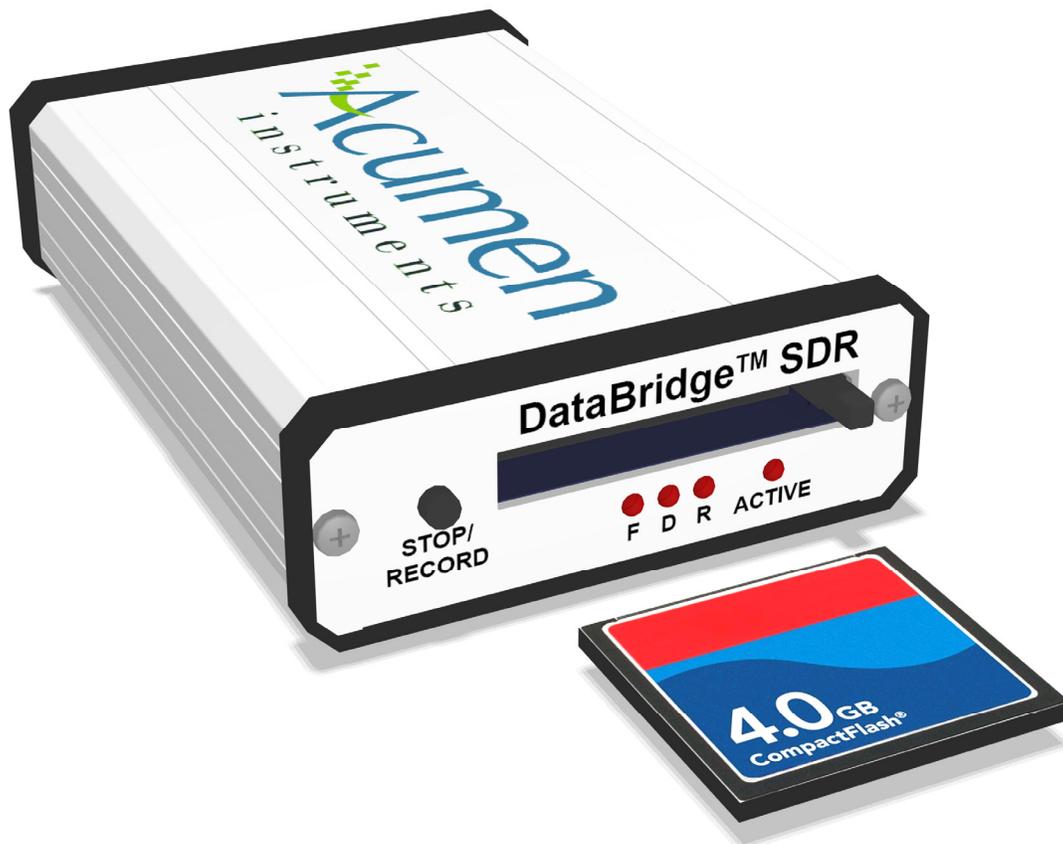


# ACUMEN INSTRUMENTS CORPORATION



## DataBridge™ SDR2-CF and SDR2-OEM-CF Configuration Guide

revision 1.0 • 09/2008



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# 1

## Getting Started

### 1.1 Overview

DataBridge SDR2-CF serial data recorders record RS-232 serial data to industry-standard mass storage using an MS-DOS™/Windows™-compatible FAT file format. The SDR2-CF (and SDR2-OEM-CF) is an SDR2-CF equipped with a Type I or II CompactFlash (CF) socket and is designed for use with CompactFlash storage media.

The SDR2-CF is equipped with two serial ports. With terminal software on a PC, you can use the *configuration port* to manage files, set up and communicate with the data port, set date and time, modify output messages, download data, manipulate the storage media, and enter record and stop modes. While recording, you can also monitor recording using the configuration port.

During Record mode, the *data port* accepts RS-232C serial data from your data source. For data sources that require initialization or querying, the SDR2-CF can store and transmit up to eight user-defined messages. Each message is independent and can be sent when recording starts, when recording stops, or periodically at specific time intervals.

**NOTE:** The *data source* is a device that transmits serial data for use by a computer, printer, or data logger.

Both SDR2-CF ports support baud rates up to 230,400 bps and RTS/CTS hardware handshaking for reliable high-speed communication. Your SDR2-CF is also equipped with a real-time clock, power-saving features, non-volatile memory, and a resume-on-power failure feature. The SDR2-CF features a one-button front panel user interface that starts and stops recording.

## 1.2 Before you start

Before you start, be sure you have the following items available:

- DataBridge SDR2-CF or SDR2-OEM-CF board
- A 5VDC regulated or 7-30VDC power supply
- RS-232 DB9 serial cable(s)
- A computer or terminal with an available serial port

## 1.3 A quick guide to the DataBridge SDR2-CF

On the front of the SDR2-CF are the CF socket, record button, and LED indicators. The SDR2-CF can be toggled in and out of record mode using the record button located on the front panel. The LED indicators show the SDR2-CF's current recording status. The *data indicator* flashes when data is received and is used to verify data reception from your data source.

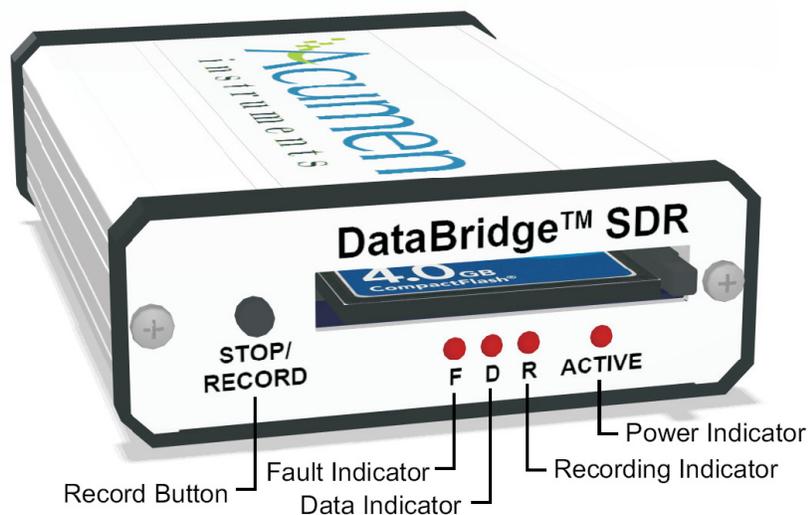


Figure 1.1. SDR2-CF Front Panel Controls.

On the rear are two serial ports – one female nine-pin D-subminiature connector (DB9F) for the configuration port and one male nine-pin D-subminiature connector (DB9M) for the data port. The 7 to 30 VDC power input is also located on the rear panel.

**NOTE:** The configuration and data ports can each operate at different baud rates.

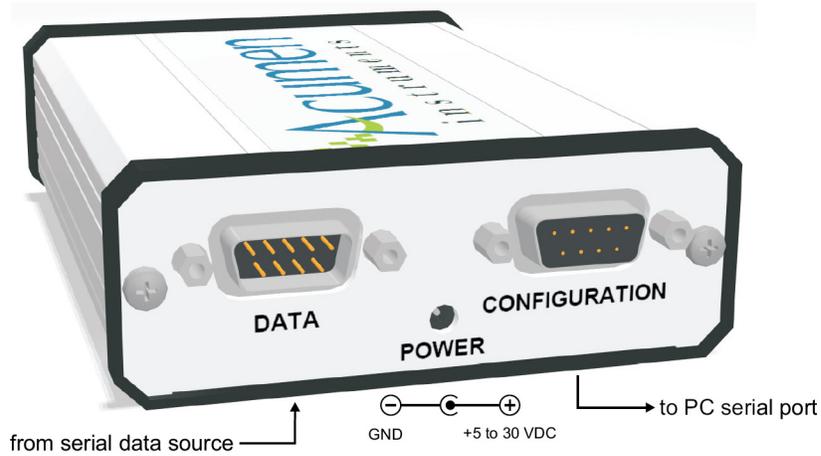


Figure 1.2. SDR2-CF Rear Panel.

Inside the enclosure (See Figure 1.3), along the left-hand side is a 2-pin 5V power connector and a 3V lithium battery. On the inside-right is a bank of four switches for setting configuration port baud rate and handshaking (if needed). You may also notice other connectors labeled API Port and JTAG Port. These are used during manufacturing and custom applications. They are not intended for general customer use.

**NOTE:** Do not remove front panel. To enter the enclosure, remove back panel only.

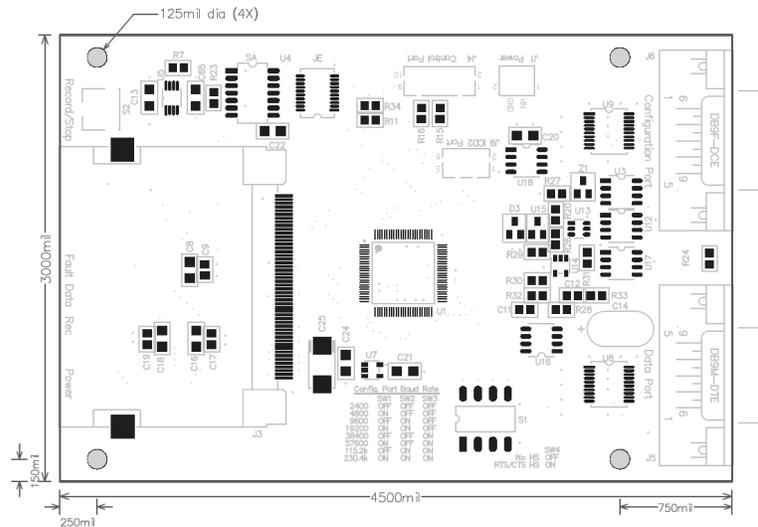


Figure 1.3. SDR2-CF Internal Connections and switches (SDR2-OEM-CF).

## 1.4 Deploying the DataBridge SDR2-CF

### 1.4.1 Connecting power to your SDR2-CF

The SDR2-CF starter kit includes a 120VAC power supply that connects via the rear panel. If you use an alternate power source, it should be capable of sourcing at least 1W. When you apply power the power indicator should light and the other indicators should flash in sequence.

### 1.4.2 Connecting to the configuration port

To configure your SDR2-CF, start by connecting the SDR2-CF's configuration port to an available serial port on your computer.

**NOTE:** Your computer's *female* DB25 connector is most likely a parallel port, not a serial port.

Most computers are equipped with either a DB9 male (DB9M), or on older computers, a DB25M connector. Male connectors have pins, while female connectors have sockets. If your computer uses a serial mouse, it may already occupy your DB9 male connector. Likewise, if your computer is equipped with an external modem, it may occupy your DB25M connector.

If you are unable to locate your serial port(s), consult the documentation included with your computer. If all of your computer's serial port(s) are occupied, contact your manufacturer or support provider for information about adding a serial port to your computer. If your computer does not have an available serial port, you may need to purchase a USB serial adapter. Using a serial to USB adaptor, you could also connect through your computer's available USB ports.

If your computer is equipped with a DB9M receptacle, connect the SDR2-CF's configuration port (DB9F) your computer's serial port using a standard serial cable. If your computer's available serial port is a DB25M connector, you will need to purchase a DB9M to DB25F adapter, often referred to as an AT adapter, to connect a 9-pin serial cable to your 25-pin serial port (the adapter has DB9 male and DB25 female connectors).

Once you have located your serial port, you need to know whether your port is configured for operation as COM1, COM2, COM3, or COM4 (some computers even include COM5-COM8). In most cases, a port that uses a DB9 male connector is configured as COM1 (or perhaps COM3), while a DB25 male connector is configured as COM2 (or COM4). If one or more of your computer's ports are occupied by a mouse, modem, serial printer, or other serial devices, you may need to explore your computer's configuration information and use a process of elimination to determine your port's COM designation.

### 1.4.3 Communications software

Now that the SDR2-CF is connected to your computer, configure communications software (also known as terminal software) to communicate

with it. Typical communications software used is HyperTerminal™ which is included with Microsoft Windows 95/98/NT 4.0/2000/XP. Many other terminal programs are widely available for Windows, DOS, linux, and other platforms. To access HyperTerminal, click the Windows start button and choose Programs, then Accessories, then Communications, and then HyperTerminal.

Configure HyperTerminal to communicate using the serial port you connected to the SDR2-CF, the appropriate baud rate (115,200 bps by default), and the serial data format parameters (must be 8N1). See Section 3.2 if you wish to change the SDR2-CF's configuration port serial parameters from the default 115,200 bps 8N1.

Once the SDR2-CF is connected to your computer and you are running terminal software the SDR2-CF Configuration menu should appear (see Figure 1.) in your terminal window. If you don't see the Configuration menu, try typing **<Enter>** or **<Space>** to refresh the display.

By default the SDR2-CF's ANSI mode is on. ANSI mode results in a more clear and readable display. The color user interface also continuously updates time and status information. By default, HyperTerminal settings are configured to communicate with the SDR2-CF. The default settings are pictured in Figures 1.4 and 1.5:

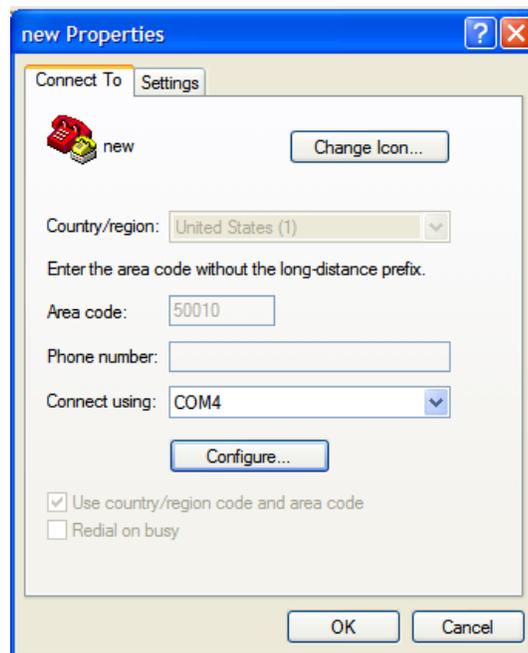


Figure 1.4. The default settings under "New Connection Properties" in HyperTerminal.

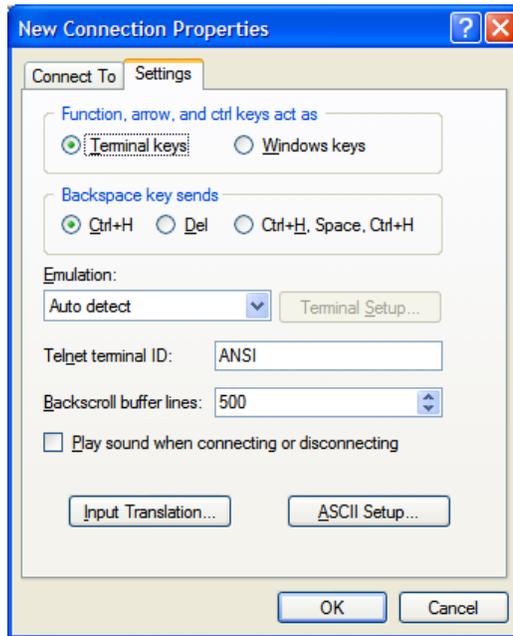


Figure 1.5. The default settings under the New Connection Properties tab in HyperTerminal.

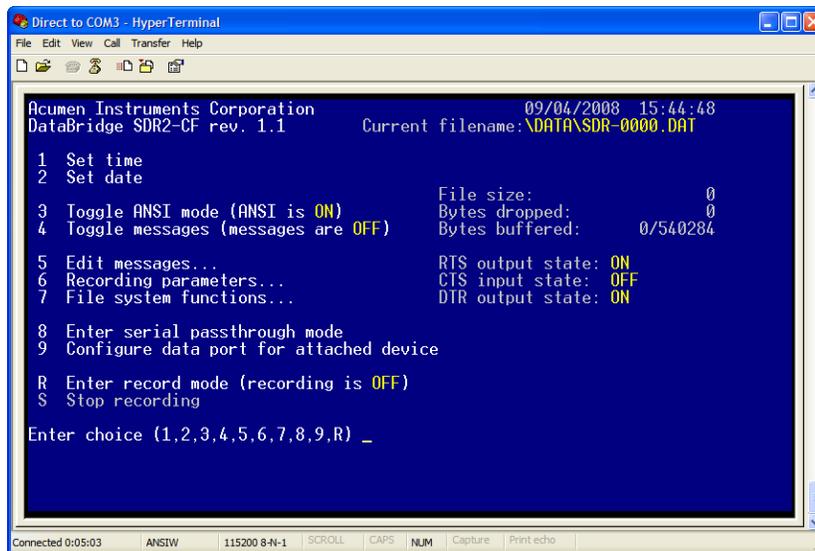


Figure 1.6. The SDR2-CF Configuration menu in HyperTerminal with ANSI mode ON.

Congratulations! You are now talking to the SDR2-CF and can begin configuring it for your application.

---

# 2

## Configuring the DataBridge SDR2-CF

Now that you have access to the SDR2-CF's menu system, you are ready to configure it for use with your serial data source. Using the Configuration menu, you can:

- Set the date and time.
- Specify a directory to record files to.
- Specify a filename for recording.
- Ensure that the media you are using is properly formatted and has enough free space to accommodate your data.
- Verify that the SDR2-CF and your device are communicating at the same speed and with the same serial data format parameters.
- Communicate with your serial data source connected to the device port.
- Set up output messages for your serial device.

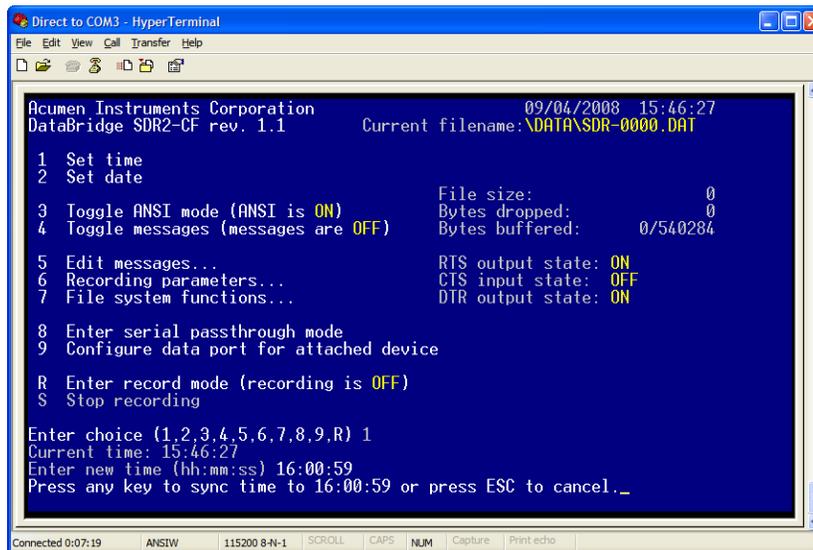
Before you begin, be sure you have the documentation available for the device you'll connect to your SDR2-CF. If possible, be sure you can communicate with the data source using the supplied software and/or your communications software. An intimate knowledge of your data source's communications standards will make connecting it to the SDR2-CF simple.

**TIP:** For detailed information about the SDR2-CF configuration menus, see Chapter 4.

## 2.1 Setting date and time

The SDR2-CF features a real-time clock that reports a file's last modified date and time. The real-time clock is preset and battery-backed, so setting the date and time is seldom necessary.

To set the time, type **1** at the menu prompt. Then, when prompted further, enter the time in 24-hour format using two digits for each of hours, minutes, and seconds (omit the colons (: ) between each field). Press any key to return to the SDR2-CF main menu. For an example, see Figure 2.1.



```
Direct to COM3 - HyperTerminal
File Edit View Call Transfer Help
Acumen Instruments Corporation          09/04/2008 15:46:27
DataBridge SDR2-CF rev. 1.1           Current filename: \DATA\SDR-0000.DAT

1 Set time
2 Set date
3 Toggle ANSI mode (ANSI is ON)      File size: 0
4 Toggle messages (messages are OFF) Bytes dropped: 0
                                       Bytes buffered: 0/540284
5 Edit messages...                   RTS output state: ON
6 Recording parameters...             CTS input state: OFF
7 File system functions...            DTR output state: ON

8 Enter serial passthrough mode
9 Configure data port for attached device

R Enter record mode (recording is OFF)
S Stop recording

Enter choice (1,2,3,4,5,6,7,8,9,R) 1
Current time: 15:46:27
Enter new time (hh:mm:ss) 16:00:59
Press any key to sync time to 16:00:59 or press ESC to cancel._

Connected 0:07:19  ANSIRW  115200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

Figure 2.1. Setting the SDR2-CF's time.

To set the date, type **2** at the menu prompt. Then, enter the date using two digits for each of the month and day fields, and four digits for the year field (omitting any hyphens or other characters). Press any key to return to the main configuration menu. See Figure 2.2 for an example.

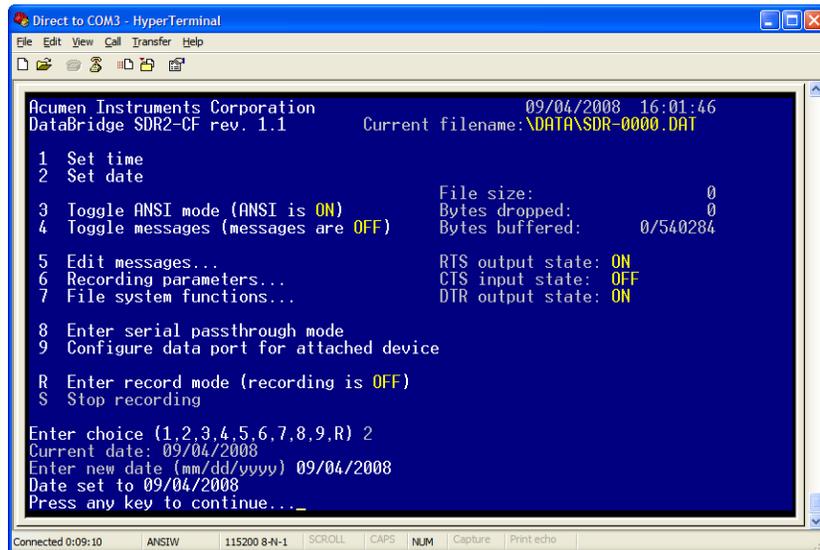


Figure 2.2. Setting the SDR2-CF's date.

## 2.2 Configuring the data port

Before the SDR2-CF and your data source can communicate, they must interact at the same data rate and using the same data format.

The SDR2-CF's data port is, by default, configured to communicate at 115,200 bps.

If your data source can communicate at 115,200 bps (also referred to as 115,200 baud), it may be easiest to configure it for 115,200 bps. For devices with a fixed data rate, you will need to set the SDR2-CF's data port baud rate to match your data source. You may also wish to choose a higher data rate (and hardware handshaking) if your data source sends a high volume of data.

Hardware handshaking ensures that the SDR2-CF sends messages only when the data source is ready to accept them. Likewise, hardware handshaking prevents a data source from sending data when the SDR2-CF is not ready to receive it.

Be sure that your serial data source and the SDR2-CF use the same handshaking settings. If the SDR2-CF monitors the handshaking signal but your data source does not send it, the SDR2-CF will wait indefinitely for "permission" to transmit messages. Likewise, if your data source monitors the handshaking signals but the SDR2-CF doesn't send the appropriate signal, the software may never transmit output data.

To change the baud rate for the data port, press 9, then press B and type the desired baud rate (e.g. 115200). To change handshaking or data format, use

**NOTE:** By default, the SDR2-CF uses a serial data format of eight data bits, no parity, and one stop bit (8N1). Most serial devices use this format.

the H or D commands. Press <Enter> to save the changes and close the window. To change the baud rate and hardware handshaking for the data port, type **9**, and select the appropriate settings to for your data source. When your desired settings are indicated, type <Enter> or <ESC> to save the settings and close the window.

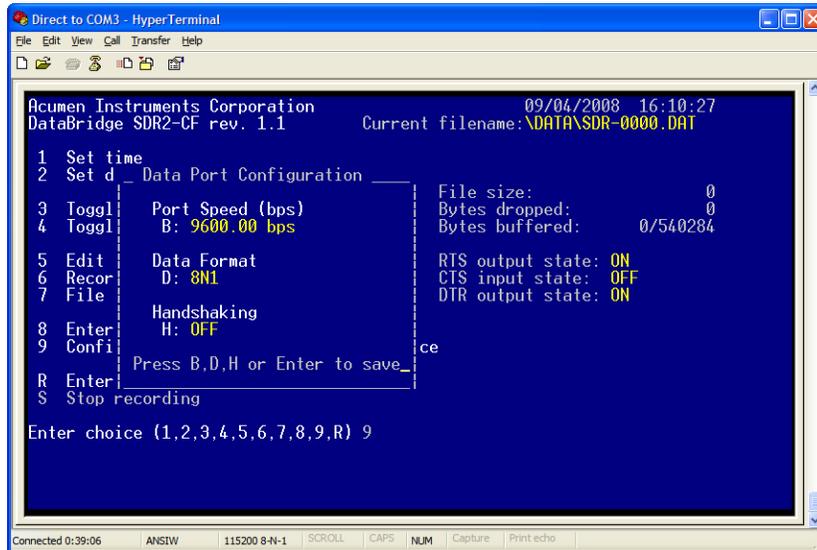


Figure 2.3. The Data Port Configuration prompt.

## 2.3 Specifying a filename and folder

You can also change the filename and folder by typing **6** at the main menu, then **1** in the Recording Parameters submenu.

By default, the SDR2-CF records data to a file called `SDR-CF-0000.DAT` located in the `DATA` subfolder in the CF card's root directory. You can keep this filename or specify a new filename that reflects the data it contains. For example, you may wish to use `PRESSURE.TXT` for pressure data or even a name like `TEMP0907.TXT` for temperature data from September 2007. Likewise, your choice of folder names may reflect something about the data it contains.

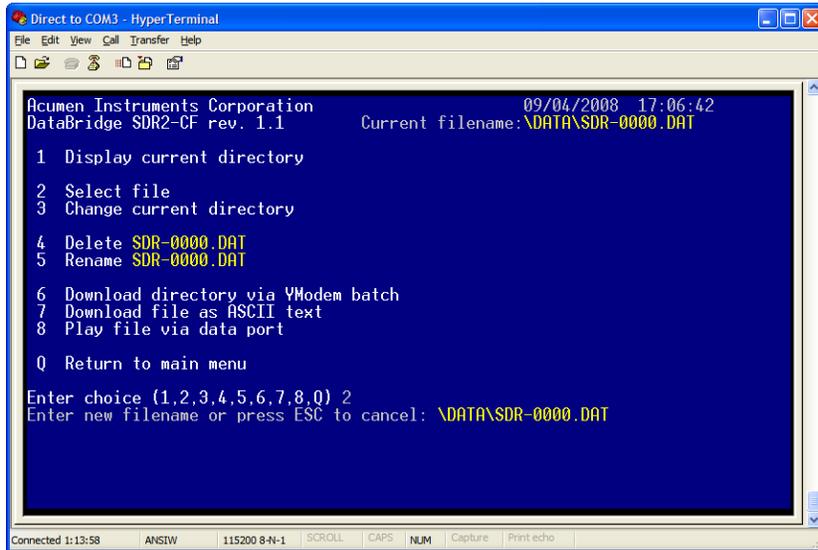
### Notes about filenames

When you enter a filename, it must conform to the FAT 8+3 filename format. This means that files contain up to 8 characters, a period ("dot"), and up to three more characters. For example, `BRIDGE.DAT`, `ABCDEFGH.123`, and `1` are all valid filenames, while `DATA.FILE`, and `JOHNSMITH.TXT` are not. The SDR2-CF ignores characters you type that are not allowed in FAT16 filenames, such as: `\/*| []`.

To specify the name of the file the SDR2-CF will use for recording data, type **7** at the main menu prompt to enter the File System Functions

submenu (see Figure 2.4). You can use Option 3 to change directory without having to retype the filename.

From the File System Functions menu, press **2**. Then, when prompted, backspace over the current filename/path and type a filename, pressing the **<Enter>** key when finished or **<Esc>** to cancel changes. If your filename is not 8+3 compliant, the SDR2-CF does its best to make it compliant. You can return to the main menu by typing **Q**.



```
Direct to COM3 - HyperTerminal
File Edit View Call Transfer Help
Acumen Instruments Corporation      09/06/2008 17:06:42
DataBridge SDR2-CF rev. 1.1        Current filename: \DATA\SDR-0000.DAT

1 Display current directory
2 Select file
3 Change current directory
4 Delete SDR-0000.DAT
5 Rename SDR-0000.DAT
6 Download directory via VModem batch
7 Download file as ASCII text
8 Play file via data port
Q Return to main menu

Enter choice (1,2,3,4,5,6,7,8,Q) 2
Enter new filename or press ESC to cancel: \DATA\SDR-0000.DAT

Connected 1:13:58  ANSIR  115200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

Figure 2.4. Changing the current filename.

## 2.4 Setting recording parameters

The SDR2-CF's recording parameters submenu allows you to control how and when new files are created, how the SDR2-CF handles a full CF card, if incoming data is date/time stamped, and how the SDR2-CF handles a power failure. To enter the Recording Parameters submenu, press **6** from the main menu prompt.

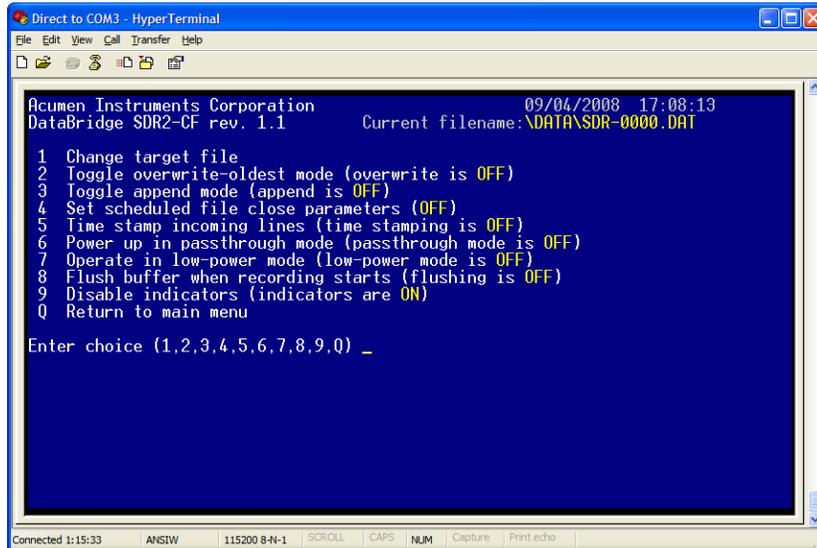


Figure 2.5. The Recording Parameters submenu.

*Overwrite-oldest mode:* When overwrite is enabled, the SDR2-CF will delete the oldest file on the disk whenever recording starts and the CF card has less than 1 megabyte of free disk space. Use this option with scheduled file closing (see below) to configure the SDR2-CF as a circular buffer that contains only the most recently received data.

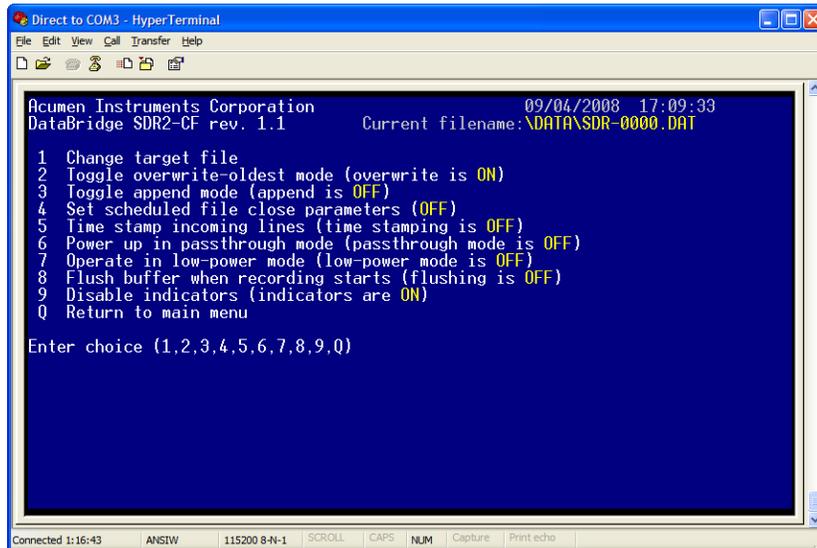
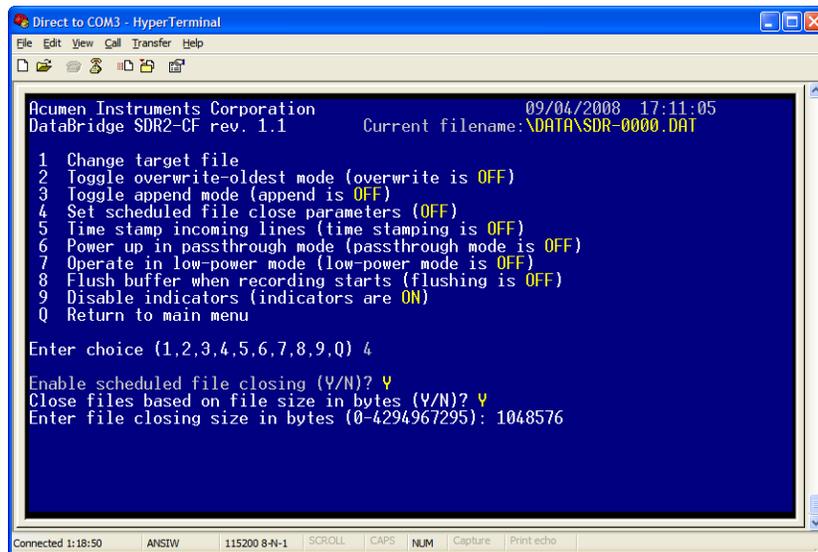


Figure 2.6. The SDR2-CF configured as a circular buffering logger.

*Append mode:* If append mode is enabled, data will be recorded to the current file whenever recording starts, resulting in one large file. New files will only be created when the filename is modified via the configuration menus.

*Scheduled file closing:* The SDR2-CF can be configured to automatically stop and restart recording based on either a time interval (in seconds) or a file size (in bytes).



```
Direct to COM3 - HyperTerminal
File Edit View Call Transfer Help
Acumen Instruments Corporation          09/04/2008 17:11:05
DataBridge SDR2-CF rev. 1.1           Current filename: \DATA\SDR-0000.DAT

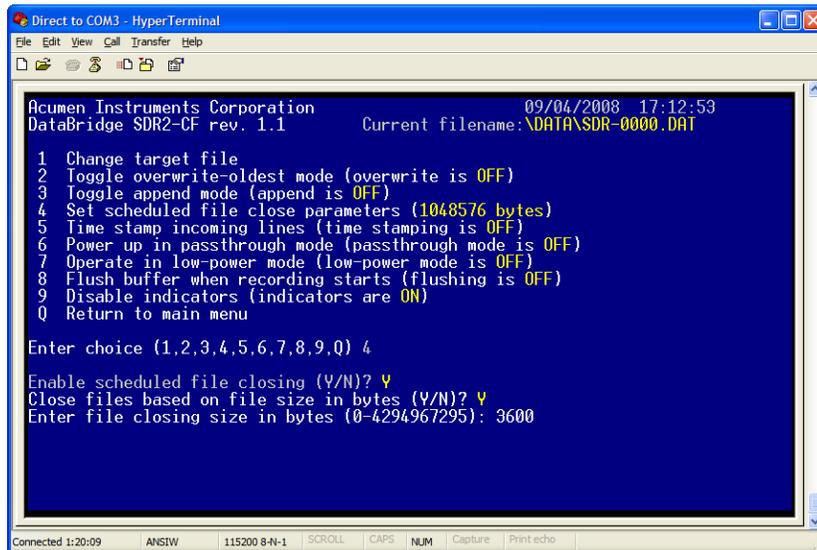
1 Change target file
2 Toggle overwrite-oldest mode (overwrite is OFF)
3 Toggle append mode (append is OFF)
4 Set scheduled file close parameters (OFF)
5 Time stamp incoming lines (time stamping is OFF)
6 Power up in passthrough mode (passthrough mode is OFF)
7 Operate in low-power mode (low-power mode is OFF)
8 Flush buffer when recording starts (flushing is OFF)
9 Disable indicators (indicators are ON)
0 Return to main menu

Enter choice (1,2,3,4,5,6,7,8,9,0) 4

Enable scheduled file closing (Y/N)? Y
Close files based on file size in bytes (Y/N)? Y
Enter file closing size in bytes (0-4294967295): 1048576

Connected 1:18:50  ANSIV  115200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

Figure 2.7. Configuring the SDR2-CF to create a new file after every 1 megabyte (1048576 bytes) of data received.



```
Direct to COM3 - HyperTerminal
File Edit View Call Transfer Help
Acumen Instruments Corporation          09/04/2008 17:12:53
DataBridge SDR2-CF rev. 1.1           Current filename: \DATA\SDR-0000.DAT

1 Change target file
2 Toggle overwrite-oldest mode (overwrite is OFF)
3 Toggle append mode (append is OFF)
4 Set scheduled file close parameters (1048576 bytes)
5 Time stamp incoming lines (time stamping is OFF)
6 Power up in passthrough mode (passthrough mode is OFF)
7 Operate in low-power mode (low-power mode is OFF)
8 Flush buffer when recording starts (flushing is OFF)
9 Disable indicators (indicators are ON)
Q Return to main menu

Enter choice (1,2,3,4,5,6,7,8,9,Q) 4
Enable scheduled file closing (Y/N)? Y
Close files based on file size in bytes (Y/N)? Y
Enter file closing size in bytes (0-4294967295): 3600

Connected 11:20:09  ANSIV  115200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

Figure 2.8. Configuring the SDR2-CF to create a new file every hour (3600 seconds).

*Time stamping:* This option is most commonly used when logging ASCII data to add date and time to the beginning of each line of data, which is useful for correlating data with other recorders. Incoming data lines will be terminated with either a carriage return (ASCII code 13) or a carriage return+line feed (ASCII code 10).

If you are unsure, it may be easiest to configure the SDR2-CF timestamping to trigger on a line feed, and then reconfigure it for carriage return if you see no time stamps in your data.

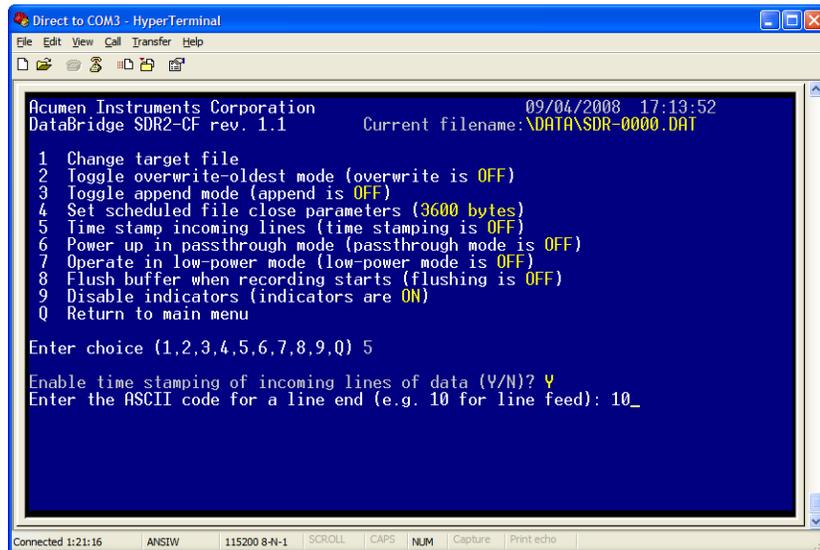


Figure 2.9. Configuring the time stamping for ASCII data with CR+LF line ends.

*Powering up in passthrough mode:* This option forces the SDR2-CF into passthrough mode (as if the user had pressed **8** from the main configuration menu) whenever the SDR2-CF powers up, regardless of whether the SDR2-CF is recording or not. When the option is enabled, the user must enter **+++** to return to the configuration menu.

If you are unsure how to use it, **DO NOT** enable this option. This option can make your SDR2-CF appear to be broken. For more information about passthrough mode, see section 4.1.5.

**NOTE:** From the main menu, in the Recording Parameters menu option you will be able to check the state of power up in passthrough mode on menu option 6. By selecting this option you can turn this feature on or off.

## 2.5 Entering messages

Some data sources need to receive specific data strings or commands before they will transmit data. Other data sources send data continuously once they are initialized with a specific string or command.

Your serial data source may also have the option of powering down with a string or command that is sent when the SDR2-CF stops recording. Or you may wish to stop the data source from transmitting data while the SDR2-CF is not recording.

If your device transmits data continuously without requiring input, you don't need to send output messages.

You can configure the SDR2-CF to send up to ten 256-byte strings independent messages to the data source on startup, periodically, or both, on intervals from once a second to once every 136 years.

Messages are stored as ASCII text strings in non-volatile memory. To use messages, first enter a text string for one of the ten messages. Then, configure whether the message should be sent on when recording starts, when recording stops, or at an interval specified in seconds. The SDR2-CF can also be configured to append a carriage return <CR> and/or line feed <LF> to any message.

To enter a new message, type **5** at the main menu prompt to enter the Edit Messages submenu. To edit a message, type **1**. When prompted, enter the desired message number (**0-9**) and type a message followed by the <Enter> key.

```

Acumen Instruments Corporation          09/04/2008  17:15:58
DataBridge SDR2-CF rev. 1.1

# interval  I  S  CR LF message
0         0  N  N  N  N
1         0  N  N  N  N
2         0  N  N  N  N
3         0  N  N  N  N
4         0  N  N  N  N
5         0  N  N  N  N
6         0  N  N  N  N
7         0  N  N  N  N
8         0  N  N  N  N
9         0  N  N  N  N

1 Edit message contents
2 Edit message parameters
Q Return to main menu

Enter choice (1,2,Q) 1
Enter message number (0-9): 0
Enter message (\hh for hex, \\ for \, press Enter to end): $1RD_

```

Figure 2.10. Changing message zero to "\$1RD".

### Setting message parameters

To change a message's parameters, type **2** at the menu prompt. When prompted, enter the desired message number (**0-9**) and type a message followed by the <Enter> key.

*Output intervals:* The SDR2-CF sends a message, then waits a specific amount of time before sending the message again. When configuring a message, you are prompted to enter this period, or output interval. For instance, if the message should be output once every ten seconds, type **10** and press the <Enter> key. To disable a message (but leave its contents intact), enter **0**.

*Initialization:* Some devices “wake up” or begin continuously sending data only after receiving a specific command, the initialization string. When prompted, press **Y** to indicate that the SDR2-CF should send the message once when it enters record mode. This feature can be used together with output interval to both initialize a device with a specific message and send the message periodically. This is useful for resetting or automatically reinitializing a data source if its power is lost. Entering **N** disables this feature.

*Stop:* In some applications you may wish to send a message to an attached device when your SDR2-CF stops recording. When prompted, press **Y** to indicate that the SDR2-CF should send the message once when it leaves record mode. This feature can be used to power down or put a device to sleep, or tell the data source to stop sending data while the SDR2-CF is not recording.

*Carriage return and line feed:* When prompted, enter **Y** to instruct the SDR2-CF to add a carriage return and/or line feed to the end of a message. Many devices require a carriage return and/or line feed after a message, while others may require neither. Your data source’s documentation can help you determine whether carriage returns and/or line feeds are required after query strings.

```

Acumen Instruments Corporation                               09/04/2008 17:54:40
DataBridge SDR2-CF rev. 1.1

# interval  I  S  CR LF  message
0          10 N  Y  Y  Y  $1RD
1           0 N  N  N  N
2           0 N  N  N  N
3           0 N  N  N  N
4           0 N  N  N  N
5           0 N  N  N  N
6           0 N  N  N  N
7           0 N  N  N  N
8           0 N  N  N  N
9           0 N  N  N  N

1 Edit message contents
2 Edit message parameters
Q Return to main menu

Enter choice (1,2,Q) 2
Enter message number (0-9): 0
Enter output interval in seconds (0-4294967295): 10
Initialize with message (Y/N)? N
Append carriage return to message (Y/N)? Y

```

Figure 2.11. Configuring message zero for output every 10 seconds and append carriage return and line feed.

The main configuration menu includes an option (menu option **4**) for globally enabling or disabling output messages. Be sure output messages are enabled when using the messaging feature.

## 2.6 Testing your configuration

**TIP:** Messages with only a carriage return (no line feed) after them will appear to overwrite previous messages in your terminal software. You can enable your communications software's "append linefeeds to incoming carriage returns" feature to see these messages properly.

To test your configuration, disconnect your terminal from the configuration port and use a null modem adapter or cable to connect your terminal to the data port. Your computer then becomes a data source.

Press the Record button to enter record mode. The SDR2-CF's record indicator will illuminate and the output messages you entered will be displayed once or at the specified output intervals.

To ensure that recording is occurring, type several keystrokes on the terminal or use the software's ASCII text upload feature to send a text file. The SDR2-CF's data indicator should blink as you press keys, indicating data is being received. When finished, press the record button again to stop recording and inspect the file created on the CF card.

**Note:** The SDR2-CF will not echo data while it is being recorded, so you will not see characters appear on-screen as you type. You can enable your terminal software's "local echo" or "full duplex" feature to view data as you send it.

---

# 3

## Operations

### 3.1 Record mode

When you press the record button or type **R** from the Configuration menu, the SDR2-CF searches for the current file specified in the File System Functions menu, creates it if necessary, and opens it. Once the SDR2-CF has successfully opened the file, the record indicator turns on and the SDR2-CF enters record mode.

Once in record mode, the SDR2-CF records any data received on the data port to the open file. While in record mode, the SDR2-CF also transmits the messages stored in nonvolatile memory at the specified intervals to the data source connected to its data port.

#### 3.1.1 Receiving data

The data indicator flashes when the SDR2-CF receives data. This indicator is useful to ensure that the SDR2-CF is actually receiving data via the data port. Note: this flashing indicator does not guarantee a correct baud rate. Incorrect baud rates between the data source and SDR2-CF may still cause the data indicator to flash.

### 3.1.2 Stopping recording

Incoming data is appended to the open file as it is received until you stop recording by either pressing the record button or typing **S** from the Configuration menu. The SDR2-CF then closes the file, updates its directory entry (recording file size, date, and time), and returns to stop mode.

### 3.1.3 Power failure and improper shutdowns

If the SDR2-CF loses power while in record mode, it returns to record mode after power is restored. When powering up after a loss of power while recording, the SDR2-CF waits about 5 seconds and prompts you to hit any key or the record button to abort returning to record mode.

An improper shutdown may result in loss of data (due to sector buffering and caching in the storage device) and minor allocation errors that can be repaired using the MS-DOS™ SCANDISK.EXE utility, Norton Disk Doctor™, or Windows 95/98/NT/2000/XP™ Explorer.

### 3.1.4 Full storage media

When the storage media's first valid partition is full, the SDR2-CF returns to stop mode unless overwrite-oldest mode is enabled, in which case the SDR2-CF will delete the oldest file in the target folder and return to recording mode.

You can delete files on the target media using your computer or replace it, then insert the media and press the record button and append data normally.

### 3.1.5 Formatting the storage media

If you have purchased a CF card, you may need to format it using MS-DOS™, Windows 95/98/ME™, Windows NT/2000/XP™, or another operating system that supports the FAT file system.

The SDR2-CF supports **only** the FAT file system. If your computer supports the NTFS, HPFS, or other advanced file systems, be sure your card is formatted using FAT.

**NOTE:** If your storage media was included with SDR2-CF, it is already formatted properly.

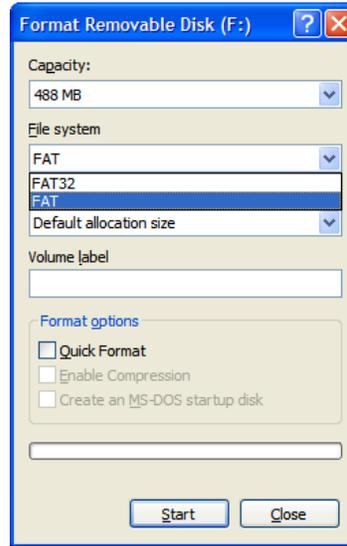


Figure 3.1. Formatting a CompactFlash card using the FAT file system.

### 3.1.6 Partitions

In some cases, disks are partitioned to contain multiple "virtual" drives on a single disk. Partitioning is sometimes done to overcome the 2 gigabyte size limit in MS-DOS™ (and create multiple 2 gigabyte drives), support multiple operating systems and file systems, or make more efficient use of disk space.

FDISK.EXE (included with MS-DOS™ and Windows 95/98™), Disk Administrator (included with Windows NT/2000/XP/Vista™), Norton Disk Doctor™, and Norton DiskEdit™ are useful tools for managing and analyzing disk partitioning schemes.

The SDR2-CF supports both extended and primary FAT partitions, but always reads and writes files in the first partition it recognizes as a FAT partition.

## 3.2 Configuration Port settings

In some cases, you may wish to choose higher (or lower) data rates for the configuration port.

For example, you may need a lower speed if you wish to configure, control, and monitor your SDR2-CF remotely using a radio modem. You may need a higher speed if you intend to download data through the serial port using YMODEM or if you simply want a "snappier" menu display.

To change the configuration port baud rate, open the enclosure and use switches S1-1, S1-2 and S1-3 to select a baud rate for the configuration port and switch S1-4 to enable or disable RTS/CTS hardware handshaking. See Table 3.1 for switch settings.

	baud rate			RTS/CTS handshake enable
Label	baud rate 0	baud rate 1	baud rate 2	
Switch Designator	S1-1	S1-2	S1-3	S1-4
RTS/CTS hardware handshaking enable	-	-	-	ON
2400 bps	OFF	OFF	OFF	-
4800 bps	ON	OFF	OFF	-
9600 bps	OFF	ON	OFF	-
19200 bps	ON	ON	OFF	-
38400 bps	OFF	OFF	ON	-
57600 bps	ON	OFF	ON	-
115200 bps	OFF	ON	ON	-
230400 bps	ON	ON	ON	-

Table 3.1. Configuration Port DIP switch settings.

### 3.3 Lithium battery maintenance

The SDR2-CF's real-time clock uses a small lithium battery to maintain time when external power is unavailable. The life of this battery should exceed 5 years.

If you find your SDR2-CF is not keeping time correctly or that the time is displayed with a question mark (?) after it when you power up, you may need to replace the battery. If necessary, replace the battery with a Panasonic CR2032, or equivalent, making sure the positive (+) face is in contact with the battery clip. After replacing the battery be sure to reset the SDR2-CF's time and date.

---

# 4

## Configuration Menu Reference

You can use menu functions to manage files, configure and communicate with the device attached to the data port, set date and time, set up output messages, download data, configure the storage media, and control the SDR2-CF without using the record button.

### 4.1 Main Configuration Menu

The SDR2-CF's core functions are accessed from the Configuration menu (see Figure 4.1) using terminal software. The Configuration menu includes functions for controlling both the SDR2-CF and the attached device. A number of the Configuration menu items either prompt for input or execute immediately, and therefore have no associated sub-menu.

The Configuration menu also provides feedback during recording. Status fields, on the right-hand side of the Configuration menu, indicate approximate recorded file size in bytes, bytes dropped because of buffer overflow (ideally zero), and a telltale for the minimum free space in the buffer (527 kilobyte maximum). In addition, the logic states of the RTS, CTS, and DTR lines of the data port are displayed. The DTR line is designed to source 3.3VDC for optionally supplying low-power devices (100mA max).

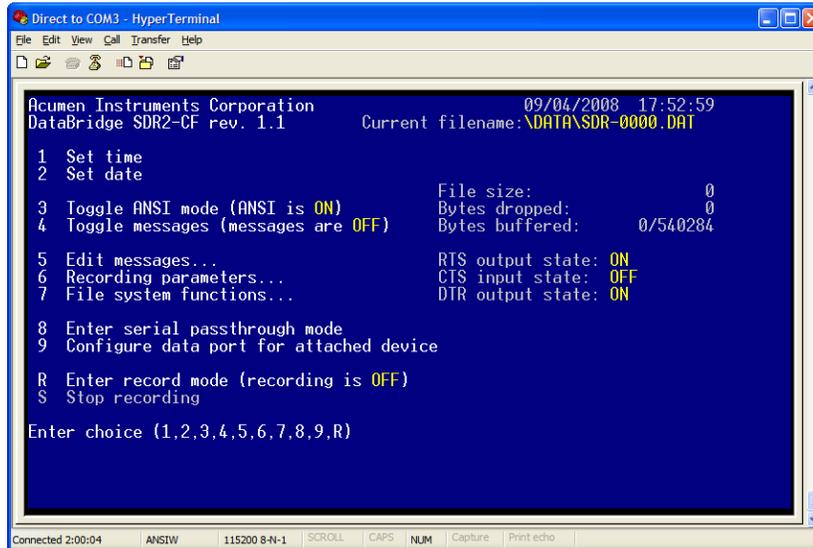


Figure 4.1. The DataBridge SDR2--CF configuration menu.

#### 4.1.1 Set Time

To update the real-time clock's time, type **1** at the menu prompt. When prompted further, enter the time in 24-hour format using two digits for each of hours, minutes, and seconds (omit the colons (: ) between each field). Press any key to return to the SDR2-CF main menu. For an example, see Figure 2.1.

#### 4.1.2 Set Date

To update the real-time clock's date, type **2** at the menu prompt. When prompted further, enter the date in MM/DD/YYYY format using two digits for each for month and day, and four digits for year (omit the slash (/) between each field). Press any key to return to the SDR2-CF Configuration menu. For an example, see Figure 2.2.

#### 4.1.3 Toggle ANSI Mode

ANSI mode provides an easy to read user interface for your SDR2-CF and is enabled (or disabled) by typing **3** from the Configuration menu. Make sure you have ANSI mode enabled in your terminal software for proper display of the menus. The current state of ANSI mode is indicated on the menu.

#### 4.1.4 Toggle Messages

For convenience and testing, all messages can be globally activated or deactivated by typing **4** from the Configuration menu. Globally turning the

messages off does not change their settings, but overrides the current message parameters. The current state of the messages is indicated.

#### 4.1.5 Enter Serial Passthrough Mode

Serial passthrough mode provides a means for communicating with the device connected to the data port. To enter passthrough mode, press **8** from the main menu. To return to the main menu, type **+++**, then wait two seconds without typing for the menu to reappear. The LED on the front of the unit will blink when data is transferred to indicate that the SDR2-CF is in passthrough mode.

#### 4.1.6 Configure Data Port for Attached Device

To set baud rate, data format, and handshaking for the data port, type **9** from the main menu. To set baud rate, press **B**, then type a baud rate that matches your device. Common baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, and 230400. Press **H** to configure hardware handshaking (on or off) and **D** to select serial data format (use **8N1** if unsure). Pressing **<Enter>** or **<ESC>** saves the settings and returns to the main configuration menu.

**NOTE:** Incorrect handshaking settings may cause the SDR2-CF to become unresponsive during passthrough mode. Particularly, enabling RTS/CTS handshaking for a device that doesn't support hardware handshaking may cause these hangs. If your SDR2-CF hangs during passthrough mode, remove power for five seconds, and then reapply power.

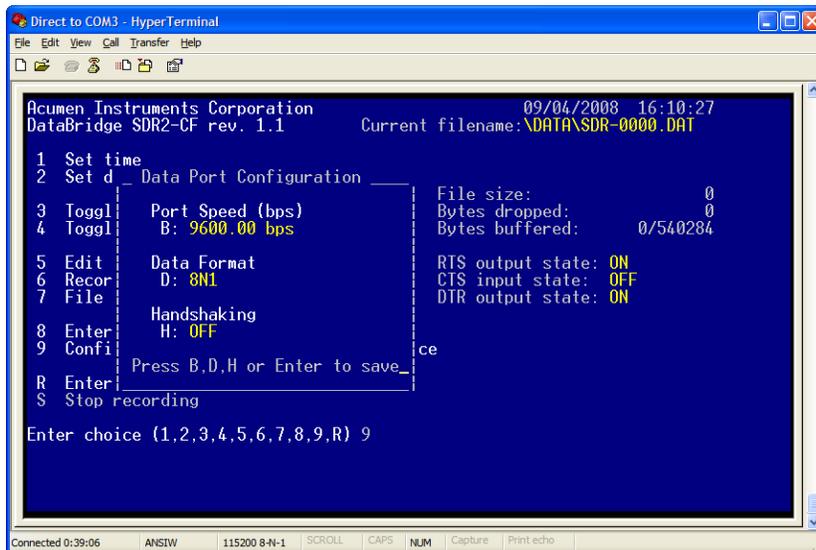


Figure 4.2. Data port configuration.

#### 4.1.7 Start/Stop Recording

Like the record button, the main menu commands **R** and **S** are used to immediately enter record and stop modes. The **R** menu option shows the current state of recording (on or off).

## 4.2 Edit Messages menu

To enter the Edit Messages submenu, type **5** from the Configuration menu. The Edit Messages menu appears (see Figure 4.3).

To edit a message's contents, type **1**. Select the number of the message you would like to edit and type in the new message contents. Pressing **<Enter>** saves the message and returns you to the Edit Messages menu.

```

Acumen Instruments Corporation           09/04/2008 17:15:58
DataBridge SDR2-CF rev. 1.1

# interval  I  S  CR LF message
0           0  N  N  N  N
1           0  N  N  N  N
2           0  N  N  N  N
3           0  N  N  N  N
4           0  N  N  N  N
5           0  N  N  N  N
6           0  N  N  N  N
7           0  N  N  N  N
8           0  N  N  N  N
9           0  N  N  N  N

1 Edit message contents
2 Edit message parameters
0 Return to main menu

Enter choice (1,2,0) 1
Enter message number (0-9): 0
Enter message (\hh for hex, \\ for \, press Enter to end): $!RD_
  
```

Figure 4.3. Entering text for message 0.

To edit a message's parameters, type **2** and select the number of the message you would like to change the parameters for. Follow the prompts to set the output interval, whether to send the message on initialization (entering record mode), whether to send the message when stopping (exiting record mode), and whether to append carriage returns and/or line feeds.

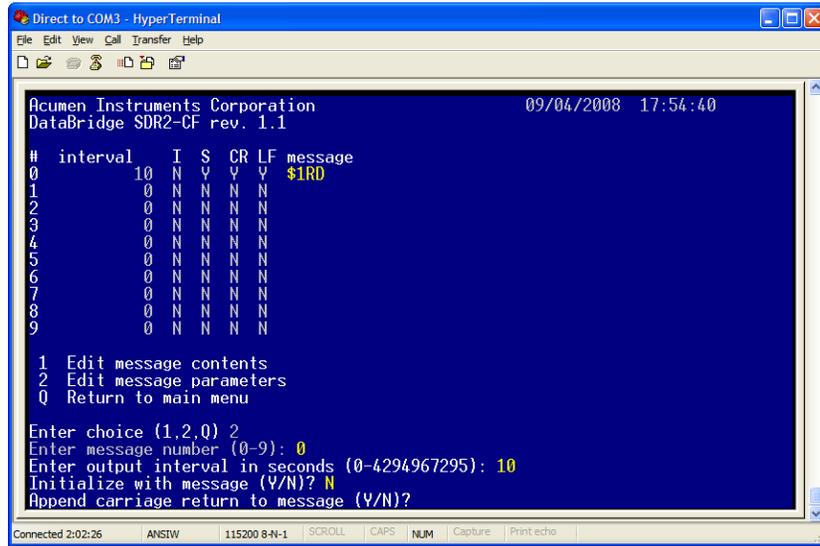


Figure 4.4. Changing the parameters for message 0.

From the main configuration menu (see Figure 4.1), typing **4** enables or disables all messages. If you are using the message feature, be sure the main menu displays “messages are ON” after menu item 4.

To return to the Configuration menu from the Edit Messages menu, press **Q**.

### 4.3 Recording Parameters menu

To enter the Recording Parameters submenu, press **6** from the main configuration menu. The Recording parameters submenu appears (see Figure 4.5).

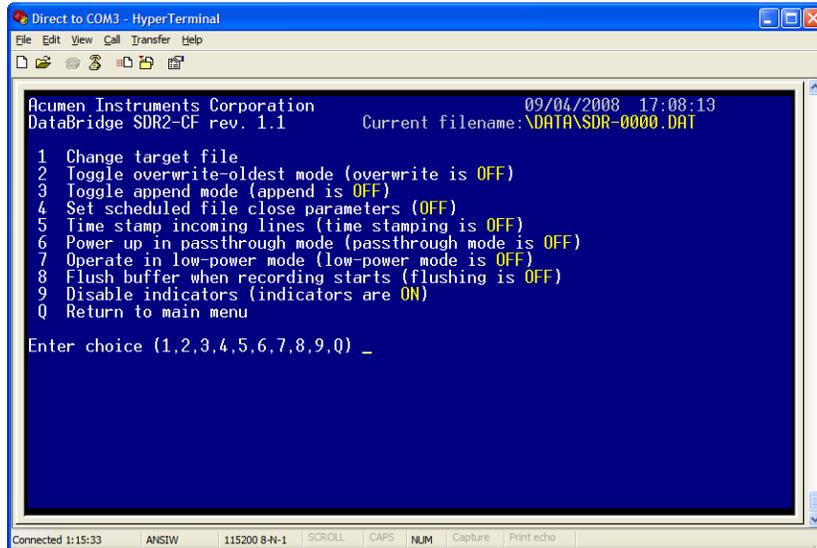


Figure 4.5. The Recording Parameters submenu.

From the Recording Parameters submenu, you can specify a filename, control how new files are created and named, how the SDR2-CF deals with a full CF card, whether timestamps are added to incoming data, and whether the configuration port displays the menu or communicates with the data source during recording.

#### 4.3.1 Change current filename

To change the filename your SDR2-CF uses to record data, type **2** from the File System Functions submenu, and edit the filename/folder using the backspace key. When you are finished, the specified file name appears at the top of the File System Functions submenu (see Figure 4.5). This menu option functions exactly the same as menu **1** in the File System Functions menu (see below).

#### 4.3.2 Toggle overwrite-oldest mode

When enabled, overwrite-oldest mode checks the media during recording and deletes the oldest file in the current recording folder whenever the CF card's free space is less than 1 megabyte. Use this option with scheduled file closing (see below) to configure the SDR2-CF as a continuous-recording circular data buffer. Menu option **2** turns overwrite-oldest mode on and off. The menu displays the state of overwrite-oldest mode.

#### 4.3.3 Toggle append mode

When power is lost during recording, your SDR2-CF can either append new data to the current file when power is restored or begin recording using a

new file. Menu option **3** turns append mode on and off. The menu displays the state of append mode.

When append mode is off, the SDR2-CF will generate a name for the new file based on the current filename. It does this by incrementing the filename using the characters **0** through **9** and **A** through **Z**. If the target filename without extension is less than eight characters and append mode is off, the SDR2-CF pads the name with zeros. Examples of filename generation are shown in Figure 4.6.

Before Incrementing	After Incrementing
BRIDGE.DAT	BRIDGE01.DAT
BRIDGE01.DAT	BRIDGE02.DAT
BRIDGE09.DAT	BRIDGE0A.DAT
BRIDGE0Z.DAT	BRIDGE10.DAT
BRIDGE10.DAT	BRIDGE11.DAT

Figure 4.6. Generating filenames when append mode is off.

**Note:** A disk's root directory typically holds only 512 directory entries. To avoid exceeding this 512 file limit, do not record using the root directory in environments where power will be lost frequently.

#### 4.3.4 Set scheduled file close parameters

The SDR2-CF can periodically close and reopen or create new files automatically. This is useful to ensure that data is committed to the disk, especially when recording at low data rates. When used with append mode off, scheduled file closings ensure that your data files are a manageable size. Each file is stamped with the date and time when closed, which can later provide useful diagnostic information.

Files can be closed on a time or file size basis. To schedule file closings, type **4** from the Recording Parameters submenu. When prompted, either chose to close files based on file size or time interval (up to 4294967296 seconds). In Figure 4.7 the user is specifying that the file will be closed every hour of recording time.

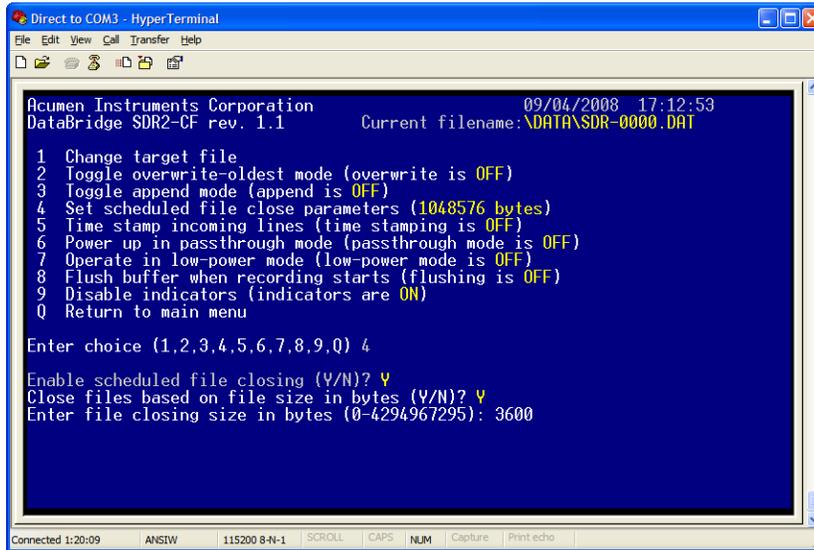


Figure 4.7. Configuring scheduled file close for every 3600 seconds (1 hour) of recording time.

Table 4.1 provides useful conversion factors for specifying file-closing intervals.

Interval	Seconds
1 second	1
1 minute	60
1 hour	3600
1 day	86400
1 week	604800
1 month*	2629800
6 months*	15778800

\*based on a 365¼-day year

Table 4.1. Common file-closing time intervals.

In Figure 4.8, the user is specifying that the file will be closed once a megabyte of data is received (1024×1024=1048576 bytes).

```

Direct to COM3 - HyperTerminal
File Edit View Call Transfer Help
Acumen Instruments Corporation          09/04/2008 17:11:05
DataBridge SDR2-CF rev. 1.1           Current filename:\DATA\SDR-0000.DAT

1 Change target file
2 Toggle overwrite-oldest mode (overwrite is OFF)
3 Toggle append mode (append is OFF)
4 Set scheduled file close parameters (OFF)
5 Time stamp incoming lines (time stamping is OFF)
6 Power up in passthrough mode (passthrough mode is OFF)
7 Operate in low-power mode (low-power mode is OFF)
8 Flush buffer when recording starts (flushing is OFF)
9 Disable indicators (indicators are ON)
0 Return to main menu

Enter choice (1,2,3,4,5,6,7,8,9,0) 4
Enable scheduled file closing (Y/N)? Y
Close files based on file size in bytes (Y/N)? Y
Enter file closing size in bytes (0-4294967295): 1048576

Connected 1:18:50  ANSIR  115200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo

```

Figure 4.8. Configuring scheduled file close every 1 megabyte (1048576 bytes) of data received.

### 4.3.5 Time stamp incoming lines

The SDR2-CF allows you to add the time and date to each line of incoming data. Time stamping is triggered by reception of a character of your choice. Typically, the line feed character (ASCII code 10) is a good choice since a line feed character usually precedes each new line from the data source (see Figure 4.9).

However, some devices output only a carriage return (ASCII code 13) at the end of each line. Consult your documentation or try line feed, then carriage return if you don't see time stamps in your data.

Time stamps are written in MM/DD/YY HH:MM:SS format.

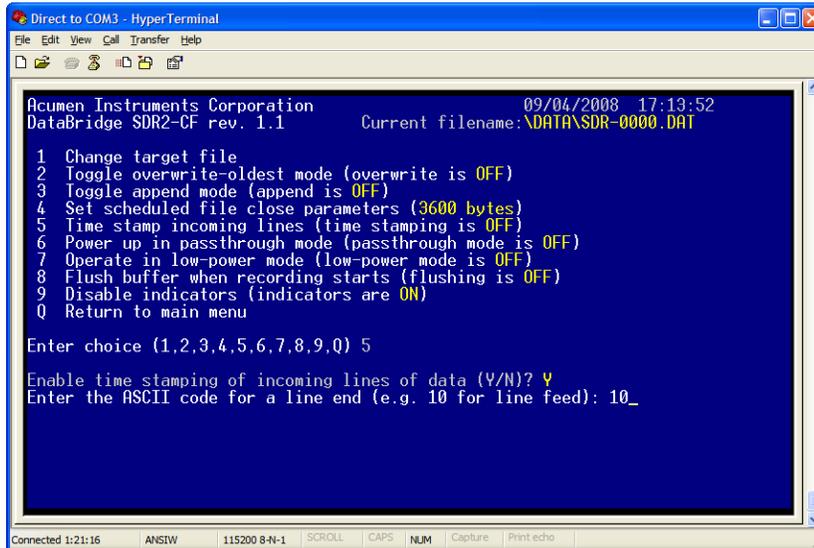


Figure 4.9. Enabling time stamping of incoming data after the line feed (LF) character.

Figure 4.10 shows an ASCII download of a file with time stamping enabled.

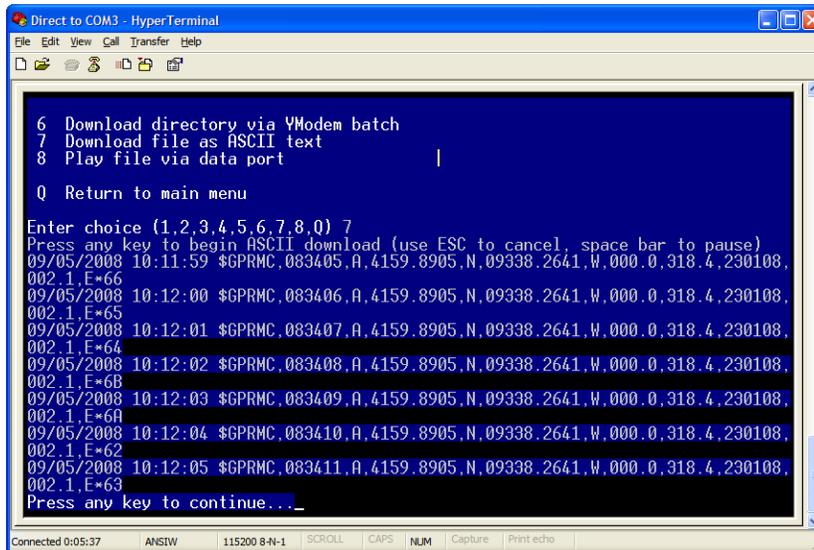


Figure 4.10. An example of a file recorded with time stamping enabled.

### 4.3.6 Power up in passthrough mode

In some unique applications, the user may wish to always communicate with the data source via the configuration port using passthrough mode. For example, if the SDR2-CF is placed "in-line" between a computer or microprocessor to log communications to or from each. The SDR2-CF can be configured to always enter passthrough mode, whether recording or not.

Menu option **6** turns power up in passthrough mode on and off, and the menu displays the state of power up in passthrough mode. The LED located on the front of the SDR2-CF will blink as data is transferred to indicate you are operating in passthrough mode. **DO NOT USE THIS OPTION IF YOU ARE UNSURE WHAT IT DOES.**

## 4.4 File System Functions menu

To enter the File System Functions submenu, press **7** from the Configuration menu. The File System Functions submenu appears (see Figure 4.5).

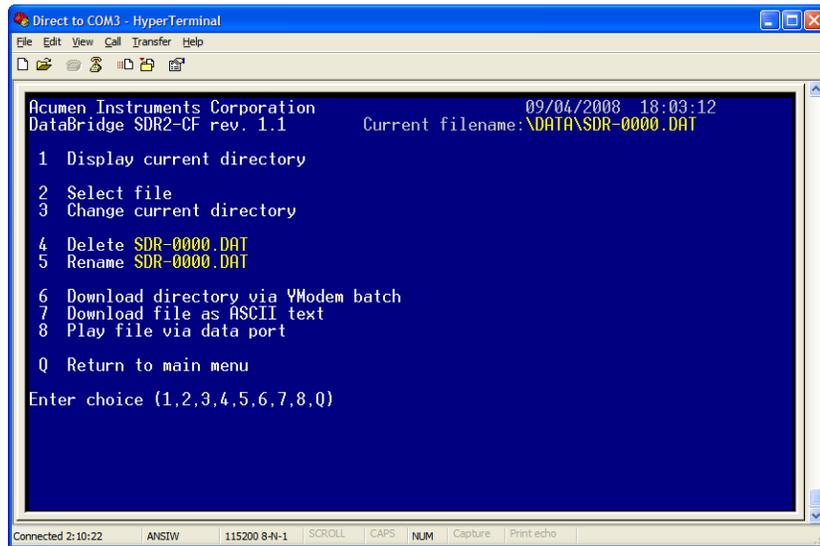


Figure 4.11. The File System Functions submenu.

Using the File System Functions menu, you can display a directory of files, change filename or target directory, delete and rename files, and download or view files.

#### 4.4.1 Display root directory

To display the current directory, type **1**. If the directory is not empty, each file's name, attributes, last modified time/date, and file size in bytes is shown (see Figure 4.12). Once the directory has been displayed, press any key to return to the File System Functions menu.

```

Directory contents:
filename      bytes      created      last modified  attrib
.             <DIR>      09/05/2008 12:31:58 09/05/2008 12:31:58
..            <DIR>      09/05/2008 12:31:58 09/05/2008 12:31:58
SDR-0001.DAT  2239902   09/05/2008 12:23:46 09/05/2008 12:23:24  a
SDR-00~1.BAK  2239902   09/05/2008 12:31:58 09/05/2008 12:23:24  a
SDR-0000.DAT  644       09/05/2008 12:31:58 09/05/2008 12:34:14  a

                    507,314,176 bytes free
Press any key to continue...

```

Figure 4.12. Displaying the root directory.

#### 4.4.2 Select file

To change the filename the SDR2-CF uses to record data, type **2** from the File System Functions submenu and edit the contents using the Backspace key. When you are finished, the specified file name appears at the top of the File System Functions submenu (see Figure 4.11). In addition to recording, the current filename is used in menu options **4**, **5**, and **7**.

#### 4.4.3 Change current directory

You can use menu option **3** from the File System Functions submenu to change the target directory without changing filenames. This is convenient for quickly changing where files are recorded without having to retype the entire filename.

#### 4.4.4 Delete current file

To delete a file, use menu option **7** file system functions. Specify the filename to delete using menu option **2**, and then use menu option **4** to delete the file.

When using menu options 4 and 5, if the specified file is not found, the SDR2-CF simply returns to the File System Functions menu.

#### 4.4.5 Rename current file

To rename a file on the storage media, specify its filename using menu option **2**, and then press **5**. When prompted, enter a new name for the file.

#### 4.4.6 Download directory via Ymodem batch

Menu option **6** allow you to download all files in the current directory using terminal software. To initiate a Ymodem download, type **6** and wait for the "begin your download" message (see Figure 4.13).

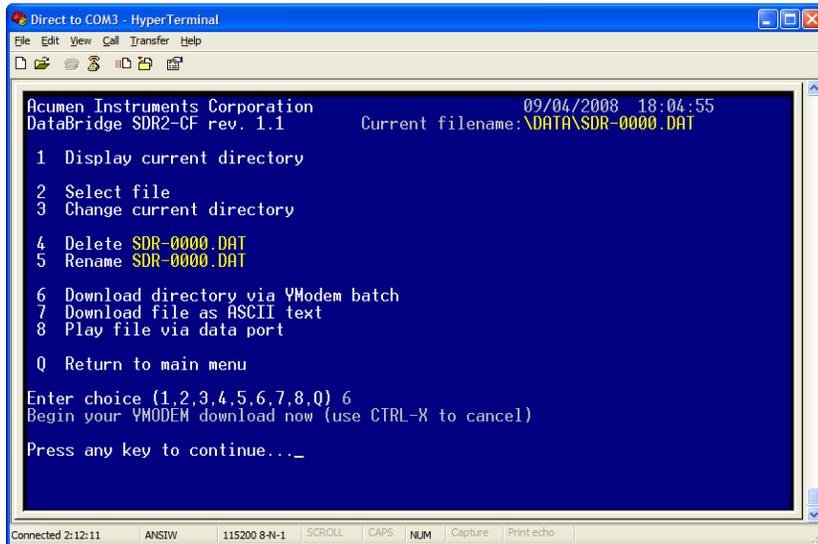


Figure 4.13. The SDR2-CF ready to begin downloading files using Ymodem.

Then, using your terminal software, start a Ymodem batch download. In HyperTerminal you can download the disk using Ymodem by selecting "Receive File..." from the "Transfer" menu item (see Figure 4.14).

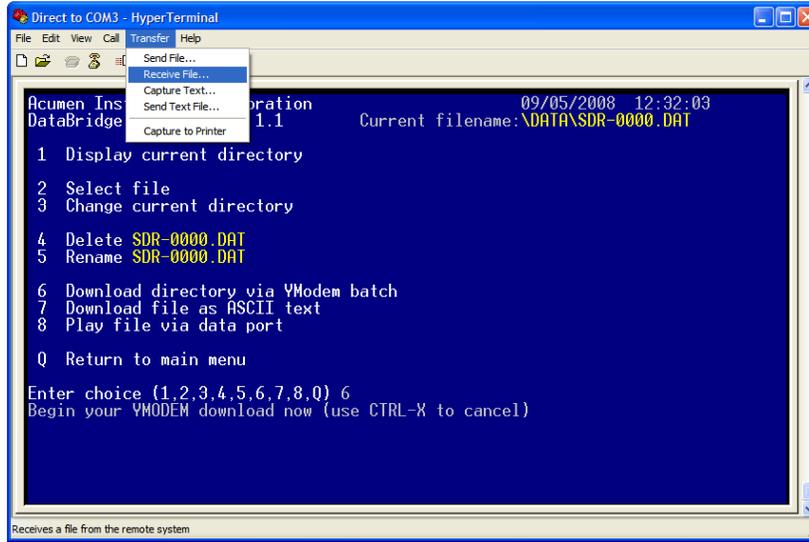


Figure 4.14. Preparing to download a directory using HyperTerminal.

Once you have chosen to receive a file, you must specify a location where HyperTerminal will put the files that are downloaded and the receiving protocol, Ymodem (see Figure 4.15).

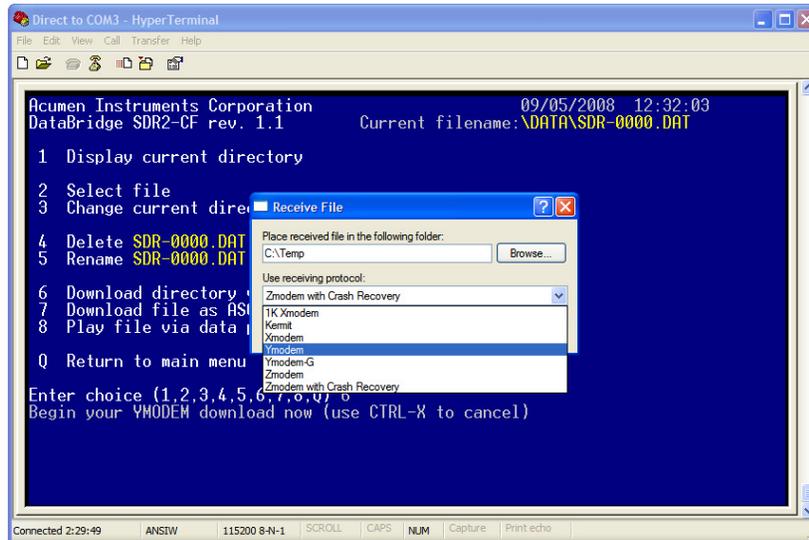


Figure 4.15. Selecting Ymodem as your file transfer protocol in HyperTerminal.

Once the download begins, everything is automatic. Figure 4.16 shows the progress menu HyperTerminal displays while the downloading. You can cancel a Ymodem download and return to the File System Functions submenu by holding the <Ctrl> key and pressing X (Ctrl-X).

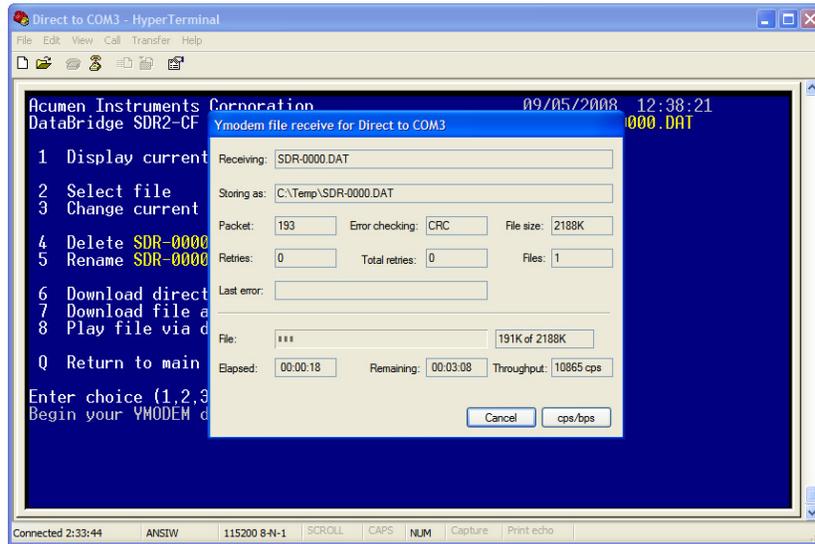


Figure 4.16. Ymodem download in progress in HyperTerminal.

#### 4.4.7 Download file as ASCII text

You may wish to disable ANSI mode (option 3 from the Configuration menu) when using ASCII download.

You can use menu option 7 to download or view a file. ASCII downloading doesn't provide error checking, but is useful for displaying short files or for downloading using terminal software that doesn't support Ymodem. To initiate an ASCII download, type 7. When the "begin your download" message appears, (optionally) initiate an ASCII download using your terminal software, and then press any key to begin or hold the **Ctrl** key and press **C (Ctrl-C)** to return to the File System Functions submenu (see Figure 4.17).

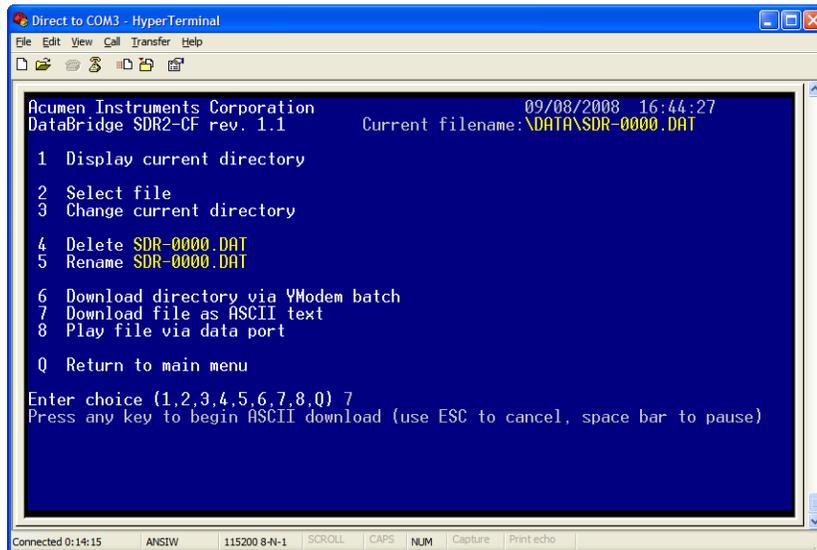


Figure 4.17. Downloading a file as ASCII text.

In HyperTerminal, you can capture the ASCII text to a file by selecting “Capture Text...” from the “Transfer” menu item (see Figure 4.18), and then specifying a filename for the captured text (see Figure 4.19).

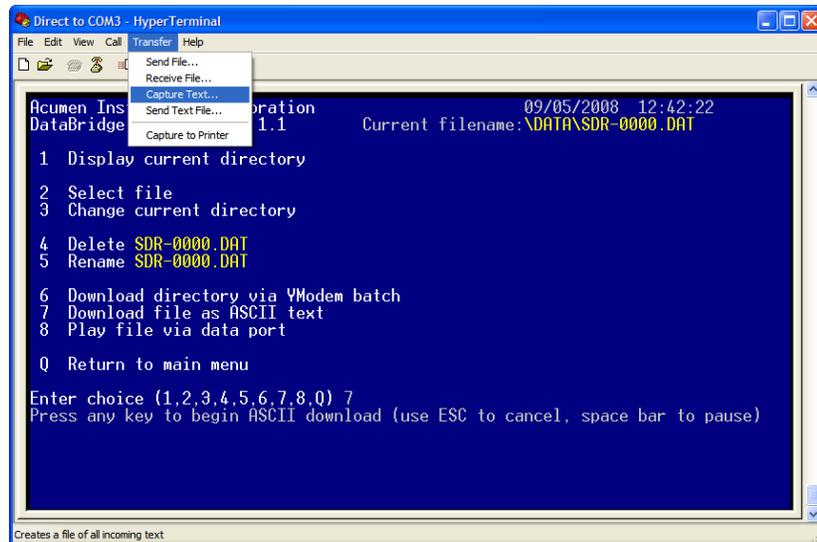


Figure 4.18. Preparing to download file as ASCII text using HyperTerminal.

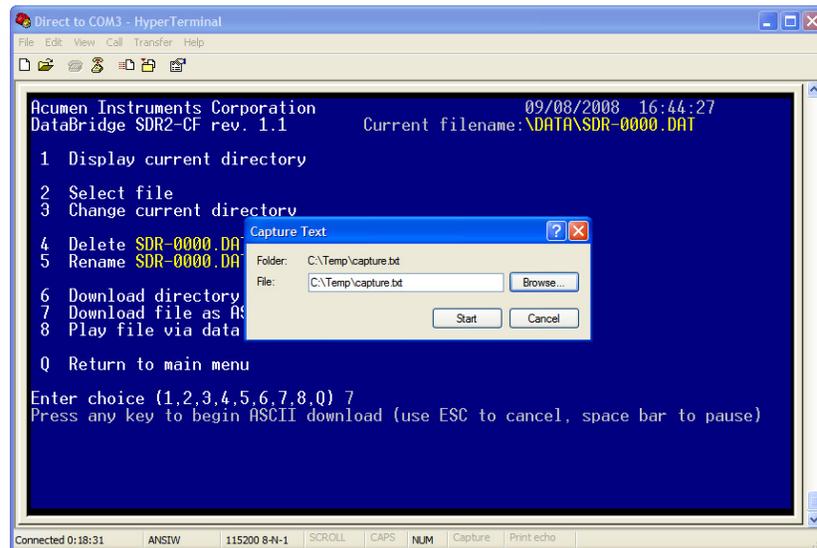


Figure 4.19. Specifying a filename for an ASCII file transfer in HyperTerminal.



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# 5

## J4 Remote Control Port

### 5.1 Overview

The SDR2-CF's J4 remote connector allows for starting and stopping recording via external switches/buttons or TTL/CMOS digital logic. The J4 connector also provides alternate outputs for the front-panel fault, data, and record indicators.

### 5.2 Location

The J4 connector is located next to the J1 power input connector on the SDR2-CF's internal circuit board (SDR2-OEM-CF).

### 5.3 Functions

Table 5.1 describes the functions of the J4 remote connector.

V <sub>DD</sub> (3.3VDC)	Regulated low-current voltage output. Use for deasserting active-low inputs and driving LED indicator outputs.
GND (0 VDC)	Signal ground. Use for asserting active-low inputs.
REC_BUTTON	Momentary record input. Function is similar to front-panel record button. To use, connect a momentary pushbutton switch between this contact and GND.
REC_TOGGLE	Force-record input. To use, connect a toggle switch between this contact and GND. When closed, the SDR2-CF will always enter record mode.
FAULT	Fault condition indicator output. Function is similar to the front-panel Fault indicator. When low, indicates an unrecoverable error has occurred in the SDR2-CF. To use, connect an LED's cathode to this contact and its anode to V <sub>DD</sub> via a current-limiting resistor. Limit current to 10 mA max.
DATA	Data indicator output. Function is similar to the front-panel Data indicator. Pulses momentarily low to indicate data reception in the SDR2-CF. To use, connect an LED's cathode to this contact and its anode to V <sub>DD</sub> via a current-limiting resistor. Limit current to 10 mA max.
RECORD	Recording indicator output. Function is similar to the front-panel Record indicator. Driven low when the SDR2-CF is recording data to an open file. To use, connect an LED's cathode to this contact and its anode to V <sub>DD</sub> via a current-limiting resistor. Limit current to 10 mA max.

Table 5.1. J4 remote control port pin functions.

## 5.4 Pinout and Mating Cable

The J4 connector is a 2mm 10-pin connector housing that mates to a Hirose DF11-10DS-2C shell (Digi-Key part number H2023-ND). A pre-built J4 cable is available from Acumen Instruments Corporation on request.

Contact	Function	Direction	Wire Color
1	V <sub>DD</sub> (3.3 VDC)		-
2	GND (0 VDC)		Black
3	<u>REC_BUTTON</u>	input	Blue
4	<u>REC_TOGGLE</u>	input	Grey
5	<u>FAULT</u>	output	Yellow
6	no connect		-
7	<u>DATA</u>	output	Orange
8	<u>RECORD</u>	output	Green
9	V <sub>DD</sub> (3.3 VDC)		-
10	GND (0 VDC)		-

Table 5.2. J4 remote control port pinout.

J4 mating plug (shell): Hirose DF11-10DS-2C (Digi-Key part number H2023-ND)

For use with DF11 crimp contacts e.g. DF11-2428SCA (Digi-Key part number H2300-ND) or pre-crimped wires (Digi-Key part number H3BXG-101LL-CW where LL=length in inches, C=color code, W=wire gauge code).

## 5.5 Force-Record Shunt Installation

The SDR2-CF can be forced into record mode any time power is applied and a CompactFlash card is present. To use this mode, install a 2mm shunt between J4 pins 4 (REC\_TOGGLE) and pin 2 (GND).



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# 6

## Service and Support

### 6.1 Exception Codes

The following are common error codes encountered when using DataBridge SDR2-CF and SDR2-OEM-CF products. To determine which error has occurred, watch the "exception" indicator on the SDR2-CF's front panel and count the number of rapid blinks. Each sequence is separated by a 1 second pause in the blink pattern.

#### **Exception 2: Root Directory Full**

A FAT root directory can have only 512 directory entries (fewer if long filenames are used). Delete files from the root directory, or record to a subfolder in the root directory to overcome this limitation.

#### **Exception 3: Disk Full**

The disk has no (or almost no) available space for files. Delete files from the disk to ensure space is available.

#### **Exception 4: Bad Boot Record**

Occurs when the disk is completely unformatted or formatted for an unsupported file system.

Use `format /FS:FAT` from the Windows command prompt to ensure proper FAT formatting.

**Exception 5: Hardware Error**

Usually occurs when the SDR2-CF cannot reset the CompactFlash card. Try ejecting and reinserting the card or using a new card and contact Acumen if problem persists.

**Exception 6: EEPROM Error**

Rare hardware error. Contact Acumen to discuss repair or replacement.

**Exception 7: Cache Error**

Rare hardware error. Contact Acumen to discuss repair or replacement.

**Exception 8: Buffer Error (firmware error)**

Rare error that may occur in customized or beta firmware versions. Contact Acumen to report.

**Exception 9: Tasking Error (firmware error)**

Rare error that may occur in customized or beta firmware versions. Contact Acumen to report.

**Exception 10: ATA/CompactFlash Error**

The CompactFlash media has reported a fatal error to the SDR2-CF.

Reinsert/replace the media and contact Acumen if problem persists.

**Exception 11: Directory Creation Error**

Rare. The SDR2-CF cannot create the subdirectory files are to be recorded to. Try using a different directory name or reformatting the media.

**Exception 12: FAT12 File System Detected**

The SDR2-CF has determined that the CF card was formatted using the FAT12 file system, which is unsupported. Reformat the CF card using the /A:512 option (Windows 2000/XP) and retry.

**Exception 13: FAT32 File System Detected**

The SDR2-CF has determined that the CF card was formatted using the FAT32 file system, which is unsupported. Reformat the CF card using the /FS:FAT option (Windows 2000/XP) and retry.

## 6.2 Contacting Acumen Instruments Corporation

### 6.2.1 Technical support

Service and technical support can be reached between the hours of 9AM and 5PM (Central Standard Time) Monday through Friday. Acumen Instruments Corporation can be reached at the following phone numbers:

**(515) 296-5366 (voice)**  
**(515) 296-3554 (fax)**

### 6.2.2 U.S. Mail

Acumen Instruments Corporation can be reached by mail at:

**Acumen Instruments Corporation**  
**2625 N. Loop Drive Suite 2200**  
**Ames, IA 50010**  
**USA**

### 6.2.3 E-mail

Acumen Instruments Corporation can be reached via e-mail at:

**[info@acumeninstruments.com](mailto:info@acumeninstruments.com)**

### 6.2.4 World Wide Web

Acumen Instruments Corporation maintains a web site containing product information and downloads:

**<http://www.acumeninstruments.com>**

## 6.3 Returning Equipment

Before returning equipment to Acumen Instruments Corporation, please call for an RMA number and shipping information. This allows us to plan for your shipment in order to provide the best possible service. When returning equipment, please include a note indicating the symptoms of the failure and any other pertinent information.

## **6.4 Warranty**

### **6.4.1 One year warranty**

Acumen Instruments Corporation warrants this product to be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. During the warranty period, Acumen Instruments Corporation will, at its option, either repair or replace products that prove to be defective.

### **6.4.2 Exclusions**

This warranty shall not apply to any defect, failure or damage caused by misuse, abuse, improper application, alteration, accident, disaster, negligence, use outside of the environmental specifications, improper or inadequate maintenance, or incorrect repair or servicing not performed or authorized by Acumen Instruments Corporation.

### **6.4.3 Limitations**

ACUMEN INSTRUMENTS CORPORATION SHALL IN NO EVENT HAVE OBLIGATIONS OR LIABILITIES TO BUYER OR ANY OTHER PERSON FOR LOSS OF PROFITS, LOSS OF USE OR INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, OR ANY OTHER THEORY OR FORM OF ACTION, EVEN IF ACUMEN INSTRUMENTS CORPORATION HAS BEEN ADVISED OF THE POSSIBILITY THEREOF, ARISING OUT OF OR IN CONNECTION WITH THE SALE, DELIVERY, USE, REPAIR, OR PERFORMANCE OF THIS PRODUCT (INCLUDING EQUIPMENT, DOCUMENTATION AND SOFTWARE). IN NO EVENT SHALL THE LIABILITY OF ACUMEN INSTRUMENTS CORPORATION ARISING IN CONNECTION WITH ANY PRODUCT EXCEED THE ACTUAL AMOUNT PAID FOR SUCH A PRODUCT.

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## A Serial Port Basics

### A.1 Serial specifications

*Serial data* is any data that is sent one bit at a time using a single electrical signal. In contrast, *parallel data* is sent 8, 16, 32, or even 64 bits at a time using a signal line for each bit. Data that is sent without the use of a master clock is said to be *asynchronous serial* data.

Several communications standards exist for the transfer of asynchronous serial data. Common PC's transfer data using the EIA RS-232C (also known as V.28 or V.24). Updated versions of this standard include RS-232D and EIA/TIA-232E, but most literature still refers to the RS-232C or RS-232 standard.

Other asynchronous serial standards in common use include RS-422, RS-423, and RS-485. These standards allow higher data rates and longer cable lengths than RS-232 and are common in industrial settings.

### A.2 Data rates

The *baud rate* for a serial connection is the number of bits that are transmitted per second. It is specified in bits/second or baud. For example, a 9600 baud serial link transfers 9600 bits per second.

The EIA RS-232C standard permits data rates up to 19200 bps and cable lengths up to 400 meters (but not both).

data rate (bps)	maximum distance	
	(meters)	(feet)
19200	15	45
9600	25	76
4800	50	152
2400	100	304
1200	200	608
600	400	1216

Table A.1. Data rates and distances for RS-232 communications.

Although the specification only defines rates up to 19200 bps, communication using data rates as high as 230400 bps and a short (<2 meter) cable are common. Standard modems communicate with computers at up to 115,200 bps.

As you may have guessed, the use of high baud rates requires more capable computer hardware. At high baud rates, a computer must process as many as 23000 characters per second. The constant attention a computer must pay to its serial port makes this problematic particularly in multitasking environments such as Microsoft Windows 3.1/95/98/NT/2000.

### A.2.1 Data rates and the UART

Computer hardware designers solve this problem by allowing the computer to respond to characters less frequently. A Universal Asynchronous Receiver/Transmitter (UART), the component responsible for communicating via RS-232, may contain several bytes of memory called a FIFO (first-in, first-out memory).

The original IBM PC (and many of its successors) used the 8250 UART, which contained no FIFO. That is, a computer with 8250 (or 16450) UART's must respond to every incoming character.

Newer PC's incorporate the 16550 UART or a variant. The 16550 incorporates a 16-byte FIFO and is **mandatory** for communications at speeds above 9600 bps and is important for error-free communications at lower speeds as well.

You can find out which type of UART's your computer uses by using the MSD.EXE tool provided with DOS and Windows or by looking in the Windows 95/98 control panel.

## A.3 More asynchronous serial parameters

In most cases, the data rate in bytes/second can be approximated by dividing the baud rate (in bits/second) by 10. If a byte consists of 8 bits, why divide by 10?

To transfer data asynchronously, the UART *frames* the 8 data bits between a stop bit and a start bit. The start bit is always a zero, while the stop bit is always a one. So, a byte of data sent serially is made up of 10 bits instead of the usual 8.

Asynchronous serial devices can communicate using 7 or 8 data bits, and 1, 1½, or 2 stop bits. To further complicate matters, devices can also employ a *parity* bit instead of an eighth data bit to check for errors. Even parity systems transmit a one when the sum of the seven bits is an even number, while odd parity systems transmit a one when the sum is odd. Still more exotic systems may specify “mark” or “space” parity, where the parity bit is always a one or zero, respectively.

What does all of this mean? Device vendors usually specify their data rate and format using statements like “9600, 8N1”, which translates to 9600 bps, 8 data bits, no parity, and 1 stop bit or “19200, 7E1”, which translates to 19200 bps, 7 data bits, even parity, and 1 stop bit.

**NOTE:** Most serial devices format of eight data bits, no parity, and one stop bit (8N1).

### A.3.2 DTE and DCE

The RS-232 specification defines two classes of devices: data terminal equipment (DTE) and data communication equipment (DCE). Your computer’s serial port is configured for DTE operation, since the computer acts as a terminal. Modems and many other serial devices are configured as DCE, since they are communications equipment.

What’s the difference? A DTE device’s TD signal means “I transmit data on this line.” A DCE’s TD signal can be read “You (the DTE) transmit data to me on this line.” A DTE’s RD signal means “I receive data on this signal line.” A DCE’s RD line means, “You, the DTE, will receive the data I transmit on this signal line.” Sound confusing?

A look at the DB9 connector pinouts and signal direction with respect to DTE (e.g. your computer) makes things a little more clear.

signal name		pin number		direction
		25-pin	9-pin	
transmitted data	<b>TD</b>	2	3	DTE→DCE
received data	<b>RD</b>	3	2	DTE←DCE
request to send	<b>RTS</b>	4	7	DTE→DCE
clear to send	<b>CTS</b>	5	8	DTE←DCE
data terminal ready	<b>DTR</b>	20	4	DTE→DCE
data set ready	<b>DSR</b>	6	6	DTE←DCE
data carrier detect	<b>DCD</b>	8	1	DTE←DCE
ring indicator	<b>RI</b>	22	9	DTE←DCE
signal ground	<b>GND</b>	7	5	

Table A.2. Pinouts for 9-pin and 25-pin serial connectors.

The cable that connects DTE devices (such as your computer) and DCE devices (such as your modem) is simple. It connects the TD pin to TD, pin RD to RD, etc. A cable that connects DTE to DTE or DCE to DCE must connect the TD to RD and RD to TD. This cable is referred to as a *null*

*modem* cable because it can connect two terminals (DTE's) without the use of modems (DCE's). Note that GND pins are always connected.

Most devices have female connectors (DB9 or DB25) if they are configured for DCE operation and male connectors if they are configured for DTE operation, but this is not always the case.

There is a simple trick for determining whether a device is DTE or DCE. Connect a voltmeter's ground line to the connector's GND pin. Then, probe the voltage on the TD and RD pins. If the TD pin voltage is small ( $-3V < V_{in} < +3V$ ), the device is configured to receive data on the TD pin, and thus is a DCE device. Likewise, if the RD pin voltage is small, the device is receiving data on the RD pin, and thus is DTE.

### A.3.3 Handshaking

Handshaking signals by the receiving device to tell the transmitter "I am ready for data" or "I am not ready for data." These signals are optional: the receiver may always be ready for data or may choose to simply discard data it couldn't process.

A DTE device asserts the "request to send" (RTS) signal when it is ready to receive data and deasserts it when it cannot accept data. Likewise, a DCE device asserts "clear to send" (CTS) when it is ready to receive data. The RTS and CTS signals form a *handshaking pair*, and their use constitutes *RTS/CTS handshaking*.

The "data terminal ready" (DTR) signal, asserted by the DTE, and the "data set ready" (DSR) signal, asserted by the DCE serve similar functions and constitute *DTR/DSR handshaking*. A DTE or DCE devices may employ either or both forms of handshaking. Often, deasserting RTS or CTS signals "micro" events, such as a buffer that is full but will be empty soon, while deasserting DTR or DSR may signal "major" events such as that power has not been applied.

RTS/CTS handshaking and DTR/DSR handshaking are both referred to as *hardware handshaking*. Another form of handshaking, XON/XOFF or *software handshaking*, requires that the receiver send a character (Control-S, ASCII 19) to halt data transfer and another character (Control-Q, ASCII 17) to resume transfer. Although this method eliminates the need for the RTS, CTS, DTR, or DSR signals, it suffers from slow response time by the receiver and renders 2 characters of the 256-character ASCII set unusable.

### A.3.4 Voltage levels

For noise immunity and long cable lengths, RS-232 devices convert TTL/CMOS-level signals ( $0V$ =logic zero,  $+5V$  or  $+3.3V$ =logic one) to higher voltage bipolar signals. For the TD and RD signal lines, RS-232 devices use a voltage between  $-3V$  and  $-25V$  to transmit a one and a voltage between  $+3V$  and  $+25V$  to transmit a zero. For the other signal lines (RTS,

CTS, etc.), RS-232 devices use +3V to +25V to assert the signal and -3V to -25V to deassert the signal. These voltage levels are defined in the EIA/TIA-232E specification. So, when a DTE device drives RTS at -9.50V, it is signaling the DCE to stop sending data.

A few devices, particularly devices that communicate at low data rates or over short cables, bypass the voltage conversion altogether. These devices often require “computer interface kits” that are really no more than a level converter in a box. These serial ports are often referred to as TTL RS-232, CMOS RS-232, or 5 Volt RS-232 ports and require level converters to interact with computers and other serial devices.



# B

## B Specifications

### B.1 Electrical specifications

SDR2-CF requires a 5 to 30 VDC power source or a regulated +5VDC power source (SDR2-OEM-CF). Connectors J7 and J1 are present on both the SDR2-CF and SDR2-OEM-CF. J1 is inaccessible on the SDR2-CF without removing the enclosure.

Recording Mode	+10 VDC	see data sheet
Idle	+10 VDC	
Recording in Low Power Mode	+10 VDC	
Idle in Low Power Mode	+10 VDC	

Table B.1. DataBridge SDR2-CF power consumption with CompactFlash card installed.

**NOTE:** The SDR2-CF datasheet contains further specifications. All specifications shown in this section may be superseded by the datasheet.

#### B.1.5 J7 rear power receptacle pin configuration

pin	Function
Tip	+5 to +30 VDC
ring	Ground

Table B.2. The SDR2-CF/SDR2-OEM-CF rear power receptacle pin configuration.

**B.1.6 J1 power receptacle pin configuration**

pin	Function
1	+5.0 to +30 VDC
2	Ground

Table B.3. The SDR2-OEM-CF power receptacle pin configuration.

**B.2 Serial communications**

<b>Serial Port</b>	
electrical interface compliance	EIA/TIA-232E and V.28
data rates	50 to 921600 baud
data bits	7 or 8
stop bits	1 or 2
Parity	None, even, odd
Handshaking	RTS/CTS, none

Table B.4. Serial communications specifications for the SDR2-CF.

**B.3 CompactFlash socket**

CompactFlash type	Type I or Type II True IDE
storage capacity	limited only by storage device and FAT file system

Table B.5. CompactFlash socket specifications for the SDR2-CF.

**B.4 Mechanical Specifications****SDR2-CF**

Dimensions	4.875" L × 3.50" W × 1.25" H (12.3 cm × 8.5 cm × 3.2 cm)
Weight (without CF card)	approx. 6.0 oz. (170 grams)
Enclosure Material	Aluminum extrusion

**SDR2-OEM-CF circuit board**

Dimensions	4.50" L × 3.00" W × 0.60" H (11.4 cm × 7.6 cm × 1.0 cm)
Weight (without CF card)	approx. 3.0 oz. (85 grams)

Table B.1. SDR2-CF and SDR2-OEM-CF mechanical specifications.

**Notes:**