INSTRUCTION MANUAL

SC932A 9-Pin to RS-232-DCE Interface

Revision: 2/04

Warranty and Assistance

The **SC932A 9-PIN TO RS-232-DCE INTERFACE** 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.

SC932A 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.

Figures

Table

SC932A 9-Pin to RS-232-DCE Interface

FIGURE 1. SC932A 9-Pin to RS-232-DCE Interface

1. General Description

The SC932A (Figure 1) is used to interface a CSI datalogger to any modem that is configured with an RS-232 DCE (Data Communications Equipment) serial port. Features include:

- True RS-232 signal levels.
- Power for the SC932A is supplied from the 5 V supply on pin 1 of the datalogger's I/O port. The SC932A will use the 5 V supply to power the RS-232 modem if needed.
- Two way (interactive) communication.

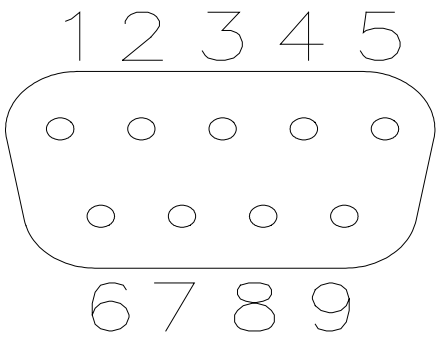
The SC932A is frequently used with a short haul modem to communicate across a dedicated line made of 2 pairs of twisted wire with a shield. Section 3 describes the details of this application using a short haul modem built by RAD.

The SC932A is also commonly used with the satellite transmitters, cellular modems, and spread spectrum radios.

The SC932A does not support one way output or printer communication. Data transfer is blocked when pin 6 from the datalogger is high (SDE/printer enable).

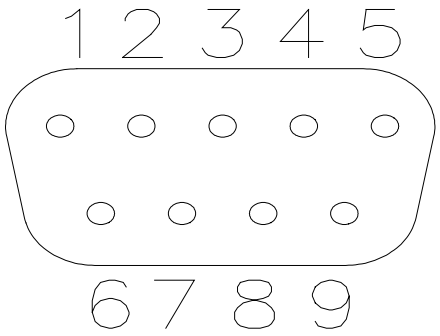
2. Specifications

RS-232 9-Pin Male Connector Pin-out:



Pin No.	I/O	Name	Description
1	In	DCD	Data Carrier Detect (No Connection)
2	In	RXD	Received Data
3	Out	TXD	Transmitted Data
4	Out	DTR	Data Terminal Ready (5 V Supply from CS I/O)
5		GND	Signal Ground
6	In	DSR	Data Set Ready (No Connection)
7	Out	RTS	Request to Send – Modem Enable
8	In	CTS	Clear to Send (No Connection)
9	In	Ring	Rings Datalogger

CS I/O 9-Pin Male Connector Pin-out:



Pin No.	I/O	Name	Description
1	in	+5V	Regulated 5 Volt supply
2		GND	Ground
3	out	RING	Ring signal to datalogger
4	out	RXD	SC932A transmits on this line
5	in	ME	Modem Enable—must be high for transfer
6	in	SDE	Synchronous Device Enable—data blocked when high
9	in	TXD	SC932A receives on this line

Data Rates

The SC932A will support baud rates up to 115,200 bps.

Electrical

The SC932A uses power from the +5 V line on the 9-pin interface connected to the datalogger.

Additional current (up to 10 mA) from the 5 V supply may be used by the RS-232 device connected to the SC932A.

Physical

Height: 0.9 in (2.3 cm)
Width: 1.6 in (4.1 cm)
Length: 3 in (7.6 cm)
Weight: 1.6 oz (45.4 g)

Environmental

Temperature: -25 to +50ºC
Humidity: up to 95% non-condensing

3. Installation

Connect the SC932A to the RS-232 device and to the datalogger with the SC12 9-pin cable (included). If the device has a 25-pin connector, a 9-pin female to 25-pin male adaptor is required (CSI PN 15751).

Proper transient protection should be installed to protect the computer and datalogger in areas where damage due to lightning is possible. If this is a RAD modem application, see Section 4.2.

4. RAD Modem Application

The SC932A is frequently used with a short range modem to communicate across a 4-wire, unconditioned dedicated line. Campbell Scientific offers a kit (PN 15770) that includes the SC932A, the 9- to 25-pin adaptor (PN 15751), and a mounting bracket (PN 6282). The bracket will mount the RAD, SC932A and adaptor to the back plate in a Campbell Scientific enclosure. This section describes using a short range asynchronous modem built by RAD*.

* SRM - 5A RAD Modem
RAD Data Communications Inc.
900 Corporate Drive
Mahwah, NJ 07430
Tel: (201) 529-1100
Fax: (201) 529-5777
Email: market@radusa.com
http://www.rad.com

For transmission, the RAD modem uses a cable made of 2 pairs of twisted wires with a shield. Data rates up to 9600 bps are possible. The low voltage transmission levels minimize cross-talk between adjacent lines within the same cable. Data are transmitted and received at a balanced impedance, providing

excellent immunity to circuit noise. Table 1 gives the data rate possible for several gage cables across several distances.

TABLE 1. Approximate Range, miles and km

Data Rate bps	19 Gauge (0.9 mm) miles	km	24 Gauge (0.5 mm) miles	km	26 Gauge (0.4 mm) miles	km
9,600	6.2	10.0	2.8	4.5	2.0	3.3
1,200	7.6	12.2	3.4	5.5	2.5	4.0

4.1 RAD Modem - Two Way

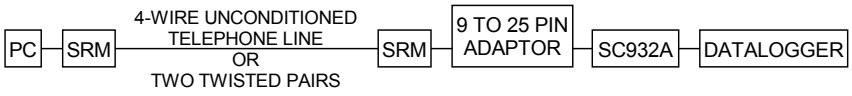


FIGURE 2. Two Way Communication

When using Campbell Scientific's datalogger support software to communicate through the SC932/RAD modem, "Setup" the link as a direct connect between the datalogger and the desired COM port. Start two way communication using the "Connect" button on the Tool bar and the "Connect" button in the "Connect" window.

4.2 RAD Modem Wiring and Grounding

Figure 3 shows a typical setup of the RAD modems. Installation is as follows:

1. Set the DCE/DTE switch on the back of the RAD modem connected to the SC932A to DCE. For a RAD modem connected to a PC, set the DCE/DTE switch to DCE. For a RAD modem connected to a serial printer, set the DCE/DTE switch to DTE.

2. Select a cable with two or more twisted pairs. A recommended direct burial rodent resistant cable is listed below. They also sell several gopher resistant cables for even greater protection.

Company	Part Number	AWG.
Anixter	F-02P22BPN	22

   Tel: 847-677-2600
   http://www.anixter.com

3. Wiring connections are made as shown in Figure 3. Note wires labeled A and B are one twisted pair of the cable. Wires labeled C and D are the other twisted pair.

4. Transients induced on the communication line may damage any electronics connected at either end of the line. To decrease the chances for damage, spark gaps should be installed as shown in Figure 3. The transient protection shown may be purchased from Campbell Scientific, Inc. (p.n. 5563 shown in Figure 3, p.n. 6536 includes a plastic case, p.n.

6361 includes hardware for mounting to ground lug of CSI enclosures models ENC 10/12, ENC 12/14, or ENC 16/18). Spark gap wiring is straight through such that pin to pin continuity exists between the two modems. If the modems are installed entirely within a building, the transient spark gap protection is probably not needed.

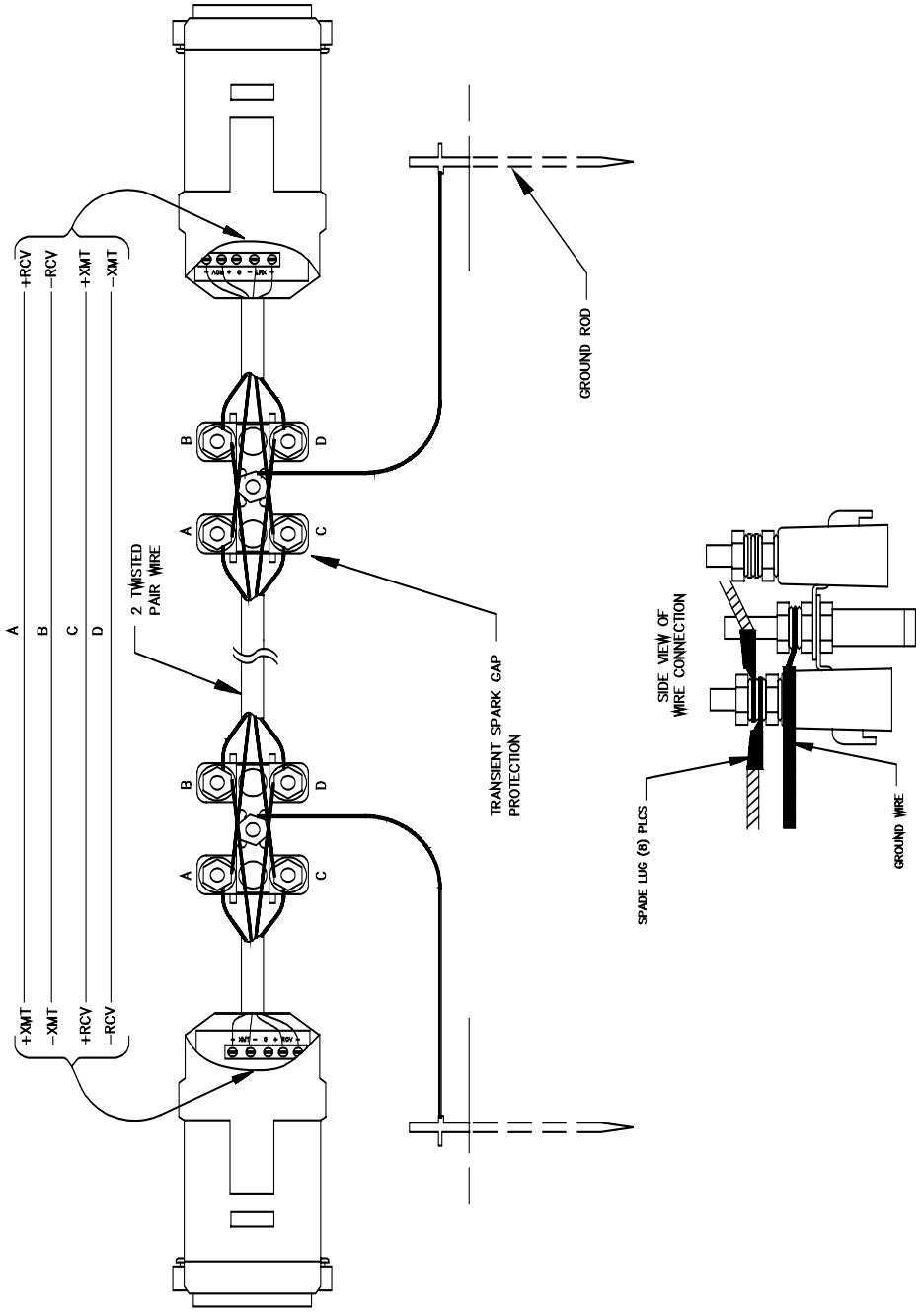


FIGURE 3. Installation of Spark Gap Protection

Occasionally a customer needs to transmit data across longer or smaller gage wires or at higher speeds than can be done with the RAD modem powered by the SC932A. RAD does sell a 9 volt power supply that will boost the signals enough to meet some of these more demanding applications. Please contact RAD for more information.

4.3 Testing RAD Modem Communication

The modem communication link is divided into the following three sections: 1) RAD modem computer end, 2) cable from computer modem to datalogger modem, 3) RAD modem datalogger end. When unable to establish communication with the datalogger, test each of the three sections.

Before proceeding through the testing procedures, a terminal emulator software program such as HyperTerminal or Campbell Scientific's datalogger support software (Test Terminal Emulator) must be used to communicate through the COM port of the computer. Once the emulator program is set up, testing can proceed as follows:

1. Disconnect the 4 conductor cables from the SRM-6A RAD modem at the computer end. Jumper the XMT + to RCV + and jumper the XMT - to RCV -. This creates a transmit loop which allows any key pressed at the computer keyboard to be seen on the screen. If the key pressed is not seen, check the following: COM port configuration, 25-pin cable from the computer to the modem and the RAD modem.

2. Reconnect the 4 conductor cables to the modem at the computer end and disconnect the cable from the modem at the datalogger end. Twist together the XMT + wire and RCV + wire, twist together the XMT - wire and the RCV - wire. Repeat the process of step 1 by pressing a key on the computer keyboard. If the key pressed is not returned, then the cable from the modem at the computer to the datalogger modem is defective and will need to be repaired or replaced.

3. If steps 1 and 2 pass, the modem at the datalogger is suspect. Disconnect the modem from the SC932A and bring the modem to the computer site. Attach the modem to the computer, and repeat step 1 by jumpering the terminals of the modem and pressing a key on the computer keyboard.

If the above tests pass and communication to the datalogger still has not been established, perform tests 4, 5, and 6.

4. A 12 V lead acid battery supply should not be discharged below 11.76 V. If this occurs, the batteries will go into a deep discharge state and will need to be replaced. The CR10 will function properly on a battery voltage of 10 to 15 volts. Check the 12 V supply with a volt meter.

5. On the wiring panel of most Campbell Scientific dataloggers there is a terminal marked 5 V. Check the 5 V supply with a volt meter. This 5 V supply should be within a tenth of a volt. If not, it would indicate a problem.

6. To verify that the datalogger and its serial I/O port are working, try to access input memory locations using a laptop PC with the SC32B or the CR10KD Keyboard Display.

If the datalogger passes tests 4, 5, and 6, then the SC932A is suspect and will need to be repaired or replaced.

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