



# Technical Considerations

What Sample Rate should I use?

What Tap Length should I use?

Filter Hose Data Input

# Technical Considerations

## Sample Rate Consideration:

- What is the sample rate you intend to implement in your device?
- Does the sample rate you pick has adequate Nyquist frequency for your use?

## Tap Length (N) Consideration:

- What is the capability of your device?
- What is the frequency resolution you intend to implement in your device?

Sample Rate (Hz)	Sample Resolution ( $\mu$ s)	Impulse Response Length		Frequency Resolution (Hz)	3x Frequency Resolution (Hz)
		Tap Number	Length (ms)		
44100	22.68	128	2.90	344.53	1033.6
		256	5.80	172.27	516.8
		512	11.61	86.13	258.4
		1024	23.22	43.07	129.2
		2048	46.44	21.53	64.6
		4096	92.88	10.77	32.3
		8192	185.76	5.38	16.1
		16384	371.52	2.69	8.1
		32768	743.04	1.35	4.0
		65536	1486.08	0.67	2.0
		131072	2972.15	0.34	1.0
		262144	5944.31	0.17	0.5
Nyquist Freq (Hz)	22050				



Sample Rate (Hz)	Sample Resolution (µs)	Impulse Response Length		Frequency Resolution (Hz)	3x Frequency Resolution (Hz)
		Tap Number	Length (ms)		
44100	22.68	128	2.90	344.53	1033.6
		256	5.80	172.27	516.8
		512	11.61	86.13	258.4
		1024	23.22	43.07	129.2
		2048	46.44	21.53	64.6
		4096	92.88	10.77	32.3
		8192	185.76	5.38	16.1
		16384	371.52	2.69	8.1
		32768	743.04	1.35	4.0
		65536	1486.08	0.67	2.0
		131072	2972.15	0.34	1.0
		262144	5944.31	0.17	0.5
		Nyquist Freq (Hz)		22050	

Sample Rate (Hz)	Sample Resolution (µs)	Impulse Response Length		Frequency Resolution (Hz)	3x Frequency Resolution (Hz)
		Tap Number	Length (ms)		
48000	20.83	128	2.67	375.00	1125.0
		256	5.33	187.50	562.5
		512	10.67	93.75	281.3
		1024	21.33	46.88	140.6
		2048	42.67	23.44	70.3
		4096	85.33	11.72	35.2
		8192	170.67	5.86	17.6
		16384	341.33	2.93	8.8
		32768	682.67	1.46	4.4
		65536	1365.33	0.73	2.2
		131072	2730.67	0.37	1.1
		262144	5461.33	0.18	0.5
		Nyquist Freq (Hz)		24000	

Sample Rate (Hz)	Sample Resolution ( $\mu$ s)	Impulse Response Length		Frequency Resolution (Hz)	3x Frequency Resolution (Hz)
		Tap Number	Length (ms)		
96000	10.42	128	1.33	750.00	2250.0
		256	2.67	375.00	1125.0
		512	5.33	187.50	562.5
		1024	10.67	93.75	281.3
		2048	21.33	46.88	140.6
		4096	42.67	23.44	70.3
		8192	85.33	11.72	35.2
		16384	170.67	5.86	17.6
		32768	341.33	2.93	8.8
		65536	682.67	1.46	4.4
		131072	1365.33	0.73	2.2
		262144	2730.67	0.37	1.1
		Nyquist Freq (Hz)	48000		

Sample Rate (Hz)	Sample Resolution ( $\mu$ s)	Impulse Response Length		Frequency Resolution (Hz)	3x Frequency Resolution (Hz)
		Tap Number	Length (ms)		
48000	20.83	128	2.67	375.00	1125.0
		256	5.33	187.50	562.5
		512	10.67	93.75	281.3
		1024	21.33	46.88	140.6
		2048	42.67	23.44	70.3
		4096	85.33	11.72	35.2
		8192	170.67	5.86	17.6
		16384	341.33	2.93	8.8
		32768	682.67	1.46	4.4
		65536	1365.33	0.73	2.2
		131072	2730.67	0.37	1.1
		262144	5461.33	0.18	0.5
		Nyquist Freq (Hz)	24000		

# Technical Considerations

For Filter Hose use, the data input must follow the requirements below:

- ✓ Data input sample rate must be the same as the FIR filter being created.
  - Filter Hose Manual Input can change the data input sample rate if needed.
- ✓ Data input length does not need to be too long.
  - It's best to keep the input impulse response at 16k or less.
  - Filter Hose will warn about long data input that may slow down the program.
  - If the measurement file is too long, you can use the advanced function: remove 2<sup>nd</sup> half N.

FIR Filter as a tool



Advantage:

Create magnitude and/or phase correction independently.

**FIR filter, limitations:**  
**May introduce processing delay**  
**Not practical for low frequency**

# Reference & Other Information

Software:

Microsoft Excel, Filter Hose v2.4.1.

Reference Materials:

Filter Hose User Guide.

Understanding Digital Signal Processing 2<sup>nd</sup>  
edition by Richard G. Lyons.

*Supporting graphics/animations were created by Hadi using Sketchup, Microsoft Paint and PowerPoint.  
Flash video by William Ladson (Ladson Media inc.), music by Cliff Lin, Reynaldo Saut  
Video: Cyberlink Screen Recorder and PowerDirector.  
Audio: Nuendo, RME UFX, DPA 4288.*