LANGER
EMV-Technik

# IC TEST SYSTEM

User Manual

## P202 / P302 L-EFT set

Direct EFT Pulse Injection



## Table of contents: Page

# 1 Declaration of Conformity

Manufacturer:

Langer EMV-Technik GmbH
Nöthnitzer Hang 31
01728 Bannewitz
Germany

Langer EMV-Technik GmbH hereby affirms, that the product specified below

**P202 / P302 L-EFT set**, Pulse Injection Langer Pulses 1.5/5 ns and 1.5/20 ns

with **P202**, **P302** and **BPS 202**

agrees with the regulations of EC guidelines:

- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- Restriction of certain Hazardous Substances 2011/65/EU

Applied standards and technical specifications:

- EN 61000-6-1:2007-10 (EMC)
- EN 61000-6-3:2011-09 (EMC)
- EN 61010-1:2011-07 (Safety)
- DIN EN 50581:2013-02 (Restriction of hazardous substances)

Person authorized to compile the technical file:

Gunter Langer

Bannewitz, 2019-05-01

Signature:

_____
G. Langer, Executive Director

# 2 General Information

## 1.1 Storing the user manual

This user manual provides the basis for the safe and efficient use of the P202 / P302 L-EFT set. It must be kept with the scanner at all times so that it is easily accessible for the user.

## 1.2 Reading and understanding the user manual

The user must have read and understood the user manual before using the product. Please contact Langer EMV-Technik GmbH if you have any queries and remarks.

## 1.3 Local safety and accident prevention regulations

The local safety and accident prevention regulations must be observed.

## 1.4 Figures and diagrams

The figures and diagrams in this user manual help the user understand the system, but they may also differ slightly from the actual design.

## 1.5 Limitations of liability

Langer EMV-Technik GmbH can assume no liability for damage to property and personal injury if

- The instructions given in this user manual have been ignored.
- The product was used by persons who are not qualified in the field of EMC and are not fit to work under the influence of disturbance voltages and electromagnetic ESD fields.
- The product was not used for its intended purpose.
- The product was subjected to unauthorised modifications or technical changes.
- Spare parts or accessories were used that had not been approved by Langer EMV-Technik GmbH.

## 1.6 Errors and omissions

The information in this user manual has been checked very carefully and found to be correct to the best of our knowledge; however, Langer EMV-Technik GmbH can assume no responsibility for spelling, typographical or proofreading errors.

## 1.7 Copyright

# 3 Scope of delivery

| Item | Designation | Type | Qty. |
|---|---|---|---|
| 1 | Pulse current generator Langer Pulse 1.5/5 ns | P202 L-EFT | 1 |
| 2 | Pulse voltage generator 500 V Langer Pulse 1.5/20 ns | P302 L-EFT | 1 |
| 3 | Burst power station | BPS 202 | 1 |
| 4 | Control cable, Fischer-Fischer | SK FI-FI 7P 1 m | 1 |
| 5 | USB cable type A-B | USB-AB | 1 |
| 6 | Power supply | 12 V / 1 A | 1 |
| 7 | Software | BSP 202-Client, DLL | 1 |
| 8 | User manual | | 1 |
| 9 | Case | | 1 |

**Important:** The scope of delivery may deviate depending on the respective order.

# 4 Technical Parameters

## 4.1 **P202**

| | |
|---|---|
| **Internal resistance** | ≈ 1 Ω |
| **Coupling capacity** | 1.2 µF |
| **Pulse parameter** | |
| Shape | 1.5 / 5 ns |
| Frequency | 0.1 Hz – 10 kHz |
| Voltage | ± (0.4 - 40) V |
| **Inductance** | ≈ 2 nH |
| **Sizes (L x W x H)** | (78 x 35 x 31) mm |

Table 1: Technical parameters P202

## 4.2 **P302**

| | |
|---|---|
| **Internal resistance** | ≈ 150 Ω |
| **Coupling capacity** | 20 pF |
| **Pulse parameter** | |
| Shape | 1.5 / 20 ns |
| Frequency | 0.1 Hz – 10 kHz |
| Voltage | ± (5 - 500) V |
| **Inductance** | 50 nH |
| **Sizes (L x W x H)** | (78 x 35 x 31) mm |

Table 2: Technical parameters P302

## 4.3 **BPS 202**

| | |
|---|---|
| **Output voltage** | ± (5 ... 500) V |
| **External trigger input** | TTL / BNC |
| **Trigger-pulse delay (bypass mode – delay line)** | |
| Min. trigger-pulse delay (typ.) | 30 ns |
| Max. jitter (typ.) | ± 1 ns |
| **Trigger-pulse delay (timer mode)** | |
| Min. trigger-pulse delay (typ.) | 130 ns |
| Max. trigger-pulse delay (typ.) | 100 ms |
| Max. jitter (typ.) | ± 15 ns |
| Trigger delay, min. increment | 10 ns |
| **Supply voltage** | 12 V / 1 A DC |
| **Weight** | 300 g |
| **Sizes (L x W x H)** | (175 x 122 x 51) mm |
| **Software** | BPS 202-Client / DLL (32 Bit / 64 Bit) |

Table 3: Technical parameters BPS 202

## 4.4 **BPS 202-Client**

| | |
|---|---|
| **Operating System** | Win XP SP3 or higher |

Table 4: Technical parameters BPS 202-Client

## 4.5 **Operating Requirements**

| | |
|---|---|
| **Temperature range** | 10 – 30°C |
| **Max. humidity** | 85% |

Table 5: Environment

# 5 Safety

## 5.1 Labels and Signs

| | | |
|---|---|---|
|  |  |  |
| General warning sign | Warning; Electricity | Prohibition sign; No access for people with active implanted cardiac devices. |

Table 6: Safety signs

Safety instructions in this user manual are marked by symbols (Table 6). Observe the safety precautions and act cautiously to avoid accidents as well as personal and material damages.

## 5.2 Intended Use

The P202/P302 set is used to determine the pulse immunity of ICs. The devices and accessories in this set may only be used in accordance with the details given in this user manual.

The pulse generators are built according to their specified use therefore they should be used only for the following purposes:

- Injection of pulses into IC pins or balls with P202 or P302 powered by BPS 202.
- Control of the P202 and P302 via BPS 202-Client or DLL.
- The P202 / P302 set must be used in conjunction with the ICE1 set from Langer EMV-Technik GmbH.

Any use beyond these specifications is considered contrary to the intended use.

## 5.3 Reasonably foreseeable Misuse

It is not allowed to touch the tip of the pulse generators while they are in operation.

Warning!

**Danger resulting from misuse!**

**Misuse of the P202/P302 set can lead to dangerous situations!**

- Use of the product outside of the given specifications
- Modification or changing of the product without consent of Langer EMV-Technik GmbH
- Operating the product with a technical fault.

## 5.4 Staff Requisition

Only qualified staff with training, knowledge, and experience in the field of EMC is allowed to operate the P202 / P302 set.

Persons whose ability to perform is influenced or impaired by alcohol, drugs, or pharmaceuticals, are not allowed to operate the P202/P302 set.

Certain functions may only be carried out by qualified personnel of Langer EMV-Technik GmbH.

## 5.5 Safety Systems

Commissioning of the P202 / P302 set is only possible if it is fully assembled.

## 5.6 Safety Instructions

Warning; Electricity

**Danger resulting from Electricity!**

**Risk of injury by electrocution!**

- If insulation is damaged, the power supply has to be disconnected immediately.
- Protect live parts from moisture to avoid short circuits.

Prohibition; No access for people with active implanted cardiac devices

**Danger resulting from magnetic fields!**

**Risk of affecting a cardiac device!**

Persons with a cardiac device, such as a pacemaker, are not allowed to work on or approach the P202 / P302 set whilst it is in operation.

# 6 Design and Operating Principle

## 6.1 Overview

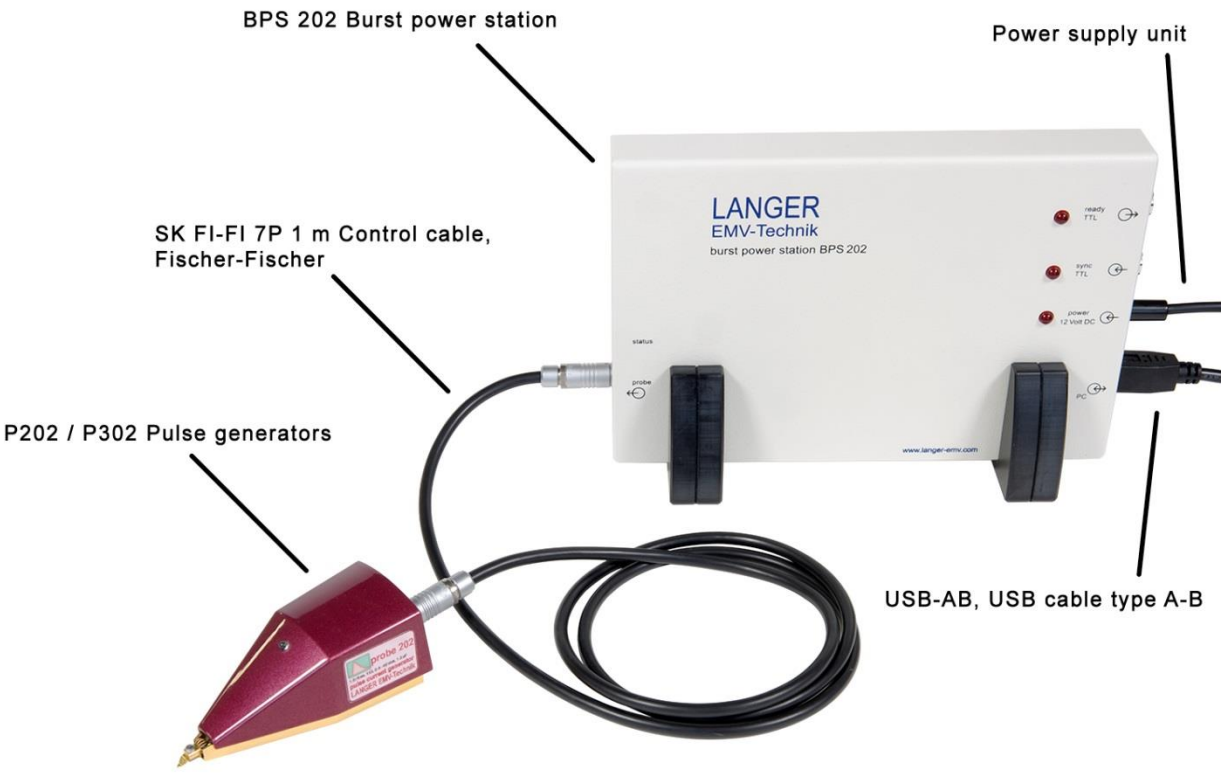



Figure 1: Overview P202/P302 set

| Name | Description |
|---|---|
| P202 | Pulse current generator |
| P302 | Pulse voltage generator |
| BPS 202 | Supplies high voltage and control signals to the pulse generators |
| SK FI-FI 7P 1 m | Connects pulse generators with the BPS 202 |
| USB-AB | Connects the BPS 202 with a PC |
| Power supply unit | 12 V / 1 A, used to power the BPS 202 |
| BPS 202-Client / DLL | PC software to control pulse generators |

Table 7: Description of P202 / P302 set

## 6.2 Additional Equipment

This additional equipment is needed to operate the P202 / P302 set.

- Windows PC
- ICE1 set[1]

[1] Product of Langer EMV-Technik GmbH

## 6.3 **Description**

The pulse generators P202 and P302 are used for pulse injection into IC pins and balls. The generators are supplied and controlled by the BPS 202 burst power station.

The P202 / P302 set has to be used in conjunction with the ICE1 set[2].

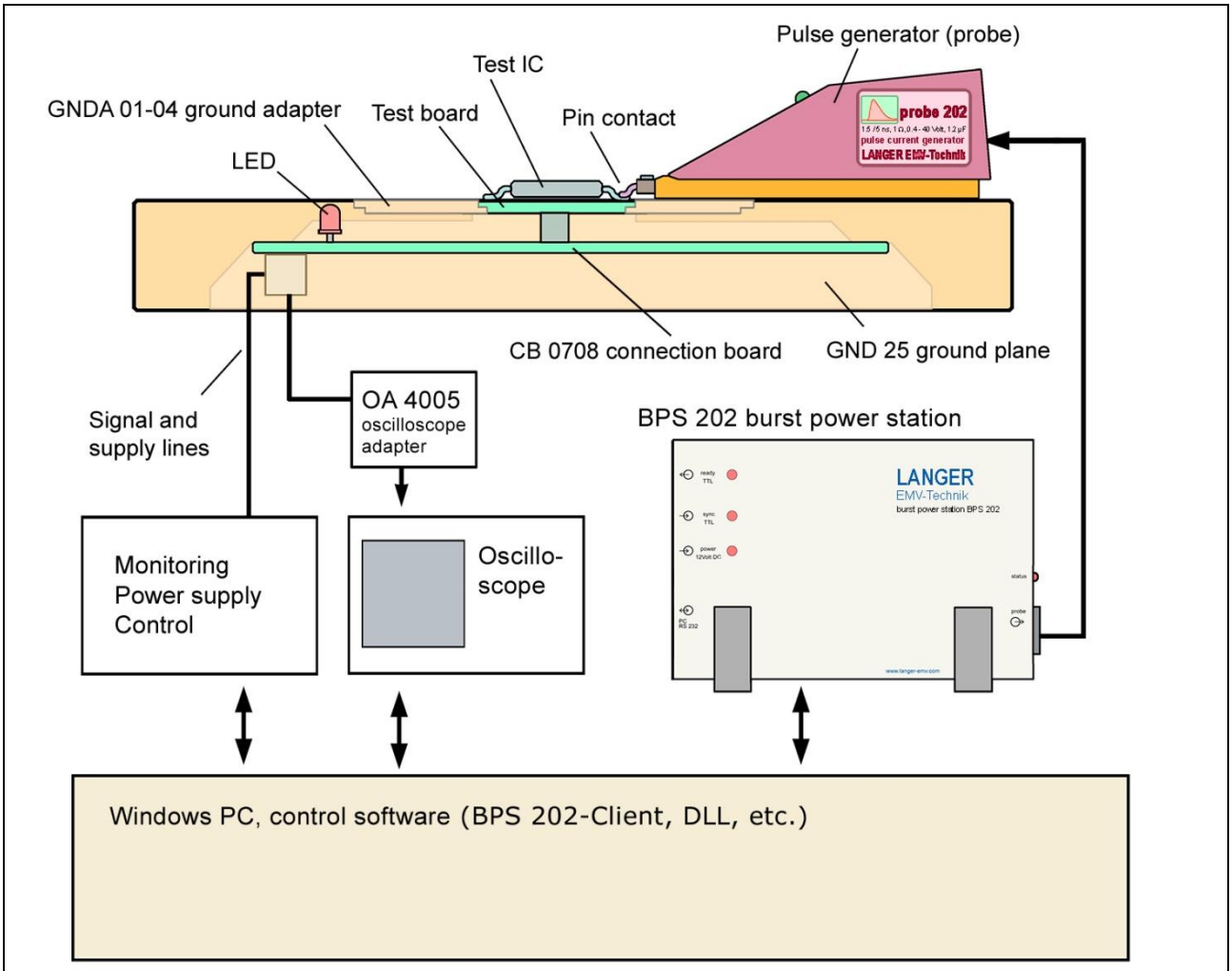



Figure 2: Schematic set-up of P202 / P302 set in combination with ICE1 set (only pulse generator and BPS 202 are included in the scope of delivery)

[2] ICE1 set is not included.

## 6.4 **BPS 202**


Figure 3: BPS 202 burst power station

The BPS 202 is used as power supply and control unit for the pulse generators. The control unit is connected to the user's Windows PC. The provided USB stick includes the BPS 202-Client software and a DLL for implementing automated systems.

The sync TTL input allows for the synchronization of the pulse generation with external events, e.g. operation sequences of ICs.

Features are:

- Adjustment of the pulse frequency and pulse voltage
- Single pulse or pulse sequence
- External triggering
- Adjustable trigger delay
- Synchronization output

### 6.4.1 Connections and LEDs of BPS 202

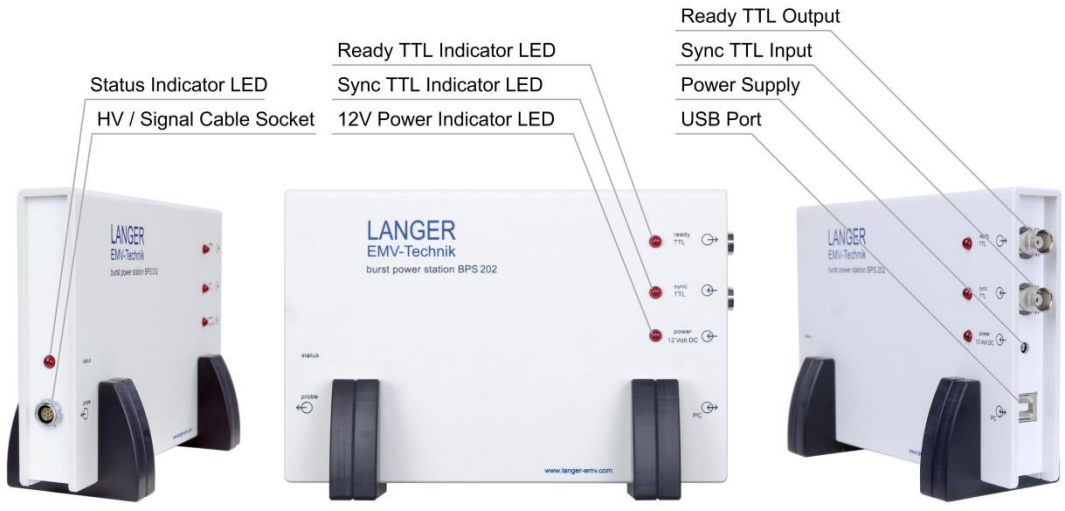



Figure 4: Designation of connections and LEDs of BPS 202

Table 8 shows all connections of the BPS 202.

| Connection | Description |
|---|---|
| Control Cable Socket | High-voltage power supply and pulse generator communication |
| Ready TTL Output / BNC | Used for external triggering, high state indicates that the BPS 202 has finished building up high voltage and is ready to start the pulse |
| Sync TTL Input / BNC | Used for external triggering, the trigger pulse is sent from an external source to the BPS 202 to start the disturbance pulse. The BPS 202 reacts on the rising or falling edge (adjustable in BPS 202-Client or DLL). |
| Power Supply | Power input for BPS 202 |
| USB-B Port | To connect BPS 202 to a PC via USB A-B cable |

Table 8: BPS 202 LEDs and Interface

Table 9 shows the states and descriptions of the LEDs of the BPS 202.

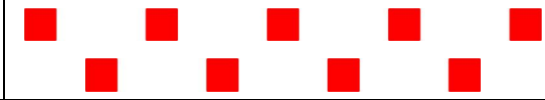
| LED | State | | Description |
|---|---|---|---|
| Status |  | 10 Hz | Fault: Probe is not connected or is incorrectly connected |
| |  | 2 Hz | Generator is ready |
| |  | 2 Hz | Pulse operation |
| Ready TTL<br>Sync TTL |  | 2 Hz | Bootloader state<br>(during firmware update) |
| Ready TTL |  | - | External trigger is ready to initiate (start pulse) |
| Sync TTL |  | - | External trigger pulse received |
| 12 V Power |  | - | BPS 202 is powered |

Table 9: BPS 202 states (Indicator LEDs)

Figure 5 shows the block diagram of the BPS 202. The internal logic is controlled by the BPS 202-Client or the DLL.

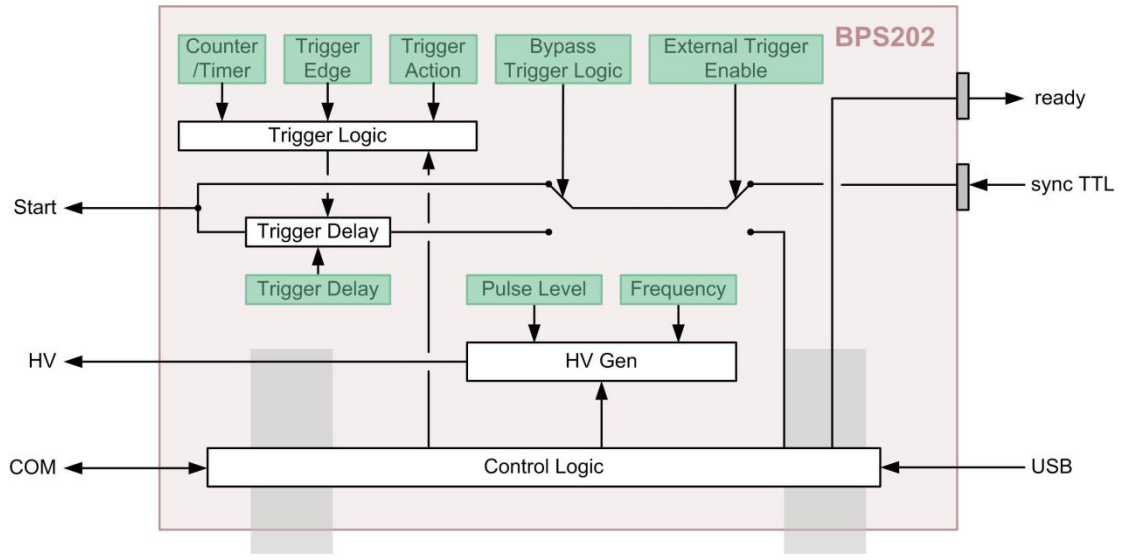



Figure 5: Block diagram of the BPS 202

## 6.5 Pulse Generators

### 6.5.1 Overview


Figure 6: Pulse generators for generating L-EFT pulses

The pulse generators inject disturbance pulses into ICs. These pulses are L-EFT pulses with a defined rise time and pulse width (see Table 1, Table 2).

A successful contact between the generator tip and an IC pin or ball can be determined with the help of the internal probe tip contact detection. This is recognizable by the state of the generator LED (Figure 7, Table 10).

The connection detection can be enabled and disabled within the BPS 202-Client or by the corresponding DLL function call.

### 6.5.2 Status and Generator LED

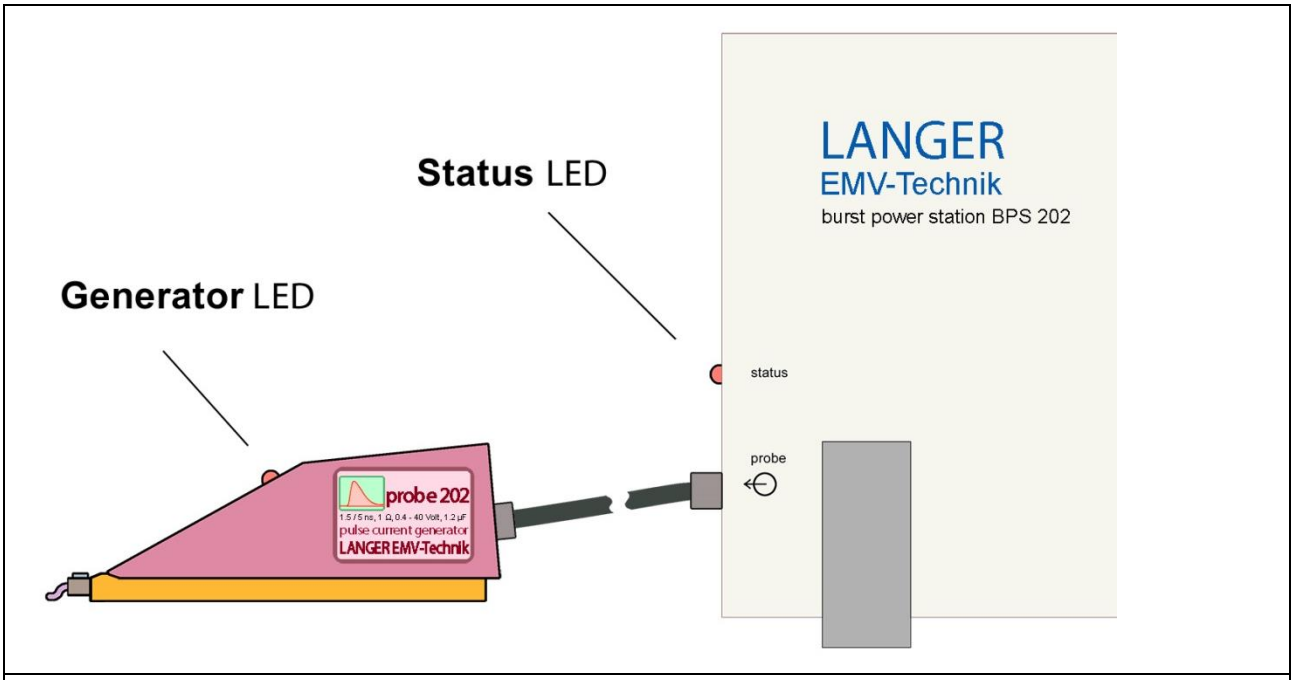



Figure 7: Pulse generator connected to BPS 202

The current operational state of the connected pulse generator is indicated by the multi-color generator LED. The possible states are listed in Table 10.

| State | | Description |
|---|---|---|
| | Strobe | System start |
| | Continuous | Generator is ready |
| | 2 Hz | Pulse operation |
| | 2 Hz | Bootloader state (during firmware update) |
| | Continuous | Detected connection at the generator tip |

Table 10: Operational states of the pulse generators LED.

### 6.5.3 P202 Pulse Current Generator

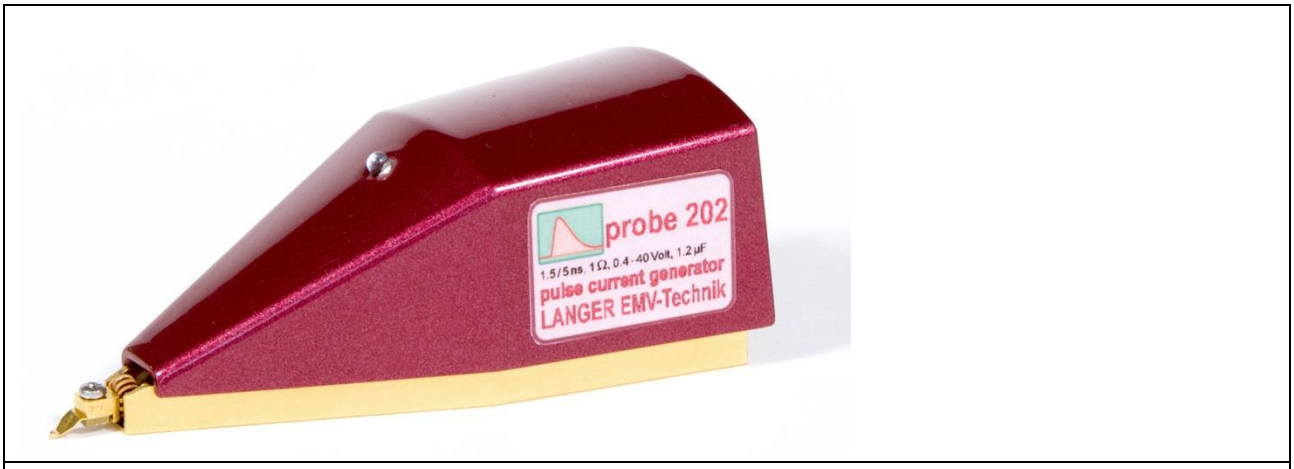



Figure 8: P202 pulse current generator

The P202 has a tip for contacting an IC pin or ball. The pulse current generator is powered with the BPS 202 via SK FI-FI 7P 1 m control cable. The control cable is plugged into the socket on the back side of the generator. The GND contact area on the bottom is magnetic and allows for quick and easy repositioning and prevents the generator from skidding on the GND 25[3] ground plane.

The P202 pulse current generator is used for the conductive coupling of disturbance pulses into test ICs. During tests according to the standards IEC 61000-4-2 / ICE 61000-4-4 reduced disturbance pulses could reach IC pins. These pulses are simulated by the P202 generator.

When a magnetic disturbance field couples into a low impedance loop connected to a pin of the test IC, a disturbance voltage will be induced. This voltage drives a disturbance current pulse into the IC pin and can lead to functional interferences. This coupling mechanism can be simulated by the low-impedance P202 pulse current generator (≈ 1 Ω). The pulse voltage is adjustable within the range of ± (0.4 - 40) V.

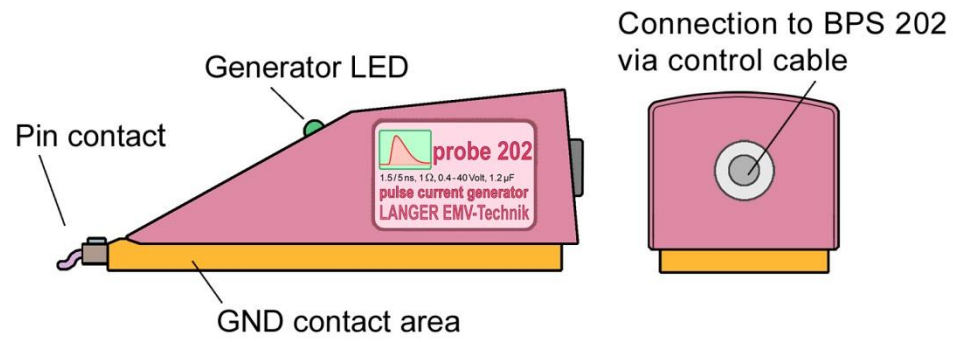



Figure 9: Schematic view from the side and back of P202

[3] GND 25 is not included in P202 / P302 set. GND 25 is Included in ICE1 set.

Figure 10 shows the equivalent circuit of the P202 pulse generator at an IC pin.

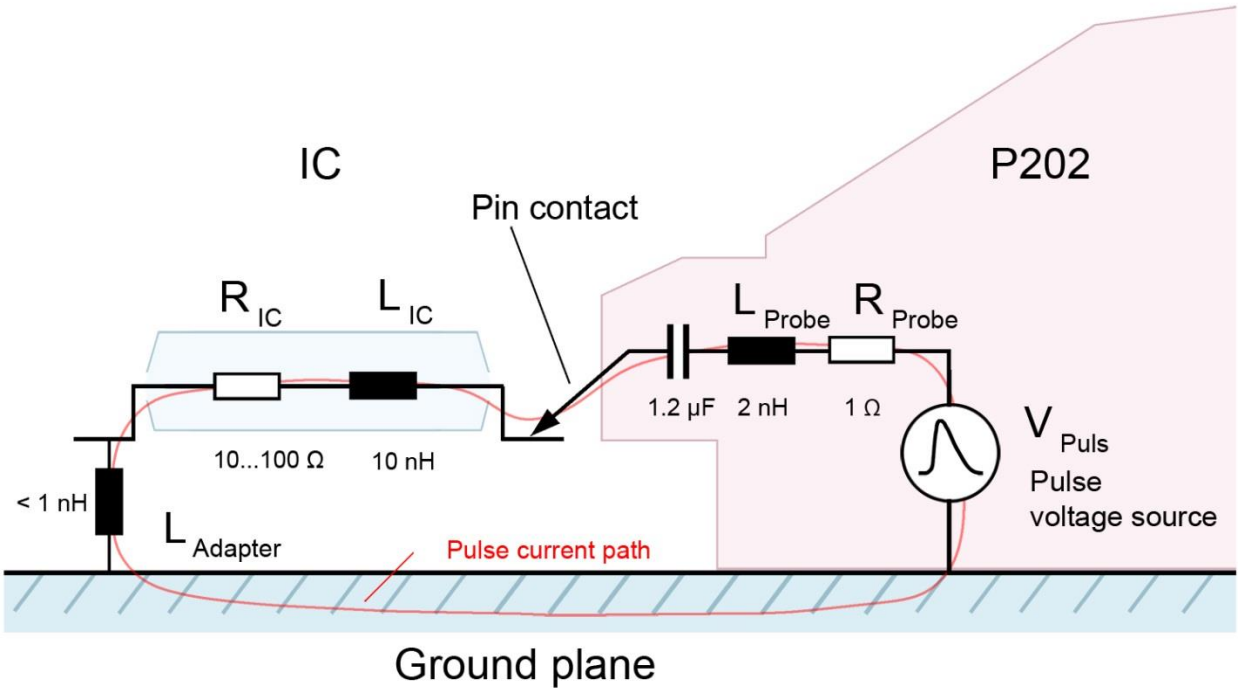



Figure 10: Equivalent circuit of P202 at an IC pin

### 6.5.4 P302 Pulse Voltage Generator


Figure 11: P302 pulse voltage generator

The P302 has a tip for contacting an IC pin or ball. The pulse voltage generator is powered with the BPS 202 via SK FI-FI 7P 1 m control cable. The control cable is plugged into the socket on the back side of the generator. The GND contact area on the bottom is magnetic and allows for quick and easy repositioning and prevents the generator from skidding on the GND 25[4] ground plane.

The P302 pulse voltage generator is used for the conductive coupling of disturbance pulses into test ICs. During tests according to the standards IEC 61000-4-2 / ICE 61000-4-4 reduced disturbance pulses could reach IC pins. These pulses are simulated by the P302 generator.

When an electrical disturbance field couples into the traces of a test IC, the disturbance voltage of the connected impedances will drop. This voltage drop occurring at the IC pins can lead to functional interferences. This coupling mechanism can be simulated by the high-impedance P302 pulse voltage generator (≈ 150 Ω). The pulse voltage is adjustable within the range of ± (5 - 500) V.

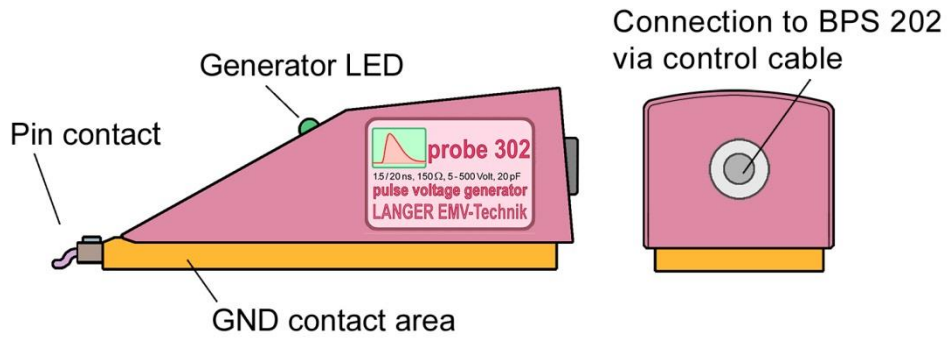



Figure 12: Schematic view from the side and back of P302

[4] GND 25 is not included in P202 / P302 set. GND 25 is Included in ICE1 set.

Figure 13 shows the equivalent circuit of the P302 pulse generator at an IC pin.

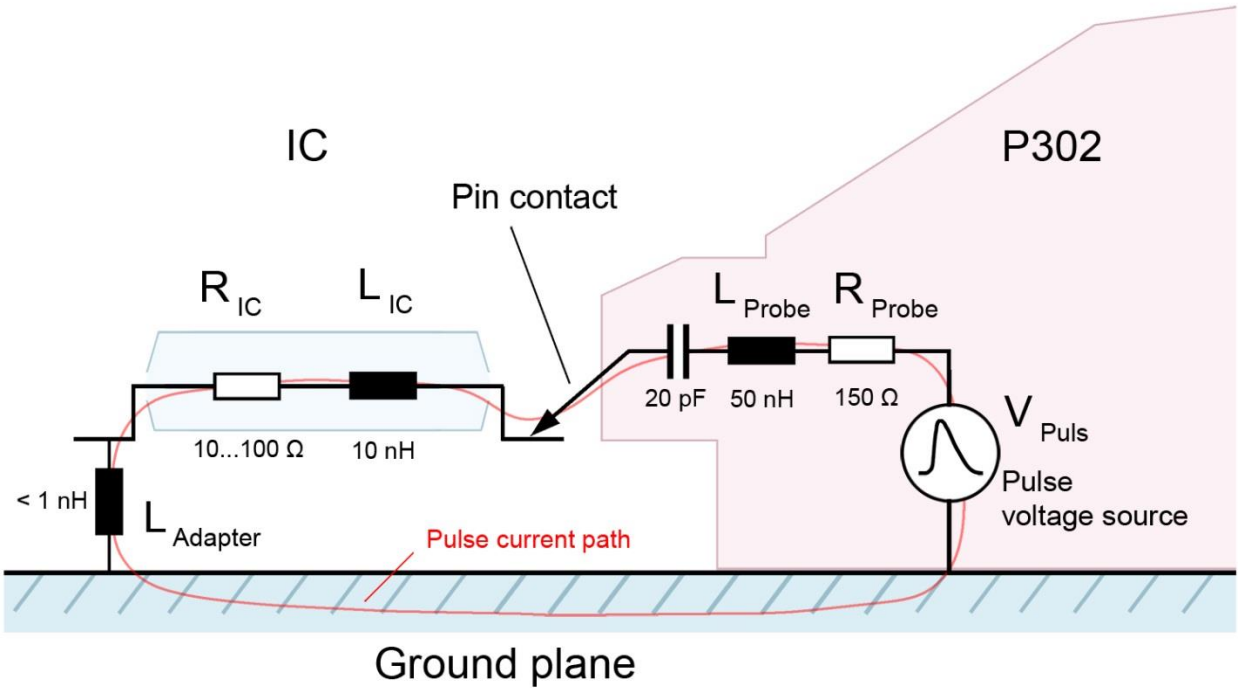



Figure 13: Equivalent circuit of P302 at an IC pin

# 7 Set-up and Commissioning

## 7.1 Description

The P202 / P302 set requires the ICE1[5] set to operate as intended.

The GND 25[6] ground plane holds the test board with the test IC. The test board is connected to the CB 0708[7] connection board or an individually constructed electronic device. The connection board or electronic device allows for monitoring and controlling of the test IC and supplying power to it.

The pulse generator has to be selected according to the specific application. The BPS 202 is connected to the pulse generator. The pulse generator is placed on the GND 25 and the contact between the generator tip and the respective pin has to be established. The functions of the generator are controlled via BPS 202-Client software.

## 7.2 Quick Start

### 7.2.1 ICE1 set

1. Install Connection Board Control software onto PC
2. Install prepared CB 0708 connection board into GND 25
3. Insert the prepared test board with the test IC into the GNDA ground adapter
4. Fasten the GNDA ground adapter to the GND 25 with the four provided screws
5. Connect power supply to CB 0708
6. Connect measurement devices to CB 0708
7. Connect CB 0708 to PC
8. Start the Connection Board Control software

### 7.2.2 P202 / P302 set

1. Install BPS 202-Client onto PC
2. Connect the pulse generator with the BPS 202 via the provided control cable
3. Connect the power supply (plugged into the socket) to the BPS 202:
   - the generator LED lights up green
   - the status LED of the BPS 202 flashes with 2 Hz
4. Connect the BPS 202 to the PC via the provided USB cable
5. Start the BPS 202-Client Software

[5] ICE1 set is not included.
[6] GND 25 is not included in the P202 / P302 set. GND 25 is included in the ICE1 set.
[7] CB 0708 is not included in the P202 / P302 set. CB 0708 is included in the ICE1 set.

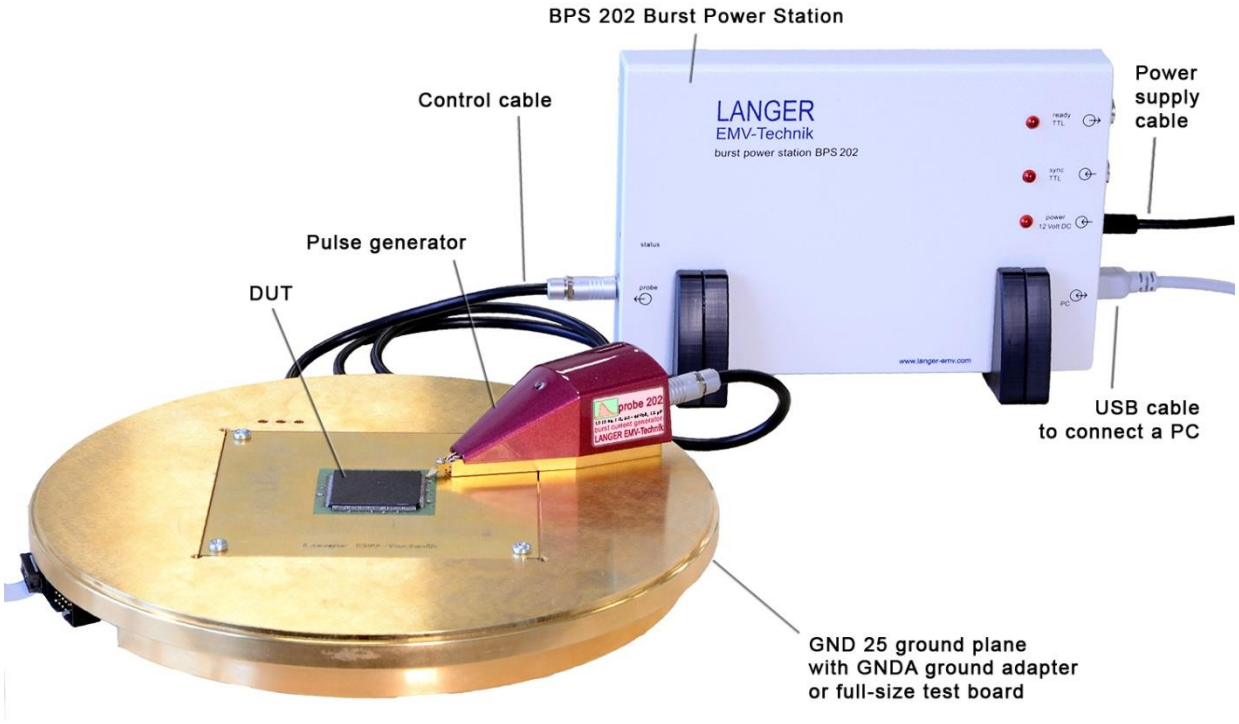



Figure 14: System set-up

# 8 BPS 202-Client Software

## 8.1 Requirements

- Windows PC with Win XP SP3 or higher
- administrator rights

## 8.2 Installation

**Important: You need administrator rights to install the device driver on the PC.**

The enclosed installation media contains:

- BPS 202-Client software and DLL
- user manual
- device driver

Instructions:

1. Double click the installer file BPS 202-Client-*.exe on the installation media.
2. Follow the instructions during the installation.
3. Proceed with the device driver installation which follows automatically.

After installing the BPS 202-client and the device driver connect the BPS 202 and pulse generator as described in Section 7.2.2.

## 8.3 General Notes

The BPS 202-Client software contains all control elements needed to operate the BPS 202 and its pulse generators in all its operating modes.

**Important: The BPS 202-Client automatically detects the connected pulse generator and displays only relevant settings and values.**

The Graphical User Interface (GUI) consists of:

- Pulse configuration
- Burst configuration *(Burst Mode only)*
- Trigger Control
- Start / Stop
- Status bar

Settings are only possible if a valid BPS 202 and a valid pulse generator are detected by the software. This is displayed in the status bar (see Section 8.11).

After launching the software, Pulse Mode is always preselected in the main dialog, see Figure 15.

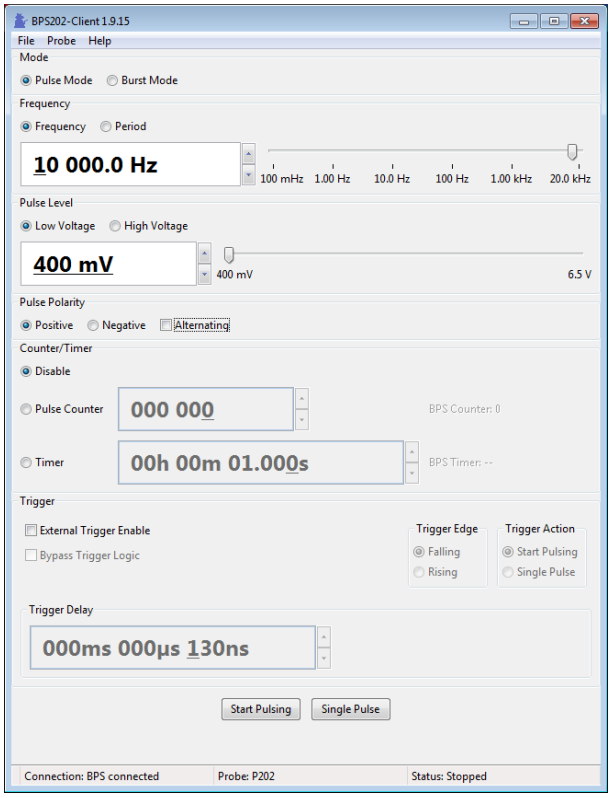



Figure 15: Main Dialog Pulse Mode

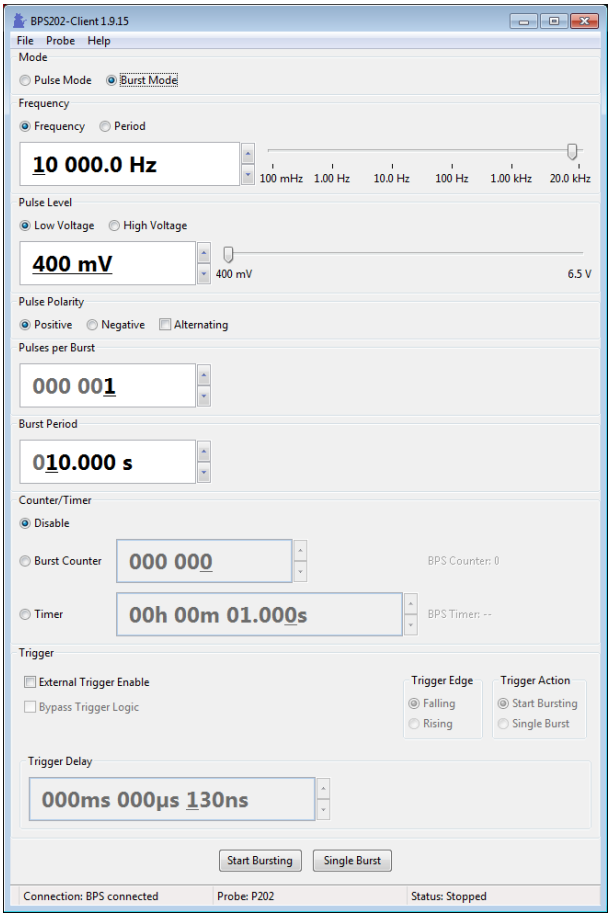



Figure 16: Main Dialog Burst Mode

## 8.4 Setting of the Operating Mode

The operating modes Pulse Mode and Burst Mode can be chosen within the Mode section by clicking the respective radio button. The main dialog changes according to the chosen mode (see Figure 15 and Figure 16).

a. Pulse Mode: creates several pulses that are equidistant in time
b. Burst Mode: creates packets of pulses that are equidistant in time

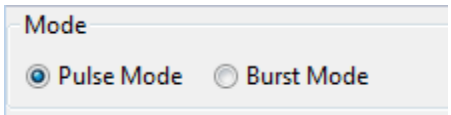



Figure 17: Operating mode options

## 8.5 Pulse Configuration

### 8.5.1 Setting of the Pulse Frequency or the Pulse Period

The Pulse Frequency can be set in the Frequency section of the GUI (Figure 18) in the range from 100 mHz to 10 kHz (depending on the used generator).

The Pulse Period can be set in a range from 50 µs to 10 s. Pulse Frequency and Pulse Period can be selected by clicking the corresponding radio button.

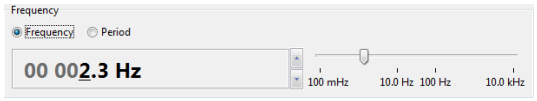



Figure 18: Setting of the Pulse Frequency

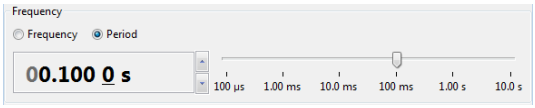



Figure 19: Setting of the Pulse Period

### 8.5.2 Setting of the Pulse Level

The voltage amplitude of the pulses can be set in the Pulse Level section of the GUI (Figure 20). The pulse level slider allows for a rough adjustment and the spin buttons allow for a fine grain adjustment. Switching between two different voltage ranges with the options Low Voltage and High Voltage is possible. The setting of the Pulse Level is possible in Pulse Mode or Burst Mode and if the BPS 202 has not been started via Start Pulsing button or Start Bursting button.

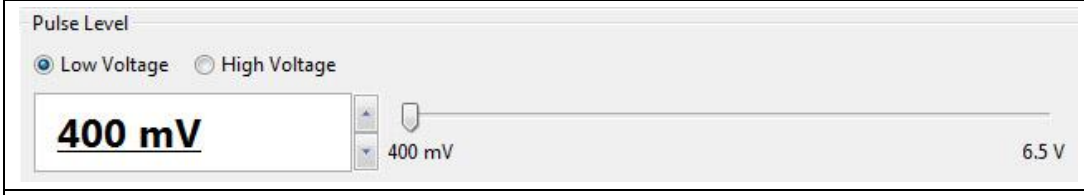



Figure 20: Setting of the Pulse Level with Low Voltage option selected


Figure 21: Setting of the Pulse Level with High Voltage option selected

## 8.6 Setting of the Pulse Polarity

The polarity of the created pulses can be set in the Pulse Polarity section of the GUI. The available options are:

- Positive (+)
- Negative (-)

**Important: Alternating of the polarity isn't available with the P202 and P302 pulse generators.**

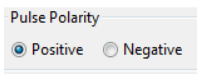



Figure 22: Setting of the Pulse Polarity

## 8.7 Burst Configuration

When the Burst Mode is chosen, the burst configuration section is displayed. In this operating mode, the Burst Period and the number of Pulses per Burst are additional parameters which have to be defined.

### 8.7.1 Setting the Number of Pulses per Burst

In the Pulses per Burst section the number of pulses per burst packet can be set (Figure 23).

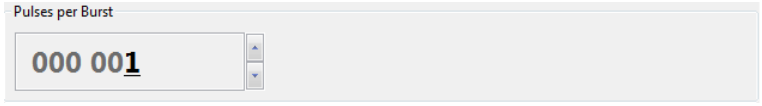



Figure 23: Setting of the number of Pulses per Burst packet

### 8.7.2 Setting of the Burst Period

In the section Burst Period the time between two consecutive burst packets can be set. The minimal value of the burst period is derived from the number of pulses in each burst packet and the value of the set pulse frequency.

$$BurstPeriod_{Min} = \frac{1}{Frequency} * Pulse\_per\_Burst \quad \text{Eq. 1}$$

$$BurstPeriod_{Min} = Period * Pulse\_per\_Burst \quad \text{Eq. 2}$$

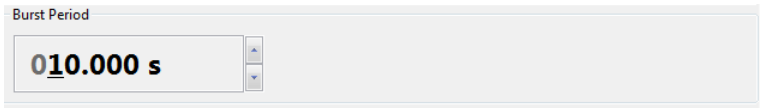



Figure 24: Burst Period is the time between two consecutive burst packets

## 8.8 Setting of a Defined Pulse Counter or Timer

In the Counter/Timer section of the GUI the Pulse Counter, Burst Counter, or the Timer can be set.

The following three options are available:

1. Disable: No counter or timer is set → Start Pulsing/Bursting leads to continuous pulses
2. Pulse Counter (Pulse Mode): Start Pulsing generates the selected number of pulses
3. Burst Counter (Burst Mode): Start Bursting generates the selected number of pulses
4. Timer: Start Pulsing/Bursting will run the selected function for the length of the timer

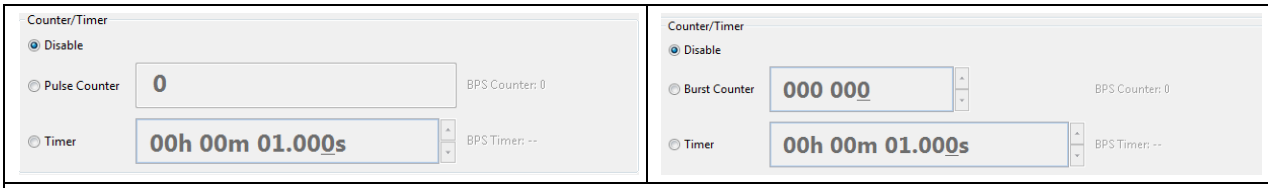



Figure 25: Setting of a defined Pulse counter, Burst Counter or a Timer

## 8.9 Setting of the External Trigger

The control of the external trigger is done in the Trigger section of the GUI.

By enabling the box External Trigger Enable, the following options will be available:

• Trigger edge:

1. Falling: Trigger activated at HIGH – LOW transition
2. Rising: Trigger activated at LOW – HIGH transition

• Trigger Action in Pulse Mode:

1. Start Pulsing: generates test pulses with the set pulse parameters
2. Single Pulse: generates one test pulse with the set pulse parameters

• Trigger action in Burst Mode:

1. Start Bursting: generates burst packets with the set burst parameters
2. Single Burst: generates one burst packet with the set burst parameters

• The Trigger Delay can be set in steps of 10 ns (see Section 10.3).

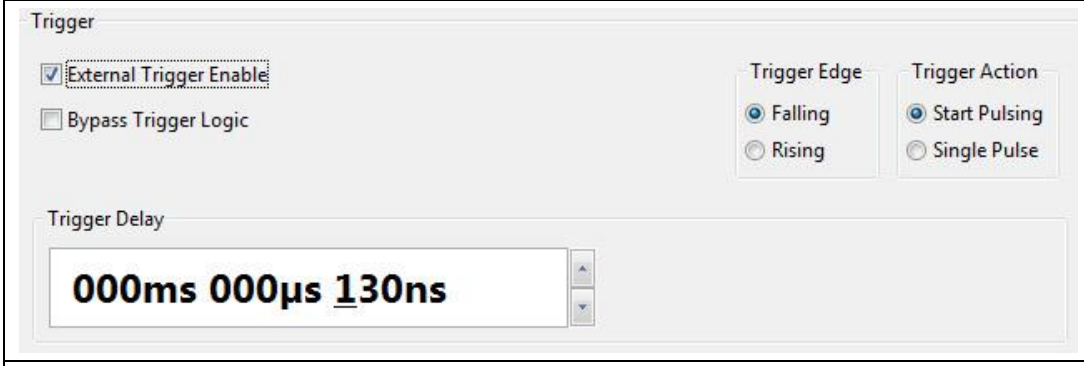



Figure 26: GUI section Trigger for operating mode pulse mode

• Bypass Trigger Logic:

1. With this option you bypass the trigger logic and the smallest trigger delay of the system is used.

## 8.10 Start Pulsing / Start Bursting

### 8.10.1 Start Pulsing / Single Pulse

Single Pulse

By pressing the Single Pulse button (Figure 27) the BPS 202 will generate a single pulse with the defined Pulse Level and Polarity. The Status LED of the BPS 202 and the Generator LED of the connected probe will blink one time, as described in Section 6.4.1.


Figure 27: Start Pulsing and Single Pulse buttons

Continuous Pulses

When the Start Pulsing button (Figure 27) is pressed, the BPS 202 will generate continuous pulses with the defined pulse parameters. Additionally the LED on the connected generator and the Status LED on the BPS 202 will blink continuously, the software's status will display "Status: running" (see Section 8.11), and the Start Pulsing button changes to Stop Pulsing. The Pulse Frequency and Voltage can be changed at any time. The continuous pulses can be stopped at any time by pressing the Stop Pulsing button.

Depending on the Counter/Timer settings, the pulses generated by the BPS 202 can be defined by time (also unlimited) or number.
The pulses or the time remaining is displayed next to the set value and is updated continuously.


Figure 28: BPS Counter in Coutner/Timer section


Figure 29: BPS Timer in Counter/Timer section

### 8.10.2 Start Bursting / Single Burst

Single Burst

By pressing the button Single Burst (Figure 30) the BPS 202 will generate a single burst packet with the defined burst parameters. Additionally, the Status LED and the Generator LED will blink as described in Section 6.5.1.

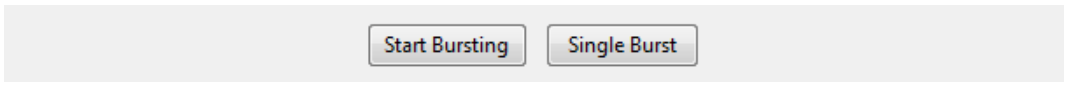



Figure 30: Start Bursting and Single Burst buttons

Continuous Burst

When the Start Bursting button (Figure 30) is pressed, the BPS 202 will generate continuous bursts with the defined burst parameters. Additionally the LED on the generator and the Status LED on the BPS 202 will blink continuously, the software's status will display "Status: running" (see Section 8.11) and the Start Bursting button changes to Stop Bursting. The burst frequency and voltage can be changed at any time. The continuously generated bursts can be stopped at any time by pressing the Stop Bursting button.

Depending on the Counter/Timer settings, the bursts generated by the BPS 202 can be defined by time (also unlimited) or number.
The bursts or the remaining time is displayed next to the set value and is updated continuously.

### 8.10.3 Externally triggered Pulses or Bursts

The generated pulses or bursts can be synchronized with an external event by activating the External Trigger Enable option. When the Start Pulsing or Start Bursting button is pressed,

- the Start Pulsing / Start Bursting button changes to Stop Pulsing or Stop Bursting respectively and will stop the generation of pulses or bursts when pressed,
- the ready TTL LED of the BPS 202 lights up,
- the BPS 202 waits for a trigger event at its sync TTL input,
- Status bar of the BPS 202-Client displays the status message “Status: Waiting for Trigger”.

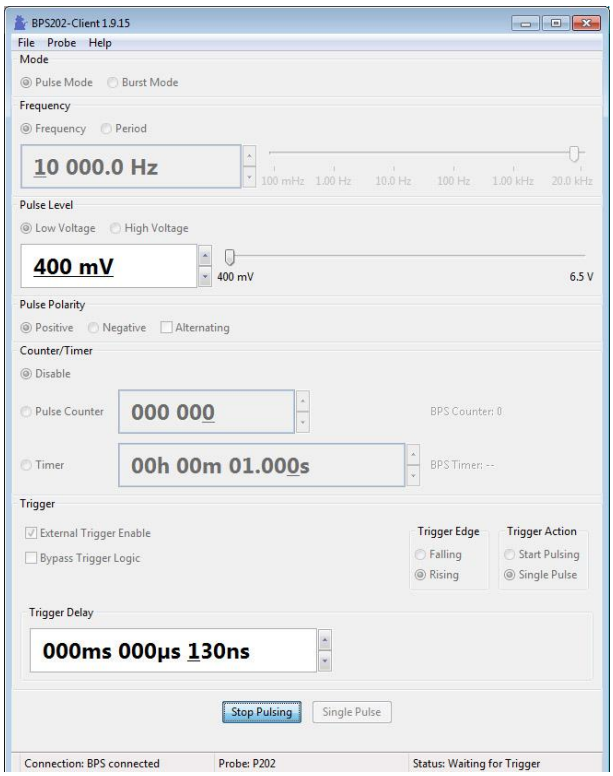



Figure 31: Trigger for **Pulse Mode**

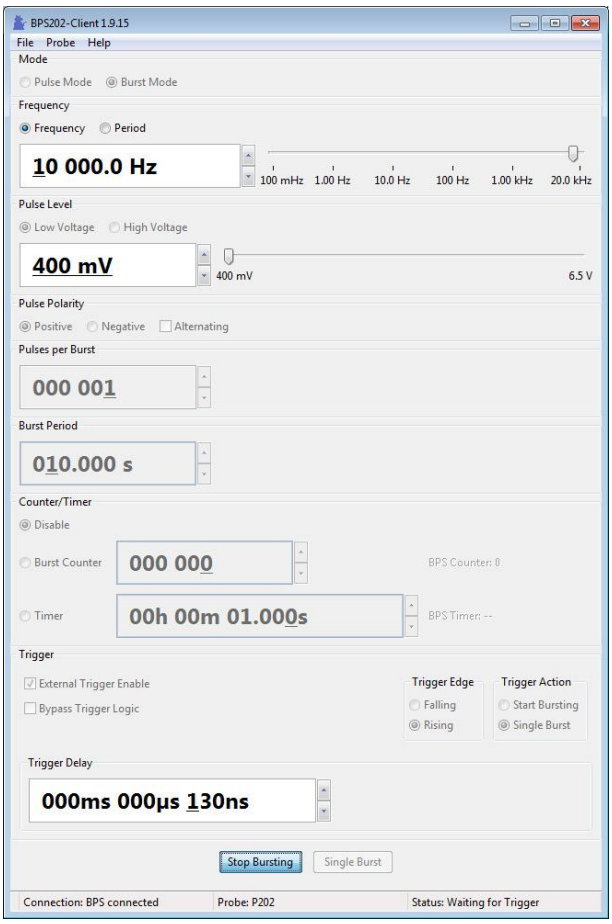



Figure 32: Trigger for **Burst Mode**

The Trigger Edge and the reaction of the BPS 202 to a trigger event can be set in the Trigger section. A trigger event recognized at the input sync TTL of the BPS 202 executes the defined Trigger Action, which is indicated by the blinking Status LED and Generator LED.

By activating the Counter and Start Pulsing options, each trigger event will prompt the defined number of pulses or bursts.

**Caution: The minimum delay relates only to the signal propagation delay in the BPS 202. The total delay varies dependent on the attached generator, pulse voltage, and polarity. (see chapter 4)**

## 8.11 Status Bar Messages

The status bar of the BPS202-Client consists of:

1. Status of the BPS 202 USB connection:
   - Connection: BPS disconnected
   - Connection: BPS connected

2. Status of the automatic generator/probe recognition:
   - No Probe detected
   - *Probe type* detected

3. Operating mode of the BPS 202:
   - Status: stopped – no generation of pulses or bursts
   - Status: running – generating pulses or bursts
   - Status: Waiting for Trigger – BPS 202 waits for an external trigger event


Figure 33: No USB connection to a BPS 202

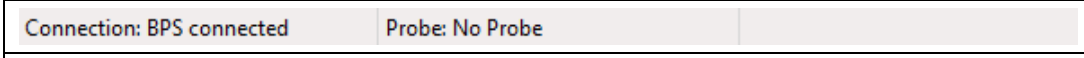



Figure 34: BPS 202 connected but no valid probe detected


Figure 35: BPS 202 connected and the P202 pulse generator is detected

## 8.12 Menus

File:

- EXIT:Shuts down the BPS202-Client


Figure 36: File menu

Probe:

- Probe Tip Contact Detection:Activation and deactivation of the contact detection function


Figure 37: Probe menu

Help:

- Hardware Info:Display hardware information about the BPS 202 and its connected generator/probe.
- About: Software information / link to https://www.langer-emv.com/
- Manual:Display User Manual
- Update BPS Firmware: Open the BPS 202 firmware update dialog
- Update Probe Firmware:Open the generator/probe firmware update dialog

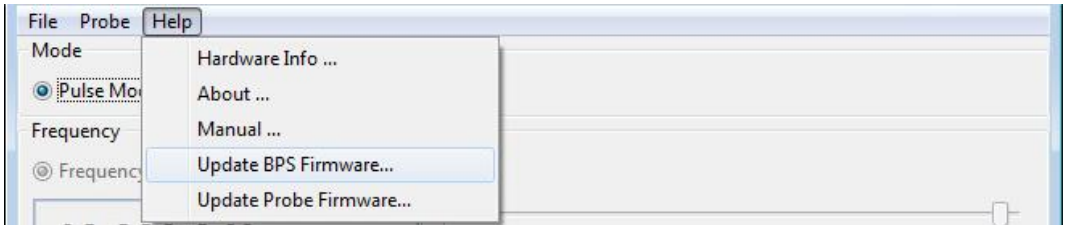



Figure 38: Help menu

# 9 DLL

The **BPS 202-Client** contains a DLL to control the **BPS 202** by function calls. Depending on your system (32bit or 64bit), the DLL file and the corresponding header file are stored at:

<installation path>\BPS202-Client_*Version*\dll_Win32 or
<installation path>\BPS202-Client_*Version*\dll_x64

**The BPS 202 remote control commands are explained in either the header file or the programming manual "BPS 202 Programming Manual.pdf".**

# 10 Operating modes overview

## 10.1 Pulse Types

The P202/P302 set can generate the following types of pulses:

- Single pulse (Figure 39)
- Continuous pulse
- Burst packets with a defined number of pulses and burst periods (Figure 40)
- Defined number of pulses or burst packets

The type of pulse sequence is set by the control software BPS 202-Client or the DLL.

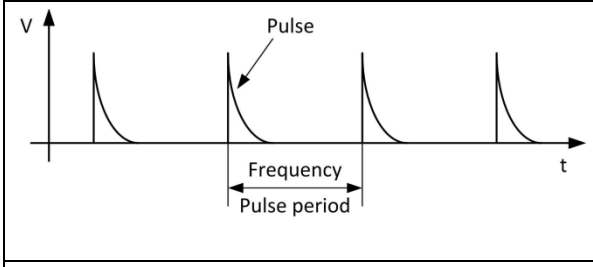



Figure 39: Single pulses

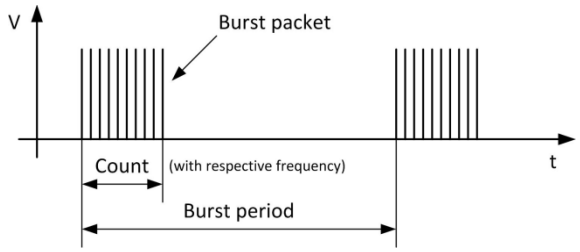



Figure 40: Burst packets

Furthermore, it is possible to synchronize the generated pulses with an external event by using the External Trigger Function.

## 10.2 Free-Running Mode (Pulses not synchronized)

In free-running mode, the pulse generation is controlled by the BPS 202-Client (see Chapter 8). The pulse generation in this mode cannot be synchronized to external trigger signals.

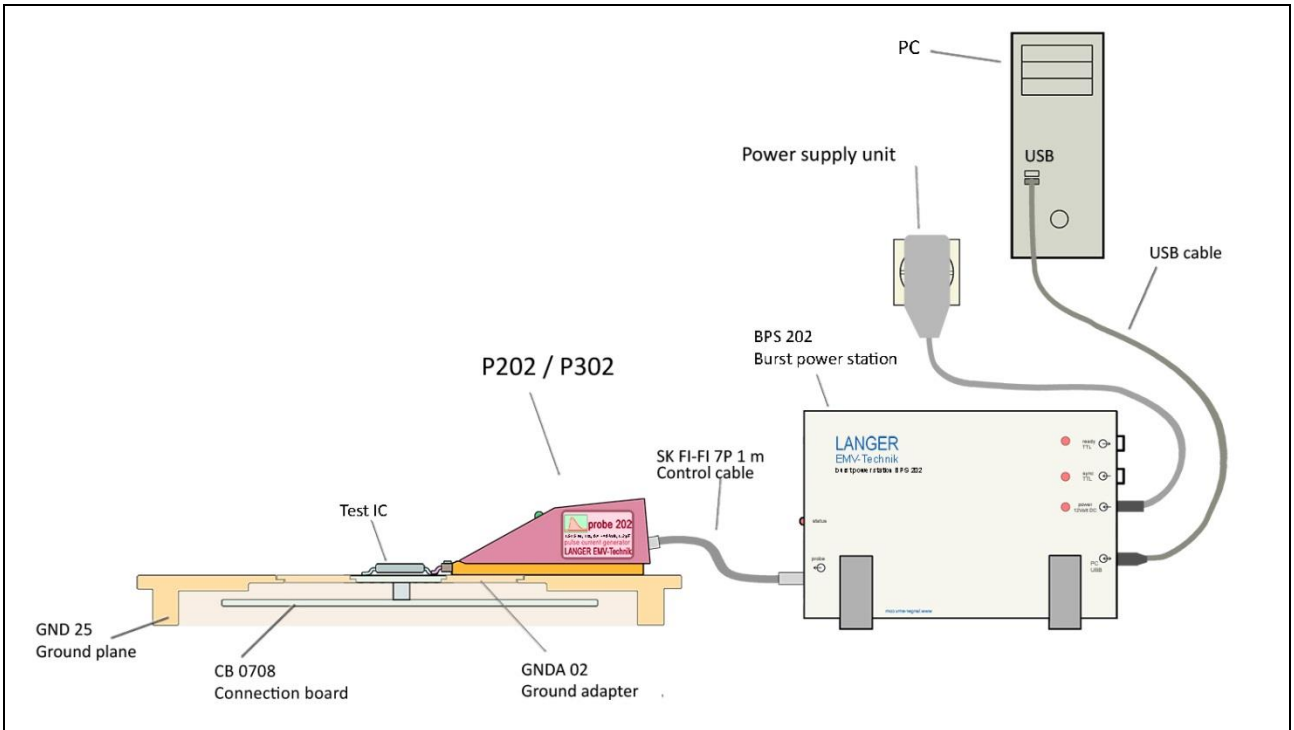



Figure 41: System set-up for free running mode

## 10.3 Synchronized Mode (Pulses synchronized with external Event)

In the synchronized mode, the pulse can be triggered by an external signal source (Start Logic) e. g. a signal from the test IC (TTL max. 5 V).

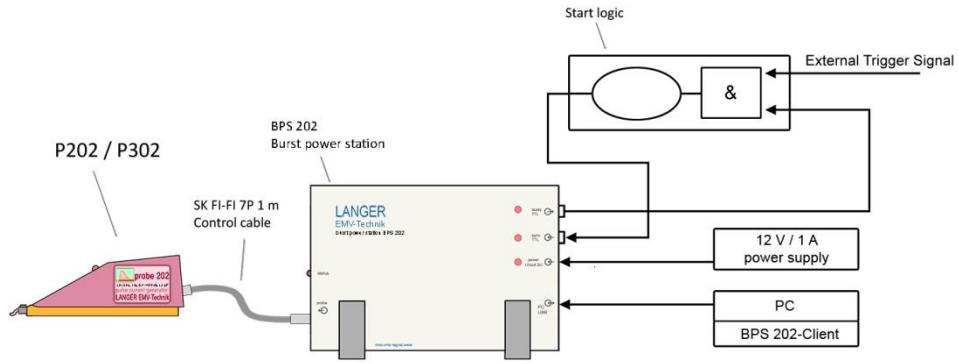



Figure 42 System set-up for external trigger event via BPS 202 sync TTL input

The trigger to pulse delay can be set in the BPS 202-Client (see Figure 5) by using the delay timer in the BPS 202.
The ready TTL output of the BPS 202 signals when the BPS 202 is ready to start a pulse. Figure 43 and Figure 44 show the sequence of control signals when the external trigger mode is used.

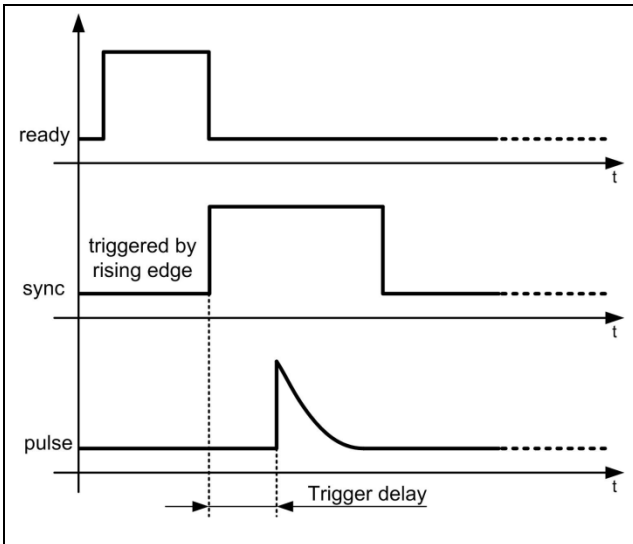



Figure 43: Signal sequence of external trigger mode, trigger on rising edge

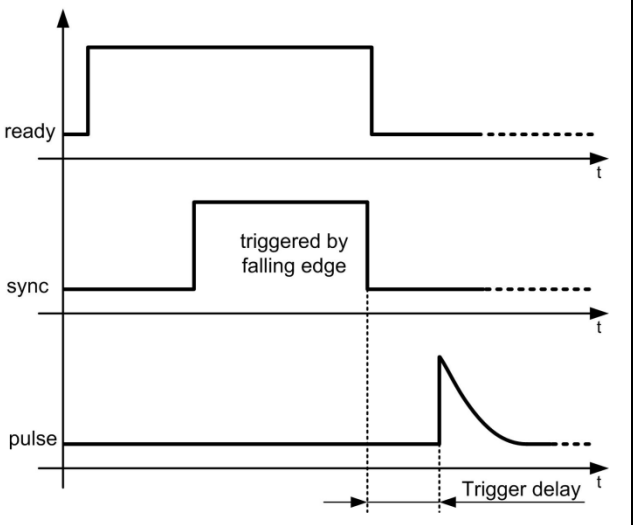



Figure 44: Signal sequence of external trigger mode, trigger on falling edge

Control signals:

Ready: When the ready signal is driven high by the BPS 202, it accepts trigger signals to start pulses.

Sync: The trigger signal for the pulse is fed into this port. The BPS 202 accepts rising or falling edges depending on the setting in the BPS 202-Client software.

Pulse: The generated pulse can be emitted with a variable trigger to pulse delay. For the minimum delay refer to Chapter 4.

Sequence:

a) external trigger of the BPS 202 is set in the BPS 202-Client software (see Section 8.9),

b) BPS 202 sets the ready TTL output to high, when the high voltage is built up and a pulse can be triggered,

c) pulse is emitted on a rising or falling edge at the sync TTL input (Figure 44). This depends on the settings in the BPS 202-Client software (see Section 8.9),

d) trigger to pulse delay between the trigger signal at the sync TTL input and pulse can be set in the BPS202-Client software.

# 11 Warranty

Langer EMV-Technik GmbH will remedy any fault due to defective material or defective manufacture during the statutory warranty period.

**Warranty is only granted on condition that:**
- the operating instructions are observed,
- only original spare parts are used.
- external components such as power supply units, etc. have separate warranty terms and conditions which are applicable for the respective manufacturer.

**The warranty will be forfeited if:**
- unauthorized repairs have been made to the Langer EMV-Technik GmbH product,
- the product from Langer EMV-Technik GmbH has been modified,
- the product from Langer EMV-Technik GmbH has not been used correctly.



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