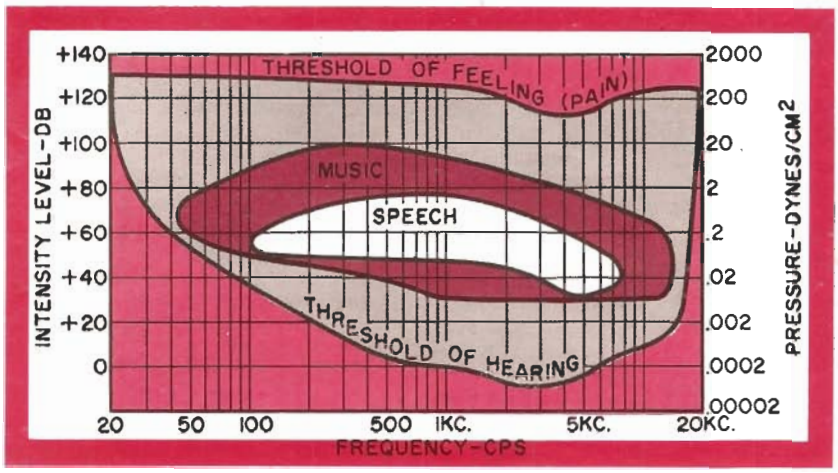
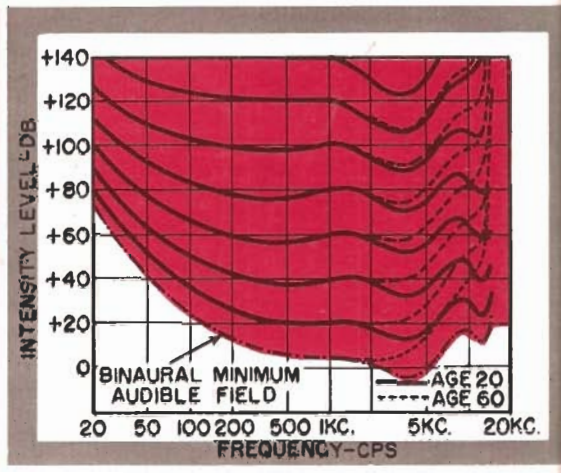


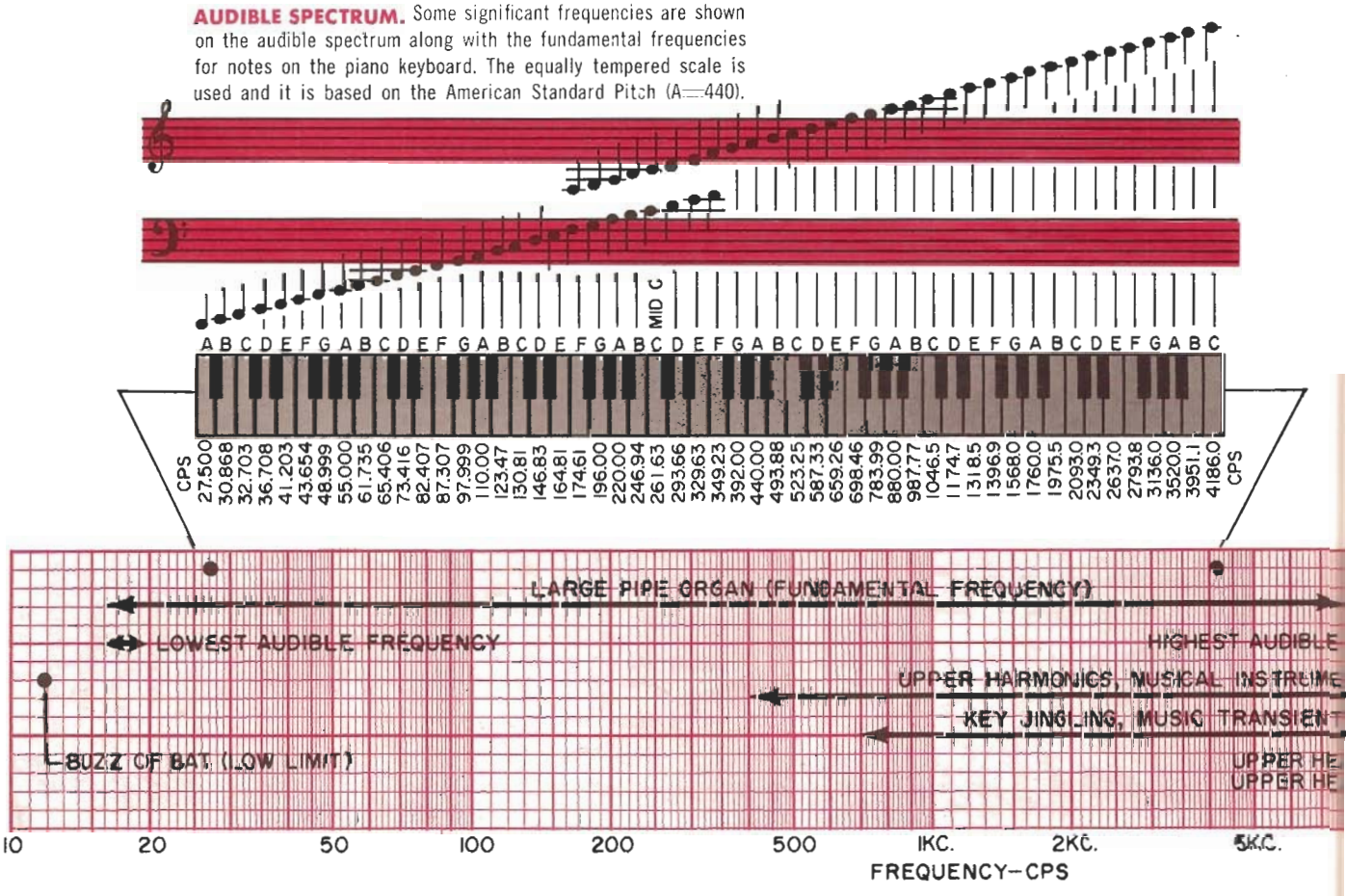


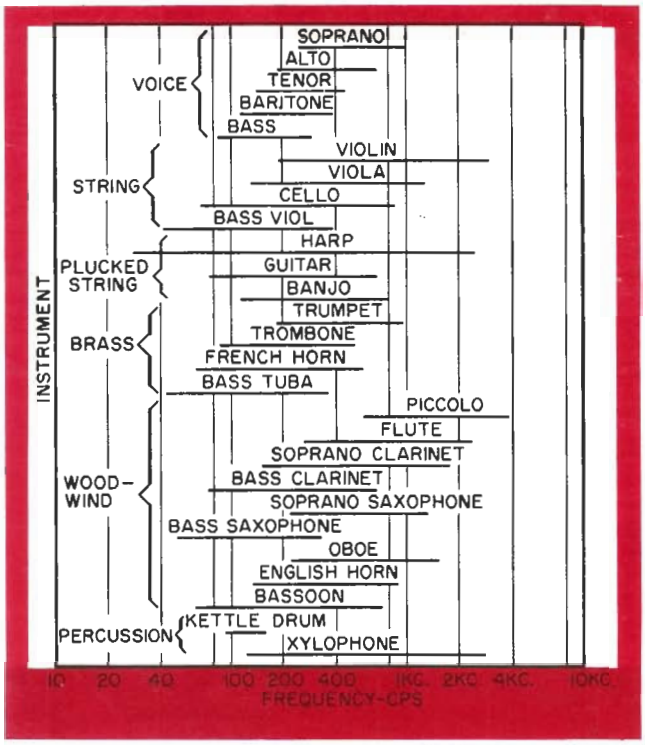
FREQUENCY & VOLUME RANGES. (Left) The approximate boundaries of normal hearing based on Fletcher-Munson data. No sound is heard below the level indicated by the lower contour. Sound levels that are in excess of those indicated by the upper contour are felt rather than heard and may be accompanied by a sensation of pain. Also shown are the volume levels and frequency ranges of music as well as speech.

EQUAL LOUDNESS CURVES. (Right) Sound intensities required to produce equal loudness at various sound levels. These curves, obtained by Robinson and Dadson, are slightly different from the older Fletcher-Munson data and have as yet to be internationally accepted. Both these curves and the Fletcher-Munson curves of equal loudness show the need to boost the bass substantially and to boost the treble slightly when listening at reduced volume levels. If this is not done, then bass and treble tones will appear to be lost.

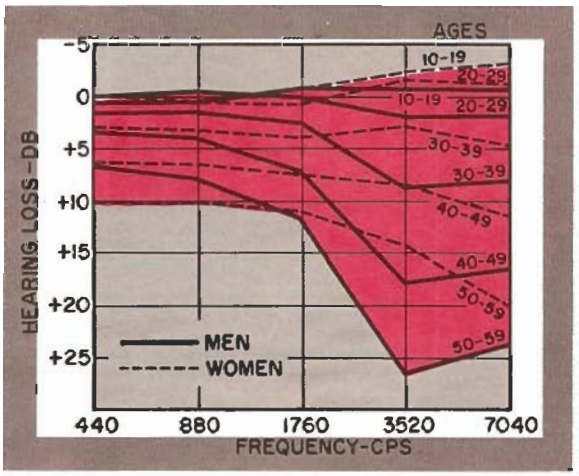
SOUND

AUDIBLE SPECTRUM. Some significant frequencies are shown on the audible spectrum along with the fundamental frequencies for notes on the piano keyboard. The equally tempered scale is used and it is based on the American Standard Pitch (A=440).

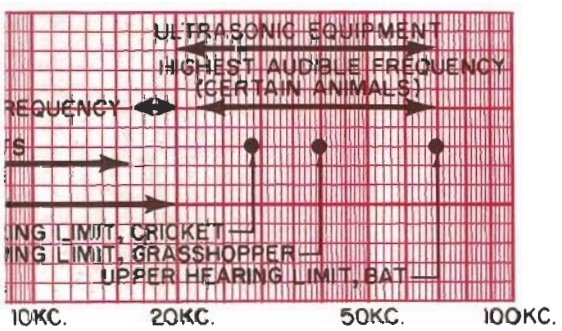


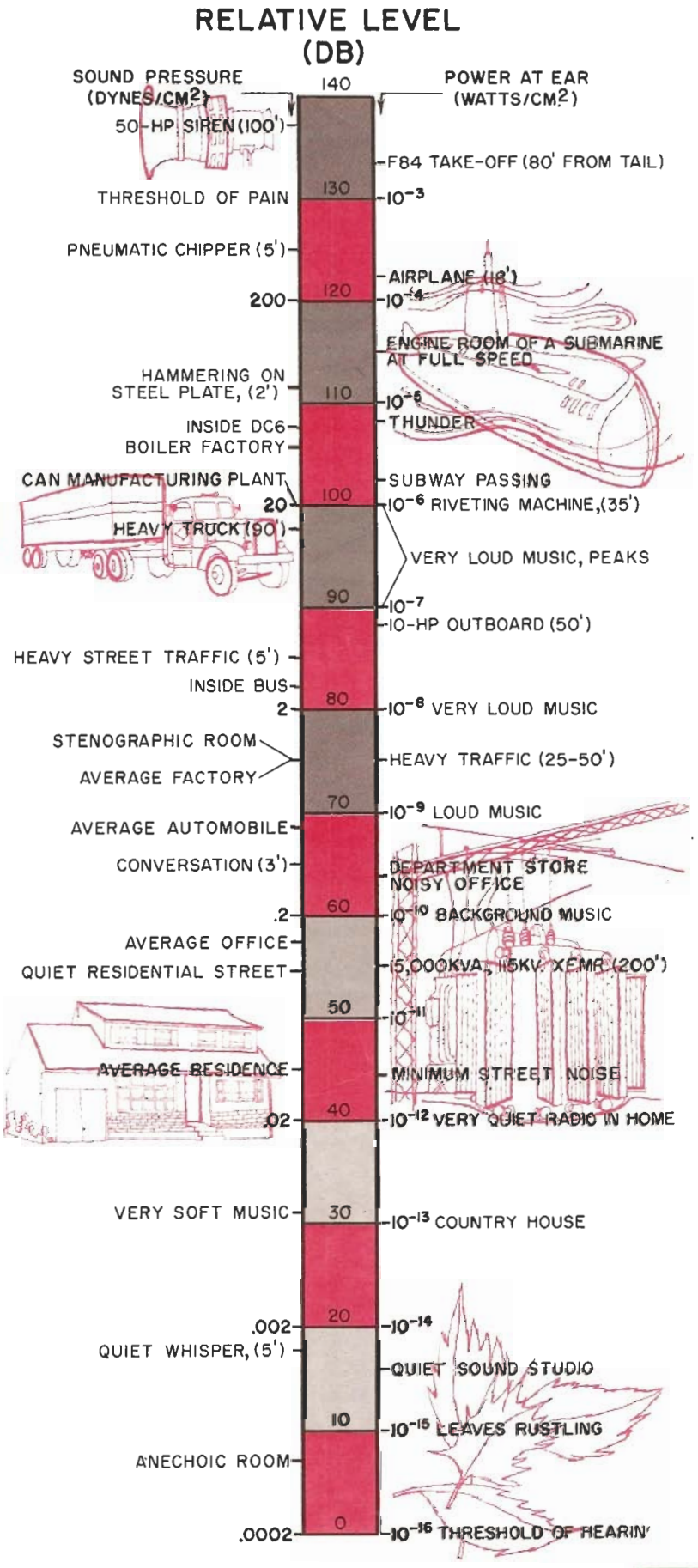


MUSICAL FREQUENCY RANGES. Fundamental frequency ranges of voices and musical instruments. Note that the range of the overtones, which give an instrument its particular timbre, is not shown. Although these vary widely depending on the instrument and how it is played, the overtones may extend the frequency range required to reproduce a given musical instrument by two or more octaves.



HEARING LOSS WITH AGE. Curves show the loss of hearing acuity with advancing age. Note that high-frequency hearing loss of women is considerably less than for men.





SOUND LEVELS. The relative levels of a number of common sounds and noises.

AUDIBLE SPECTRUM. Some significant frequencies are shown on the audible spectrum along with the fundamental frequencies for notes on the piano keyboard. The equally tempered scale is used and it is based on the American Standard Pitch (A=440).