

## Chapter Six: Tuning Theory and Terminology

|   |       |       |       |       |        |        |        |        |        |        |        |
|---|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
|   |       |       |       |       |        |        |        |        |        |        | F      |
|   |       |       |       |       |        |        |        |        |        | E      | *      |
|   |       |       |       |       |        |        |        |        | D#/Eb  | *      | *      |
|   |       |       |       |       |        |        |        | D      | *      | *      | 15.850 |
|   |       |       |       |       |        |        | C#/Db  | *      | *      | 14.958 | 10.997 |
|   |       |       |       |       |        | C      | *      | *      | 14.121 | 10.382 | 1.180  |
|   |       |       |       |       | B      | *      | *      | 13.327 | 9.798  | 1.116  | *      |
|   |       |       |       | A#/Bb | *      | *      | 12.577 | 9.250  | 1.053  | *      | .790   |
|   |       |       | A     | *     | *      | 11.870 | 8.732  | .995   | *      | .744   | *      |
|   |       | G#/Ab | *     | *     | 11.202 | 8.244  | .941   | *      | .702   | *      | 9.424  |
|   |       | G     | *     | *     | 10.578 | 7.778  | .886   | *      | .664   | *      | 8.894  |
|   | F#/Gb | *     | *     | 9.982 | 7.343  | .838   | *      | .625   | *      | 8.396  | *      |
| F | *     | *     | 9.424 | 6.930 | .790   | *      | .590   | *      | 7.925  | *      | *      |

\* The beat rates of these intervals are too fast to be useful.

6-14. Theoretical beat rates per second of all temperament octave intervals.

the lower note. Following the line to the right of G over to the C column, you will find that the theoretical beat rate is .886. Intervals marked with asterisks on the chart have beat rates too fast to be useful in tuning.

Illustration 6-15 lists all useful tuning intervals from illus. 6-14 in order of theoretical speed of beat rate. The left portion includes the fast beating intervals, including major thirds, minor thirds and sixths. The

| Test Interval     | Theoretical Beat Rate Per Second |        |                            | Rounded Off Beat Rate |
|-------------------|----------------------------------|--------|----------------------------|-----------------------|
|                   | Maj. Thirds (4 Half Steps)       | Sixths | Min. Thirds (3 Half Steps) |                       |
| F-A               | 6.93                             |        |                            | 7 -                   |
| F#-A#             | 7.34                             |        |                            | 7 +                   |
| G-B               | 7.78                             |        |                            | 8 -                   |
| F-D               |                                  | 7.93   |                            | 8                     |
| A <sup>b</sup> -C | 8.24                             |        |                            | 8 +                   |
| F#-D#             |                                  | 8.40   |                            | 8.5 -                 |
| A-C#              | 8.73                             |        |                            | 8.5 +                 |
| G-E               |                                  | 8.89   |                            | 9 -                   |
| B <sup>b</sup> -D | 9.25                             |        |                            | 9 +                   |
| A <sup>b</sup> -F |                                  | 9.42   |                            | 9.5 -                 |
| F-A <sup>b</sup>  |                                  |        | 9.42                       | 9.5 -                 |
| B-D#              | 9.80                             |        |                            | 10 -                  |
| F#-A              |                                  |        | 9.98                       | 10                    |
| C-E               | 10.38                            |        |                            | 10 +                  |
| G-B <sup>b</sup>  |                                  |        | 10.58                      | 10.5 +                |
| D <sup>b</sup> -F | 11.00                            |        |                            | 11                    |
| G#-B              |                                  |        | 11.20                      | 11 +                  |
| A-C               |                                  |        | 11.87                      | 12 -                  |
| A#-C#             |                                  |        | 12.58                      | 12.5                  |
| B-D               |                                  |        | 13.33                      | 13 +                  |
| C-E <sup>b</sup>  |                                  |        | 14.12                      | 14 +                  |
| C#-E              |                                  |        | 14.96                      | 15                    |
| D-F               |                                  |        | 15.85                      | 16                    |

| Tuning Interval | Theoretical Beat Rate Per Five Seconds | Rounded Off Beat Rate |       |
|-----------------|--|-----------------------|-------|
| Fifths          | F-C                                    | 2.95                  | 3 -   |
|                 | F#-C#                                  | 3.125                 | 3 +   |
|                 | G-D                                    | 3.32                  | 3.5 - |
|                 | G#-D#                                  | 3.51                  | 3.5   |
|                 | A-E                                    | 3.72                  | 3.5 + |
|                 | B <sup>b</sup> -F                      | 3.95                  | 4 -   |
| Fourths         | F-B <sup>b</sup>                       | 3.95                  | 4 -   |
|                 | F#-B                                   | 4.19                  | 4 +   |
|                 | G-C                                    | 4.43                  | 4.5 - |
|                 | G#-C#                                  | 4.71                  | 4.5 + |
|                 | A-D                                    | 4.98                  | 5     |
|                 | A#-D#                                  | 5.27                  | 5.5 - |
|                 | B-E                                    | 5.58                  | 5.5 + |
| C-F             | 5.90                                   | 6 -                   |       |

6-15. Beat rates of tuning and test intervals in order of speed, including the fast-beating thirds and sixths (left) and slow-beating fourths and fifths (right).