SC32A
Optically Isolated
RS232 Interface

Reference Manual

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SC32A Optically Isolated RS232 Interface

The SC32A interfaces an RS232 peripheral, commonly a computer or printer, to the serial I/O port of a Campbell Scientific datalogger. The SC12 cable supplied is used to connect the datalogger to the 9-pin port of the SC32A. Connection to the serial port of a PC is made with an RS232 cable such as the Campbell Scientific SC25 or SC25AT.

Refer to this manual if you have difficulty communicating with your PC or if you intend to use the SC32A with anything other than a PC.

1. Function

The functions of the SC32A are:

1. To convert datalogger logic levels to RS232 logic levels.
2. To optically isolate the datalogger and the RS232 peripheral. Optical isolation separates the SC32A into a datalogger section and an RS232 section. Signals entering from either side are electrically independent, protecting against ground loops, normal static discharge and noise.
3. To block the transmission of synchronous CR10 data to the RS232 peripheral. This function is enabled by the installation of an internal jumper.

SC32As with serial numbers less than 1500 were shipped with the jumper in the blocking position (two posts connected). All other SC32As have the jumper on one post only, in the passing position.

When used with a CR10 Measurement and Control Module, the correct SC32A jumper position depends on the application. For all other Campbell Scientific dataloggers, the jumper has little effect and could be removed (see Section 5).

2. Specifications

Operating temperature: -25ºC to +50ºC

Power: Powered by host devices (see Section 4)

Ports: 25-pin female; configured as DCE
9-pin male; connects to datalogger via SC12 cable (included)

Size/Weight: 130 x 60 x 25mm, 0.1kg

3. Connector Descriptions

3.1 25-Pin

The SC32A 25-pin female port is configured as Data Communications Equipment (DCE) for direct cable connection to Data Terminal Equipment (DTE). Most terminals, computers and printers are configured as DTE. For connection to DCE devices such as modems and some computers, a null modem cable is required (see section 5).

3.2 9-Pin

The SC32A 9-pin male port connects to the datalogger through the SC12 Two Peripheral Cable supplied with the SC32A.

Table 1 gives pin descriptions for both the SC32A connectors.

Table 1 SC32A Connector Descriptions

25-Pin Female Connector			9-Pin Male Connector		
Pin #	**I/O**	**Description**	**Pin #**	**I/O**	**Description**
1		GROUND	1	IN	+5V
2	IN	TX	2		GROUND
3	OUT	RX	3	OUT	RING
4	IN	RTS (POWER)	4	OUT	RX
5	OUT	CTS	5	IN	ME
6	OUT	DSR	6	IN	PE (CR10 SDE)
7		GROUND	9	IN	TX
8	OUT	DCD			
15	IN	SPECIAL POWER			
20	IN	DTR (POWER)			

4. Operation

Power for the datalogger section of the SC32A comes from the 5V supply on pin 1 of the datalogger I/O port. Communication logic levels to and from the datalogger are referenced to this voltage, ranging from 0 to slightly less than 5V.

Power for the RS232 section is taken from the Data Terminal Ready (DTR) and Request To Send (RTS) lines of the RS232 peripheral. An on-board DC to DC converter supplies the negative voltage required for RS232 signals. The logic levels from the SC32A to the RS232 peripheral are 0.6V less than the supply voltage. For example, if the DTR line supplies 9V to the SC32A, logic levels of ± 8.4V are returned. If the peripheral requires logic levels greater than the voltage provided by the DTR and RTS voltages, an external supply may be used to power the RS232 side of the SC32A (see Section 5).

When the SC32A first receives a character from the peripheral (pin 2), 5V is applied to the datalogger Ring line (pin 3) for one second or until the datalogger Modem Enable (ME) goes high, putting the datalogger into the Telecommunications Mode.

RS232 cables of up to 60m have been used successfully between the SC32A and an IBM PC at 9600 baud. The length of cable that can be used is largely dependent on the RS232 DTR and RTS drive capability as well as the RS232 RX operating thresholds. A good quality screened cable should be used for long runs.

5. Application

The 21X and CR7 dataloggers communicate with a peripheral by enabling it with an assigned I/O pin. The CR10 can use this enabling system, but also supports a synchronous addressing scheme to select peripherals. The addressing system allows up to 16 peripherals to be selected for communication, whereas the pin-enable system is limited by the number of pins available for the enabling task (three). Correct use of the SC32A not only depends on the datalogger type but also, for the CR10, how the peripheral is activated (pin-enabled or address-selected) and how many peripherals are present.

In the following discussion, the term ‘enable’ means the method which activates a peripheral by setting an assigned datalogger I/O pin high. The term ‘address’ means the method which selects peripherals by addressing.

5.1 SC32A With 21X and CR7 Dataloggers

These dataloggers use the pin-enable method. The SC32A is a modem-type peripheral, and only one modem may be connected to these dataloggers. With two modems connected, the magnitude of a logic high is too low for proper communication.

There are three cases were the SC32A could be used with this category of data-loggers:

Case 1. An SC32A interfaces a terminal/computer to the datalogger and no peripherals enabled by pin 6 are connected. In this case, the datalogger is in the telecommunications mode and all data transfer is a result of pin 5 being enabled. The jumper has no effect.

Case 2. An SC32A interfaces a datalogger to an RS232 printer-type peripheral. The jumper must be removed (i.e. left in its default position) so that data is sent to the peripheral when pin 6 is high. Because only one modem can be connected to a datalogger, data transfer resulting from telecommunications (pin 5 high) is impossible in this situation. This means, for example, that a 21X connected to a printer via the SC32A cannot communicate with a PC.

Case 3. An SC32A interfaces a terminal/computer to the datalogger and at least one other peripheral enabled by pin 6 is *directly* connected to the datalogger (e.g. a Storage Module). The jumper must again be removed. The dataloggers are designed to delay output to a peripheral enabled by pin 6 while pin 5 is active (i.e. there is no output to peripherals while in the telecommunications mode). When telecommunications is exited, pin 5 is set low and output to peripherals enabled by pin 6 is resumed. If the terminal/computer is left on, and the baud rate is compatible, data sent to the Storage Module will also appear at the terminal/computer.

5.2 SC32A With CR10 Datalogger

To understand where the SC32A can be used and the significance of the jumper, a short discussion of the CR10’s communication methods is necessary.

The CR10 enters telecommunications in two ways:

1. Pin 5 enables telephone modems and the SC32A for telecommunications.
2. To achieve telecommunication through an RF modem or CR10KD Keyboard/ Display, the CR10 addresses the appropriate peripheral using a combination of the Synchronous Device Enable (SDE, pin 6), Clock/Hand Shake (CLK/HS, pin 7) and Transmit (TX, pin 9) lines.

Addressable peripherals include the SM192/716, the CSM1, the CR10KD, the SDC99 Synchronous Device Interface and the RF95 (in SDC state). In addition to the addressing process, the SDE line also enables peripherals in the same way as the PE line (pin 6) of the 21X and CR7 dataloggers. Simultaneous use of addressed peripherals and peripherals enabled by pin 6 (SDE) should be avoided. When addressing occurs, enable-type peripherals will receive address information which, at a minimum, will mix garbage in with data, and at worst, cause the peripheral to lock up and become inoperative.

NOTE More information on addressing is given in the CR10 instruction manual.

In most cases, if the SC32A is used between the CR10 and some peripheral (e.g. a PC), *and addressable peripherals are also present* (e.g. a Storage Module), the jumper should be in place. This will block addressing information from reaching the SC32A interfaced peripheral. The only situation in which the jumper may safely be removed is if the SC32A is interfacing the only peripheral attached to the CR10 (with the exception of cassette tape).

NOTE

1. Any printer-type peripheral interfaced to the CR10 through an SC32A can be used as an addressable peripheral by using an SDC99 Synchronous Device Interface. The SDC99 should be connected between the SC32A and the datalogger. Data is passed to the SC32A only if the SDC99 is addressed. After being addressed, the SDC99 raises pin 6 of the SC32A; thus, the jumper must be removed.
2. An SC32A may be used to interface a computer to a CR10 which also has an RF95 (in SDC state) attached. This is the only situation in which two modems may be operating simultaneously on one datalogger.

5.3 Special Cases

5.3.1 Null Modem

A null modem connection is required only if the RS232 device connected to the SC32A is configured as Data Communications Equipment (DCE). Wiring between two RS232 connectors for creating a null modem is shown in Table 2.

Table 2 Null Modem Configuration

SC32A Side 25-Pin Connector		**RS232 Side 25-Pin Connector**
PIN #	Connects To	PIN #
1		1
7		7
2		3
3		2
6		20
4 and/or 20		To a line that is logic high

NOTE The side of the null modem connected to the SC32A must be male. The gender of the other side is dependent on the mating connector going to the computer.

5.3.2 External Power Supply

Two situations require an external power supply for the RS232 side of the SC32A:

1. The input logic levels required by the Data Receive line of the RS232 device exceed the output level of the RTS and DTR lines.

2. The RTS and DTR lines which power the SC32A are absent from the cable going to the RS232 device.

The most common external supply is a 6 or 12V DC battery. Any supply over 9V must be connected to pin 15 only.

CAUTION Connecting a non-current limited supply of greater than 9V to pins 4 or 20 could cause permanent damage to the SC32A.

External power connections to the SC32A are given below:

SC32A 25-Pin Port Pin #	**External Power Supply**
4 and/or 20 or 15	+
1 and/or 7	-

Ensure that the grounds of the RS232 device and the external supply are tied together.

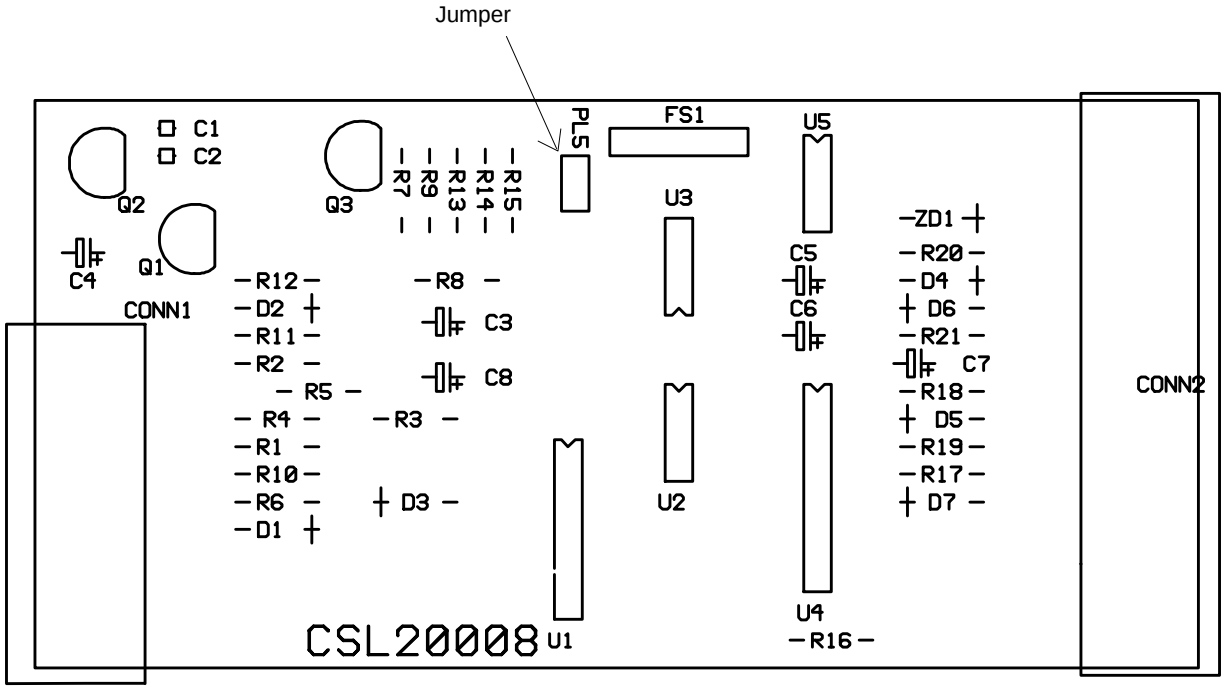

Figure 1 PCB Layout

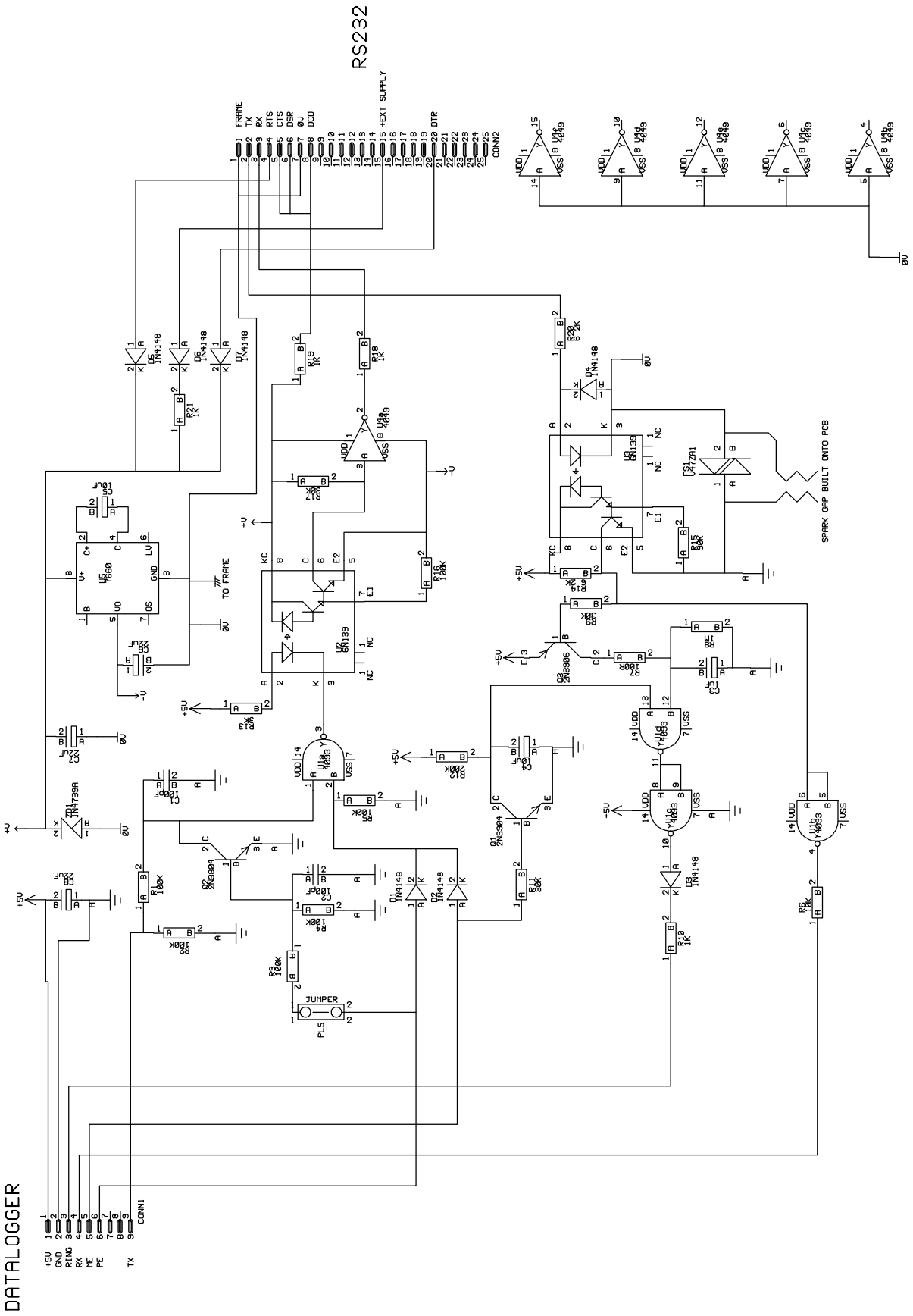

Figure 2 Schematic