



**TELEDYNE LECROY**  
Everywhere you look™



**Operator's  
Manual**  
ZS Series  
High-Impedance  
Active Probes



**ZS1000, ZS1500, ZS2500**  
**High-Impedance Active Probes**  
**Operator's Manual**

December, 2019





## **ZS Series High-Impedance Active Probes Operator's Manual**

© 2019 Teledyne LeCroy, Inc. All rights reserved.

Users are permitted to duplicate and distribute Teledyne LeCroy documentation for internal training purposes only. Resale or unauthorized duplication of Teledyne LeCroy documentation materials is strictly prohibited.

Teledyne LeCroy is a registered trademark of Teledyne LeCroy, Inc. Other product or brand names are trademarks or requested trademarks of their respective holders. Information in this publication supersedes all earlier versions. Specifications are subject to change without notice.

932001-00 Rev A  
December, 2019

## 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.

# Table of Contents

<b>Safety Instructions</b> .....	<b>1</b>
<b>Introduction</b> .....	<b>2</b>
<b>Standard Accessories</b> .....	<b>3</b>
Tips .....	4
Grounds .....	5
Leads .....	6
Clips and Grabbers .....	6
Probe Holder .....	7
Probe Impedance and Loading .....	8
<b>Probe Operation</b> .....	<b>10</b>
Handling the Probe .....	10
Connecting the Probe to the Test Circuit .....	10
Connecting the Probe to an Oscilloscope .....	10
Operation with a Teledyne LeCroy Oscilloscope .....	11
High Frequency Measurements .....	11
<b>Care and Maintenance</b> .....	<b>15</b>
Cleaning .....	15
Calibration Interval .....	15
Service Strategy .....	15
Replacement Parts .....	15
<b>Performance Verification</b> .....	<b>16</b>
Required Test Equipment .....	16
Test Setup and Preliminary Procedure .....	18
Functional Check .....	18
Verification Procedure .....	19
ZS Series Probe Test Record .....	23
<b>Reference Material</b> .....	<b>24</b>
Certifications .....	24
Returning a Product for Service .....	26
Technical Support .....	26

## Safety Instructions

Observe generally accepted safety procedures in addition to the precautions listed here. **The overall safety of any system incorporating this accessory is the responsibility of the assembler of the system.**

### Symbols

These symbols appear on the probe body or in documentation to alert you to important safety considerations.



**CAUTION** of potential for damage to equipment, or **WARNING** of potential for bodily injury. Attend to the information, and do not proceed until conditions are fully understood and met.



**ELECTROSTATIC DISCHARGE (ESD) HAZARD.** The probe is susceptible to damage if anti-static measures are not taken.

### Precautions

**Connect and disconnect properly.** Connect probe to the measurement instrument before connecting the test leads to a circuit/signal being tested.

**Use only within operational environment listed.** Do not use in wet or explosive atmospheres.

**Use indoors only.**

**Keep product surfaces clean and dry.**

**Be careful with sharp tips.** The tips may cause bodily injury if not handled properly.

**Use only accessories designed for use with the product.**

**Observe all terminal ratings.** To avoid electric shock or probe damage, do not use the probe above the input limits shown on the probe.

**Do not excessively bend cables.**

**Do not operate with suspected failures.** Do not use the probe if any part is damaged. Cease operation immediately and secure the probe from inadvertent use.

### Operating Environment

The accessory is intended for indoor use and should be operated in a clean, dry environment. Before using this product, ensure that its operating environment is maintained within these parameters:

**Temperature:** 0 to 40° C

**Humidity:** Maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40° C

**Altitude:** Up to 10,000 ft (3,048 m)

### Introduction

The ZS Series (ZS1000, ZS1500, and ZS2500) are a small, high-impedance active probes designed to meet today's increasing demand for measurements on a variety of test points. With low input capacitance and high input resistance, circuit loading is minimized.

The ZS probes can be used with a variety of Teledyne LeCroy oscilloscopes with MAUI firmware version 6.5.0.5 or later (see the product page at [teledynelecroy.com/oscilloscope](http://teledynelecroy.com/oscilloscope) for compatibility). With the ProBus interface, the probe becomes an integral part of the oscilloscope, controlled from the oscilloscope's front panel. The oscilloscope provides power to the probe, so there is no need for a separate power supply or batteries.

See the ZS product page at [teledynelecroy.com](http://teledynelecroy.com) for probe specifications.

Key Benefits	Features
High frequency performance Low input capacitance Wide dynamic range ProBus interface	Small, low mass probe head is designed for ease of use and high performance. Probe tip socket fits easily onto 0.025 inch square pins for direct access to test points. Several available adaptors connect directly to the probe socket. Ground socket accepts several different ground leads to provide a short ground path for high frequency performance.



## Standard Accessories

ZS Series probes are shipped with the following standard accessories:

Standard Accessory	QTY	Replacement Part Number
Straight Pin Lead – Short	1	PK-ZS-003
Straight Pin Lead – Long	1	PK-ZS-004
Right Angle Lead – Short	1	PACC-LD003
Right Angle Lead – Long	1	PACC-LD004
Y Lead Adapter	1	PK-ZS-005
Micro-Grabber Pair	1	PK-ZS-007R and PK-ZS-007B
Ground Blade – Wide	1	PK-ZS-011
Probe Tip – Standard	3	PK-ZS-001
Right Angle Socket	1	PK-ZS-006
Offset Ground – Z Lead	1	PK-ZS-002
Ground Blade – Narrow	1	PK-ZS-008
Copper Tape	2	PK-ZS-009
Pogo Tip	1	PK-ZS-013
2.54mm Square Pin Adapter	1	PK-ZS-012
Channel ID Clips (1 set of 4)	4	PK-ZS-010
Freehand Probe Holder	1	PACC-MS005
Bent Tip	1	PACC-PT005
IC Tip	1	PACC-PT003
Pogo Ground Lead	1	PACC-CD008
Operator's Manual	1	N/A*
Certificate of Calibration	1	ZS-CC

\* PDF copy of this manual available free at [teledynelecroy.com/support/techlib](http://teledynelecroy.com/support/techlib).

### Tips

#### Straight Tip



The straight tip is rugged and designed for general probing. Fits in either probe socket.

#### IC Lead Tip



The IC Lead Tip is covered in insulation on all sides (except for a small edge). This tip was designed to prevent shorting neighboring IC leads. The gold part of the tip is not insulated and should touch the IC lead to be tested. It is one-size-fits-all and will work with any IC lead pitch. Fits in either probe socket.

#### Bent Tip



The Bent Tip is made out of titanium, this tip is ideal for situations that require you to hold the probe parallel to the circuit board under test. Also gives you more control when holding the probe like a pencil. Fits in either probe socket.

#### Pogo Tip



The pogo tip provides z-axis compliance. The tip can fit into a socket or onto an IC leg.

#### Discrete SMD Tip



The crescent shape of this tip is designed to fit tightly on capacitors, resistors, transistors and other surface mount components with discrete leads. Fits in either probe socket.

#### 2.54mm Square Pin Adapter



2.54 mm Square Pin Adapter. The 2.54 mm square pin adapter fits into both the input and ground lead of the ZS probe for easy connection to standard 2.54 mm square pin spacing on a circuit board.

## Grounds

### Offset Ground



The Offset Ground is designed to be attached to either socket of the probe head. The Offset Ground connects to the ground socket and wraps around the probe head, making it possible to probe a signal and ground that are extremely close together. The short length provides the highest quality grounding for high frequency applications.

### Narrow Ground Blade and Copper Pad



The Narrow Ground Blade and Copper Pad together are the best grounding solution for probing an IC. The Narrow Ground Blade is designed to provide a short, low inductance ground path. The Copper Pad is adhesive backed to stick to the top of an IC, and can then be soldered to the IC ground.

### Wide Ground Blade

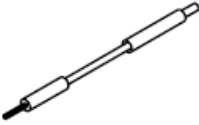


The Wide Ground Blade is ideal for use when the best quality ground is needed. The wide blade offers the minimal inductance compared to the narrow ground blade.

### Leads

While longer leads provide greater flexibility when connecting the probe to a circuit, the added inductance may degrade the fidelity of high frequency signals.

#### Short and Long Straight Pin Lead



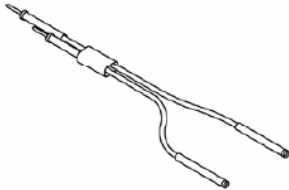
These leads have a socket on one end and a square pin on the other to connect to the input or ground socket of the probe body, and may be used for general purpose probing.

#### Short and Long Right Angle Pin Lead



These leads have a socket on one end with a right angle and a square pin on the other to connect to the input or ground socket of the probe body, and may be used for general purpose probing.

#### Y Lead



This lead is used for both ground and input lead simultaneously. It has two sockets on one end and two square pins on the other and may be used for general purpose probing.

### Clips and Grabbers

#### Channel ID Clips

The Channel ID Clips can be attached to the probe cable to quickly identify to which channel the probe is currently connected: CH1 yellow, CH2 red, CH3 green, and CH4 blue.

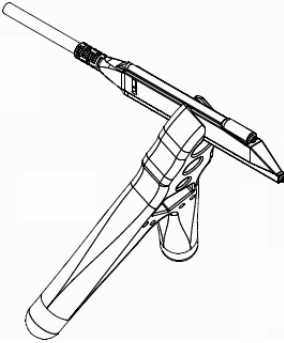
#### Micro-Grabbers



The micro-grabbers are ideal for connecting to small IC legs or pins very tightly spaced.

## Probe Holder

### Freehand Probe Holder

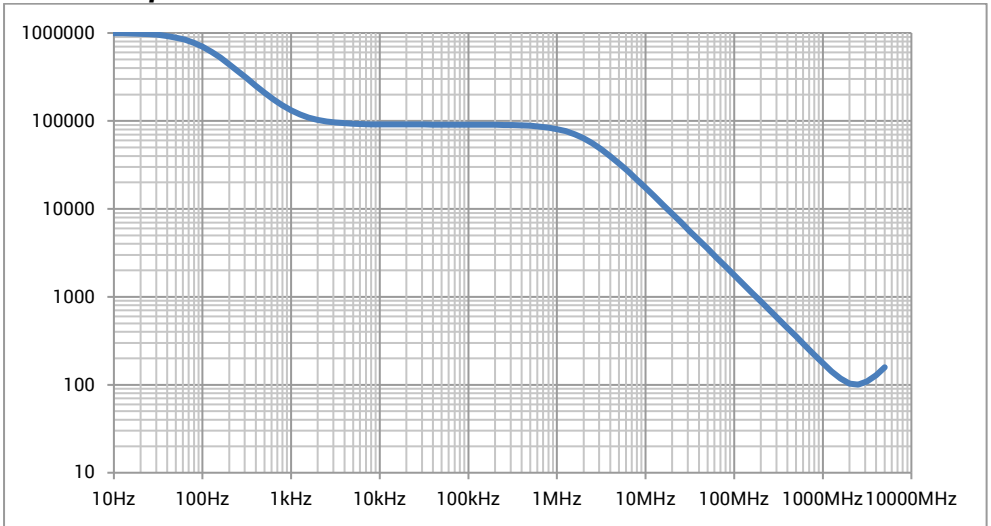


The FreeHand lets you focus on the oscilloscope screen instead of on maintaining contact to multiple test points. It allows you to concentrate on what is really important – the waveform.

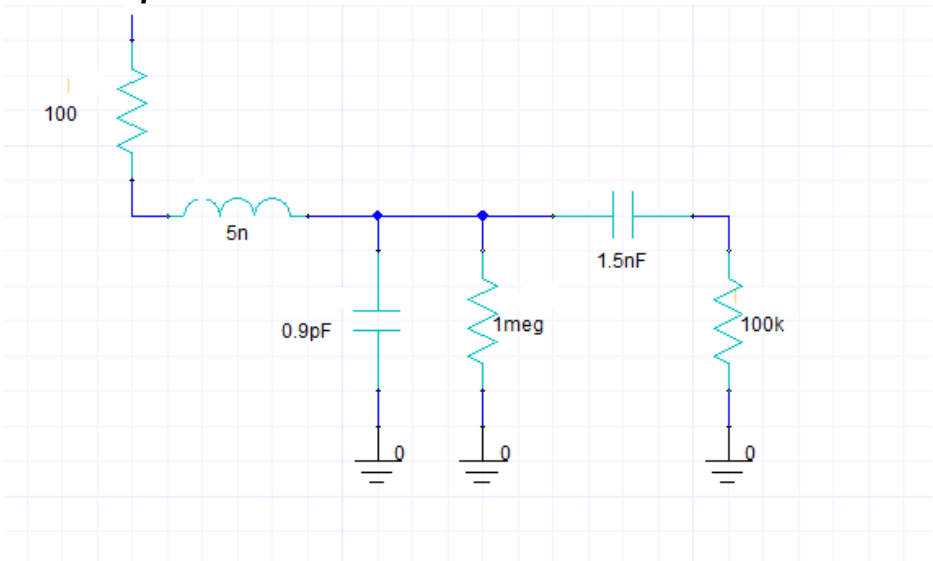
It is designed to keep most of the weight on the probe tip and will prevent lost contact when a bump to the table shakes the circuit under test.

## Probe Impedance and Loading

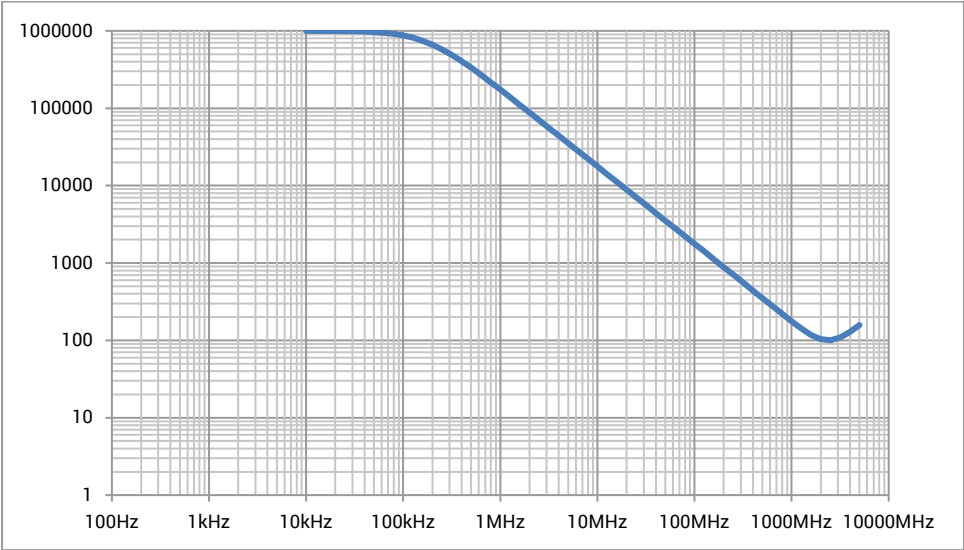
### ZS1x00 Impedance Chart



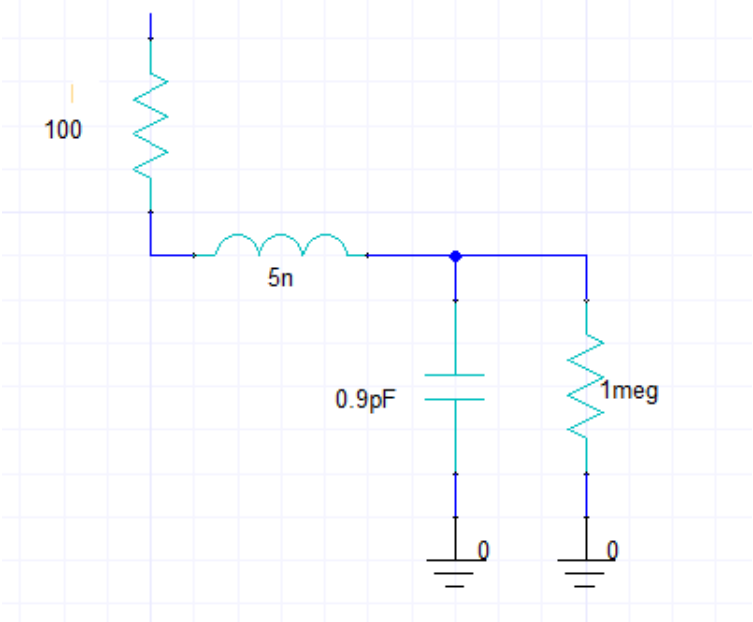
### ZS1x00 Equivalent Circuit



### ZS2500 Impedance Chart



### ZS2500 Equivalent Circuit



## Probe Operation

### Handling the Probe

The ZS Series probes are precision test instruments. Exercise care when handling and storing the probe. Always handle the probe by the probe body or compensation box. Avoid putting excessive strain or exposing the probe cable to sharp bends.



**ESD Sensitive:** The tips of the probes are sensitive to Electrostatic Discharge (ESD). Avoid causing damage to the probe by always following anti-static procedures (wear wrist strap, etc.) when using or handling the probe.

### Connecting the Probe to the Test Circuit

To maintain the high performance capability of the probe in measurement applications, care must be exercised in connecting the probe to the test circuit. Increasing the parasitic capacitance or inductance in the input paths may introduce a “ring” or slow the rise time of fast signals. Input leads which form a large loop area will pick up any radiated electromagnetic field which passes through the loop and may induce noise into the probe input.

Using one of the available accessories makes the ZS probe with its small profile and low mass head ideally suited for applications in dense circuitry.

### Connecting the Probe to an Oscilloscope

ZS Series probes are designed for use with Teledyne LeCroy platforms equipped with the ProBus interface. When you attach the probe output connector to the oscilloscope’s input connector, the oscilloscope recognizes the probe, provides proper termination, and activates the probe control functions in the user interface.



## Operation with a Teledyne LeCroy Oscilloscope

When the ZS probe is connected to any compatible Teledyne LeCroy oscilloscope, the displayed scale factor and measurement values are automatically adjusted. A Probe dialog appears behind the corresponding Channel dialog.

The probe can be controlled through the oscilloscope front panel:

- The **Volts/Div** knob controls the oscilloscope's scale factor to give full available dynamic range up to 2 V/div (16 V peak to peak).
- The channel **Offset** knob controls the probe input offset circuit over its range of  $\pm 12$  V.

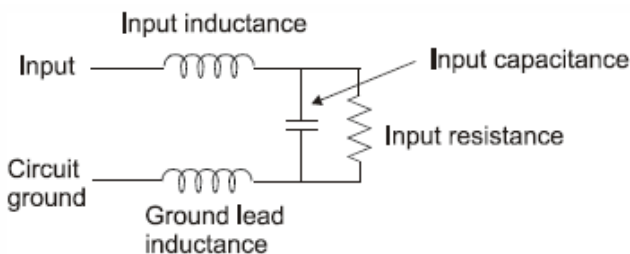
## High Frequency Measurements

### *Probe Input Loading*

When you touch a probe to the circuit under test, the probe will affect your measurement because of the probe's input impedance introduced into the circuit. All probes present resistive, capacitive and inductive loading.

### *Inductive Loading (Lead Length)*

A significant element in this circuit is the inductance shown in the input ground leads of the oscilloscope probe.



*Probe input equivalent circuit*

The ground lead is the primary return path for the current resulting from the input voltage acting on the probe's input impedance. The ground lead and input lead inductances act with the probe's input capacitance to form series LC network. The impedance of a series LC network drops dramatically at its

## ZS Series High-Impedance, Active Probes

---

resonant frequency. This is the cause of the "ring" we often see after the leading edge of pulses in measured waveforms.

This effect is referred to as ground lead corruption. Because it is impossible to eliminate either the L or C from this circuit, the method to improve waveform fidelity is to raise the resonant frequency beyond the bandwidth of interest in the measurement.

The resonant frequency of a simple LC circuit can be represented by:

$$F_{resonance} = \frac{1}{2\pi\sqrt{LC}}$$

The resonant frequency of a series LC circuit can be raised by decreasing the inductance, capacitance or both. Since the input capacitance is already very low and cannot be reduced, you can only try to reduce the inductance. This can be accomplished by using the shortest possible input lead as well as the shortest possible ground lead.

For example, to obtain the shortest possible ground lead when measuring IC related signals, attach a small piece of copper clad material to the top of the IC package and connect this to the package grounding wires.

Using the shortest ground lead and input lead available makes probing signals on the package easier and makes for the shortest lead length for the best signal fidelity. To illustrate how dramatic this effect is, we will work a simple example. Assuming an input capacitance of 0.9 pF and a total lead length (input and ground) of 2 inches (inductance of  $\approx 25$  nH/inch) such a setup may cause ringing with a resonant frequency ( $f_0$ ) of:

$$f_o = \frac{1}{2\pi\sqrt{50 * 10^{-9} * 0.9 * 10^{-12}}} = 750 \text{ MHz}$$

This frequency is well within the passband of the probe and therefore shows up as part of the measured signal at faster time/div settings.

To determine how fast a waveform to be measured can be without causing ringing on a probe like this, divide the BW (ringing frequency) of the probe into 0.35:

$$t_{rise} = \frac{0.35}{BW} = \frac{0.35}{750 \text{ MHz}} = 0.47 \text{ ns}$$

Any input signal with a rise time faster than 0.47 ns can cause ringing.

### Capacitive Loading

Capacitive loading is usually the most troublesome of the three loading effects. It can affect the rise time, bandwidth and delay time measurements. At higher frequencies the capacitive loading can affect the amplitude as well as the waveshape of the measured signal by introducing an exponential response to the waveform.

For a simple RC network the time constant of this exponential response is:

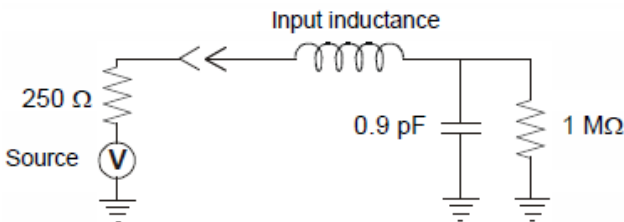
$$t_{rise} = 2.2 \times C_{total} \times R_{total}$$

Where  $C_{total}$  is the combined probe and circuit capacitance and  $R_{total}$  is combined circuit and probe resistance.

For a setup where  $C_t = 0.9 \text{ pF}$  and a source resistance is  $250 \Omega$ , the measured rise time will be 0.495 ns, which will correspond to a bandwidth of 909 MHz, assuming no inductive loads.

$$t_{rise} = 2.2 \times 0.9 \times 10^{-12} \times 250 \Omega = 0.495 \text{ ns}$$

Parallel combination of  $250 \Omega$  and  $1 \text{ M}\Omega$  is still  $250 \Omega$



*Example probe input equivalent circuit*

To illustrate the effect of capacitive loading at higher frequencies:

- At frequency 750 MHz the reactance of the 0.9 pF capacitance is 236  $\Omega$
- At frequency 1.0 GHz the reactance has been lowered to 177  $\Omega$

## ZS Series High-Impedance, Active Probes

---

If, at a given frequency, the source impedance is large with respect to the input impedance, a measurable reduction in the output signal amplitude may occur.

$$V_{out} = \frac{Z_{probe}}{Z_{probe} + Z_{source}} \times V_{in}$$

where  $Z_{probe}$  is the probe's input impedance and  $Z_{source}$  is the source impedance.

For example: At 750 MHz, where the probe input impedance has reduced to 236  $\Omega$ , and a source resistance of 250  $\Omega$  the probe output amplitude is reduced to:

$$V_{out} = \frac{236}{236 + 250} = 0.49 * V_{in}$$

# Care and Maintenance

## Cleaning

The exterior of the probe and cable should be cleaned using a soft cloth moistened with water. Abrasive agents, strong detergents, or other solvents may damage the probe. Always ensure that input leads are free of debris.



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

## Calibration Interval

The recommended calibration interval is one year from the time the probe is put into service. The complete performance verification procedure should be performed as the first step of annual calibration.

## Service Strategy

The ZS probes utilize fine pitch surface mount devices. It is therefore impractical to attempt to repair in the field. Defective probes must be returned to a Teledyne LeCroy service facility for diagnosis and exchange. Defective probes under warranty are repaired or replaced. A probe that is not under warranty can be exchanged for a factory refurbished probe for a modest fee. You must return the defective probe in order to receive credit for the probe core.

## Replacement Parts

The probe connection accessories and other common parts can be ordered through the North America Customer Care Centers. Refer to the Standard Accessories table (p.3).

# Performance Verification

This procedure can be used to verify the warranted characteristics of a ZS Series High Impedance Active Probe. It tests:

- Output Zero Voltage
- LF Attenuation Accuracy

Performance verification can be completed without removing the probe covers or exposing the user to hazardous voltages.

**NOTE:** The correct operation of the ZS probe controls requires software version 6.5.0.5 or higher. The oscilloscope software version can be verified by going to Utilities > Utilities Setup > Status. Contact your local Teledyne LeCroy representative or visit [teledynelecroy.com](http://teledynelecroy.com) if the software in your oscilloscope requires updating.

## Required Test Equipment

This procedure has been developed to minimize the number of calibrated test instruments required. Only equipment listed in boldface must be calibrated to the accuracy indicated. Because the input and output connector types may vary on different brands and models of test instruments, additional adaptors or cables may be required.

The warranted characteristics of the probe are valid at any temperature within the Operating Environment (p.2) listed in this manual. However, some of the other test equipment used to verify the performance may have environmental limitations required to meet the accuracy needed for the procedure. Be sure that the ambient conditions meet the requirements of all the test equipment used in his procedure.

**NOTE:** The function generator used in this Performance Verification Procedure is used for making relative measurements. Because the output of the generator is measured with an oscilloscope in this procedure, it is not required to calibrate the generator.

Description	Minimum Requirement	Example Equipment
Oscilloscope	ProBus Interface; Windows-based	Teledyne LeCroy WaveRunner 8000 or HDO 6000
Digital Multimeter (DMM) with test probe leads	<b>4.5 digit</b> <b>DC: 0.1% Accuracy</b> <b>AC: 0.1% Accuracy</b>	Keysight 34401A Fluke 8842A-09
Function Generator	Sine Wave output Amplitude adjustable to 14.14 Vp-p (5 Vrms) into 1 MΩ at 70 Hz	Keysight 33120A Stanford Research DS340
Power Supply	0-12 V, settable to 10 mV	HP E3611A
BNC Coaxial Cable (2 ea.)	Male to Male, 50 Ω, 36" Cable	Pomona 2249-C-36 Pomona 5697-36
BNC Tee Connector	Male to Dual Female	Pomona 3285
Calibration Fixture	ProBus Extender Cable	Teledyne LeCroy PROBUS-CF01
Terminator, Precision, BNC	50 Ω ± 0.05%	Teledyne LeCroy TERM-CF01
Banana Plug Adapter (2 ea.)	Female BNC to Dual Banana Plug	Pomona 1269
BNC to Mini-grabber	BNC Mail to Mini-grabber Cable, 36"	Pomona 5187-C-36

### Test Setup and Preliminary Procedure

1. Connect the probe to the female end of the ProBus Extension Cable. Connect the male end of the ProBus Extension Cable to channel 1 of the oscilloscope.
2. Turn on the oscilloscope and allow at least 20 minutes warm-up time for the probe and oscilloscope before performing the Verification Procedure.
3. Turn on the other test equipment and allow them to warm up for the manufacturer's recommended timeframe.
4. While the instruments are reaching operating temperature, make a photocopy of the Performance Verification Test Record and fill in the necessary data.

### Functional Check

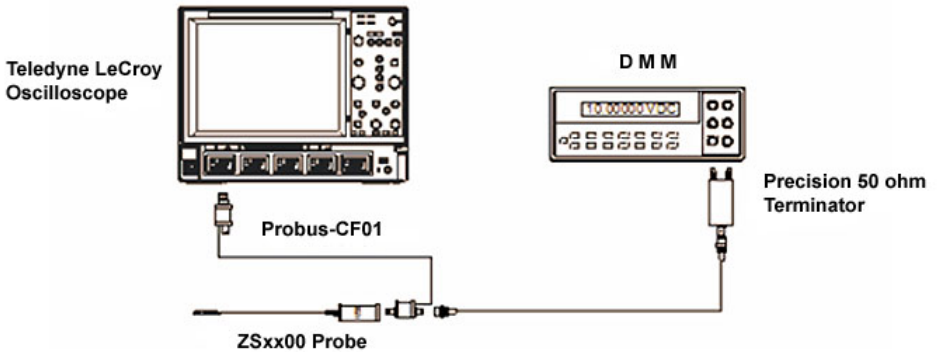
The functional check verifies the basic operation of the probe functions. Perform the Functional Check prior to the Performance Verification.

1. Return to the factory default settings:
  - Choose File > Recall Setup from the menu bar.
  - Touch the Recall Default button.
2. Touch the C1 descriptor box to open the C1 dialog.
3. Verify that the probe is sensed and the correct model displayed on the probe dialog tab behind the C1 dialog.



## Verification Procedure

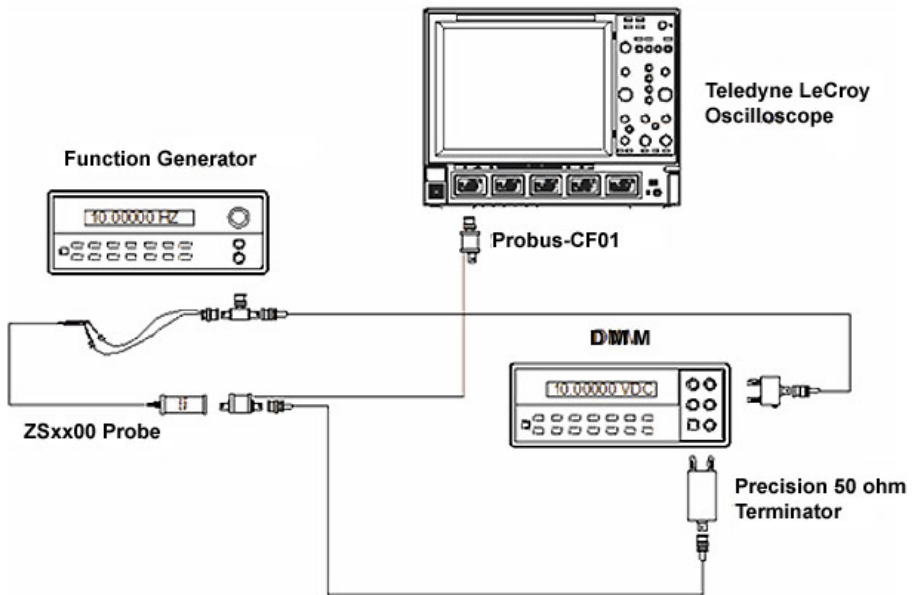
### A. Output Zero Voltage



*Output Zero Voltage Test Setup*

1. Connect one end of a BNC cable to the female BNC connector on the probe end of the ProBus extender cable. Connect the precision 50  $\Omega$  terminator to the other end of the BNC cable.
2. Connect the banana plugs of the Precision terminator to the input of the DMM. Make sure that the plug corresponding to the BNC shield (marked "Ground") is connected to the **LOW** or **COMMON** input of the DMM.
3. Set the OFFSET on the oscilloscope to zero.
4. Set the DMM to read DC Volt on the most sensitive range.
5. Record the voltage measured on the DMM to 100  $\mu\text{V}$  resolution as "Output Zero Voltage" in the Test record.
6. Check that the voltage indicated by the DMM is between  $\pm 1.0$  mV.
7. Disconnect the DMM from the precision 50  $\Omega$  terminator. Leave the remaining setup in place for the next test.

## B. LF Attenuation Accuracy



*LF Attenuation Accuracy Setup*

1. Disconnect the BNC tee at the power supply from the dual banana plug adapter. Connect the BNC tee to the output of the function generator. (Use a 50  $\Omega$  termination if the function generator requires such a load.)
2. Carefully insert the Straight Tips (supplied in accessory kit) into the sockets of the probe head. Attach the red lead of the mini-grabber to the signal input and the black lead to the ground input of the probe head.
3. Connect the BNC tee to the output of the function generator. (Use a 50  $\Omega$  termination if the function generator requires such a load).
4. Attach a BNC cable to the unused female port of the BNC tee and connect a dual banana plug adapter to the other end of the cable and plug the dual banana plug adapter into the DMM input. Be sure the side of the banana plug adapter corresponding to the BNC shield (marked "GROUND") is connected to the **LOW** or **COMMON** input of the DMM.

5. Set the DMM to read AC volt and set the range to measure 5.0 Vrms.
6. Set the mode of the function generator to sine wave, the frequency to 70 Hz and the output amplitude to 5 Vrms  $\pm$ 10 mV as measured on the DMM.
7. Record the output voltage to 1 mV resolution as "Generator Output Voltage" in the Test Record. Be careful not to alter the output amplitude after the reading is recorded.
8. Divide the reading recorded in step B-7 by 10 and record the result with 100  $\mu$ V resolution as "Expected Output Voltage, top range" in the Test Record.
9. Remove the banana plug adapter, connected to the function generator, from the DMM and connect the precision 50  $\Omega$  terminator to the DMM, making sure that the banana plug side marked "GROUND" is connected to the **LOW** or **COMMON** input of the DMM.
10. After the DMM reading has stabilized, record the reading to 100  $\mu$ V resolution as "Measured Output Voltage, top range" in the Test Record.
11. Calculate the error by dividing the measured top range output voltage recorded in step B10 by the expected top range output voltage recorded in step B-8. Subtract 1 from this ratio and multiply by 100% to get the error in percent.
12. Record the calculated error to two decimal places ( $\pm$ 0.xx%) as "Gain Error, top range" in the test record.
13. Verify that the error is less than  $\pm$ 1.0 %.
14. Disconnect the precision 50  $\Omega$  terminator from the DMM.
15. Connect the banana plug adapter connected via a BNC cable to the BNC tee at the function generator to the DMM. Verify that the side of the plug marked 'Ground' is connected to the **LOW** or **COMMON** input of the DMM.
16. Adjust the sine wave generator output amplitude to approximately 2.5 Vrms as measured on the DMM.
17. Record the reading to 1 mV resolution as "Generator Output Voltage, mid range" in the Test Record. Be careful not to alter the output amplitude after the reading is recorded.

## ZS Series High-Impedance, Active Probes

---

18. Divide the reading recorded in step B-17 by 10.
19. Record the result to 100  $\mu\text{V}$  resolution as "Expected Output Voltage, mid range" in the test record.
20. Remove the banana plug adapter from the DMM and connect the precision 50  $\Omega$  terminator to the DMM, making sure that the banana plug side marked "GROUND" is connected to the LOW or COMMON input of the DMM.
21. After the DMM has stabilized, record the reading to 100  $\mu\text{V}$  resolution as "Measured Output Voltage, mid range" in the Test record.
22. Calculate the error by dividing the measured mid range output voltage recorded in step B-21 by the expected mid range output voltage recorded in step B-19. Subtract 1 from this ratio and multiply by 100% to get the error in percent.
23. Record the calculated error to two decimal places ( $\pm 0.xx$  %) as "Gain Error, mid range" in the Test record.
24. Verify that the mid range gain error is less than  $\pm 1.0\%$

This completes the Performance Verification of the ZS probe. Complete and file the Test Record, as required to support your internal calibration procedure.

Apply suitable calibration label to the probe housing as required.

## ZS Series Probe Test Record

Technician: \_\_\_\_\_

Date: \_\_\_\_\_

### Equipment Used

Equipment	Model	Serial Number	Cal Due Date
Oscilloscope			
Digital Multimeter			
Function Generator			
Probe			
Lead			
Tip			

### Test Record

#### OUTPUT ZERO VOLTAGE

Step	Description	Results
A-4	<b>Output Zero</b> (Test limit $\leq \pm 1.0$ mV)	mV

#### LF ATTENUATION ACCURACY

Step	Description	Results
B-7	Generator Output Voltage	V
B-8	Expected Output Voltage, top range	V
B-10	Measured Output Voltage, top range	V
B-12	<b>Gain Error</b> , top range (Test Limit $\leq \pm 1.0\%$ )	%
B-17	Generator Output Voltage	V
B-19	Expected Output Voltage, mid range	V
B-21	Measured Output Voltage, mid range	V
B-23	<b>Gain Error</b> , mid range (Test Limit $\leq \pm 1.0\%$ )	%

Permission is granted to photocopy this page to record the results of the Performance Verification procedure. The test limits are included in each step. Create a new record for each probe, lead, and tip combination.

## Reference Material

### Certifications

Teledyne LeCroy certifies compliance to the following standards as of the date of publication. For the current certifications, see the EC Declaration of Conformity shipped with your product.

#### **EMC Compliance**

##### **EC DECLARATION OF CONFORMITY - EMC**

The probe meets intent of EC Directive 2014/30/EU for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

IEC/EN 61326-1:2013 EMC requirements for electrical equipment for measurement, control, and laboratory use<sup>1</sup>

##### **Electromagnetic Emissions:**

IEC/EN 55011/A1:2010 Radiated and Conducted Emissions Group 1 Class A<sup>2,3</sup>

##### **Electromagnetic Immunity:**

IEC/EN 61000-4-2:2009 Electrostatic Discharge, 4 kV contact, 8 kV air, 4 kV vertical/horizontal coupling planes<sup>4</sup>

IEC/EN 61000-4-3/A2:2010 RF Radiated Electromagnetic Field, 3 V/m, 80-1000 MHz; 3 V/m, 1400 MHz - 2 GHz; 1 V/m, 2 GHz - 2.7 GHz

- 1 To ensure compliance with applicable EMC standards, use high-quality shielded interface cables.
- 2 This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.
- 3 Emissions which exceed the levels required by this standard may occur when the probe is connected to a test object.
- 4 Meets Performance Criteria "B" limits of the standard: during disturbance, product undergoes a temporary degradation or loss of function or performance which is self-recoverable.

##### **European Contact:**

Teledyne LeCroy Europe GmbH  
Im Breitspiel 11c  
D-69126 Heidelberg  
Germany  
Tel: (49) 6221 82700

### **AUSTRALIA & NEW ZEALAND DECLARATION OF CONFORMITY - EMC**

The probe complies with the EMC provision of the Radio Communications Act per the following standards, in accordance with requirements imposed by the Australian Communication and Media Authority (ACMA):

AS/NZS CISPR 11:2009/A1:2010, IEC 55011:2009/A1:2010 Radiated and Conducted Emissions, Group 1, Class A.

#### **Australia / New Zealand Contacts:\***

RS Components Pty Ltd.  
Suite 326 The Parade West  
Kent Town, South Australia 5067

RS Components Ltd.  
Units 30 & 31 Warehouse World  
761 Great South Road  
Penrose, Auckland, New Zealand

\* Visit [teledynelecroy.com/support/contact](http://teledynelecroy.com/support/contact) for the latest contact information.

### **Safety Compliance**

#### **EC DECLARATION OF CONFORMITY – LOW VOLTAGE**

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:

IEC/EN 61010-031:2015 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 031: Safety requirements for handheld 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 2012/19/EU and 2013/56/EU 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, visit [teledynelecroy.com/recycle](http://teledynelecroy.com/recycle).

#### **RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS)**

The product and its accessories conform to the 2011/65/EU RoHS2 Directive.

### Returning a Product for Service

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.

For a complete list of Teledyne LeCroy offices by country, including our sales and distribution partners, visit: [teledynelecroy.com/support/contact](http://teledynelecroy.com/support/contact).



## Technical Support

### ***Live Support***

Registered users can contact their local Teledyne LeCroy service center at the number listed on our website. You can also request Technical Support via the website at:

[teledynelecroy.com/support/techhelp](http://teledynelecroy.com/support/techhelp)

### ***Resources***

Teledyne LeCroy publishes a free Technical Library on its website. Manuals, tutorials, application notes, white papers, and videos are available to help you get the most out of your Teledyne LeCroy products. Visit:

[teledynelecroy.com/support/techlib](http://teledynelecroy.com/support/techlib)

### ***Service Centers***

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

[teledynelecroy.com/support/contact](http://teledynelecroy.com/support/contact)

Teledyne LeCroy  
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](mailto:contact.corp@teledynelecroy.com)

### **Support:**

Ph: 800-553-2769

[customersupport@teledynelecroy.com](mailto:customersupport@teledynelecroy.com)





932001-00 Rev A  
December, 2019



700 Chestnut Ridge Road  
Chestnut Ridge, NY 10977  
USA

[teledynelecroy.com](http://teledynelecroy.com)