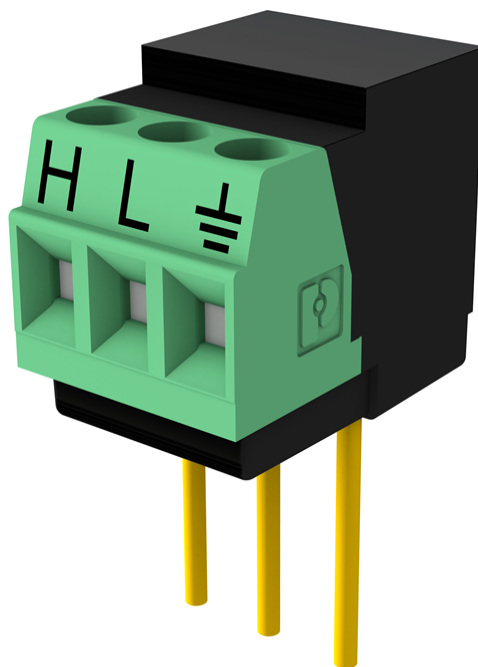




# VDIV10:1 and VDIV2:1

Voltage Divider  
Terminal Input Modules



# Please read first

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## About this manual

Please note that this manual was produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this. In addition, while most of the information in the manual is correct for all countries, certain information is specific to the North American market and so may not be applicable to European users. Differences include the U.S. standard external power supply details where some information (for example the AC transformer input voltage) will not be applicable for British/European use. Please note, however, *that when a power supply adapter is ordered from Campbell Scientific it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials (antennas) may also not be applicable according to your locality. Some brackets, shields and enclosure options, including wiring, are not sold as standard items in the European market; in some cases alternatives are offered.

## Recycling information for countries subject to WEEE regulations 2012/19/EU



At the end of this product's life it should not be put in commercial or domestic refuse but sent for recycling. Any batteries contained within the product or used during the products life should be removed from the product and also be sent to an appropriate recycling facility, per [The Waste Electrical and Electronic Equipment \(WEEE\) Regulations 2012/19/EU](#). Campbell Scientific can advise on the recycling of the equipment and in some cases arrange collection and the correct disposal of it, although charges may apply for some items or territories. For further support, please contact Campbell Scientific, or your local agent.

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# 1. Function

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Voltage dividers are a type of terminal input module that reduce voltage to a fraction of the original voltage. Reducing voltage output is necessary if an expected output is greater than the maximum range a data logger can measure.

The VDIV10:1 and VDIV2:1 are compatible with GRANITE 6, VOLT 108, VOLT 116, CR6, CR3000, CR1000X, CR800-series, and CR300-series data loggers. Each voltage divider module may be used to measure one differential voltage or two single-ended voltages.

As the VDIV10:1 is a 10:1 voltage divider, the output voltage is one-tenth the input voltage. This allows a maximum of  $\pm 50$  volts to be measured on data loggers with a  $\pm 5000$  mV range (GRANITE 6, VOLT 108, VOLT 116, CR6, CR3000, CR1000X, and CR800-series data loggers). The VDIV2:1 is a 2:1 voltage divider, allowing a maximum of  $\pm 10$  volts to be measured on data loggers with a  $\pm 5000$  mV range.

The CR300-series data loggers have an input range of  $-100$  to  $+2500$  mV. This allows a maximum of 25 volts to be measured with the VDIV10:1, or 5 volts with the VDIV2:1.

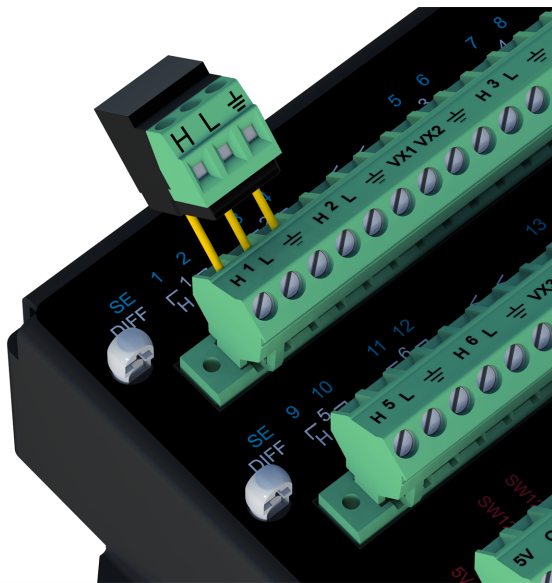


Figure 1-1. Terminal input module

# 2. Specifications

## 2.1 VDIV10:1

10:1 resistive divider

Resistors:	90 k $\Omega$ and 10 k $\Omega$
Ratio tolerance @ 25 °C:	$\pm 0.02\%$
Ratio temperature coefficient:	2 ppm/°C
Power rating:	0.1 W per element (@ 70 °C)
Maximum input voltage:	50 V
Compliance:	View compliance documents at: <a href="http://www.campbellsci.com/vdiv10-1">www.campbellsci.com/vdiv10-1</a>

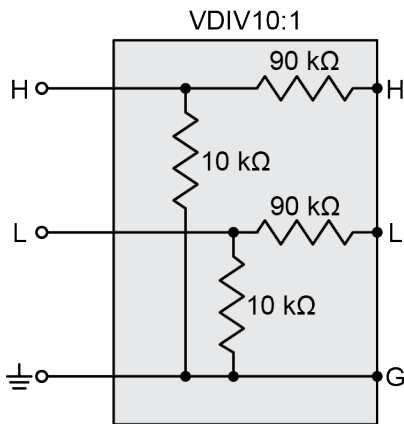


Figure 2-1. VDIV10:1 schematic

## 2.2 VDIV2:1

2:1 resistive divider

Resistors:	10 k $\Omega$ and 10 k $\Omega$
Ratio tolerance @ 25 °C:	$\pm 0.02\%$
Ratio temperature coefficient:	2 ppm/°C

Power rating:	0.1 W per element (@ 70 °C)
Maximum input voltage:	10 V
Compliance:	View compliance documents at: <a href="http://www.campbellsci.com/vdiv2-1">www.campbellsci.com/vdiv2-1</a>

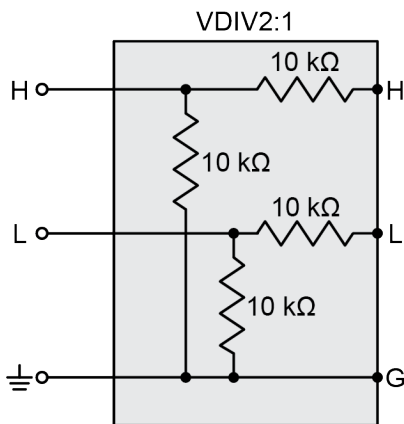


Figure 2-2. VDIV2:1 schematic

## 3. Wiring

Each voltage divider module may be used to measure one differential voltage (Figure 3-1 [p. 4]) or two single-ended voltages (Figure 3-2 [p. 4]).

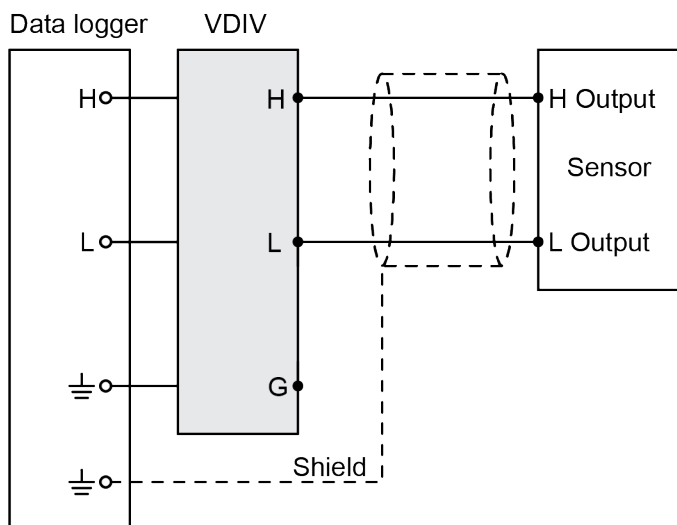


Figure 3-1. Wiring for differential voltage measurement

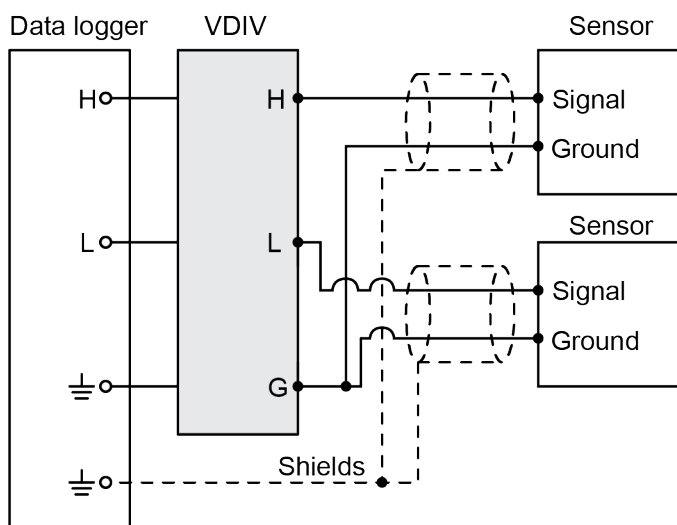


Figure 3-2. Wiring for single-ended voltage measurements

Table 3-1: Data logger wiring			
Function	VDIV	CR3000, CR1000X, CR800 series, CR300 series	GRANITE 6, CR6
Output high	H	H	U (odd)
Output low	L	L	U (even)
Ground	⏏	⏏	⏏

# 4. Programming

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The output of the voltage divider is measured with the appropriate voltage measurement instruction. A differential input is measured with the `VolDiff()` instruction. A single-ended input is measured with the `VolSE()` instruction. Select the smallest input voltage range that will accommodate the maximum expected output. Using the smallest possible range provides the best measurement resolution.

The following is a typical voltage divider measurement using the `VolDiff()` instruction for the CR1000X data logger. In this example, the instruction can safely measure a voltage of up to 50 VDC using the mV5000 input range and the VDIV10:1.

```
VolDiff(DiffVolt,1,mV5000,1,True,500,60,.01,0)
```

## 4.1 Example

A downloadable example program is available at [www.campbellsci.com/downloads/vdiv-example-program](http://www.campbellsci.com/downloads/vdiv-example-program). The program is written for the CR1000X. Other data loggers will be very similar.

The example uses the `VolDiff()` instruction to measure the voltage of a 12 volt battery system that may actually experience voltages in excess of 14 volts. Using the VDIV10:1 10:1 voltage divider, the 14 volt output will be divided to  $14/10 = 1.4$  volts, or 1400 mV. Thus the voltage range on which to make the measurement is the  $\pm 5000$  mV range on the GRANITE 6, VOLT 108, VOLT 116, CR6, CR3000, and CR1000X, or the  $\pm 2500$  mV range on the CR800 series and CR300 series.

The multiplier to use with the voltage measurement must take into account the divisor, the calibration of the sensor, and the units desired for the result. In the example, voltage is divided by 10 and read by the data logger as millivolts (i.e.,  $(V/10) \times 10^3 = V \times 10^2$ ). To output directly in volts, use a multiplier of 0.01.



# Limited warranty


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Covered equipment is warranted/guaranteed against defects in materials and workmanship under normal use and service for the period listed on your sales invoice or the product order information web page. The covered period begins on the date of shipment unless otherwise specified. For a repair to be covered under warranty, the following criteria must be met:

1. There must be a defect in materials or workmanship that affects form, fit, or function of the device.
2. The defect cannot be the result of misuse.
3. The defect must have occurred within a specified period of time; and
4. The determination must be made by a qualified technician at a Campbell Scientific Service Center/ repair facility.

The following is not covered:

1. Equipment which has been modified or altered in any way without the written permission of Campbell Scientific.
2. Batteries; and
3. Any equipment which has been subjected to misuse, neglect, acts of God or damage in transit.


Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page of the manual for a list of [regional offices](#) or visit [www.campbellsci.com/contact](http://www.campbellsci.com/contact)  to determine which Campbell Scientific office serves your country. For directions on how to return equipment, see [Assistance](#).

Other manufacturer's products, that are resold by Campbell Scientific, are warranted only to the limits extended by the original manufacturer.

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In the event of any conflict or inconsistency between the provisions of this Warranty and the provisions of Campbell Scientific's Terms, the provisions of Campbell Scientific's Terms shall prevail. Furthermore, Campbell Scientific's Terms are hereby incorporated by reference into this Warranty. To view Terms and conditions that apply to Campbell Scientific, Logan, UT, USA, see [Terms and Conditions](#) . To view terms and conditions that apply to Campbell Scientific offices outside of the United States, contact the [regional office](#) that serves your country.

# Assistance

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Products may not be returned without prior authorization. Please inform us before returning equipment and obtain a **return material authorization (RMA) number** whether the repair is under warranty/guarantee or not. See [Limited warranty](#) for information on covered equipment.

Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page of the manual for a list of [regional offices](#) or visit [www.campbellsci.com/contact](http://www.campbellsci.com/contact)  to determine which Campbell Scientific office serves your country.

When returning equipment, a RMA number must be clearly marked on the outside of the package. Please state the faults as clearly as possible. Quotations for repairs can be given on request.

It is the policy of Campbell Scientific to protect the health of its employees and provide a safe working environment. In support of this policy, when equipment is returned to Campbell Scientific, Logan, UT, USA, it is mandatory that a “[Declaration of Hazardous Material and Decontamination](#)” form be received before the return can be processed. If the form is not received within 5 working days of product receipt or is incomplete, the product will be returned to the customer at the customer’s expense. For details on decontamination standards specific to your country, please reach out to your [regional Campbell Scientific](#) office.

## NOTE:

All goods that cross trade boundaries may be subject to some form of fee (customs clearance, duties or import tax). Also, some regional offices require a purchase order upfront if a product is out of the warranty period. Please contact your [regional Campbell Scientific](#) office for details.

# Safety

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DANGER — MANY HAZARDS ARE ASSOCIATED WITH INSTALLING, USING, MAINTAINING, AND WORKING ON OR AROUND TRIPODS, TOWERS, AND ANY ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC. FAILURE TO PROPERLY AND COMPLETELY ASSEMBLE, INSTALL, OPERATE, USE, AND MAINTAIN TRIPODS, TOWERS, AND ATTACHMENTS, AND FAILURE TO HEED WARNINGS, INCREASES THE RISK OF DEATH, ACCIDENT, SERIOUS INJURY, PROPERTY DAMAGE, AND PRODUCT FAILURE. TAKE ALL REASONABLE PRECAUTIONS TO AVOID THESE HAZARDS. CHECK WITH YOUR ORGANIZATION'S SAFETY COORDINATOR (OR POLICY) FOR PROCEDURES AND REQUIRED PROTECTIVE EQUIPMENT PRIOR TO PERFORMING ANY WORK.

Use tripods, towers, and attachments to tripods and towers only for purposes for which they are designed. Do not exceed design limits. Be familiar and comply with all instructions provided in product manuals. Manuals are available at [www.campbellsci.com](http://www.campbellsci.com) You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified engineer. If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

## General

- Protect from over-voltage.
- Protect electrical equipment from water.
- Protect from electrostatic discharge (ESD).
- Protect from lightning.
- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a hardhat and eye protection, and take other appropriate safety precautions while working on or around tripods and towers.
- Do not climb tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

## Utility and Electrical

- You can be killed or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in contact with overhead or underground utility lines.
- Maintain a distance of at least one-and-one-half times structure height, 6 meters (20 feet), or the distance required by applicable law, whichever is greater, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.
- Only use power sources approved for use in the country of installation to power Campbell Scientific devices.

## Elevated Work and Weather

- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

## Internal Battery

- Be aware of fire, explosion, and severe-burn hazards.
- Misuse or improper installation of the internal lithium battery can cause severe injury.

- Do not recharge, disassemble, heat above 100 °C (212 °F), solder directly to the cell, incinerate, or expose contents to water. Dispose of spent batteries properly.

#### Use and disposal of batteries

- Where batteries need to be transported to the installation site, ensure they are packed to prevent the battery terminals shorting which could cause a fire or explosion. Especially in the case of lithium batteries, ensure they are packed and transported in a way that complies with local shipping regulations and the safety requirements of the carriers involved.
- When installing the batteries follow the installation instructions very carefully. This is to avoid risk of damage to the equipment caused by installing the wrong type of battery or reverse connections.
- When disposing of used batteries, it is still important to avoid the risk of shorting. Do not dispose of the batteries in a fire as there is risk of explosion and leakage of harmful chemicals into the environment. Batteries should be disposed of at registered recycling facilities.

#### Avoiding unnecessary exposure to radio transmitter radiation

- Where the equipment includes a radio transmitter, precautions should be taken to avoid unnecessary exposure to radiation from the antenna. The degree of caution required varies with the power of the transmitter, but as a rule it is best to avoid getting closer to the antenna than 20 cm (8 inches) when the antenna is active. In particular keep your head away from the antenna. For higher power radios (in excess of 1 W ERP) turn the radio off when servicing the system, unless the antenna is installed away from the station, e.g. it is mounted above the system on an arm or pole.

#### Maintenance

- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

WHILE EVERY ATTEMPT IS MADE TO EMBODY THE HIGHEST DEGREE OF SAFETY IN ALL CAMPBELL SCIENTIFIC PRODUCTS, THE CUSTOMER ASSUMES ALL RISK FROM ANY INJURY RESULTING FROM IMPROPER INSTALLATION, USE, OR MAINTENANCE OF TRIPODS, TOWERS, OR ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC.

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