in age produce an increasing loss which starts at the high frequency end of the spectrum After sixty, few persons can hear beyond 10,000 or 12,000 Hz However, the maximum sensitivity range of the ear is between 1000 and 4000 Hz

Before discussing hearing loss, let us first decide what constitutes normal hearing "Normal hearing" is defined as the average hearing of a group of persons considered essentially representative of the population Normal hearing has been designated only for the following frequencies 250, 500, 1000, 2000, 4000, and 8000 Hz in the audible spectrum For any one of the chosen frequencies hearing is measured in units called "decibels of hearing level"

Some areas of the audible spectrum are more important than—others, for example—the speech range as represented in a conventional pure tone audiogram, 500, 1000 and 2000 Hz The value at these frequencies will indicate quite accurately how well a person can hear and understand speech

Another area in the audible spectrum important to the person interested in noise extends through 3000, 4000, and 6000 Hz Although these frequencies have no significant relation to the understanding of speech, they are a sensitive indicator of the onset and progress of noise-induced hearing loss Hearing tests are designed to test hearing by way of the *external ear,* called air conduction tests, and the *skull,* or bone conduction tests

Remember that the reference points for normal hearing are average values obtained by testing a large group of individuals An average figure implies that many of the individuals tested are either better or worse than average Because of this, normal hearing should not be thought of as a specific level, but rather as an area extending 15 dB (decibels) on either side of the average value

Audiometry

The field of audiometry (hearing measurement) now embraces pure tone audiometry, speech audiometry, screening audiometry, group audiometry, and recently, automatic audiometry

The electronic audiometer is the instrument commonly used to measure hearing It is necessary when using the general term "audiometer" to specify which type of instrument is meant a pure tone audiometer, speech audiometer, screening audiometer, automatic audiometer, group audiometer, and others which are beyond the scope of this Manual The choice of measurement technique and the type of audiometer is dictated by the purpose for which the test is being made

Audiometry may be divided into two broad subfields, based on the sound stimulus used (*a*) pure tone audiometry and (*b*) speech audiometry Pure tone audiometry is used primarily to determine air conduction and bone conduction thresholds of hearing These thresholds are necessary for diagnostic evaluations of hearing loss Pure tone air conduction threshold tests and pure tone air conduction screening tests are also used extensively in industrial and school hearing conservation programs Speech audiometry is used principally to obtain speech reception thresholds and speech discrimination scores for diagnostic purposes and to evaluate the performance of hearing aids

Pure tone audiometry. Hearing loss for pure tone is measured at specific discrete frequencies in the audible spectrum Early audiometers were designed to measure threshold responses at octave intervals starting at 64 Hz, extending through eight octaves to approximately 16,000 Hz at the upper end As audiometric experience increased, measurements at the extreme ends of the scale were gradually omitted, and at present most instruments are designed to test from 250 through 8000 Hz There is even a trend to contract the range still further to 500 and 6000 Hz limits, and for good reasons ambient noises in the test environment mask the low frequency thresholds, at the upper frequencies the output of earphones decreases sharply, making the audiometer inherently unreliable Thresholds measured at frequencies below 500 Hz and above 6000 Hz are usually quite unreliable and therefore limited in testing

At one time audiometers were calibrated to generate pure tones one octave apart With the increasing use of speech audiometry, however, it has become important to know a lot more about pure tone thresholds at several half-octave frequencies The two half-octaves first included in the audiometric frequencies were 3000 and 6000 Hz Tones of 750 Hz