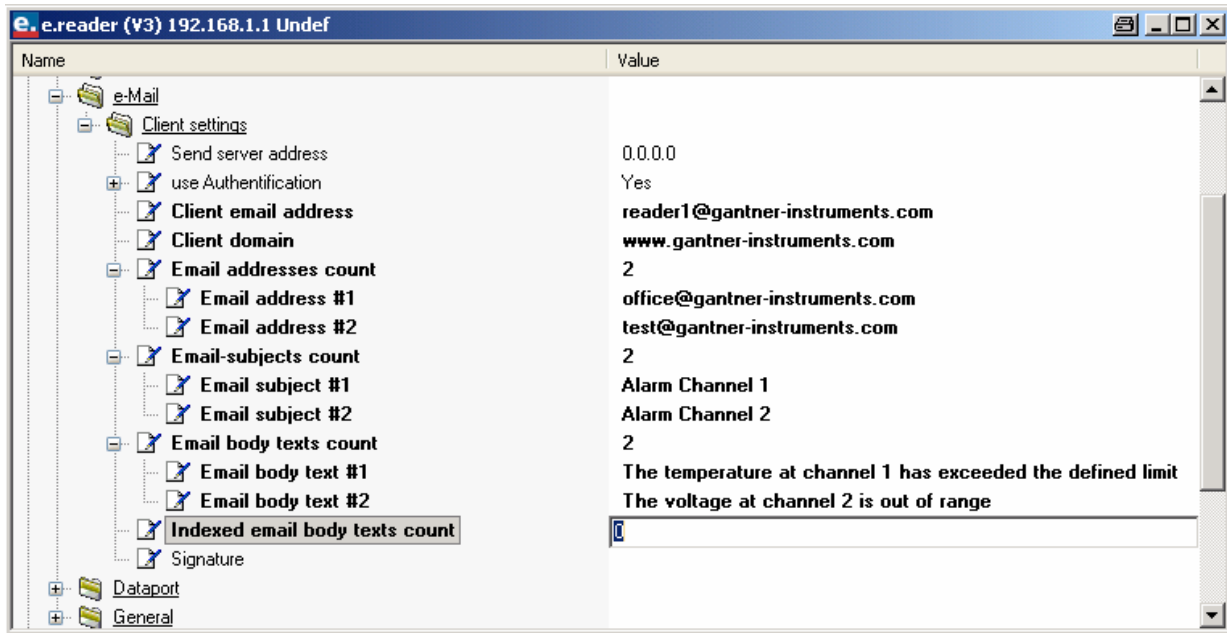
With the e.reader up to 10 different e-mail addresses, e-mail subjects and e-mail body texts can be defined. The general information has to be defined in here, the details/selections have to be defined with the arithmetic variables in the virtual variables of the e.reader.
The e.reader provides the possibility to send e-mails which may contain data from its memory to a server automatically.

In a next step you have to define a virtual variable in the e.reader. A double click on this variable opens the edit window – select "Formula". To create the e-mail you have to select the "SendMail" functionality:
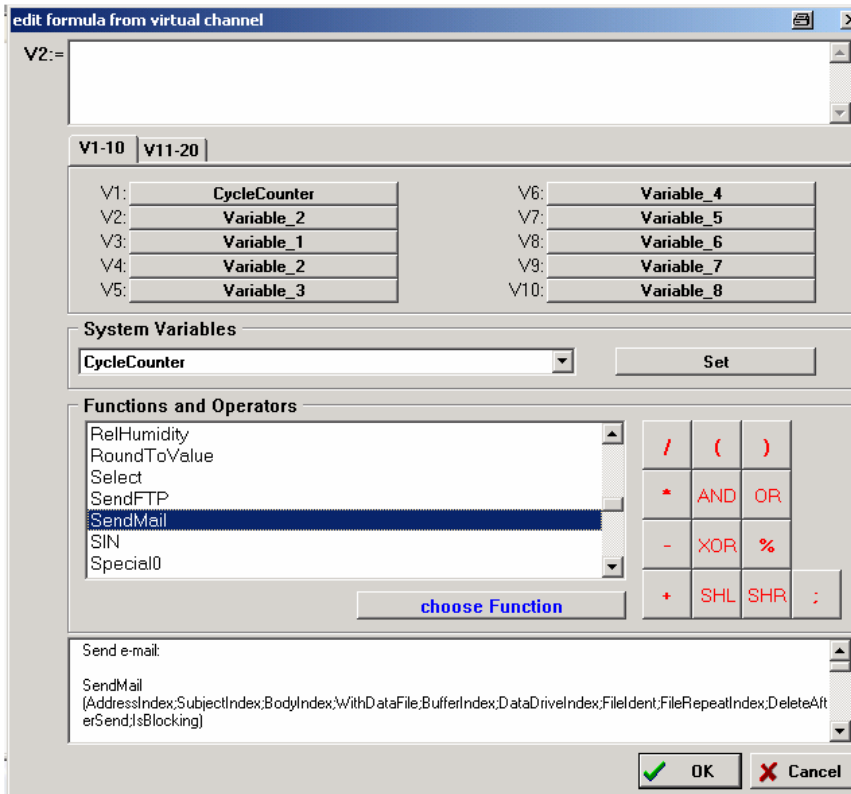
The online help shows all required parameter for the e-mail functionality and its handling and will not be part of this description.

The following example shows a way on how to configure the e-mail functionality. This configuration is built up in a way that an e-mail - including a data file – is being sent as soon as a certain measurement value exceeds a threshold value.

5.5.2 FTP - Client

The handling of the FTP communication is very similar to the e-mail communication. The settings are done in the e.reader settings:
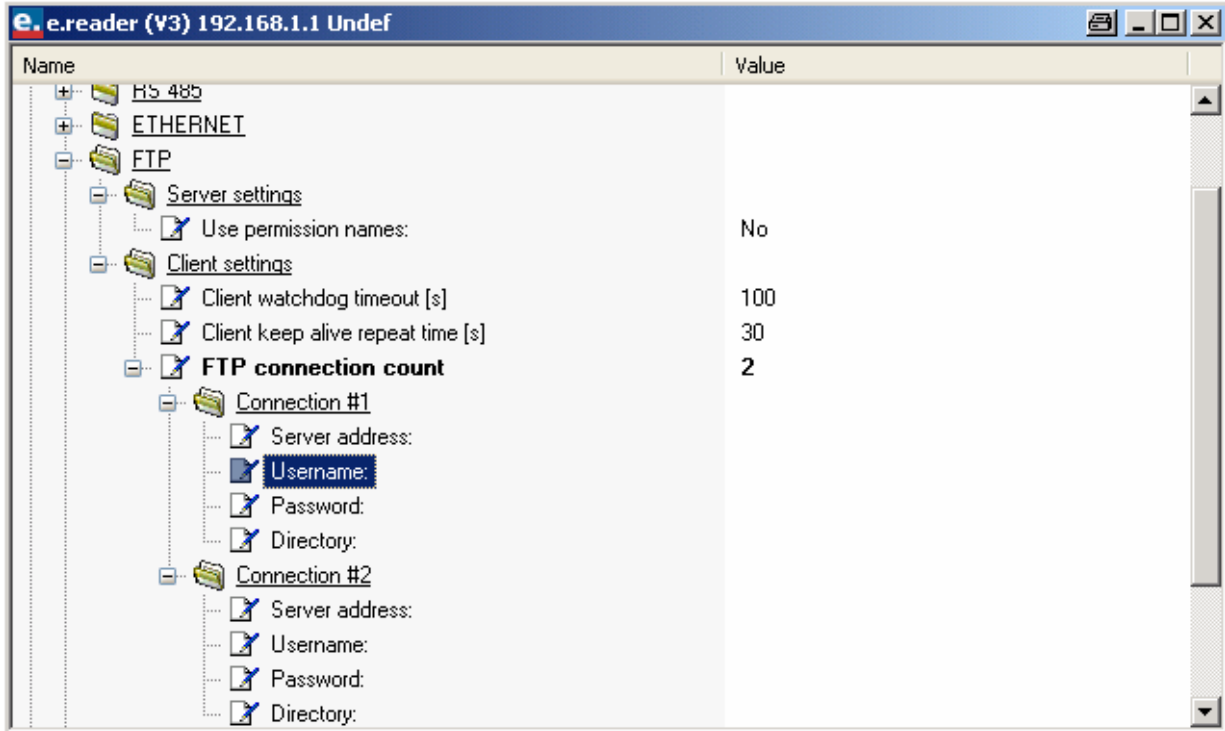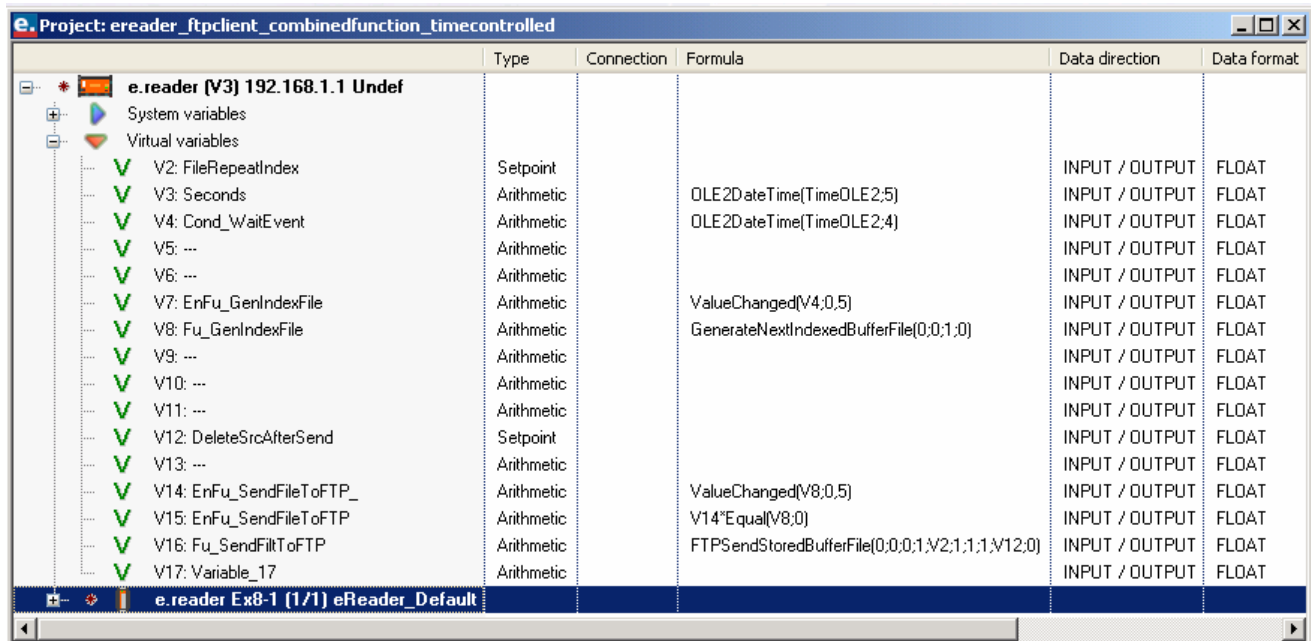
Up to 10 FTP connections can be defined. For each connection you have to define the required information. The handling itself will be done with the virtual variables as well – the formula editor will provide the required handling.

This FTP communication can be used to send data to a server automatically. These data will be stored to the server into a certain directory – and there they are available for further handling.

Attention: Please keep in mind to open an FTP connection before sending data to a FTP server and close it afterwards. The e.commander provides the function FTPSendStoredBufferFile(...) which covers the whole functionality.

To program such an FTP transfer this has to be programmed via the virtual variables of the e.reader. It is recommended to use some variables as spare parts as the parameter are fixed and do not change automatically.

The following picture shows an example on how to configure such a FTP transfer, some comments will be added:

		Type	Connection	Formula		Data direction	Data format
	e.reader (V3) 192.168.1.1 Undef						
	System variables						
	Virtual variables						
V	V2: FileRepeatIndex	Setpoint				INPUT / OUTPUT	FLOAT
V	V3: Seconds	Arithmetic		OLE2DateTime(TimeOLE2;5)		INPUT / OUTPUT	FLOAT
V	V4: Cond_WaitEvent	Arithmetic		OLE2DateTime(TimeOLE2;4)		INPUT / OUTPUT	FLOAT
V	V5: ---	Arithmetic				INPUT / OUTPUT	FLOAT
V	V6: ---	Arithmetic				INPUT / OUTPUT	FLOAT
V	V7: EnFu_GenIndexFile	Arithmetic		ValueChanged(V4;0;5)		INPUT / OUTPUT	FLOAT
V	V8: Fu_GenIndexFile	Arithmetic		GenerateNextIndexedBufferFile(0;0;1;0)		INPUT / OUTPUT	FLOAT
V	V9: ---	Arithmetic				INPUT / OUTPUT	FLOAT
V	V10: ---	Arithmetic				INPUT / OUTPUT	FLOAT
V	V11: ---	Arithmetic				INPUT / OUTPUT	FLOAT
V	V12: DeleteSrcAfterSend	Setpoint				INPUT / OUTPUT	FLOAT
V	V13: ---	Arithmetic				INPUT / OUTPUT	FLOAT
V	V14: EnFu_SendFileToFTP_	Arithmetic		ValueChanged(V8;0;5)		INPUT / OUTPUT	FLOAT
V	V15: EnFu_SendFileToFTP	Arithmetic		V14*Equal(V8;0)		INPUT / OUTPUT	FLOAT
V	V16: Fu_SendFiltToFTP	Arithmetic		FTPSendStoredBufferFile(0;0;0;1;V2;1;1;1;V12;0)		INPUT / OUTPUT	FLOAT
V	V17: Variable_17	Arithmetic				INPUT / OUTPUT	FLOAT
	e.reader Ex8-1 (1/1) eReader_Default						

Attention: This design of the window is available with e.commander version 1.4.2 or higher

Here is a short description of the FTP-programming – sending a new file after a certain period of time:

V2: The FileRepeatIndex defines which files has to be sent to. E.g. "-1" will send the oldest file, "-2" will send the latest file

V3: this function calculates the seconds of the day.

V4: this function defines the condition for sending a file – in that case every 60 seconds.

V7: here it is defined that an indexed file has to be created as soon as V4 changes from one minute to the next one.

V8: Here the new data file is being generated.

V12: This defines if the source file has to be deleted or not. It is not necessary to do this via a setpoint, it can be fixed as well.

V14: This variable enables the function to send the file in case a new file had been generated

V15: this is the second part of enabling to send the file

V16: this last command will now send the data file.

All parameters mentioned are described in the online help of the e.commander software.

5.5.3 PPP – Connection for modem communication

The e.reader is capable of communicating via PPP. All the settings have to be done with the e.reader settings as shown in the following picture:
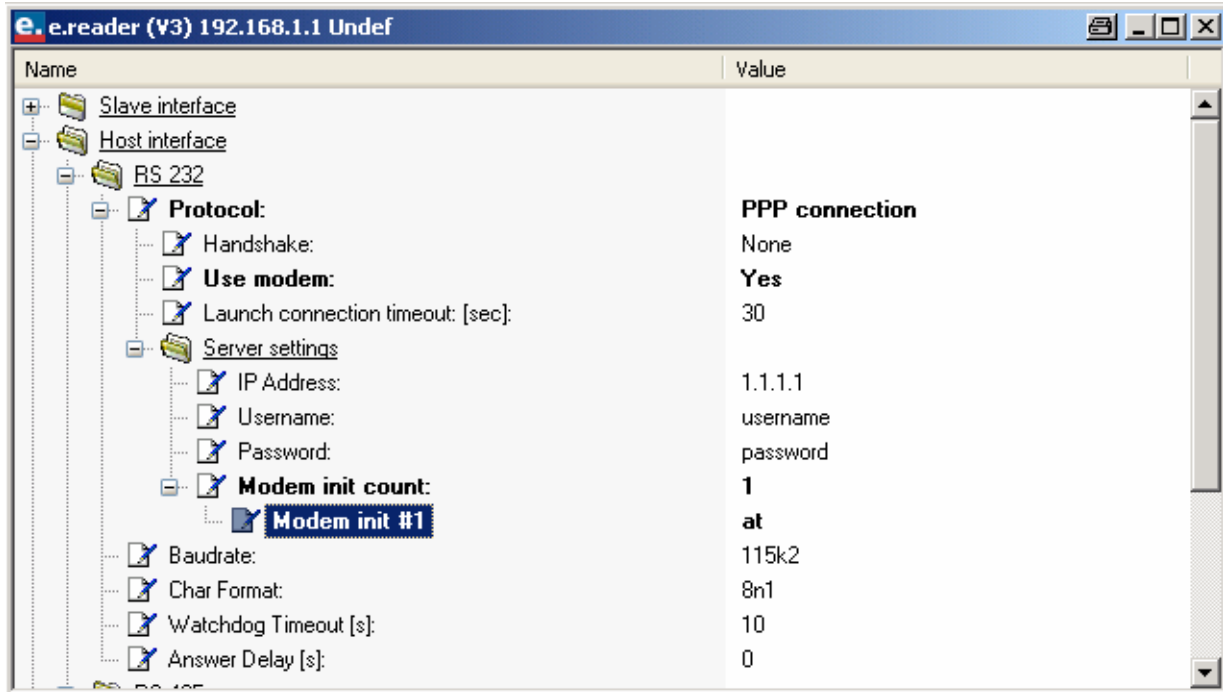
In the section "Server settings" the settings of the e.reader have to be defined. The "Launch connection timeout" will be required e.g. to synchronize the modem for communication.
Depending on the modem type being used different init strings might be necessary. It might be necessary to add one string by another (up to 10 separate strings will be possible), some modems provide the possibility to add several strings into one single command.
The Watchdog Timeout is recommended to be at least 100 seconds. If you decide for a very short time it might happen that the connection will close during the synchronization time.

Attention: It is required to have a PPP connection available with the PC as well!

The following part describes who to communicate via modem and the PPP communication.

First of all a data communication has to be defined on the PC (the same way as it has to be done if a modem has to be connected (e.g. iPassConnect). Afterwards the e.commander has to perform a network scan (as described in chapter 3.4) which will show all known modules in the network.
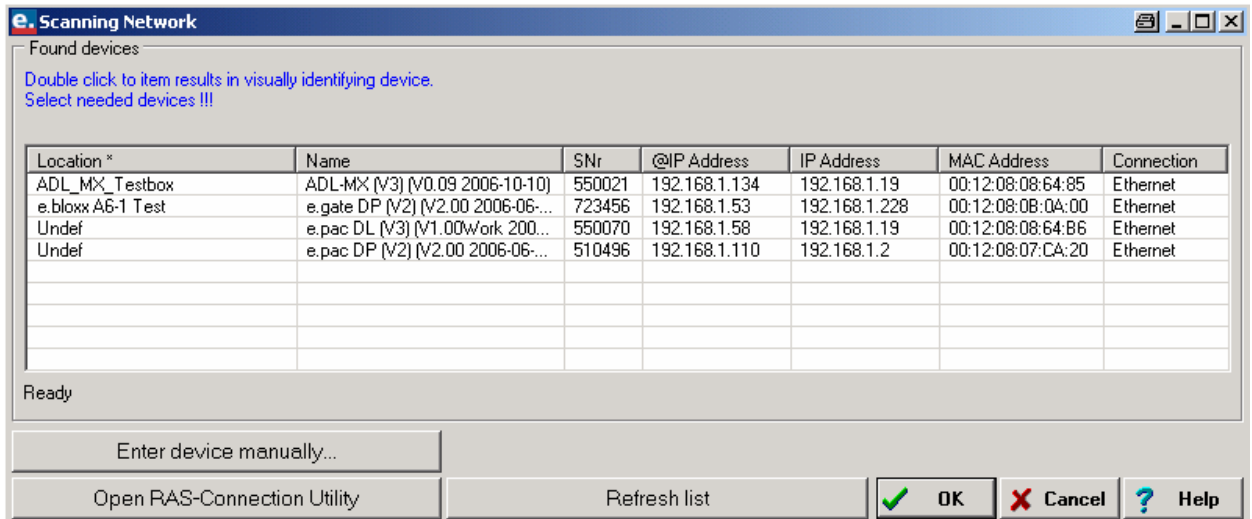
For the PPP connection click the button "Open RAS-Connection Utility":
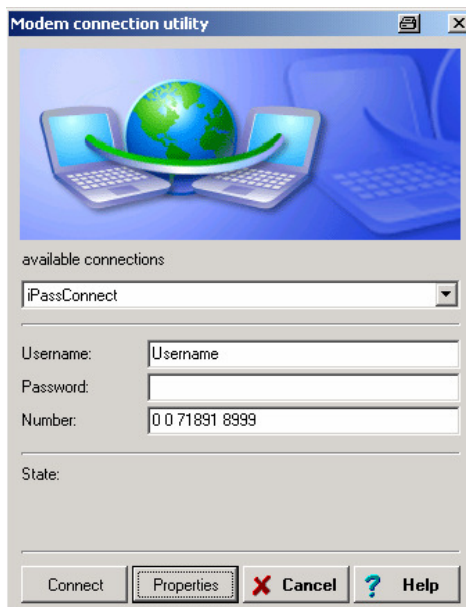
In the available connections all on the PC defined connections will be displayed. Select the connection you require and the number will be displayed.

If all required information is available click "Connect" to get access to the e.reader.

Details on Username and Password will follow in the next section.

To get access to the e.reader via the modem Username and Password have to be defined – this information has to be equal to the information being defined with the e.reader settings. The following picture shows the required part:
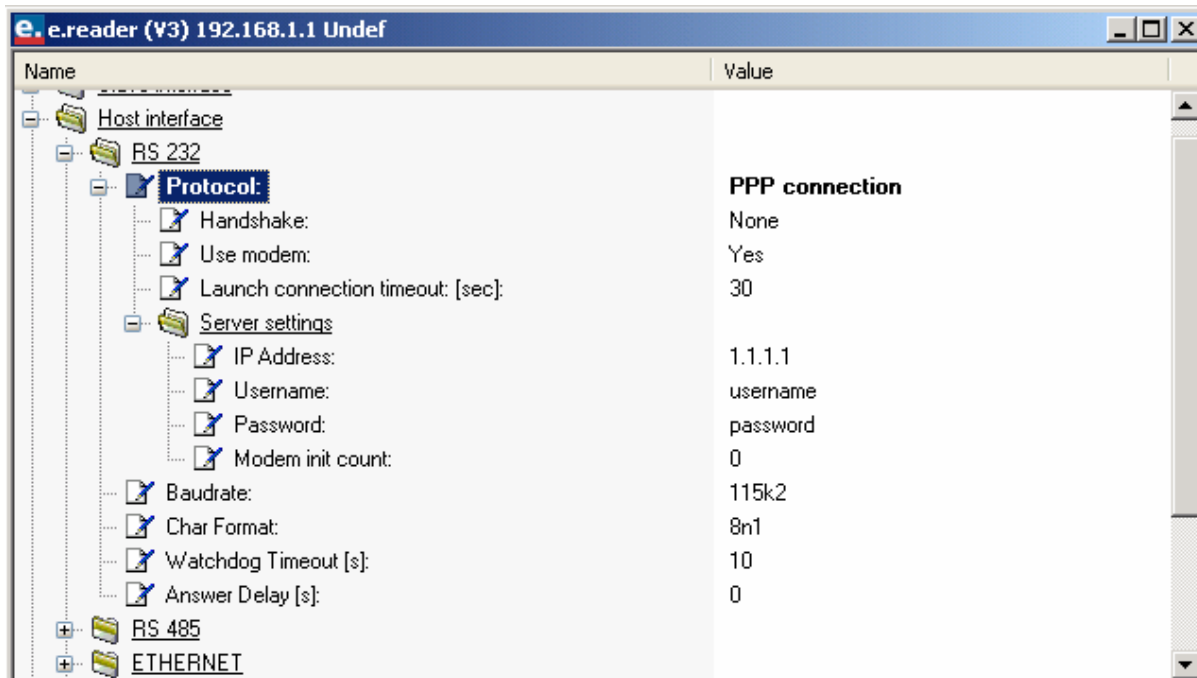
The IP address is the address of the e.reader the connection has to be established with, Modem init count depends on the type of modem being used.

After successful connection the handling is the same as with an online communication.

5.5.4 Truecon – modem with firewall

A communication via the Truecon modem will establish a VPN tunnel. The communication itself is e.g. via GPRS.
The following picture gives an idea on the functionality when establishing an VPN tunnel. In this example a GPRS-router is being used – available at www.hyline.de. This router mentioned is one of several possibilities which could be used. We recommend this router as this one had been tested by Gantner Instruments and it works fine. As the settings depend on the network provider please contact Hyline for technical details – it is also recommended to purchase this router at Hyline directly.
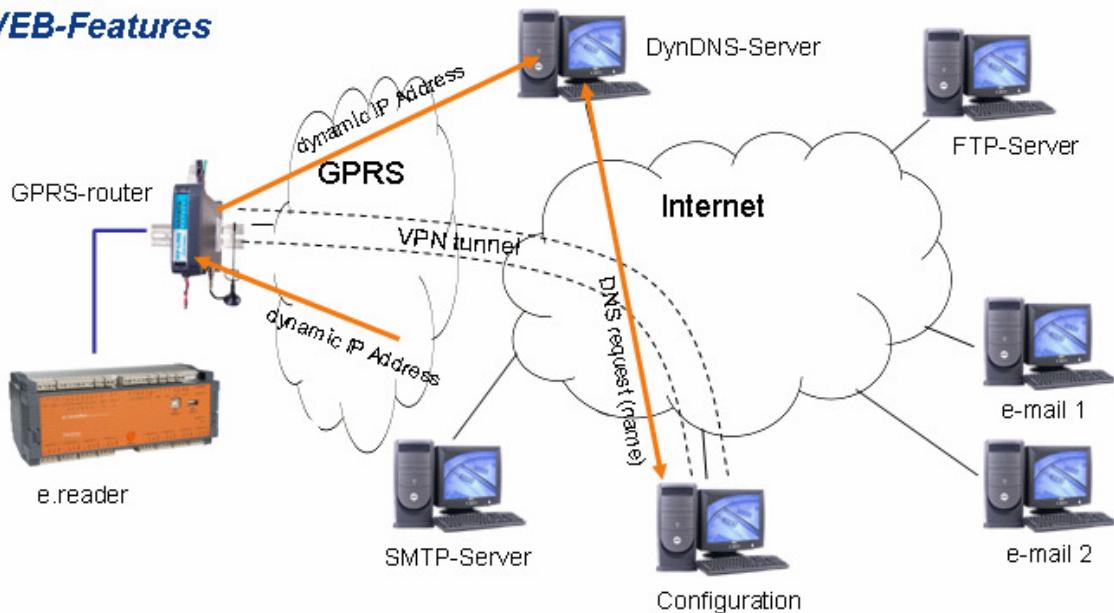
5.5.5 (A)DSL modem

To have access to a remote e.reader it is possible to connect it to an (A)DSL modem via a wired router.
For such a connection there are several requirements for the wired router:

1. The e.reader requires a wired connection to the router
2. Dial in possibility via PPTP (mainly Austria) and/or via PPPoE (mainly Germany) – dependent on the provider.
3. Possibility to enable a constant connection (e.g. after a reboot, resp. break down of the connection an automated dial in is required).
4. Setup of a DMZ computer in the private network (a computer being visible from outside within a secured network) and/or support of port forwarding with freely definable ports (the router should be able to answer on a WAN-ping).
5. DynDNS-support to have access to a domain name instead of an IP-address (which can be different with each new dial in)

5.5.6 USB- Data Transfer

Logged data can be read out e.g. with an USB-stick. The following part will describe how to handle the e.reader with an USB stick:

1. In case the e.reader is in low power mode, the "Wake-Up" button has to be pressed. Now the lower LED is shining green
2. Now the USB stick can be plugged in – the LED starts blinking very fast while recognising the stick and writing data to it
3. As soon as the LED is shining green again (continuously) the USB stick can be plugged off.
4. Data can be visualized with GreenEye directly which is part of the e.commander software. Afterwards data can be stored e.g. as a csv-file.

5.6   Adding e.bloxx modules to an e.reader

To add a new e.bloxx sensor module (slave) to an e.reader click with the right mouse button on the icon of the e.reader. From the context menu that appears select "Add Slave" and select the required module with one of the predefined configurations.
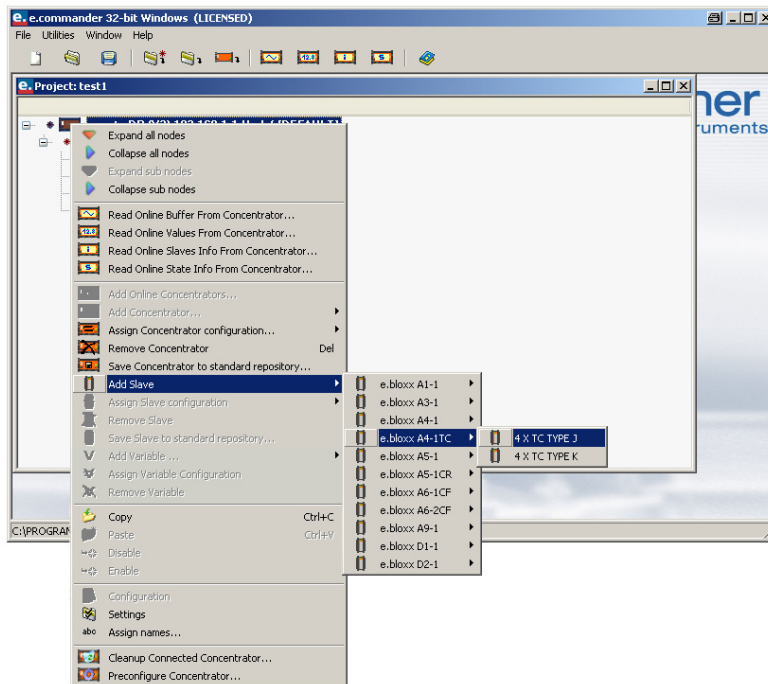
In the following window you have to define the UART interface of the test controller, where the e.bloxx module has to be connected to and the address of the e.bloxx. Since an e.reader only has one slave interface (UART) UART 1 will be selected and cannot be changed.
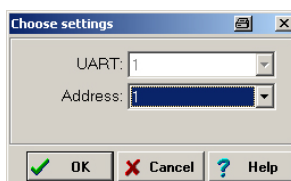
Now the module is added to the e.reader in the project with standard measurement settings for its in-/outputs.

5.6.1   Configuration of e.bloxx variables

Now configure the measurement functions of every variable of the just added e.bloxx. Therefore double-click on the e.bloxx module or a variable or click with the right mouse button and select "Configuration". The Configuration Software ICP 100, which is integrated in e.commander, will be opened. You will see the predefined variable definition.
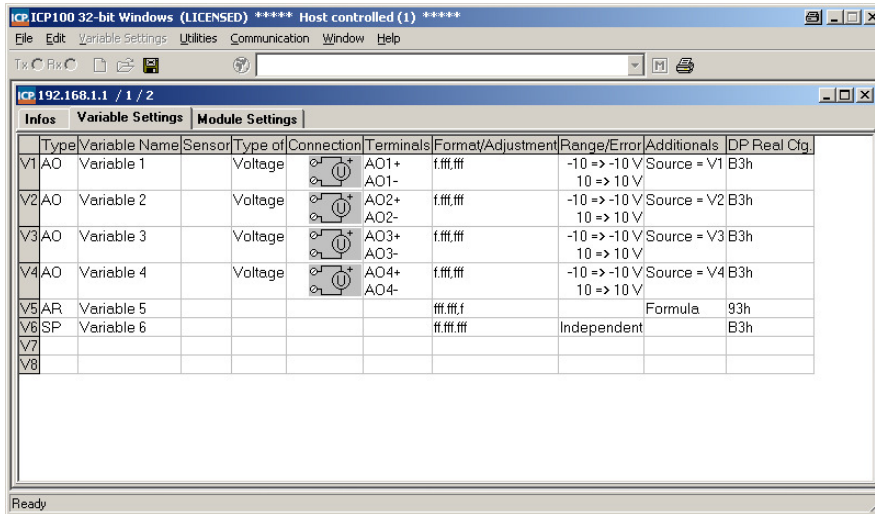
Every variable is displayed in a row. You can set a name for the variable (name will be shown in the project window) and you can select the type of measurement, the measurement range, format settings and more different settings depending on the type of variable. Click on the corresponding field (column and row) of the setting you want to change. For a more detailed description see the online help of the Configuration Software ICP 100.

After configuration close the ICP 100 Configuration Software by pressing the icon ▤ "Save to File and Exit". You will return to the e.commander project window and the variable settings will be updated.

5.6.2 Limitation of additional e.bloxx modules

With an e.reader up to 126 additional e.bloxx modules (single modules, resp. addresses) can be added. But nevertheless there is a main limitation which might reduce the number of additional e.bloxx modules.

There is no slot limitation, but the number of data to be read by the e.reader is limited to 1024 Byte.
These are e.g. 256 channels in real format or 512 channels in integer format – or a mixture of both.

5.7 Statistics

Another very useful tool is the statistics functionality. This feature can be accessed when clicking the button in the menu bar.

This functionality provides the following information:
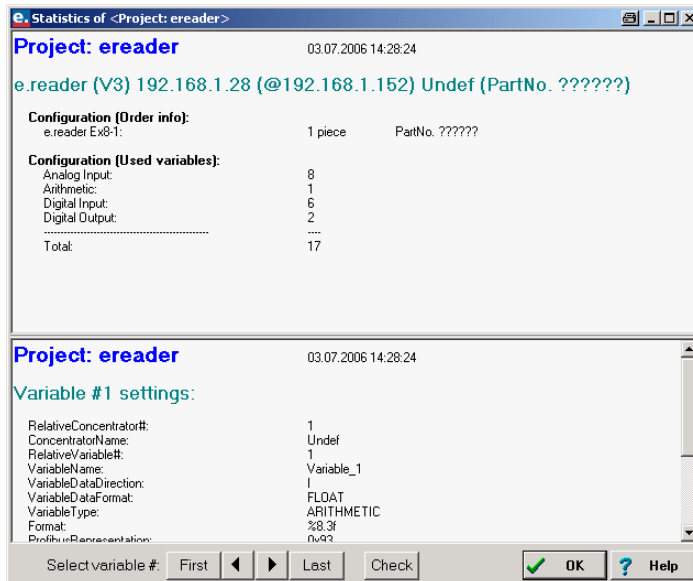
The first part of the window shows an overview on the whole project with:

- Project name, date and time
- IP-address, name/location, part number of the e.reader
- Type and number of e.bloxx modules connected to the e.reader with its part number(s)
- The number of each type of variable like alarm, analog input, analog output,… being defined for this project.

If there are several e.reader in one system, you will find this information for each one.

The second part describes all variables being defined in the project with its most important information in the order as they are configured. With the buttons "First", "Last" and the arrows you can search for the variable you are interested in.

5.7.1 Design Rule Check

The performance of the system depends on the numbers of variables, number of variables, transfer rate, data format, active interfaces, etc.

So it is very helpful to check a configuration after the first setup or after having reconfigured the system by clicking the "Check" button.

The result of the test will be explained by the background colors:

- WHITE: Configuration is fine and will run after downloading.
- RED: Configuration will not run, a download is not possible.
- YELLOW: It is not definitely possible to say ok or not ok. In this boarder range it is necessary to test the setup. It is possible to download the configuration.

In praxis mostly the error state will be generated by:
- connecting too many modules to the UART.
- defining too many variables.
- selected sample rate could not be reached.

5.8   Display of Slave Information

Slaves are the e.bloxx measurement modules connected to the e.reader. Information about those slaves can be displayed on screen.

To read out and display the slave information click on the icon [icon] "Read Online Slaves Info from Concentrator". The e.commander will scan the network and display all connected concentrators in a window (see chapter 5.2).

Select the desired e.reader and press "OK". The e.reader will be read out and the information about the slave modules connected to the e.reader will be displayed in a new window.
Note: Because of the hardware structure of the e.reader the I/O part will be shown as slave module e.reader Ex8-1 as well – its address always is 1.
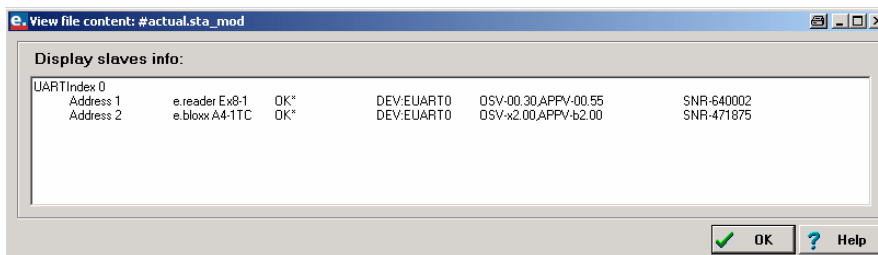
5.9 Display of Status Information from Concentrator

The actual state of an e.reader can be read. These information include run states, error information and general states like if the measurement mode is active, etc.

To read the status information from an e.reader click on the icon ![icon] "Read Online State Info from Concentrator". The e.commander will scan the network and display all connected test controllers in a window (see chapter 5.2).

Select the desired e.reader and press "OK". The e.reader will be read out and the status information will be displayed in a new window.
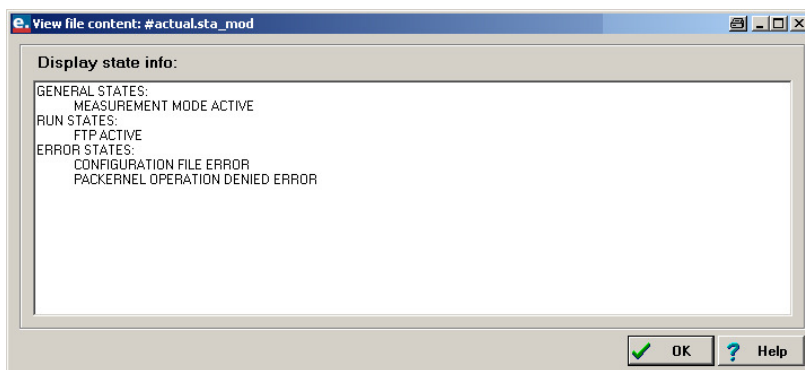
6. FUNCTIONALITY WITH E.CON

The e.reader permits complex control functionality such as PID controller, state machine, arithmetic, numeric and logical operations, transmission terms, function generators, time functions as well as visualization and additional functionality.

The software e.con is an easy-to-handle graphical programming system to define the functionality of an e.reader. As only graphical blocks are used for the definition, time to get familiarized with the system is minimized. The presentation of graphical blocks follows existing specification and technical languages. Structure blocks permit a hierarchic structure of projects. Linked projects and export mechanisms facilitate the reuse of structure blocks that have been created earlier.

The software e.con combines programming, simulation, testing and running in one tool. Special blocks and additional tools permit online observation of signals and signal tracing as well as run-time measurements.

Note: This chapter will give a short overview of the e.con software. A more detailed description can be found in the e.con software manual and the online help of e.con.

6.1 Overview of the e.con User Interface

After in installation of e.con from the CD start the software and the main window of e.con will open.

Figure 6.1 - *Main Window of e.con*
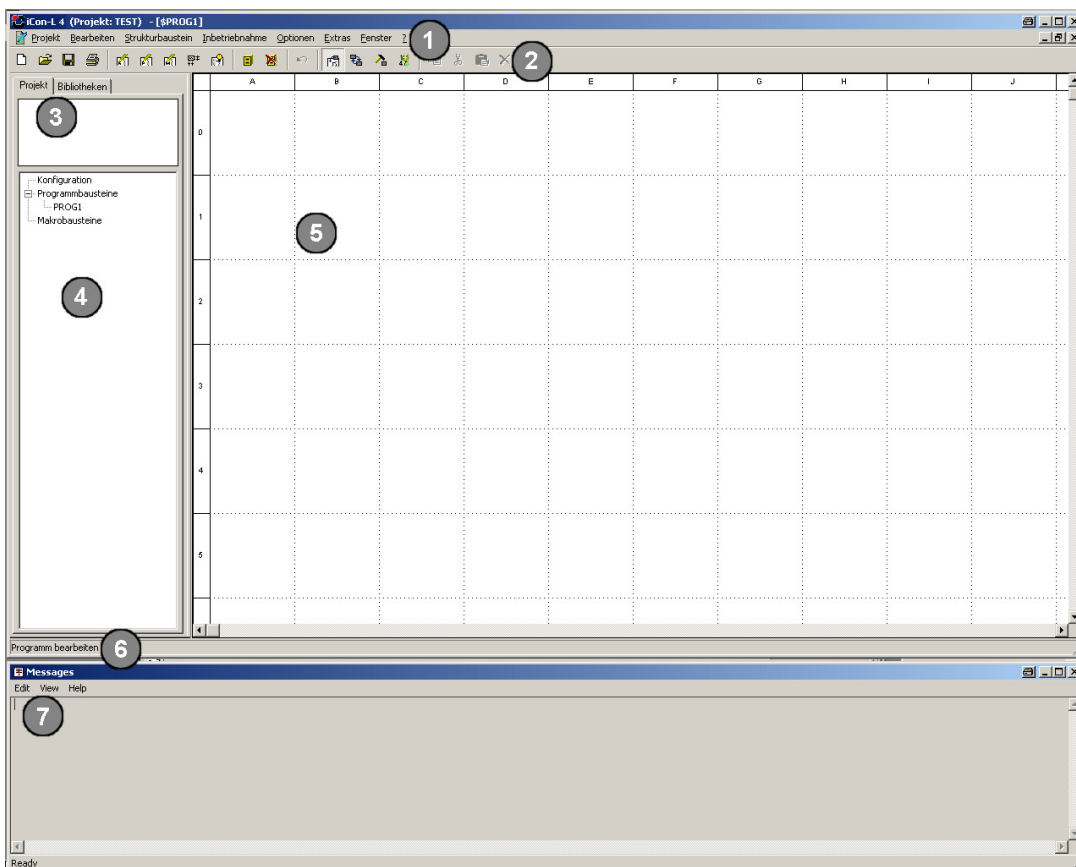
Commands for working with the system can be selected from the Menu ①, the Toolbar ②, the Quickstart Window, and Context Menus as well as by using Keyboard Shortcuts. The structure of the project is presented in the Project Tree ④ which is displayed when you click on the tab "Project" on top of the tree. A number of operations can also be carried out from the project tree. By selecting a structure block in the project tree a graphical preview of it will be shown in the preview area ③. From there it is possible to drag the structure block into the working area ⑤, which contains the worksheet with the presentation of the blocks and their connections. Instructions, status information and messages are displayed in the Status Line ⑥ and the Messages Window ⑦.

The whole functionality of the function blocks of the system is defined in the e.reader. The software e.con is just a tool for combining and "wiring" the single blocks.

6.2 Projects

A project can be subdivided into any number of hierarchic structures. However, it always comprises not less than two levels, i.e. its configuration and program blocks. A project is processed by arranging the desired structure blocks (program and macro blocks) and connecting them graphically.
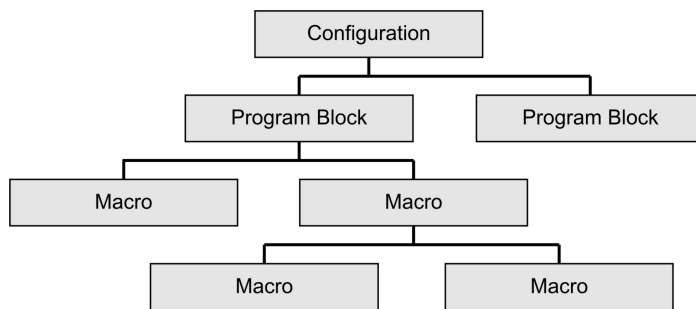
Figure 6.2 *- Structure of e.con*

The top level of a project is the configuration (&Main). It allows the graphical configuration of the target system tasks.

Program blocks are added to the configuration. They form the second level of the project where the functions are called and their sequence is established. Program blocks are flagged with a $ symbol preceding its designation. By determining the priority and cycle time of program blocks the task management parameters are defined. Connections between the program blocks facilitate the asynchronous data exchange via the e.reader. The number of program blocks is limited by the number of the parallel tasks in the target system (usually 15).

Programs are structured by using macro blocks. They make it easier to call functions which are used repeatedly. Macro blocks can be inserted into program blocks and other macro blocks. However, recursive calling is not permitted. Macro blocks contain sub functions of the programs and relating local parameters. These are no subprograms. During code generation they generate the complete target code for each call.

All project levels may contain visualization blocks (without target function). For exchanging data between project levels, the Input and Output blocks from the Standard Library are used. The Enable block from the same library is used for conditional processing operations of program and macro blocks.

6.3 Classes and Instances

When a project is processed, there is a difference between classes and instances. Classes are generated during editing operations by combining certain structure blocks and they contain preset values. Instances are formed when changing to the "Run" mode and can be parameterized there. So it is possible to define a special functionality (class) in the "Edit" mode which can be used in different programs/macros with different parameters.

During editing operations only preset values are defined in the parameter dialogs of the blocks. During the first change to the *Run* mode they are copied into instance parameters. Thereafter, the instance parameters can be modified in the *Run* mode. However, these modifications have no effect on the preset values in the structure block classes. When returning to *Edit* and modifying preset values, the instance parameters remain unaffected. The instances of newly inserted structure blocks contain the preset values as instance parameters.

Note: When changing a parameter in the *Run* mode (instance parameter) it is necessary to download them into the e.reader to ensure that the new parameter is still valid in the e.reader after a power off/on, otherwise the old parameter are loaded after a new start.

To facilitate easier differentiation between structure block instances, they can be assigned to different names. The context menus for structure blocks in the *Run* mode contain the *Instance Name* command. Upon opening the dialog a designation may be entered which afterwards in the symbol of the structure block and in the project tree.

Instance names are only indicated in the *Run* mode. An exception is the configuration where the instance name of the programs remains visible even during editing operations.

6.4 The Four States of the e.con Software

The software e.con facilitates creating, changing, testing and running projects by using one tool only. The program distinguishes between the following 4 system states:

- Edit
- Design
- Run
- Online Observation

Each state can be obtained by using the menu, the toolbar or partly the context menu.

6.4.1 Edit State

"Edit" is the basic state of the system. It is the state where a project is mainly processed. The structure of a project is determined by loading and removing libraries, defining and deleting structure blocks, and inserting, removing and connecting structure blocks. In the edit mode the classes of structure blocks are processed. The values entered in the parameter dialogs of the blocks only serve as presetting for the instances visible in the run mode.

Upon entering one of the first three commands of the edit menu or closing all work sheet windows, the system changes to the edit state. This state can be easily identified through the appearance of the project tree. There, the defined structure blocks and loaded libraries are listed in two views. In addition, the grid for block positions and connections are indicated by means of dotted lines in the work sheet windows.
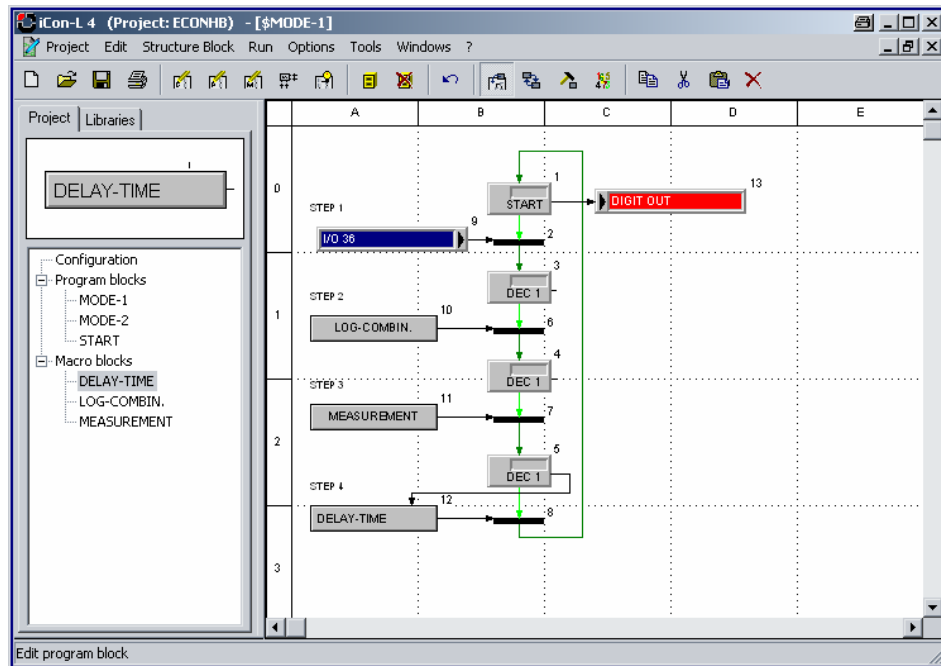
Figure 6.3 - Worksheet Edit State
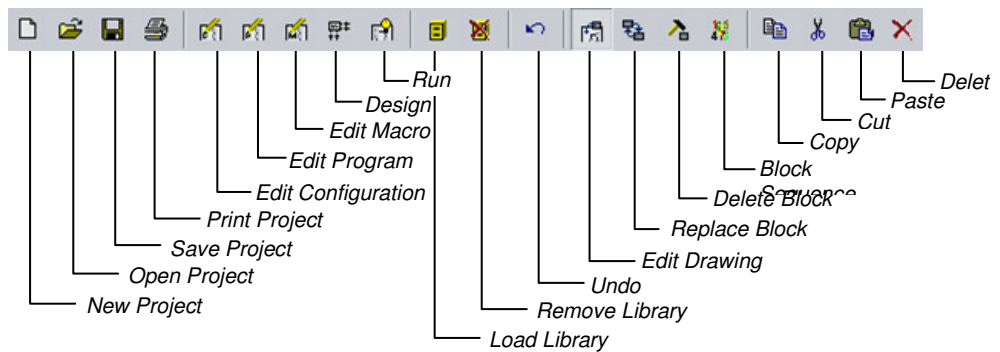
Figure 6.4 - Toolbar Edit State

6.4.2 Design State

Apart from the operations described above, i. e. inserting and deleting objects, also the structure block design ("Design Structure Block") can be used. From a specific work sheet window and by means of an additional toolbar, label positions, the appearance of symbols and the presentation in the work sheet window can be changed.
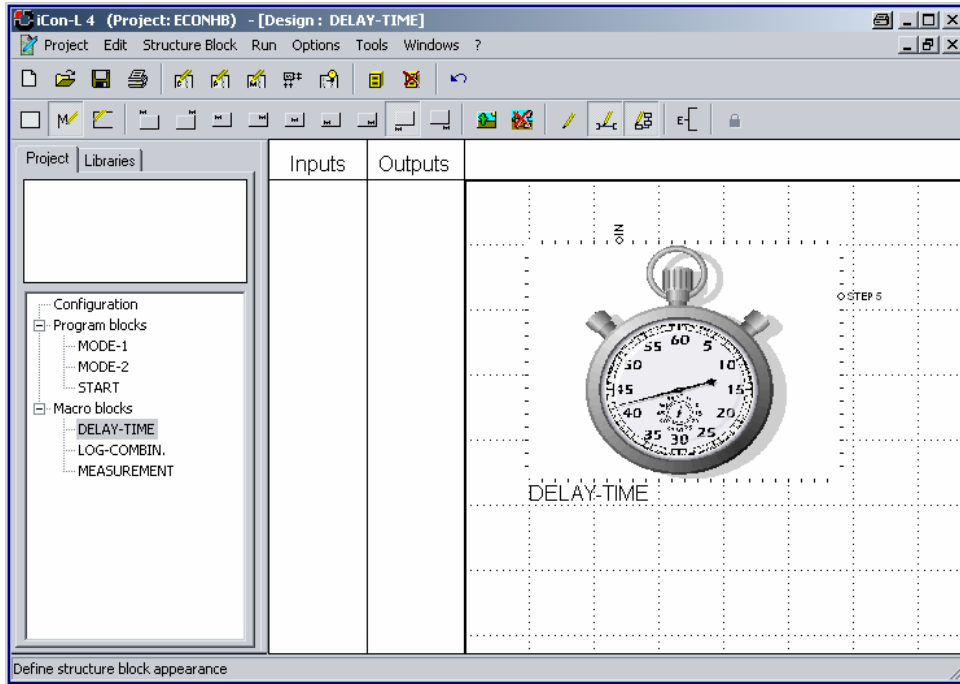
Figure 6.5 - Worksheet Design State

Additionally to the already mentioned toolbar there are some more functions available to design the appearance of the project, the programs and the macros.

Figure 6.6 - Toolbar Design State

6.4.3   Run State

When using the Enter command from the "Run" submenu the program turns from the edit to the run state. During this changeover the program performs an instantiation. Instances are formed from the classes established during editing operations (refer to chapter 6.3 - Classes and Instances). When this option is chosen, a new work sheet window is opened, indicating the configuration. In contrast to the work sheet windows in the edit mode, t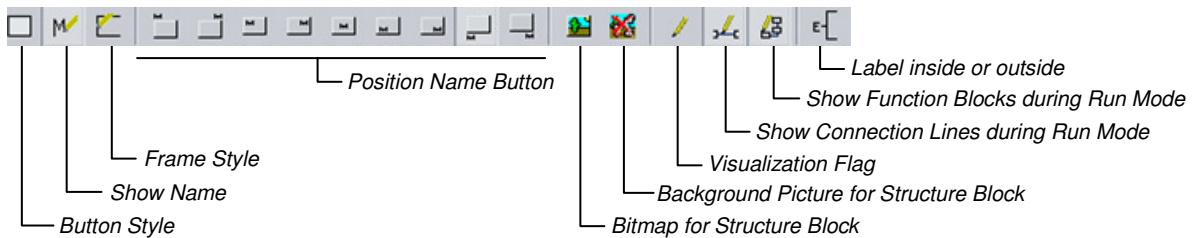he work sheet windows in the Run state does not contain a grid. The project tree offers one view only, presenting the hierarchic structure of the project.

The run mode serves to assign instance parameters used by the blocks later on in the e.reader. Commands for importing and exporting parameter files (refer to the submenus "Structure Block" and "Run") support this work. In addition, cycle times of tasks can be defined. In the run state structural changes of the project are no longer possible. The other commands in the run submenu serve to start simulation, establish target system connections as well as to create, load and start the program and change to online observation.
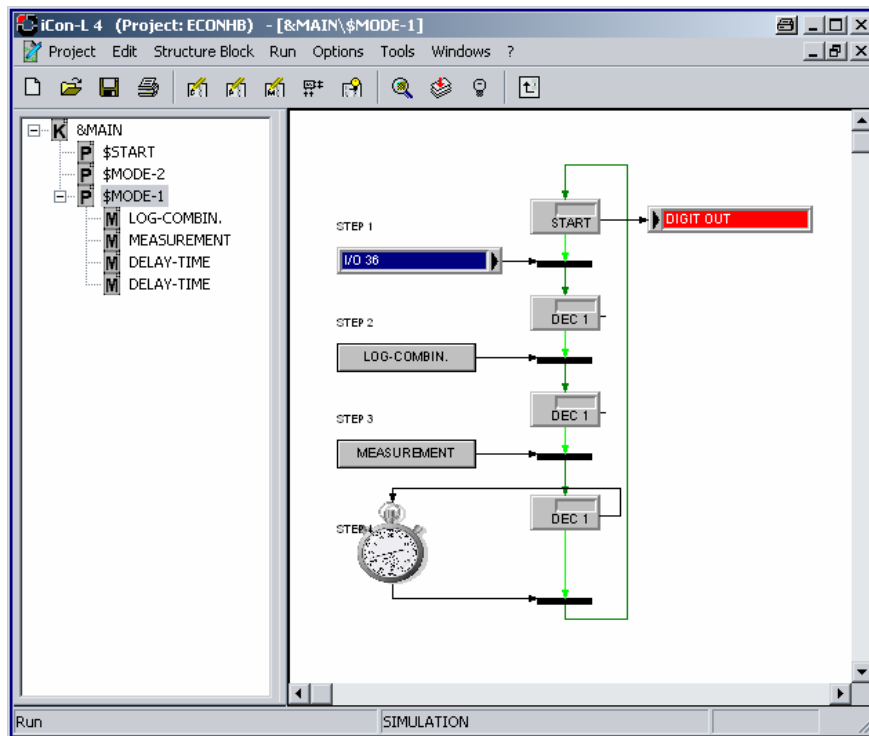

Figure 6.7 - Worksheet Run State

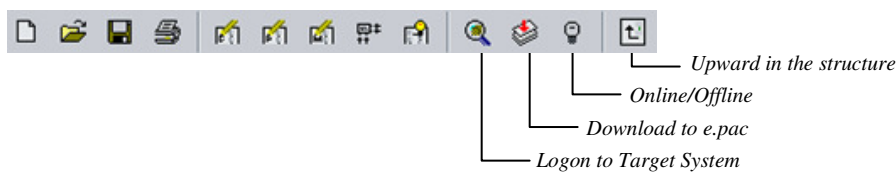The toolbar of the run state is similar to that one of the edit state. The difference is shown in the next picture.

Upward in the structure
Online/Offline
Download to e.pac
Logon to Target System

Figure 6.8 - Toolbar Run State

6.4.4   Online Observation State

When a program has been successfully loaded into simulation or e.reader, online observation starts automatically. For switching from the run mode without performing a download before directly, the "online" command in the "Run" submenu is being used.

For online observation the visualization blocks indicate the current values of connected signals. Clicking the connection lines by means of the left mouse button opens a window displaying the current signal value. Via parameter blocks and signal editors values are being changed online. However, they only influence the volatile memory (RAM). For transferring the values into the nonvolatile memory of the e.reader, the "Parameter" command in the "Logon Target System" dialog is used.

If the project uses archive blocks, they record signal patterns in the e.reader. Signal patterns can be read out and displayed by means of an additional tool iTrend.

The refresh rate of value representation can be defined in the "Work Sheet Settings" dialog. The online observation can be stopped by using the "Offline" command/button or by exiting e.con.
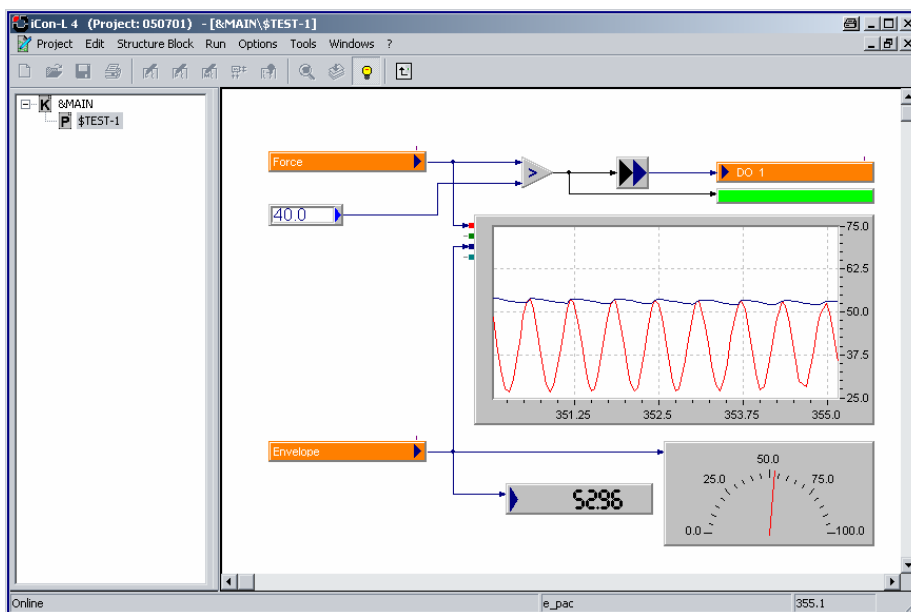
Figure 6.9 - Worksheet Online Observation State

6.5   Starting a Project

After the program e.con had been started it is possible

- to start a new project,
- to open an existing project,
- to upload the project from a connected e.reader or
- to load a project from the restore directory.

Start a new project:

Click on the button *Create a New Project* or select the menu *File - New Project* and the following window will appear:
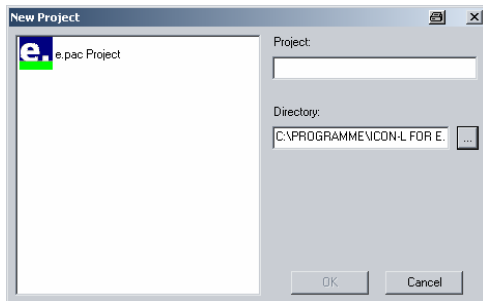
Figure 6.10 - Window New Project

Enter a project name and confirm/modify the directory where the project shall be stored.

Open an existing project:

Select the project and open the xxx.MDL file
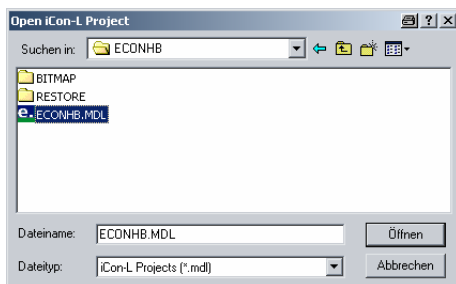
Figure 6.11 - Window Open Project

Upload a project from e.reader:

The window for the selection of the so called *target system* will open. There all selected e.reader modules and the PC-simulation are offered. By clicking the relevant e.pac the color will change from red to green.
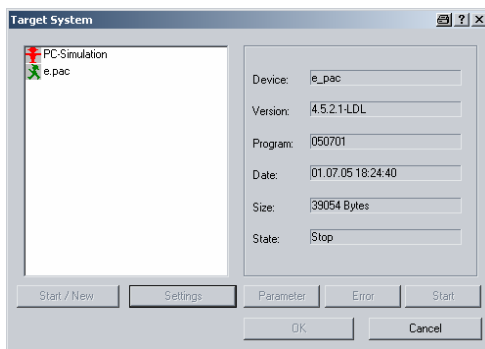
Figure 6.12 - Window Upload from e.reader

In case the icon color is yellow the settings (IP address) have to be checked.

Load a project from restore directory (zipped file):
Selection of the file to be opened.
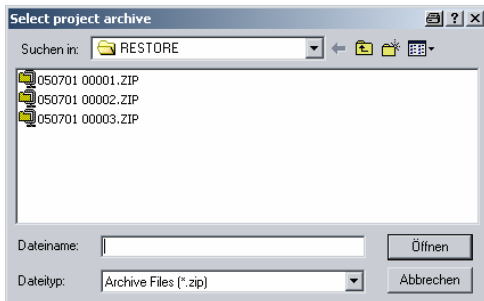
Figure 6.13 - Window Load from Restore file

6.6 Connecting e.reader and e.con

In a new or an already existing project open the e.con has to be selected first by using the menu *Tool - Select Device*:
Now it is possible to select *Online* or *Offline*. In case *Offline* is selected a browser will open to select a #summary.sta file.
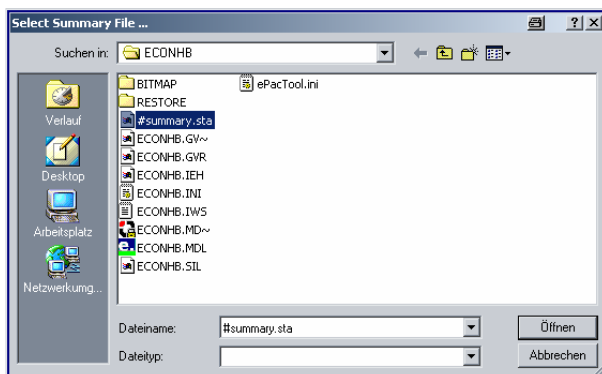
Figure 6.14 - Selection Online/Offline and Browser to choose a #summary.sta file

Selecting *Online* a network scan will be done. After selecting the e.reader the successful selection has to be confirmed.

Figure 6.15 - Successful selection of an e.reader

Now the software e.con will work with all the variables defined in the measuring and I/O system.

6.7 Practical Use of the Structuring

In the practical use the combined measurement, automation and control tasks consist of many sub tasks, which themselves consist of different sequences, flow parameter and evaluations resp. decisions. This chapter gives an introduction on how to layout a project. More information can be found in the online help of e.con and the e.con instruction manual.

In a first step we recommend the definition of the process inputs and the process outputs. This could be done in a macro "Inputs" and in a macro "Outputs". Due to the use of global parameter these signals will then be available in any further program and macro block.

In the next step the total function of the project should be partitioned in logical function such as Test Mode 1 and Test Mode 2. The block "START" will enable/disable the different Test Modes.
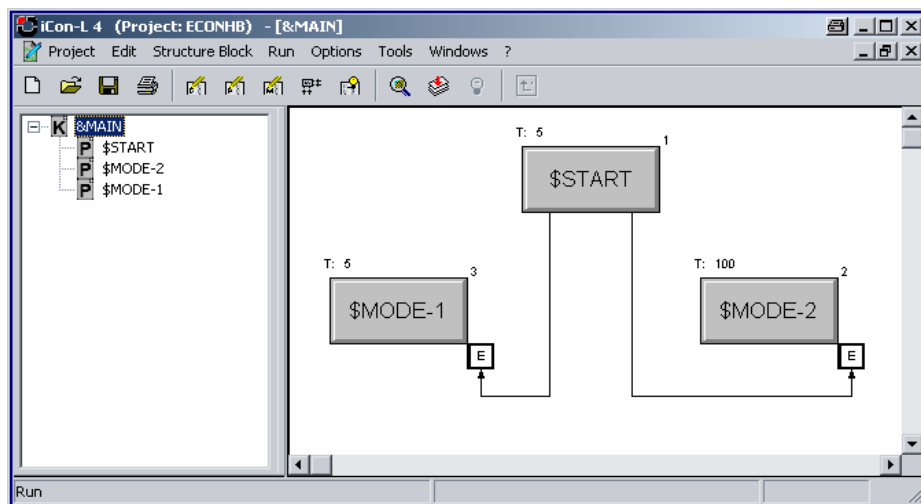

Figure 6.16 - *Example: Project with Test Mode 1 and Test Mode 2*

A Test Mode consists of different steps; each step can be controlled by a process I/O (host or process controlled) or by a decision made in the e.pac. The program MODE-1 could contain e.g.:

Step 1: Proceed at an external I/O signal
Step 2: Proceed by a combination of events which have happened
Step 3: Proceed when a measurement signal exceeds a set point limit
Ste4 4: Proceed after a special time (delay)
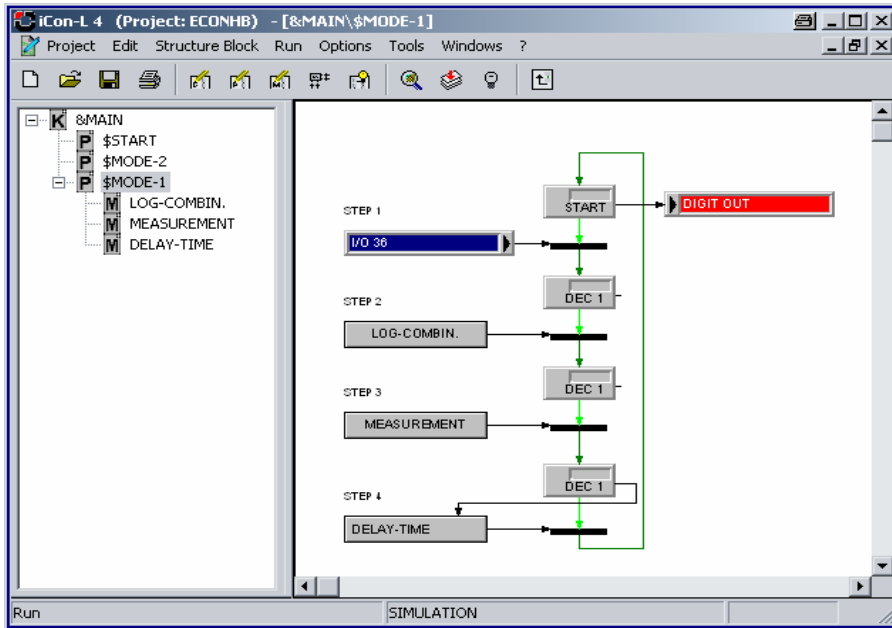
Figure 6.17 - Example: Function of Test Mode 1

In the example the macros LOG-COMBIN, MEASUREMENT and DELAY TIME have the following function:
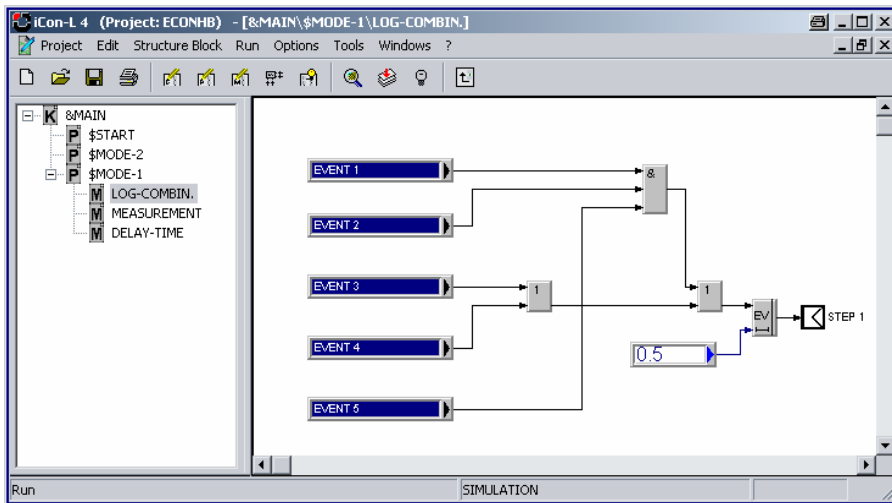
Figure 6.18 - Example: Function of macro LOG-COMBIN

Providing the events according to the logical combinations as a "true" signal at the output *STEP 1,* the condition is fulfilled and the next condition is required.
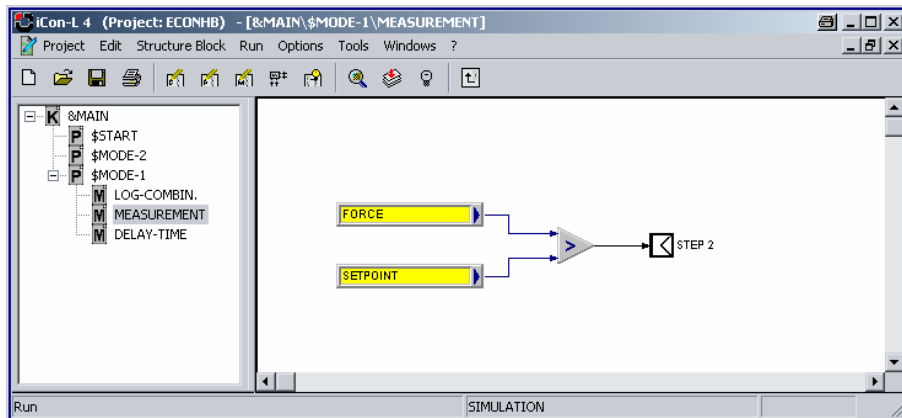
Figure 6.19 - *Example: Function of macro MAESUREMENT*

If *FORCE* exceeds the *SETPOINT* the output of *STEP 2* will be "true" and the next macro is in charge.
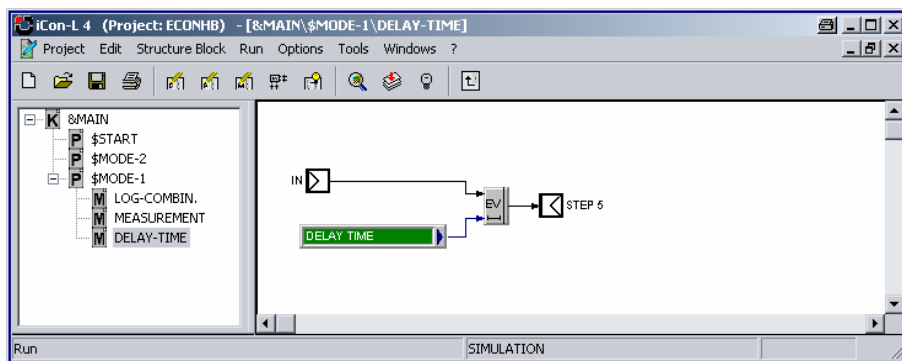
Figure 6.20 - *Example: Function of macro DELAY-TIME*

After a selectable *DELAY-TIME* the input will be switched to the output *STEP 3* and all three conditions are fulfilled.

This example shows how a structure can be used to setup a clear functionality by using different program and macro

7. HARDWARE INSTALLATION

7.1 Environmental Conditions

The e.reader is protected against water and dirt according IP 20. If required by the conditions of the operating site the modules have to be installed accordingly, e.g. in a water-resistant or water-proof case, compliant with the regulations of electrical engineering.

For the allowed ambient temperatures for the e.reader see the Technical Specifications at the end of this manual.

7.2 Mounting

The e.reader has a snap-on mounting for installation on standard profile rails 35 mm (1.4 inch) according to DIN EN 50022. The mounting on the DIN rail is performed by four straps on the reverse side of the module. First you push the two lower straps behind, the lower notch of the DIN rail and then you press the module on the DIN rail until the two upper straps snap in to the upper notch.

In order to take the module off the DIN rail either slide the module side-wards off the rail or, if it is not possible, lift the module slightly so that the straps on the top are released from the notch and the module can be taken off easily by tipping it forwards and removing it from the DIN rail.

7.3 Module Parts

Figure 7.1. – Module Parts of the e.reader

1 to 7 and 9… Pluggable screw-type terminal strips:
        1 …. RS 485 serial bus for connection to a PC/laptop
        2 …. Power Supply +10 up to 30 VDC
        3 …. 6 Digital I/Os
        4 …. 2 Relay outputs
        5 …. RS 232 serial bus for connection to a PC/laptop (us the RS 232 cable included in the scope of supply)

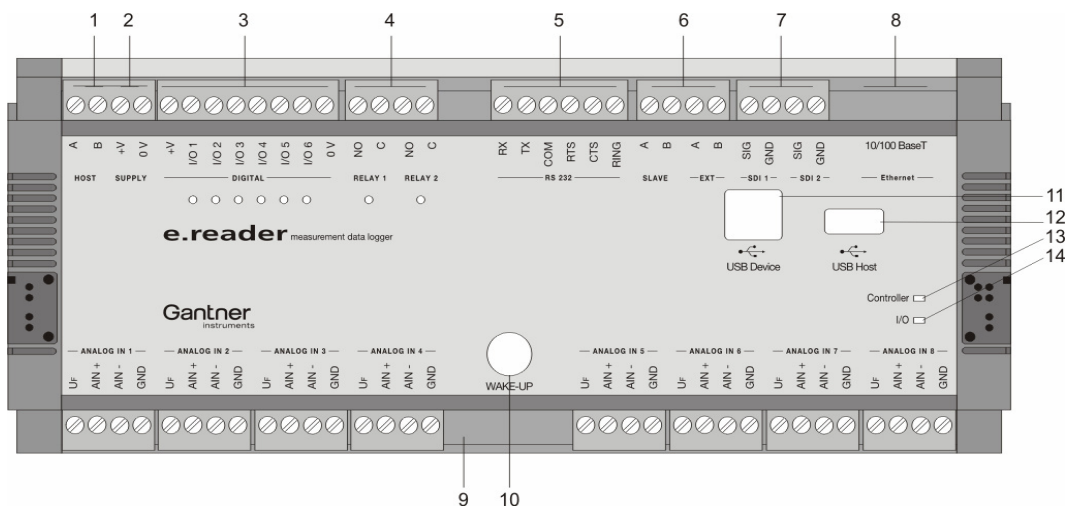6 … Slave bus for connecting other e.bloxx measurement modules and external devices
7 … Two SDI interfaces
8 … RJ 45 plug for Ethernet connection
9 … Eight analog inputs
10 ..Push button to weak up the processor unit
11 ..USB Device interface
12 ..USB Host interface
13 ..Status LED "Controller"
14 ..Status LED "I/O"

7.3.1 Front LEDs

The LED at the front of the e.bloxx modules provides the following information:

LED "Controller": This LED indicates the status of the processor board.
LED "I/O": This LED describes the status of the I/O board of the e.reader.

7.4 Connection Technique

The wires for the power supply, serial interfaces RS 232, RS 485, SDI and for the sensor signals are connected to the e.reader via screw-type terminals. The captive terminal screws are part of the terminal strips. All terminal strips are of a plug-in type and can be detached from the e.reader.
Not more than 2 leads should be connected with one clamp. In this case both leads should have the same conductor cross section. For the precise clamping of stranded wire we recommend the use of wire-end ferrules.

Notice: Connecting wires respectively the plugging-in and -out of the terminal strip is only allowed with an e.reader in power-off status.

In order to prevent interference with sensors, signals and modules, shielded cables have to be used for the power supply, bus connection and signal lines.

For the connection of the Ethernet a standard RJ 45 connector is provided by the e.reader.

7.5 Power Supply

Non-regulated DC voltage between +10 and +30 VDC is sufficient for the power supply of the modules. The input is protected against excess voltage and polarity connecting error. The power consumption remains approximately constant over the total voltage range, due to the integrated switching regulator.

Due to their low current consumption the modules can also be remotely supplied via longer lines. Several modules can be supplied in parallel within the permissible voltage range and drop in the lines. If required, the supply lines together with the bus line may be incorporated in one cable.

In order not to overload the module power supply needlessly and to avoid unnecessary line troubles, a separate power supply is recommended for sensors with a large current drain.

The distribution voltage for the e.reader modules has to be protected by a fuse with maximum 1 A (inert). The modules have an internal fuse (reversible) for protection against excess voltage, excess current and wrong polarity.
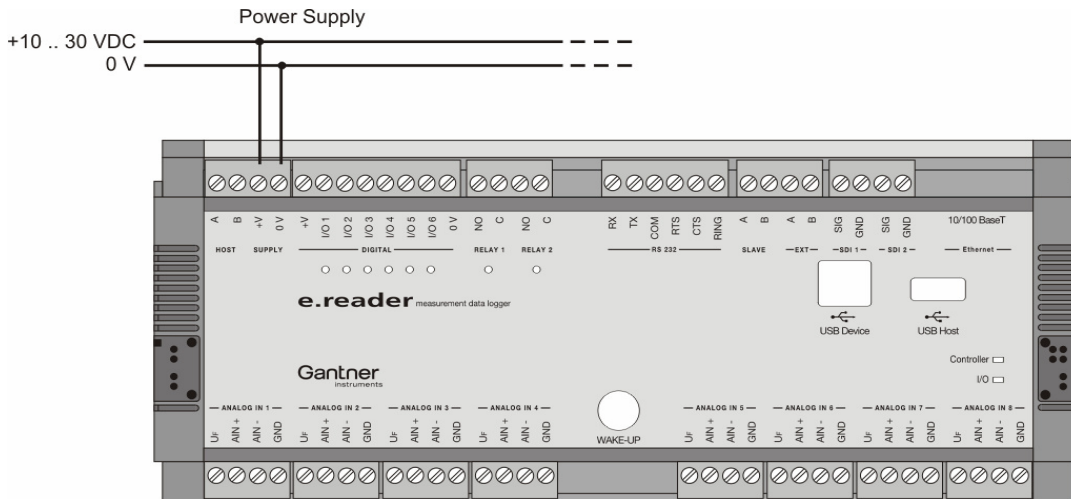
Figure 7.2. - Power Supply of the e.reader

7.6 Connection of e.bloxx Modules

e.bloxx modules are connected to the RS 485 slave interface (screw terminals "ASlave" and "BSlave") at the e.reader.
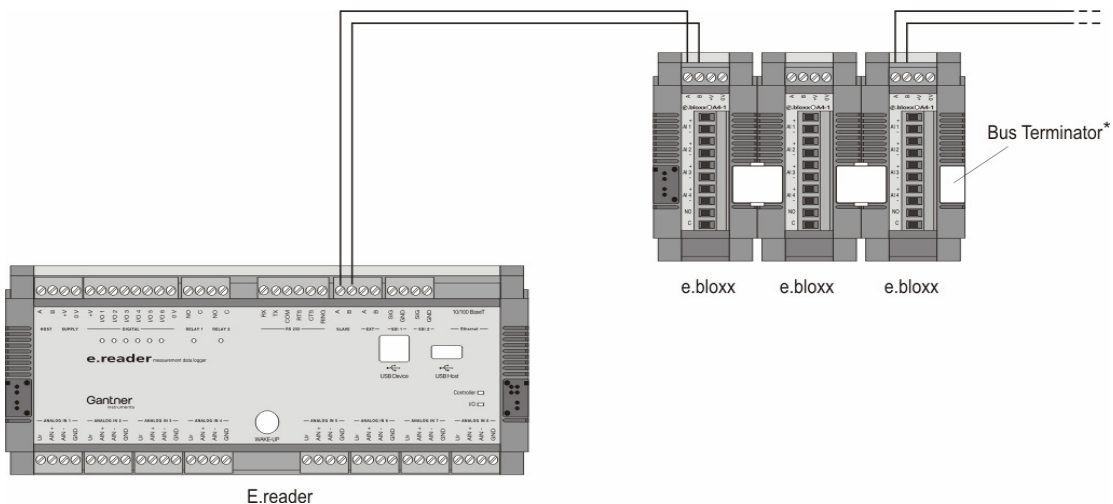
Figure 7.3. – e.bloxx Modules connected to e.reader

* ... If the e.bloxx (here A4-1TC as an example) are used together with an e.reader, which is used to collect the data of all connected e.bloxx modules and process them for fast transmission via the further network, a bus termination must be connected to the last e.bloxx in each bus line.

7.7 Connection to Ethernet

The e.reader is supported with a connector 10/100 BaseT to connect the e.reader into an Ethernet. The IP address and DHCP setting must be set-up correctly (see chapter 3 "Start-Up"). Then it is possible to communicate with the e.reader via the ethernet.

It is also possible to connect the e.reader directly to a PC via the 10/100 BaseT connector. In this case a cross-wire Ethernet cable must be used.
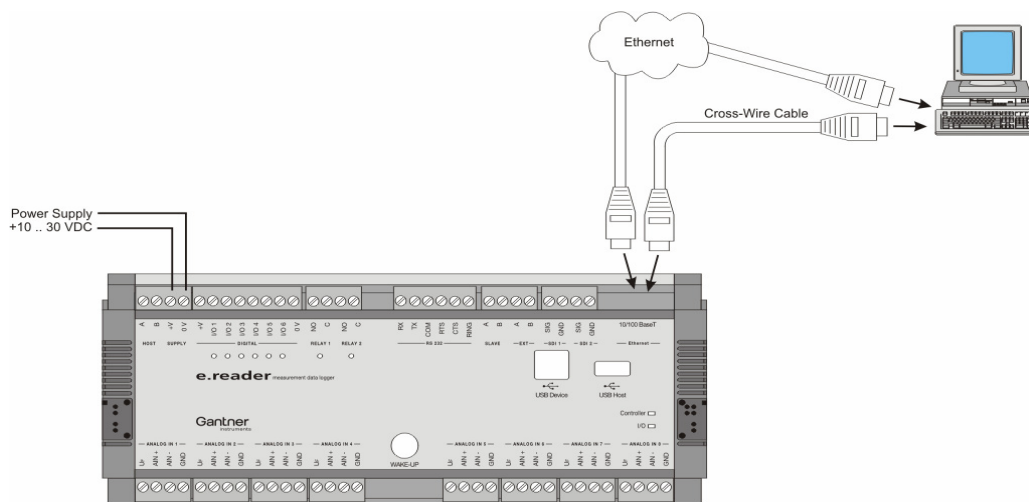
Figure 7.4. - Connection to Ethernet

7.8 Connection to the RS 485 Communication Bus

The e.reader has an RS 485 serial interface. The bus lines are connected to the screw terminals "A_{HOST}" and "B_{HOST}" of the e.reader.

Figure 7.5. - Connection to RS 485 Serial Interface

A detailed description of the bus and the communication with the e.reader and the connected e.bloxx modules can be found in the manual "e.bloxx Communication" (Part No. 159583).

7.9 Shielding RS 485

In case of increased interference, such as in industrial areas, we recommend a shielding of the power supply, bus, and signal cables. In general, the shield should be con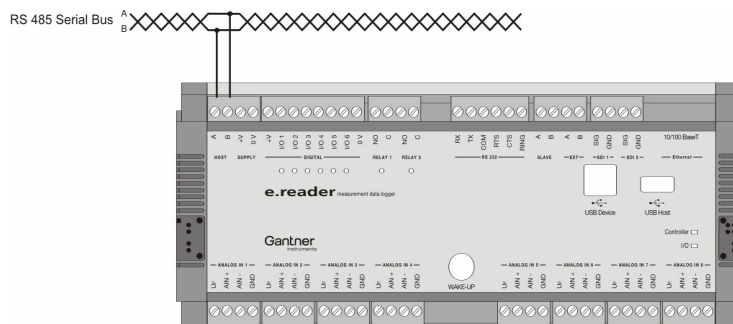nected to the protective earthing (not Data ground!) at each bus connection. If necessary, the shield should also be applied along the course of the cable several times. For shorter distances, e.g. with stub cables, the interference response is often improved if the shielding is only applied to the stub cable exit.

Bus users such as controllers (PLCs), computers (PCs), repeaters and interface converters (ISK), etc., generally feature the possibility of applying the shield directly to the appliance or to separate shield rails. Shield rails offer the advantage of preventing possible interfering signals from reaching the appliance. The shields which are connected to protective earthing conduct interference signals off before reaching the module.

The e.reader does not have a direct shield connection at the module. Here the shield of the bus cable can be connected to earth e.g. by so-called shield clamps.
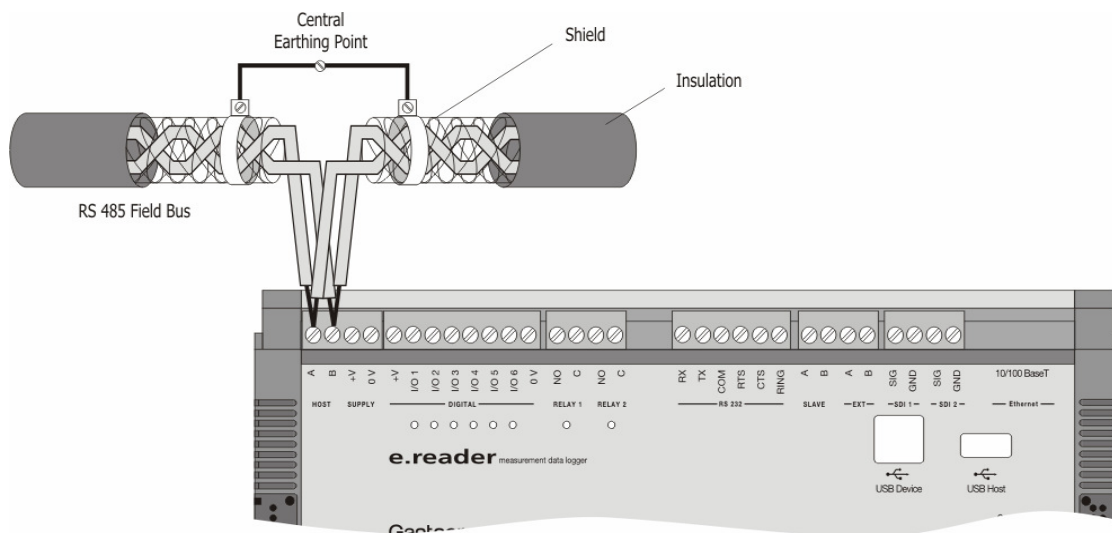

Figure 7.5. - Earthing of the Bus Line Shield at an e.reader

Notice: The shielding screen must not be connected to the ground (0V) of the power supply and it should always be connected to earth with a large surface and low-inductance.

7.10 LED Indication

7.10.1 Indication of RUN and ERROR States

The lower one of the LED indicates the RUN and ERROR states. This LED will shine red and/or green

Each different state increases the number of blinks. One blink means that the LED is switched on for 200 ms (20 ms with the USB connection) and off for 200 ms (20 ms with the USB connection). At the start of an indication sequence there will be a period of 1000 ms during which the LED is switched off.

Example:
If there are e.g. 2 active RUN conditions and no ERROR, the LEDs blinks like this:
Green LED: 1000 ms OFF -> 200ms (1st) ON -> 200ms (1st) OFF -> 200ms (2nd) ON -> 200ms (2nd) OFF restart
Red LED: OFF
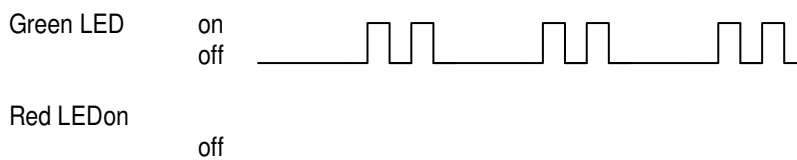
If there are e.g. 1 active RUN condition and 2 ERROR, the LEDs blinks like this:
Green LED: 1000 ms OFF -> 200ms ON -> 200ms OFF -> restart
Red LED: 1000 ms OFF -> 200ms (1st) ON -> 200ms (1st) OFF -> 200ms (2nd) ON -> 200ms (2nd) OFF restart
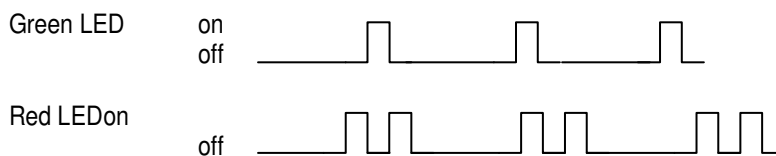
RUN states:
- DATAPORT ACTIVE   … TCP/IP data port activated
- PACKERNELPORT ACTIVE   … e.pac kernel port activated
- HIGHSPEEDPORT UDP ACTIVE   … UDP highspeed port activated
- HIGHSPEEDPORT TCP/IP ACTIVE   … TCP/IP highspeed port activated
- DISTRIBUTORPORT ACTIVE   … UDP distributor port activated
- FTP ACTIVE   … FTP activated
- CONFIGBUS RS232 ACTIVE   … RS 232 configbus activated
- CONFIGBUS RS485 ACTIVE   … RS 485 configbus activated

ERROR states:
- SLAVE ERROR   … Slave error (not found, data type mismatch,…)
- SLAVE LINE x INSTABLE ERROR   … Bad line
- CONFIGURATION FILE ERROR   … Error in configuration file(s)
- DATA FLASH FILE SYSTEM ERROR   … Data FLASH error (full,…)
- REDUCED PERFORMANCE ERROR (1000.0 Hz -> 500.0 Hz)   … due to health is too low
- PACKERNEL OPERATION DENIED ERROR   … due to e.pac kernel operation is denied (e.g.
                                                                          configuration has changed)
- DISTRIBUTORPORT SYNC ERROR   … due to distributor port thread has too less time to be
                                                                          synchronized to the slave communication
- SOCKET OVERLOADED ERROR   … due to socket has no time to work proper
- EXTENSION BOARD ERROR   … due to unknown extension board found

8. SPECIFICATIONS

All following data are valid after a warm-up time of approx. 45 minutes.

8.1 Analog Inputs (8 per module)

Accuracy	0.01 % up to 0,5% range dependent
Repeatability	0.003 % typical (within 24 hours)

Type of Measurement	Range
Voltage	±10 V
	±5 V
	±1 V
	±100 mV
	±10 mV
Current	25 mA
	1 mA
imput impedance	100Ω
Resistance 2-/4-wire	20 kΩ
	4 kΩ
	400 Ω
Measurement current	0,5 mA DC

Linearity deviation:	0.01% of the final value

Temperature influence	
on zero	10 µV / 10 K
on sensitivity	0.02 % / 10 K

8.2 Analog/Digital Conversion

Resolution	16 bit
In numbers	0,003 up to 0,01% range dependent
Sample Rate	1 s up to 24 h
Conversion method	Sigma Delta

8.3   Digital In- and Output (6 per module)

Input
Functionality	Status, counter, frequency
Input voltage	max. +30 VDC
Input current	max. 1,5 mA
Input frequency	1 kHz

Output
Functionality	Process- or host controlled
Type of output	Open-Collector
Output voltage	max. 30 VDC
Output current	max. 100 mA
Output frequency	max. 100 Hz

8.4   Relais Outputs (2 per module)

Functionality	Closer
Current	max. 1 A
Voltage	max. 60 VDC

8.5   Data Memory

Flash (non volatile)	128 MByte
RAM (volatile)	8 MByte
Logging Interval	1 s up to 24 h individual per channel

8.6   Interfaces

RS 485	1 Slave
	1 Master and Slave
	1 Master for connection of additional modules
RS 232	1
USB Client	1
Ethernet TCP/IP	1
SDI-12	2
Data Formats:	8E1, 8N1 selectable
Protocols:	ASCII, MODBUS-RTU (parts)
	Gantner LocalBus (binary), PPP
As master	Ott, SD-12, DDP (in extracts)
Baud Rates:	2.4it/s up to 115.2 kbit/s
	LocalBus up to 1.5Mbit/s

8.7   Power Supply

Power supply	10 VDC to 30 VDC
	over voltage and overload protection
Power consumption at	
Samplerate of 10min	approx. 100 mW
Samplerate of 1min	approx. 200 mW
Samplerate of < 20s	approx. 4 W

8.8   Mechanical

Case:	Aluminium and ABS
Dimensions (W x H x D):	225 x 90 x 83 mm (8.8 x 3.5 x 3.3 inch)
Weight:	800 g
Protective System:	IP 20
Mounting:	DIN EN-Rail

8.9   Connection

Plug-In screw terminals	Wire cross-section up to 1.5 mm²
Ethernet	RJ 45 plug

8.10   Environmental Conditions

Operating Temperature	-20 ℃ to + 60 ℃ (-4 ℉ to + 140 ℉)
Storage Temperature	-30 ℃ to +85 ℃ (-22 ℉ to + 185 ℉)
Relative humidity	0% up to 95% at +50 ℃ (+122 ℉), non-condensing

8.11   Electromagnetic Compatibility

Electro static discharge (ESD)	level 2 acc. IEC 801-2: 4 kV
Radiated electromagnetic Fields	level 3 acc. IEC 801-3: 10 V/m
Electrical fast transients	level 3 acc. IEC 801-3: 2 kV / 1 kV
Radiated RFI/EMI	level B acc. VDE 0871-1/CISPR 11

Notice:

Information in this manual are valid as of July 10th 2007 until revocation.
Further changes and completion of the manual are reserved and possible without notice.

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