







# Limited Warranty

"Products manufactured by CSI are warranted by CSI to be free from defects in materials and workmanship under normal use and service for twelve months from the date of shipment unless otherwise specified in the corresponding product manual. (Product manuals are available for review online at www.campbellsci.com.) Products not manufactured by CSI, but that are resold by CSI, are warranted only to the limits extended by the original manufacturer. Batteries, fine-wire thermocouples, desiccant, and other consumables have no warranty. CSI's obligation under this warranty is limited to repairing or replacing (at CSI's option) defective Products, which shall be the sole and exclusive remedy under this warranty. The Customer assumes all costs of removing, reinstalling, and shipping defective Products to CSI. CSI will return such Products by surface carrier prepaid within the continental United States of America. To all other locations, CSI will return such Products best way CIP (port of entry) per Incoterms ® 2010. This warranty shall not apply to any Products which have been subjected to modification, misuse, neglect, improper service, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied. The warranty for installation services performed by CSI such as programming to customer specifications, electrical connections to Products manufactured by CSI, and Product specific training, is part of CSI's product warranty. CSI EXPRESSLY DISCLAIMS AND **EXCLUDES ANY IMPLIED WARRANTIES OF MERCHANTABILITY** OR FITNESS FOR A PARTICULAR PURPOSE. CSI hereby disclaims, to the fullest extent allowed by applicable law, any and all warranties and conditions with respect to the Products, whether express, implied or statutory, other than those expressly provided herein."

## Assistance

Products may not be returned without prior authorization. The following contact information is for US and international customers residing in countries served by Campbell Scientific, Inc. directly. Affiliate companies handle repairs for customers within their territories. Please visit <a href="https://www.campbellsci.com">www.campbellsci.com</a> to determine which Campbell Scientific company serves your country.

To obtain a Returned Materials Authorization (RMA) number, contact CAMPBELL SCIENTIFIC, INC., phone (435) 227-9000. Please write the issued RMA number clearly on the outside of the shipping container. Campbell Scientific's shipping address is:

#### CAMPBELL SCIENTIFIC, INC.

RMA#\_\_\_\_\_\_ 815 West 1800 North Logan, Utah 84321-1784

For all returns, the customer must fill out a "Statement of Product Cleanliness and Decontamination" form and comply with the requirements specified in it. The form is available from our website at <a href="www.campbellsci.com/repair">www.campbellsci.com/repair</a>. A completed form must be either emailed to <a href="repair@campbellsci.com">repair@campbellsci.com</a> or faxed to (435) 227-9106. Campbell Scientific is unable to process any returns until we receive this form. If the form is not received within three days of product receipt or is incomplete, the product will be returned to the customer at the customer's expense. Campbell Scientific reserves the right to refuse service on products that were exposed to contaminants that may cause health or safety concerns for our employees.

## Safety

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 or by telephoning (435) 227-9000 (USA). 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, 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 nonessential 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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# 24 Vdc Power Supplies

### 1. Introduction

A Campbell Scientific 24 Vdc power supply kit allows a datalogger and sensors to be powered when AC power is available on-site. AC voltage is routed into the enclosure and through a circuit breaker to the power supply. The power supply sends 24 Vdc to the rest of the system through a charger such as the CH200. It is also possible to use a rechargeable power supply (for example, PS150) if a battery reserve is required in case of AC power failure.

Three power supplies are available with different output amperage ratings (FIGURE 1-1). Available ratings include 3.8 Amps (pn 28370), 10 Amps (pn 28371), and 20 Amps (pn 28372). Verify the power supply provides adequate amperage for all system components that will be connected to the power supply.



FIGURE 1-1. 3.8 A (pn 28370), 10 A (pn 28371), and 20 A (pn 28372) power supplies

## 2. Cautionary Statements

- READ AND UNDERSTAND the Safety section at the front of this manual.
- Prior to performing site or installation work, obtain required approvals and permits.
- Use only qualified personnel for installation, use, and maintenance.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- The use of licensed and qualified contractors is highly recommended.
- Use only manufacturer recommended parts, materials, and tools.

- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.
- Use appropriate equipment and safety practices.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.
- 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.

#### NOTE

The incoming AC voltage wires must be attached to the Ground (G), Neutral (N), and Line (L) terminal blocks. Do not connect the AC directly to the 24 Vdc power supply. Full wiring instructions are given in Section 5, *Installation (p. 5)*.

### 3. Initial Inspection

The 24 Vdc power supply kit includes a 24 Vdc power supply, terminal blocks, circuit breaker, and the hardware required to mount them inside a Campbell Scientific enclosure (see FIGURE 3-1). Ensure all components are present (see TABLE 3-1).

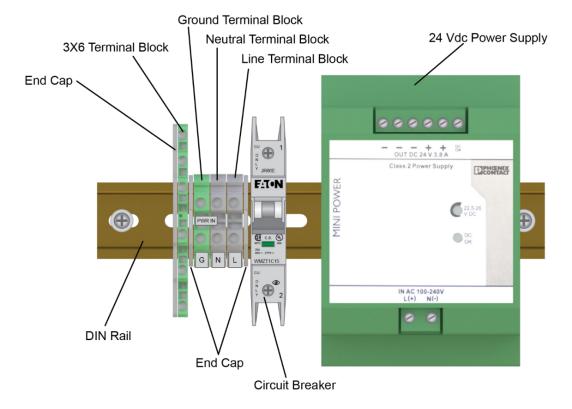


FIGURE 3-1. 24 Vdc power supply kit contents

TABLE 3-1. Parts List			
Item	Quantity		
Power Supply	1		
15 A Circuit Breaker	1		
End Cap (Gray)	2		
End Cap (Green/Yellow)	1		
Terminal Block (Gray)	2		
3 x 6 Terminal Block	1		
3 x 6 End Cap	1		
AC Black Wire	2		
AC White Wire	1		
AC Green Wire	3 (2 in 3.8 A kit)		
DC Black Wire	2		
DC Red Wire	2		
9-in DIN Rail	1		
DIN Rail Stopper	2		
#6-32 X .375 Screw	3		
Grommet	3		
Washer	3		
DIN Rail End Cap	2		

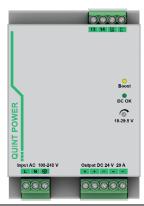
### NOTE

AC jumper wires in the 3.8 A and 10 A power supply kits are 14 AWG. DC jumper wires in the 3.8 A and 10 A power supply kits are 16 AWG. All jumper wires in the 20 A power supply kit are 12 AWG.

# 4. Specifications







Specification	pn 28370	pn 28371	pn 28372	
Nominal input voltage 100 to 240 Vac		100 to 240 Vac	100 to 240 Vac	
AC input voltage range	85 to 264 Vac	85 to 264 Vac	85 to 264 Vac	
DC input voltage range	90 to 350 Vdc	90 to 350 Vdc	90 to 350 Vdc	
AC frequency range	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz	
Inrush surge current	< 15 A (typical)	< 15 A (typical)	< 20 A (typical)	
Power failure bypass	120 Vac > 20 ms 230 Vac > 100 ms	120 Vac > 36 ms 230 Vac > 36 ms	120 Vac > 32 ms 230 Vac > 32 ms	
Input fuse	3.5 A 10 A (slow-blow, internal) (slow-blow internal)		12 A (slow-blow internal)	
Nominal output voltage	24 Vdc ±1% 24 Vdc ± 1%		24 Vdc ± 1%	
Setting range of the output voltage	22.5 to 26 Vdc (> 24 V constant capacity)	18 to 29.5 Vdc (> 24 V constant capacity)	18 to 29.5 Vdc (> 24 V constant capacity)	
Output current	3.8 A (-25 to 60 °C) 10 A (-25 to 60 °C		20 A (-25 to 60 °C)	
Derating	60 to 70 °C (2.5%/K)	60 to 70 °C (2.5%/K)	60 to 70 °C (2.5%/K)	
Residual ripple	$<40~\mathrm{mV_{pp}}$ (20 MHz)	< 50 mV <sub>pp</sub> (with nominal values)	< 30 mV <sub>pp</sub> (with nominal values)	
Maximum power dissipation, no load	2.5 W	9.1 W	8 W	
Maximum power loss of nominal load	12 W	22 W	40 W	

## 5. Installation

The power supply kit components are mounted on a DIN rail inside a Campbell Scientific enclosure. Each component will snap onto the DIN rail as shown in FIGURE 5-1.

#### **NOTE**

All wire gauge descriptions in these instructions are for the  $3.8\ A$  and  $10\ A$  power supply kits. The  $20\ A$  power supply kit uses  $12\ AWG$  wire for all connections.



FIGURE 5-1. DIN rail mounting procedure

1. FIGURE 5-2 shows the components of the kit mounted on a DIN rail. From left to right, these include a 3 x 6 terminal block, a ground terminal block, a neutral terminal block, a line terminal block, the circuit breaker, and the 3.8 A power supply. Also shown are a CR1000 datalogger and CH200 charging regulator (not included in the kit).



FIGURE 5-2. DIN rail components prior to wiring

2. Connect a black 14 AWG wire between the bottom of the breaker and the L(+) terminal on the power supply (FIGURE 5-3).

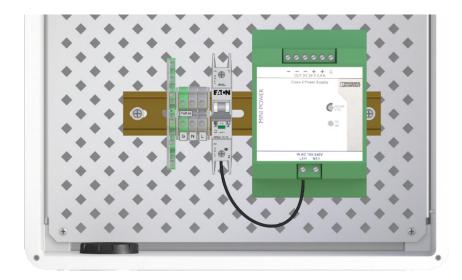


FIGURE 5-3. Connecting the L(+) terminal to the circuit breaker

3. Connect a black 14 AWG wire between the top of the breaker and the L (Line) terminal block (FIGURE 5-4).



FIGURE 5-4. Connecting the circuit breaker to the L (Line) terminal block

4. Connect a white 14 AWG wire between the N (Neutral) terminal block and the N(–) terminal on the power supply (FIGURE 5-5).

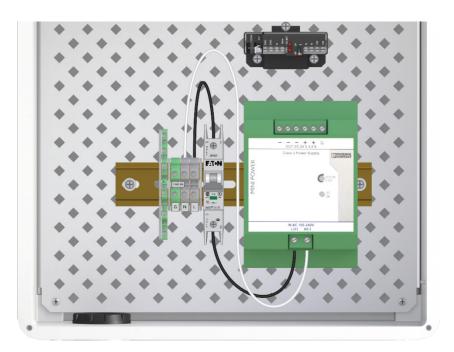


FIGURE 5-5. Connecting the N (Neutral) terminal block to the power supply

5. Connect the 3 x 6 terminal block to the datalogger (not included) ground point using a green/yellow 14 AWG ground wire (FIGURE 5-6). The remaining points on the terminal block are intended for additional accessories with ground lugs, such as the AVW200 or the SDM-CD8.



FIGURE 5-6. Connecting the 3 x 6 terminal block to the datalogger

6. Connect the bottom-side of the 3 x 6 terminal block to the enclosure ground lug (FIGURE 5-7).

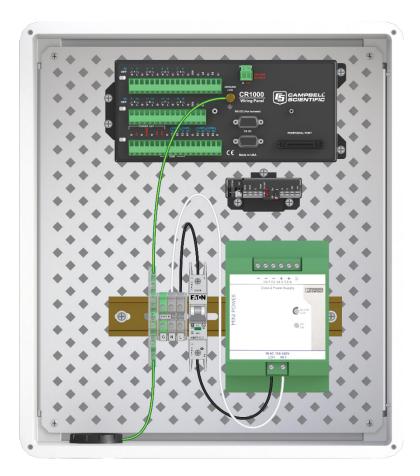


FIGURE 5-7. Connecting the 3  $\times$  6 terminal block to the enclosure ground lug

7. Use the included 16 AWG red and black wires to connect the output (+) and (-) terminals of the power supply to the two (2) CHG inputs on the CH150, or CH200 (not included in the kit). See FIGURE 5-8. The G and **Solar** terminals on the charging regulator are used when power input is from a solar panel. Use the red wire for the + terminal and the black wire for the – terminal

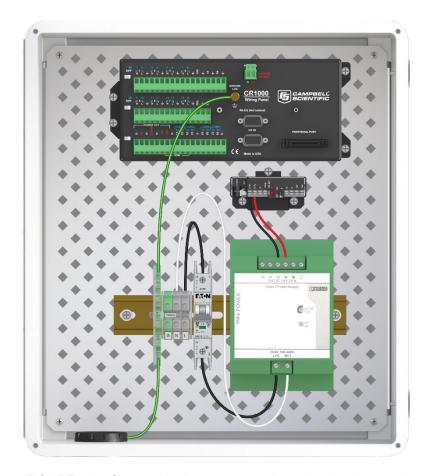


FIGURE 5-8. Connecting the power supply to the charging regulator

8. Use 16 AWG red and black wires to connect the CH150 or CH200 +12 and G terminals to the G and 12V on the datalogger (FIGURE 5-9). Use the red wire for the 12V terminals and the black wire for the G terminals.

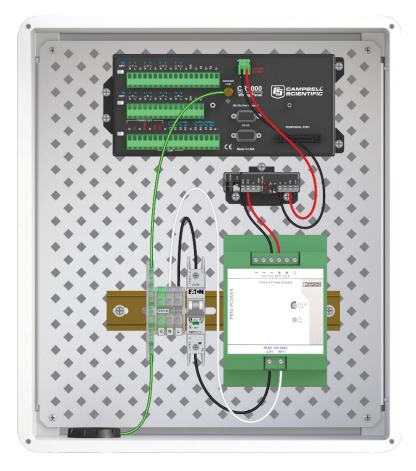


FIGURE 5-9. Connecting the charging regulator to the datalogger

9. FIGURE 5-10 shows an overview of the complete 10 amp kit Campbell Scientific pn 28371. The CR1000 and CH200 are not included in the kit. The 10 A power supply has a ground terminal, and requires a 14 AWG green wire to be connected between the ground terminal on the power supply and the G (Ground) terminal block as shown.

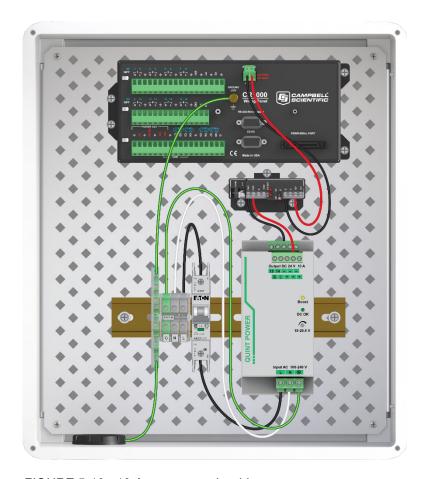


FIGURE 5-10. 10 A power supply wiring

10. FIGURE 5-11 shows an overview of the complete 20-amp kit Campbell Scientific pn 28372. The CR1000 and CH200 are not included in the kit. The 20 A power supply has a ground terminal, and requires a 12 AWG green wire to be connected between the ground terminal on the power supply and the G (Ground) terminal block as shown.

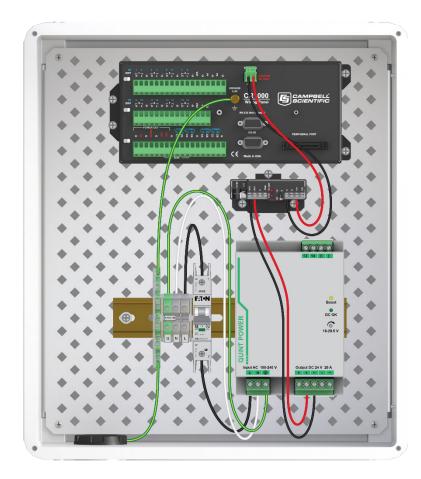


FIGURE 5-11. 20 A power supply wiring

11. Have a licensed and qualified electrical contractor complete the AC connections to the outside voltage source.

#### **NOTE**

The incoming AC voltage wires must be attached to the Ground (G), Neutral (N), and Line (L) terminal blocks. Do not connect the AC directly to the 24 Vdc power supply.

## 6. Troubleshooting

When troubleshooting the 24 Vdc power supply, begin by checking the 'DC OK' LED on the power supply (FIGURE 6-1). This LED remains lit whenever the power supply is receiving AC voltage and has a DC voltage output. If this LED is not lit, verify AC voltage is present from the outside power source. Also check the circuit breaker to ensure it has not been tripped. With the external power off, check the wire connections to ensure each terminal connection is secure.

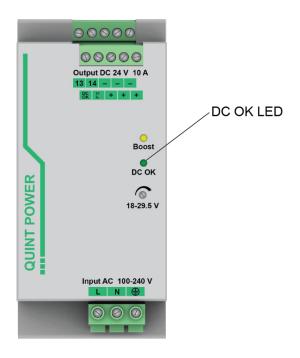


FIGURE 6-1. 24 Vdc power supply DC OK LED

If the 'DC OK' LED is lit, next look at the charging regulator. Campbell Scientific charging regulators include an LED that will light to indicate a valid charge source is found. The switch on the charging regulator must be in the 'On' position.

Current charging regulator LEDs will flash green to indicate the valid charge source. The PS150/CH150 will flash approximately once per second. The PS200/CH200 will flash approximately every 4 to 5 seconds. If this LED remains off with the switch in the 'On' position, the regulator is not receiving voltage from the 24 Vdc power supply. Check the wire connections between the two components.

#### **NOTE**

The PS100/CH100 has a red LED that lights constantly when a valid charge source is present.

Additional troubleshooting is possible by using a digital multimeter. With the power off, use the meter to check continuity of the wires between components. With the power on, check for the appropriate voltage at each connection. Take care to set the meter to the correct voltage type (AC or DC) for each measurement.

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