



TELEDYNE LECROY
Everywhereyoulook™



User Manual

PP066 Transmission
Line Probe /
RP4000-BROWSER

PP066 Transmission Line Probe / RP4000-BROWSER User Manual

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Safety Instructions

Follow generally accepted safety procedures in addition to the precautions specified in this section. The overall safety of any system incorporating this accessory is the responsibility of the assembler of the system.

Symbols

These terms and symbols may appear on the probe body or in this manual to alert you to important safety considerations.



CAUTION of potential damage to equipment, or **WARNING** of potential injury. Attend to the accompanying information to protect against personal injury or damage. Do not proceed until conditions are fully understood and met.



DOUBLE INSULATION



PROTECTIVE (EARTH) TERMINAL

Precautions

To avoid personal injury or damage to property, review and comply with the following safety precautions. **Use product only as specified.**

Connect only to grounded instruments. Use only with compatible Teledyne LeCroy oscilloscopes that have their BNC input connected to an earth ground. Do not connect the probe reference lead to any point which is at a potential other than earth ground.

Connect and disconnect properly. Connect probe to the oscilloscope before connecting the probe to the test circuit. Disconnect the probe input and reference lead from the test circuit before disconnecting the probe from the oscilloscope. To avoid injury or death due to electric shock, do not connect or disconnect probes or probe accessories while they are connected to a voltage source.

Do not overload; observe all terminal ratings. To avoid electric shock or fire, do not apply any potential to the probe leads that exceeds the maximum rating of the probe. Consult the respective oscilloscope product manual for further ratings information.

Do not remove probe casing. Removing the probe's case or touching exposed connections may result in electric shock. Refer all repair and maintenance to qualified service personnel.

Use only within operational environment listed. Do not use in wet or explosive atmospheres. Keep product surfaces clean and dry.

Use only accessories compatible with the probe.

Handle with care. The probe tip is extremely sharp and may puncture skin or cause other bodily injury if not handled properly.

Keep fingers behind the finger guard of probe body and accessories.

Do not operate with suspected failures. Before each use, inspect the probe and accessories for any potential damage such as tears or other defects in the probe body, cable jacket, accessories, etc. If any part is damaged, cease operation immediately and sequester the probe from inadvertent use.

Introduction

The PP066 is a $\pm 10 / \pm 20$ high frequency probe using a special 50Ω cable with an SMA connector for high-speed, transmission line type measurements. Input resistance is 500Ω when the ± 10 attenuation probe resistor is installed. It is designed to be used with high-bandwidth oscilloscopes.

NOTE: For proper attenuation and high-speed performance, the PP066 probe must be connected to an oscilloscope with a 50Ω input.

The spring loaded, hinged ground pin contributes to contact stability, in addition to making it easier to reach into dense circuitry.

The probe includes:

- ± 20 attenuation probe resistor to increase the input resistance to $1 \text{ k}\Omega$
- 0Ω pin that can be used to create a ± 1 browser for use with the RP4030 Power Rail Probe (see the RP4030 manual for instructions)

NOTE: The 0Ω pin is intended only for use with the RP4030. Beware exceeding the safe voltage when using it; max. input voltage is limited to RP4030 specifications.

- SMA-to-BNC adapter to connect to oscilloscopes with BNC inputs for taking measurements at lower frequencies.

Standard Accessories

The PP066 is shipped with the following standard accessories:

- $\div 10$ Probe Resistor (qty 2) (1 installed at shipment)
- $\div 20$ Probe Resistor (qty 2)
- $\div 1$ Probe Resistor with 0 Ω Pin (qty 1) for use as RP4000-BROWSER
- Standard SMA-to-BNC Adapter (qty 1)
- High-bandwidth SMA-to-BNC Adapter (qty 1)
(only included when ordered as a PP066 probe)
- Plastic Nose Housing
- User Manual

For part numbers, refer to the Replaceable Parts section.

Warranty

Teledyne LeCroy warrants this oscilloscope accessory for normal use and operation within specification for a period of one year from the date of shipment. Spare parts, replacement parts and repairs are warranted for 90 days.

In exercising its warranty, Teledyne LeCroy, at its option, will either repair or replace any assembly returned within its warranty period to the Customer Service Department or an authorized service center. However, this will be done only if the product is determined by Teledyne LeCroy's examination to be defective due to workmanship or materials, and the defect is not caused by misuse, neglect, accident, abnormal conditions of operation, or damage resulting from attempted repair or modifications by a non-authorized service facility.

The customer will be responsible for the transportation and insurance charges for the return of products to the service facility. Teledyne LeCroy will return all products under warranty with transportation charges prepaid.

This warranty replaces all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability, fitness or adequacy for any particular purposes or use. Teledyne LeCroy shall not be liable for any special, incidental, or consequential damages, whether in contract or otherwise.

Specifications

The following specifications apply when used as a conventional PP066 transmission line probe. See the *RP4030 Operator's Manual* for specifications when used with the RP4030 as an RP4000-BROWSER.

Nominal Characteristics

(Guaranteed by design, but do not have associated tolerances)

Input Dynamic Range	$\pm 15 V_{\text{rms}}$
System Attenuation	$\pm 1\%$ plus 50Ω termination tolerance and oscilloscope gain accuracy
Input Resistance $\div 10$	$500 \Omega \pm 1.5\%$
Input Resistance $\div 20$	$1 \text{ k}\Omega \pm 1.25\%$
Coupling	50Ω
Max. Non-destruct Input Voltage	$16 V_{\text{rms}}, 40 V_{\text{max}}$ for the 1/10 tip $20 V_{\text{rms}}, 40 V_{\text{max}}$ for the 1/20 tip

Typical Characteristics

(Not guaranteed, but representative of the average performance from a sample of several probes)

System Bandwidth (-3 dB)	DC to 7.5 GHz
Rise Time	47 psec
Input Capacitance	$\div 10$: 0.25 pF $\div 20$: 0.3 pF

Environmental Characteristics

Operating Temperature	0° to 45° C at 80% RH
Humidity	$\leq 80\%$ at 31° C max.
Altitude	up to 3000 m (9850 ft)

Physical Characteristics

Weight (probe only)	26.5 g (0.94 oz)
Cable Length	1 m

Operation

Handling the Probe

Exercise care when handling and storing the probe. Always lift the probe by the probe body. Do not put excessive strain on the probe cable or bend it sharply.

Connecting the Probe to the Test Instrument

The PP066 probe has been designed for use with Teledyne LeCroy oscilloscopes. Connecting the probe to any oscilloscope using the SMA-to-BNC adapter will make the total of the measuring system equal to the bandwidth of the oscilloscope. Use the standard SMA-to-BNC adapter with Teledyne LeCroy oscilloscopes with ProBus inputs, up to 4 GHz. Use the high bandwidth SMA-to-BNC adapter with instruments that have ProBus2 inputs for operation > 4 GHz.

NOTE: For proper operation, set the oscilloscope input to 50 Ω .

See the *RP4030 Operator's Manual* for instructions on connecting to the RP4030 probe for use as an RP4000-BROWSER.

Connecting the Probe to the Test Circuit

To maintain the high-performance capability of the probe, care must be exercised when connecting the probe to the test circuit. Increasing the parasitic capacitance or inductance in the input paths may deteriorate the performance by introducing a "ring" or slowing the rise time of fast signals. To obtain the highest performance, keep the body of the probe perpendicular to the circuit under test.

NOTE: Keep fingers behind the finger guard of probe body, as fingers in proximity of the plastic tip will increase capacitance and reduce probe bandwidth.

Oscilloscope Attenuation Setting

Because the PP066 probe is not supplied with ProBus encoding, you'll have to set the system's attenuation manually by entering the probe attenuation on the (input) Channel setup dialog (*Cn*).

In addition, when using an oscilloscope capable of different input resistances, set the resistance to 50 Ω by opening the channel's vertical setup dialog and selecting **DC50 Ω** from the **Coupling** pop-up selector.

Replacing the Attenuating Resistor

The attenuation can be changed from $\div 10$ (as shipped) to $\div 20$ or $\div 1$ by changing the resistor inside the probe body. To change or replace the resistor:

1. Remove the nose housing by rotating it counter clockwise and pulling it away from the probe body taking care not to bend or twist the resistor inside the housing.
2. Pull the resistor straight out of the probe body without twisting or bending the resistor.
3. Gently insert one end of the alternate resistor into the probe body.



1/10 resistor



1/20 resistor

4. Re-install the nose housing by carefully sliding it over the resistor and screwing it onto the probe body.
5. Select the proper attenuation on the input Channel (*Cn*) setup dialog.

NOTE: The RP4030 will not work properly when a resistor other than 0Ω is installed in the RP4000-BROWSER. If the resistor is changed and is not reverted to 0Ω prior to using the browser with the RP4030 probe, the voltages displayed on the oscilloscope will be incorrect. Even when operated as a conventional transmission line probe connected directly to the input, because the PP066 lacks ProBus encoding, attenuation and coupling must be set manually on the oscilloscope Channel (*Cn*) setup dialog.

Cleaning

The exterior of the probe and cable should only be cleaned using a soft cloth moistened with water or isopropyl alcohol. The use of abrasive agents, strong detergents, or other solvents may damage the probe.



CAUTION. The probe case is not sealed and should never be immersed in any fluid.

Clear the input receptacles of debris before inserting connection accessories.

Service

Defective probes must be returned to a Teledyne LeCroy service facility for diagnosis and exchange. A defective probe under warranty will be repaired or replaced with a factory refurbished probe. A probe that is not under warranty can be exchanged for a factory refurbished probe. A modest fee is charged for this service. A defective probe must be returned in order to receive credit for the probe core.

Replaceable Parts

Description	Part Number	QTY.
Probe Body	PACC-PB001	1
Probe Cable	PACC-CB001	1
÷10 Attenuating Resistor*	PACC-X1001	1
÷20 Attenuating Resistor	PACC-X2001	1
÷1 Attenuating Resistor / Pin	927419-00	1
Plastic Nose Housing, Black	PACC-NH001	1
SMA-to-BNC Adapter (standard bandwidth ProBus)	PACC-AD001	1
SMA-to-BNC Adapter (high-bandwidth ProBus2)	928829-00	1

* Probe body is supplied with the ÷10 resistor and a black plastic nose housing installed.

Returning a Probe

Contact your local Teledyne LeCroy service center for calibration or other service. If the product cannot be serviced on location, the service center will give you a Return Material Authorization (RMA) code and instruct you where to ship the product. All products returned to the factory must have an RMA.

Return shipments must be prepaid. Teledyne LeCroy cannot accept COD or Collect shipments. We recommend air-freighting. Insure the item you're returning for at least the replacement cost.

1. Remove all accessories from the probe.
2. Pack the probe in its case. If possible, include all tips. Do not include the manual.
3. Pack the case in its original shipping box, or an equivalent carton with adequate padding to avoid damage in transit.

4. Mark the outside of the box with the shipping address given to you by Teledyne LeCroy. Be sure to add the following:
 - ATTN:<RMA code assigned by Teledyne LeCroy>
 - FRAGILE
5. **If returning a probe to a different country:** contact Teledyne LeCroy Service for instructions on completing your import/export documents.

Extended warranty, calibration and upgrade plans are available for purchase. Contact your Teledyne LeCroy sales representative to purchase a service plan.

Service Centers

For a complete list of offices by country, including our sales and distribution partners, visit:

teledynelecroy.com/support/contact

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700 Chestnut Ridge Road
Chestnut Ridge, NY, 10977, USA

Sales and Service:

Ph: 800-553-2769 / 845-425-2000

FAX: 845-578-5985

contact.corp@teledynelecroy.com

Support:

Ph: 800-553-2769

customersupport@teledynelecroy.com

Certifications

Teledyne LeCroy certifies compliance to the following as of publication.

European Council



Please see the EC Declaration of Conformity document shipped with your product for current certifications.

EC Declaration of Conformity – Safety

The probe meets the intent of EC Directive 2014/35/EU for Product Safety. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61010-1:2010+A1:2019 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

End-of-Life Handling / WEEE



The probe is marked with this symbol to indicate that it complies with the applicable European Union requirements to Directives 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE).

The probe is subject to disposal and recycling regulations that vary by country and region. Many countries prohibit the disposal of waste electronic equipment in standard waste receptacles. For more in-formation about proper disposal of your Teledyne LeCroy product, visit teledynelecroy.com/recycle.

Restriction of Hazardous Substances (RoHS)

The probe conforms to the 2011/65/EU RoHS2 Directive inclusive of any further amendments or modifications of said Directive.

United Kingdom



The probe conforms to all applicable United Kingdom standards for Safety. The design of the product has been verified to conform to the applicable harmonized standards and technical specifications.

China



Unless otherwise specified, all materials and processes are compliant with the latest requirements of China RoHS. Any hazardous substances contained in the product are disclosed in accordance with standards.

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