

SensorFinder V1.1

Help File



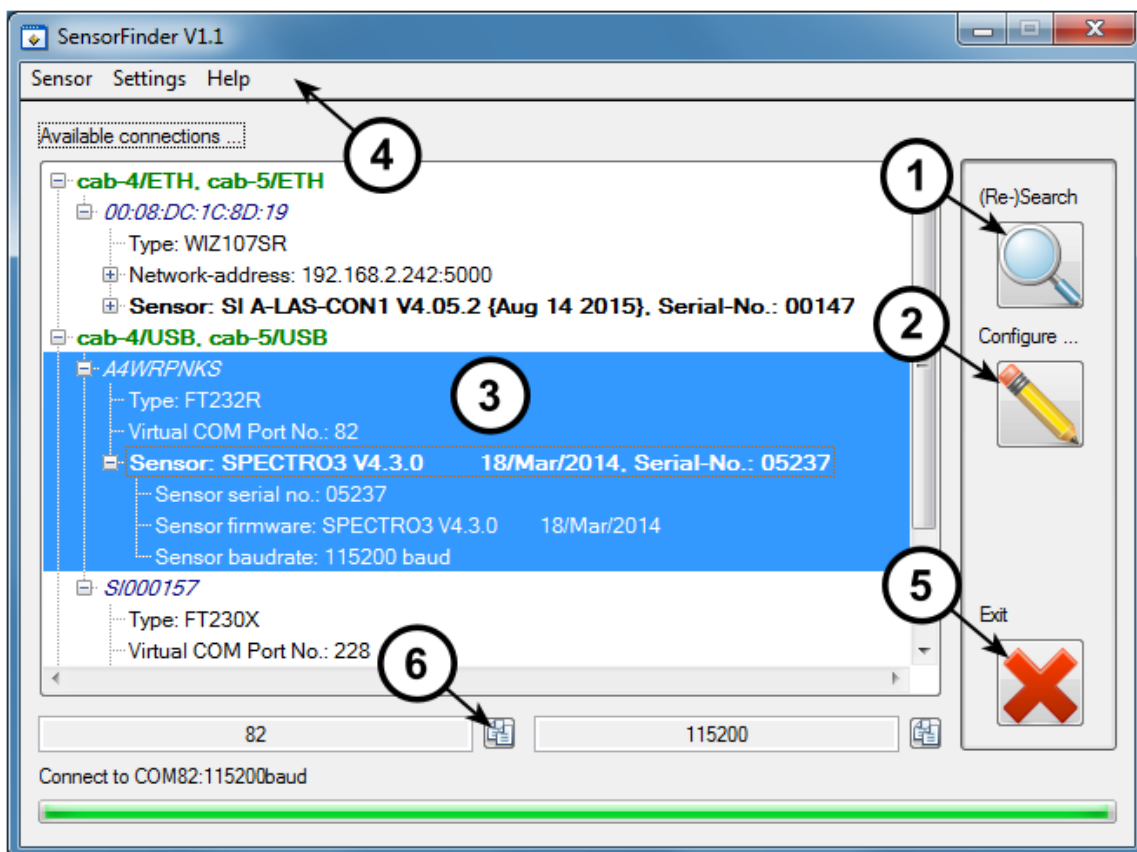
Synopsis

SensorFinder is a software tool intended to provide support to search and identify sensors of Sensor Instruments GmbH connected to the local PC. The sensors identity, its firmware and its connection parameter are acquired and presented in a compact and well-arranged tree-view.

Furthermore adapters of the type “cab-4/USB”, “cab-5/USB”, “cab-4/ETH” and “cab-5/ETH” can be located and configured.

Handling

Main panel



Picture 1: Main panel

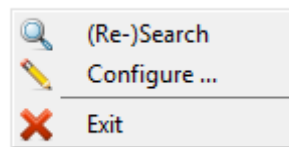
The main panel which appears when the software is started, features the tree view listing the identified connections available and their individual characteristics.

The search for available sensor connections is started with the **(Re-)Search** (1) button or by **Menu** (4) → **Sensor** → **(Re-)Search**. Depending on the configuration of the SensorFinder software (to be found at **Menu** (4) → **Settings**) the PC's physical RS232 interfaces („COM-ports“), the USB adapters of type „cab-4/USB“ and „cab-5/USB“, which are treated as virtual COM ports, as well as – if a network is available – all adapters of type „cab-4/ETH“ and „cab-5/ETH“ within the network segment

the host PC is on are detected. Every connection found is probed by the SensorFinder software for presence and activity of sensors whose serial number, firmware version and hardware-ID is read and displayed together with the connection details.

The combined information is displayed in a hierarchical **Tree view** ③, segmented into the individual connection types (network, virtual COM ports, physical COM ports). Individual sensors/connections are selected by clicking left with the mouse onto the device. A left double click resets and clears the tree view. Once the connection is selected its relevant connection parameter (IP address and port number with Ethernet based connections or COM port number and baud rate with virtual or physical COM ports) are displayed in two textboxes at the lower part of the panel. Using one of the two **Copy buttons** ⑥ may be used to transfer this information into the systems clipboard. By using the key combination **STRG+V** it can be inserted into e.g. the input field of the sensor software connection parameter.

To be able to change the connection settings (e.g. the network settings of „cab-4/ETH“ and „cab-5/ETH“ type adapters) the adapter needs to be found and identified correctly (i.e.: it needs to be listed correctly within the tree view). Once selected within the tree view the configuration can be started by clicking the button **Configure ...** ② by **Menu** ④ → **Sensor** → **Configure ...** which displays the relevant configuration mask.



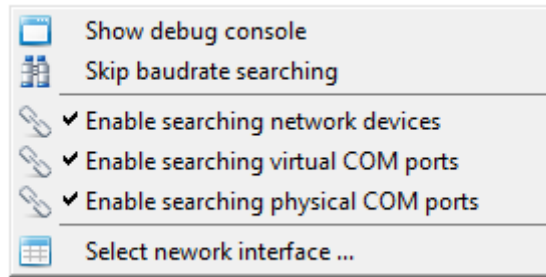
Picture 2: Menu "Sensor"

The software does not access the connections permanently! Once the identification process is finished the software remains passive until a new search is initiated or the software is shut down by clicking the button **Exit** ⑤ or by **Menu** ④ → **Sensor** → **Exit** or by clicking the window close button in the right upper corner of the main panel. So it is possible to leave the software running in the background – without it having influence on any sensor software – to have all sensor connection data ready at hand.

Settings

The software's behavior can be adjusted to the user's requirements by selecting the options within **Menü** ④ → **Settings**.

If connections of a certain kind are known not to be possible (e.g. because only one type of adapter is used) those connections can be exempt from search causing this search to be finished faster.



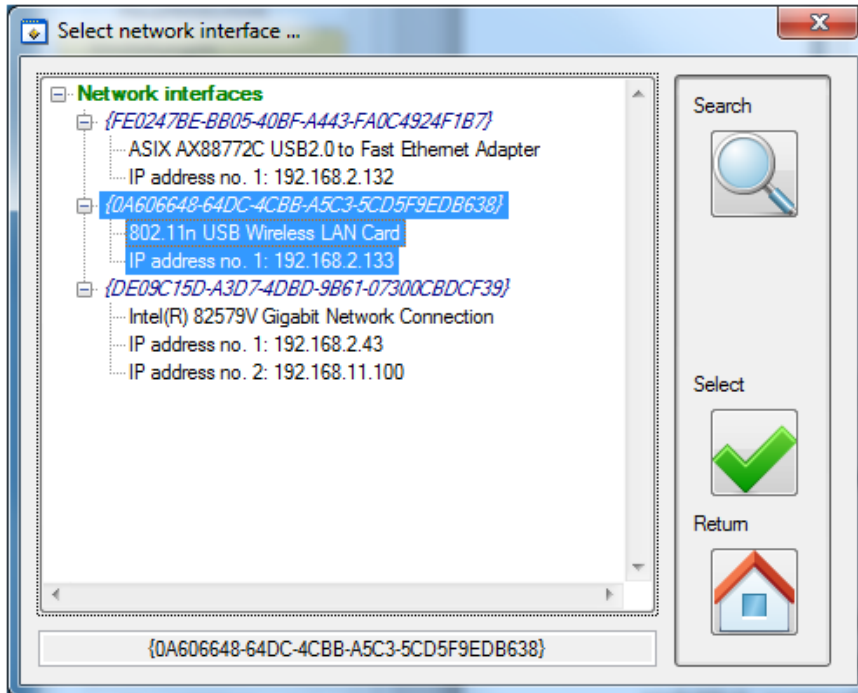
Picture 3: Options for searching sensors

To enable/disable searching for “cab-4/ETH” and “cab-5/ETH” adapters activate/deactivate the option **Enable searching network devices**, to enable/disable searching for “cab-4/USB” and “cab-5/USB” adapters activate/deactivate the option **Enable searching virtual COM ports** and activate/deactivate the option **Enable searching physical COM ports** to enable/disable searching for physical RS232 interfaces on the local PC as well as for other types of adapters which present themselves as virtual COM ports.

Every serial (COM port based) connection is probed by the SensorFinder software by default. Successively all possible baud rates are tested with each of the connections to determine the correct setting with the connected sensor. This lengthens the time needed to complete the search process and display the results. To skip the baud rate determination the option **Skip baudrate searching** can be enabled.

To get more detailed information on the current operation one can display the debug console. Every action of the search process is quoted immediately. To support the search for reasons why an adapter that is expected to appear in the tree view does not, one can display the debug console by enabling the option **Show debug console** and reinitialize the search process.

If more than one network interface is available on the PC have all network interfaces listed and select the correct interface from the list by clicking **Select network interface ...** to call up the selection display.



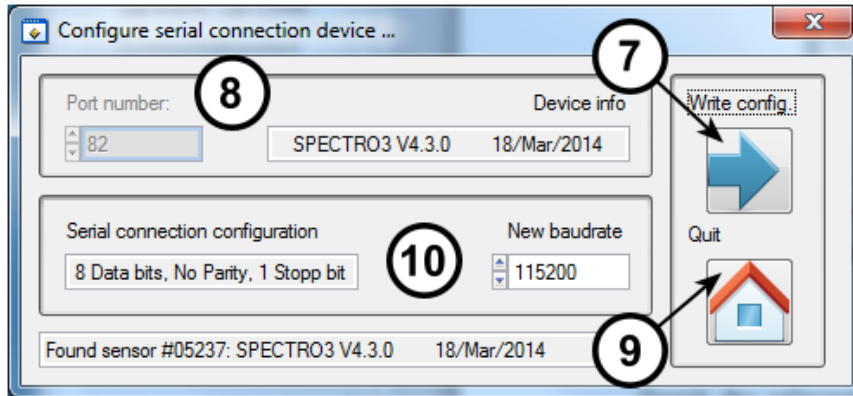
Picture 4: List of available network interfaces

Start a search for available network interfaces by clicking the **Search** button. All interfaces using IPv4 found are listed in the main window. Select the desired network interface to use by left clicking on it in the tree view. The selected network interface name is also featured in the status line at the lower border of the panel. Click **Select** to use this network interface in further operations with the software. The selection panel is closed after the selection. Use **Quit** to close the panel without any change on the currently used network interface selection.

Configuration

cab-4/USB, cab-5/USB, others

Physical RS232 interfaces need not be configured since the COM port number is assigned by the operating system and the baud rate is selected at the time of initialization by the sensor software. Adapters of the type “cab-4/USB” and “cab-5/USB” act transparent i.e. from the sensor software’s point of view they act as COM ports. Whether these COM ports are physical or virtual is irrelevant. Configuration with serial connections is therefore an operation on the sensor connected by this connection rather than on the adapter or the COM ports themselves. The sensors baud rate setting can be adjusted.



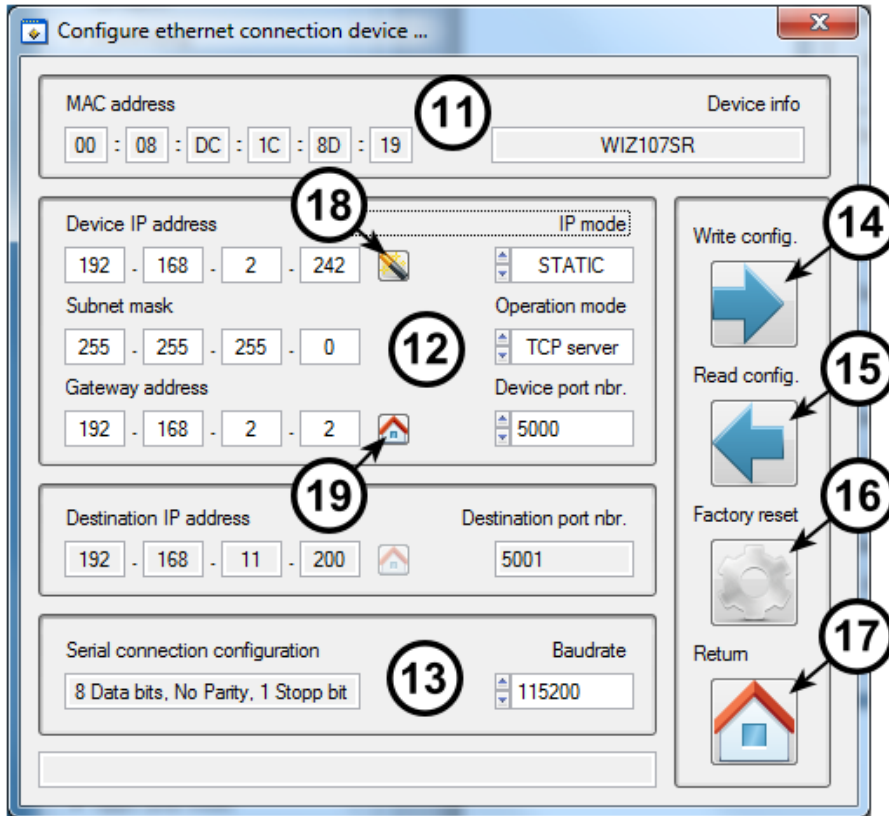
Picture 5: Configuration mask for serial connections

To be able to configure the relevant sensor, it must be positively identified and displayed in the **tree view** (3). When the configuration panel is called up a connection is established to the sensor and its serial number and firmware version is read out and displayed in the **Device info** (8) text box. The currently configured baud rate is displayed in the dropdown list **New baudrate** (10) where it can be changed to the new desired value. Using the button **Write config.** (7) the new setting is transferred to the sensor and stored and executed. To quit the configuration one can use the button **Quit** (9) or by the window close button in the right upper corner of the panel.

cab-4/ETH, cab-5/ETH

While “cab-4/USB” and “cab-5/USB” are acting transparent, adapters of the type “cab-4/ETH” and “cab-5/ETH” are independent units which communicate with sensors by the RS232 protocol and with PCs by the TCP/IP protocol. A microcontroller embedded within the adapter acts as a bridge between PC and sensor handling the communication requests of both sides and relaying their information.

Configuration of the Ethernet adapter is therefore the configuration of two individual interfaces: the RS232 interface towards the sensor and the TCP/IP interface towards the local network.



Picture 6: Configuration mask for network connections

To be able to configure the relevant adapter, it must be positively identified and displayed in the **tree view** ③).

The Ethernet adapter's identity is uniquely determined by its MAC address. This address can be found engraved on the housing of the adapter. It is also displayed as **MAC address** ⑪ in the upper part of the panel.

Configuration of the RS232 interface (towards the sensor) of the Ethernet adapter is done by selecting the **Baudrate** ⑬ parameter displayed in the lower part of the panel. The currently configured setting is displayed when the configuration panel is called up or when the user clicks on the **Read config.** ⑮ button. To change the parameter, select the new value by clicking on the dropdown list. This parameter will be transmitted together with every other (network-)parameter when writing the configuration data to the adapter.

The configuration of the network parameter of the Ethernet adapter consists of setting the **Device IP address** ⑫, the **Subnet mask** as well as the **Gateway address** of the adapter which are mandatory if static IP addressing is used. The selection of the addresses must match with the network settings. The configured IP address may not be identical to an already existing IP address on the same subnet. Integrating the adapter to an existing network should be done in cooperation with its network administrator. Knowledge of subnet-mask and gateway address is mandatory and can be requested from the network administrator

Besides static IP addressing it is possible to select dynamic addressing by selecting DHCP with the **IP mode** ⑫ parameter. The Ethernet adapter will then upon power up try to retrieve an IP address as

well as a subnet mask and a gateway address from a DHCP server present on the local subnet. These addresses are leased temporarily to the adapter. In IP mode DHCP the relevant addressing parameter are not accessible by the user.

The **Operation mode** ⑫ of the adapter is configured with this parameter. At the moment only TCP server mode is supported. Therefore the PC software always acts as TCP client.

The TCP server's port number is configured by **Device port nbr.** ⑫ and is set to 5000 by default. This port number can be changed to match the user's requirements.

To further simplify configuration of the adapter the SensorFinder software allows copying the host PC's gateway address to the adapter's gateway address by clicking the button next to **Gateway address** ⑲. If more than one gateway address is configured with the local PC successive clicks on the button switch between these addresses.

In the case of a direct connection between adapter and PC the adapter's IP address can be chosen arbitrarily (within the host PC's subnet) since there is no danger of the IP address being already taken. To simplify the process of assigning a static IP address to the adapter in such a PC-adapter-only-network a button is provided located next to the **Device IP address** ⑱. By clicking on this button a random address is generated within the same subnet as the host PC based on the host PC's own IP address. In the case that there is more than one IP address assigned to the host PC clicking successively on the button switches between these addresses. On each click a new random IP is generated.

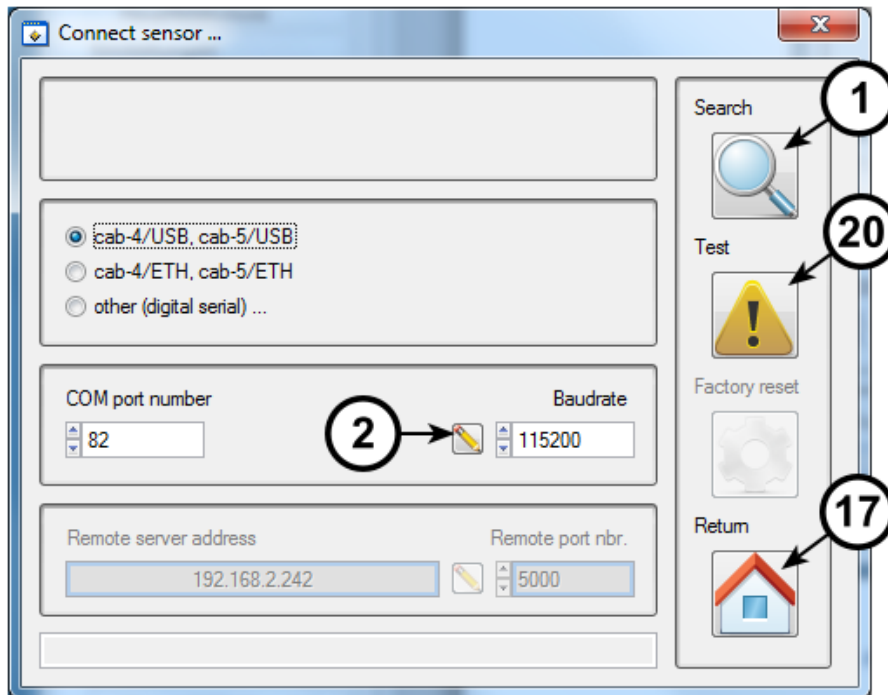
To transmit the settings to the nonvolatile memory of the Ethernet adapter click the button **Write config.** ⑭ causing the settings to be collected and transmitted. The adapter will then reboot with the new settings within 3 to 5 seconds. Please check the signal LEDs of the adapter to determine when the adapter has returned to normal operation. After sending data to the adapter the configuration mask should be closed using the button **Quit** ⑰ or the windows close button in the right upper corner of the panel. Closing the panel causes the renewal of the search for connections and should display the adapter with the recently configured parameters.

Clicking the **Factory reset** ⑯ button causes the adapter (whose **MAC address** ⑪ is taken from the relevant text box) to be reconfigured with the factory settings. All parameters are reset to their default value.

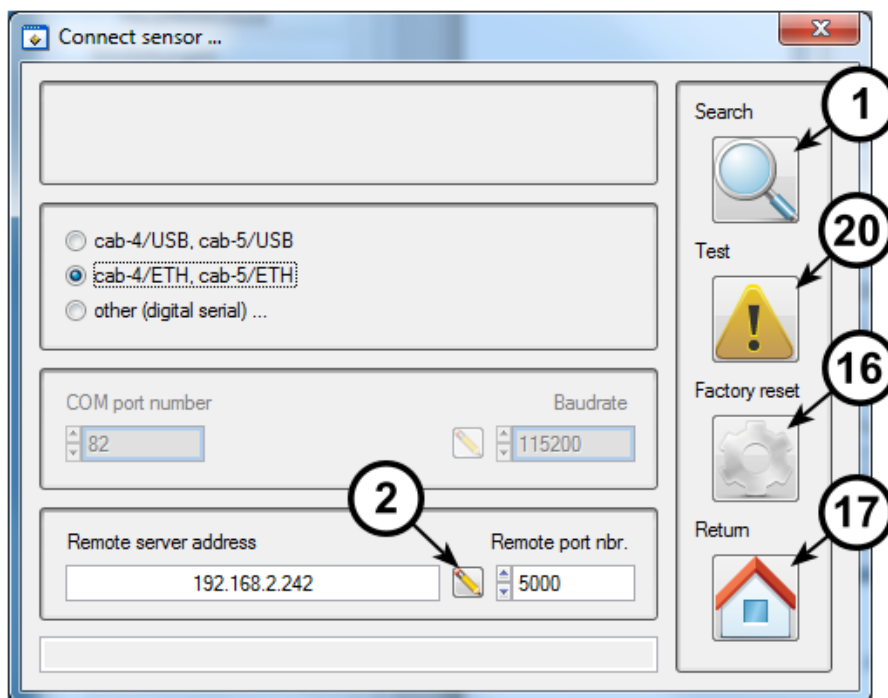
Parameter	Factory setting
Device IP address	192.168.11.2
Subnet mask	255.255.255.0
Gateway address	192.168.11.1
IP mode	STATIC
Operation mode	TCP Server
Device port nbr.	5000
Baudrate	57600baud

Communication test panel

If no connection was selected when clicking the **Configure ...** ② button or the equivalent menu entry this panel is called up instead of the configuration mask.



Picture 7: Communication test panel (Auswahl: cab-4/USB, cab-5/USB)



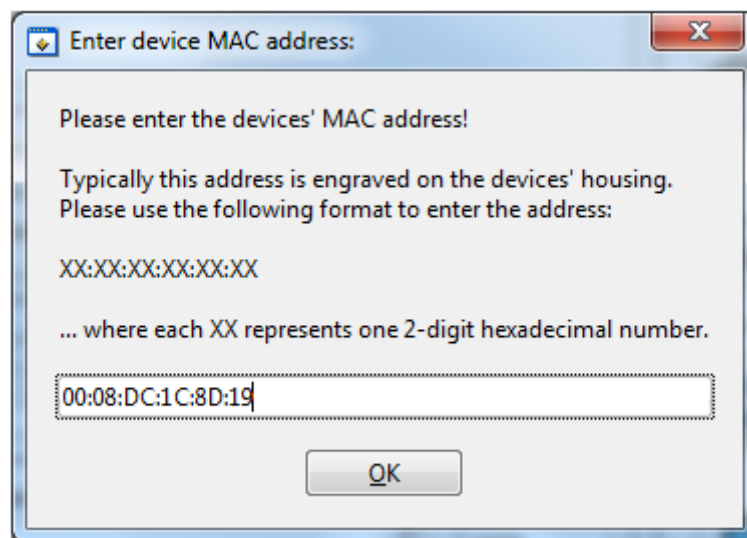
Picture 8: Communication test panel (Auswahl: cab-4/ETH, cab-5/ETH)

Clicking the button **Search** ① causes the communication test panel to be closed and the **tree view** ③ to be displayed while at the same time initializing a new search. The button **Quit** ⑰ closes the panel without initializing a new search.

The connection settings are pre-entered into the respective fields. It is however possible to enter other connection settings by the user. Clicking on the button **Test** (20) causes the SensorFinder software to try to establish a connection to the respective connection settings. The result of this test will be successful if a sensor is connected at this connection and active. The test result will be displayed in the status line (at the bottom of the panel).

If the connection settings match those of one device featured within the tree view, clicking on the **Configure ...** (2) button causes the configuration mask to be called for this connection.

If an adapter could not be found by the SensorFinder software and a configuration error is suspected as cause of the problem, this individual adapter can be reset to its factory default settings by the **Factory Reset** (16) button. This command is transmitted by UDP broadcast into the network and is thus independent from the current IP address of the adapter. However only the adapter with the matching MAC address responds to it. Note that broadcasts do not extend beyond routers.

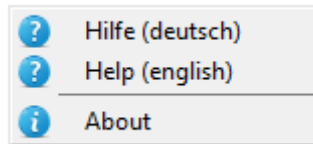


Picture 9: Send a factory reset command by broadcast to an Ethernet adapter

Knowledge of the adapter's unique MAC address (engraved onto the housing) is needed for this operation. The success of the operation cannot be determined directly. Once the Ethernet adapter is reset to its factory default settings, it should be found with the SensorFinder program having its default settings.

Help

To display this file click **Menu** (4) → **Help** → **Hel**. A link to this file is also available from the start menu in the directory where the link for the SensorFinder software is located.



Picture 10: Help

Using **Menu** ④ → **Help** → **About** displays a detailed overview of the versions of the software and its used libraries.

F.A.Q

What is the meaning of “MAC” address?

The MAC (Media Access Control) address is a unique identifier assigned to network interfaces used for communication within a physical network. The MAC address is part of layer 2 of the OSI layer model and thus below and independent of the IP address. MAC addresses are assigned by the IEEE organization.

While IP addresses can be changed to match the requirements of the given network, the MAC address is fixed and does not change. It thus identifies the network device uniquely. It consists of 6 numbers ranging from 0 to 255 typically written in hexadecimal representation. Commonly MAC addresses are written with colons or dash between the single numbers e.g.: 00:08:DC:1C:8D:01 or 00-08-DC-1C-8D-01

What is the meaning of “IP” address?

The IP protocol is a widely spread type of network protocol and is part of the TCP/IP protocol family. It handles addressing and routing packages of data within a network. The IP address (together with the subnet mask) is a unique address within the network segment. Public IP addresses (those that can be accessed by internet) are assigned by organizations like the IANA while addresses within an intranet (like an office or within a production hall) are typically assigned by a network administrator, who makes sure that addresses are assigned only once within a network. If more than one device is assigned the same IP address this usually creates a conflict making one or both of the devices unreachable within the network.

The IP address consists of 4 numbers in human readable decimal representation. Commonly IP addresses are written with a dot between each number e.g. 192.168.2.100

Certain IP addresses have special meaning like 0.0.0.0, 255.255.255.255 and most addresses ending on 0 or 255 and should be used as addresses for network devices.

What is the meaning of “subnet mask”?

The subnet mask divides IP addresses into one common subnet address and one host number. An analogy would be a telephone number which is divided into an area code and call number. The area code (subnet address) is identical for all that live within the same village. The call number (host number) is different for each citizen.

Subnet mask have the format of an IP address. Since they only specify the division between subnet address and host number their form is restricted. E.g.: 255.255.255.0 (here the first three numbers are part of the subnet address; the last number is part of the host number)

What is the meaning of “OSI layer model”?

To keep orientation in the growing complexity of network structure a model was devised consisting of seven layers. Each of the seven layers is assigned a certain clear function and an interfacing, which makes it possible to replace a protocol within a layer without need to change the underlying layers. When one network participant transmits a message to another his message is passed from the top layer to the layer below and so on until it reaches the first layer where it is transmitted by copper cable, glass fiber, etc. Once it reaches the receiver, the message passes from the lowest layer up to the top layer in reverse order.

An analogy would be writing a letter with the message “The weather is nice.” The message (letter) would be placed within an envelope, which would end up in a mail bag. This mail bag would be placed in a truck together with other mail bags which transports it to the airport. There the contents of many trucks will end up in one airplane to transport it over the Atlantic. After landing the contents would be distributed among different trucks, transported to regional hubs, handed out in mail bags to postmen and delivered – still within the envelope – to the letterbox where it finally gets unpacked. The transitions of the message from letter to envelope to mail bag etc. are equivalent to the data passing through the individual layers of the OSI model.

The MAC address is part of layer 2, the IP address is part of layer 3 of the model.

What is a “gateway address”?

A “gateway” is a connection between two network segments. If the destination IP address lies outside of the participants own subnet (as determined by its IP address and subnet mask) the package is sent to the gateway instead (which lies inside of the network segment). The gateway then relays the message to the destination. This enables local networks to access the internet.

Gateway addresses have the format of an IP address. Typically the gateway address is equivalent to the address of the router. E.g.: 192.168.2.1

What is the meaning of “baud rate”?

The RS232 protocol is a so called “asynchronous serial” interface meaning that bytes are transmitted serially (one bit at a time) without an additional signal signaling the recipient the clock of the transmission. Therefore both sender and receiver need to be configured up front to use a certain transmission clock. If this clock was different for sender and receiver data would be corrupted and could not be transmitted.

The baud rate is a unit of measure determining the symbol rate (symbols per second) of this clock. Common baud rates used with RS232 interfaces are 9600baud, 19200baud, 38400baud, 57600baud and 115200baud. E.g.: 115200baud means 11520 bytes/sec or 11.25kbytes/sec.

What does “DHCP” mean?

DHCP (Dynamic Host Configuration Protocol) is a network protocol used where new network participants frequently join a network without knowing the parameter of the network e.g. on airports, hotels and train stations but also e.g. in company offices.

With DHCP a dedicated server (DHCP server which is typically but not necessarily the same as the router) distributes upon request IP addresses (together with the networks subnet mask and gateway address) from a pool to new clients. These addresses are leased for a certain amount of time. With the client DHCP is configured as an option. If the option is selected and the client joins the network (e.g. when the client powers up) it searches the network for a DHCP server and request the assignment of an IP address. Once it receives the address it automatically configures itself with this address and is consequently linked to the network.

When using DHCP on a client it is mandatory that there is a DHCP server present and active on the network. If no server is available the client won't be configured and remains unreachable within this network (until explicitly configured to use a static IP instead).

What is the difference between client and server?

Server is offering a service, client is requesting a service. With connection-oriented protocols as TCP participants are separated into clients and servers. Servers are continuously waiting for (unspecified) clients requesting a connection. Therefore servers are passive – they don't initiate connections. Clients actively establish a connection and therefore need to know the specific IP address of the destination server. Usually adapters of the type "cab-4/ETH" and "cab-5/ETH" are TCP-servers, the PCs running the sensor software are TCP-clients.

Apart from the connection setup there is no difference between client and server in terms of data exchange. Data can be sent and received from both participants.

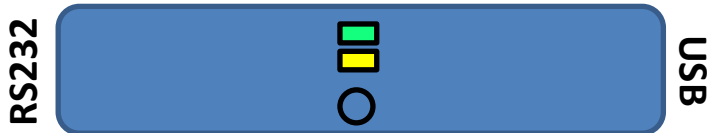
What is a port number?

Port numbers are part of the TCP and UDP protocols and determine endpoints of communication. If the IP address was a house number of a tenement the port number would be the name of the tenant in this analogy. The port number makes sure the message reaches the correct receiver.

Valid port numbers can have the range from 1 to 65535. Many port numbers are standardized and assigned to certain application (e.g.: TCP port 80 is reserved for HTML), so that not all port numbers can be used freely. The IANA organization manages port number. Adapters of the type "cab-4/ETH" and "cab-5/ETH" use TCP port 5000 by default.

What is the meaning of the LEDs on "cab-4/USB" and "cab-5/USB" adapters?

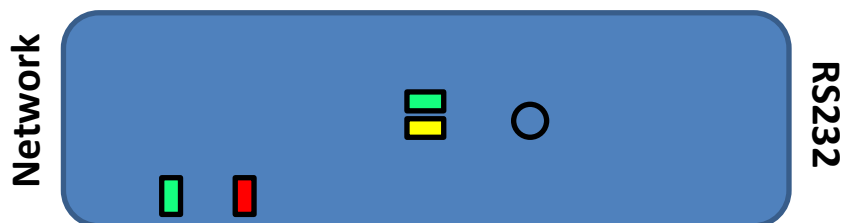
USB adapters have two LEDs – one green and one yellow – placed directly on the PCB within the housing of the adapter. The green LED when active shows that the adapter is connected to a PC and ready to be used. The yellow LED blinks when data is exchanged between PC and sensor and vice versa.



What is the meaning of the LEDs on "cab-4/ETH" and "cab-5/ETH" adapters?

Ethernet adapters have four LEDs – two green, one yellow, one red – placed directly on the PCB within the housing of the adapter. The green LED on the rim of the PCB signals that the sensor connected to the adapter is powered up and is supplying power to the adapter. The central green LED signals the

presence of a network signal (“Link-LED”) while the central yellow LED shows – if active – that the network speed is 100Mbit. Additionally the yellow LED blinks if data is exchanged between PC and sensor and vice versa. The red LED on the rim of the PCB has multiple purposes. If the adapter is powered up but not physically connected to a network, the LED blinks about once per second (while the central LEDs are off). If a network is physically connected but no connection is established between the sensor software and the sensor, the red LED is off. Once a TCP connection is established to the sensor, the red LED is continuously on until the connection is closed down.



What is the difference between TCP and UDP?

TCP and UDP are both protocols of layer 4 of the OSI layer model above IP (layer 3) and MAC (layer 2) and therefore independent of both. TCP is a connection oriented protocol where the participants (one server and one client) maintain their current states (connected, disconnected). Once a connection is established between client and server the respective ports are blocked for other communications. The connection is maintained until one of the participants disconnects (or if one of the participants powers down). In this case the connection has to be reestablished before communication can be resumed. TCP is considered safe and is spread widely.

UDP in contrast is a connection-less protocol. Thus it is possible to send data packages to many different recipients at the same time (broadcasts). UDP is considered unsafe, because neither sender nor recipient can determine if packages have been lost. Because of its flexibility UDP is used by many protocols of higher layers.

Tipps und Tricks

How do I connect one Ethernet adapter directly to my PC?

Ethernet adapters of type “cab-4/ETH” and “cab-5/ETH” are Auto-MDIX enabled. Therefore they can be directly connected to PCs without needing special cables.

Since in this miniature network there is no DHCP server present, neither on the PC nor on the adapter dynamic addressing (DHCP) may be used. Both must use static IP addresses.

The PC’s IP address and its subnet mask determine a subnet address. The adapter needs to be configured to use the same subnet address as the PC. Since only two participants are part of this network and therefore the possibility of address collision is nonexistent, the adapters IP address can be assigned at random unless a specific address is desired.

Step by step:

1. Configure your PC to use static IP addresses (if necessary). Assign an IP address.

2. Connect the LAN cable of the adapter to your PC.
3. Search for the adapter with the SensorFinder software.
4. Make sure the **IP mode** (12) of the adapter is configured STATIC.
5. Based on the address of the PC's IP address assign a random IP address within the same subnet. To this purpose use the button next to **Device IP address** (18) or enter manually.
6. Change the adapter's settings and restart it (i.e.: press **Write config.** (14))
7. Close the configuration panel and research for the adapter.

Frequent errors

I can detect "cab-4/ETH" or "cab-5/ETH" adapters with the SensorFinder software but I can't establish a connection to the sensor software!

Please check these points:

- If the Ethernet-adapter is not within the same subnet as the PC a TCP connection cannot be established. In this case assign an IP address within the PC's subnet to the Ethernet adapter.
- Check if the TCP port number that is configured on the adapter is also entered in the sensor software's port number input field. You need to enter this number correctly into the sensor software'. You can find the adapter's port number in the tree view listed as "*Local portno.:*"
- Remember that your sensor software communicates with the adapter which communicates with the sensor. Despite the fact that a connection to the adapter is successfully established communication may fail if the RS232 interface configuration of the adapter does not match the settings used in the sensor itself. In this case configure the Ethernet adapter to use the same baud rate that is used in the sensor (ideally using a "cab-4/USB" or "cab-5/USB" temporarily replacing the "cab-4/ETH" or "cab-5/ETH" and the SensorFinder software to check for the currently configured baud rate on the sensor and taking configuring this information into the Ethernet adapter)

I cannot find any "cab-4/ETH" or "cab-5/ETH" on my network!

Consider these points a start for your search. Other reasons not mentioned may well be possible.

- Are the sensors the "cab-4/ETH" and "cab-5/ETH" are connected to powered up and active? If no supply power to the sensors.
- Are the adapters physically connected to the network (the cables are plugged into switch or hub who themselves are connected to your PC)? If not establish a physical connection between the adapters and your PC using the cables and network infrastructure.
- Is the PC running the SensorFinder software part of the same network as the adapters? The SensorFinder software uses UDP broadcasts to identify Ethernet adapters on the network. Router block broadcasts, so the SensorFinder software is unable to see what is beyond the local network segment. If your PC is outside the network segment the adapters are running in, rerun your search again from within this network.
- Is the PC the SensorFinder software is running on equipped with multiple network interfaces (e.g.: WLAN and LAN)? If so select the correct network interface that is connected to the network also containing the Ethernet adapters.

- Are you using IPv6? The Ethernet adapters are IPv4 based and the network interface must support IPv4. Please consult your network-administrator on how to accomplish this.