

## *Evaluation Board for CS8420*

### Features

- Asynchronous Sample Rate Conversion
- Input to output conversion ratio as large as 1:3 or 3:1
- Receives and transmits AES/EBU, S/PDIF and EIAJ-340 compatible digital audio
- Runs from a single 5 Volt supply.
- Crystals are supplied to allow operation at 44.1 kHz, 48 kHz, and 96 kHz output sample rates.
- Digital patch area.

### Description

The CDB8420 is designed to allow rapid evaluation of the CS8420. Because of the high performance of the CS8420, the board is set up for easy connection to an Audio Precision or a Rohde and Schwarz test system. Currently available A/D and D/A converters are not adequate to test the full performance of the device.

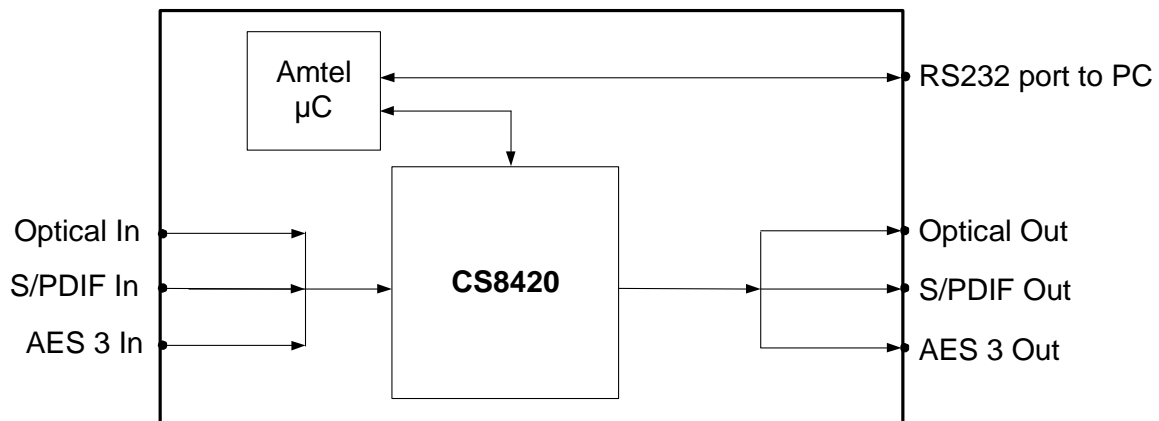
Input and output data may independently be set to either AES/EBU or S/PDIF in optical or coaxial physical formats.

Windows 98 PC software provides a GUI interface to make configuration easy. The software communicates through the PC's RS232 port to a micro-controller on the evaluation board that controls the CS8420. All the possible software modes of the CS8420 may be tested.

### ORDERING INFORMATION

CDB8420

Evaluation Board



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## 1. OVERVIEW

The CDB8420 evaluation board contains a CS8420 and the supporting circuitry necessary for it to operate. The input and output options include AES3 and S/PDIF in optical and coaxial formats. In software mode, the control registers of the CS8420 are set by an Atmel AVR RISC micro-controller. A Windows 98 based program communicates with the micro through an RS232 port to control the configuration.

### 1.1 CS8420

The features and functions of the CS8420 are described in its data sheet.

### 1.2 Micro-Controller and Memory

The functions of the board are controlled by an Atmel AVR RISC micro-controller. The board is equipped with 512 kilobytes of static RAM so that Channel Status and User bits from the AES stream may be captured and uploaded to the host PC. The micro-controller communicates with the CS8420 through its SPI port. The Atmel AVR RISC micro-controller may be bypassed in order to utilize an external micro-controller through header J10. Additional software development tools and applications information for the Atmel micro-controller are available at <http://www.atmel.com>.

### 1.3 Crystal Oscillators

There are two crystal oscillators on the board, both are mounted in pin sockets that allow them to be re-

placed. The oscillator labeled U10 provides the 6 MHz clock for the micro-controller and should not be changed.

U3 is the oscillator that provides the Output Master Clock for the CS8420. The board is shipped with a 12.288 MHz crystal oscillator stuffed at U3 which sets the output sampling rate to 48 kHz.

Oscillators are also provided for the frequencies of 11.2896 and 24.576 MHz. These allow the SRC to be operated at output sampling frequencies of 44.1 and 96 kHz.

### 1.4 RS232 Port

The RS232 port on the upper right hand side of the board should be connected to the serial port of the PC running the CDB8420 control software. Follow the software instructions to properly configure the serial port for use with the evaluation board.

### 1.5 LED Function Indicators

LEDs D8 and D9 on the upper right hand corner of the board allow the user to determine when data is being transmitted over the RS232 link. The red LED D4 is the reset indicator and the red LED D1 is connected to the RERR pin of the CS8420. The two remaining LEDs on the board are not currently of use to the end user.

CONNECTOR	INPUT/OUTPUT	SIGNAL PRESENT
+5V	Input	+5 Volt power
GND	Input	Ground connection from power supply
OPTICAL INPUT	Input	Digital Audio Interface optical input
S/PDIF INPUT	Input	Digital Audio Interface coaxial input
AES3 INPUT	Input	Digital Audio Interface XLR input
RS232	Input/Output	Parallel RS232 port for connection to serial port of PC
OPTICAL OUTPUT	Output	Digital Audio Interface optical output (always active)
S/PDIF OUTPUT	Output	Digital Audio Interface coaxial output
AES3 OUTPUT	Output	Digital Audio Interface XLR output
J5	Input/Output	I/O for RMCLK, ISCLK,ILRCK, and SDIN
J6	Input/Output	I/O for OLRCK, OSCLK, OMCK, and SDOUT
J9	Input	10-pin header for external programming of Atmel AVR $\mu$ C
J10	Input/Output	12-pin header for CS8420 control by external $\mu$ C

**Table 1. System Connections**

JUMPER	PURPOSE	POSITION	FUNCTION SELECTED
J11	Selects physical format of digital audio interface input	AES3 & S/PDIF OPTICAL	Specifies input as either AES3 or S/PDIF type Specifies input as OPTICAL type
J12	Enables AES3 INPUT	ENABLE DISABLE	AES3 INPUT enabled AES3 INPUT disabled
J13	Enables S/PDIF INPUT	ENABLE DISABLE	S/PDIF INPUT enabled S/PDIF INPUT disabled
J14	Enables OPTICAL INPUT	ENABLE DISABLE	OPTICAL INPUT enabled OPTICAL INPUT disabled
J16	Selects physical format of digital audio interface output	AES3 S/PDIF	Specifies output as AES3 XLR Specifies output as coaxial S/PDIF
J17	Enables S/PDFIF OUTPUT	ENABLE DISABLE	S/PDIF OUTPUT enabled S/PDIF OUTPUT disabled
J15	Enables HARDWARE MODE MUTE	ENABLE DISABLE	Enables MUTE when in hardware mode 1 Disables MUTE when in hardware mode 1

**Table 2. CDB8420 Jumper Settings**

## 2. CDB8420.EXE QUICK START GUIDE

### 2.1 Setting up the hardware:

- 1) Connect the CDB8420 to a 5V DC power supply.
- 2) Set: J11 to Optical, J16 to S/PDIF, enable J13 (S/PDIF), and disable J15 (MUTE).
- 3) Connect the CDB8420 to the PC COM port using RS232 cable.
- 4) Apply power to the board.
- 5) Press the RESET switch (S5).

At this point, the RERR and PROC should be lit. The hardware is now ready!

### 2.2 Installing the software:

- 1) Create a directory called CDB8420 anywhere on your system.
- 2) Copy CDB8420.exe into this directory.
- 3) If you do not already have them, copy the included DLLs msvcr7.dll and mfc42.dll into your \Windows\System directory.
- 4) If desired, create a shortcut to CDB8420.exe on your desktop.

At this point, you are ready to start up the software.

### 2.3 Starting up the software:

- 1) Double-click on CDB8420.exe or its shortcut.
- 2) If you get errors right away, the COM port needs to be set properly.
- 3) Click anywhere but inside one of the boxes, this brings up the Board Setup control panel.
- 4) Select the COM port you are using to connect to the CDB8420.
- 5) Shut down the application, reset the board, and then restart the application.

### 2.4 Starting up the Hardware:

- 1) Click anywhere but inside one of the boxes, this brings up the Board Setup control panel.
- 2) Click on the Reset button. You should see the TX and RX leds light up briefly.
- 3) Click on the Sample Rate Converter tab, then set the SRC data source to AES3 Receiver.
- 4) Click on the Clock Sources tab, uncheck the Stop Internal Clocks box and click on RMCK derived from AES3 input frame.
- 5) Check the performance of the board by doing an FFT with a -1dBFS 1kHz sine wave for input at 44.1kHz and 48kHz sample rates using the optical input and optical output.

### 3. CDB8420.EXE USER'S GUIDE

#### 3.1 Main Window

The CDB8420 Control Panel allows you to view and access the data flow configuration of the CS8420. Clicking the right mouse button in any of the boxes will bring up a property menu containing all the register bits relevant to that block, as well as some high level functions, such as data sources and formatting options.

To access additional details about each block, click the left mouse button on the desired block. This will display a control panel for the selected block. If you click outside the boxes, you will bring up the Board Setup control panel, as shown on the next page. Note that you can click on any of the tabs to quickly access that section. Also, any changes you make in the panel are immediately reflected in the Main Window, so you may wish to arrange them so that they do not obscure each other.

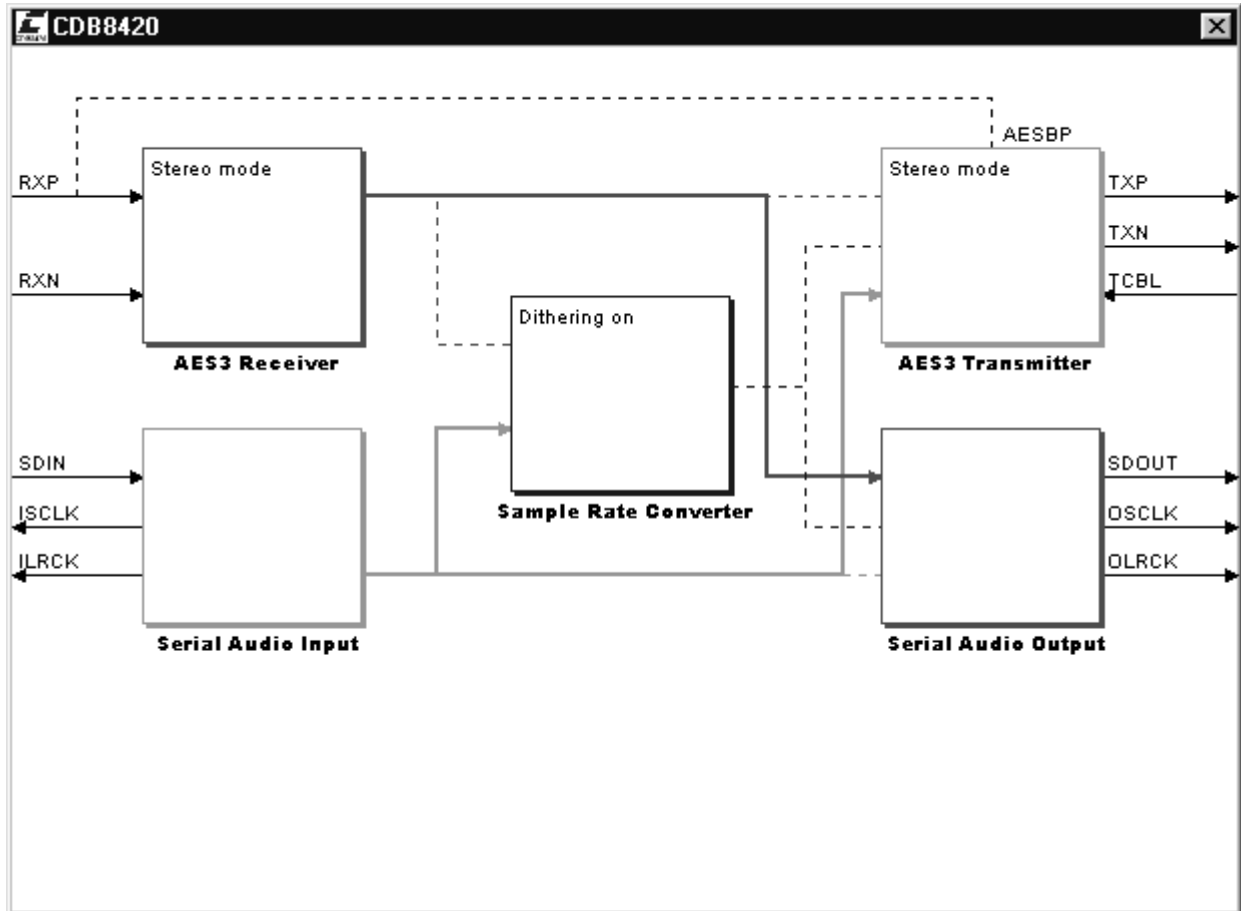


Figure 1. CDB8420 Control Panel Main Window

### 3.2 Board Setup

The Board Setup panel has some very useful functions, including setting the COM Port used by the application, resetting the CS8420 by the software, as well as loading/saving register settings into files. You can also read or write any register on the CS8420 using the CS8420 Register Access.

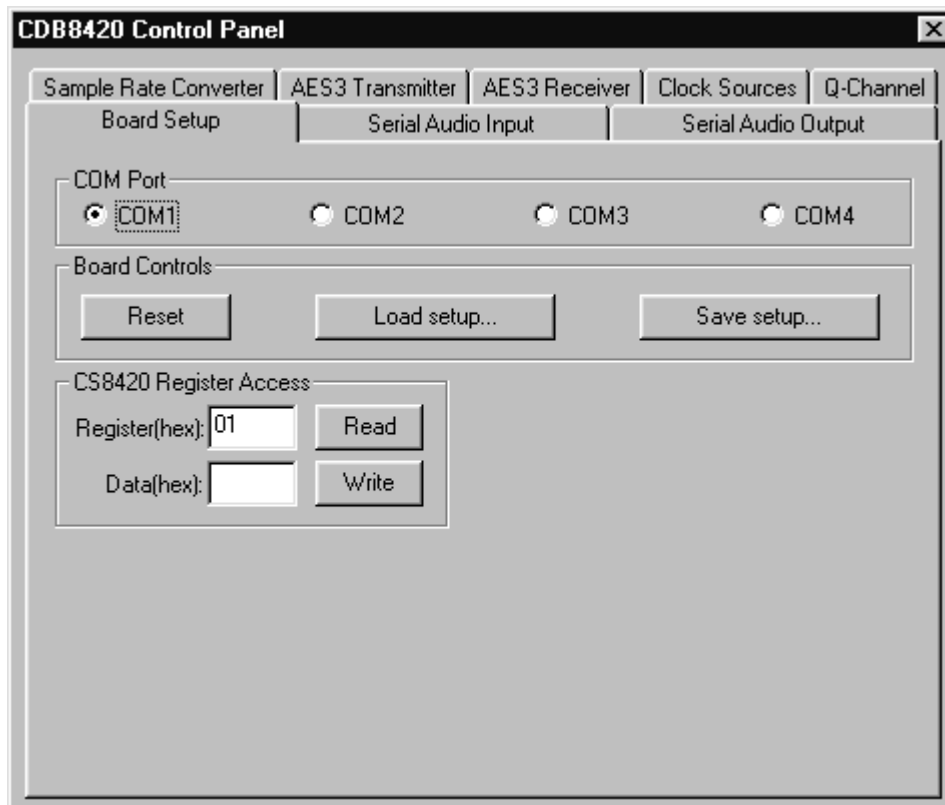
### 3.3 Script file syntax

The setup files generated by the board setup function only record the state of the chip registers. There are many more useful commands that you can insert into the setup scripts. Here is a short description of them with their allowed syntax.

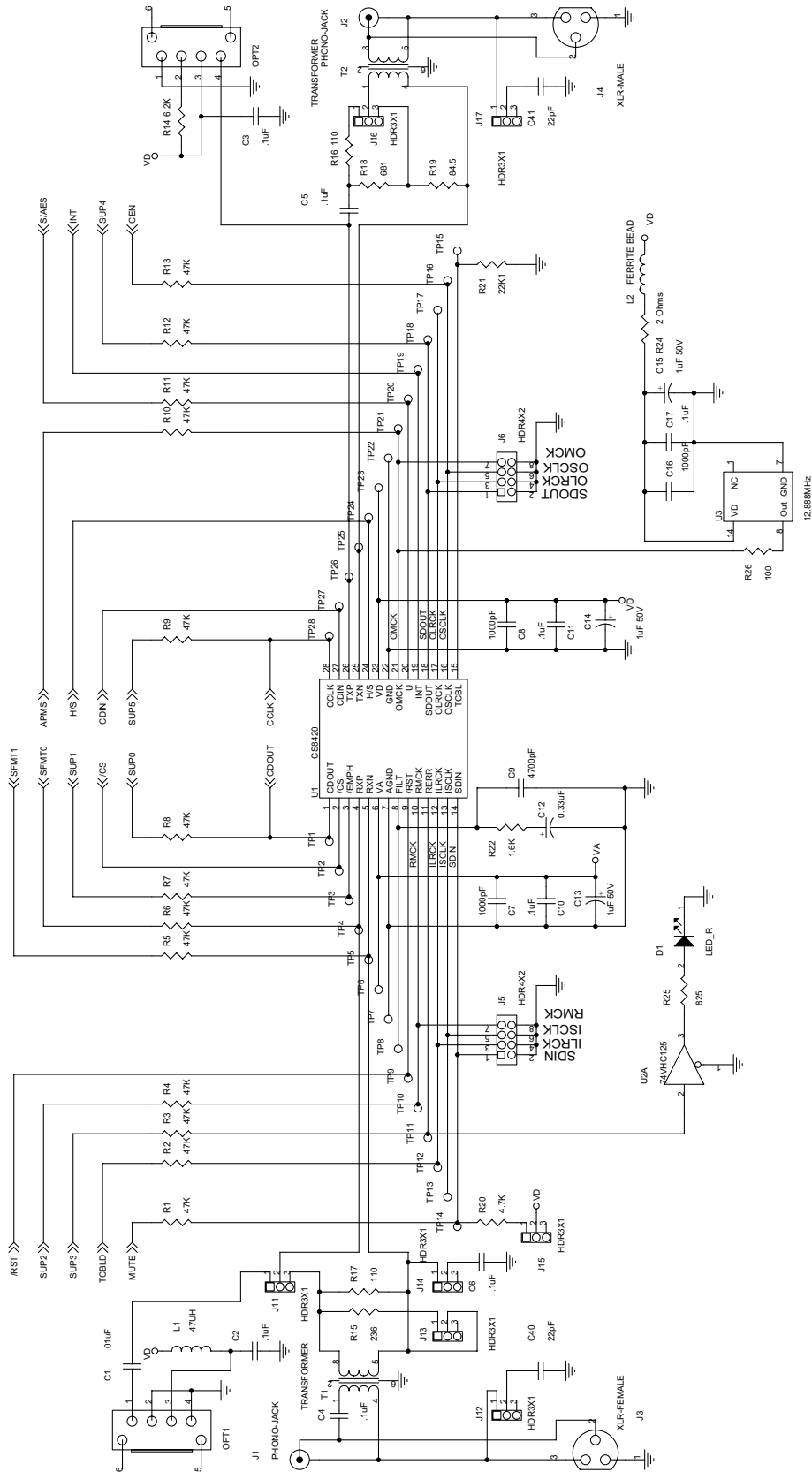
NOTE: Most commands accept either hexadecimal (indicated by either a "0x" prefix or "h" suffix) or decimal parameters.

//	used for single line comments
script scriptfile	call an external script file named "scriptfile"
reset 1	assert reset of the CS8420
reset 0	de-assert reset of the CS8420
wr 1 30h	write register 1 with hex 30
set DITH 1	set the bit field labeled DITH to 1
write 2 3 0x10 12h 13	write 3 consecutive registers starting from register 2 with hex 10, hex 12, and decimal 13

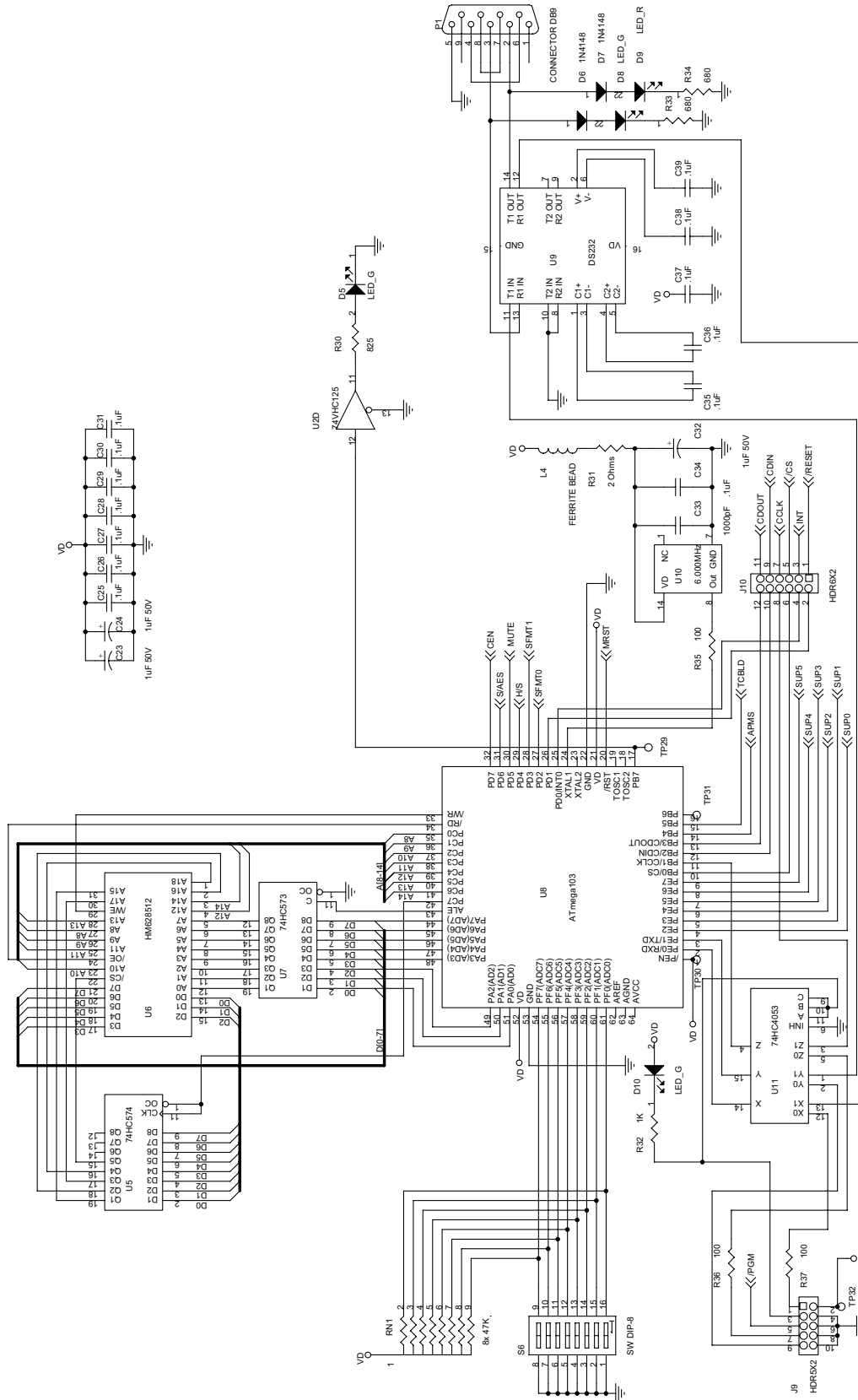
**Table 3. Script file syntax description**



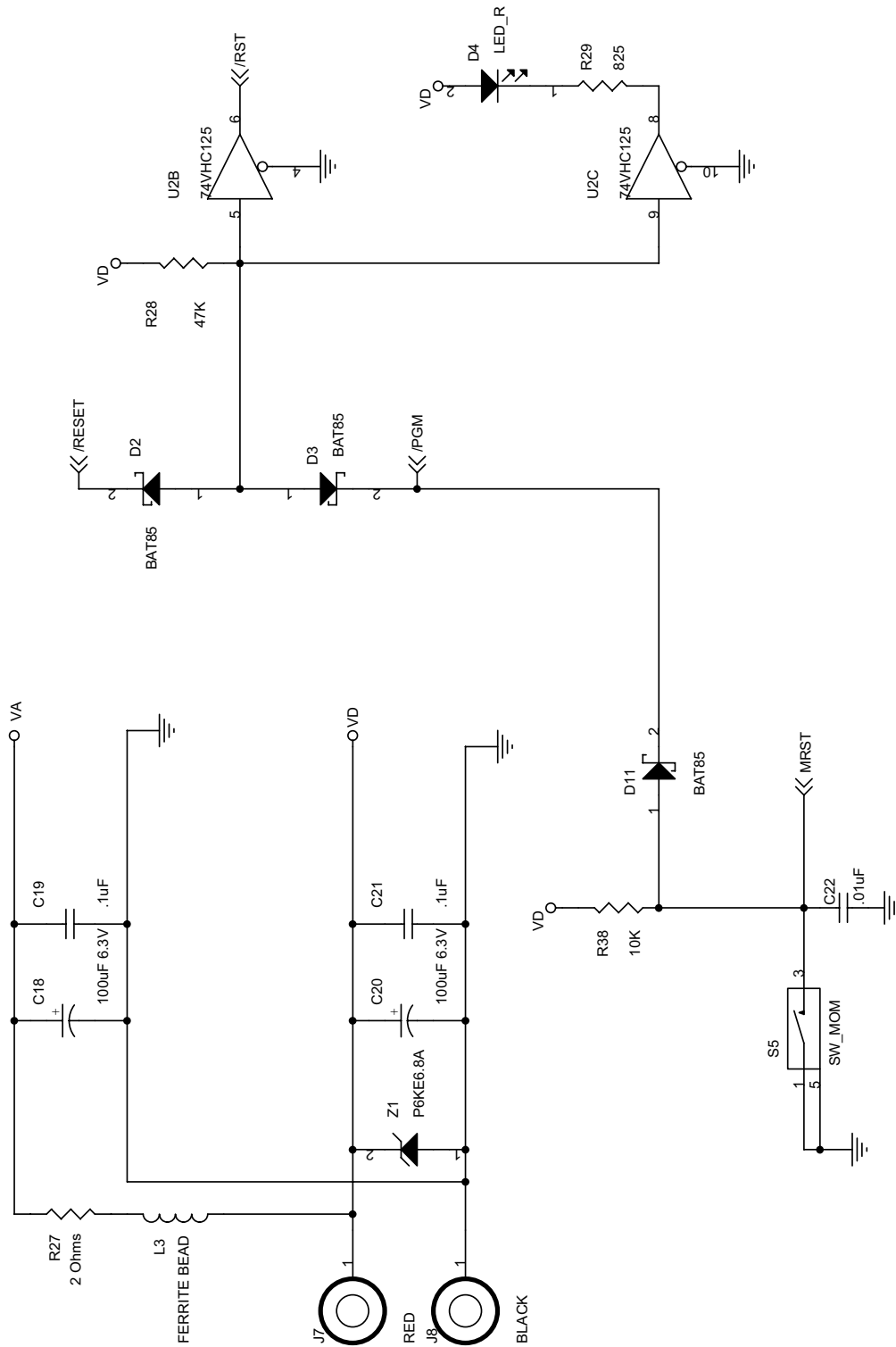
**Figure 2. Board Setup Panel**


**Figure 3. CS8420 Sample Rate Converter**

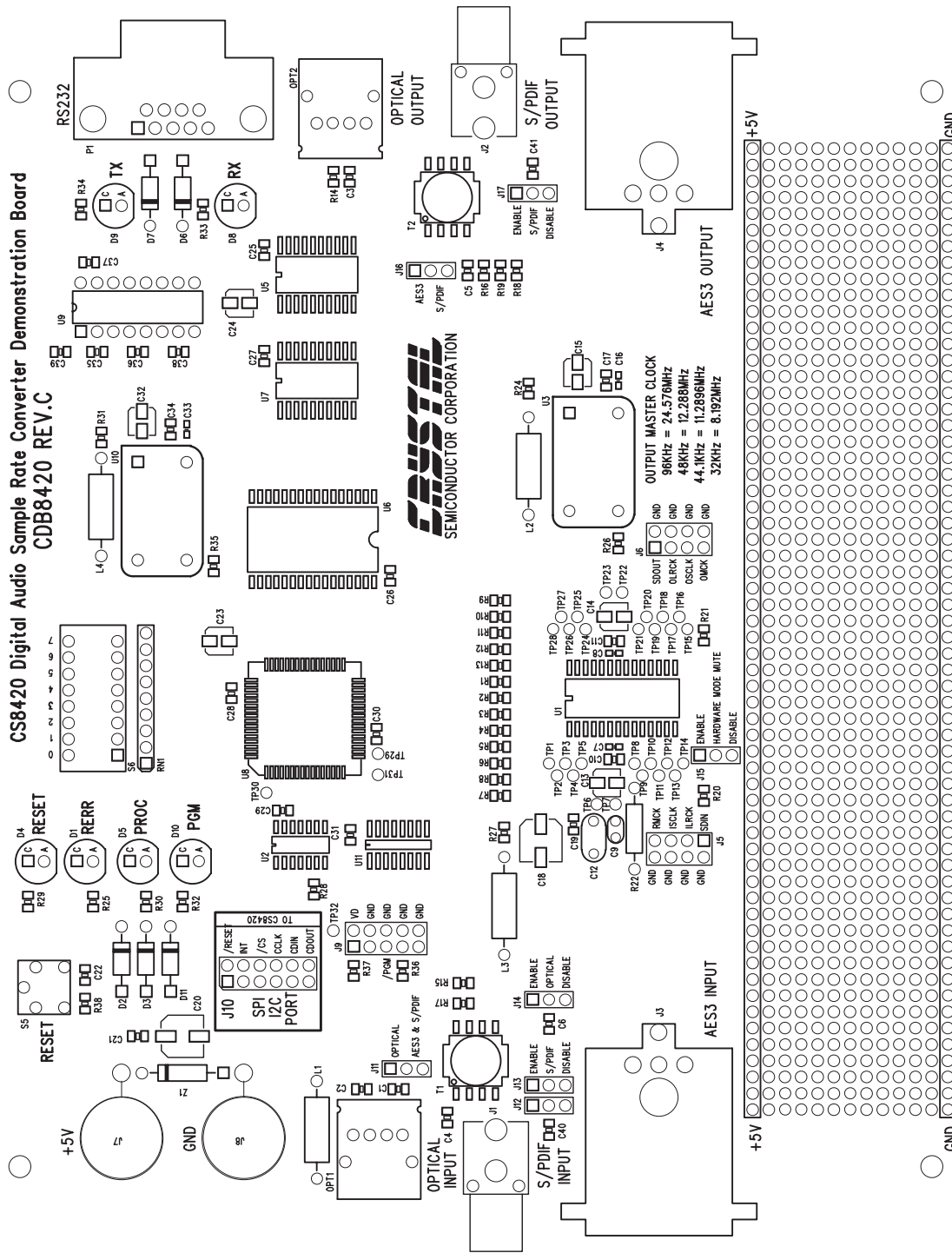




**Figure 4. Atmel AVR RISC Micro-controller**



**Figure 5. Power Supplies and Reset Circuit**


**Figure 6. Silkscreen**

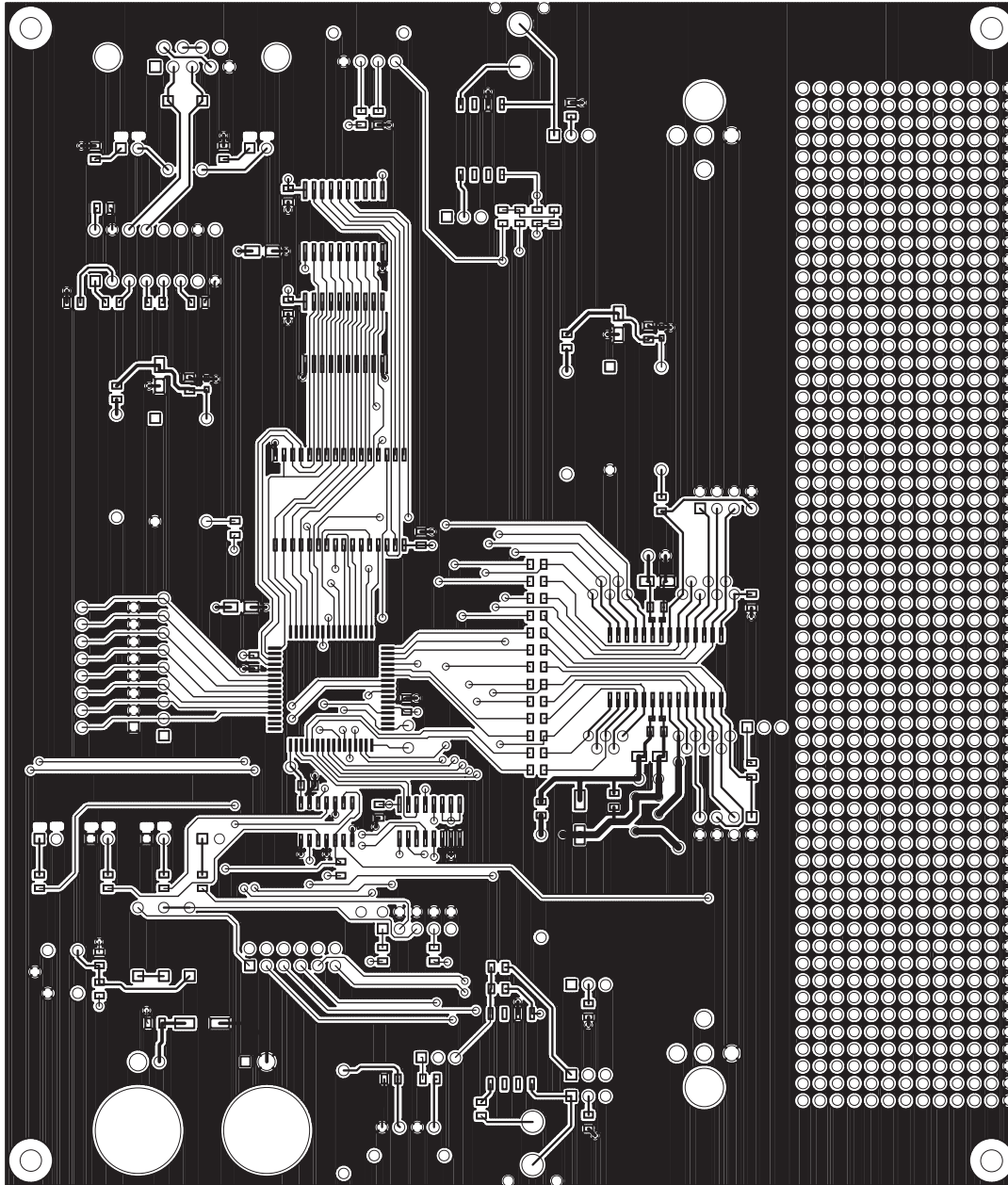


Figure 7. Top PCB

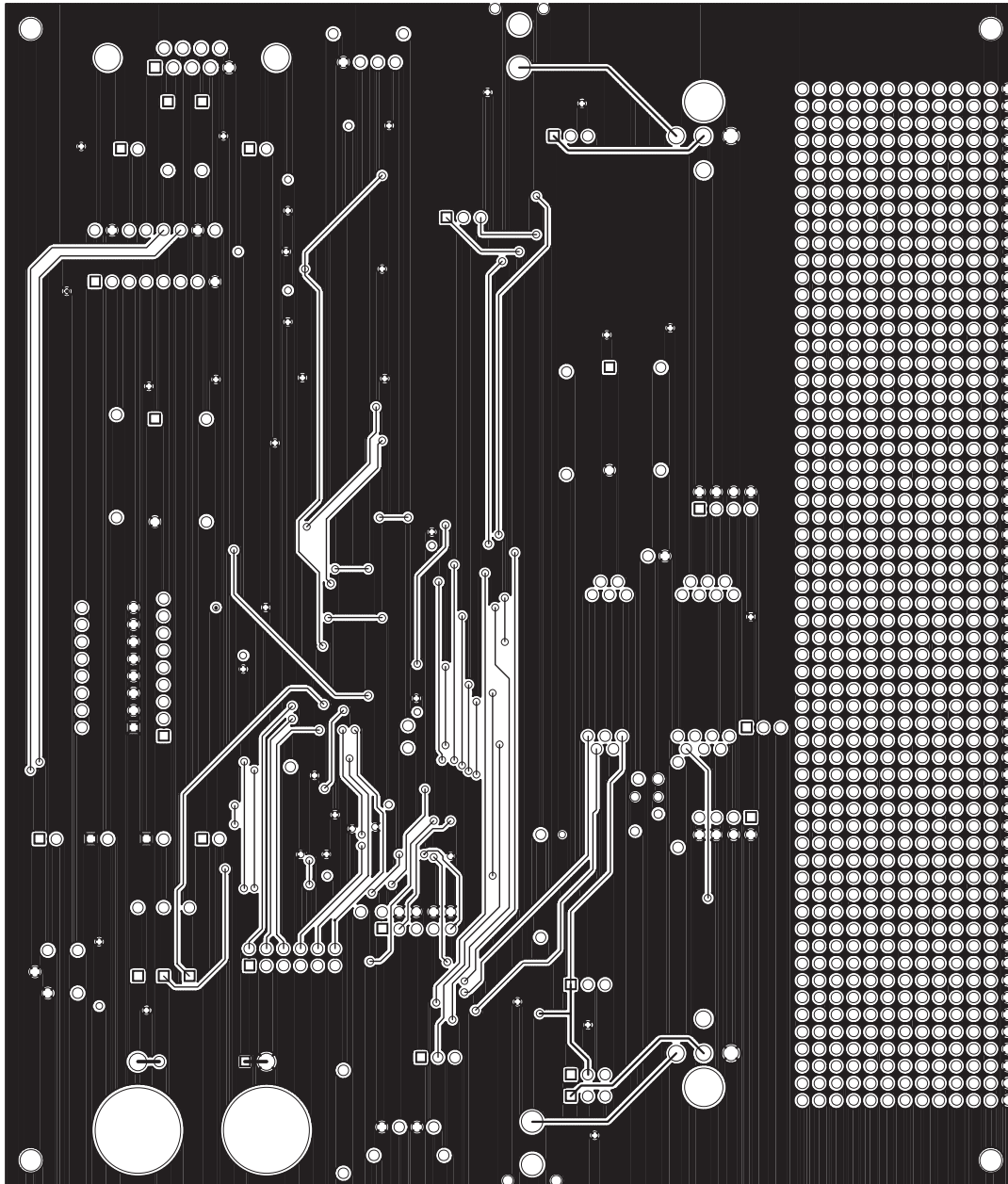


Figure 8. Bottom PCB

**Revision History**

<b>Release</b>	<b>Date</b>	<b>Changes</b>
DB4	Nov 12, 2003	Updated schematics. Moved legal statement to end of document and updated. Added revision block.

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