Calculate Hard Drive Storage Requirements for Audio WAV Files

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The procedures outlined below apply only to Waveform Audio File format (WAVE or WAV) files encoded using pulse code modulation (PCM) and no compression. This is the most common format and is the method used in the popular Radio-SkyPipe charting program.

1. **Determine** the sampling rate, encoding level and channel configuration used by the sound application. In Radio-SkyPipe, the settings are found in menu Options – Sound tab – Choose Sound Format button
   Example: sample rate = 12 000 samples/s, encoding = 16 b/sample, and configuration = stereo (2 channels)

2. **Determine** raw bit-rate per channel:
   Raw bit-rate per channel = (sample rate) x (encoding)
   To convert from b/s to kb/s, divide by 1000
   Example: Raw bit-rate/channel = (12 000 samples/s) x (16 b/sample) = 192 000 b/s/channel = 192 kb/s/channel

3. **Convert** to raw kilobytes/s/channel:
   kB'/s/channel = (bit-rate/channel) / (8 b/B)
   Example: kB'/s/channel = (192 kb/s) / (8 b/B) = 24 kB/s/channel

4. **Convert** to conventional kB as reported by Windows for hard drive storage:
   kB/s/channel = (kB'/s/channel) / (1.024 kB'/kB)
   Example: kB/s/channel = (24 kB'/s/channel) / (1.024 kB'/kB) = 23.4 kB/s/channel

5. **Account** for configuration:
   Total rate = (kB/s/channel) x (number of channels)
   - For monaural (mono): number of channels = 1
   - For stereo: number of channels = 2
   Example: Total rate = (23.4 kB/s/channel) x (2 channels) = 46.8 kB/s for stereo sound at 12 000 samples/s and 16 b encoding

6. **Calculate** storage requirements for each second, minute and hour:
   - Each second: (kB/s/channel) x (number of channels) x (1 s)
   - Each minute: (kB/s/channel) x (number of channels) x (60 s/min)
   - Each hour: (kB/s/channel) x (number of channels) x (3600 s/h)
   Example for stereo sound, 12 000 samples/s, 16 b/sample:
   - Each second: (23.4.kB/s/channel) x (2 channels) x (1 s) = 46.8 kB/s = 0.047 MB/s
   - Each minute: (23.4 kB/s/channel) x (2 channels) x (60 s/min) = 2813 kB/min = 2.813 MB/min
   - Each hour: (23.4.kB'/s/channel) x (2 channels) x (3600 s/h) = 168 750 kB'/h = 168.75 MB/h

7. **Check limitations**: WAV files are inherently limited to 4 GB maximum size; however, some software applications including Radio-SkyPipe cannot handle files larger than 2 GB.

8. **Summary**: The necessary hard drive storage space is calculated for WAV files that use PCM encoding and no compression from the sample rate, number of encoding levels, configuration and recording time:
   Storage (MB) = [(sample rate / 1000) x (encoding levels) x (number of channels) x (time)] / (8 x 1024)
   where:
   sample rate =   audio encoder sample rate in samples/s
   encoding levels =   number of encoding levels in bits/sample
   number of channels =   2 for stereo and 1 for monaural (mono)
   time =   total recording time in seconds

9. **Comparison with actual**: A WAV file recording was made with Radio-SkyPipe for a time period of 8 hours 10 minutes 6 seconds (8.1683 h) using the example settings (12 000 samples/s, 16-bit/sample, stereo). Indicated file size: 1 378 397 kB.

   Working backwards: 1 378 397 kB / 8.1683 h = 168 750 kB/h = 2.812 MB/min = 46.9 kB/s (23.45 kB/s/channel) (slight difference due to rounding and metadata embedded in file)