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Operator's Manual

PP065/PP066
Transmission Line
Probe



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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.

Safety Instructions

This section contains instructions that must be observed to keep this oscilloscope accessory operating in a correct and safe condition. You are required to 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 for bodily injury. Attend to the accompanying information/product manual 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.

Do not overload. To avoid electric shock or fire, do not apply any potential to the probe leads that exceeds the maximum rating of the probe.

Observe all terminal ratings. To avoid electric shock or fire, observe all markings on the oscilloscope before connecting. 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.

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 $\div 10$ high frequency probe using a special $50\ \Omega$ cable with an SMA connector for high-speed transmission line type measurements. Input resistance is $500\ \Omega$. It is designed to be used with high bandwidth oscilloscopes.

A $\div 20$ attenuation probe resistor is included to increase the input resistance to $1\ \text{k}\Omega$. An SMA-to-BNC adapter has been provided to connect the probe to an oscilloscope with a BNC input connector for measurements at lower frequencies.

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

The **PP065** is a $\div 100$ probe using a $50\ \Omega$ cable with a BNC connector for transmission line type measurements. Input resistance is $5\ \text{k}\Omega$.

NOTE: For proper attenuation and high-speed performance, the PP066 and PP065 probes must be connected to an oscilloscope having a $50\ \Omega$ input.

Key Features:

- Small size
- High bandwidth
- Very low input capacitance

Standard Accessories

The **PP066** is shipped with the following standard accessories:

- ± 20 Probe Resistor
- SMA-to-BNC Adapter
- Plastic Nose Housing
- Instruction Manual

The **PP065** is shipped with the following standard accessories:

- BNC Adapter
- PCB Adapter
- Ground lead 11cm
- Spring tip 0.5mm
- Insulating Tip
- IC Insulating Tip
- Ground lead short on probe tip

For part numbers, refer to Replaceable Parts section.

Operation

Handling the Probe

Exercise care when handling and storing the probe. Always handle the probe by the probe body. Avoid putting excessive strain on the probe cable or bending it sharply.

Connecting the Probe to the Test Instrument

The PP066 and PP065 probes have 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.

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

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.

Replacing the Attenuating Resistor (PP066)

The attenuation of the PP066 probe can be changed from $\div 10$ to $\div 20$ or visa versa 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 resistor straight out of the probe body without twisting or bending the resistor.
3. Insert a different resistor by gently inserting one end of the resistor into the probe body.
4. Install the nose housing by carefully sliding it over the resistor and screwing it onto the probe body.

NOTE : The $450\ \Omega$ ($\div 10$) resistor is directional. The dotted end of the resistor needs to be placed towards the probe side. The $950\ \Omega$ ($\div 20$) resistor is not directional. Two different Nose Housings have been supplied to indicate the probe's attenuation: a black one to indicate a $450\ \Omega$ resistor for $\div 10$ attenuation and a blue one to indicate a $950\ \Omega$ resistor for $\div 20$ attenuation.

Oscilloscope Attenuation Setting

Because the PP066 and PP065 probes are 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.

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

Care and Maintenance

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.

Assure that the input receptacles are free of debris before inserting connection accessories.

Service Strategy

All repair and maintenance should be referred to qualified service personnel.

Defective probes must be returned to a 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.

Returning a Probe

Contact your local Teledyne LeCroy service center for calibration or other service. 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 product. Do not include the manual.
2. Pack the product in its case, surrounded by the original packing material (or equivalent).

3. Label the case with a tag containing:
 - The RMA
 - Name and address of the owner
 - Product model and serial number
 - Description of failure or requisite service
4. Pack the product case in a cardboard shipping box with adequate padding to avoid damage in transit.
5. 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
6. **If returning a product to a different country:**
 - Mark the shipment as a "Return of US manufactured goods for warranty repair/recalibration."
 - If there is a cost for the service, list the cost in the Value column and the original purchase price "For insurance purposes only."
 - Be very specific about the reason for shipment. Duties may have to be paid on the value of the service.

Replaceable Parts

PP066

Description	Part Number	QTY.
Probe Body*	PACC-PB001	1
Probe Cable	PACC-CB001	1
±10 Resistor	PACC-X1001	1
±20 Resistor	PACC-X2001	1
Plastic Nose Housing, Black	PACC-NH001	1
Plastic Nose Housing, Blue	PACC-NH002	1
SMA-to-BNC Adapter	PACC-AD001	1

* Probe body is supplied with a ±10 resistor and a black plastic nose housing.

PP065

Description	Part Number	QTY.
BNC Adapter	PK1-5MM-110	1
PCB Adapter	PK1-5MM-107	1
Ground Lead 11cm	PK1-5MM-102	1
Spring Tip 0.5mm	PK007-005	1
Insulating Tip	PK1-5MM-105	1
IC Insulating Tip	PK1-5MM-108	1
Ground lead short on probe tip	PK1-5MM-118	1

Specifications

	PP065	PP066
Nominal Characteristics (guaranteed by design, but do not have associated tolerances)		
Input Dynamic Range		$\pm 15 V_{\text{rms}}$
System Attenuation	100:1 $\pm 1\%$	$\div 10$ and $\div 20 \pm 1\%$ plus 50 Ω termination tolerance
Input Resistance	5 k Ω $\pm 0.5\%$	$\div 10$ 500 Ω $\pm 1\%$ plus 50 Ω termination tolerance $\div 20$ 1 k Ω $\pm 1\%$ plus 50 Ω termination tolerance
Coupling	50 Ω	50 Ω
Maximum non-destruct input voltage	30 V (DC + peak AC)	
Typical Characteristics (performance not guaranteed, but representative of the average performance from a sample of several probes)		
System Bandwidth (-3 dB)	1 GHz	DC to 7.5 GHz
Rise Time		47 psec
Input Capacitance	2 pF $\pm 5\%$	0.25 pF
Environmental Characteristics		
Operating Temperature	0° to 50° C at 80% RH	0° to 45° C at 80% RH
Humidity	$\leq 80\%$ at 31° C max.	$\leq 80\%$ at 31° C max.
Altitude	up to 3000 m (9850 ft)	up to 3000 m (9850 ft)
Physical Characteristics		
Weight	38 g *	26.5 g (0.94 oz) †
Cable Length	1.4 m	1 m ± 20 mm

* Probe plus accessories.

† Probe only.

Certifications

This section certifies the probe' Safety and Environmental compliance.

EC Declaration of Conformity - Safety

The probe meets intent of EC Directive 2006/95/EC for Product Safety.

Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61010-031/A1:2008 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test.

Environmental Compliance

END-OF-LIFE HANDLING



The probe is marked with this symbol to indicate that it complies with the applicable European Union requirements to Directives 2002/96/EC and 2006/66/EC on Waste Electrical and Electronic Equipment (WEEE) and Batteries.

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 information about proper disposal and recycling of your

Teledyne LeCroy product, please visit teledynelecroy.com/recycle.

RESTRICTION OF HAZARDOUS SUBSTANCES (ROHS)

The probe conforms to 2011/65/EU RoHS2 Directive based on the fact it is classified as an Industrial Monitoring and Control Instrument (per Article 4, Paragraph 24), and these products and associated accessories are exempt from RoHS compliance until 22 July 2017 (per Article 4, Paragraph 3).

Contact Teledyne LeCroy

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