Application Note ~ Using the SAM-III with a Serial Data Recorder

1. Introduction

This application note describes using a serial data recorder to collect data from the SAM-III magnetometer. With this setup, the SAM-III and data recorder are powered from a 12 volt battery and operated autonomously.

2. Basic operation

In most installations, the SAM-III is connected to the serial interface of a PC, which runs SAM_VIEW software or a user's custom software. The SAM_VIEW software collects and processes the digitized data. It is desirable in some installations to operate the SAM-III autonomously, in which case the data is collected by a data recorder and then processed later. For this type of installation, a serial data recorder is needed to collect the digitized data and store it.

When the SAM-III is connected to a power source, it boots into its firmware operating system and starts sending digitized data on its serial data port within a few seconds. A serial data logger only needs to listen and does not need to transmit anything to the SAM-III.

3. SAM-III Data format

SAM-III samples the magnetic field and sends data at its configured interval, typically one data sample per second. It is adjustable from 1 Hz to 0.0083 Hz (1 second sample interval to 120 seconds sample interval). Data are sent as ASCII characters in the format shown in the example below. The SAM-III serial port settings are 9600 b/s, 8N1, and no flow control.

DD.MM.YY HH:MM:SS: X,ddddd,Y,ddddd,Z,dddddd EoL

```
27.07.10 10:24:17: X,17399,Y,41481,Z,-12052 LF CR
....
```

where

DD	Day
MM	Month
YY	Year
HH	Hour
MM	Minute
SS	Second
X	Value that follows is X-component of magnetic field
Y	Value that follows is Y-component of magnetic field
Z	Value that follows is Z-component of magnetic field
d	Magnetic induction, nT with leading minus sign when appropriate
EoL	End of line: LF (Line Feed) and CR (Carriage Return) ASCII characters

When the SAM-III is configured for a 1 second sample interval (1 Hz sample rate), the ASCII data storage requirements are approximately 3.7 MB per day or 115 MB per month.

4. Data Recorder

The Acumen Instruments SDR2-CF can be used with SAM-III to record data. This device may be setup to record between certain times during the current day or to record continuously. The data recorder is configured prior to deployment using a terminal emulator program on a PC. The default serial Data port settings are 115,200 b/s, 8N1, and hardware flow control. The data recorder is then disconnected from the PC and deployed. Data recording is then started and stopped by a pushbutton on the data recorder (recording also may be started when connected to the PC).

The SDR2-CF uses a compact flash card for data storage. The file format is FAT or FAT32. A 2 GB CF card can store over 12 months of data at a 1 Hz sample rate. The data may be uploaded from the SDR2-CF through the configuration port or the CF card may be removed and the data uploaded from a card reader.

5. Setup

The SDR2-CF and SAM-III must be setup prior to deployment. Refer to the SDR2-CF Configuration Guide and the SAM-III Software Setup Guide for procedures. A basic connection diagram is given (figure 1). The SAM-III requires only pins 2, 3 and 5 to be wired straight through, but the SDR2-CF requires a complete cable. Both the SDR2-CF and SAM-III remember their respective settings after power is disconnected.

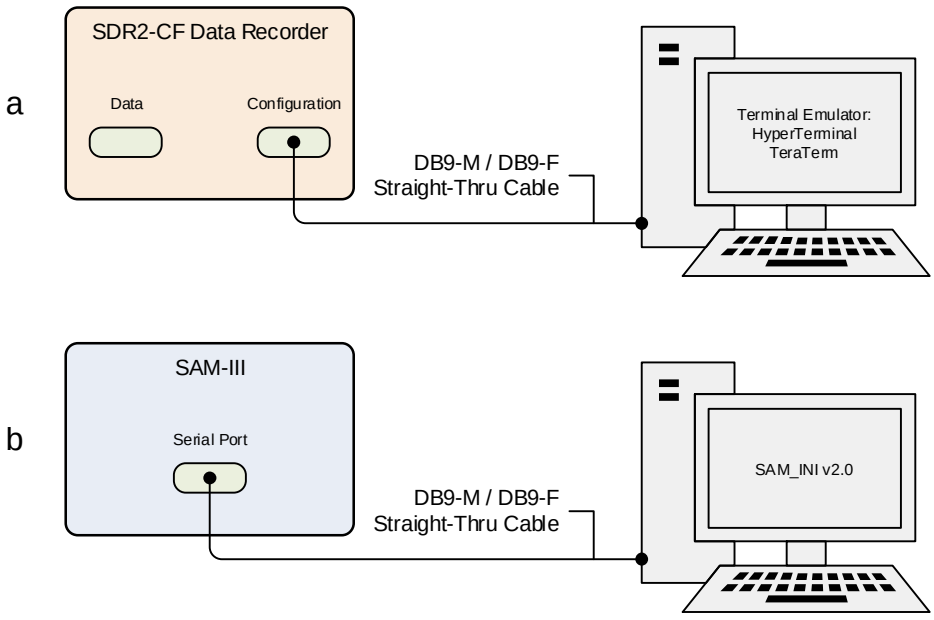

Figure 1 ~ Data connections for setup (power connections not shown). Note: In order to use a straight-thru data cable as shown, it is necessary to change the SAM-III serial port interface to DCE as described in Section X, Alternate Arrangement I, of the SAM-III Construction Manual.

6. Field use

After the SDR2-CF and SAM-III are setup, connect the SDR2-CF Data interface to the SAM-III serial interface (figure 2). When the two units are powered up, the red "Active" indicator on the SDR2-CF should be on and the "D" (data) indicator should flash at a 1 second interval (the flash rate will depend on the SAM-III sample interval).

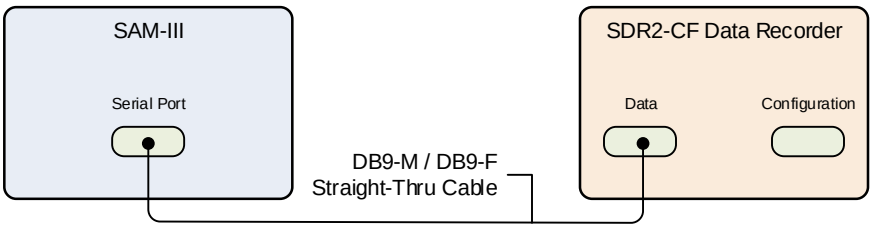

Figure 2 ~ Data connections for deployment (power connections not shown). See also Note in figure 1.

Press the "Record" pushbutton on the SDR2-CF for 1 second to start recording. The red "R" (Record) indicator should turn on and remain on during the recording session. Press the "Record" pushbutton again to stop recording. The record indicator "R" should turn off.

After data has been collected, the CF card may be removed and placed in a card reader to transfer data. The data may be uploaded directly from the SDR2-CF; refer to the Configuration Guide.

If the SDR2-CF is setup for timed recording schedule, it will repeat the schedule each day. Therefore, if the schedule is used for testing, be sure to delete it afterwards to avoid losing data when it is deployed.

7. Power requirements

The SAM-III and SDR2-CF can operate from a 12 V battery. The SAM-III operating range is 9 to 15 Vdc and the SDR2-CF operating range is 5 to 30 Vdc. If the SAM-III was purchased installed in an aluminum enclosure, it was designed for battery operation and has an externally accessible fuse (SAM-III installed in a plastic enclosure is designed for use with a current-limited ac adapter power supply). Suitable replacement fuses are Bussmann p/n and Littelfuse p/n cartridge fuse, type 2AG (5 mm x 15 mm), 375 mA, time delay (time lag or "Slo Blo"). The SAM-III is supplied with one installed fuse and one spare fuse. If additional replacement fuses are required, replace with Cooper-Bussmann p/n C519-350mA or Littelfuse p/n 229.350.

The current and power values given below are nominal and 5% variation can be expected. For battery operation, it is advisable to assume the keyboard LED will be on and LCD backlight off (the backlight can be set to off in SAM_INI v2.0). The power required by the data recorder varies – peak power is drawn when data is sent to it by

the SAM-III (typically at 1 Hz rate). However, the duty cycle is low giving a low average current. The two typical conditions (SAM-III LED on/backlight off and SDR2-CF in record mode/average) are shaded in the table below.

Input: 12.0 Vdc	**Current (mA)**	**Power (W)**
SAM-III, 3 sensors, LED off and LCD backlight off	67	0.80
SAM-III, 3 sensors, LED off and LCD backlight on	85	1.02
SAM-III, 3 sensors, LED on and LCD backlight off	70	0.84
SAM-III, 3 sensors, LED on and LCD backlight on	88	1.06
SDR2-CF data recorder in recorder mode, 1 Hz data, minimum	14	0.17
SDR2-CF data recorder in recorder mode, 1 Hz data, maximum	35	0.42
SDR2-CF data recorder in recorder mode, 1 Hz data, average	16	0.19
SDR2-CF data recorder idle	13	0.16

Unit	**Power interface**
SAM-III:	Coaxial power plug, 2.1 x 5.5 mm, center positive
SDR2-CF:	Coaxial power plug, 1.3 x 3.5 mm, center positive

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Document information

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