HOW TO RECORD WAV FILES FOR CONVERSION TO CSW

Recording good CSW files involves using an amplifier. A better setup may be with an amplifier and a graphic equalizer. I will be investigating this at a later date.

ASCERTAIN YOUR CASSETTE PLAYER IS NOT A PHASE SHIFTING ONE

Some cassette players apply a +90 degree phase shift. You need to identify whether you have one of these cassette players and if you have one I recommend getting a different cassette player. To discover if yours is one, connect your cassette player straight to the line in jack socket with a 3.5mm stereo jack plug to 3.5mm stereo or mono jack plug cable. Use only stereo jack plugs with stereo sockets or you will damage something. Alternatively a cable from a DIN socket could be used.

It is best to record with a volume that makes the waves cover $\frac{2}{3}$ of the available amplitude range. Too high a volume could damage your sound card. Use a sound recording program such as Gold Wave, Cool Edit 2000 or Sound Forge Studio to record a mono 8bit WAV file from the cassette. Switch off Dolby noise reduction if it is available on your cassette player. You will need to record a sample from a computer cassette and look close up to see whether the waves are starting at 0/180 degrees or 90/270 degrees. Players that apply a phase shift are typically awful with computers, and as I said, one will have to be changed for a player that does not apply a +90 phase shift. The 2 graphs on the next 2 pages are suitable for comparing recordings.

ASCERTAIN WHETHER YOUR AMPLIFIER IS A PHASE SHIFTING ONE

When you have ascertained that you have a cassette player that does not apply a phase shift you can then ascertain whether your amplifier applies a phase shift. Some amplifiers apply a +90 degree phase shift along a sine wave to waves when not using tone bypassing.

Connect a mono cassette player via a DIN cable to an amplifiers left channel, TAPE input socket. Alternatively the player's ear socket might do, with a low volume. Connect the headphone jack socket of the amplifier to the line in jack socket on your sound card. This connection is easily done with a 3.5mm stereo jack plug to ¼ inch stereo jack plug cable or a 3.5mm to 3.5mm stereo plug to plug cable and a plug adaptor. Set the amplifiers balance to full left and volume at a listening level. Turn all tone controls off while recording a sample.

Following is a couple of pictures of recordings from different amplifiers. Amplifiers that do phase shifting are likely to be ones with digital IC components.

+180 degrees: This amplifier will be easier to use.



The amplitude levels are not quite the same on the positive and negative sides but this is unimportant. It is important with 0/180 degree starting waves to see greater amplitude with the longer waves, to make a good CSW file. Use the bass control to make the long waves have greater amplitude than the short waves. The treble control can also be used but I would try the bass alone first. If you have one of these amplifiers you can go ahead and record now. Sometimes you may want to smooth gaps between files, as explained later. Also you may on occasions have to run a low-pass filter over the whole recording, to remove unwanted small waves that are being interpreted as data waves, as explained later.



+90 degrees: This amplifier will make extra work for you.

The waves are clearly starting and finishing at 90 degrees. It is important with 90/270 degree starting waves to have even amplitude with all waves to make a good CSW file. Use the bass control to make the waves have even amplitude. The treble control can also be used but I would try the bass alone first.

To help CSW Viewer remove the phase shift a filter has to be ran with a sound editor. A static low-pass filter with 3600Hz and a steepness of 1 could be done with Gold Wave. The frequency you use depends on the highest frequency of the cassettes waves. 3600Hz is suitable for Acorn cassettes. It should be greater than the highest frequency used on the cassette. The whole recording should be selected before applying the filter. Saving a preset makes it easier to use.

Low/Highpass						×
Cutoff frequency	0.					
Initial cutoff (Hz):					• 3600	
	56	186	156	286		
Final cutoff (Hz):	-				+ 3600	
	Si.	186	1Š6	SAP		
Settings						
Lowpass				•	Static	
C Highpass				C	Dynamic	8
Steepness:	-				+ 1	
	5	1	- 15	ZI		
Presets						
Acorn 1200 b	aud cassette		•	+		
OK	Cancel		<u>A</u> pply		Help	

Gold Waves low-pass filter dialog box:

It is necessary to smooth gaps between files after the above filter has been used. A static low-pass filter with 400Hz and a steepness of 5 could be done with Gold Wave. The gap should be selected before applying the filter. Start the selection just after a crossing point of the zero line. Saving a preset makes it easier to use.

Gold Waves low-pass filter dialog box:

Low/Highpass					×
Cutoff frequency	6				
Initial cutoff (Hz):	-			1	4 00
	56	186	156	286	
Final cutoff (Hz):	-				F 400
	Sk	186	156	ZÓL	
- Settings					
Compass				œ	Static
C Highpass				0	Dynamic
Steepness:				-	• 5
	5	1	15	Z	
Cassette gap	smooth		•	+	
OK	Cancel		Apply		Help

Cassettes with large hiss waves on the data waves may appear to have not had a +90 degree offset applied. It will not be possible to make these cassettes into CSW files correctly with a phase shifting amplifier. An example of one of these cassettes is BBC Mastermind Quizmaster for the BBC micro.



Large hiss waves on data waves (from BBC Mastermind Quizmaster):

MORE GUIDELINES FOR ACORN CASSETES

Start and stop the recording to catch the whole tape.

Listen for dropouts, which are often on the trailing tone of the last block of a file.

Extremely short gaps should be examined with a sound editor for hiss and hum. Firebird's game Estra would have hum turned into security waves by MakeUEF without making the hum unreadable. Some cassettes have small gaps between data blocks. E.g. Software Invasion's game 3D Grand Prix.

Ideal view for searching for small gaps:



Save the selected recording in the WAV format preferably using the file naming conventions used at <u>www.acornpreservation.org</u>. Remember to use "Save Selection As …" and not "Save as…". If you use Cool Edit 2000 turn off the option Settings, Data, "Smooth all edit boundaries by crossfading." Other programs may also have an option like that.

GENERAL GUIDELINES

Have a look at recordings from a few cassettes to ascertain whether you have a phase shifting amplifier.

Some cassettes have waves that start at 315 degrees, probably recorded with a phase shifting cassette player. These cassettes are difficult to do so I would not bother with them. Also cassettes with waves considerably bigger on one side of the zero line are difficult to do.

A cassette players heads have to be regularly cleaned with head cleaning fluid and a cotton wool bud. Use one end to clean and the other to wipe the heads dry.

Playing a tape through helps when it hasn't been used for years and also fast winding it. The cassette player heads may need cleaning after.

If a cassette makes high pitched squeaks warm it for a while near a heater and play it through before recording.

I recommend often running a demagnetising cassette. These are only to be played on one side and not rewound by the cassette player.

Using batteries makes a small improvement by not having a minor 50Hz signal from the AC power source.

Don't use loudness buttons on amplifiers because these usually apply a phase shift even with analogue component amplifiers.

If the volume decreases as you are recording you probably have dirt on the cassette players head.

Don't use any other programs while recording because sections of the cassette may become missing in the recording and you may not even notice it.

Turn off Dolby noise reduction.

Use your cassette players pause button to start a cassette playing to avoid a noise at the start.

RECORDINGS FROM COMPUTERS

Acorn Electron:



The waves start positive. The amplitude levels of waves are even. There is a rough sine wave shape to the waves.

Spectrum +2A:

مىر) Jacob		~		~	
0.7		A	1			ļ,		/		/		
		1	μ									
0.6		Π.			 } [<u> </u>						0
0.5			<u>}</u>			1 +						
0.0												2
: : 0.4			+	<u> </u>								
0.3								×				
	Í											
0.2												
0.1												
0.0												
-0.1									<u> </u>			
.02						+						
- 0.2												
: -0.3								<u></u>				
-0.4										ſ		
									8			
-0.5												
-0.6	ι –	V I	V		V	Y	ļ		4			
							1				-1	
-0.7	~~~			\sim							<u> </u>	-11
1												

The waves start positive. The amplitude levels are noticeably weak with negative short pulses. The waves show the signal is lowered faster than it is raised resulting in lob-sided waves.