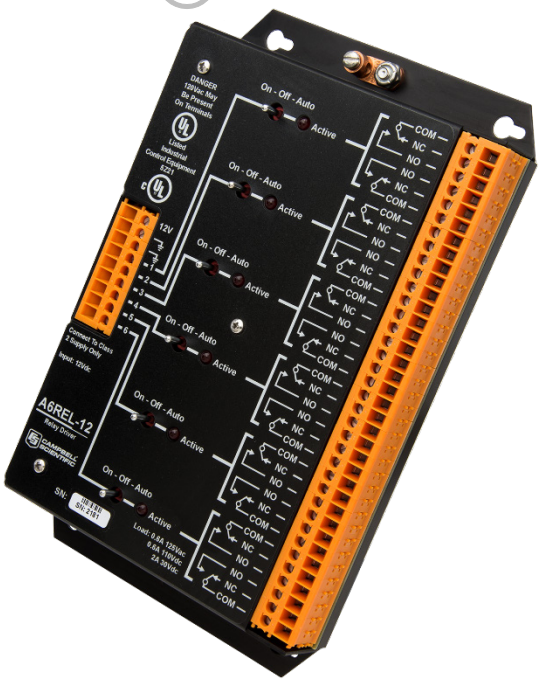
INSTRUCTION MANUAL

A6REL-12 Relay Driver

Revision: 4/17



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

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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 *www.campbellsci.com/repair*. A completed form must be either emailed to *repair@campbellsci.com* 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 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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A6REL-12 Relay Driver

1. Function

The A6REL-12 (FIGURE 1-1) drives six dual single pole double throw internal relays for control of up to 12 external AC or DC devices. Each of the six relays has a three position toggle switch: **ON** and **OFF** for manual override, and **AUTO** for datalogger control. In the **ON** position, the common (**COM**) and normally open (**N.O.**) contacts are shorted (FIGURE 1-2 and FIGURE 1-3). In the **AUTO** position, the state of a relay is controlled by a datalogger control port.

Please note that the A6REL-12 is not compatible with CR200(X)-series dataloggers.

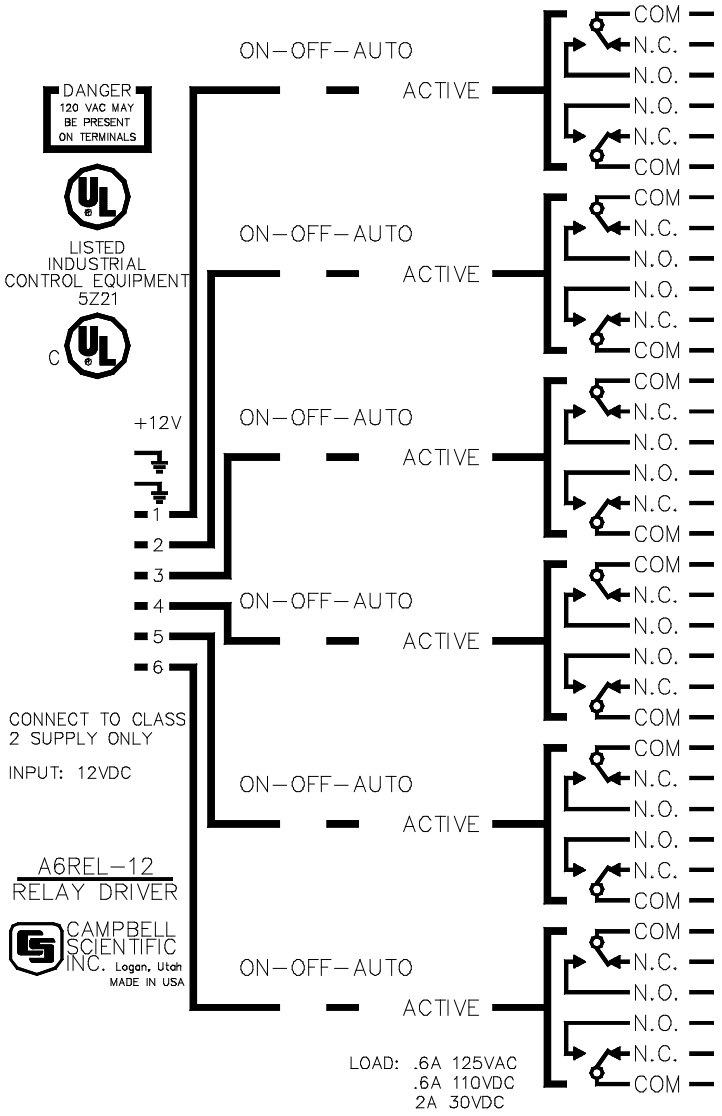

FIGURE 1-1. A6REL-12 panel view

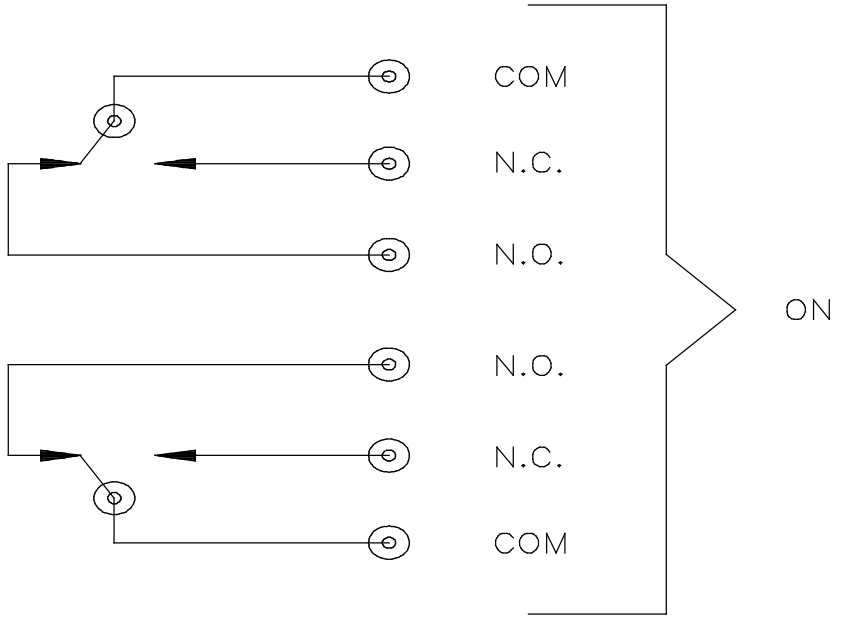

FIGURE 1-2. Position of contacts when coil IS energized (ON)

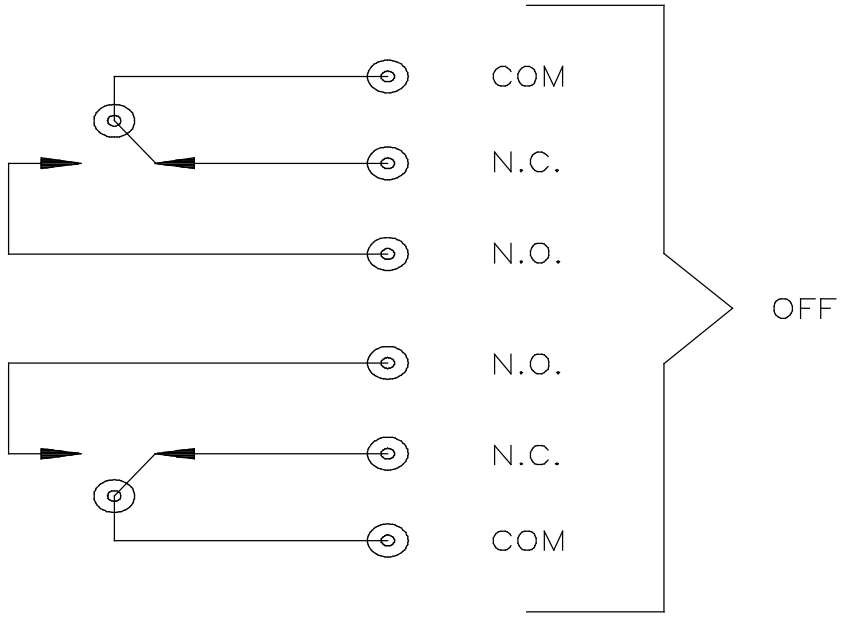

FIGURE 1-3. Position of contacts when coil IS NOT energized (OFF)

2. Specifications

Operating voltage: 12 Vdc nominal (8.4 to 24)

Current drain at 12 Vdc: 6 μa quiescent; 30 mA per active LED (switch ON or AUTO active).

Toggle Switch: ON/OFF manual override; AUTO for datalogger control.

RELAY SPECIFICATIONS

Arrangement: Dual single pole double throw
Break before make

Contact material: Gold-clad silver

Individual contact rating: 2 A at 30 Vdc
0.6 A at 125 Vac

Coil voltage: 8.4 to 24 Vdc

Coil resistance: 720 Ω ±10%

Expected life (contact closures)

Mechanical:	10^8	
Electrical:	2 A at 30 Vdc	$5x10^5$
	1 A at 30 Vdc	$2x10^6$

Actuation/release time: Approx. 3 ms

Operating temperature: –40 to 70 °C

Standards: Underwriters Laboratories (UL) listed product (E162021)
Canadian Underwriters Laboratories (CUL) listed product (5Z21)

Dimensions: 22.4 x 13.9 x 4.1 cm (8.8 x 5.5 x 1.6 in) including switches and mounts

Weight: 635 g (1.4 lb)

NOTE The A6REL-12 protects each contact against voltage surges of 180 Vdc (130 V rms) or greater with a power content of 8 Watts maximum and maximum duration of 0.1 ms.

3. Installation

The A6REL-12 relay driver includes mounting flanges with keyhole slots that attach to the backplate of a Campbell Scientific enclosure.

The A6REL-12 must be in an enclosure that provides a pollution degree 2 environment (normally, only nonconductive pollution; however, a temporary conductivity caused by condensation may be expected). All Campbell Scientific enclosures meet this requirement.

TABLE 3-1 shows the cables recommended for connecting the relays. A two-foot length should be sufficient if the datalogger and A6REL-12 are housed in the same enclosure. Tightening torque should be 4.5 in/lb. A user-supplied cable can be used if the cable has:

- only copper conductors
- wire range of 26 to 14 AWG
- minimum 60/75 °C wire

Input power must be connected to a class 2 supply only. All Campbell Scientific power supplies meet the class 2 supply requirements.

TABLE 3-1. Recommended Cables to Control Relays

Number of Relays Controlled	Recommended Cable(s)
1	(1) CABLE3CBL-L
2	(1) CABLE4CBL-L
3	(1) CABLE5CBL-L
4	(2) CABLE3CBL-L
5	(1) CABLE3CBL-L and (1) CABLE4CBL-L
6	(2) CABLE4CBL-L

4. Example Program

In the following programming example, temperature is being controlled between 96 and 99 °F. A copper-constantan thermocouple is measured to determine the temperature. If the temperature drops below 96 °F, terminal **C1** is set high to activate the associated relay and turn the heater on. If the temperature equals or exceeds 99 °F, terminal **C1** is set low to turn the heater off.

Although the following example is a CR1000 program, other dataloggers that use CRBasic such as the CR800 and CR3000 are programmed similarly.

CRBasic Example 4-1. Measuring Temperature Through an A6REL-12

```
'CR1000 Series Datalogger

'Declare Public Variables
Public PTemp, batt_volt, P, TC

'Define Data Tables
DataTable (Test,1,-1)
  DataInterval (0,15,Sec,10)
  Minimum (1,batt_volt,FP2,0,False)
  Sample (1,PTemp,FP2)
  Sample (1,TC,FP2)

EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)
    Battery (Batt_volt)
    'Measure TC reference temperature
    PanelTemp (PTemp,250)
    'Make temperature measurement and convert it to degrees Fahrenheit
    TCDiff (TC,1,mV2_5C,1,TypeT,PTemp,True ,0,250,1.8,32)
    'If temperature is greater than 99, set Port low
    If TC>99 then
      P=0
      'If temperature is less than 96, set Port high
    ElseIf TC<96 then
      P=1
    EndIf
    PortSet (1 ,P)
    'Call Output Tables
    'Example:
    CallTable Test
  NextScan
EndProg
```

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