

Interval Tuning

Most modern keyboard instruments and electronic tuners are tuned to what is called “equal temperament.” This means that each half step is exactly equal to one twelfth of an octave. This is perhaps the best compromise for instruments (like pianos and organs) that cannot adjust their pitch on the fly. However, instruments which are capable of adjusting their pitch on the fly are capable of what is called “just intonation.” Just intonation is a tuning system where we attempt to align each of the pitches of a chord to a partial in the harmonic series. This will result in a harmony that sounds more stable, rich, and intense. However, tuning justly requires some harmonic analysis and careful listening. The chart below shows us how to justly tune various common intervals.

ET interval lists the size of a given equally tempered (ET) interval in semitones from the lower pitch to the upper pitch.

Lower and Upper partial shows which partials of a harmonic series to which we might choose to tune the ET interval to achieve just intonation.

Just interval shows what the ET interval becomes when tuned to these partials.

Adjustment measures how far to adjust the ET interval in cents (1 cent is 1/100th of a semitone) to achieve this just interval.

Just Intonation for Common Intervals

ET interval (semitones)	Lower partial	Upper partial	Just interval (semitones)	Adjustment (cents)
1	19	20	0.8880	-11.20
1	18	19	0.9360	-6.40
1	17	18	0.9895	-1.05
1	16	17	1.0496	4.96
1	15	16	1.1173	11.73
1	14	15	1.1944	19.44
1	13	14	1.2830	28.30
1	12	13	1.3857	38.57
2	11	12	1.5064	-49.36
2	10	11	1.6500	-35.00
2	9	10	1.8240	-17.60
2	17	19	1.9256	-7.44
2	8	9	2.0391	3.91
2	15	17	2.1669	16.69
2	7	8	2.3117	31.17
2	13	15	2.4774	47.74
3	6	7	2.6687	-33.13
3	17	20	2.8136	-18.64
3	11	13	2.8921	-10.79
3	16	19	2.9751	-2.49
3	5	6	3.1564	15.64
3	14	17	3.3613	36.13

ET interval (semitones)	Lower partial	Upper partial	Just interval (semitones)	Adjustment (cents)
3	9	11	3.4741	47.41
4	13	16	3.5947	-40.53
4	4	5	3.8631	-13.69
4	15	19	4.0924	9.24
4	11	14	4.1751	17.51
4	7	9	4.3508	35.08
5	10	13	4.5421	-45.79
5	13	17	4.6443	-35.57
5	3	4	4.9804	-1.96
5	14	19	5.2869	28.69
5	11	15	5.3695	36.95
6	8	11	5.5132	-48.68
6	13	18	5.6338	-36.62
6	5	7	5.8251	-17.49
6	12	17	6.0300	3.00
6	7	10	6.1749	17.49
6	9	13	6.3662	36.62
6	11	16	6.4868	48.68
7	13	19	6.5699	-43.01
7	2	3	7.0196	1.96
7	13	20	7.4579	45.79
8	11	17	7.5364	-46.36
8	9	14	7.6492	-35.08
8	7	11	7.8249	-17.51
8	12	19	7.9556	-4.44
8	5	8	8.1369	13.69
8	8	13	8.4053	40.53
9	11	18	8.5259	-47.41
9	3	5	8.8436	-15.64
9	10	17	9.1864	18.64
9	7	12	9.3313	33.13
9	11	19	9.4620	46.20
10	4	7	9.6883	-31.17
10	9	16	9.9609	-3.91
10	5	9	10.1760	17.60
10	11	20	10.3500	35.00
10	6	11	10.4936	49.36
11	7	13	10.7170	-28.30
11	8	15	10.8827	-11.73
11	9	17	11.0105	1.05
11	10	19	11.1120	11.20