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## Frequently Asked Questions and... Rarely Asked Questions

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## Answers

### [1] Which is the accuracy of a measurement done using Sample Champion ?

The accuracy of a measurement (not considering external devices like microphones, amplifiers...) depends basically on the sound card. You can evaluate the performance of your sound card using Sample Champion itself in a loop back configuration. See application notes and FAQ #5. If your sound card has poor frequency response, some improvements could be obtained using MLS filtering and equalization capabilities of Sample Champion. A nice solution could consist in using an audio card with S/PDIF digital IN/OUT and an external high quality A/D-D/A converter.

### [2] Which sound cards are more suitable for Sample Champion?

Any sound card working under windows 95/98/2000/NT4 in full-duplex mode is suitable. Nowadays all sound cards satisfy these requirements.

Some sound cards have peculiar characteristics.  
For example:

- Turtle Beach audio cards (Pinnacle, Fiji...) have an excellent frequency response, low noise and in our test **NEVER** lost a bit of sound data or the sync between input and output audio streams. They work very well also on slow computers because of their hardware architecture and powerful

software drivers. These audio cards are **recommended** for Sample Champion.

- Last generation SoundBlaster cards (ex. SBLive, PCI128...) have a very good frequency response but can be used with Sample Champion **ONLY** at the sampling frequency of 12 kHz, 24 kHz and 48 kHz because they work internally always at 48 kHz. Other sampling frequencies are obtained by an internal frequency conversion that can give poor results with Sample Champion.
- Good old first generation SoundBlasters (SB16, SB32, some AWE...) used on slow computers can experience sync losses caused by software interference with the video cards. Sample Champion, in *Blinded Mode*, operates a workaround. Anyway we recommend to update your sound card!

### [3] Why Sample Champion requires a lot of RAM memory?

This is a consequence of the very high accuracy used for all internal operations. For example the FFT (limited for the user to 64K, but extended for some internal operations to 256K) is computed on double-precision complex data and using both frequency bands (positive and negative frequencies) to perform some specific signal processing operations and in prevision of any future DSP expansion (using special purpose plugins). To prevent any resizing or reallocating of the virtual memory during measurements, Sample Champion allocates, once started, all RAM memory required for working.

### [4] Is Sample Champion Y2K compliant?

Yes. We have found no negative Y2K results in our tests.

### [5] How can I test whether Sample Champion works perfectly with my PC configuration?

There is a test that can be done. First of all **download the full-working trial version** and install it. The main thing to test is whether your computer is fast enough to perform the real-time operations required by Sample Champion and nothing in the system interferes with the input and output audio streams.

The test:

- Connect in loop back the input and output of your sound card
- Start Sample Champion and open the Impulse Response and Info windows
- Set a sampling frequency of 44100 Hz and the 'Repeat' mode
- Start a Sync Rec&Play loop of 4096 cycles and read the peak position of each cycle, in the info window
- Adjust, if necessary, the in and out levels from the mixer to obtain a distortion-free impulse response; increase the 'Step' value (if required, see manual for details) until you can read in the control bar the yellow label 'BUFFER OK' for at least 1 second. Repeat the above procedure several times.

If the peak is at the same position at **every** cycle, your computer can perform real measurements with Sample Champion to (once calibrated, the peak will be near  $t=0$ ).

**Note 1:** When a measurement cycle starts, it is normal observing a small change of the peak position, that could be advanced or delayed by one or two samples with respect to other measurement cycles. The peak must, however, remain at the same position during a measurement cycle.

**Note 2:** See the FAQ about sound cards. If you have a SBLive or similar, perform the test at 48 kHz.

**Note 3:** If the peak changes its position, during the test, this means that something interferes with either input or output audio streams. This is not due to Sample Champion but to the specific software/hardware configuration.

**WARNING:** If you experience this, **all** programs manipulating audio data in real-time (for example multitrack recording or other measurement software) on that system could experience the same problems. However only performing synchronous playing and recording (and especially using correlation techniques with MLS) it is possible to discover them! Sample Champion tells you the truth!

**ANYWAY**, the above test is very significant and, if performed correctly with positive results, can assure you that Sample Champion works fine.

If the problem is caused by the sound card, see the above FAQs about most suitable sound cards.

### **[6] If I have more than one soundcard in my system which is actually used by Sample Champion?**

Sample Champion uses always the first (ore the only) audio device mapped in the system. If you have more soundcards, the one to be used must appear as first (number 0). In future versions of SC it will be possible to select the card to be used.

### **[7] About full-duplex operations, should I play at 8 or 16 bit the MLS signal?**

Sample Champion can play either at 8 or 16 bit resolution (for backward compatibility with some old audio devices). When playing tonal signals it is recommended to use 16 bit resolution, but when playing MLS signals (just a series of +K and -K, where K is the output value) it doesn't matter. In our tests we didn't find any difference using 8 or 16 bits in playing MLS signals.

### **[8] My SoundBlaster audio card refuses to perform full-duplex operations**

Download and install the latest driver! Remember also to disable 3D spazialization enhancements and set bass and treble controls to zero when performing measurements. If any loss of sync is observed (see FAQ #5) try also other IRQ and DMA settings because windows can share some of these channels and some configurations could give poor performances in terms of audio quality.

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## Tips

- [\[1\] How can I optimize my operating system for real-time audio measurements?](#)
- [\[2\] How avoiding common errors using digital audio cards and improving sampling result?](#)
- [\[3\] In Sample Champion the wave and the spectrum data seem to "jump" high and low. What happens?](#)

### [1] How can I optimize my operating system for real-time audio measurements?

You should eliminate all not strictly necessary programs running in background. In Windows 95/98 by pressing CTRL-ALT-DEL it is possible to see all running tasks (at least those installed by the user). Close all programs and windows then press C-A-D: the best thing would be to see listed only "Explorer". In Windows NT4 or Windows 2000 use the taskmanager to see all running processes and try to close all unnecessary ones. Refer to the operating system manual to avoid unnecessary tasks automatic start.

### [2] How avoiding common errors using digital audio cards and improving sampling result?

The worst thing that can happen working with digital audio is distortion caused by excessive input levels. For musical audio recording this is a big problem because distortion caused by A/D saturation is usually very unpleasant. The same problem can occur when making measurements with digital instrumentation. The suggestion is to monitor constantly the peak level meters and adjust consequently the input level in the mixer. As a rule, the maximum peak level should be at least 6 dB above the saturation level. Note that in some old sound cards the output section (D/A) can give some distortion on the last bit (actually playing signals greater than  $16384=2^{14}$  in absolute value). If you notice this using Sample Champion, the solution is simple: in Settings|Level use values < 50%. Fortunately Sample Champion gives you a simple way to analyze the acoustical performance of your audio card in terms of distortion in order to perform a fine tuning of your level settings. See the application notes concerning this kind of measurements.

### [3] In Sample Champion the wave and the spectrum data seem to "jump" high and low. What happens?

Sample Champion has the "Y Auto Scale" option turned on (default).



Simply perform a test measure to let the program measure the maximum peak amplitude and then turn off the autoscale or, in a repeated or averaged measure cycle, turn off the option once that the result of the first measure is plotted. When the autoscale is off, it is always possible to perform a manual autoscale by pressing the button on the left of the autoscale one.

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## Known issues

We had a problem sampling with **TurlteBeach Pinnacle** and length of the input buffer equal to **16K samples** (with pure tones or custom waves, **NOT** MLS signal). The problem is certainly due to a bug in the Pinnacle drivers, since it is not present with other audio cards. **Solution:** if you experience this problem, avoid that input length (use instead 8K or 32K).

- This problem does not affect MLS measurements (impulse response) because when a 16K MLS signal is selected, the actual input length is 16K-1 samples.

**Windows 2000** seems to be very stable and suitable for audio measurement software. But some precautions must be taken:

- We found that W2K does not "inform" audio software of the correct **maximal sampling frequency** allowable for a specific sound card. The consequence is that, when a sampling frequency not allowable is selected, the system could not respond (in this case try stopping the non responding application with Task Manager). This affects all audio software and not only Sample Champion. **Solution:** see your sound card manual to learn the maximal allowable sampling frequency.

- Another minor problem we found concerns the **audio mixer** of W2000: for some audio devices, the "Enable"- "Disable" checkboxes are inverted. **Solution:** with Sample Champion, make some test measurements and check the input level meters to see if the signal IN/OUT are correctly selected.

Troubles have been noticed during the concomitant execution of Sample Champion and other programs when a reduced disk space (less than about 100 MB) is available. This happens because Windows creates a swap file (Win386.swp, usually located inside the Windows directory) for emulating the RAM memory required by specific programs (when not present as RAM). The disk space required by Sample Champion (when all RAM memory is used by other software) is about 70 MB or more, depending by settings and opened plugins. If this free disk space is not available, Sample Champion will not work properly and will terminate with unexpected errors. The symptoms are error messages such as **Plugin default not found** and other fatal errors during startup. **Solution:** Leave at least 200 MB of free space on the disk where the Windows swap file is allocated. Close **any** other software before starting Sample Champion (this is always recommended).

## Most common problems (and solutions)

The first configuration to be performed before making any test measurement concerns the audio card mixer. In the following examples a Sound Blaster SB Live! audio card is considered, but the suggestions are valid also for any other device. The operating system was Windows 2000.

1- Connect Line IN to Line OUT with a jack-jack cable and start Sample Champion. Open the Impulse Response Window.

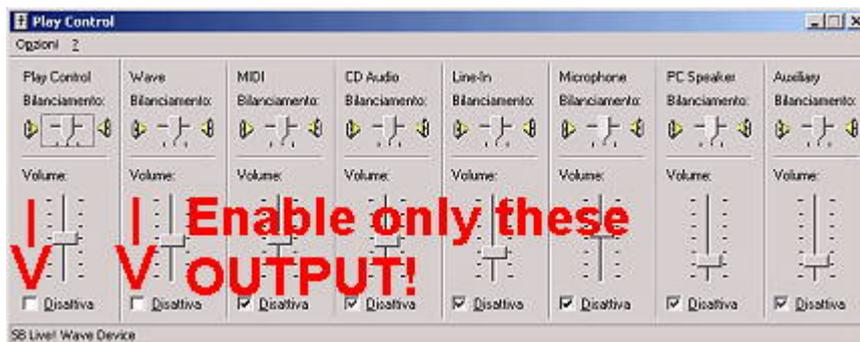


2- Close any other software, including any taskbar application.

3- Open the internal Sample Champion mixer or the standard Windows mixer and enable ONLY the following:

**PLAY Control:**

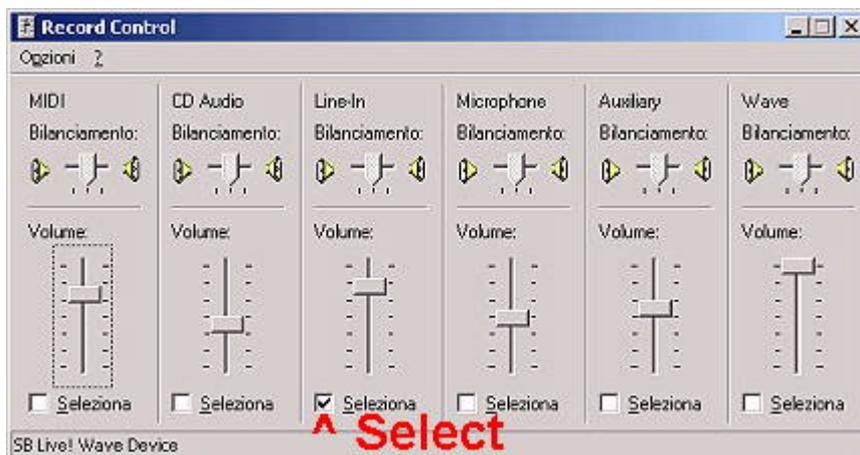
- Enable Play (set level to middle)
- Enable Wave (set level to middle)
- Disable all others



Play Control settings (SB Live!)

**RECORD Control:**

- Enable Line-In (set level to middle)
- Disable all others

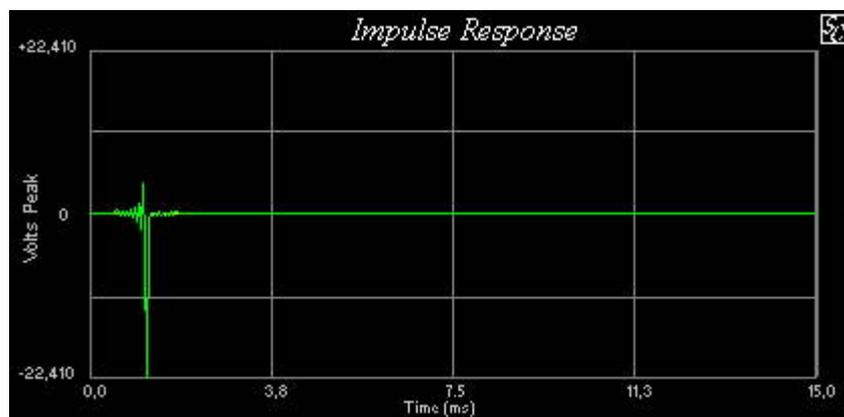


Record Control settings (SB Live!)

In Settings/General, set:

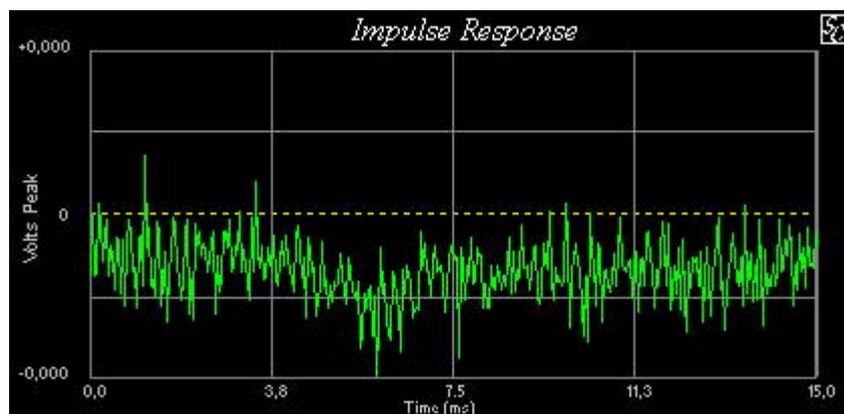
- 1 Channel In
- 1 Channel Out (16 bit)
- Buffer Length 4K
- Block = 16
- Mode = Repeat
- Sampling Rate = 48000 Hz
- Step = 4
- MLS type = 4K
- Level = 50%

4- Now press "Syncro Start/Stop MLS and Sampling" button and look at what happens.



Correct Loop-Back Impulse Response

If you will see a still Impulse Response like in the above figure, congratulations, you are lucky! Sample Champion is running correctly and your hardware/software configuration is suitable for MLS measurements. Anyway some other tests with different parameters are suggested for an extensive test.



Absence of signal Loop-Back Impulse Response

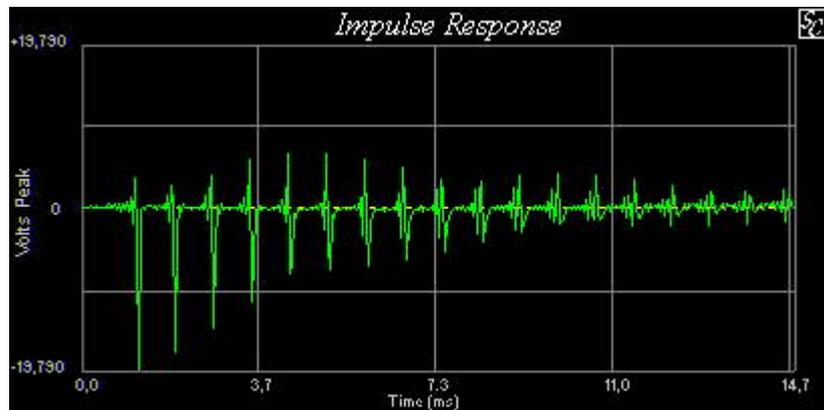
If the computed Impulse Response looks like in the above figure, it means that the chain between input and output is interrupted. Check loop-back connection and mixer settings.

The above plot can be obtained also by pressing the "Rec" button without any MLS signal in output; it is due, in this case, to the cross-correlation between the selected MLS signal (Settings/General, MLS Type) and (uncorrelated) background noise.

Most common problems:

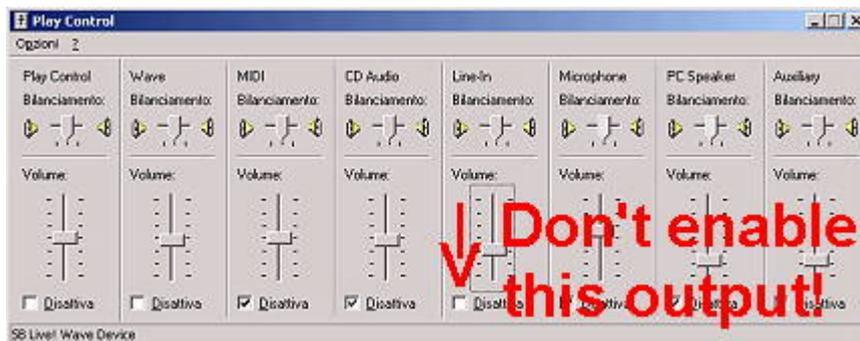
### Echo in the measured Impulse Response

If the measured Impulse Response (?!) looks like the following



Wrong Loop-Back Impulse Response

most probably the cause is in a wrong mixer setting. In the above example a repetition of the first (correct) peak can be easily observed. In this case the "Line-In" volume in the Play Control of the mixer had been erroneously enabled.



Wrong Mixer Setting

In other audio devices there are other similar level settings that must be disabled to obtain correct measurements. For example in the Pinnacle audio card mixer there is an "Input Monitor" control: set it to zero (and, if present, check also the mute button).

Obviously every "3D sound", "Reverb", "Chorus", "Spatialization" or other similar controls must be disabled for these kind of measures.

## Not still Impulse Response

If the measured Impulse Response has a correct shape for a loop-back measure, but does not remain still during the cycle measures, there could be several reasons:

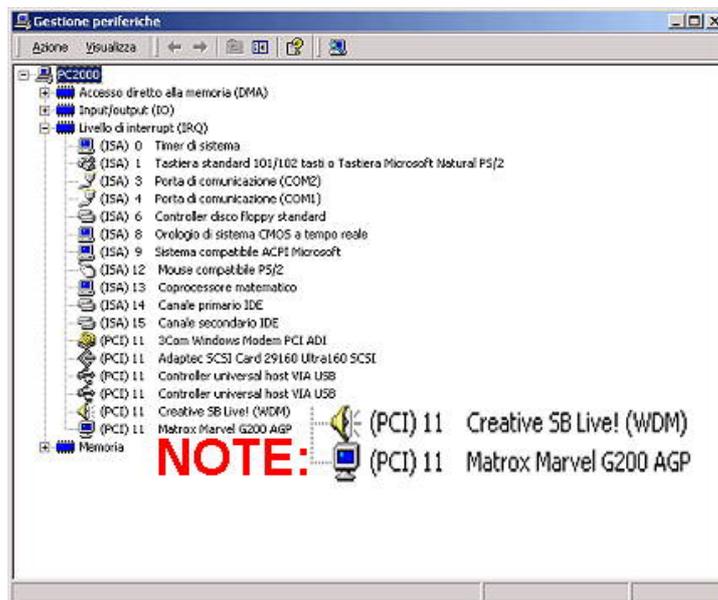
1- The sound card works internally at 48 kHz and emulates other sampling frequencies (this is the case, for example, of the SB Live). In this case, for MLS measurements, only 48, 24 and 12 kHz sampling frequencies must be used. Other frequencies will produce an unclear and not still Impulse Response.

2 - The sound card shares an IRQ with other devices of your system.

NOTE: this affects every audio software working in your system, so it could be worth to avoid it, even if you will not use Sample Champion.

The worst thing is IRQ sharing between audio and video devices because during sampling often graphic information are shown and this could cause problems.

This is an example of IRQ sharing (to be avoided!):



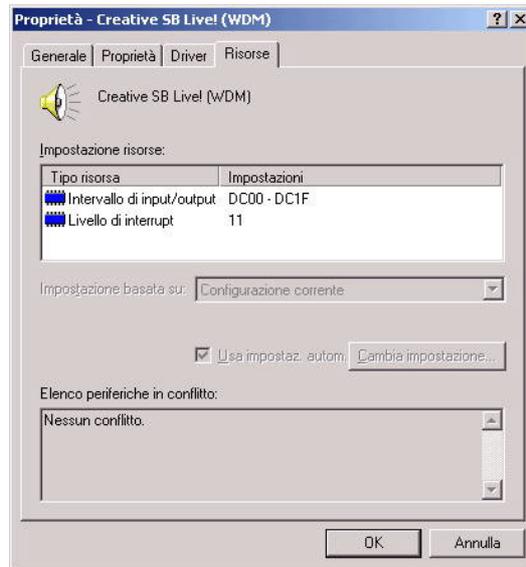
System configuration IRQ resources

As shown above, IRQ 11 is shared between Modem, SCSI adapter, USB adapters, audio card and video card!!

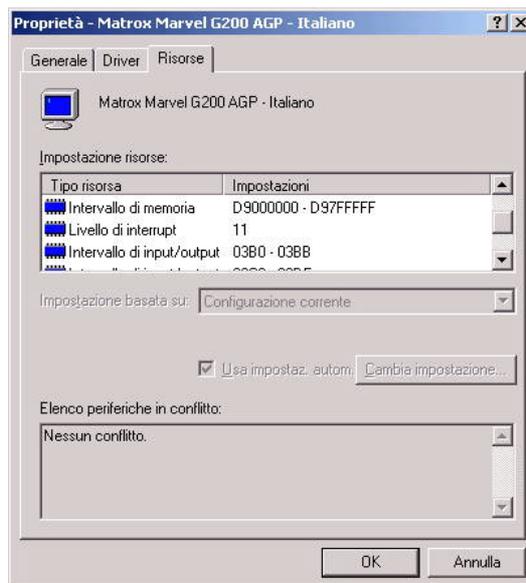
By the way, IRQs 2, 5, 7 and 10 are free.

The solution is to assign to the audio device one of the free IRQs. Sometimes uninstalling and reinstalling the device could be necessary, but it will be surely worth!

Following figures show in detail the settings of the audio card and of the video card.



Audio Card IRQ setting



Video Card IRQ setting

In this case Windows doesn't allow the manual configuration of the audio device IRQ and the reinstallation could be necessary. For this purpose, follow the audio device and Windows installation guides.