



# More About Hearing

Hearing senses sound frequencies.

## Hearing-2

### THE FREQUENCIES OF SOUND

The Hearing String identifies the sound frequencies (pitch) which a sophont can hear, and the sound frequencies of the sophont voice.

**F Freq.** The central frequency the ear can hear in Hertz (= cycles per second). F is a power of 2 (so, if F=8, Freq = 2^8 = 256). The difference between any two Freq values is an Octave.

**S Span.** The number of Octaves above and below Freq. If S=1, then the span of sound the sophont can hear is one octave above and below Freq.

**V Voice.** The central frequency of the voice in Hertz.

**R Range.** The number of Octaves above and below Voice.

### THE FREQUENCIES OF SOUND

Flux	Code	Freq (Hz)	Formula	Description
-9	1	2	2^1 C d	delta
-8	2	4	2^2 C th	theta
-7	3	8	2^3 C a	alpha
-6	4	16	2^4 C 0	beta
-5	5	32	2^5 C 1	gamma
-4	6	64	2^6 C 2	Low human audible.
-3	7	128	2^7 C 3	
-2	8	256	2^8 C 4	Middle C
-1	9	512	2^9 C 5	
0	A	1,000	2^10 C 6	
+1	B	2,000	2^11 C 7	
+2	C	4,000	2^12 C 8	High human audible.
+3	D	8,000	2^13 C 9	
+4	E	16,000	2^14 C10	Dog whistle
+5	F	32,000	2^15 C11	
+6	G	64,000	2^16 C12	
+7	H	128,000	2^17 C13	
+8	J	256,000	2^18 C14	
+9	K	524,288	2^19 C15	

Pitch is sound frequency (in Hertz; in cycles per second). Each increase in pitch is twice the frequency of the previous level and equals one octave.

### Calculating What Sounds Can Be Heard

Human Hearing is H-16-9392.

**Frequency =9.** Human hearing is centered on Frequency =9 = 2^9 cycles per second = 512 hertz. This corresponds to C5 on the Musical Pitch Chart.

**Span = 3.** Human hearing extends 3 octaves above and below the central Frequency. A human can hear sounds from 2^6 (= 64) Hz to 2^12 (= 4000) Hz.

**Voice= 9.** The human voice is centered on Voice= 9 = 2^9 cycles per second = 512 hertz. This corresponds to C5 on the Musical Pitch Chart (the Human male voice is one octave lower).

**Range = 2.** The human voice extends 2 octaves above and below the central Voice frequency. A human can make sounds from 2^7 (= 128) Hz to 2^11 (= 2000) Hz. The Human Male is about one octave lower.

### SPECIAL SOUNDS

Some frequencies of sound have additional effects outside of the sense of hearing (they have no effect on sophonts who hear the Frequency naturally).

**F=1. Delta Waves.** Induces or promotes sleep. After 5 minutes of exposure, Check C3: Failure = Character falls asleep for 1D minutes the first time; 1D hours the second time.

**F=2. Theta Waves.** Induces hypnotic or trance suggestive states. After 5 minutes, a Personal against the subject may include Mod = Good Flux.

**F3. Apha Waves.** Induces relaxation states. After 5 minutes, the subject is Sleepy.

**F=4. Beta Waves.** Induces alertness. After 1 minute of exposure, subject is Ordinary for 1 hour, followed by a return to previous attention level.

Many alarms include output at F=4 (overuse checks San).

**F=5. Gamma Waves.** Induces heightened productivity. After 5 minutes, subject is Optimal for 1 hour, followed by a return to previous attention level.

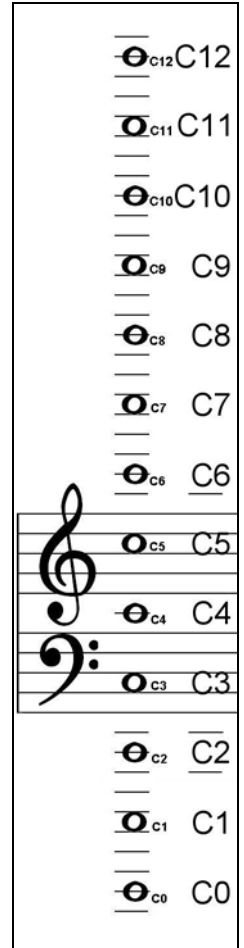
### TECHNOLOGICAL HEARING

Many devices input, process, and output sound. A Hearing Device is identified with a Hearing String and may include an enhanced Hearing Constant, a Rang Mod, and alternate sound input and output.

Player-8 H-16-0093 is a TL-8 sound entertainer reproduces sound in the human hearing range.

Comm-9 H-16-9090 R=5 inputs and outputs sound (with a tinny quality) and communicates with similar communicators with Range=5.

### MUSICAL PITCH



**Musical Pitch.** Pitch is most understandable in a musical format. The pitch levels shown correspond to musical C (Middle C= 256 Hertz). The typical human male voice centers on C4 or Middle C; the typical human female voice centers on C5.

