VS1005 HIRES RECORDER ON BOB V2.0

VS1005g

All information in this document is provided as-is without warranty. Features are subject to change without notice.

Revision History

Rev.	Date	Author	Description
0.71	2019-03-05	HH	Changes in UART character commands.
0.70	2019-02-19	HH	4-channel recording now also available in 96 kHz.
0.60	2019-02-07	HH	Added 48 kHz 4-channel recording option.
0.52	2018-09-04	HH	It is now possible to exit with Ctrl-C even from menus.
0.51	2018-08-30	HH	Added human and machine readable menu modes.
0.50	2018-05-09	HH	Enabled recording to up to 8 microSD cards.
0.40	2018-02-08	HH	Added BWF file linking support.
0.32	2018-01-31	HH	SD cards up to 256 GB tested.
0.31	2018-01-22	HH	Automatically suggests formatting if card is not FAT32.
0.30	2018-01-19	HH	First public release.
0.10	2017-12-22	HH	Initial limited release.

Contents

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1 Introduction

The VS1005g Hi-Res Recorder is an application that makes it possible to record high-resolution up to 4-channel 24-bit 96 kHz PCM audio to an SD card.

This document explains how to use the application on the VS1005 Breakout Board v2.0.

After the disclaimer and definitions in Sections 2 and 3, features of the HiRes Recorder are presented in Section 4, *Features*. After that, requirements are given in Section 5, *Requirements*.

After you have started the HiRes Recorder following the instructions in Section 6, *Starting the HiRes Recorder*, user instructions are provided in Section 7, *Using the HiRes Recorder*.

Section 8, *4-Channel Recording*, explains the things to take into account when doing 4-channel recording.

RIFF WAVE Broadcast Wave Format extensions are discussed in Section 9, *Broadcast Wave Format Compatibility*.

Section 10, *Example* `config.txt` *File* shows a configuration file suitable for the HiRes Recorder.

The document ends with Section 11, *Latest Document Version Changes*, and Section 12, *Contact Information*.

2 Disclaimer

VLSI Solution makes everything it can to make this documentation as accurate as possible. However, no warranties or guarantees are given for the correctness of this documentation.

3 Definitions

ADC Analog to digital converter.

DAC Digital to analog converter.

dB Decibel, a logarithmic unit that indicates the ratio of two powers. 1 bel, which equals 10 decibels, is a power ratio of 10. With additional qualifiers (like dBfs, or dbV), it can also be used to quantify absolute signal levels.

dB(A) Decibel, but with the signals run through A Weighting curve before calculation. A Weighting usually gives results more relevant to how humans hear differences than measurements done without a weighting curve.

dBfs Decibel full scale. Decibel scale where zero point is bound to a digital full scale sine wave.

dBV Decibel volt. Decibel scale where zero point is bound to 0 dBV = 1 Vrms.

DSP Digital Signal Processor.

I-mem Instruction Memory.

LSW Least Significant (16-bit) Word.

VS_DSP[4] VLSI Solution's DSP core.

VSIDE VLSI Solution's Integrated Development Environment.

VSOS VLSI Solution's Operating System.

X-mem X Data Memory.

Y-mem Y Data Memory.

4 Features

Below is a list of the main features for the HiRes Recorder on VS1005 Breakout Board v2.0.

- High sample rates supported:
  - Stereo recording at 96, 48, or 24 kHz.
  - 4-channel recording at 96 or 48 kHz.
- Supports bit depths of 24 and 16 bits per sample.
- UART-based user interface optimized for handling by microcontroller.
- Can buffer up to 0.45 s audio data at highest quality setting.
- Requires microSD cards that are formatted in royalty-free FAT32 file format. Many microSD cards that are 64 GB or larger are preformatted into exFAT format, but the HiRes Recorder can reformat them to FAT32. To VLSI Solution's knowledge, microSD cards reformatted to FAT32 work universally both in computers (Windows, Mac, Linux) as well as portable devices like car stereos.
- Overcomes FAT32 file size limitations by splitting longer recordings into files that are slightly below 2 GiB, with zero sample loss. At 96 kHz 24 bits recording time for each file is exactly one hour.
- To keep real-time performance as high as possible, only creates unfragmented files. If the microSD card's free space is fragmented, the largest contiguous free area is used for recording.
- No set microSD card size limit. SD cards up to 256 GB successfully tested.
- Full source code available.

Typ. recording performance using VS1005's ADCs on VS1005 DevBoard		
Measurement	**Typ. val**	**Unit**
Line in dynamic range	98	dB(A)
Line in maximum signal level	1.16	Vrms
Line in channel gain mismatch	-0.02	dB
Line in channel separation	90	dB(A)
Line in frequency response, 20-20000 Hz	±0.07	dB

Chan-nels	**Sample rate / Hz**	**Bits**	**Recording time**	
			256 GB microSD card	**16 GB microSD card**
2	96000	24	125 hours 14 minutes	7 hours 43 minutes
2	96000	16	187 hours 51 minutes	11 hours 35 minutes
2	48000	24	250 hours 28 minutes	15 hours 27 minutes
2	48000	16	375 hours 41 minutes	23 hours 10 minutes
2	24000	24	500 hours 55 minutes	30 hours 54 minutes
2	24000	16	751 hours 23 minutes	46 hours 21 minutes
4	96000	24	62 hours 37 minutes	3 hours 36 minutes
4	96000	16	93 hours 55 minutes	5 hours 47 minutes
4	48000	24	125 hours 14 minutes	7 hours 43 minutes
4	48000	16	187 hours 51 minutes	11 hours 35 minutes

5 Requirements

5.1 Hardware Requirements

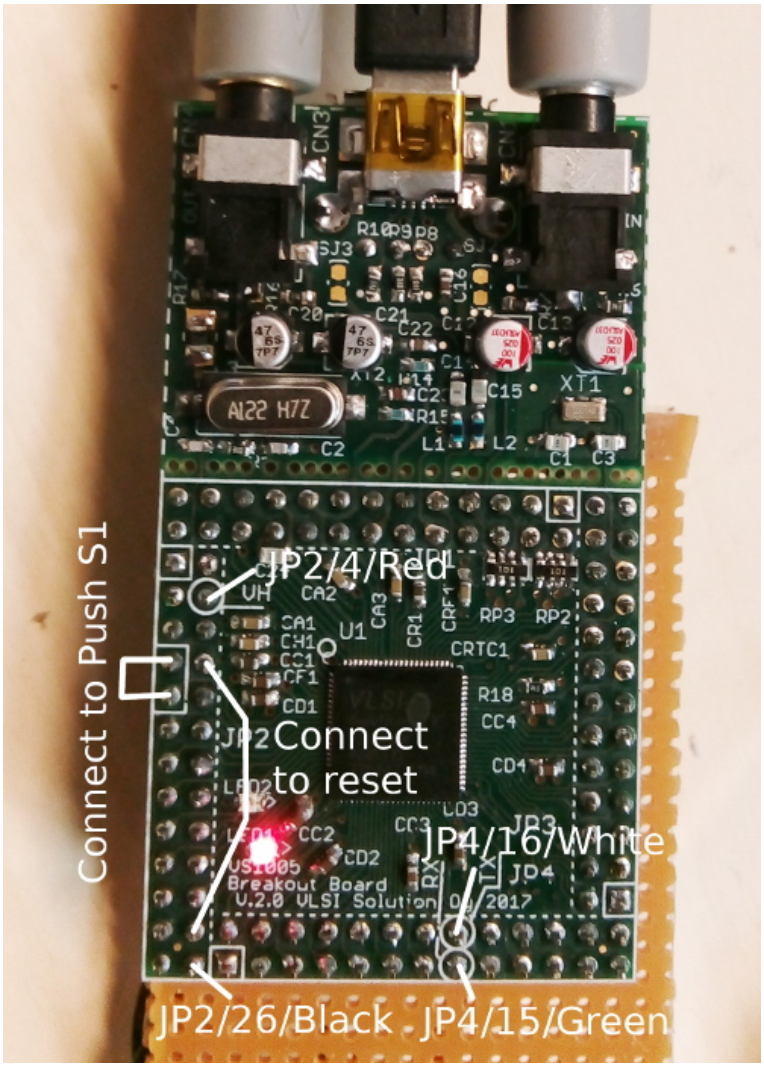

Figure 1: How to connect the VS1005 Breakout Board.

To test the application of this document, you need to have the following building blocks:

- VS1005 Breakout Board v2.0, with VSOS 3.52 or newer installed.
- A 3.5 mm stereo line in plug to CN1, located on the top right of the BoB in Figure 1.
- A 3.5 mm stereo line out plug to CN4, located on the top left of the BoB in Figure 1.
- USB cable between BoB and PC for uploading new software. The Mini USB plug is inserted to the to right connector on the BoB in Figure 1.
- UART or USB->UART cable connected between BoB and PC for using the UART interface. Data speed is 115200 bps, format is 8N1. The UART cable is wired

to the BoB as follows: Black to JP2/26 (or any other ground), White or Yellow to JP4/16, Green to JP4/15, and finally Red to JP2/4, as shown in Figure 1.

- Your favorite UART Terminal Emulation program installed on the PC. Read the document “VS1005 VSOS Shell” for further details.
- A microSD card inserted to the microSD connector. Sizes up to 128 GB have been successfully tested. If the card is not in FAT32 format, it will optionally be formatted.

When all of this is in order, you are ready to test the HiRes Recorder.

Note: Whenever you need to reset the board, connect JP2/8 (XRST) with JP2/24 (GND) (or any other ground), then disconnect them.

Note: Whenever instructions ask to push button S1 (available on the VS1005 Developer Board), connect JP2/7 (IOVDD) with JP2/9 (D0).

5.2 Software Requirements

The HiRes Recorder software is dependent on the following other software:

- VSOS 3.55 or newer installed.
- SDSD23 driver which uses VS23S040 on VS1005 Breakout Board v2.0 for audio buffering purposes. It is also pussible to use the VS23S010 with this driver, but this is not recommended for application running at more than 48 kHz and 16 bits.
- AUIADC or similar audio input driver connected to stdaudioin, with input buffer size set to at least 4096 words.
- AUODAC or similar audio output driver connected to stdaudioout, with output buffer size set to at least 4096 words.
- HiRes Recorder software, compiled with at least the following options (see source code for details):
  - USE_UART_KEYS

6 Starting the HiRes Recorder

To power up the VS1005 BreakOut Board, connect a 5 V power source to VHIGH (JP2/4). For testing you can power the board with the VSIDE USB UART cable connected as shown in Figure 1 on Page 7.

When you power the board up, you should see approximately the following greeting screen on your UART terminal:

```
Hello.
VSOS 3.56 build Apr 06 2018 12:31:43
VLSI Solution Oy 2012-2018 - www.vlsi.fi

Starting the kernel..
Starting Devices...
Internal Flash

Installed system devices:
S: SPI Flash c213, handled by FAT.
Load drivers, config 0...
Driver: RUN... SETCLOCK -l93 80
Driver: LCD177...
Driver: SDSD23... D: SD + VS23S040

Driver: UARTIN...
Driver: AUODAC...
Driver: RUN... AUOUTPUT -s4096 -b32 -l-12
Driver: AUIADC...   Input 0x0440  Rate 48000
Driver: RUN... AUINPUT -s4096 -b32
Driver: S:SHELL.AP3...
VSOS SHELL
S:>
```

If there is an error at the SDSD23 line, check that an microSD card is actually inserted, and that it is formatted to the FAT32 file system.

Before doing further testing, check that the microSD card you are using is working. Type:

```
S:>dir d:
D    1. AUDIO                0 2017-12-31 14:55:12 AUDIO
S:>
```

In this example there is one directory on the microSD driver, called AUDIO. If the microSD card is empty, no output is generated.

If you get an error message, the card may have been formatted to some other file system, like exFAT (Microsoft Windows does this automatically for any microSD card larger

than 32 GB). You may reformat the card to FAT32 by using the FORMAT command as follows (Microsoft Windows will recognize and be able to use the card even if formatted to FAT32):

```
S:>format -y d:
Raw disk geometry:  1929216 sectors (942 MiB =  0.9 GiB), 1 sect per block
  sectors 1929216, sectorsPerCluster 8, clusters 240896
  numberOfFats 1, sectorsPerFat 1883, reservedSectors 165
  startOfFat 0, startOfFileSystem startOfFat+2048
  serialID 0xffc20ee2
Writing FAT32 information (1.0 MiB of data)...
Formatted capacity: 1927168 sectors (941 MiB =  0.9 GiB)
S:>
```

You can again try to list the directory for the D: drive, and when you succees, it is time to start the HiRes Recorder:

```
S:>HiResRec

Hi-Res Recorder v0.60
VLSI Solution 2019

Continuous space 1713s (0:28:33) at 96000 Hz, 24 bits...
D:AUDIO/AUD00001.WAV:    0s,    0 samples lost, 512/512 KiB buffer used
```

The recorder has now started, and is in monitoring mode.

For all the command line options of HiResRec, start it with the “-h” option:

```
S:>HiResRec -h

Hi-Res Recorder v0.60
VLSI Solution 2019

~0206=0
Usage: HiResRec [-p|+p|-v|+v|-nx|rate|bits|-h]
-p/+p   Pause / Don’t pause at start
-a/+a   Auto next drive on/off
-dX     Use drive X:
-nx     Set file number counter to x (1-65535)
-v/+v   Verbose on/off
-2/-4   Start in 2-channel / 4-channel mode
rate    96000 / 48000 / 24000
bits    24 / 16
-h      Show this help
Exiting.
S:>
```

6.1 Autostarting the HiRes Recorder

For some applications, it may be better if the HiRes Recorder is started automatically very time VS1005 Breakout Board v2.0 is powered up. To make this happen, do the following:

1. Make sure the USB cable is attached between VS1005 Breakout Board v2.0 and your PC.
2. Reboot VS1005 Breakout Board v2.0 while keeping S1 pushed. You should now see approximately the following message:

   ```
   Hello.
   VSOS 3.56 build Apr 06 2018 12:31:43
   VLSI Solution Oy 2012-2018 - www.vlsi.fi

   Starting the kernel..
   Starting Devices...
   Internal Flash

   Installed system devices:
   S: SPI Flash c213, handled by FAT.
   USB publishing disk: SPI Flash c213.
   Size 0.9 MB.
   SCSI START
   BRST
   BRST
   ```

   Note: If you don't see the BRST messages at the end, the USB connection is not working properly.
3. VS1005 Breakout Board v2.0 should now be visible as a mass storage device.
4. In the main folder, you should find a file called config.txt. Open it up in a text editor.
5. At the end of the default configuration [0], so just before the line that reads `[1]`, you will find a line that reads `S:SHELL.AP3`. Just before this line, add the line that starts HiResRec so that the portion looks approximately like this:

   ```
   RUN HIRESREC
   S:SHELL.AP3

   [1]
   ```

6. Save the text file.
7. Safely remove / Eject the USB drive.
8. Reset VS1005 Breakout Board v2.0 without pushing S1.

7 Using the HiRes Recorder

After starting, the HiRes Recorder is by default in monitoring mode.

To start recording, push 'r':

```
D:AUDIO/AUD00001.WAV:    0s,    0 samples lost,   0/512 KiB buffer used
D:AUDIO/AUD00001.WAV:    1s,    0 samples lost,   3/512 KiB buffer used
D:AUDIO/AUD00001.WAV:    2s,    0 samples lost,   3/512 KiB buffer used
D:AUDIO/AUD00001.WAV:    3s,    0 samples lost, 192/512 KiB buffer used
D:AUDIO/AUD00001.WAV:    4s,    0 samples lost,   3/512 KiB buffer used
D:AUDIO/AUD00001.WAV:    5s,    0 samples lost,   6/512 KiB buffer used
[...]
```

To see the maximum VU meter values since last time, push 'v':

```
VU -3.0 -2.5 dB
```

If the SD card is too slow to write all the data, the *samples lost* counter is shown as non-zero. A non-zero number is an indication of how much audio has been lost due to the insufficient speed of the SD card. If making a 4-channel recording, sync between main audio channels and auxiliary audio channels may also have been lost. The risk for this happening is biggest when running the HiRes recorder in 4-channel mode at 96 kHz.

To stop recording, push 'r' again:

```
[...]
D:AUDIO/AUD00001.WAV:  279s,    0 samples lost,   3/512 KiB buffer used
D:AUDIO/AUD00001.WAV:  280s,    0 samples lost,   8/512 KiB buffer used

Finalizing file entries.
MAKE SURE THE DEVICE IS NOT POWERED OFF WHILE
FILE ENTRIES ARE BEING BUILT!!!
Creating file entry for D:AUDIO/AUD00001.WAV, length  280.27 seconds
Fix length to RIFF WAV headers, cluster 4, block 2064, aSC 39417 -> 39417
Create file handle, name D:AUDIO/AUD00001.WAV, firstCluster 4, bytes 161434112
File size should be 161434112 bytes
Fixing directory entry pointer
Closing file
Finalizing took 3.6 seconds.
Continuous space 1432s (0:23:52) at 96000 Hz, 24 bits...
D:AUDIO/AUD00002.WAV:    0s,    0 samples lost,   0/512 KiB buffer used
```

For a full summary of all commands, see Section 7.1, *Summary of Controls*.

7.1 Summary of Controls

Controls of HiRes Recorder			
UART	**DevBoard**[1]	**Ext1**[2]	**Description**
p	S1	-	Start playback of files recorder earlier
space	S2	-	Toggle pause in playback or recording mode
s	S3	-	Stop playback of files recorded earlier
r	S4	-	Toggle recording (not available in playback mode)
v	-	-	Show current VU meter status
,	-	Left	Fast reverse 60 seconds in playback mode
.	-	Right	Fast forward 60 seconds in playback mode
;	-	Up	Go to start of song / previous song in playback mode
:	-	Down	Go to next song / exit player in playback mode
<	-	CCW[3]	Turn monitoring volume down by 2 dB
>	-	CW[3]	Turn monitoring volume up by 2 dB
m	-	Center	Enter menu mode, or go one Menu level up (not available while recording)
z	-	Left	Left - Turn slider down in Menu, or go one Menu level up
x	-	Right	Right - Turn slider up in Menu, select toggle/radio button in Menu, or enter next Menu level
u	-	Up	Up - Go up to next Menu item
d	-	Down	Down - Go down to next Menu item
t	-	Center	Select toggle/radio button in Menu, or enter next Menu level
h	-	-	Turn on Human Readable menu format (Section 7.3).
H	-	-	Turn on Machine Readable menu format (Section 7.3).
c	-	-	Enter Command Mode (Section 7.2).
q	-	-	Quit HiRes Recorder
Ctrl-C	-	-	Force quit HiRes Recorder

[1] VS1005 Developer Board
[2] VS1005 Dev. Board Extension 1
[3] Rotate wheel CCW = Counter ClockWise, or CW = ClockWise

7.2 Command Mode

In Command Mode it is possible to enter VSOS Shell commands without exiting the HiRes Recorder. For how to activate Command Mode, see Section 7.1. To execute the command, send either <CR> (ASCII code 13) or <LF> (10). To cancel a partially written command, send <DEL> (8).

Examples of useful commands could be "`DIR D:AUDIO`" or "`DISKFREE -v D:`".

Audio monitoring is not available while executing a command.

7.3 Traversing Text Menus

For applications where there is no LCD or the display user interface is provided by a microcontroller, a UART interface to the Menu display is provided. It has been designed to be machine readable. Menu lines are formed according to the following rules:

- Every Menu output line begins with an '@' character.
- Every Menu line ends with two '@' characters.
- There are never two '@' characters in the middle of a Menu line.
- '@' characters are also used to separate fields in a Menu line.

A Menu screen may look like this:

```
@M@491d@@                  # Every menu begins with @M@unique-4-char-id@@
@t@Main Menu@491d@@        # Menu title, ID repeated
@i00+@<-- Exit@@           # i=Item 00, '+' = line selected
@i01-@4 ch mode@t0@@       # t=Toggle/Radio button, 1=selected
@i02-@Quality -->@@        # i=Item 01, link to next menu level
@i03-@Monitor@v-40:-36:0@@ # v=Value: low=-40, current=-36, max=0
@i04-@Format  -->@@        #
@i05-@Version -->@@        #
@E@@                       # Every menu ends with @E@@
```

Another example Menu screen:

```
@M@4857@@
@t@Quality@4857@@          #
@i00-@<-- Back@@           #
@i01-@Sample rate@@        #
@i02-@  96 kHz@t1@@        # t=Toggle/Radio button, 1=selected
@i03+@  48 kHz@t0@@        # t=Toggle/Radio button, 0=deselected
@i04-@  24 kHz@t0@@        #
@i05-@Sample resolution@@  #
@i06-@  24 bits@t0@@       #
@i07-@  16 bits@t1@@       #
@E@@                       #
```

When in Human Readable menu format mode, the menu is redrawn each time it is traversed. If in Machine Readable menu format mode, only the lines that have changed are sent, to save time when transmitting changes to the microcontroller. E.g., if the user pushes 'd' while at the previous menu, and the system is in Machine Readable meny format mode, the output would be:

```
@t@Quality@4857@@
@i03-@  48 kHz@t0@@
@i04+@  24 kHz@t0@@
@E@@
```

8 4-Channel Recording

The HiRes Recorder is capable of recording four channels, with the following conditions and limitations:

- The two additional channels are an I2S Analog to Digital Converter:
  - Connected to VS1005's I2S pins I2S_BCK (41), I2S_FRM (42), I2S_DI (39), optionally also I2S_12M (44).
  - The I2S ADC is in slave mode.
  - For 16-bit recording to work, the I2S ADC must support 16-bit data.
  - For 24-bit recording to work, the I2S ADC must support 32-bit data.
- Sample rate may be 96 (see Chapter 8.1) or 48 kHz. 24 kHz is not supported.
- The I2S Master Input library S:SYS/AUII2SM.DL3 must be available.
- The system must have enough memory for the I2S driver and its working space (4 KiW of Y Data Memory).
- The main input for stdaudioin may not be I2S (typically the main input is VS1005's own ADC driver S:SYS/AUIADC.DL3).
- There may be a gain difference between VS1005's ADC and I2S channels.
- There may be a slight delay difference between VS1005's ADC and I2S channels.

When recording 4 channels, the RIFF WAV files created are 4-channel files, without any metadata to describe how to map the channels. The channel order in the recording is: Main Left, Main Right, I2S Left, I2S Right.

The inputs are mapped for monitoring as follows:

Monitoring mapping of input channels in 4-channel mode	
Input	**Mapping**
Default (typically VS1005 ADC) left channel	Left
Default (typically VS1005 ADC) right channel	Right
I2S ADC left channel	Left
I2S ADC right channel	Right

8.1 96 kHz and AK5720

The hardware configuration of the AK5720 Analog to Digital converter installed to the *VS1005 Dev Board Extension 1* board doesn't support 96 kHz with full bandwidth. While it is possible to record in 4-channel audio at 96 kHz, the effective bandwidth of AK5720 is only comparable to a 48 kHz recording. If you are designing a device using the AK5720 or similar as the second ADC and require full-quality 96 kHz recording, please contact VLSI Solution for design recommendations.

9 Broadcast Wave Format Compatibility

The HiRes Recorder implements some Broadcast Wave Format extensions to the RIFF file format.

9.1 BWF: <link> Chunk

The HiRes Recorder implements the BWF format <link> chunk, as specified in the document *Specification of the Broadcast Wave Format / A format for audio data files in broadcasting / Supplement 4: <link> Chunk*. This chunk makes it possible for editing software to automatically recognize and join audio files that originally have been split for reasons of file system file size limitations.

The HiRes Recorder stores the <link> chunk after audio data.

The ID is created from a combination of the RTC clock and uptime counter at the time when the audio file(s) is/are being finalized.

An example of the link chunk is shown below (this is from a file AUD1392.WAV from a sequence of AUD1389.WAV through AUD1396.WAV):

```
Chunk header in hexadecimal|ASCII notation:
6C 69 6E 6B 4E 03 00 00|link....

Rest of chunk in ASCII:
<LINK>
  <FILE type="other">
    <FILENUMBER>1</FILENUMBER>
    <FILENAME>AUD01389.WAV</FILENAME>
  </FILE>
  <FILE type="other">
    <FILENUMBER>2</FILENUMBER>
    <FILENAME>AUD01390.WAV</FILENAME>
  </FILE>
  <FILE type="other">
    <FILENUMBER>3</FILENUMBER>
    <FILENAME>AUD01391.WAV</FILENAME>
  </FILE>
  <FILE type="actual">
    <FILENUMBER>4</FILENUMBER>
    <FILENAME>AUD01392.WAV</FILENAME>
  </FILE>
  <FILE type="other">
    <FILENUMBER>5</FILENUMBER>
    <FILENAME>AUD01393.WAV</FILENAME>
  </FILE>
```

```
  <FILE type="other">
    <FILENUMBER>6</FILENUMBER>
    <FILENAME>AUD01394.WAV</FILENAME>
  </FILE>
  <FILE type="other">
    <FILENUMBER>7</FILENUMBER>
    <FILENAME>AUD01395.WAV</FILENAME>
  </FILE>
  <FILE type="other">
    <FILENUMBER>8</FILENUMBER>
    <FILENAME>AUD01396.WAV</FILENAME>
  </FILE>
  <ID>1646108589</ID>
</LINK>
```

10 Example config.txt File

The following config.txt file shows the initializations that are necessary for the HiRes Recorder to work properly.

```
[0]
# Default configuration, no buttons pressed during boot.
# Sets up audio drivers and clock, then starts HiRes Recorder..
#
# Set clock to a higher value so that even the more difficult codecs can play.
RUN SETCLOCK -l100 80
# Start SD card as device D
SDSD23 D
# Start UART in/out driver
UARTIN
# New 2015 audio DAC out driver
AUODAC s
# Enough buffer for HiRes Recorder to work
RUN AUOUTPUT -s4096
# New 2015 audio ADC in driver
AUIADC s 48000 line1_1 line1_3
# Enough buffer for HiRes Recorder to work
RUN AUINPUT -s4096
# HiRes Recorder
RUN HIRESREC
# Start the shell if HiRes Recorder is exit
S:SHELL.AP3
```

11 Latest Document Version Changes

This chapter describes the latest changes to this document.

Version 0.71, 2019-03-05

- There was a conflict in UART character commands. 'l' for left and 'r' for right have been replaced with 'z' and 'x', respectively, in. Chapter 7.1, *Summary of Controls*.

Version 0.70, 2019-02-19

- 4-channel recording available also in 96 kHz.
- Added Chapter 10, *Example* `config.txt` *File*.

Version 0.60, 2019-02-07

- Added 48 kHz 4-channel recording option, see new Chapter 8, *4-Channel Recording*.

Version 0.52, 2018-09-04

- Ctrl-C can now be used to exit while in a menu.

Version 0.51, 2018-08-30

- Added Human Readable / Machine Readable text menu formats, see Chapter 7.1, *Summary of Controls*.

Version 0.50, 2018-05-09

- Recording to up to 8 SD cards is supported with the VS1005 Dev. Board and 8xSD Board. A new document called "VS1005 HiRes Recorder on 8xSD v2.0" has been created to document how to use this board.
- Chapter 6, *Starting the HiRes Recorder*, corrected for the Extension Board 1 version of the document. It partially contained instructions relevant to the Breakout Board v2.0.

Version 0.40, 2018-02-08

- Added mention of splitting large files to Section 4, *Features*.

- Added new Section 9, *Broadcast Wave Format Compatibility*, and a Subsection 9.1, *BWF: <link> Chunk*, that tells about BWF file linking support.

Version 0.32, 2018-01-31

Release for VSOS 3.53. The following modification were made for this version.

- Added new Section 4, *Features*.
- Tested SD cards up to 256 GB (was up to 64 GB).
- Handles better when an SD card is removed and inserted.
- Still compatible with VSOS 3.52, but finalizing recordings is more than an order of magnitude faster when used under VSOS 3.53.
  Example: Finalizing 17 audio files with a total size of 34.3 GB (16 hours and 34 minutes of 24-bit 96 kHz recording) takes 89 seconds under VSOS 3.52, but only 4 seconds under VSOS 3.53.

Version 0.31, 2018-01-22

Automatically suggests formatting if card format is not FAT32.

Version 0.30, 2018-01-19

First public release for both the VS1005g Breakout Board v2.0 and VS1005 Dev. Board Extension 1.

Version 0.10, 2017-12-22

First limited release for VS1005g Breakout Board v2.0.

12 Contact Information

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