

Pitch Ratios

Semitones	Up	Down
1	1.059	0944
2	1.122	.891
3	1.189	.841
4	1.260	.794
5	1.335	.749
6	1.414	.707
7	1.498	.667
8	1.587	.630
9	1.682	.595
10	1.782	.561
11	1.888	.530

Pitch/Tape Speed

30 IPS		
Semitones	Up	Down
1	31.77	28.32
2	33.66	26.73
3	35.67	25.23
4	37.80	23.82
5	40.05	22.47

15 IPS		
Semitones	Up	Down
1	15.89	14.16
2	16.83	13.37
3	17.84	12.615
4	18.90	11.91
5	20.03	11.24

Frequency	Wavelength
20 Hz	17.03m
50	6.81
100	3.41
125	2.72
250	1.36
500	680mm
1KHz	340
10KHz	34
20KHz	1.7

1 milli = 10⁻³
 1 micro = 10⁻⁶
 1 nano = 10⁻⁹
 1 pico = 10⁻¹²

BPM	1/16	1/8T	1/8	1/4T	3/16	1/4	3/8	1/2	5/8	MS/BAR	FPB	BAROFFSET
65	230.8	307.7	461.5	615.4	692.3	923.1	1385	1846	2308	3692	23.06	3.17.24
66	227.3	303.0	454.5	606.1	681.8	909.1	1364	1818	2273	3638	22.58	3.15.72
67	223.9	298.5	447.8	597.0	671.6	895.5	1343	1791	2239	3582	22.31	3.14.44
68	220.6	294.1	441.2	588.2	661.8	882.4	1324	1765	2206	3529	22.04	3.13.18
69	217.4	289.9	434.8	579.7	652.2	869.6	1304	1739	2174	3478	21.59	3.11.76
70	214.3	285.7	428.6	571.4	642.9	857.1	1286	1714	2143	3429	21.34	3.10.57
71	211.3	281.7	422.5	563.4	633.8	845.1	1268	1690	2113	3380	21.10	3.09.40
72	208.3	277.8	416.7	555.6	625.0	833.3	1250	1667	2083	3333	20.66	3.08.26
73	205.5	274.0	411.0	547.9	616.4	821.9	1233	1644	2055	3288	20.43	3.07.15
74	202.7	270.3	405.4	540.5	608.1	810.8	1216	1622	2027	3243	20.21	3.06.06
75	200.0	266.7	400.0	533.3	600.0	800.0	1200	1600	2000	3200	20.00	3.05.00
76	197.4	263.2	394.7	526.3	592.1	789.5	1184	1579	1974	3158	19.58	3.03.75
77	194.8	259.7	389.6	519.5	584.4	779.2	1169	1558	1948	3117	19.38	3.02.73
78	192.3	256.4	384.6	512.8	576.9	769.2	1154	1538	1923	3077	19.18	3.01.73
79	189.9	253.2	379.7	506.3	569.6	759.5	1139	1519	1899	3038	18.78	3.00.75
80	187.5	250.0	375.0	500.0	562.5	750.0	1125	1500	1875	3000	18.60	3.
81	185.2	246.9	370.4	493.8	555.6	740.7	1111	1481	1852	2963	18.41	2.24.05
82	182.9	243.9	365.9	487.8	548.8	731.7	1098	1463	1829	2927	18.23	2.23.13
83	180.7	241.0	361.4	481.9	542.2	722.9	1084	1446	1807	2892	18.05	2.22.23
84	178.6	238.1	357.1	476.2	535.7	714.3	1071	1429	1786	2857	17.68	2.21.34
85	176.5	235.3	352.9	470.6	529.4	705.9	1059	1412	1765	2824	17.51	2.20.47
86	174.4	232.6	348.8	465.1	523.3	697.7	1047	1395	1744	2791	17.35	2.19.61
87	172.4	229.9	344.8	459.8	517.2	689.7	1034	1379	1724	2759	17.19	2.18.77
88	170.5	227.3	340.9	454.5	511.4	681.8	1023	1364	1705	2727	17.03	2.18.14
89	168.5	224.7	337.1	449.4	505.6	674.2	1011	1348	1685	2697	16.88	2.17.33
90	166.7	222.2	333.3	444.4	500.0	666.7	1000	1333	1667	2667	16.53	2.16.53
91	164.8	219.8	329.7	439.6	494.5	659.3	989	1319	1648	2637	16.38	2.15.74
92	163.0	217.4	326.1	434.8	489.1	652.2	978	1304	1630	2609	16.24	2.15.17
93	161.3	215.1	322.6	430.1	483.9	645.2	968	1290	1613	2581	16.10	2.14.41
94	159.6	212.8	319.1	425.5	478.7	638.3	957	1277	1596	2553	15.76	2.13.66
95	157.9	210.5	315.8	421.1	473.7	631.6	947	1263	1579	2526	15.63	2.13.12
96	156.3	208.3	312.5	416.7	468.8	625.0	938	1250	1563	2500	15.50	2.12.40
97	154.6	206.2	309.3	412.4	463.9	618.6	928	1237	1546	2474	15.37	2.11.68
98	153.1	204.1	306.1	408.2	459.2	612.2	918	1224	1531	2449	15.24	2.11.17
99	151.5	202.0	303.0	404.0	454.5	606.1	909	1212	1515	2424	15.12	2.10.48
100	150.0	200.0	300.0	400.0	450.0	600.0	900	1200	1500	2400	15.00	2.09.79
101	148.5	198.0	297.0	396.0	445.5	594.1	891	1188	1485	2376	14.68	2.09.32
102	147.1	196.1	294.1	392.2	441.2	588.2	882	1176	1471	2353	14.56	2.08.65
103	145.6	194.2	291.3	388.3	436.9	582.5	874	1165	1456	2330	14.45	2.08.20
104	144.2	192.3	288.5	384.6	432.7	576.9	865	1154	1442	2308	14.33	2.07.55
105	142.9	190.5	285.7	381.0	428.6	571.4	857	1143	1429	2286	14.22	2.07.11
106	141.5	188.7	283.0	377.4	424.5	566.0	849	1132	1415	2264	14.12	2.06.48
107	140.2	186.9	280.4	373.8	420.6	560.7	841	1121	1402	2243	14.01	2.06.05
108	138.9	185.2	277.8	370.4	416.7	555.6	833	1111	1389	2222	13.71	2.05.44
109	137.6	183.5	275.2	367.0	412.8	550.5	826	1101	1376	2202	13.60	2.05.03
110	136.4	181.8	272.7	363.6	409.1	545.5	818	1091	1364	2182	13.50	2.04.43
111	135.1	180.2	270.3	360.4	405.4	540.5	811	1081	1351	2162	13.41	2.04.04
112	133.9	178.6	267.9	357.1	401.8	535.7	804	1071	1339	2143	13.31	2.03.45
113	132.7	177.0	265.5	354.0	398.2	531.0	796	1062	1327	2124	13.21	2.03.07
114	131.6	175.4	263.2	350.9	394.7	526.3	789	1053	1316	2105	13.12	2.02.50
115	130.4	173.9	260.9	347.8	391.3	521.7	783	1043	1304	2087	13.03	2.02.13
116	129.3	172.4	258.6	344.8	387.9	517.2	776	1034	1293	2069	12.74	2.01.57
117	128.2	170.9	256.4	341.9	384.6	512.8	769	1026	1282	2051	12.65	2.01.22
118	127.1	169.5	254.2	339.0	381.4	508.5	763	1017	1271	2034	12.56	2.00.67
119	126.6	168.1	252.1	336.1	378.2	504.2	756	1008	1261	2017	12.48	2.00.33

TIME STRETCH PERCENTAGE EQUATIONS FOR SAMPLERS

1 Semitone	UP	106%	1 Semitone	DOWN	94%
2 Semitones (1 tone)	UP	112%	2 Semitones (1 tone)	DOWN	89%
3 Semitones (minor 3rd)	UP	119%	3 Semitones (minor 3rd)	DOWN	84%
4 Semitones (major 3rd)	UP	126%	4 Semitones (major 3rd)	DOWN	79%
5 Semitones (major 4th)	UP	133%	5 Semitones (major 4th)	DOWN	75%
6 Semitones	UP	141%	6 Semitones	DOWN	71%
7 Semitones (major 5th)	UP	150%	7 Semitones (major 5th)	DOWN	67%
8 Semitones	UP	159%	8 Semitones	DOWN	63%
9 Semitones	UP	168%	9 Semitones	DOWN	60%
10 Semitones	UP	178%	10 Semitones	DOWN	56%
11 Semitones	UP	188%	11 Semitones	DOWN	53%
12 Semitones (octave)	UP	200%	12 Semitones (octave)	DOWN	50%

Note: all percentages have been rounded up.

Transposition Formula:

To transpose upwards: Multiply 1.0595 by itself for as many semitones and then multiply the result by 100.
 Example: for 3 semitones - 1.0595 x 1.0595 x 1.0595 x 100 = 119%

To transpose downwards: Divide 100 by 1.0595 multiplied by as many semitones as is required.

Example: for 2 semitones - 100/(1.0595 x 1.0595) = 89%

Time Stretch/Shrink Formula: New time divided by original time x 100.

BPM Stretch/Shrink Formula: Original tempo divided by new tempo x 100

TUNING TABLE FOR DRUM LOOPS

BPM	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
80	-2.30	-2.05	-1.82	-1.58	-1.35	-1.12	-.89	-.66	-.44	-.21
85	-2.16	-1.93	-1.71	-1.49	-1.27	-1.05	-.84	-.63	-.41	-.19
90	-2.05	-1.82	-1.61	-1.40	-1.18	-.99	-.79	-.59	-.39	-.19
95	-1.93	-1.73	-1.51	-1.32	-1.13	-.94	-.75	-.56	-.37	-.18
100	-1.84	-1.63	-1.44	-1.26	-1.07	-.89	-.71	-.53	-.35	-.17
105	-1.73	-1.54	-1.37	-1.19	-1.02	-.85	-.67	-.50	-.33	-.16
110	-1.66	-1.48	-1.31	-1.14	-.97	-.81	-.65	-.48	-.31	-.15
115	-1.57	-1.41	-1.25	-1.09	-.93	-.77	-.62	-.46	-.30	-.15
120	-1.50	-1.35	-1.19	-1.04	-.89	-.74	-.59	-.44	-.29	-.15
125	-1.44	-1.30	-1.15	-1.00	-.85	-.71	-.57	-.42	-.28	-.14
130	-1.39	-1.24	-1.10	-.96	-.82	-.68	-.55	-.40	-.27	-.13

BPM	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
80	+21	+43	+64	+84	+105	+125	+145	+165	+183	+204
85	+20	+40	+57	+79	+100	+118	+137	+155	+176	+192
90	+19	+37	+54	+75	+94	+112	+130	+147	+165	+183
95	+18	+36	+51	+71	+89	+106	+123	+139	+156	+173
100	+17	+34	+50	+68	+84	+99	+117	+133	+149	+165
105	+16	+32	+49	+65	+80	+97	+112	+127	+142	+157
110	+15	+30	+47	+62	+77	+92	+107	+121	+136	+150
115	+15	+29	+45	+59	+74	+88	+103	+116	+130	+144
120	+14	+28	+43	+57	+71	+84	+98	+112	+125	+138
125	+14	+27	+41	+55	+68	+81	+95	+108	+120	+133
130	+13	+26	+39	+53	+65	+78	+91	+104	+115	+128