3B SCIENTIFIC® PHYSICS

3B Net*log*™ with Ethernet port

1000541 (115 V, 50/60 Hz)
1000009 (230 V, 50/60 Hz)

Instruction manual
14/06 MEC

1. Safety instructions

To guarantee the safe functioning of the 3B NET*log*™ equipment, it is necessary to abide by the following instructions:

- Do not connect the 3B NET*log*™ device to a voltage in excess of ±20V or current in excess of ±2A.

- Make sure the 3B NET*log*™ device does not come into contact with water.

- The 3B NET*log*™ device should not be exposed to temperatures above 80°C.

The operating voltage input is protected against polarity reversal. However, it is not protected against excess voltage.

- Do not apply voltage in excess of 4.5V to the operating voltage input.

Use of the Ethernet port requires a power supply of higher power rating.

- When using the 3B NET*log*™ unit with the Ethernet port, supply power by means of a plug-in power supply.

2. Scope of delivery

1 3B NET*log*™ device
1 Power supply unit (4.5V DC, 300mA)
1 USB cable
1 Installation CD

3. Introduction

3B NET*log*™ is a multimedia data acquisition and evaluation system for current and voltage measurements and for measurements using sensors. The system can be used with or without being connected to a computer. With the accompanying 3B NET*lab*™ software, measurements can be conducted with arbitrarily chosen parameters as well as in prepared experiments. The prepared experiments take the user through an interactive experimental environment where the measurement parameters have already been defined. When used within a network, the teacher and students can mutually monitor their results.

The Ethernet port allows the 3B NET*log*™ unit to be directly connected to a local network, so that data can be sent to any computer in the network for evaluation. In order to use the unit with Ethernet an intranet in the same sub-network must be in place.

Without being connected to a computer, the 3B NET*log*™ device can be used as a digital multimeter for current and voltage measurements. Combined with different sensors, the 3B NET*log*™ equipment can also be used as a handheld unit with automatic sensor recognition.

4. Technical specifications

4.1 Analogue inputs

Voltage inputs (channels A and B):

Measuring equipment:	2 Differential amplifiers
Measuring range:	±200mV, ±2V, ±20V
Surge voltage protection:	Max. ±40V
Connections:	4-mm safety sockets

Current input (channel A):

Measuring range:	±200mA, ±2A
Excess current protection:	Max. ±2.5A
Connections:	4-mm safety sockets

Sensor inputs (channels A and B):

Sensor type:	Analogue
Sensor identification:	Automatic
Sensor connections:	8-pin mini DIN sockets
Sampling:	Continuous
Sampling rate:	50k samples/s
Resolution:	12 bit

4.2 Analogue outputs (channels A and B)

Reference point (earth):	Common
Measuring range:	± 5V
Connections:	4-mm safety sockets and 8-pin mini DIN sockets
Sampling rate:	10kSamples/s
Resolution:	12bit

4.3 Digital inputs

Channels:	4 (separated into 2 TTL inputs, one of which is a high-speed time input, plus 2 inputs via optocoupler)
Sampling rate:	50k samples/s 100k samples/s (high-speed time input)
Connection:	8-pin mini DIN socket

4.4 Digital outputs

|	
Channels:	6
Signal:	TTL
Connection:	8-pin mini DIN socket

4.5 Additional data

|	
Computer connection:	USB
Network port:	Ethernet
Internal data memory:	128k
Display:	64 x 122 matrix for measurements and units
Power supply:	4.5 V DC/300mA or 3 batteries (AA, LR6 or AM3); owing to their longer battery life, use of alkaline batteries is recommended.
Dimensions:	21 x 8 x 4 cm^3 approx.
Weight:	400g approx. (including batteries)

5. Description

5.1 Components

1 Display
2 Operating controls
3 Current input for channel A
4 Voltage outputs for channels A and B
5 Voltage inputs for channels A and B
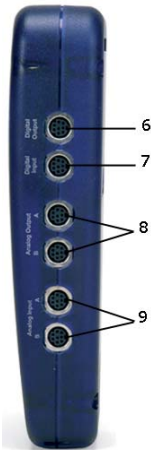
6 Digital outputs
7 Digital inputs
8 Analogue outputs A and B
9 Analogue inputs A and B

10 Recessed socket for power supply unit
11 USB connection
12 Ethernet port
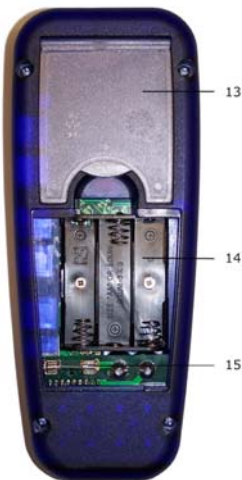
13 Mount
14 Battery compartment
15 Fuse

5.2 Operating controls

The operating controls of the 3B NET*log*™ unit consist of five multi-function buttons for operation without connection to a PC.

On/Off button
- Switching the device on and off (keep the button pressed for approx. 2 seconds to switch off the device)
- Switching the display lighting on and off (briefly press the button)

Date/Time button ↵
- Switching on the battery and temperature displays
- Switching on the time display
- Switching on the date display
- Selection of operating mode (manual or automatic)
- Confirming the display →

Store button ↓
- Communication to data logger
- Scrolling down the menu
- Selecting Yes or No
- Confirming the display ↓

Rate button ↑
- Selection of sampling rate
- Scrolling up within the menu
- Selecting Yes or No
- Confirming the display ↑

Channel button ←
- Selection of measurement parameters for channels A and B
- Changing between fields while setting the time and date
- Return to previous menu

5.3 Measurement parameters

Name	Significance
VdcA	DC voltage on channel A
VacA	AC voltage on channel A
Idc	DC current on channel A
Iac	AC current on channel A
VdcB	DC voltage on channel B
VacB	AC voltage on channel B
Bin	Binary representation

5.4 Connection of sensors

Connected sensors are automatically detected by the 3B NET*log*™ device. The following status message appears on the display:

PROBE DETECT…. Subsequently, the measurement and the unit corresponding to the connected sensor are displayed.

6. Commissioning

6.1 Operating with the power supply unit

- Insert the recessed plug of the power supply unit into the recessed socket of the 3B NET*log*™ device.
- Connect the power supply unit to the mains.
- If necessary, press the On/Off button.

6.2 Operating with batteries

- Open the lid of the battery compartment and insert three batteries (AA, LR6 or AM3) while carefully observing the polarity (batteries not included).
- If necessary, press the On/Off button.

7. Operating with a computer and 3B NET*lab*™ software

In order to operate the 3B NET*log*™ equipment with a computer, the 3B NET*lab*™ software and a computer with the following system requirements are necessary:

- Windows XP and Microsoft Internet Explorer up to version 8
- Windows 7 (32-bit and 64-bit) and Microsoft Internet Explorer up to 11 or higher
- Windows 8.1 (32-bit und 64-bit) and Microsoft Internet Explorer up to 11 or higher
- 32-bit (x86) or 64-bit (x64) processor with a speed of at least 1 GHz
- At least 1 GB RAM
- At least 500 MB hard disc memory

⚠ **Note** *when operating via a computer, never press the buttons on the 3B NETlog*^{TM} *console.*

7.1 Driver installation

Before installing the 3B NET*lab*™ software, it is important to install the USB driver:

- Insert the installation CD into the CD-ROM drive of the computer.

- Connect 3B NET*log*™ to the computer via the USB cable.

The computer reports that it has detected a new hardware.

Windows XP:

- Do not activate Windows Update.
- Select "Install software from specified location".
- Under "Browse", specify the location of the driver on the CD.
- A hardware message will state that the software has failed to pass the Windows Logo Test. You should nevertheless click "Proceed with installation".

Windows 7 and 8.1:

The operating system automatically installs a driver which is packaged with Windows. However, this driver is not used with 3B NET*log*™. The correct driver therefore needs to be installed manually as per the following instructions:

- Open the hardware manager under *Control Panel -> Hardware and Sound -> Hardware Manager*.
- Double click "USB Controller" in the hardware manager.
- Double click "USB Serial Converter".
- Click *Drivers -> Update Driver*.
- A small window will open so that you can search for the driver software. Click "*Find driver software on this computer*" in the window.
- Click the "*Browse…*" button and select the path for the driver.
- Follow the instructions to install the driver.

As an alternative, the folder containing the driver file can be copied directly onto the computer from the CD and can be installed from the hard disk.

Exception:

⚠ If the software for the CCD linear camera (1013311) is already installed on your computer, carry out the following instructions:

- Connect 3B NET*log*™ to the computer via the USB cable.

The computer **will not** report that a new hardware **has been detected**.

- Insert the installation CD into the CD-ROM drive of the computer.

Windows XP:

- *System control panel -> System -> Hardware ->* open *Device manager*.
- Double-click on USB controller.
- Double-click "ULICE USB Product".
- Click *Driver -> Update driver*. (The hardware assistant will start.)
- Do not activate Windows Update.
- Select "Install software from specific source".
- Select "Do not search. Autodetect driver".
- Select "Drive" and then "Search" to establish the path to the driver.
- Click "Yes" to confirm that the file should be overwritten.
- Click "Proceed with installation" when the hardware message states that the software has failed to pass the Windows Logo Test.

Windows 7 and 8.1:

- Open the hardware manager under *Control Panel -> Hardware and Sound -> Hardware Manager*.
- Double click "USB Controller" in the hardware manager.
- Double click "ULICE USB Product".
- Click *Drivers -> Update Driver*.
- A small window will open so that you can search for the driver software. Click "*Find driver software on this computer*" in the window.
- Click "*Select from a list of device drivers on this computer*".
- Click the "*Medium…*" button.
- Click the "*Browse…*" button and select the path for the driver.
- Click "Yes" to confirm that the file should be overwritten.

7.2 Software installation

Note on installing the software

For this software, please refer to the installation instructions available in the 3B NET*lab*™ software manual.

8. Operating without a computer

Operating a 3B NET*log*™ device without a computer is achieved by using the buttons on the operating panel. The functions of these buttons may change according to the operation being undertaken.

⚠ *Note: a menu selection can be cancelled at any time by using the Channel ← button.*

8.1 Battery level and temperature display

- Switch on the 3B NET*log*™ device by pressing the *On/Off* button.
- Press the *Date/Time* ↵ button.

The following should appear on the display:

e.g.: BATTERY: 100%
TEMP.: 22.0°C

8.2 Setting the time

- Switch on the 3B NET*log*™ device by pressing the *On/Off* button.
- Press the *Date/Time* ↵ button twice (the time field will appear on the display).
- Press the *Store* ↓ button (the input field for SET TIME will appear on the display).
- Specify the desired time in the input field by pressing the *Rate* ↑ or the *Store* ↓ button and use the *Channel* ← button to skip between the hours, minutes and seconds fields.
- Confirm by pressing the *Date/Time* ↵ button.

8.3 Setting the date

- Switch on the 3B NET*log*™ device by pressing the *On/Off* button.
- Press the *Date/Time* ↵ three times (the date field will appear on the display).
- Press the *Store* ↓ button (the input field for SET DATE will appear on the display).
- Specify the desired date in the input field by pressing the *Rate* ↑ or *Store* ↓ button and use the *Channel* ← button to skip between the year, month and day fields.

- Confirm by pressing the *Date/Time* ↵ button.

8.4 Application as a handheld device for measuring current and voltage

- Set up the 3B NET*log*™ equipment.
- Connect the voltage/current input of channel A or B, as desired.
- If necessary, disconnect any sensor which might be connected to the same channel.

Setting and selecting measurement parameters:

- Press the *Channel* ← button (the menu DISPLAY SIGNAL 1 will appear on the display).
- Select the desired measurement parameter with the *Rate* ↑ or *Store* ↓ button.
- Select the mode of operation with the *Date/Time* ↵ button (the menu RANGE SIGNAL 1 will appear on the display).
- Select the desired mode of operation with the *Rate* ↑ or *Store* ↓ button.
- Confirm this selection with the *Date/Time* ↵ button (the menu DISPLAY SIGNAL 2 will appear on the display).
- Select the desired measurement parameter with the *Rate* ↑ or *Store* ↓ button.
- Select the desired mode of operation with the *Rate* ↑ or *Store* ↓ button.
- Confirm the selection with the *Date/Time* ↵ button (a dot will appear in front of the respective measurement parameter when operating manually).

The 3B NET*log*™ device is ready to conduct measurements.

8.5 Application as a handheld measuring device with sensors

- Set up the 3B NET*log*™ equipment.
- Connect the sensor to the relevant input and remove the connections of the 4-mm sockets from the same channel.

After the automatic sensor detection PROBE DETECT… has been completed, the 3B NET*log*™ equipment is ready to conduct measurements.

8.6 Setting the sampling rate

- Press the *Rate* ↑ button (the options list for SAMPLE RATE will appear).
- Select the desired sampling rate with the *Rate* ↑ or *Store* ↓ button.
- Press the *Date/Time* ↵ button (the settings

STORE ANALOGUE INPUT 1, STORE ANALOGUE INPUT 2 and STORE BINARY INPUTS will appear in succession).

- Select YES or NO for each setting with the *Rate* ↑ or *Store* ↓ button and confirm with the *Date/Time* ↵ button (the subsequent setting will appear after each confirmation).

8.7 Data logger

In data logger mode, the 3B NET*log*™ equipment records the data with a pre-selected sampling rate and saves it internally. After completing a measurement, the data can be transferred onto a computer for evaluation.

Calling up data logger mode:

- Press the *Store* ↓ button (STORE will appear with → START or ↑ CLEAR → START displayed).

Starting data logger:

When the display shows → START:

- Start recording data with the *Date/Time* ↵ button ("BUSY → STOP" will appear in the display and the measurement begins).

Stopping the data logger:

When the display shows → STOP:

- Stop recording data by pressing the *Date/Time* ↵ button (↑ CLEAR → START will appear in the display).

Clearing data logger:

When the display shows ↑ CLEAR:

- Press the *Rate* ↑ button (MEM.CLEAR? → YES will appear in the display).
- Confirm by pressing the *Date/Time* ↵ button.

Exiting data logger mode:

When the display shows ↑ CLEAR → START:

- Press the Channel ← button.

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9. Use of Ethernet port

In order to connect the 3B NET*log*™ unit into a local network using its Ethernet port, carry out the following procedure:

9.1 Assignment of an IP address by the router

- Turn off the 3B NET*log*™ device and un-plug the Ethernet cable.
- Press down the *Store* ↓ button and turn on the 3B NET*log*™. The display should show the following:

```
Ethernet interface ?

ON
```

- Confirm this by pressing the *Date/Time* ↵ button. The following will then appear on the display:

```
DHCP?

YES
```

- Now plug in the Ethernet cable to connect the 3B NET*log*™ unit to the local network. Confirm the above question by pressing *Date/Time* ↵.

An available IP address for the local network will be sought out and assigned to the device:

```
Obtaining address
from server ...
```

After about 3 seconds, the IP address, the subnet mask and the gateway address will be displayed. The display might, for example, display the following:

```
IP:   192.168.1.100
MASK: 255.255.255.0
GATE: 192.168.1.1
```

- Use the *Date/Time* ↵ button to confirm. The 3B NET*log*™ unit will then have the IP address assigned to it.

9.2 Assignment of a known or fixed IP address

- Turn off the 3B NET*log*™ device and un-plug the Ethernet cable.
- Press down the *Store* ↓ button and turn on the 3B NET*log*™. The display should show the following:

```
DHCP?

YES
```

- Press the *Rate* ↑ or *Store* ↓ button until the display shows the following:

```
DHCP?

NO
```

- Use the *Date/Time* ↵ button to confirm this, then plug in the Ethernet cable to connect the 3B NETlog™ unit to the local network.
- Now you can modify the known, fixed IP address by pressing the *Store* ↓ or *Rate* ↑ buttons along with *Channel* ← or *Date/Time* ↵ e.g.:

```
Set IP address:

192.168.001.020
```

- Confirm the address by pressing the *Date/Time* ↵ button. Now enter or modify the subnet mask, e.g.:

```
Set Subnet mask:

255.255.255.000
```

- Confirm the mask by pressing the *Date/Time* ↵ button. Now enter or modify the gateway address, e.g.:

```
Set Gateway:

192.168.001.001
```

- Confirm using the *Date/Time* ↵ button.

9.3 Assignment of default value for IP address

- Turn off the 3B NET*log*™ device and un-plug the Ethernet cable.
- Remove a battery from the unit.
- Pressing down the *Rate* ↑ a**nd** *Date/Time* ↵ buttons at the same time, put the battery back in the unit.

9.4 Turning off Ethernet mode

- Turn off the 3B NET*log*™ device and un-plug the Ethernet cable.
- Press down the *Store* ↓ button and turn on the 3B NET*log*™. The display should show the following:

```
Ethernet interface ?

ON
```

- Press the *Rate* ↑ or *Store* ↓ button until the display appears as follows:

```
Ethernet interface ?

OFF
```

- Confirm by pressing the *Date/Time* ↵ but-ton. Ethernet mode is now switched off.

The full menu for configuring Ethernet can be found in the appendix.

9.5 Entering an IP address into 3BNET-*lab*™

- Run 3BNET*lab*™.
- Set up a new data entry in "Measurement lab".

After the window with the new data entry has opened, proceed as follows:

- Click the button to the right of ***Device port***.
- An entry box will open into which you should enter the IP address that has been determined.

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10. 3B NET*data* transfer software

Data stored in the 3B NET*log*™ memory can be retrieved and saved as text files with the help of the 3B NET*data* software. In addition, the software also provides the capability to set modes of measurement and measurement parameters.

⚠️ ***Note:*** *Only one interface 3B NETlog™ may be connected to the computer when using the software 3B NETdata.*

10.1 Installation of the driver

Before installing the 3B NET*lab*™ software it is necessary to install a USB driver. Proceed as described in 7.1.

10.2 Software installation

- Run the installation program "start.exe" as administrator and follow the instructions on the screen.

10.3 Control elements

The control interface consists of three dialogs that can be brought to the front by clicking the relevant tab. The "Read Data" tab is used for transferring measurement data from the 3B NET*log*™ memory, the "Device Set-up" tab is used for setting the measurement parameters and mode of measurement for the 3B NET*log*™ device and the "Update firmware" tab is for updating the firmware of 3B NET*log*™, see description in chapter 11.

Read Data

Read: reads all data available in the memory of the device and presents an overview of the measurements in a list.

Abort: aborts the reading operation.

Status: displays the current status.

Time elapsed: shows the time that has elapsed since the beginning of the read operation.

Time remaining: shows the approximate time remaining for the read operation.

Options: the following settings can be made here:

Decimal separator: sets the decimal separator which is used in exported files.

Date/Time format: specifies the time and date format which is used in exported measurement files.

List (left): shows the acquired data.

List (right): additional selection of columns which can be added to the exported files.

Index: serial number, beginning with 1.

Absolute date/time: date and time when the measurement/set of measurements was recorded.

Relative time [s]: elapsed time in seconds, from the beginning of the measurement to the recording of the current measurement/set of measurements.

Save selected data to files: converts the measurements selected in the left-hand list into text files (separated by tab characters). A file name is requested for each measurement. The preset file names include date, time, measurement values and sampling rate and can be adopted without any changes.

Quit exits the program.

Device Set-up

Vdc/Vac/(Idc/Iac): selects the measuring mode for the aforementioned analogue input (Vdc: DC voltage/Vac: AC voltage/Idc: DC current/Iac: AC current).

Range slider (200mV-20V/200mA-2A): selects the measurement range for the above-mentioned analogue input.

Auto Range: if this control box is activated, the measuring range is automatically adjusted by the device during the measurement.

Store: determines whether data from the aforementioned input should be stored.

Sampling rate slider: this sets the sampling rate for the measurements. Frequency is displayed in the field f=, and the corresponding cycle duration is displayed in the field T=.

Apply settings: writes the selected settings to the device.

Clear memory: clears the entire memory of the instrument.

Quit: exits the program.

10.4 Reading and saving measurement data

Reading and saving measured data with the 3B NET*log*™ equipment:

- Connect the 3B NET*log*™ equipment to a computer via USB cable.
- Start 3BNET*data* and click on the tab "Read Data".
- Press **Read** and wait till the progress bar reaches 100%.
- Select the measurements you wish to be saved from the list on the left.
- Select columns that are to be written next to the data.
- Click **Save selected data to files.**
- Enter a file name for each measurement, or accept the default name.
- For further processing of the saved data, use spreadsheet or data analysis programs.

11. Update Firmware

- In the 3B NET*data* software, click "Update firmware" tab.
- Follow the instructions in the left-hand section of the software window and click "*Start*" in the options box.

The current version of the firmware will now be installed automatically. As an alternative, use "Browse" in the options' box to search and install older firmware versions.

12. Format of exported files

Exported files have the following format (the words shown here between the delimiters <> are simply placeholders for actual data. Entries are separated by tab characters. Depending on the settings, some columns may be omitted):

<Date> <Time>, <Inputs/Measurement modes>, <Sampling rate>, <Number of measurement records>

Index (tab) Absolute date/time (tab) Relative time (tab) <Quantity at analogue input A>[<Unit for analogue input A>] (tab) <Quantity at analogue input B>[<Unit for analogue input B>] (tab) Dig A (tab) Dig B (tab) Dig C (tab) Dig D(return)

1(tab)<Absolute date/time of the first measurement record>(tab)<Relative time of the first measurement record>(tab)<Value 1 of analogue input A>(tab)<Value 1 of analogue input B>(tab)<Value 1 of digital input C>(tab)<Value 1 of digital input D>(return)

2(tab)<Absolute(s) Date/Time of the second measurement data set >(tab)<Relative time of the second measurement data set>(tab)<Value 2 of analogue input A>(tab)<Value 2 of analogue input B>(tab)<Value 2 of digital input C>(tab)<Value 2 of digital input D>(return)

etc.

13. Faults and possible remedies

Fault	Cause	Remedy
The 3B NET-*log*™ device cannot be switched on when operating with batteries	The batteries are worn out.	Replace with new batteries or use the power supply unit.
When the "Test" button in the 3B NET*lab*™ software is activated, the "Connected" message does not appear.	The 3B NET-*log*™ device is not switched on. There is no connection between the computer and the 3B NET*log*™ equipment.	Switch on the 3B NET*log*™ device. Check the connection between the computer and 3B NET*log*™ device. Press "Test" again and, if necessary, refresh by pressing F5.

14. Support

If you have any queries and/or suggestions, please feel free to contact our support team:

Email: support@3bnetlog.com
Internet: http://www.3bnetlog.com/

15. The CE marking

3B NET*log*™ conforms to the requirements of these EU specifications

EN 61010-1:   Protoype-tested

EN 61326-1:   Tested for noise immunity and interference

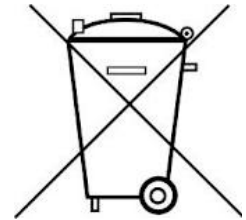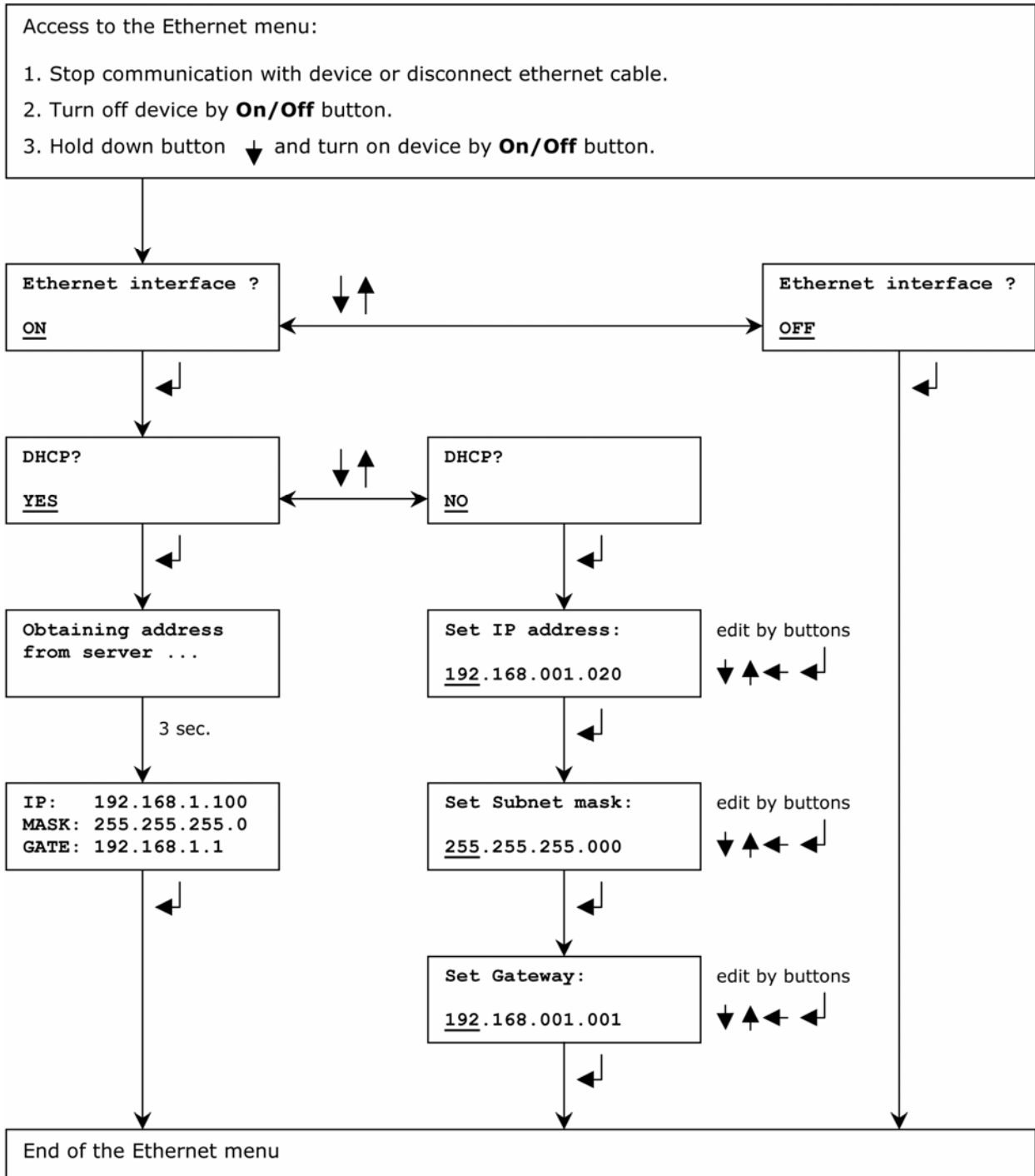Conformity with EU guidelines is indicated by the CE marking on the device.

16. Licence

3B Net*log*™ and 3B Net*lab*™ are registered trademarks of 3B Scientific GmbH in Germany and other countries.

The 3B Net*lab*™ computer program is protected by worldwide copyright. It may be used exclusively for educational purposes in schools and educational institutions, including preparatory purposes at home. The fabrication of copies, unauthorised application or unauthorised sale is strictly prohibited.

17. Care, maintenance, disposal

- Before cleaning the equipment, disconnect it from its power supply.
- Use a soft, damp cloth to clean it.
- The packaging should be disposed of at local recycling points.
- Should you need to dispose of the equipment itself, never throw it away in normal domestic waste. Local regulations for the disposal of electrical equipment will apply.
- Do not dispose of the batteries in the regular household garbage. Follow the local regulations (In Germany: BattG; EU: 2006/66/EG).

Access to the Ethernet menu:

1. Stop communication with device or disconnect ethernet cable.

2. Turn off device by **On/Off** button.

3. Hold down button ↓ and turn on device by **On/Off** button.

```
Ethernet interface ?

ON
```
↓↑
```
Ethernet interface ?

OFF
```
↵

↵

```
DHCP?

YES
```
↓↑
```
DHCP?

NO
```
↵

↵

```
Obtaining address
from server ...
```

```
Set IP address:

192.168.001.020
```
edit by buttons

↓▲← ↵

3 sec.

↵

```
IP:   192.168.1.100
MASK: 255.255.255.0
GATE: 192.168.1.1
```

```
Set Subnet mask:

255.255.255.000
```
edit by buttons

↓▲← ↵

↵

↵

```
Set Gateway:

192.168.001.001
```
edit by buttons

↓▲← ↵

↵

End of the Ethernet menu

ETHERNET DEFAULT SETTINGS

1. Stop communication with device or disconnect ethernet cable.

2. Remove any battery from device.

3. Hold down buttons ▲ and ↵ then insert battery back.