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pico PG900 Series USB Differential Pulse Generators

pico PG900 Series USB Differential Pulse Generators User Guide

Contents

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Introduction

Thank you for purchasing a PicoSource pulse generator.

The fast-transition output from the PicoSource pulse generators can stimulate a transmission path, device, or network with a broad-spectrum signal in a single instant. These signals, combined with differential capability, are invaluable for making high-speed broadband measurements in many fields such as time domain reflectometry, semiconductor testing, gigabit interconnect and port testing, and radar systems.

Two differential output models are available, offering extensive control over pulse parameters including amplitude, pulse period, pulse width and deskew between output channels.

- The PicoSource PG911 is a two-channel pulse generator based on Step Recovery Diode (SRD) technology. It produces two pulses, up to 6 V amplitude with 60 ps rise time.

- The PicoSource PG914 is a four-channel pulse generator benefiting from both SRD and TD technology.

Note: The PicoSource PG912 (no-longer available) was a two-channel pulse generator based on Tunnel Diode (TD) technology. It used remote tunnel diode pulse heads to produce positive and negative 200 mV pulses with 40 ps rise time.

For further setup information following basic installation, see the User's Guide by either clicking the Help menu within the PicoSource PG900 software or by opening the PDF from our website.

Safety information

To prevent possible electrical shock, fire, personal injury, or damage to the product, carefully read this safety information before attempting to install or use the product. In addition, follow all generally accepted safety practices and procedures for working with and near electricity.

This product has been designed and tested in accordance with the harmonized standard publication EN 61010-1: 2010+A1:2019 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use) and EN 61010-2-030: 2010 (Requirements for Testing and Measuring Circuits). The product left the factory in a safe condition.

The following safety descriptions are found throughout this guide:

WARNING identifies conditions or practices that could result in injury or death.

CAUTION identifies conditions or practices that could result in damage to the product or equipment to which it is

connected.

Symbols
These safety and electrical symbols may appear on the product or in this guide.

Symbols	Description
− − −	Direct current
∿	Alternating current
⏚	Earth (ground) terminal
⏛	Chassis terminal
⚡	Possibility of electric shock
⚠	Caution
▲	Static awareness. Static discharge can damage parts.
⌫	Do not dispose of this product as unsorted municipal waste

This terminal can be used to make a measurement ground connection. It is NOT a safety or protective earth.
Appearance on the product indicates a need to read this safety and operation instruction.

WARNING: To prevent injury or death use the product only as instructed and use only accessories supplied or recommended. Protection provided by the product may be impaired if used in a manner not specified by the manufacturer.

Maximum input and output ranges
Observe all terminal ratings and warnings marked on the product.
The table below indicates the maximum voltage of the outputs and the overvoltage protection range for the trigger input on each pulse generator. The overvoltage protection ranges are the maximum voltages that can be applied without damaging the instrument.

Connection port	Maximum voltage (output or input)	Overvoltage protection
Positive and negative integrated pulse outputs	±8 V unterminated	±10 V Do not connect a source
Drive outputs	±5 V DC or AC pk	±5 V DC or AC pk Do not connect a source
Tunnel diode pulse head outputs	250 mV	0 V Do not connect a source
Trigger input	±2 V DC or AC pk	±2 V DC or AC pk
Trigger output	+3 V DC or AC pk	+4 V / −2 V DC Do not connect a source

WARNING To prevent electric shock or permanent damage to the signal source, do not connect an input voltage to the integrated pulse outputs or the tunnel diode pulse heads.

CAUTION Exceeding the overvoltage protection range on any connector can cause permanent damage to the instrument and other connected equipment.

Grounding

WARNING The instrument's ground connection through the USB cable is for functional purposes only. The instrument does not have a protective safety ground.

WARNING To prevent injury or death, or permanent damage to the instrument, never connect the ground of an input or output (chassis) to any electrical power source. To prevent personal injury or death, use a voltmeter to check that there is no significant AC or DC voltage between the pulse generator's ground and the point to which you intend to connect it.

CAUTION To prevent signal degradation caused by poor grounding, always use the high-quality USB cable supplied with the instrument.

External connections

WARNING To prevent injury or death, only use the Pico approved adaptor supplied with the product. This is approved for the voltage and plug configuration in your country.

PicoSource model	USB connection	EXT power supply		
		Voltage (V)	Current (A pk)	Total power (W)
PG900 Series	USB 2.0. Compatible with USB 3.0.	5 V	1.6 A pk	8 W

CAUTION Take care to avoid mechanical stress or tight bend radii for all connected leads, including all coaxial leads and connectors. Mishandling will cause deformation of sidewalls, and will degrade performance.

Environment

This product is for indoor or outdoor use, in dry locations only. The product's external mains power supply (if required) is for indoor use only.

WARNING To prevent injury or death, do not use in wet or damp conditions, or near explosive gas or vapor.
CAUTION To prevent damage, always use and store your pulse generator in appropriate environments.

	Storage	**Operating**
Temperature	−20 to 50 °C	5 to 35 °C 15 °C to 25 °C for quoted accuracy
Humidity	≤ 95 %RH (non-condensing)	≤ 85 %RH at 35 °C (non-condensing)
Altitude	2000 m	
Pollution degree	2	

Care of the product
The product and accessories contain no user-serviceable parts. Repair, servicing and calibration require specialized test equipment and must only be performed by Pico Technology or an approved service provider. There may be a charge for these services unless covered by the Pico Technology five year warranty (see www.picotech.com for details).

WARNING To prevent injury or death, do not use the product if it appears to be damaged in any way, and stop use immediately if you are concerned by any abnormal behavior.
CAUTION To prevent damage to the device or connected equipment, do not tamper with or disassemble the instrument, case parts, connectors, or accessories.
When cleaning the product, use a soft cloth and a solution of mild soap or detergent in water, and do not allow liquids to enter the instrument's casing.

Conformity

General statement of conformity
The enclosed instrument has been calibrated in accordance with the manufacturer's verification procedure using standards that are traceable to UK national standards. The test locations quality management system and its calibration processes are designed to certify that the instrument was within its published specification at the time of calibration. The measurements were made in a monitored environment.
A full calibration certificate including test data and traceable to national standards is available on request. Please refer to picotech.com/products for pricing.

CE & UKCA notices
This PicoSource PG900 pulse generator meets the intent of the CE EMC directive 2014/30/EU and UKCA SI2016/1091 EMC Regulations.
It also meets the intent of the CE Low Voltage Directive 2014/35/EU and UKCA SI 2016/1101 Electrical Equipment (Safety) Regulations.
For more information, please refer to your product's UKCA Declaration of Conformity or EU Declaration of Conformity, available for download from **www.picotech.com/downloads**

System requirements

To ensure that the PicoSource pulse generator and PicoSource PG900 software operate correctly, you must use a

computer with the system requirements and one of the operating systems shown in the table below.

Processor, memory, free disk space	As required by the operating system
Operating system	Microsoft Windows, 32-bit and 64-bit versions Linux and macOS (beta software only), 64-bit versions See **picotech.com/downloads** for details
Ports	USB 2.0 (also compatible with USB 3.0)

Included with your PicoSource PG900 pulse generator

PicoSource PG900 Pulse Generator kits contain the following items:

- PicoSource PG900 Pulse Generator
- PicoSource PG900 software disk
- Storage and carry case
- Power adaptor 5 V DC at 2 A, universal input
- USB 2.0 cable, 1.8 m
- SMA/PC3.5/2.92 PicoWrench
- Quick Start Guide

Each pulse generator is also supplied with additional accessories, as shown below.

Accessories	Order code	PicoSource model		
		PG911	PG912	PG914
9040 40 ps TD positive pulse head	–		1	1
9041 40 ps TD negative pulse head	–		1	1
12 GHz N(f) to SMA(m) adaptor (fitted to TD pulse heads)	TA172		2	2
10 GHz 20 dB SMA(m-f) attenuator (fitted to SRD pulse outputs)	TA173	2		2
50 Ω coaxial SMA(m-m) pulse drive cable, 60 cm	–		2	2

Some product packs may contain additional items. For a full list of all available kits and additional accessories, see the User's Guide or visit **www.picotech.com**
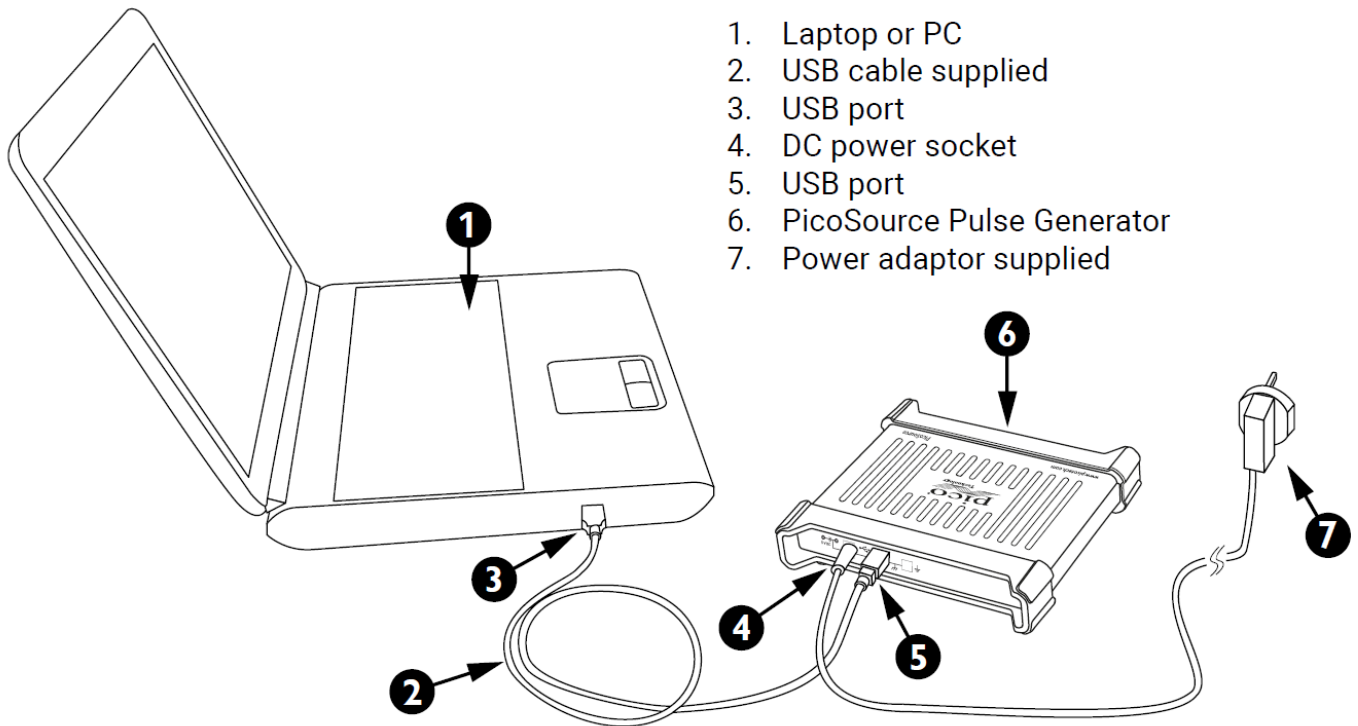
Installing the PicoSource pulse generator and software

1. Install the PicoSource PG900 software using the software disk supplied. Alternatively, you can download the software from picotech.com/downloads. Follow the on-screen instructions to complete the setup.

   Note: Do not connect the pulse generator until the installation is complete.

2. Connect the power cord to the power adaptor, and plug it into a mains (line) power socket. Then connect the

DC power cord to the back of the pulse generator, and switch on the mains power.

3. Earth (ground) terminal. Some laptop power supplies can produce electrical noise which may interfere with your measurements. If this occurs, the earth terminal can be connected to an external ground point (for example, on the system you are testing) to provide a ground reference for the instrument. This can help to avoid external noise interfering with your signal. Alternatively, you can run the laptop using battery power.

4. Connect the pulse generator to the PC using the USB cable supplied. Windows may automatically display a New Hardware Found notification. Follow any instructions shown. Note: If Windows asks to connect to Windows Update, select No.

5. Run the PicoSource PG900 software.

1. Laptop or PC
2. USB cable supplied
3. USB port
4. DC power socket
5. USB port
6. PicoSource Pulse Generator
7. Power adaptor supplied

1. Laptop or PC

2. USB cable supplied

3. USB port

4. DC power socket

5. USB port

6. PicoSource Pulse Generator

7. Power adaptor supplied

Using your pulse generator

Getting started with the PicoSource PG900 software
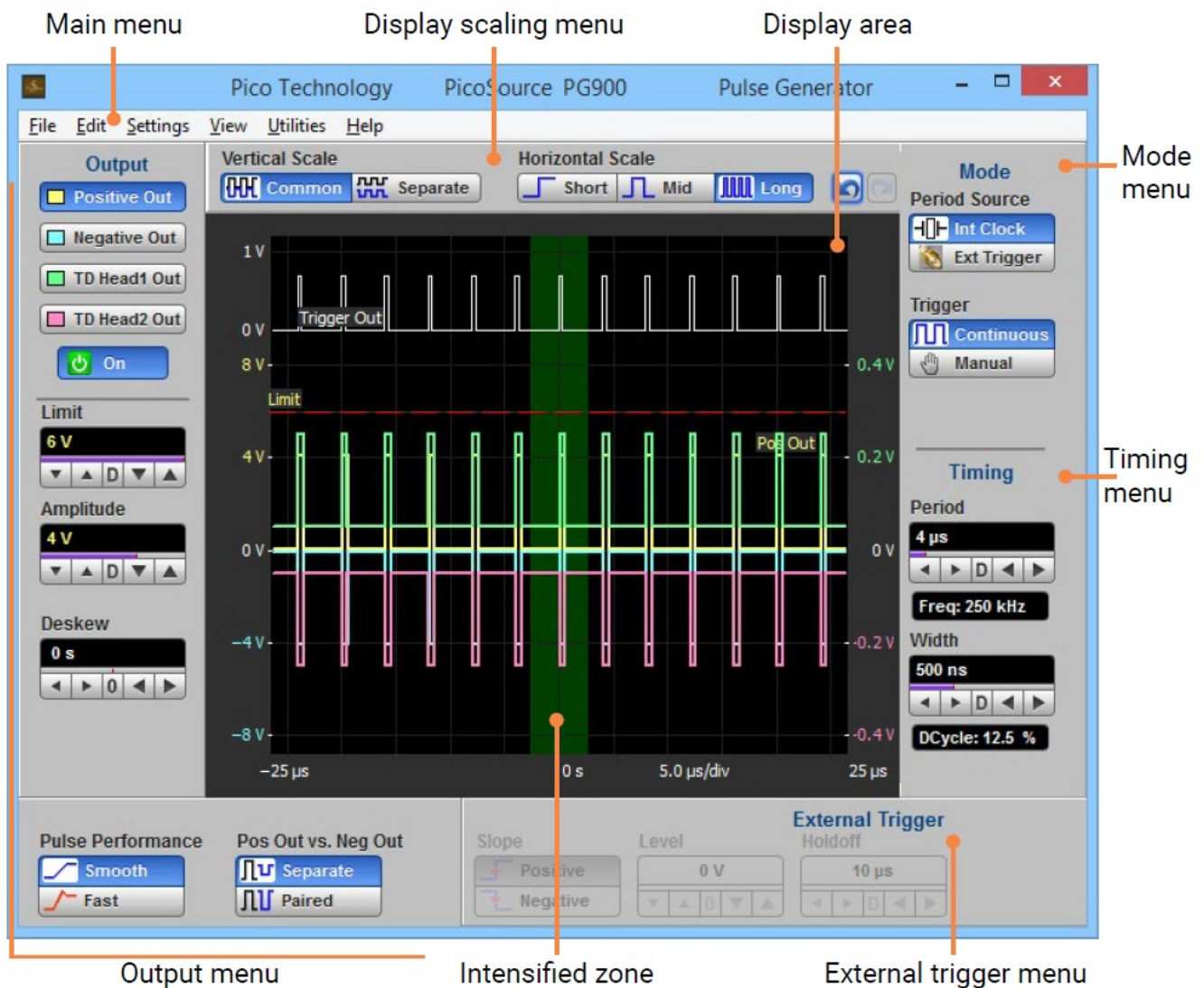
- **Main menu**

  Store and recall your settings, and access detailed Help information.

- **Display scaling**

  These controls allow you to adjust how information is shown in the Display area. The Intensified zone shows a section of the waveform that can be expanded using the Horizontal scale control. This function can be used to show the pulse train and the pulse timing, including the timing in relation to the trigger.

- **Mode menu**

  Select a trigger source (internal or external) and operating mode. When Ext Trigger is selected as the source, the External trigger menu will be enabled.

- **Timing menu**

  Adjust the period and width of the pulse.

- **Output menu**

  Select the appropriate channel and adjust the related parameters. Choose from Positive Out and Negative Out (for the integrated step recovery diode outputs) or TD Head1 Out and TD Head2 Out (for the tunnel diode pulse heads).

- **Adjusting a parameter**

  The value of a parameter can be adjusted in a number of ways:
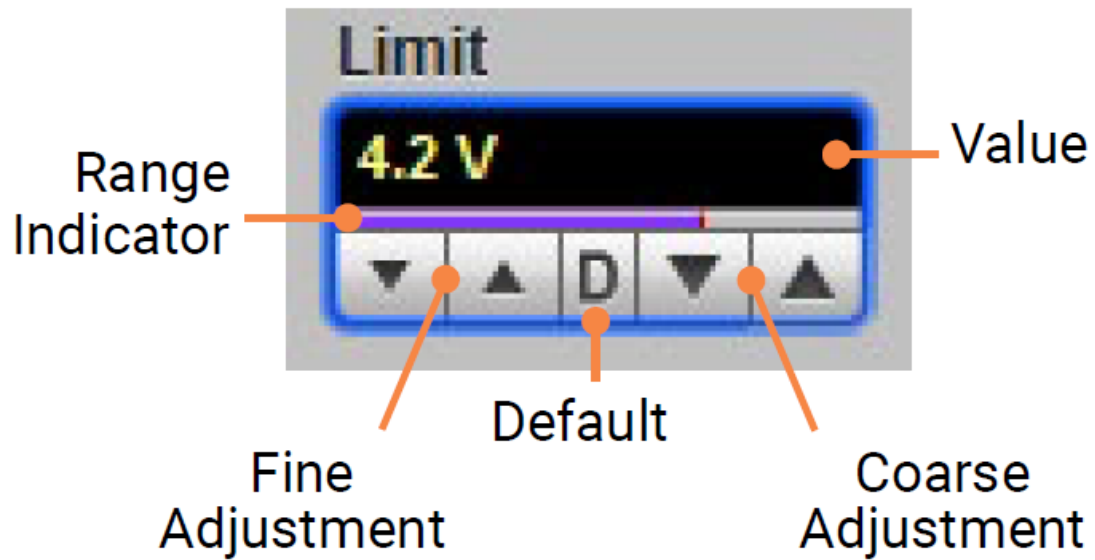
- Use the up and down arrows to adjust the value in Fine or Coarse increments, or click D to return to the default value.
- Click and drag the Range Indicator bar.
- Click the parameter box to highlight it, and directly type a precise new value using your keyboard.
- Right click on the value to quickly access the Maximum, Middle, or Minimum value.
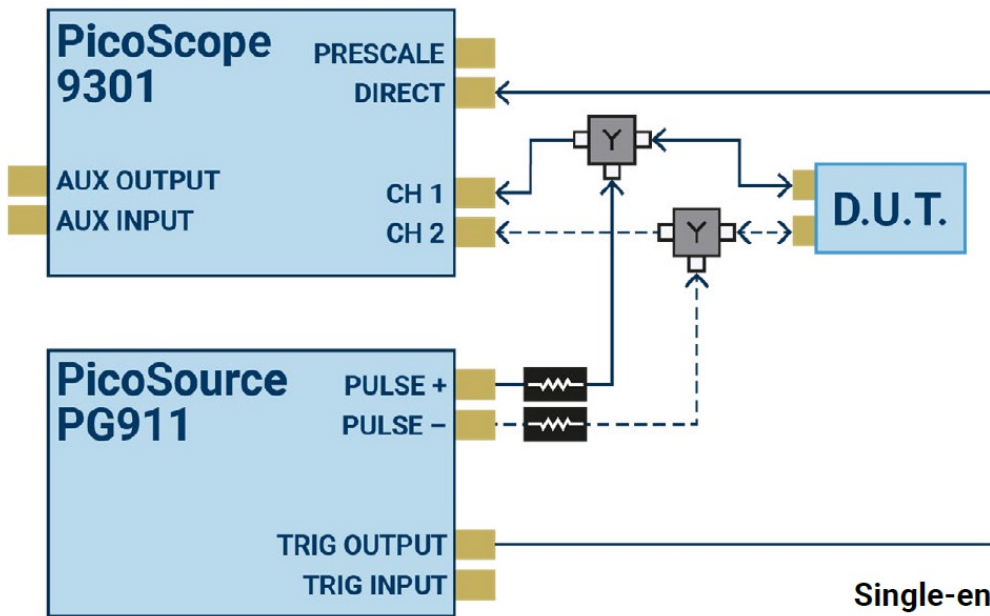- Right click on the value and select Calculator to enter a precise new value using the on-screen keypad.
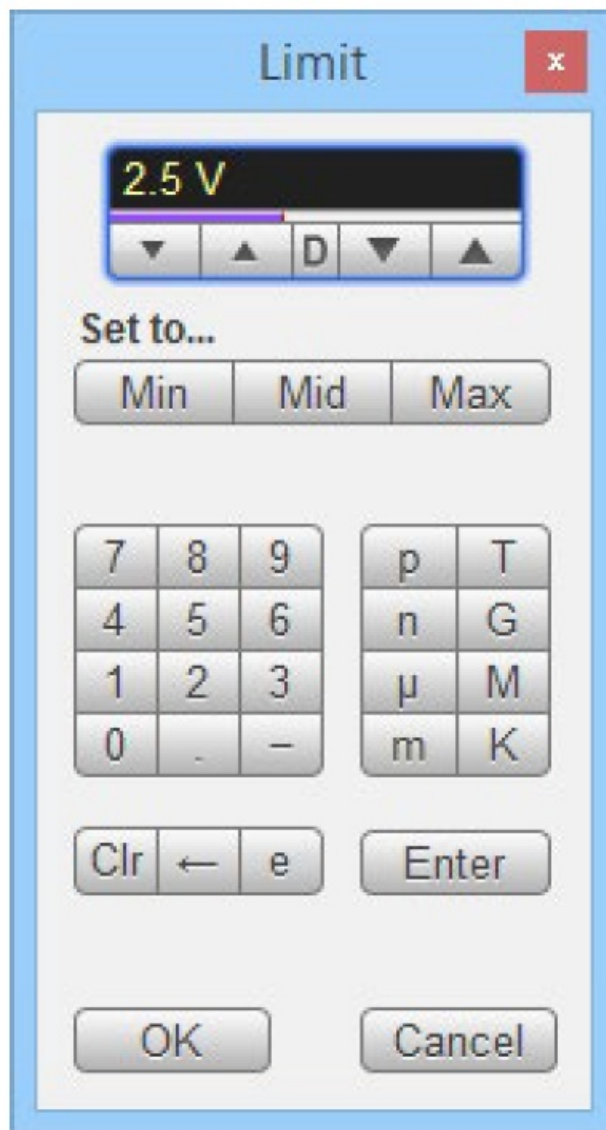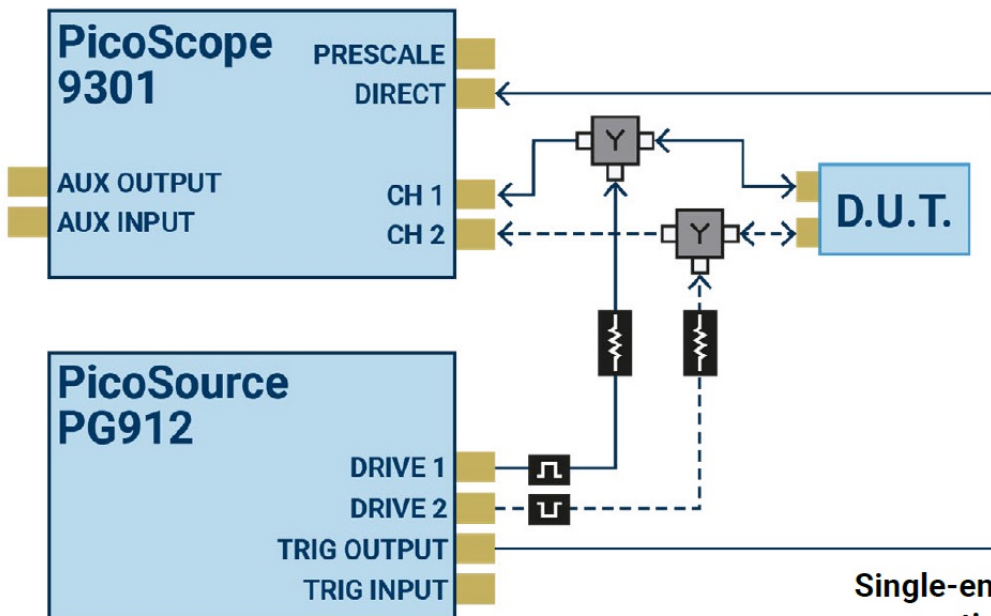
Connection diagrams

The following diagrams illustrate time domain transmission and reflectometry setup options using a PicoSource pulse generator, a PicoScope oscilloscope, and the device under test (DUT). In all setups, the pulse generator shown can be substituted by the PicoSource PG914.

Signal connections should be made using precision SMA cables, unless otherwise specified. Trigger connections can be made using lower grade cables.

TDR applications

PicoScope 9301
PRESCALE
DIRECT
AUX OUTPUT
AUX INPUT
CH 1
CH 2

PicoSource PG911
PULSE +
PULSE −
TRIG OUTPUT
TRIG INPUT

D.U.T.

Single-ended and differential connections for TDR testing, using a PicoSource pulse generator with SRD outputs

PicoScope 9301
PRESCALE
DIRECT
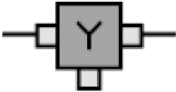AUX OUTPUT
AUX INPUT
CH 1
CH 2

PicoSource PG912
DRIVE 1
DRIVE 2
TRIG OUTPUT
TRIG INPUT

D.U.T.

Single-ended and differential connections for TDR testing, using a PicoSource pulse generator with TD pulse head outputs

TDT applications
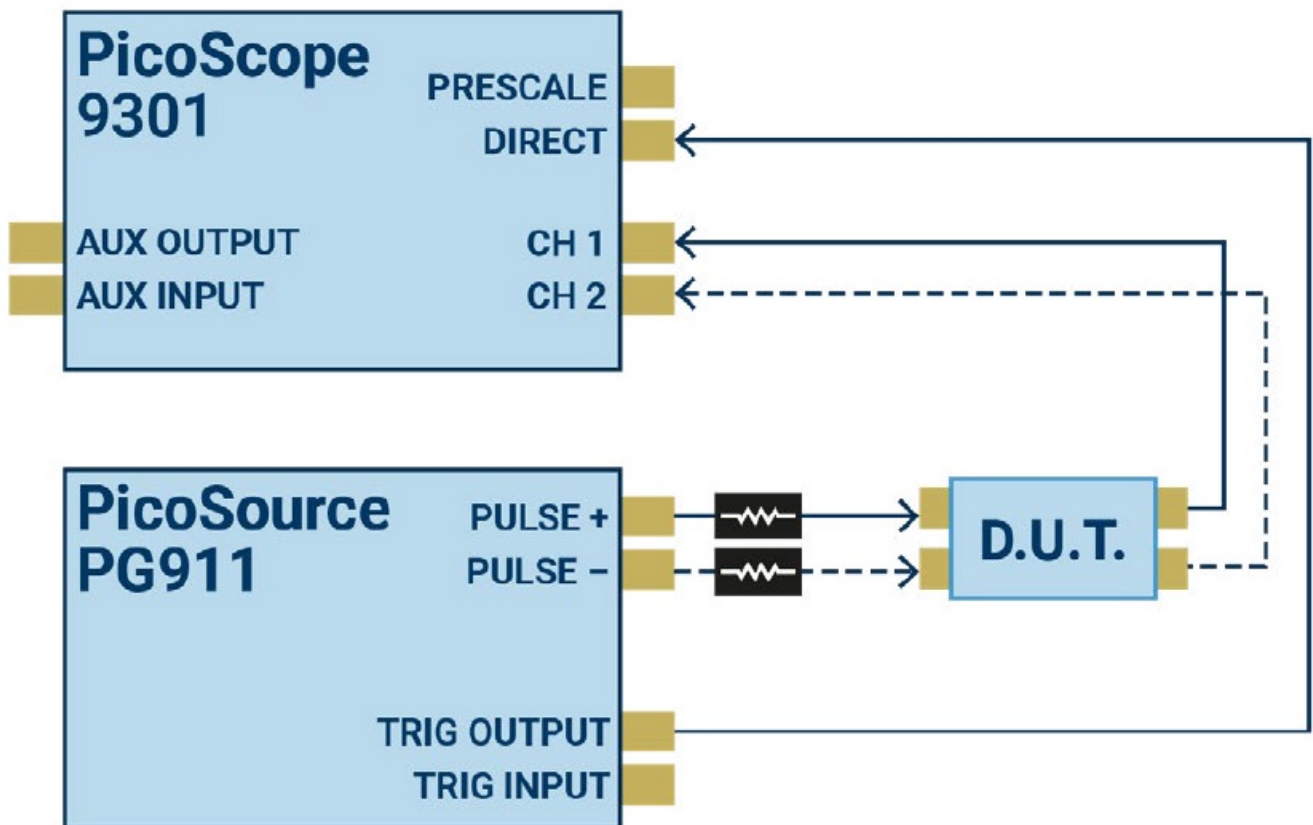
Single-ended and differential connections for TDT testing, using a PicoSource pulse generator with SRD outputs

TDT and crosstalk
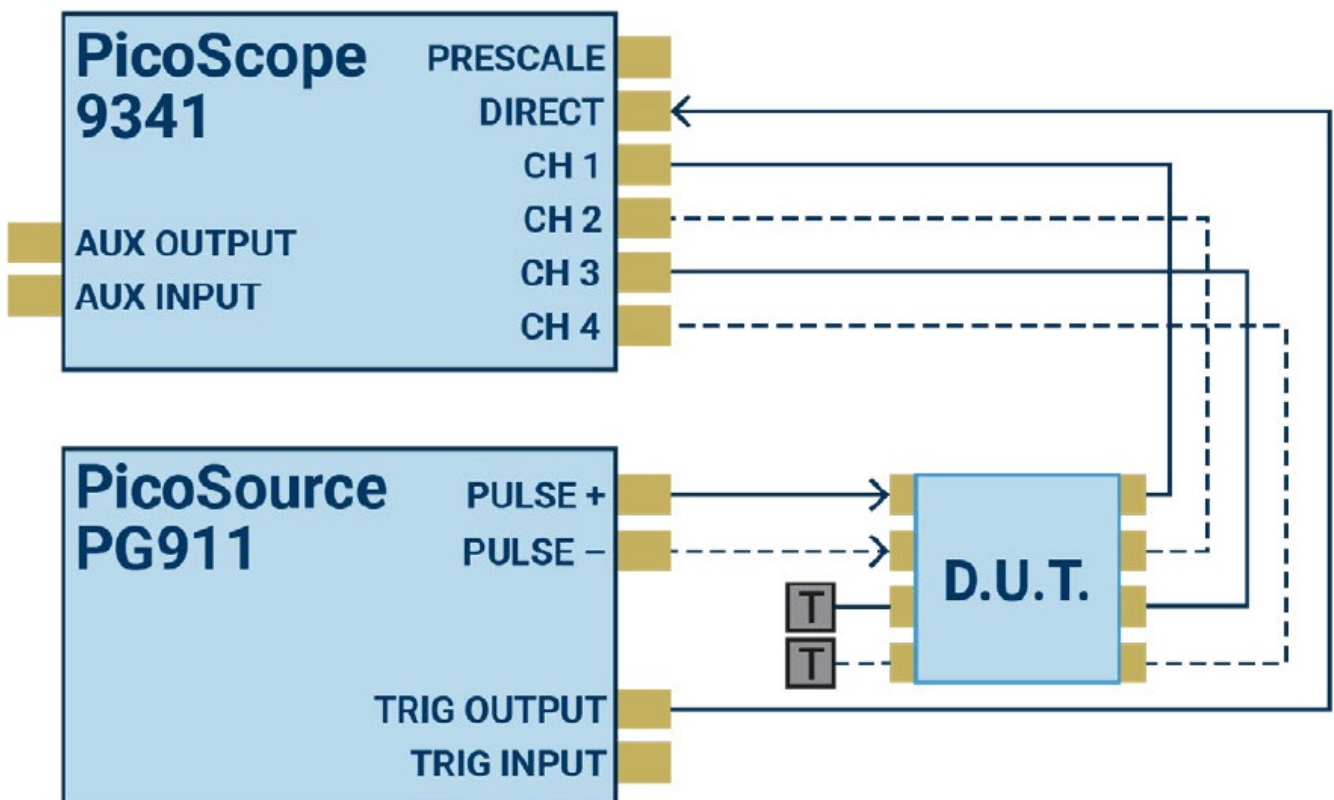
Single-ended and differential connections for simultaneous TDT and crosstalk assessment, using a PicoSource pulse generator with SRD outputs

Diagram key

	Single-ended connection		20 dB attenuator (TA173)*
	Differential connection		Power divider kit (TA238)*
	Positive TD pulse head		Terminated load, TDR kit (TA237)*
	Negative TD pulse head		

Additional accessories and kits are available from Pico Technology Ltd. For ordering information, see the product data sheet or visit **www.picotech.com**

Free newsletter
Pico Technology sends out a free monthly newsletter by email. This gives news of product launches, software upgrades and application notes, as well as hints and advice. We treat your e-mail address and other details as confidential and will not pass them to any third party. To subscribe, visit: **www.picotech.com/newsletter**

Software updates and replacement
The latest versions of all Pico software and manuals can be downloaded free of charge at: **www.picotech.com/downloads**

User's guides
All User's Guides can be downloaded from: **www.picotech.com/downloads**

Specifications
The User's Guide and Data Sheet contain the latest specifications for your PicoSource pulse generator.

Technical support
Regularly updated technical support information can be found in the Pico Technology support forum here: **www.picotech.com/tech-support**

Warranty and returns

These PicoSource pulse generators are supplied with a five year return-to-manufacturer warranty. For full terms and conditions, see **www.picotech.com**

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Documents / Resources

![Pico PicoSource PG900 Series Quick Start Guide thumbnail]	**pico PG900 Series USB Differential Pulse Generators** [pdf] User Guide PG900 Series USB Differential Pulse Generators, PG900 Series, USB Differential Pulse Generators, Differential Pulse Generators, Pulse Generators

References

- 🌐 **pico.asia**
- 📑 **PicoScope oscilloscope software and PicoLog data logging software**
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