LAUTERBACH
DEVELOPMENT TOOLS

Operating Manual

Part Number	Part
LA-3050	MicroTrace Hardware V1
LA-3503	PowerDebug E40
LA-3507	PowerDebug X51

MANUAL

Operating Manual

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Operating Manual

Version 15-Dec-2025

History

19-Nov-2025 Update product list

18-Nov-2025 Integration into the TRACE32 help system

1. Introduction

1.1 Intended Use of the Product

The TRACE32® In-Circuit Debugger is used for development, analysis, and debugging in embedded microprocessor systems. The TRACE32® In-Circuit Debugger is a modular system that users can assemble themselves depending on the desired range of functions, performance, and processor architecture to be analyzed (ARM, RISC-V, TriCore, etc.). Details are explained in Chapter **"3. Product Description"**, page 8.

1.2 User Group

The TRACE32® In-Circuit Debugger is intended exclusively for use by qualified personnel in professional development and test environments.

1.3 Manufacturer Name and Address

The manufacturer of the TRACE32® In-Circuit Debugger is

Lauterbach GmbH
Altlaufstrasse 40
85635 Hoehenkirchen-Siegertsbrunn
Germany

https://www.lauterbach.com

1.4 Contact for Technical Support

Lauterbach Support Center

https://support.lauterbach.com

In addition to answers to frequently asked questions, instructional videos, technical articles, and tips & tricks, you will also find country-specific contact details (time zone, language). For Germany, these are:

support@lauterbach.com

+49 (0)8102 9876-555

2. Notes on Use

The TRACE32® In-Circuit Debugger may only be used in accordance with the instructions below. Improper or inappropriate use may cause damage to the Lauterbach product or the device being analyzed (hereinafter referred to as the “target system”) and may impair operation.

2.1 General

All users must be informed about the risks involved in handling electronic assemblies and devices.

2.2 Electrical Environment

- Handling and use may only take place in an environment protected against electrostatic discharge.
- To prevent damage to the contacts and uncontrolled electrical discharge, touching open electrical contacts should generally be avoided.
- Changes to the connections may only be made when the power is off.
- The device is not protected against incorrect connections. Ensure that the pin assignment and voltage ranges between the TRACE32® In-Circuit Debugger and the target system are correct.
- Only use the power supply unit supplied.
- Before commissioning, all components of the setup must be checked for integrity. Do not put the device into operation if it is damaged.
- The housing of the TRACE32® In-Circuit Debugger must not be opened. For any type of repair, the device must be sent to the Lauterbach Service Center.
- The TRACE32® In-Circuit Debugger emits electromagnetic radiation during operation. Therefore, sufficient distance should be maintained from radio-sensitive equipment. If interference occurs, the distance must be increased.

2.3 Climatic Environment

- The device may only be used in dry and clean indoor areas. Dust can reduce the effectiveness of cooling systems (e.g., fans).
- Operation is only permitted at an ambient temperature of 10-40 °C. In “PCIe Trace” operating mode, a PowerTrace Serial (LA-3120, LA-3121, and LA-3122) may only be used at an ambient temperature of up to 30°C.
- Operation is only permitted at a relative humidity of 30-70%, non-condensing.

- The device may only be operated at altitudes up to 2000 m above sea level.
- Condensation or high humidity in combination with dust can lead to short circuits or damage. After transport in cold environments, the device must acclimatize before operation.
- The device heats up during operation. The device must not be covered, as this may impair its function. Conditions that could lead to heat accumulation in the device are not permitted.
- In the event of unusual heating, the device must be disconnected from the power supply immediately and Lauterbach Support must be contacted.

2.4 Requirements for Operation

- The device may only be operated by qualified personnel.
- The device must not be left unattended for long periods during operation.

3. Product Description

The TRACE32® In-Circuit Debugger consists of several hardware modules that users can assemble themselves depending on the desired range of functions.

3.1 Type Label

A type label with the **part number** is located on the bottom or on the packaging of each module. The part number has the format “LA-XXXX,” where XXXX is four decimal digits.

The type label may also contain a **serial number**. It begins with the letter “C” or “E”, followed by 11 decimal digits. The first four digits encode the date of manufacture (year-year-month-month), followed by a seven-digit sequential number that uniquely identifies the product.

3.2 Examples of Possible Modules and their Identification

There is a **complete system** of the TRACE32® In-Circuit Debugger:

Part Number	Part	Host Interface
LA-3050	MicroTrace Hardware V1	USB
LA-4513	MIPI20T-HS Whisker for CombiProbe/MicroTrace	

Optionally, a **probe for recording digital and analog signals** can also be connected to the µTrace®:

Part Number	Part
LA-2500	Mixed-Signal Probe CombiProbe2/MicroTrace/PT

All other TRACE32® In-Circuit Debuggers consist of several modules. One of the following **debug base modules** is always included:

Part Number	Part	Host Interface
LA-3503	PowerDebug E40	USB
LA-3507	PowerDebug X51	USB /Ethernet

A suitable **power supply unit** from a third-party supplier is included with each debug base module. The power supply unit is connected to the debug base module (“POWER” connector) and supplies power to the modules of the TRACE32® In-Circuit Debugger.

The debug base module is connected to the controlling host PC (personal computer or laptop) using the **USB cable** supplied. The USB cable must be plugged into the “USB” connector on the debug base module. Debug base modules with an Ethernet host interface (see table above) can alternatively be connected to the host PC via the Ethernet network. The “ETHERNET” connector on the debug base module is used for this purpose. An **Ethernet cable** is not included in the scope of delivery.

The connection to the target system to be tested is made using a separately available connection part, the so-called **debug probe** or **whisker**. On the base module, the connector is labeled “DEBUG CABLE.” The target system must have a suitable debug connector.

Part Number	Part
LA-3000	IDC20A Debug Probe V5
LA-3011	AUTO26 Debug Probe V3
LA-3719	Debugger for RH850/V850 (ICD)
...	For further parts, see Chapter 10.1

Part Number	Part
LA-3060 + LA-4513	CombiProbe Hardware V2 + MIPI20T-HS Whisker for CombiProbe/MicroTrace
LA-3060 + LA-4505	CombiProbe Hardware V2 + MIPI34 Whisker for CombiProbe/MicroTrace
LA-3060 + LA-4553	CombiProbe Hardware + AUTO26 Whisker for CombiProbe
LA-3060 + LA-4571	CombiProbe Hardware V2 + MIPI60-Cv2 Whisker for CombiProbe
LA-3060 + LA-4515	CombiProbe Hardware V2 + DCI OOB Whisker for CombiProbe
LA-3060 + ...	For further parts, see Chapter 10.2

Optionally, a **probe for recording digital and analog signals** or a second, identical whisker of type MIPI20T-HS, MIPI34, or AUTO26 can be connected to the CombiProbe 2.

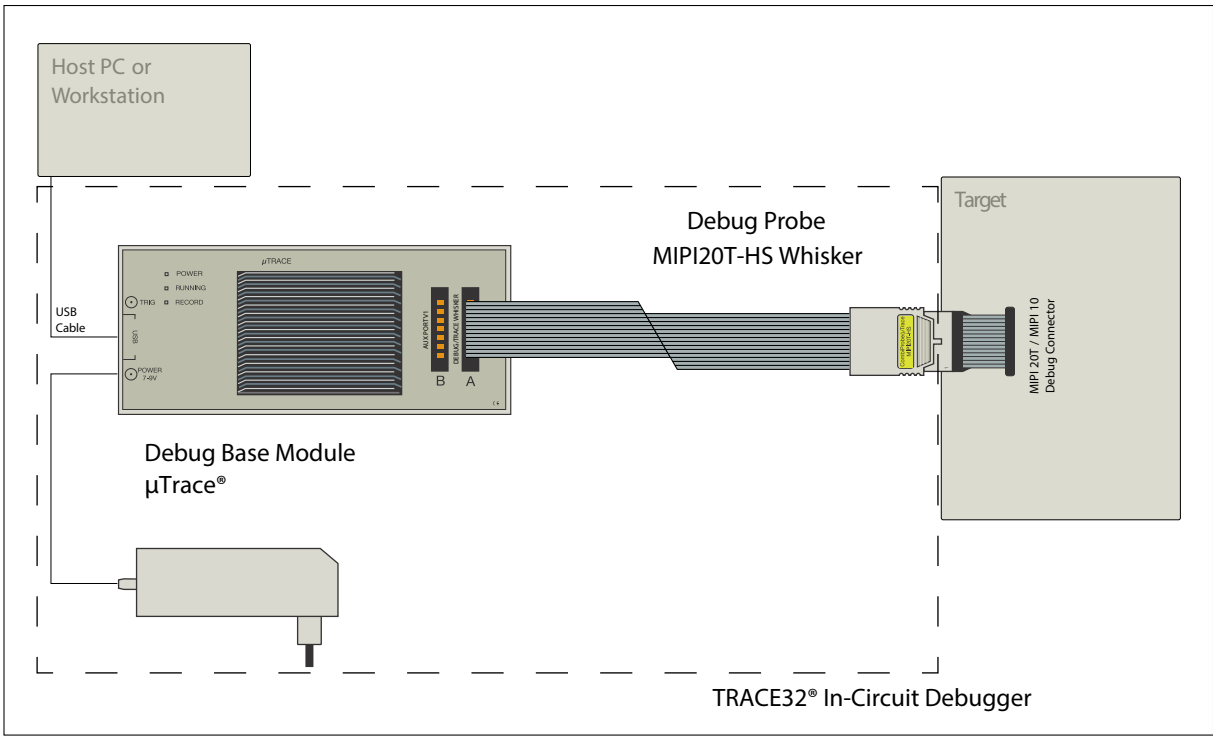
Part Number	Part
LA-2500	Mixed-Signal Probe CombiProbe2/MicroTrace/PT

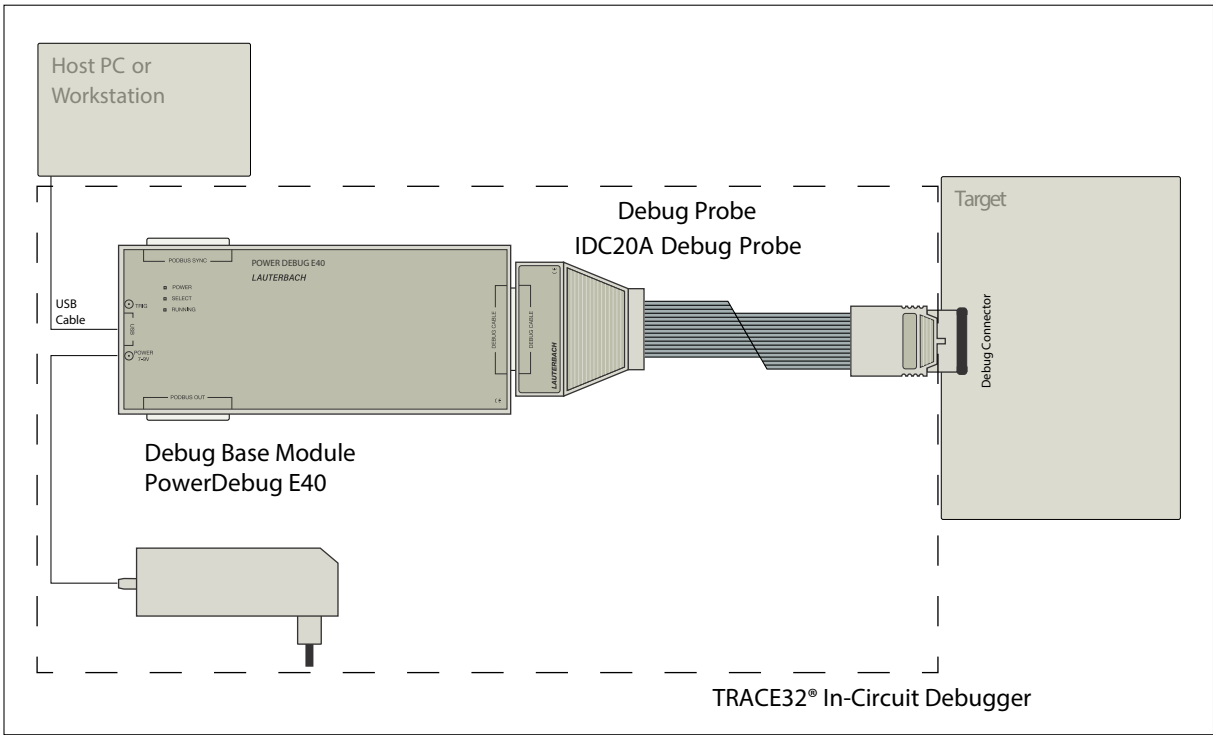
To use the TRACE32® In-Circuit Debugger, the TRACE32® PowerView operating software must first be installed on the host PC. This software is used to control the TRACE32® In-Circuit Debugger. The operating software is suitable for all hardware and architecture variants. It is included on the installation DVD that comes with every debug probe. Alternatively, it can also be downloaded from the Lauterbach homepage.

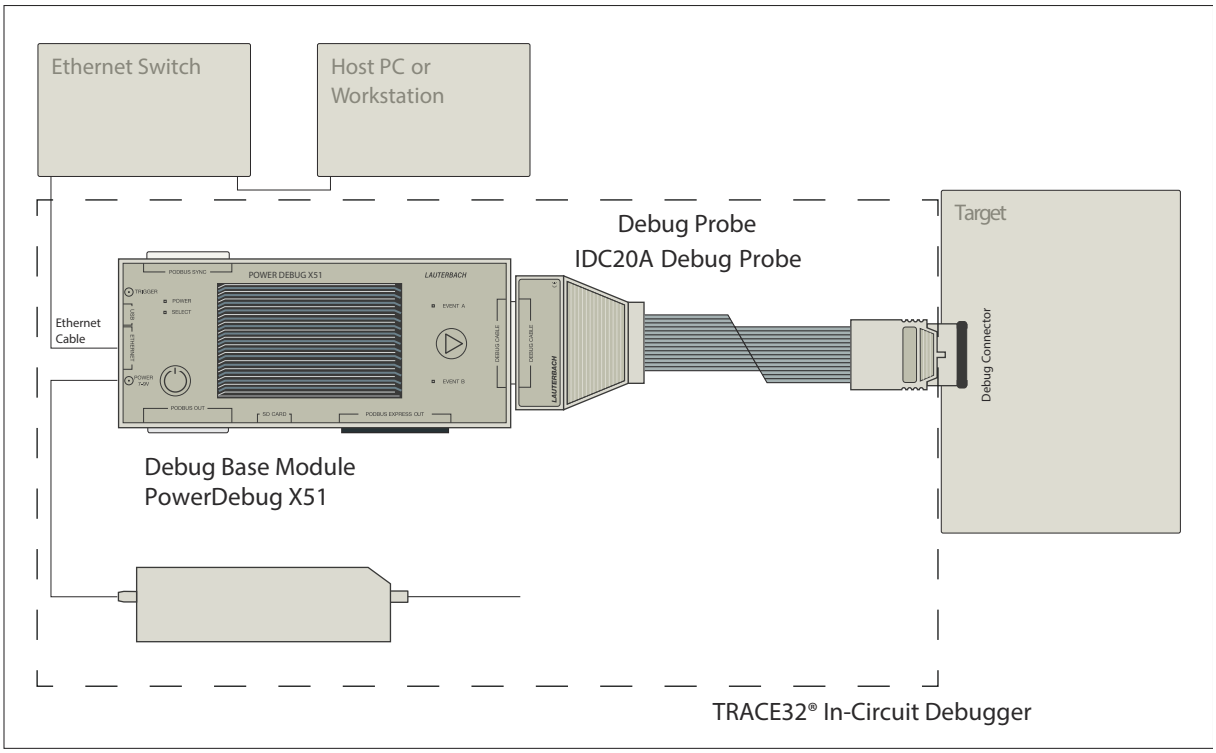
The licenses required for the architecture to be analyzed and/or the desired functionality are usually stored on the hardware modules. Alternatively, there is a license model based on a license server.

The TRACE32® In-Circuit Debugger can only be put into operation as a complete system, as described below, although the individual components can also be ordered separately.

Three possible complete systems are shown graphically below:







To obtain additional off-chip trace functionality, the “PowerDebug X51” debug base module can be supplemented by connecting a **trace extension** to the “PODBUS EXPRESS” connector and a trace probe. These extensions can be classified technologically as parallel or serial.

Parallel trace extensions:

Part Number	Part
LA-3581	PowerTrace II LITE 1GB
LA-7693	PowerTrace II 2 GigaByte
LA-2520/LA-2521	PowerTrace III 8 / 4 GigaByte

These trace extensions are used together with **trace probes** with the following names:

Part Number	Part
LA-3100	AutoFocus II Hardware V2
LA-3160	AutoFocus II MIPI Hardware
LA-7630	NEXUS Debug/Trace for Qorivva MPC5xxx/SPC5xxx
LA-3140	Serial Preprocessor Hardware V2
...	For further parts, see Chapter 10.5

Optionally, a **probe for recording digital and analog signals** can also be connected to the PowerTrace III:

Part Number	Part
LA-2500	Mixed-Signal Probe CombiProbe2/MicroTrace/PT

Serial trace extensions:

Part Number	Part
LA-3121/LA-3122	PowerTrace Serial V2 with 4 / 8 GByte Memory

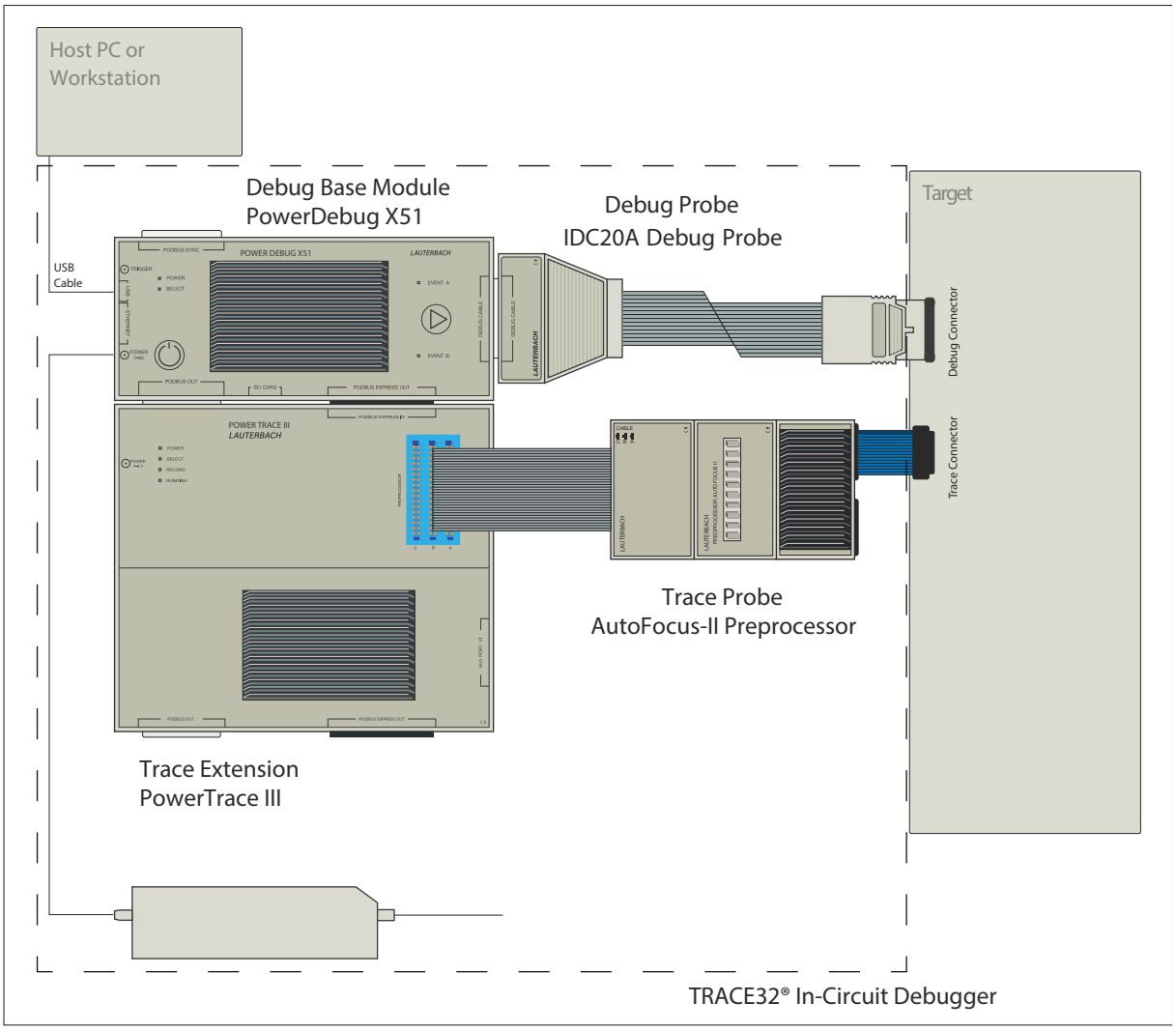
The serial **trace probes** with the following designation are suitable for this purpose:

Part Number	Part
LA-3945	Aurora 2 Preprocessor for PowerTrace Serial
LA-3556	AGBT Trace Adapter for PowerTrace Serial
LA-3561	RH850-34pin Debug&Trace Adapter for PT Serial
LA-3585	HSDP Adapter for PowerTrace Serial
LA-3590	OCuLink Trace Adapter for PowerTrace Serial
LA-3524/LA-3525/LA-3527	PTSERIAL-PCIe-Gen3 x4 / x8 / x1 Slot-Card-Adapter
LA-3529	PCIe Gen 4 Preprocessor for PowerTrace Serial
LA-3596	HSTCU Trace Adapter for PowerTrace Serial
LA-3562	RH850-40pin Trace Adapter for PT Serial
LA-3599	Universal Trace Adapter for PowerTrace Serial

Optionally, a **probe for recording digital and analog signals** can also be connected to the PowerTrace Serial 2.

Part Number	Part
LA-2500	Mixed-Signal Probe CombiProbe2/MicroTrace/PT

Below is a graphical representation of a possible complete system with trace extension:



Details on the required connector type and pin assignment on the target system can be found on the Lauterbach website **https://www.lauterbach.com** in the description of the corresponding debug or trace probe. The available adapters/converters that convert to a different connector type or pinout are also listed there, if this is required for the target system.

3.3 Scope of Delivery

The TRACE32® In-Circuit Debugger consists of one or more modules, which can also be ordered and delivered separately. The possible type variants of the modules and their designation can be found in the description in the previous section. Typically, the following accessories are included in the scope of delivery of the modules:

Debug base module:

- Power supply with country-specific power plug
- USB cable
- Plug, suitable for the trigger socket
- For µTrace® additionally: MIPI20T-HS Whisker

Debug probe:

- DVD with TRACE32® PowerView operating software
- In some cases, together with suitable connection cables or adapters/converters
- For CombiProbe 2 additionally: Whisker

Trace extension:

- Some models come with suitable connection cables or adapters/converters

Trace probe:

- Some models come with suitable connection cables or adapters/converters

3.4 Technical Data

- Power supply: 8.0V / 8.1A for the PowerDebug X51, otherwise 7.5V / 2.2A
- USB 3.0/2.0 host interface
- Ethernet host interface: 2.5/1.0/0.1 Gbit Ethernet for PowerDebug X51
- The supported debug protocols (e.g., JTAG, SWD, DAP) depend on the connected debug probe.
- The supported trace protocols (e.g., ETM, Nexus, N-Trace, MCDS) depend on the module used.
- The supported voltage ranges on the target system depend on the connected debug probe, whisker, or trace probe. The exact values can be obtained from the Lauterbach Support Center mentioned above.
- Debug clock frequency: 10 kHz to 160 MHz (depending on the target system and debug probe or whisker)
- Trace frequency (parallel): up to 300 MHz, lane speed (serial): 0.625-22.5 Gbps
- Trace port width: Parallel: up to 32 bits, Serial: up to 8 lanes
- Supported architectures: ARM, RISC-V, TriCore, etc.
- Status light-emitting diodes (LEDs) for displaying voltage and operating status
- Bidirectional trigger connector: Output 4.4 V / Input 3.3 V (5 V tolerant)

4. Intended Use

The TRACE32® In-Circuit Debugger is intended exclusively for use by qualified personnel in professional development and test environments for electronic devices, e.g., in technical development departments. It is designed for the development, testing, and debugging of embedded systems in conjunction with a computer. The instructions in Chapter **“2. Notes on Use”**, page 6, must be observed.

All devices with an Ethernet interface (e.g., LA-3507 “PowerDebug X51”) may only be used in computer networks that have been secured against unauthorized access by appropriate measures.

5. Commissioning

Before commissioning for the first time, a few basic steps must be carried out to ensure the safe and functional operation of the TRACE32® In-Circuit Debugger. The following instructions describe the recommended procedure for installation, configuration, and establishing a connection.

5.1 Requirements

- Host:
  - Operating systems: Windows 7/8/10/11, Linux, or macOS 10.13 and newer
  - USB connector, preferably USB 3.0
  - Optional: LAN/Ethernet, preferably 2.5 Gbit
  - At least 16 GB RAM, 32 GB recommended
  - Available hard disk space 16 GB
- Installation of the USB driver for Windows requires administrator rights.
- Installed TRACE32® PowerView software
- TRACE32® In-Circuit Debugger configured as a complete system (see Chapter **"3. Product Description"**, page 8)
- Target system with available debug and, if necessary, trace interface

5.2 Software Installation

The debug probe comes with a DVD containing the installation software. Alternatively, the software can be downloaded from the Lauterbach website at **https://www.lauterbach.com**.

The installation software is suitable for all TRACE32® In-Circuit Debugger configurations and processor architectures. Further information can be found in the **"TRACE32 Installation Guide"** (installation.pdf) on the DVD or on the Lauterbach website.

5.3 Hardware Installation

To prevent damage to the product and the target system due to electrostatic discharge, appropriate protection measures must be taken during installation.

The modules of the TRACE32® In-Circuit Debugger must be connected as described in Chapter **"3. Product Description"**, page 8. The debug base module is connected to the host PC via the supplied USB cable or via Ethernet. The connection to the target system is then established via the debug probe or

whisker and, if applicable, the trace probe. Ensure that the connectors are oriented correctly and that the pin assignments are correct. This information can be found in the description of the respective probe or whisker on the Lauterbach website. The target voltage must be within the permissible range of the probe or whisker.

6. Operation

6.1 Starting a Debug Session

The following steps can only be performed once commissioning has been successfully completed (see Chapter **"5. Commissioning"**, page 16). The steps listed below must be performed in the order specified.

1. Power up the TRACE32® In-Circuit Debugger either by pressing the switch on the power supply unit or by plugging the power supply unit into the power outlet. The PowerDebug X51 debug base module also has a power button on the top of the device.

   On all base modules, the red "POWER" LED indicates that the device is switched on. The "SELECT" LED flashes steadily.

2. Start the TRACE32® PowerView software on the host PC. Depending on the installation, PowerView immediately establishes a connection to the debug base module. If PowerView displays the "TRACE32 PowerView Connection Configuration" dialog, you can use this dialog to establish a connection to the debug base module.

   The "SELECT" LED stops flashing and lights up red continuously.

3. Power up the target system.

4. Configure the TRACE32® In-Circuit Debugger for the target system and the desired functionality using the PowerView software. The necessary steps can also be found in the **"TRACE32 Installation Guide"** (installation.pdf) on the DVD or on the Lauterbach website.

6.2 Working with the TRACE32® In-Circuit Debugger

The TRACE32® In-Circuit Debugger is used for software development, analysis, and debugging and is usually configured and controlled via the TRACE32® PowerView software.

The relevant debugger manuals and tutorials are located on the enclosed DVD and in the TRACE32® installation directory of the host PC in the "pdf" sub-folder. For a quicker start, we recommend using the ready-made demo scripts in the "demo" sub-folder.

6.3 Light-Emitting Diode (LED) Indicators

Depending on the device, the debug base module and trace extension of the TRACE32® In-Circuit Debugger have a selection of the following LEDs for status indication, which have the following meanings during operation:

- The POWER LED lights up red when power is supplied and the device is switched on. If it flashes purple, the device has detected an insufficient power supply.

- The SELECT LED flashes slowly (1 Hz) when there is no connection to the host PC. It lights up continuously when a connection is established. It flashes an error code (see **"TRACE32 Installation Guide"** (installation.pdf) if the device detects an error during the self-test. On a PowerDebug X51, the SELECT LED lights up blue continuously if the device was booted from the SD card.
- The RUNNING LED indicates processor activity on the target system.
- The RECORD LED lights up when the device is recording trace data.

6.4 Ending a Debug Session and Disconnecting

At the end of a debug session, follow these steps:

1. Disconnect the target system from the power supply.
2. Exit the TRACE32® PowerView software.
3. Disconnect the TRACE32® In-Circuit Debugger from the power supply, either by pressing the switch on the power supply unit or by unplugging the power supply unit from the power outlet. Alternatively, a PowerDebug X51 debug base module can be switched off directly using a button on the top of the device. Wait at least 20 seconds before switching it back on.
4. The debug and trace probe or whisker can now be disconnected from the target system.

7. Maintenance and Care

7.1 Visual Inspection

The TRACE32® In-Circuit Debugger is largely maintenance-free. Nevertheless, it is recommended to regularly check all connection cables and the housing for damage. Damaged parts must be replaced with original parts. The following maintenance measures should be carried out to ensure trouble-free operation and extend the service life of the device.

7.2 Cleaning

- Appropriate protective measures must be taken during all cleaning work to prevent possible damage to the device due to electrostatic discharge.
- If the device becomes dirty, it can be cleaned with a dry, lint-free cloth when it is switched off.
- Liquids, solvents, or compressed air must not be used.
- Contacts and connectors can be cleaned with a suitable brush if they are visibly dirty.

7.3 Storage

When not in use, the device should be stored in its original packaging or in an antistatic protective cover. The storage environment should be dry, dust-free, and temperature-stable. Direct sunlight should be avoided. The storage temperature must be between 10 and 40 °C and the relative humidity between 30 and 70%, non-condensing.

8. Troubleshooting

In the event of malfunctions or unexpected behavior of the TRACE32® In-Circuit Debugger, the following troubleshooting guide can help you isolate and resolve the problem. Many problems can be solved by performing simple checks and taking simple measures.

8.1 Typical Errors and Causes

The TRACE32® In-Circuit Debugger is not recognized by the host PC:

Cause	Measure
USB driver not installed	Install driver
Missing USB or Ethernet connection	Establish connection
Defective USB or Ethernet cable	Replace cable
Problematic USB connector on the front of a host PC	Use a different connector, preferably one on the rear panel of the host PC.
The TRACE32® In-Circuit Debugger is not supplied with power	Supply power using the included power supply unit

The TRACE32® PowerView software cannot establish a connection to the target system:

Cause	Measure
Incorrect pin assignment	Use a suitable adapter/converter
Damaged connection cable	Replace cable
Insufficient or unstable power supply to the target system	Use an appropriate power supply

Faulty debug behavior/crashes:

Cause	Measure
The target system has an insufficient power supply.	Use a suitable power supply
Signal problems with the debug interface, for example due to stub lines	Revise interface
Interference with other connected devices	Increase shielding or distances
JTAG/SWD frequency set too high	Set lower frequency
Debug base module is not supplied with original power supply	Use the supplied power adapter

Interference with radio receivers/radio equipment (e.g., radio or television receivers) in the vicinity:

Cause	Measure
Too close to the radio receiver/radio system	Increase distance to radio receiver/radio system

Further errors and their causes can be found in the document **"TRACE32 Installation Guide"** (installation.pdf) on the enclosed DVD and in the TRACE32® installation directory in the sub-folder "pdf".

8.2 Contacting Support

If the problem persists despite all measures taken, please contact technical support as described in Chapter **"1. Introduction"**, page 5. When contacting support, you will need the serial numbers printed on the modules.

9. Disposal and Recycling

The crossed-out wheelie bin symbol on electrical and electronic equipment indicates that it must not be disposed of in household waste or normal waste. Instead, equipment sold by Lauterbach must be returned in accordance with the procedure described on the Lauterbach website. This ensures that they are recycled or disposed of in an environmentally friendly manner (see information sheet on the take-back concept: **https://www.lauterbach.com/about-us/compliance**).

To reset the devices to factory settings, please contact technical support (see **“1.4 Contact for Technical Support”**, page 5).

10. Accessories

10.1 Debug Probes

LA-2703, LA-2704, LA-2706, LA-2715, LA-2719, LA-2751, LA-2755, LA-2757, LA-3000, LA-3010, LA-3011, LA-3060, LA-3712, LA-3713, LA-3714, LA-3715, LA-3719, LA-3730, LA-3732, LA-3733, LA-3735, LA-3745, LA-3746, LA-3747, LA-3748, LA-3756, LA-3757, LA-3774, LA-3779, LA-3786, LA-3793, LA-3794, LA-3795, LA-3796, LA-3798, LA-3844, LA-4570, LA-4607, LA-7661, LA-7710, LA-7712, LA-7719, LA-7721, LA-7722, LA-7723, LA-7729, LA-7733, LA-7734, LA-7735, LA-7738, LA-7739, LA-7744, LA-7745, LA-7752, LA-7755, LA-7758, LA-7759, LA-7760, LA-7761, LA-7766, LA-7774, LA-7817, LA-7833, LA-7835, LA-7837, LA-7842, LA-7848, LA-7863

10.2 Whisker

LA-4400, LA-4403, LA-4505, LA-4508, LA-4513, LA-4515, LA-4553, LA-4571, LA-4611

10.3 Other Extensions

LA-2500, LA-3502, LA-3888, LA-3889, LA-3940, LA-3941, LA-3942, LA-4405, LA-4406, LA-7492, LA-7494, LA-7691, LA-7940, LA-7944, LA-7945, LA-7947, LA-7949

10.4 Trace Extensions

LA-2520, LA-2521, LA-3121, LA-3122, LA-3581, LA-7693

10.5 Trace Probes for PowerTrace II/III

LA-3140, LA-3160, LA-3759, LA-3801, LA-3900, LA-3901, LA-3902, LA-3905, LA-3907, LA-3917, LA-3918, LA-3943, LA-7620, LA-7630, LA-7791, LA-7898

10.6 Trace Probes for PowerTrace Serial

LA-3524, LA-3525, LA-3527, LA-3529, LA-3556, LA-3561, LA-3562, LA-3585, LA-3590, LA-3596, LA-3599, LA-3945

10.7 Adapter/Converter

LA-3945, LA-2740, LA-2785, LA-3770, LA-3771, LA-3780, LA-3809, LA-3842, LA-3850, LA-3855, LA-3858, LA-3890, LA-4608, LA-4609, LA-4617, LA-4618, LA-4619, LA-7482, LA-7505, LA-7507, LA-7508, LA-7922