



CT4192 User Manual

Safety Summary

To avoid personal injury and/or product damage, review and comply with the following safety precautions. These precautions apply to both operating and maintenance personnel and must be followed during all phases of operation, service, and repair of this probe.

A **WARNING** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A **CAUTION** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

Do Not Work Alone

Do not work alone when working with high voltages.

Inspect the Probe

Inspect the probe and accessories for cracks and frayed or broken leads before each use. If defects or damages are noted, DO NOT USE the probe.

Dry Conditions

Hands, shoes, floor, and work bench must be dry. Avoid making measurements under humidity, dampness, or other environmental conditions that might affect safety.

Do Not Remove the Probe's Casing

Removal of the probe's casing may expose you to electric shock. If necessary, disconnect the inputs and outputs of the probe before opening the case.

Hazardous Contact

To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.

Unexpected Charges

Hazardous voltages may be present in unexpected locations in circuitry being tested when a fault condition in the circuit exists.

Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

Use Only in Office-Type Indoor Setting

The probe is designed to be used in office-type indoor environments. Do not operate the probe:

- In the presence of noxious, corrosive, flammable fumes, gases, vapors, chemicals, or finely-divided particulates.
- In environments where there is a danger of any liquid being spilled on the probe.
- In air temperatures exceeding the specified operating temperatures.
- In atmospheric pressures outside the specified altitude limits or where the surrounding gas is not air.

Not for Critical Applications

This probe is not authorized for use in contact with the human body or for use as a component in a life-support device or system.

Do Not Substitute Parts

Do not install substitute parts or perform any unauthorized modification to the instrument.

Only Qualified Personnel

Only qualified personnel should use this probe. This differential voltage probe is designed to be used by personnel who are trained, experienced, or otherwise qualified to recognize hazardous situations and who are trained in the safety precautions necessary to avoid possible injury when using such a device.

Observe Maximum Working Voltage

Do not use the CT4192 probe above its maximum working voltage ranges. See “Electronic Characteristics” on page 8.

Use Proper Power Source

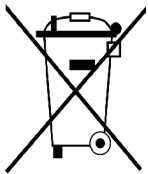
Do not operate this probe from a power source that applies more than the voltage specified.

Must be Grounded

This probe is grounded by the shell of the BNC connector through the grounding conductor of the power cord of the measurement instrument. Before making connections to the input leads of this probe, ensure that the output BNC connector is attached to the BNC connector of the measurement instrument, and that the measurement instrument is properly grounded. Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.

Compliance Statements

Disposal of Old Electrical & Electronic Equipment



(Applicable in the European Union and other European countries with separate collection systems). This product is subject to Directive 2012/19/EU of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

This probe is in compliance with IEC-61010-031 CAT II, Pollution Degree 2.



1 Introduction

Overview

Differential probes allow safe, accurate measurement between two voltage points where neither point is referenced to ground. The CT4192 offers a 70 MHz bandwidth. Compatible with oscilloscopes from all major manufacturers, the probe can be battery operated, or powered by the optional 9 V adapter (CT3723).

Features

- Meets IEC 61010-031 safety standard
- 70 MHz bandwidth (-3dB)
- Up to ± 700 V (DC + AC peak) common mode
- Selectable attenuation settings of 10x/100x
- Power indicator
- High accuracy ($\pm 1\%$)
- Powered by 4 AA batteries (included)
- Power adapter, CT3723 (optional)

Initial Inspection

This unit is tested prior to shipment. It is therefore ready for immediate use upon receipt. An initial physical inspection should be made to ensure that no damage has been sustained during shipment. After the inspection, verify the contents of the shipment. The included accessories for this product are:

- Differential probe
- (2) Hook probes, black & red
- (4) AA batteries
- Offset adjustment tool
- User manual

2 Product Overview

CT 4192 Description

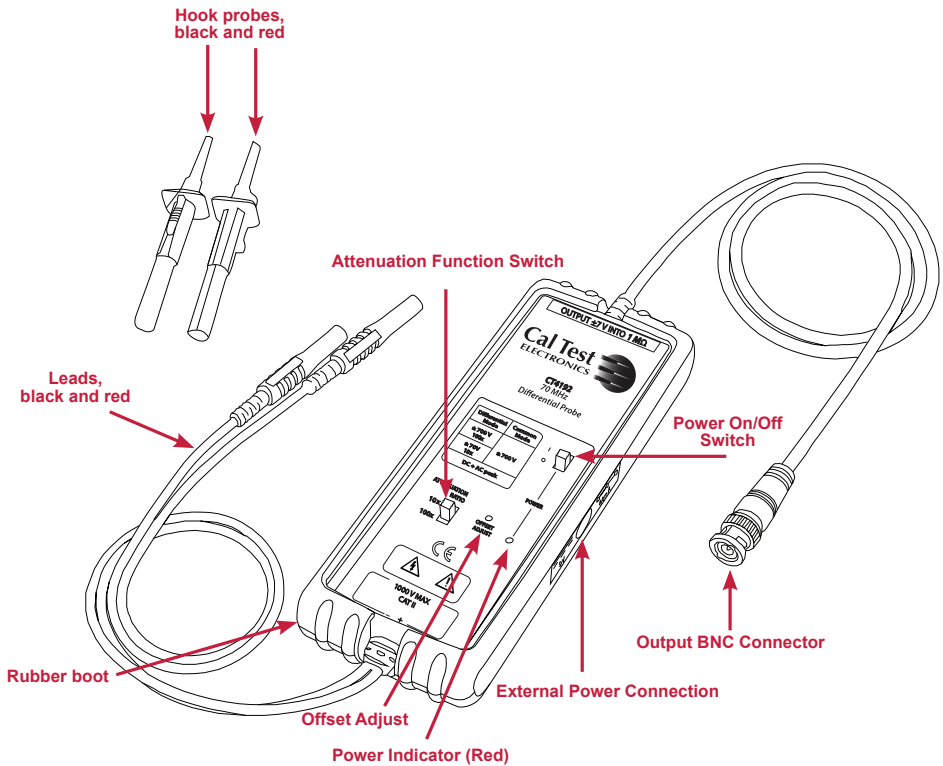


Figure 1 Front Panel Features

3 Using the Probe

Power Connection

Take the rubber boot off of the probe. Slide open the battery compartment and insert 4 AA batteries, being sure to match polarity with the printed indicators inside the compartment. Then Slide the cover back and replace the rubber boot. See Figure 2.

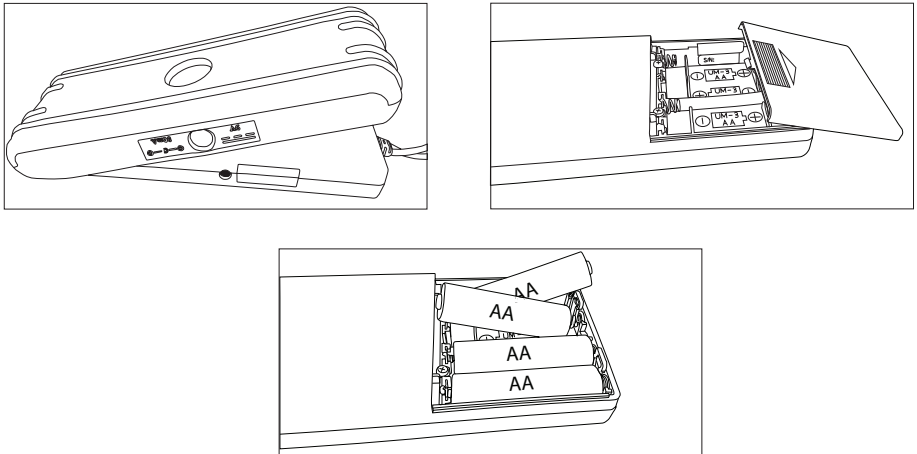
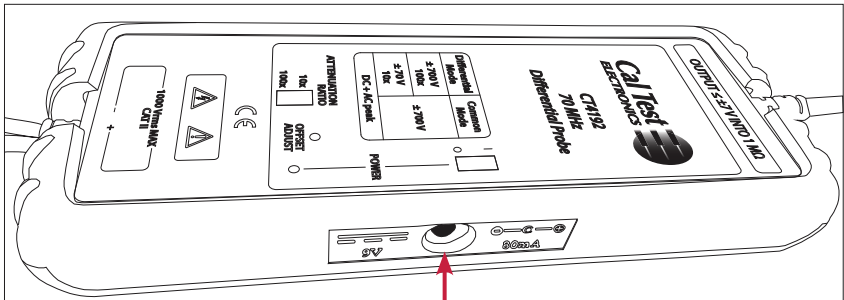


Figure 2 Battery Connection

Alternatively, connect the 9 VDC power adapter to the power jack on the probe. See Figure 3. Connect power adapter to an appropriate voltage source.



Power Jack

Figure 3 Power Jack

Getting Started

1. Connect the BNC output connector to the vertical input of a general purposed oscilloscope or other measurement instrument. The measurement instrument must have a ground referenced.
2. Connect power source.
3. Select the proper attenuation ratio. When measuring signals below 70 V, switch the attenuation ratio to 10x in order to get higher resolution and less noise ratio. For voltages up to 700 V, set the attenuation ratio to 100x.
4. Plug the hook probes onto the test leads and connect the circuit to be tested.
5. Slide the power switch on the probe to the “ I ” position. The indicator will light up.

CAUTION

This probe is used to carry out differential measurements between two points on the circuit under test. This probe is not designed for electrically insulating the circuit under test or the measuring instrument.

Vertical Scale on Oscilloscope

The actual vertical scale of the oscilloscope is equal to the attenuation factor multiplied by the range of vertical scale selected on the oscilloscope. For example, with the probe on factor 10x and the oscilloscope on 0.5 V/div, the real vertical scale is $10 \times 0.5 = 5$ V/div. With the probe on 100x, the real vertical scale is $100 \times 0.5 = 50$ V/div. These values apply when the oscilloscope is set to the typical 1 M Ω impedance input. When the scope is set to 50 Ω input, the actual vertical scale will be doubled: 10 V/div for the 10x setting and 100 V/div for the 100x setting. See the chart below.

Vertical Scale on Oscilloscope				
Scope Input Impedance	Probe Attenuation Setting	Actual Attenuation Setting	Vertical Scale Reading on the Oscilloscope	Actual Vertical Scale of the Oscilloscope
1 M Ω	10x	10x	0.5 V/div	5 V/div
1 M Ω	100x	100x	0.5 V/div	50 V/div
50 Ω	10x	20x	0.5 V/div	10 V/div
50 Ω	100x	200x	0.5 V/div	100 V/div

Table 1 Oscilloscope Readings

Offset Zero Procedure

The CT4192 can be adjusted to zero the probe's offset voltage using the offset adjustment tool supplied with the probe. Follow this procedure to perform the offset adjustment.

1. Connect the probe to Channel 1 of the oscilloscope. Turn on the probe power. You may use the CT3723 or batteries to power the probe. Set the probe attenuation ratio to the low setting.
2. Short the + and - probe inputs together with the hook tips.
3. Turn on power to the oscilloscope. Leave both the instrument and the probe turned on for 30 minutes to stabilize.
4. Press [Default Setup] and [Auto] on the oscilloscope.
5. Press the Channel 1 button, then press the probe softkey and set the attenuation to match that of the probe.
6. Set the oscilloscope to DC coupled mode and then the trace on the scope to 0 volts.
7. If possible, set the oscilloscope to average mode (x16) or high-resolution mode to reduce oscilloscope noise.
8. Using the offset adjustment tool (included), adjust the probe offset voltage to 0 volts.

4 Cleaning

This probe does not require any particular cleaning. If necessary, clean the case with a soft cloth.

WARNING

Dry the probe thoroughly before attempting to make voltage measurements.

CAUTION

Avoid immersing or using abrasive cleaners or solvents containing Benzene (or similar solvents) on the probe as these can cause deterioration of the probe body and cables.

5 Specifications

All specifications apply to the unit after a temperature stabilization time of 20 minutes over an ambient range of $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$.

Electrical Characteristics	
Bandwidth	70 MHz
Rise Time	7.5 ns
Attenuation	10x/100x
Accuracy	$\pm 1\%$
AC CMRR	-80 dB @ 50 Hz -60 dB @ 20 kHz -46 dB @ 1 MHz -40 dB @ 10 MHz
Maximum Differential Input Voltage (DC + AC peak)	$\pm 70\text{ V @ } 10\text{x}$ $\pm 700\text{ V @ } 100\text{x}$
Maximum Common-Mode Input Voltage (DC + AC peak)	$\pm 70\text{ V @ } 10\text{x}$ $\pm 700\text{ V @ } 100\text{x}$
Absolute Max Rated Input Voltage (each side to ground)	1000 Vrms
Input Resistance // Capacitance	4 M Ω // 5.5 pF (each side to ground)
Output Voltage Swing	$\pm 7\text{ V}$ (driving 1 M Ω oscilloscope input)
Offset (typical)	$\pm 5\text{ mV}$ (adjustable)
Noise (typical)	2 mVrms
Source Impedance	50 Ω
Power Supply	4 AA batteries (included)* or CT3723 power adapter (optional)
Power Consumption	80 mA (about 9 VDC)

*Power indicator will flicker when battery voltage drops to 4.5 V or below

Mechanical Characteristics

Weight	400 g (with probe and rubber boot)
Dimensions	170 x 63 x 21 mm
BNC Cable Length	95 cm
Input Leads Length	45 cm each

Environmental Characteristics

Operating Temp/Humidity	-10°C to 40°C / up to 85% RH
Storage Temp/Humidity	-30°C to 70°C / up to 85% RH
Pollution Degree	Pollution Degree 2
Altitude	Operating: 3,000 m Nonoperating: 15,300 m

Safety Specifications

IEC 61010-031 CAT II

Specifications are subject to change without notice. To ensure the most current version of this manual, please download the current version from our website: caltestelectronics.com.

6 Voltage Derating Curve

The derating curve of the absolute maximum input voltage in common mode is shown as follows:

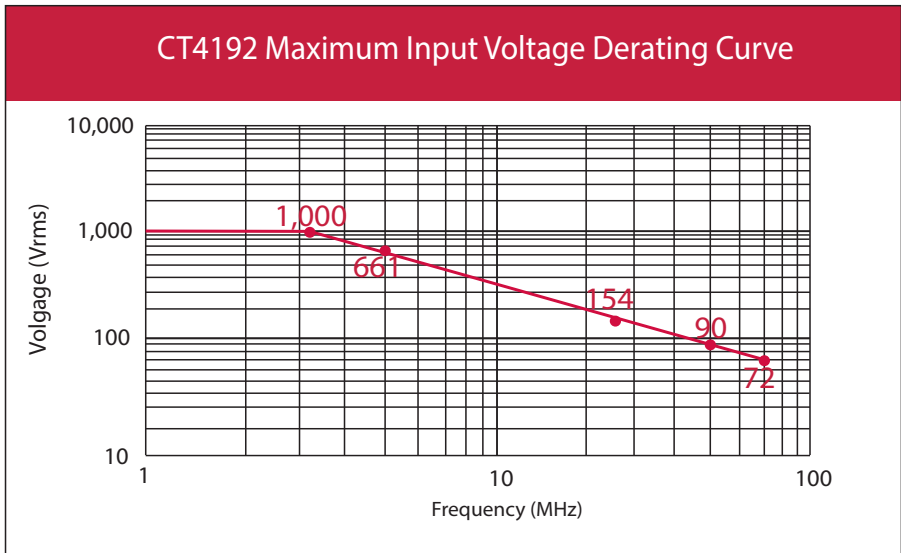


Figure 4 Derating Curve

7 Service & Warranty Information

Limited One-Year Warranty

Cal Test Electronics warrants this product to be free from defective material or workmanship for a period of 1 year from the date of original purchase. Under this warranty, Cal Test Electronics is limited to repairing the defective device when returned to the factory, shipping charges prepaid, within the warranty period.

Units returned to Cal Test Electronics that have been subject to abuse, misuse, damage, or accident, or have been connected, installed, or adjusted contrary to the instructions furnished by Cal Test Electronics, or that have been repaired by unauthorized persons, will not be covered by this warranty.

Cal Test Electronics reserves the right to discontinue models, change specifications, price, or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees, or agents.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of Cal Test Electronics is authorized to assume any other obligation in connection with the sale and purchase of this device.

Service

If you have a need for calibration or repair services, technical, or sales support, please contact us:

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Notes

