

INSTRUCTION MANUAL



DSP4 Heads Up Display

Revision: 2/99

Copyright (c) 1984-1999
Campbell Scientific, Inc.

Warranty and Assistance

The **DSP4 HEADS-UP DISPLAY** is warranted by CAMPBELL SCIENTIFIC, INC. to be free from defects in materials and workmanship under normal use and service for twelve (12) months from date of shipment unless specified otherwise. Batteries have no warranty. CAMPBELL SCIENTIFIC, INC.'s obligation under this warranty is limited to repairing or replacing (at CAMPBELL SCIENTIFIC, INC.'s option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CAMPBELL SCIENTIFIC, INC. CAMPBELL SCIENTIFIC, INC. will return such products by surface carrier prepaid. This warranty shall not apply to any CAMPBELL SCIENTIFIC, INC. products which have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose. CAMPBELL SCIENTIFIC, INC. is not liable for special, indirect, incidental, or consequential damages.

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 www.campbellsci.com to determine which Campbell Scientific company serves your country. To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 753-2342. After an applications engineer determines the nature of the problem, an RMA number will be issued. Please write this 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

CAMPBELL SCIENTIFIC, INC. does not accept collect calls.

DSP4 HEADS UP DISPLAY

TABLE OF CONTENTS

PDF viewers note: These page numbers refer to the printed version of this document. Use the Adobe Acrobat® bookmarks tab for links to specific sections.

	PAGE
WARRANTY AND ASSISTANCE	
1. INTRODUCTION	
1.1 Specifications	1
1.2 Product Terminology	1
1.3 Overview	1
1.4 Summary of Features.....	1
2. PREPARATION	
2.1 Installation	2
2.2 Hardware Connections with SM192/SM716/CSM1.....	2
2.3 System Power-up	2
3. OPERATION	
3.1 The Command Mode	2
3.2 Displaying Datalogger Input Locations (RUN MODE).....	2
3.3 Controlling Datalogger Flags with the DSP4	3
3.4 Programming the Datalogger	3
3.5 From a Remote Communications Link	4
3.6 Saving a Datalogger Program (SAVE MODE)	4
3.7 Creating/Editing Input Location Labels (LABEL MODE)	4
3.8 Communication Via a Modem	4
3.9 Controlling Data Output to Peripherals (PRINTER MODE)	5
3.10 DSP4 Reset and Memory Backup	6
APPENDIX	
A. CHANGING PROM OR RAM CHIPS	
A.1 Disassembly of the DSP4	A-1
A.2 Installing New PROM Chips	A-1
A.3 Installing New RAM Chips.....	A-1
FIGURES	
1.2.1 DSP4 Heads Up Display	1
A-1 Memory Sockets on the CPU Card.....	A-1

DSP4 HEADS UP DISPLAY

1. INTRODUCTION

1.1 SPECIFICATIONS

Power Requirement: 10.0 to 15.6 VDC at 1 AMP

Operating Range: -40 to +80°C standard

Dimensions: 2.9" x 12.9" x 3.3"

1.2 PRODUCT TERMINOLOGY

1. Power ON/OFF switch
2. 12 Volt DC power plug
3. 9-Pin female Ribbon Connector
4. 9 Pin male Ribbon Connector
5. User Flag Key 1 through 8
6. Scroll Down Key
7. Scroll Up Key
8. Cursor Key
9. Select Key
10. Mounting Bracket Screw Holes
11. Display

1.3 OVERVIEW

The DSP4 Heads Up Display is a microprocessor-based peripheral that automatically interrogates an active datalogger to which it is connected. The DSP4 displays the current values of the datalogger's input locations and automatically sends any datalogger Final Storage data to a Storage Module (SM192/SM716/CSM1) or serial printer.

1.4 SUMMARY OF FEATURES

- Displays any 4 of the first 254 datalogger Input Storage Locations with a 9 character alphanumeric label for the first 99 locations.
 - Locations shown are changed with scroll UP and DOWN keys.
- Displays the datalogger real time clock as input location 0.
- Allows datalogger flags 1 through 8 to be set via keys on the DSP4.
- Reads datalogger programs and labels from a Storage Module, CSM1, or with direct connection to a PC using an SC32A interface. Cassette tape is no longer supported after January 1, 1998.
 - *Program retained in DSP4 for reprogramming datalogger without rereading from Storage Module or CSM1.*
- Programs datalogger with the program stored in its RAM memory.
- Stores datalogger programs and labels on Storage Modules or CSM1.
- Allows input location labels to be developed and/or edited directly.
- Buffers datalogger Final Storage data and automatically writes it to Storage Modules, CSM1, and printer.
- Yields access to the datalogger when called by a modem.
- Protects memory during power loss when connected to an operating datalogger.

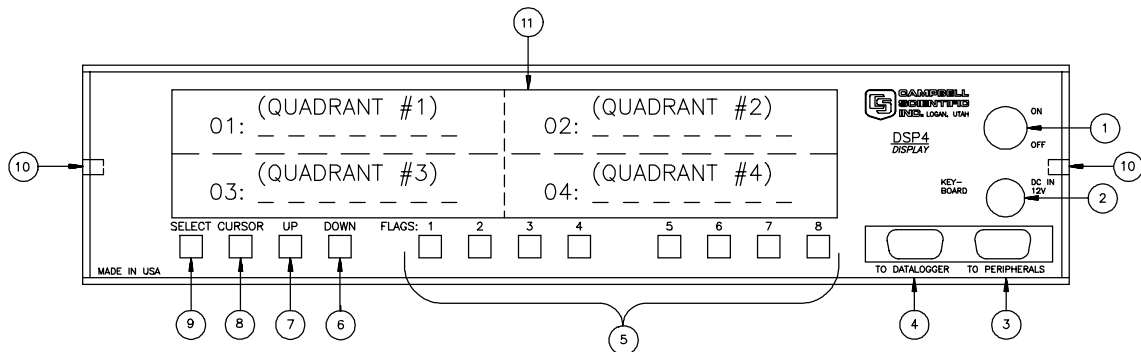


FIGURE 1.2.1. DSP4 Heads Up Display

DSP4 HEADS UP DISPLAY

2. PREPARATION

2.1 INSTALLATION

When installing the DSP4, use the 1/4x20x1/3" mounting bracket screw holes on both side panels (Figure 1.2.1 Item 11). Velcro is also used in many applications to mount and secure the unit. In direct sunlight, a sun shield or visor may be used to reduce glare.

2.2 HARDWARE CONNECTIONS WITH SM192/SM716/CSM1

1. Connect an external 1 Amp 12 VDC power supply to the DSP4 "DC IN 12V" connector.
2. Turn on the DSP4 power switch.
3. Connect the DSP4 male 9 pin ("TO DATALOGGER") connector cable to the datalogger.
4. Connect the DSP4 female 9 pin ("TO PERIPHERALS") connector cable to the SM192/SM716, CSM1, or PC via a modem (e.g. SC32A, COM200).

2.3 SYSTEM POWER-UP

2.3.1 POWER-UP SELF TEST

When power is applied to the DSP4, it displays the message "DSP4 DISPLAY" and automatically tests its memory. If the DSP4 passes the self test, it immediately attempts to establish communications with the datalogger. If an error is encountered during this memory test, the DSP4 displays one of the following messages to indicate the defective memory area:

"PROM 0 ERROR"

"PROM 1 ERROR"

"RAM ERROR"

2.3.2 ESTABLISHING COMMUNICATIONS WITH THE DATALOGGER

If a datalogger is not connected to the DSP4, or if the datalogger is not on, the DSP4 will display the message "DATALOGGER NOT READY." Once a powered datalogger is connected or re-connected, the DSP4 establishes communications automatically. If communication cannot be established because the datalogger is servicing a peripheral (Storage Module, CSM1, or printer), the DSP4 displays

the message "DATALOGGER BUSY." As soon as the datalogger completes the peripheral function the DSP4 automatically establishes and maintains communication. If for some reason the communication is broken with a properly connected datalogger, the DSP4 will automatically re-establish communication.

3. OPERATION

3.1 THE COMMAND MODE

When an operating datalogger is connected, the DSP4 establishes communication and enters the COMMAND mode. One of the seven following modes can then be selected using the CURSOR key to position the cursor at the desired mode and the SELECT key to enter the mode.

RUN	Display Datalogger Input Locations with User Assigned Labels created with the DSP4 or transferred to the DSP4.
LOAD	Load Datalogger Program with Labels from Storage Module or CSM1 to DSP4's RAM memory and simultaneously send the program to the datalogger.
SAVE	Save the Datalogger Program with the current labels to a Storage Module or CSM1.
PROGRAM	Program Datalogger with the Program Stored in the DSP4's RAM Memory.
LABELS	Create/Edit Labels assigned to the Datalogger Input Locations.
EXIT	Exit Telecommunications with the Datalogger and enable the datalogger keyboard.
PRINTER	Enable Printer Output and Set Baud Rate.

3.2 DISPLAYING DATALOGGER INPUT LOCATIONS (RUN MODE)

3.2.1 CHANGING THE INPUT LOCATIONS DISPLAYED

Use the CURSOR key to position the cursor under one of the four location numbers shown on the display. Use the UP or DOWN key to change the datalogger location displayed.

Momentarily pressing the UP or DOWN key causes a single location change.

NOTE: If either key is pushed for longer than 1/3 of a second, the locations scroll at a rapid rate.

With the cursor under the colon in the first quadrant, pressing the UP or DOWN keys causes all four displayed locations to change by one location.

With the cursor under the colon in the fourth quadrant, pressing the UP or DOWN key changes all four displayed locations by four locations (e.g., if locations 1, 2, 3, and 4 were displayed, pressing UP would display 5, 6, 7, and 8).

NOTE: If you try to view input locations with higher numbers than allocated in the datalogger *A Mode, E09 will be displayed on the datalogger.

The DSP4 retrieves Final Storage data regardless of the Instruction 96 or *4 options selected in the datalogger. Because the DSP4 maintains continuous telecommunications with the datalogger, the datalogger does not have the opportunity to send data directly to the Storage Module. Final Storage data sent to the DSP4 also remains stored in the datalogger. If a Storage Module, CSM1, or printer is not connected to the DSP4, the data can be retrieved from the datalogger when the DSP4 is disconnected from the datalogger.

In summary, Final Storage data can be stored on Storage Module, CSM1, or printer by connecting these devices to the DSP4 or by connecting these devices to the datalogger after test completion when the DSP4 is disconnected from the datalogger.

NOTE: A file mark may not be sent to a Storage Module or CSM1 while using a DSP4.

3.2.2 STORAGE MODULE OR CSM1 PREPARATION

When communication is established with the datalogger and the RUN mode is selected, the DSP4 prompts the operator to prepare the media used for recording data.

Storage Modules

The Storage Module (SM192/SM716/CSM1) must be connected to the peripheral 9 pin connector.

The operator then presses the CURSOR key as prompted to signal completion of data storage media. The DSP4 then begins to display the first 4 datalogger locations. Pressing the SELECT key returns the DSP4 to the COMMAND mode.

3.2.3 STORAGE MODULE DATA

The DSP4 retrieves datalogger Final Storage data along with the regular updates of the display data. The Final Storage data are buffered by the DSP4 and sent to the Storage Module or CSM1. Data are sent to the printer (if enabled) in printable ASCII format. DSP4 PROMS with a date later than March 1, 1993, have the delay for tape removed.

3.3 CONTROLLING DATALOGGER FLAGS WITH THE DSP4

The datalogger user flags are alterable by pressing the user flags keys on the DSP4 front panel in the RUN mode. When a flag is high in the datalogger, the LED associated with that flag is on. When a flag is low in the datalogger, the LED is off.

NOTE: While in the Monitor mode of GraphTerm, user Flag 8 cannot be toggled when the communications is via the DSP4 to the datalogger.

3.4 PROGRAMMING THE DATALOGGER

The datalogger can be programmed with its keyboard display, an SM192/SM716/CSM1 Storage Module, a program previously loaded into the DSP4, or over a remote communications link such as phone modem (Section 3.5) .

3.4.1 FROM THE KEYBOARD DISPLAY (EXIT MODE)

To program the datalogger from its own keyboard, select the EXIT command to enable the datalogger keyboard. (If the datalogger was simply disconnected from the DSP4, its keyboard would not be enabled for up to two

DSP4 HEADS UP DISPLAY

minutes.) After completing the programming, press the DSP4 SELECT key to call the datalogger and restore the COMMAND menu.

3.4.2 FROM A STORAGE MODULE or CSM1 (LOAD MODE)

To program the datalogger from an SM192/ SM716/ CSM1 Storage Module, connect the Storage Module to the 9 pin "TO PERIPHERALS" connector and select the LOAD command. This brings up the LOAD menu. Press the user flag key that coincides with the number of the program to 'load from' the Storage Module. The DSP4 downloads the selected program. When the program is loaded, the DSP4 automatically returns to the COMMAND menu.

If the program is loadable, but for some reason the loading is not completed properly, the DSP4 displays the message "DATALOGGER LOADING ERROR."

A program can be loadable, yet contain programming errors which also produces the same error message.

3.4.3 FROM AN EXISTING PROGRAM IN THE DSP4 (PROGRAM MODE)

The DSP4 retains a datalogger program from a Storage Module or CSM1. To program or reprogram a datalogger after the DSP4 has already read a program, select the PROGRAM mode. If no program is resident, the DSP4 will display the message "NO PROGRAM IN DSP4" and return to the COMMAND mode.

3.5. FROM A REMOTE COMMUNICATIONS LINK

Campbell Scientific, Inc. provides a number of different methods of telecommunications to the datalogger. Each of these methods are transparent to the user when interrogating the datalogger for data or programming. These methods include the SC32A RS232 Serial Interface, the COM200 or COM100 phone mode, the MD9 coaxial link, and the SRM-6A hardware modems.

NOTE: When using telecommunications with the datalogger and DSP4, the maximum baud rate is 1200 baud. Also, when using the DOS version of PC208, the station file for the PC must select DSP4 Display as the datalogger type. This can be entered by using the "H" key rather than the space bar to scroll through the hidden options.

3.6 SAVING A DATALOGGER PROGRAM (SAVE MODE)

3.6.1 IN A STORAGE MODULE or CSM1

When the SAVE mode is selected on the DSP4, the DSP4 prompts the user to see if the media is ready for saving the program. This means the SM192/SM716/CSM1 must be connected to the peripheral port. In that same prompt, the user can select "FLAG 1 through 8". Select the flag that corresponds to the number under which the program is to be stored in the Storage Module (e.g. press flag 1 to store the program in program storage area 1).

3.7 CREATING/EDITING INPUT LOCATION LABELS

With telecommunications to the datalogger established with the DSP4, the labels associated with datalogger input locations can be created or edited. The operator selects the LABELS mode on the DSP4, and the DSP4 responds by showing the label for the first location. The CURSOR UP, and DOWN keys are then used to create or edit the labels. The SELECT key will then enter the current label displayed. Editing labels over a remote communication link is described in Section 3.8.3.

3.8 COMMUNICATING VIA A MODEM

3.8.1 COMMUNICATING WITH THE DATALOGGER

NOTE: Communications with the DSP4 and datalogger via a modem is limited to 1200 baud.

When the DSP4 is in the RUN or COMMAND mode, it can be called by a modem connected to its peripherals connector. When the DSP4 is called via modem, the DSP4 displays the message "MODEM ACCESS". The remote operator uses the normal datalogger telecommunications commands and the DSP4

becomes transparent; the remote operator sees only the datalogger responses. The DSP4 does however, show all the telecommunications on the display. When the remote operator issues the "E" command or allows the link to time out, the DSP4 automatically re-establishes communications with the datalogger and returns to the COMMAND mode.

NOTE: In the Monitor mode of GraphTerm, while trying to view location 12:, it will be mislabeled and will display as location 11:. The value will be correctly measured and stored, but the label will be incorrect. There will be two Location 11: labels.

NOTE: User flag 8 cannot be toggled from the PC keyboard.

Printer data is aborted when a modem calls.

3.8.2 BAUD RATE AND DATA FORMAT

The baud rate is established with the DSP4 by striking the Return key on the remote terminal until the "*" prompt is received. Valid baud rates in the MODEM mode are 300 and 1200 baud. Data must be serial, one start bit, 7 data bits, no parity (8th bit is logic 0), and at least 1 stop bit.

3.8.3 ACCESSING THE DSP4 LABELS

CTRL L is used to enter labels. When CTRL is pressed, the DSP4 echoes CTRL L<, signaling it is ready for label editing commands. The cursor is positioned before the first element of the first label. Tab and CTRL D move the cursor forward in memory. CTRL S moves the cursor backward in memory. CTRL E and Return move the cursor to the first position of the next lower label. CTRL X moves the cursor to the next higher label.

3.8.4 SAVING AND LOADING A PROGRAM WITH LABELS

At any time while editing labels in the MODEM mode, CTRL U causes the DSP4 to get the program from the datalogger and combines it with the DSP4 labels. The DSP4 then sends the program and labels to the remote device in the same format as it saves the program and labels on tape. If this data is saved in a computer file by the receiving system, the file is suitable to reprogram the datalogger in the *D

MODE. If the file is sent to the datalogger via the DSP4, the DSP4 extracts the labels from the file and sends the program to the datalogger. If the file is sent to the datalogger directly, the datalogger ignores the label information.

3.9 CONTROLLING DATA OUTPUT TO PERIPHERALS (PRINTER MODE)

3.9.1 PRINTER BAUD RATES

Selecting the PRINTER mode produces the following message:

PRINTER BAUD: OFF, 300, 1200, 9600B

The cursor is positioned under the "9600B", the default setting for the printer. The CURSOR key is used to move the display cursor to the desired rate. A printer attached to the DSP4 peripheral port is enabled if either 300, 1200, 9600 baud is selected or conversely disabled if the OFF function is selected. When 9600B is selected, Final Storage data are sent to the Storage Module in the efficient binary form. When 9600B is selected, it is not necessary to program the *4 Mode in the datalogger or to insert Instruction P96 in a program to output the Final Storage data to an SM192/SM716/CSM1. The DSP4 takes precedence over the program of the datalogger.

3.9.2 EFFECTS OF PRINTER ENABLED

With the printer enabled, datalogger Final Storage data print in ASCII characters when the DSP4 is in the RUN mode. When the DSP4 is acting as a terminal in the telecommunications mode, the datalogger responses are printed. When the DSP4 is in the LABELS editing mode, the labels edited print.

3.9.3 WAITING FOR PRINTER OR ABORTING PRINTER DATA

If the LOAD, SAVE, PROGRAM, LABELS, or EXIT mode is selected while the printer is active, the DSP4 displays the message "WAIT FOR PRINTER" while the DSP4 empties its printer buffers. At 300 baud, the printer buffer requires up to 5 minutes to empty. Printer data can be aborted by pressing the SELECT key to restore the command menu, then selecting the PRINTER OFF function. Aborted printer data is lost.

DSP4 HEADS UP DISPLAY

3.10 DSP4 RESET AND MEMORY BACKUP

3.10.1 BACKUP FROM OPERATING DATALOGGER

The DSP4 retains its datalogger program and associated labels even if the DSP4 power is removed as long as the DSP4 is connected to an operating datalogger. The backup power for the DSP4 memory is supplied by the operating datalogger through the 5 volt line of the 9 pin connector. If the DSP4 power is off and the DSP4 is not connected to an operating datalogger, the datalogger program and labels are lost. The DSP4 is totally reset on power-up only if the datalogger is either not connected or off.

3.10.2 DATA STATUS DURING PRIMARY POWER LOSS

If the DSP4 is in the RUN mode at the time of power loss, it returns to the RUN mode when the DSP4 power is restored, provided it has not been disconnected from the operating datalogger. Printer output is aborted at power loss.

APPENDIX A. CHANGING PROM OR RAM CHIPS

The DSP4 has 5 sockets for memory chips. Two sockets hold 8 K Random Access Memory (RAM) chips and two hold Programmable Read Only Memory (PROM) chips. There is one empty socket between the two types of memory.

A.1 DISASSEMBLY OF THE DSP4

1. Turn power off, remove the four Phillips head screws located near the edge of the top and bottom of the DSP4. Place the DSP4 face down. Carefully lift the outside cover of the DSP4 up and away from the inside circuit boards.
2. Figure 1 shows the CPU card; the memory chips are opposite the connector. The locations numbered 1 and 2 hold PROM chips (with Campbell Scientific, Inc. labels). Location 3 is empty. Locations 4 and 5 contain RAM chips.

A.2 INSTALLING NEW PROM CHIPS

1. PROMS are located at locations 1 and 2 in Figure A-1. To replace a RAM chip, carefully pry the old chip up with a small flat blade screwdriver. Start at one end and then loosen the other, alternating until the chip is free. The new chip should be installed with the notched end in the same direction as the other chips, to the edge of the card (see Figure A-1). Before pushing the chips into the socket, make certain that all pins are correctly seated. Start one side

first, then the other, if needed. After installing the chip, check for pins that may be bent or not firmly seated in the socket. If there is a bent pin, remove the chip, carefully straighten the pin, and reinstall the chip.

2. The PROM chip with the lowest number is inserted in socket 1, and the PROM with the highest number in socket 2. In the event you have special PROMS, check the documentation that came with them.

A.3 INSTALLING NEW RAM CHIPS

1. The standard DSP4 has the maximum memory allowable. In the unlikely event that a RAM chip fails, the DSP4 can detect the bad chip. The error code is given in section 2.3.1, as to the problem detected.
2. RAM chips are installed in locations 4 and 5 in Figure A-1. The procedure for changing an RMA chip is the same as for a PROM chip - carefully pry out the old chip and insert the new one, being certain that the notch on the chip is toward the close edge of the card and that all pins are correctly seated in the sockets.

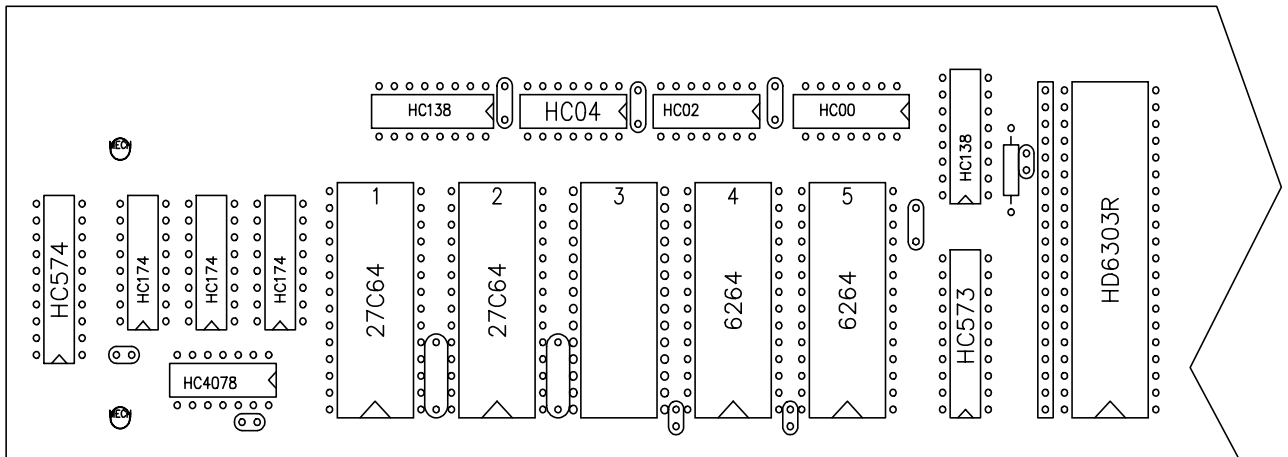


FIGURE A-1. Memory Sockets on the CPU Card

Campbell Scientific Companies

Campbell Scientific, Inc. (CSI)

815 West 1800 North
Logan, Utah 84321
UNITED STATES
www.campbellsci.com
info@campbellsci.com

Campbell Scientific Africa Pty. Ltd. (CSAf)

PO Box 2450
Somerset West 7129
SOUTH AFRICA
www.csafrica.co.za
sales@csafrica.co.za

Campbell Scientific Australia Pty. Ltd. (CSA)

PO Box 444
Thuringowa Central
QLD 4812 AUSTRALIA
www.campbellsci.com.au
info@campbellsci.com.au

Campbell Scientific do Brazil Ltda. (CSB)

Rua Luisa Crapsi Orsi, 15 Butantã
CEP: 005543-000 São Paulo SP BRAZIL
www.campbellsci.com.br
suporte@campbellsci.com.br

Campbell Scientific Canada Corp. (CSC)

11564 - 149th Street NW
Edmonton, Alberta T5M 1W7
CANADA
www.campbellsci.ca
dataloggers@campbellsci.ca

Campbell Scientific Ltd. (CSL)

Campbell Park
80 Hathern Road
Shepshed, Loughborough LE12 9GX
UNITED KINGDOM
www.campbellsci.co.uk
sales@campbellsci.co.uk

Campbell Scientific Ltd. (France)

Miniparc du Verger - Bat. H
1, rue de Terre Neuve - Les Ulis
91967 COURTABOEUF CEDEX
FRANCE
www.campbellsci.fr
campbell.scientific@wanadoo.fr

Campbell Scientific Spain, S. L.

Psg. Font 14, local 8
08013 Barcelona
SPAIN
www.campbellsci.es
info@campbellsci.es