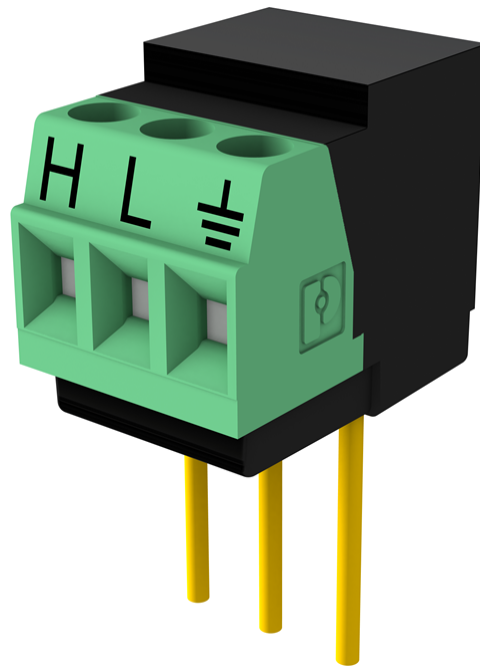




VDIV10:1 and VDIV2:1

Voltage Divider
Terminal Input Modules



Guarantee

This equipment is guaranteed against defects in materials and workmanship. We will repair or replace products which prove to be defective during the guarantee period as detailed on your invoice, provided they are returned to us prepaid. The guarantee will not apply to:

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- Batteries
- Any product which has been subjected to misuse, neglect, acts of God or damage in transit.

Campbell Scientific will return guaranteed equipment by surface carrier prepaid. Campbell Scientific will not reimburse the claimant for costs incurred in removing and/or reinstalling equipment. This guarantee and the Company's obligation thereunder is in lieu of all other guarantees, expressed or implied, including those of suitability and fitness for a particular purpose. Campbell Scientific is not liable for consequential damage.

Please inform us before returning equipment and obtain a Repair Reference Number whether the repair is under guarantee or not. Please state the faults as clearly as possible, and if the product is out of the guarantee period it should be accompanied by a purchase order. 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 a "Declaration of Hazardous Material and Decontamination" form will be issued for completion.

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Campbell Scientific Ltd,
80 Hathern Road,
Shepshed, Loughborough, LE12 9GX, UK
Tel: +44 (0) 1509 601141
Fax: +44 (0) 1509 270924
Email: support@campbellsci.co.uk
www.campbellsci.co.uk

About this manual

Please note that this manual was originally produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this origin.

Some useful conversion factors:

Area: 1 in ² (square inch) = 645 mm ²	Mass: 1 oz. (ounce) = 28.35 g 1 lb (pound weight) = 0.454 kg
Length: 1 in. (inch) = 25.4 mm 1 ft (foot) = 304.8 mm 1 yard = 0.914 m 1 mile = 1.609 km	Pressure: 1 psi (lb/in ²) = 68.95 mb
	Volume: 1 UK pint = 568.3 ml 1 UK gallon = 4.546 litres 1 US gallon = 3.785 litres

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 it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials 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. Details of the alternatives will be covered in separate manuals.

Part numbers prefixed with a “#” symbol are special order parts for use with non-EU variants or for special installations. Please quote the full part number with the # when ordering.

Recycling information



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.

Campbell Scientific Ltd 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 advice or support, please contact Campbell Scientific Ltd, or your local agent.



Campbell Scientific Ltd, 80 Hathern Road, Shepshed, Loughborough, LE12 9GX,
UK Tel: +44 (0) 1509 601141 Fax: +44 (0) 1509 270924
Email: support@campbellsci.co.uk
www.campbellsci.co.uk

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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.eu or by telephoning +44(0) 1509 828 888 (UK). 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

- 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, or 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.

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.

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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1. Function

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 ± 50 volts to be measured on data loggers with a ± 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 ± 10 volts to be measured on data loggers with a ± 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.

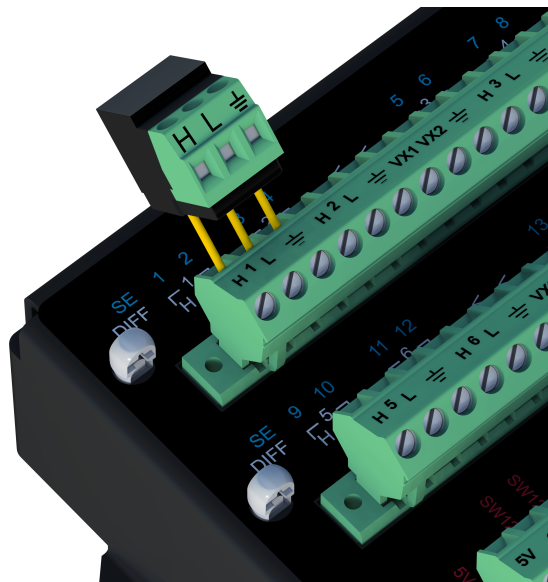


Figure 1-1. Terminal input module

2. Specifications

2.1 VDIV10:1

10:1 resistive divider

Resistors:	90 kW/10 kW
Ratio tolerance @ 25 °C:	±0.02%
Ratio temperature coefficient:	2 ppm/°C
Power rating:	0.1 W per element (@ 70 °C)
Maximum input voltage:	50 volts
Compliance:	View compliance documents at:

www.campbellsci.eu/vdiv10-1 

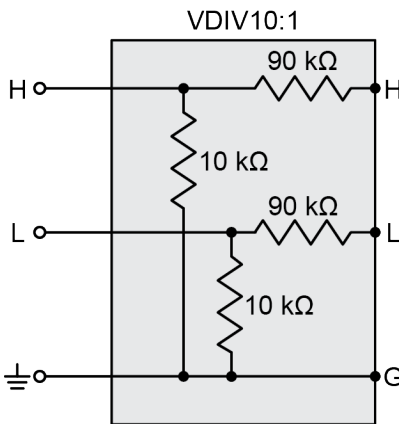


Figure 2-1. VDIV10:1 schematic

2.2 VDIV2:1

2:1 resistive divider

Resistors:	10 kW/10 kW
Ratio tolerance @ 25 °C:	±0.02%
Ratio temperature coefficient:	2 ppm/°C

Power rating:

0.1 W per element (@ 70 °C)

Maximum input voltage:

10 volts

Compliance:

View compliance documents at:

www.campbellsci.eu/vdiv2-1 

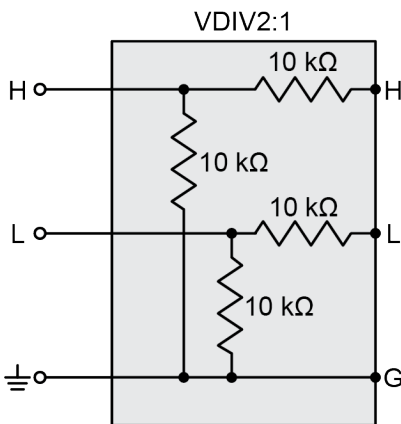


Figure 2-2. VDIV2:1 schematic

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]).

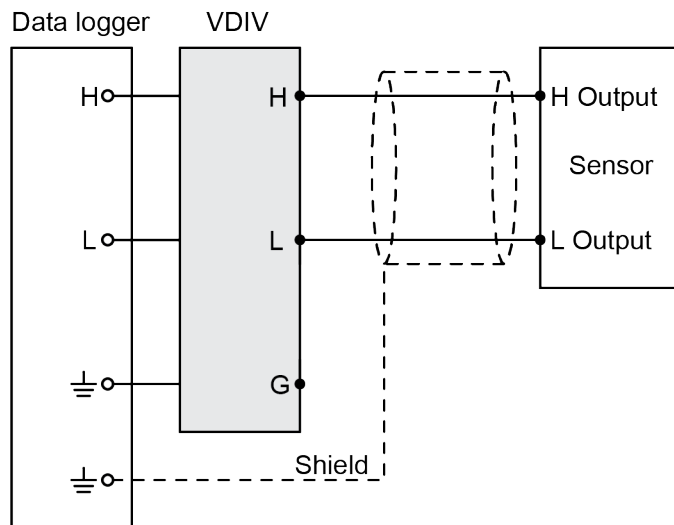


Figure 3-1. Wiring for differential voltage measurement

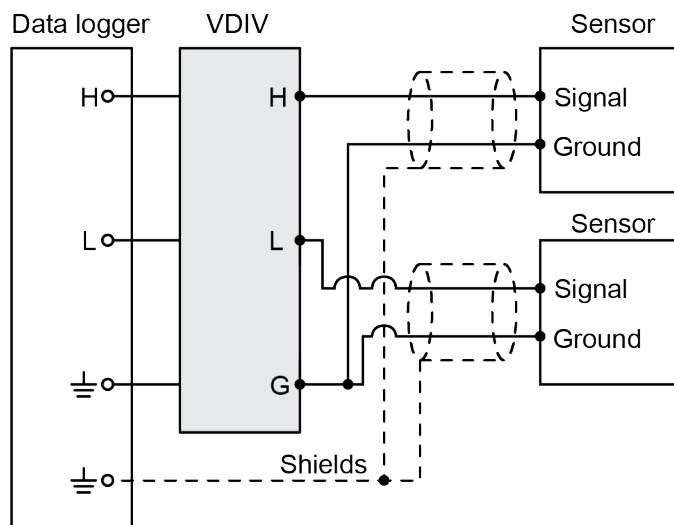


Figure 3-2. Wiring for single-ended voltage measurements

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

The output of the voltage divider is measured with the appropriate voltage measurement instruction. A differential input is measured with the `Voltdiff()` instruction. A single-ended input is measured with the `VoltSE()` 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 `Voltdiff()` 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.

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

4.1 Example

A downloadable example program is available at www.campbellsci.eu/downloads/vdiv-example-program. The  program is written for the CR1000X. Other data loggers will be very similar.

The example uses the `Voltdiff()` 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 ± 5000 mV range on the GRANITE 6, VOLT 108, VOLT 116, CR6, CR3000, and CR1000X, or the ± 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.



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UK

Location: Shepshed, Loughborough, UK
Phone: 44.0.1509.601141
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Phone: 435.227.9120
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