# DON'T I JUST PUSH THE BUTTONS AND BLOW?

## (A Band Director's Guide to Woodwind Pitch)

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## Have you ever been in this situation?

A portion of band rehearsal has just been spent tuning each and every member of the woodwind section on a concert B-flat. Now that each instrument has been properly adjusted, the band is ready to make the first sounds. The students bring their instruments up to playing position, take a deep breath, and play the first few notes of the piece and...

...the most horrendous sound is heard from the woodwind section!

"How can this be?!" the director and students ask themselves. "We just spent twenty minutes making sure each instrument was in tune!"

The director stops in frustration and proceeds to tune each and every woodwind instrument again, but this time not using a concert B-flat as the tuning note. Instead, the director asks each student to play the first note of the piece individually as he glances at the electronic tuner to see if students are still in tune. Sadly, none of them are. As the director turns to Sally, the first chair flute player, to have her play her first note of the piece, she looks up angelically at the director.

"But my concert B-flat is already in tune," Sally states, innocently. "Once that's in tune, don't I just push the buttons and blow?"

* * *

Unfortunately for Sally, playing a woodwind instrument in tune is not as easy as pushing buttons and blowing. Bad intonation problems are the result of not understanding the tendencies of an instrument and have a negative effect on the band's sound. *Don't I Just Push the Buttons and Blow? (A Band Directors Guide to Woodwind Pitch)* provides directors with the necessary information to teach their woodwind players how to fix their intonation problems. Most intonation problems for woodwinds are caused by things the players are doing.

This book provides in-depth information about the pitch tendencies for each instrument and ways to improve intonation in the woodwind section. Each instrument is discussed and information is provided in three sections:

- The first section provides basic information about each instrument including what causes bad intonation. Solutions to intonation problems controlled by the student are also discussed.
- The next section contains a reproducible alternate fingering chart created to help make out of tune notes sound more in tune.
- Finally, a reproducible student-friendly Pitch Tendency Packet provides information about intonation.

This book is not designed to be read cover-to-cover but instead used as an as-needed reference for the band room.

## Alternate Fingering Section

Each instrument has alternate fingerings that will help improve intonation. The selection for each note is based off of the pitch tendencies specific to that instrument. Not every note considered out of tune will be included because sometimes the best adjustment to pitch is done by the student. These alternate fingerings should not be taught until they understand how to make adjustments using the standard fingerings. These fingerings will not be helpful to every student, but they provide another option for solving pitch problems.

## Pitch Tendency Packet

Intonation is a very individual process and probably is the most frustrating thing about playing a woodwind instrument. The purpose of the Pitch Tendency Packets is to get students to discover what their individual intonation problems are and what they can

do to play more in tune. Each Pitch Tendency Packet includes information explaining the science of intonation, how it is heard, what determines flat and sharp, and suggestions for memorizing pitch tendencies. A how-to guide for an electronic tuner is included as well.

The Pitch Tendency Chart included in each packet covers the range of the instrument. Depending on the level of the student, certain notes may need to be left out. Students will need an electronic tuner and somebody to help them fill out the chart, whether it is the director, a parent, or another student. This chart should be filled out at least twice a year because students' pitch tendencies may change as they advance.

Once the student has completed the Pitch Tendency Chart, the student should consult the Quick Fixes page to learn ways to improve intonation. They should experiment with each suggestion to find what makes them sound the most in tune.

## The Results...

It is well worth the time and effort to engage students in the tuning process. They will feel a sense of ownership with their playing and will feel obligated to play in tune with their best tone all the time. Students will start to actively listen to what they are playing and make adjustments to their intonation without even thinking about it. Not only will the efforts of individual players improve, but the overall intonation of the band will get better!

# Flute

## Sound Production

Many believe that sound on the flute is created by blowing air into the head joint. The initial noise of the flute is actually produced at the edge of the aperture hole while the body of the flute turns air vibrating at the aperture hole into musical sound. The head joint carries the air from the edge of the aperture hole to the body of the flute. The sound that vibrates at the edge of the aperture hole, called the edge tone, is similar to lips buzzing on a brass instrument. As air is blown at the edge of the aperture hole, it does not flow smoothly around or past the edge. Rather, it becomes quite turbulent. The air moves side to side, creating small whirlpools of air above and below the edge of the tone hole. The effect heard without the body of the flute is a high-pitched whistle, much like what happens when wind whistles through a crack in a door.[1]

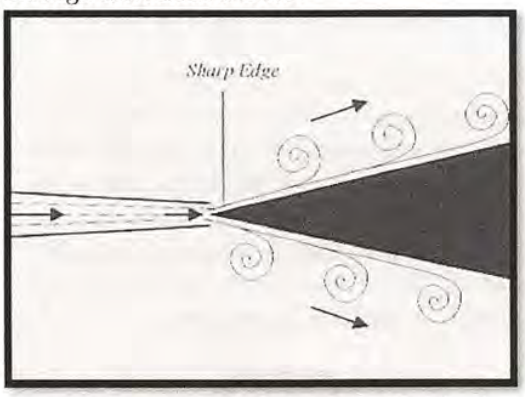



**Figure 1: A demonstration of what air is doing when it reacts with the edge of the aperture hole.**

When the edge tone separates, the downward air travels down the body of the flute. As the air reaches the end of the flute, it reacts with low-pressure air that is already in the flute from the atmosphere. The low-pressure wave combines with the air from the player to make high-pressure air. This air is forced back up the instrument to react with the air coming from the player. The entire process takes a very short amount of time.

[1] (Jakeways, 2011)

Every time the air moves up and down the flute, they increase in power forcing the air to oscillate in and out of the first open hole, or tone hole.[2] The oscillating air creates a powerful sound wave heard to the human ear as a flute sound.

How far the air travels back and forth through the flute depends on the location of the first open tone hole. Air exits the flute through the opening whether it is located at the top or bottom of the flute. The player opens and closes tone holes by pushing and releasing keys to control how far air travels up and down the flute. A tone hole that opens near the head joint will create a smaller area for the air to vibrate, forcing faster vibrations. Those faster vibrations will be heard by the ear as high pitches. Conversely, the first open tone hole near the foot joint will release air that is vibrating slower because of the large space it has to move through. In this case, a lower pitch will be heard.[3]

**Figure 2: A flute with some tone holes open.**

## Natural Tendencies

The flute's natural overtone series break the octaves down in the following way:

- The first octave occupies the fundamental.
- The second octave occupies the second partial.
- The third octave occupies a combination of the second and third partials.

When a flute player over-blows a note or lifts the first finger, the fundamental frequency of a note is eliminated and the second partial is heard. Air is forced to vibrate at the second partial's frequency creating a sound eight

[2] (Jakeways, 2011)
[3] (Shepard)

notes higher, called an octave. The same reaction happens to create the third octave, however the second partial is still the primary partial heard for the first few notes.[4]

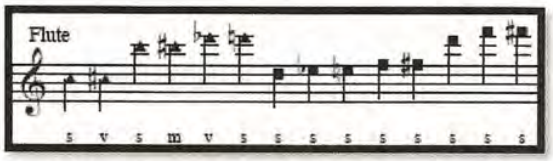


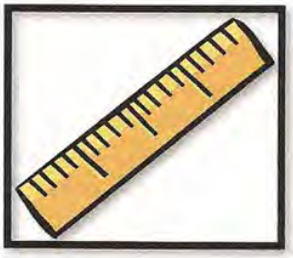

**Figure 3: Pitch tendencies for the flute. The notes with triangle note heads are sharp notes. Notes with square note heads are flat notes. S stands for slightly, M stands for moderately, and V stands for very. The first note would be slightly sharp. Notes that are left off are considered in tune.**

There are compromises in the design of the flute that allow it to play all octaves with a good embouchure. However, the natural overtone series causes the first and second octaves to be generally flat while the third octave is generally sharp. (Westphal, 1990) Figure 3 displays the typical tendencies for each note of the flute. Unlike brass instruments that follow a specific pattern to find pitch tendencies, the flute tendencies are seemingly random. Each note on the chart should be played using the standard fingering with slight adjustments controlled by the player. Alternate fingerings can be used, but as a last resort.[5]

It is important to mention that the natural tendencies for the flute shown in Figure 3 are *typical* and are not experienced by all flute players. A very sharp note on flute could be perfectly in tune on another. Students playing on the same instrument will not play the same notes in tune, either. Because of this, flute players need to be made aware of natural pitch tendencies and monitor them regularly so they understand what affects them individually.[6] The band director should also know what the natural tendencies are so players are provided with ways to improve out of tune sounds. This will help improve intonation and tone for the entire flute section.

## General Tuning Procedure

The flute is an instrument that must be in tune with itself before it can tune its natural tendencies. The tendencies will get worse if a flute is not tuned properly.[7] Students should follow this procedure:



1. **Adjust the head joint so that it is pulled out an eighth of an inch.**

Flutes are not made to be played with the head joint pushed all the way in. Pulling the head joint out an eighth of an inch will allow the player to push in if the tuning note is flat.[8] If the head joint is pushed in all the way and the student plays flat, they cannot push the head joint in any further and will not be able to make the proper adjustments.

2. **Warm up for at least ten minutes.**

A cold instrument is an extremely flat instrument.[9] By warming up for at least ten minutes the flute will adjust to the player's body temperature. Avoid tuning if players

[4] (Westphal, 1990)
[5] Alternate fingerings are presented on page 11.
[6] See page 16 for the Flute Pitch Tendency Packet.
[7] (Westphal, 1990)
[8] (Cluff, 2004)
[9] (Allen, 2002-2007)

have been sitting in rehearsal for a short amount of time because the instrument will adapt to the temperature of the room.

3. **Using a good tone, play fourth-space D at mezzo forte with no vibrato.**

Dynamics greatly affect the flute's intonation. A mezzo forte dynamic affects intonation the least and requires very little manipulation by the player.[10] Students should always focus on using their best tone because a poor tone quality results in poor intonation. Fourth-line D is a great note for students to start tuning with even though it typically tends to be slightly flat. Students should start tuning within the first few months of playing. Hands are still small at this point and they may have trouble holding the flute with only their left hand. The fingering for D uses both hands, which in turn balances the flute.[11] Vibrato should be avoided when tuning since the player is moving the pitch from flat to sharp to create the pulses.

4. **Adjust the head joint by pulling out if the D is sharp and pushing in if the D is flat.**

The flute is an instrument that can adjust its general tuning by pulling out or pushing in the head joint. Doing so will put the flute at a different length which can affect the frequency of the D. It is recommended to adjust the head joint *only* for the purpose of getting the flute in tune with itself. If every out of tune note was adjusted with the head joint, intonation of the natural tendencies would get worse.[12]

## Causes and Solutions for Intonation Problems[13]

### Embouchure and Air Direction

Bad embouchure and air support lead to poor intonation and tone. Emphasizing good embouchure and air support continually and consistently throughout a player's career is important when dealing with intonation. Most solutions to individual pitch problems on flute use corrections made to the air direction and embouchure. The direction of air entering the flute can be altered by making changes with the embouchure using the corners of the mouth. Air directed at the aperture hole in a more downward direction results in a flat pitch. Moving the corners of the mouth back towards the ears will bring the pitch up. If the air is moving across the aperture hole, the pitch will be sharp and the corners of the mouth should move forward to lower the pitch. The jaw can be used to make adjustments but only when adjusting large pitch discrepancies.

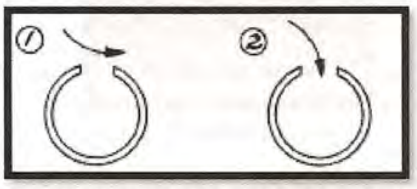



**Figure 4: 1. Air direction when pitch is sharp. 2. Air direction when pitch is flat.**

[10] (Westphal, 1990)
[11] (Cluff, 2004)
[12] (Westphal, 1990)
[13] (Westphal, 1990)

### Dynamics

The speed of air striking the aperture hole controls dynamics. Faster air creates a louder tone but also a sharper pitch. As a flute gets louder, the direction of the air goes more across the aperture hole than in it also making the pitch sharper. To adjust, the air will need to be directed downward by moving the corners of the lips back towards the ears. When the flute gets softer, the pitch gets flatter because air is directed more into the aperture hole than across it. Pushing the corners of the lip forward will help raise the pitch. As a note gets louder or softer, the pitch will gradually change and so should the direction of air. Students should get used to making these adjustments by practicing long tones that crescendo and decrescendo while checking pitch with an electronic tuner.

### Playing Position

If a player slouches while playing, breath support is reduced and air speed entering the flute cannot be controlled making intonation flat. Also, playing the flute at an angle that does not follow the line of the lips will force the air to hit the aperture hole at an angle and bring out the natural tendencies of the flute. Both problems can be prevented by always encouraging students to sit with the correct posture so the flute can be held at the correct angle.

Figure 5: Flute lip plate.

### Lip Plate Placement

Overall pitch, intonation, and tone quality can be affected by the placement of the lip plate. When checking intonation, the first thing to look at is the location of the lip plate. If it is placed too low on the lip, the pitch will be flat; if the plate is too high, the pitch will be sharp. The lip plate should always be placed just above the edge of the lower lip.

### Mechanical Factors

Teaching students to regularly monitor the condition of keys, pads, and rods on their flute will not only keep the instrument in good playing condition, but also will help intonation. All keys should open and close at the same height. Unadjusted keys will affect intonation the most if they are the first open key of a fingering. A key that is too close to the tone hole will flatten the pitch, but a key that is too open will raise the pitch. Keys that do not seal completely around the tone hole will interfere with response and also cause notes to sound sharp. Make sure adjustments screws on each finger key are allowing keys to seal properly.

The plug in the end of the head joint can affect intonation even though it should never be regularly adjusted for tuning. The sole purpose of the plug is to close the head joint, which is done so by a cork shaped much like the cork from a wine bottle. The cork must be exactly 17.3 millimeters from the center of the aperture hole and it needs to be checked daily. If it is not at 17.3 millimeters, the player will be consistently out of tune regardless of the adjustments made.[14]

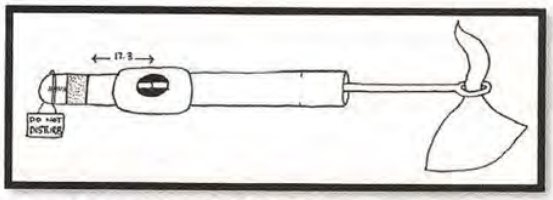
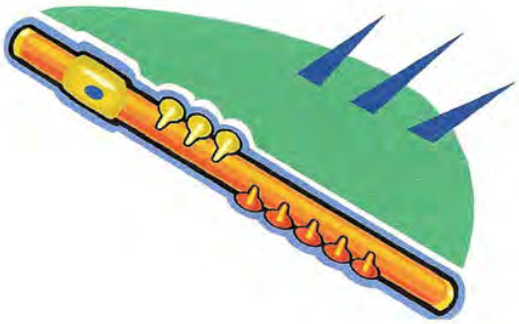



Figure 6: A cork that is set at 17.3 mm.

To access the cork, a cap is attached to the head joint. To verify the distance, insert the bottom of the cleaning rod into the head joint until it touches the cork. The etched line found at the bottom of the

[14] (Cluff, 2004)

cleaning rod should be in the exact center of the aperture hole. Unscrew the cap and push the plug into place by applying pressure to the cap if the line is closer to the top of the head joint. The player will be flat on the general tuning note even after multiple adjustments to the head joint are made. If the line is closer to the body of the flute making the player sharp, unscrew the cap and gently tap the cleaning rod with a rawhide mallet until the line returns to the center. The cap should always be tightened by the fingers to the point that it securely stays in place. Students should be warned that the plug should be kept in place at all times and not unscrew the cap.



# Alternate Fingering Chart (Flute)

## Purpose of Alternate Fingerings

Alternate fingerings are used primarily for technical ease on the flute. However, there are fingerings that can be used to improve intonation for some notes. Using alternate fingerings to adjust the pitch of a note should be used as a "last resort" method. Students should be taught how to make intonation adjustments with the embouchure and direction of air using standard fingerings before alternate fingerings are taught. Not all of the fingerings included in this chart include every note on the Pitch Tendency Chart[15] nor will they be useful to every player. Some of the fingerings will be out of tune to a greater or lesser degree for some player.

## How to Read the Alternate Fingering Chart

- The first column shows the note the alternate fingering affects.
- The second column shows the typical tendency of the note.
- The third column shows the alternate fingering.
- The fourth column explains how the alternate fingering will improve the intonation of that note.

The pitch tendency symbols used in this fingering chart will explain the typical tendency of a note.


shows that a note is slightly flat.


shows that the note is slightly sharp.


shows that the note is moderately sharp.


shows that the note is very sharp.

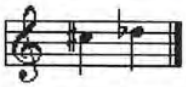
Most fingerings in this chart are actually slight deviations from the standard fingering. If a key is used in the standard fingering, it will be colored in black.

When a key is not typically used in the standard fingering, it will be colored in yellow.

There are instances where eliminating one key from the standard fingering will improve intonation. The eliminated key will have a red X placed over it.

## Examples of Alternate Fingerings

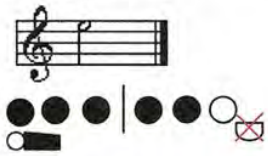
Flute players typically will make fingering adjustments by closing one or more tone holes to adjust pitch. An example of this is with third-space C-sharp, normally played as:



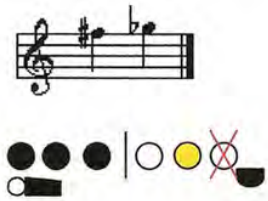
[15] See page 23 for the Flute Pitch Tendency Chart.

This note tends to be very sharp. By adding fingers four, five, and six, this very sharp note will lower in pitch:[16]

Flute players can also eliminate the use of a key. An example of this is the alternate fingering for E:

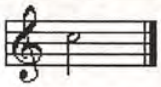
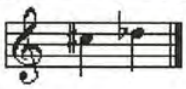
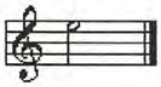
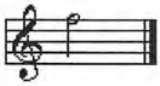
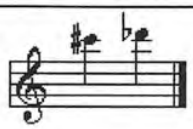


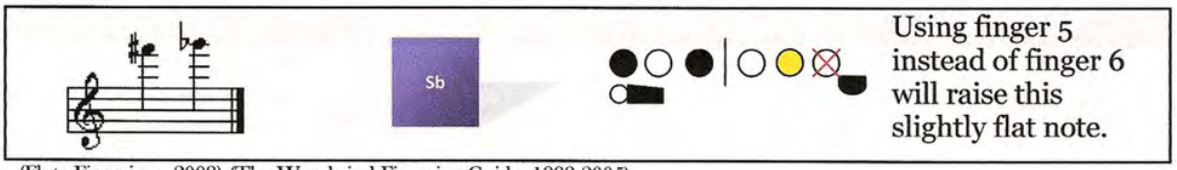
Using a different key altogether can also help improve pitch. An example of this is the alternate fingering for F-sharp:



Whether or not this fingering chart will be distributed to students is at the discretion of the director because students may mistake alternate fingerings for the standard ones. Also, this chart would not be appropriate for students who are in the first couple years of their playing career. These students need to learn the basics of flute playing and how to make intonation adjustments with their embouchure and air direction. As stated earlier, this chart is to be used as a last resort.

[16] (Flute Fingerings, 2008)

| Note | Tendency | Fingering | How It Helps |
|---|---|---|---|
|  |  |  | Adding fingers 5 and 6 will help to lower this slightly sharp note. |
|  |  |  | Adding 4, 5, and 6 will help to lower this very sharp note. |
|  |  |  | Eliminating the use of the Eb key will raise the pitch of this slightly flat note. |
|  |  |  | Adding finger 6 will raise this slightly flat note. |
|  |  |  | Using finger 5 instead of finger 6 will raise this slightly flat note. |
|  |  |  | Adding finger 6 will help to lower this slightly sharp note. |
|  |  |  | Adding fingers 4, 5, and 6 will help lower this moderately sharp note. |
|  |  |  | To lower this very sharp note, use the 4th-space Eb fingering and over blow. |
|  |  |  | Eliminating the Eb key will lower this slightly sharp note. |
|  |  |  | Adding finger 6 will raise this slightly flat note. |




(Flute Fingerings, 2008) (The Woodwind Fingering Guide, 1998-2005)

# Pitch Tendency Packet (Flute)

Name_____
Date_____

**Materials needed:**

1. Instrument
2. Pencil
3. Electronic Tuner
4. Someone to help you (either a friend, parent, or band director)

**Knowing the tendency of each note is important!**

Playing the general tuning note and making a physical adjustment is not enough to play in tune. Each note on your instrument will play flat, sharp, or in tune. The purpose of the Pitch Tendency Packet is to teach you what notes are in tune and out of tune on your instrument. Once you discover what the out of tune notes are, you can manipulate the notes to play in tune by making small adjustments when you are playing.

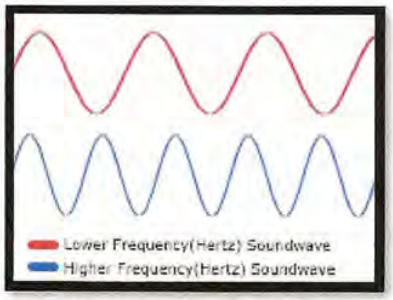
This packet will help you develop an individualized plan for tuning. As you discover which notes need special attention, it is your responsibility as a musician to figure out how **you** can play the note in tune. The tricky thing about this process is what gets you to play in tune may not work for your stand partner! Things like dynamics, reeds, embouchure, and even the brand of instrument can cause one person to play a note in tune while another plays the same note out of tune.

The last page of this packet will provide you with some tricks of the trade that you can experiment with those tricks to improve those out of tune notes. You will notice that once you start focusing on making those out of tune notes sound in tune, your tone will improve and your musician's instincts will start to anticipate intonation problems before they happen.

## What is intonation?[17]

A musical pitch you hear is actually a sound wave going through your instrument. The sound wave can travel at different speeds, or frequencies, depending on what finger combinations you are using. More fingers usually means a lower pitch and a slower sound wave, but adding playing the note at a higher octave will make the sound wave move faster.

Frequency is measured in cycles per second, or Hertz (hz). One cycle per second is equal to one Hertz. Musicians have a standard frequency that we agree will make us sound the most in tune. That frequency is measured at 440 hz. Anything higher or lower than that will not agree with the musicians' or the audience's ears.




An example of sounds at different frequencies.

## A Case of the "Wah's"[18]

If two musicians are playing the same note at exactly the same time, they're playing in tune, right? Not really. Have you ever heard two musicians play the same note at the exact same time, but instead it sounds like "wah-wah-wah"? This means the musicians have a case of the "wah's", a disease that cause musicians to play out of tune!

[17] (Pitch (music))
[18] (Hein, 1981)

You are actually hearing the musicians play out of tune with each other. Each note's sound wave is moving at a slightly different frequency, making the sound waves clash. Both notes are fighting so much to be the main note heard that they are cancelling each other out!

One of the musicians should make an effort to get rid of the "wah's" by making adjustments to the way they are playing their instrument or by physically adjusting something on their instrument. If the musician makes the right adjustment, the "wah's" will start to disappear and the note will be in tune. However if the wrong adjustment is made, the "wah's" will move faster.

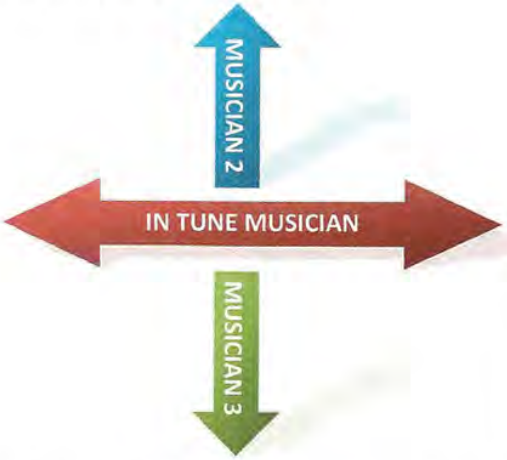
## Flat vs. Sharp[19]

Musicians think of intonation as a vertical concept. The straight line below represents In Tune Musician, a musician who always plays in tune.


[19] (Pitch (music))

Now, another musician will play the same note along with In Tune Musician.


Finally, a third musician will play the same note with the other musicians.




Even though all three musicians were playing the same note, Musicians 2 and 3 were playing their notes at different frequencies.

Musician 2's note was played at a slightly higher frequency than In Tune Musician. Even though the both musicians were playing the same note, Musician 2's note sounds a little higher than In Tune Musician's. When notes vibrate at a slightly higher frequency than 440 hz, they are considered sharp. Musician 2 will have to lower his frequency so he can play at the same frequency as In Tune Musician.


What about Musician 3? Well, his note was played at a slower frequency than In Tune Musician's. He sounds a little lower because his note vibrates slightly slower than 440 hz. When notes vibrate at slightly slower frequencies, they are considered flat. Musician 3 will have to raise his frequency so he can play in tune with the others.


## How to Improve Intonation

Intonation will not get better by itself; it is something that will constantly need to adjust no matter your musical experience. Professional musicians struggle with intonation issues even with all the experience they have. Constant practice and reinforcement will help you understand intonation. Here are some suggestions to help you improve your intonation:

**Fill out the Pitch Tendency Chart.** The chart will tell you what notes are the notes you need to focus on. As you advance in your playing, your pitch tendencies may change. Continue to fill the chart out every four to six months to see if there are any changes.

**Practice making the adjustments!** Remember, it is your responsibility as a member of the ensemble to play in tune. If you do nothing to improve intonation, nothing will get better. Your brain will train itself to make the adjustment automatically once you've found what works and practice making those adjustments every time you see the note. If you focus on improving only five

notes a week in your practice time, you will see huge improvements in your playing.

**Use a friend, an electronic tuner, or a tuning CD to help train your ear.** If your ear doesn't know what bad intonation sounds like, then you will always play out of tune. Here are some ways to help train your ear:

- Have a friend help you by having them play each note as the In Tune Musician. If you have the "wah's", then you need to adjust to cure yourself. Have them play again and see if you adjusted correctly. Remember, if the "wah's" get better, you made the correct adjustment!
- An electronic tuner will give you a visual measurement of how flat or sharp you are. Play a note you're your eyes closed and guess if it's flat or sharp. Electronic tuners are usually around $25 and can be purchased at any music store or website. Korg brand tuners are the most common.
- Some electronic tuners also have a function where they can produce pitches so you can check for the "wah's". This is a great function to use if you are by practicing by yourself.
- "The Tuning CD" is available for download on iTunes and can be purchased online. It is a CD containing all the notes of the chromatic scale that you can play along with to check the "wah's".

**Memorize your pitch tendencies.** You can do this by creating flashcards or writing the tendencies in your music.

## The Results...

Poor intonation doesn't fix itself and is not pleasant to listen to. If you focus and stay consistent in your efforts to improve your intonation, you will also hear improvement in your tone quality. It will start to become second nature to you and you will begin to adjust your pitch without even thinking about it.

# Electronic Tuner How-to Guide


1. Turn your tuner on by pushing the on/off button.
2. Check the upper left-hand corner to see if your tuner is calibrated to 440 hz. If it is not, push either the calibration up button or the calibration down button until you see 440 on the screen.
3. Set the tuner on your stand so the screen is facing you. Make sure the microphone (indicated by the word "mic") is not covered up.
4. Play a note to move the needle. The concert pitch letter name of the note you are playing will be shown in the upper right-hand corner of the screen.
5. If you are...
   ...flat, the needle will move to the left and the light next to the flat sign will light up.
   ...in tune, the needle will stand straight up and the green light will light up.
   ...sharp, the needle will move to the right and the light next to the sharp sign will light up.
6. If your tuner has the option and wish to have the tuner produce a sound while you are playing, hit the sound button on the tuner. Hitting the sound button again will turn off the sound.
7. Turn your tuner off by pushing the on/off button when you are finished using it.

The meter on a tuner measures pitches in cents. In tune notes are measured at zero cents, which makes the needle stand straight up. As a note gets progressively flatter, the needle will move to the left measuring the note in negative cents. When a note gets increasingly sharper, the needle will move to the right measuring the note in positive cents.

# Completing Your Pitch Tendency Chart

## *Make sure you have someone to help you complete this!*

1. Fill out the top portion of the guide as completely as you can. Ask your band director for help if you have questions about the brand of your instrument or reed.
2. Warm up for at least ten minutes to allow your instrument to adjust to your body temperature.
3. Turn the electronic tuner on and get your instrument in tune with itself using the following procedure:

> 1. Adjust the head joint so it is pulled out an eighth of an inch.
> 2. Using a good tone, play D at a mezzo forte volume with no vibrato.
> 3. Adjust the head joint by pulling out if the note was sharp or pushing in if the note was flat.
> 4. Continue this process if your first attempt was not in tune.

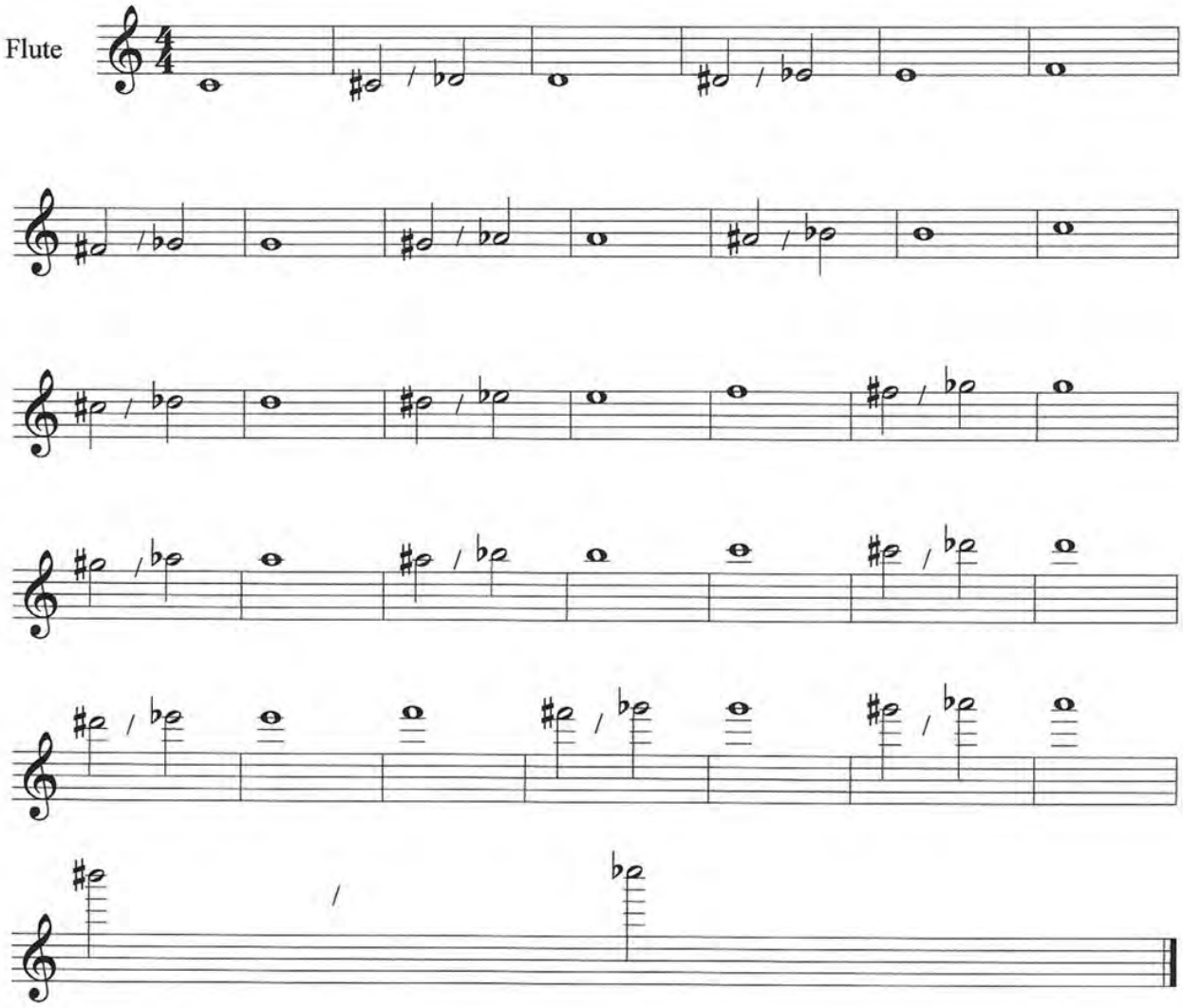
4. Give the tuner and your Pitch Tendency Chart to your partner so they can fill it out while you play.
5. It is best to start at concert B-flat and work your way down and then start again at concert B-flat and work your way to the top to get the most accurate reading. Have your partner tell you what note to play. Play the note and have your partner write down what your pitch tendency is based on the chart below.

| Pitch Tendency Category | Cents |
|---|---|
| Slightly flat (Sb) | -1 to -10 cents |
| Moderately flat (Mb) | -11 to -25 cents |
| Very flat | -25 cents to -50 cents |
| Slightly sharp (S#) | +1 to +10 cents |
| Moderately sharp (M#) | +11 to +25 cents |
| Very sharp (V#) | +25 cents to +50 cents |

6. Once you have completed the chart, return it to your director. A copy will be made for their files and your completed chart will be returned to you.
7. Using the *Quick Fixes for Flute* chart and an electronic tuner, find the tricks for each note that will make them in tune. Make a note of what works and use those tricks each and every time you play.

# Flute Pitch Tendency Chart

Name_____ Make of Instrument_____



# Flute Quick Fixes

## If the note sounds sharp....

- ☑ Use a mirror to see if the lip plate is placed too high. It should be placed right above the edge of your lip.
- ☑ Move the corners of your mouth towards your ears to direct the air stream into the aperture hole.
- ☑ If the music is written at forte or louder, you will need to move the corners of your mouth towards your ears to direct the air stream into the aperture hole.
- ☑ Check to see if any of keys on your flute are too open. Let your band director fix any keys that are out of line.

## If the note sounds flat....

- ☑ Use a mirror to see if the lip plate is placed too low. It should be placed right above the edge of your lip.
- ☑ Make sure you are sitting up nice and tall, holding the flute in the proper playing position
- ☑ Move the corners of your mouth forward to direct the air steam across the aperture hole.
- ☑ If the music is written at piano or softer, you will need to move the corners of your mouth forward to direct the air stream across the aperture hole.
- ☑ Check to see if any keys on your flute are too close to the tone hole. Let your band director fix any keys that are out of line.

# Oboe

## Sound Production

The oboe is a double-reed instrument that cannot produce sound unless both blades of the reed are forced to vibrate against each other. Like all wind instruments, air is important in producing sound on an oboe. Once the correct oboe embouchure is formed around the reed, air is blown into the reed and moves toward the first open tone hole as low-pressure air. The pressure of the lips around the reed and the air moving inside the reed causes the blades of the reed to move together. The wave of low pressure air continues to move down the bore of the oboe and arrives at the first open tone hole.

Low-pressure air forces outside air into the oboe and both types of air combine to create high-pressure air. The air then moves back toward the reed changing all the air inside the oboe to high-pressure air while returning the blades of the reed back to their original position. Another dose of low-pressure air coming from the player collides with the returning air and creates high-pressure air that moves toward the first open tone hole. When it arrives, it forces air that is coming into the bore to exit through the tone hole to create a musical sound. This continues to happen until the player ends the air flow.

Oboe players usually complain of feeling resistance or pressure as they blow into the reed. When high-pressure air re-enters the oboe, it releases pressure points back at the player. These pressure points are created because of the high-pressure air from the oboe reacting with the low-pressure air from the player's mouth in the tiny space of the oboe reed. This sensation, called backpressure, makes the player feel like they are inhaling and exhaling at the same time. This is very similar to what trumpet players experience when they blow into their horns.[20]

[20] (11Ju)

Reed vibration controls air flow into the oboe just as much as air flow controls reed vibration. But too much air or reed vibration will completely stop the sound. This is like what someone feels if their nose is plugged while their mouth is closed. Pitch is changed when players cover tone holes by pressing and releasing keys. The oboe has small holes in some keys that will force the oboe to not respond correctly if they are not covered completely. Covering more tone holes means the air takes longer to travel through the oboe. A low sound is heard because the air is not moving as fast. If less tone holes are covered, then air is traveling through a shorter length of the oboe. This smaller space forces air to move quickly and the listener will hear a high sound.

## Natural Tendencies

The oboe's natural overtone series break octaves down in the following way:

- The first octave occupies the fundamental.
- The second octave occupies the second partial.
- The third octave occupies a combination of the second and third partials.

There are compromises in the design of the oboe that allows it to play all octaves with a good embouchure.

Figure 7: The half-hole key on oboe. The side octave key is on the right.

When an oboist uses the back octave key or the half-hole option on the first finger, the fundamental frequency is eliminated and the second partial becomes the vibrating frequency. The second octave is heard as the oboe is letting air escape two parts—out of the octave key or half-hole key and also the first open tone hole. The half-hole and octave keys are small in diameter so air will still move down the horn. The same effect occurs when the side octave key is used or the first finger is not used. The oboe is still vibrating in two parts; however the third octave is heard.

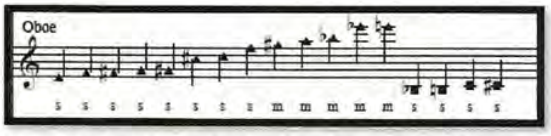



Figure 8: Pitch tendencies for oboe. The notes with triangle note heads are sharp notes. Notes with square note heads are flat notes. S stands for slightly, M stands for moderately, and V stands for very. The first note would be slightly sharp. Notes that are left off are considered in tune.

Figure 8 displays the typical tendencies of the oboe. When broken down as individual pitches, notes below the staff tend to be slightly flat, notes on the staff tend to be slightly sharp, and notes above the staff tend to be moderately sharp.[21] Each note on the chart should be played using the standard fingering with adjustments being controlled by the player. Alternate fingerings can be used, but as a last resort.[22]

It is important to mention that the natural tendencies of the oboe presented in this book are *typical* and are not experienced by all oboe players. An out of tune note on one oboe could be perfectly in tune on another. A reed could make a note sound in tune one day and terrible the next. Because of this, oboe players need to know the instrument's natural pitch tendencies and monitor them regularly so they understand what affects them individually. The band director also should know what the natural tendencies are and provide the players with tools to improve them. This will help improve the intonation and tone for the oboe section.

## General Tuning Procedure[23]

Oboes cannot make physical adjustments to intonation like other woodwinds because all adjustments are made with the embouchure and reed. Students should never be asked to pull the reed out of the oboe slightly because this will cause notes to not speak. Essentially, the oboe has to tune each note every time it is played due to the sensitivity of the reed. Knowledge of the pitch tendencies and how it affects the player is extremely important.[24] In this situation, it is best for students to develop their ear by playing with another instrument or an electronic tuner.

A mezzo forte dynamic affects intonation the least and requires very little manipulation by the player. Students should always focus on using their best tone because a poor tone quality results in poor intonation. Vibrato should be avoided because it is an effect that moves the pitch quickly between flat and sharp to create pulses in the sound. Avoid tuning if players have been sitting in rehearsal for a short amount of time or right when the oboe is taken out of the case. A cold instrument tends to be flat and the reed dries out making it difficult to respond so students should play for about ten minutes before tuning.

[21] (Westphal, 1990)
[22] Alternate fingerings are found on page 30.
[23] (Oboe Intonation, 2009), (Allen, 2002-2007)
[24] See page 34 for the Oboe Pitch Tendency Packet.

## Causes and Solutions to Intonation Problems[25]

Figure 9: Oboe reeds.

### Reed

The reed has the most effect on an oboist's intonation. Good reeds are more likely to play in tune for the entire range of the instrument. Monitor students' reeds so that they are constantly playing on newer reeds. Old reeds are impossible to control with embouchure or reed adjustments so the student should be given a new reed. Also, monitor the strength of reed students are using and adjust as they advance. A common mistake directors make is keeping students on the same strength reed that they started on and never giving them harder reeds.

Soft reeds tend to play flat, especially in the highest and lowest notes of the range. Tone will become very harsh and do not respond to embouchure adjustments. Clipping a very small amount of the tip of the reed will make the reed a bit harder. Another mistake directors make is providing students with reeds that are too hard, which sound sharp and emphasize the natural tendencies of the horn. The reed will be difficult to control with the embouchure. Scraping the heart of the reed lightly will soften the reed and flatten the pitch.

[25] (Westphal, 1990)

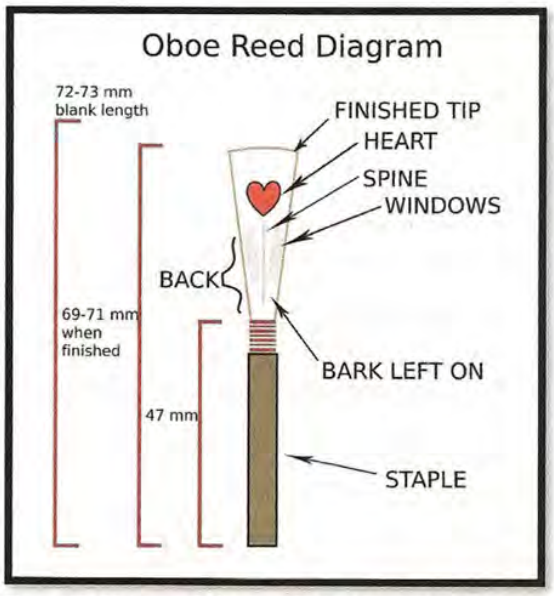



Figure 10: Diagram of oboe reed. The heart is located just below the tip.

Directors should let students experiment with different brands of reeds to find which sound the best to the players. Hand-made reeds are better than machine-made reeds because they respond well to adjustments made to improve intonation.

### Embouchure

Poor embouchure and air support lead to poor intonation and tone. Emphasizing good embouchure and air support continually and consistently throughout a player's career is important when dealing with intonation. Most solutions to individual pitch problems on oboe use corrections made with the embouchure to support the reed. Relaxing embouchure pressure will flatten pitch while increasing pressure will make a note sharper. Changing the amount of reed that goes in a player's mouth fixes intonation the same way moving the barrel on a clarinet does. Not enough reed in the mouth will make a pitch flat.

"Biting" on the reed with the embouchure is the result of a hard reed. The second octave will sound like the first octave and pitch will be extremely sharp.

Check to see if the corners of the mouth are touching the sides of the reed. This will give the reed more support so it can vibrate to its full ability.

### Playing Position

The oboe should always be held at a forty degree angle with the chin parallel to the floor to maintain good intonation. Constantly monitor oboe players to make sure they are holding the horn at the correct angle. If the angle is too high or the head is down, the pitch tends to be flat. The upper lip will support the reed more than the lower lip, interfering with the control of the reed. The pitch, especially in the upper register, will be sharp if the horn is held too close to the body.


Figure 11: Correct playing position.

### Mechanical Factors

Teaching students to regularly monitor the condition of keys, pads, and rods of their oboe will not only keep the instrument in good playing condition, but also help intonation. All keys should open and close at the same height. Unadjusted keys will affect intonation the most when they are the first open key of a fingering. A key that is too close to the tone hole will flatten the pitch, but a key that is too open will raise the pitch. Keys that do not properly seal will interfere with response and also cause the notes to be sharp. Make sure adjustments screws on each finger key are allowing keys to seal properly and check post screws to see if they are properly adjusted.

Dirt tends to build up in the opening of the half-hole key, third finger of the left hand, and both octave keys. The director should regularly take apart the octave keys and clean the opening out with a feather. The half-hole key can be cleaned out by inserting a toothpick gently into the opening and then using a feather to remove any dirt that has entered the bore.

# Alternate Fingering Chart (Oboe)

## Purpose of Alternate Fingerings

Alternate fingerings are used primarily for technical ease on the oboe. The flexibility of the reed allows the player to make a majority of intonation adjustments. There are a few alternate fingerings, however, that improve intonation.

Using alternate fingerings to adjust the pitch of a note should be used as a "last resort" method. Students should be taught how to make intonation adjustments using the embouchure and reed with standard fingerings before alternate fingerings are taught. Not all of the fingerings included in this chart include every note on the Pitch Tendency Chart[26] nor will they be useful to every player. Some of the fingerings will be out of tune to a greater or lesser degree depending on the individual.

As stated earlier, this chart is to be used as a last resort. Whether or not this fingering chart will be distributed to students is at the discretion of the director because students may mistake alternate fingerings for the standard ones. Also, this chart would not be appropriate for students who are in the first couple years of their playing career. These students need to learn the basics of flute playing and how to make intonation adjustments with their embouchure and air direction.

## How to Read the Alternate Fingering Chart

- The first column shows the note the alternate fingering affects.
- The second column shows the typical tendency of the note.
- The third column shows the alternate fingering.
- The fourth column explains how the alternate fingering will improve the intonation of that note.

[26] See page 41 for the Oboe Pitch Tendency Chart.

The pitch tendency symbols used in this fingering chart will explain the typical tendency of a note.


shows that the note tends to be slightly flat.


shows that the note tends to be slightly sharp.


shows that the note tends to be moderately sharp.

Most fingerings in this chart are actually slight deviations from the standard fingering. If a key is used in the standard fingering, it will be colored in black.

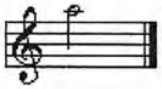
When a key is not typically used in the standard fingering, it will be colored in yellow.

There are instances where eliminating one key from the standard fingering will improve intonation. The eliminated key will have a red X placed over it.

## Examples of Alternate Fingerings

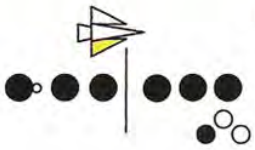
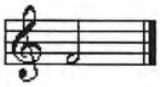
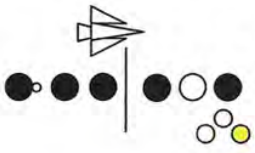
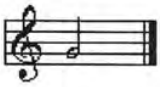
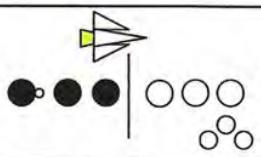
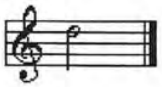
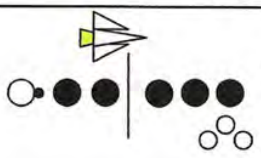
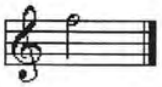
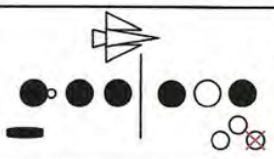
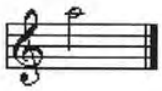
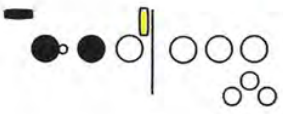
Most alternate fingerings that help intonation on the oboe involve the standard fingering and the addition of a right or left hand pinky key. Adding a pinky key will lower the pitch of a sharp note by slightly changing where air exits the oboe. Slight changes to the air will lower the frequency of the note slightly to make it more in tune. For

example, high A on oboe sounds moderately sharp if just the standard fingering is used:



By adding the A-flat key to the standard fingering, the pitch will lower.

Since the A-flat key is normally closed when it is not used, air will not escape through that tone hole. Opening that key when playing high A will allow some of the air that cannot exit the tone hole of the third finger to exit out the now opened A-flat key. The frequency of the air traveling through the oboe will be slower, lowering the pitch of the note.

| Note | Tendency | Fingering | How It Helps |
|---|---|---|---|
|  |  |  | Using the left Eb key and put more reed in mouth. This will raise the pitch of this slightly flat note. |
|  |  |  | Used forked F fingering and the Eb key to raise the pitch of this slightly sharp note. |
|  |  |  | Adding the B key will lower this slightly sharp note. |
|  |  |  | Adding the B key will help lower the pitch of this slightly sharp note. |
|  |  |  | Using the forked F fingering without the Eb key will lower the pitch of this slightly sharp note. |
|  |  |  | Adding the Ab key will lower the pitch of this moderately sharp note. |

(The Woodwind Fingering Guide, 1998-2005) (Oboe Fingerings, 2008)

# Pitch Tendency Packet (Oboe)

Name_____
Date_____

**Materials needed:**

1. Instrument
2. Pencil
3. Electronic Tuner
4. Someone to help you (either a friend, parent, or band director)

**Knowing the tendency of each note is important!**

Playing the general tuning note and making a physical adjustment is not enough to play in tune. Each note on your instrument will play flat, sharp, or in tune. The purpose of the Pitch Tendency Packet is to teach you what notes are in tune and out of tune on your instrument. Once you discover what the out of tune notes are, you can manipulate the notes to play in tune by making small adjustments when you are playing.

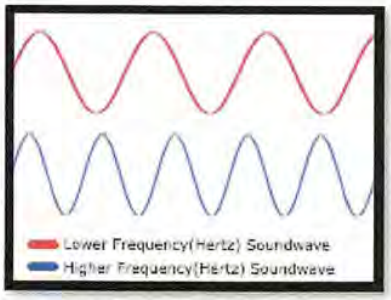
This packet will help you develop an individualized plan for tuning. As you discover which notes need special attention, it is your responsibility as a musician to figure out how **you** can play the note in tune. The tricky thing about this process is what gets you to play in tune may not work for your stand partner! Things like dynamics, reeds, embouchure, and even the brand of instrument can cause one person to play a note in tune while another plays the same note out of tune.

The last page of this packet will provide you with some tricks of the trade that you can experiment with those tricks to improve those out of tune notes. You will notice that once you start focusing on making those out of tune notes sound in tune, your tone will improve and your musician's instincts will start to anticipate intonation problems before they happen.

## What is intonation?[27]

A musical pitch you hear is actually a sound wave going through your instrument. The sound wave can travel at different speeds, or frequencies, depending on what finger combinations you are using. More fingers usually means a lower pitch and a slower sound wave, but adding playing the note at a higher octave will make the sound wave move faster.

Frequency is measured in cycles per second, or Hertz (hz). One cycle per second is equal to one Hertz. Musicians have a standard frequency that we agree will make us sound the most in tune. That frequency is measured at 440 hz. Anything higher or lower than that will not agree with the musicians' or the audience's ears.




An example of sounds at different frequencies.

## A Case of the "Wah's"[28]

If two musicians are playing the same note at exactly the same time, they're playing in tune, right? Not really. Have you ever heard two musicians play the same note at the exact same time, but instead it sounds like "wah-wah-wah"? This means the musicians have a case of the "wah's", a disease that cause musicians to play out of tune!

You are actually hearing the musicians play out of tune with each other. Each note's sound wave is moving at a slightly different frequency, making the sound waves clash. Both notes are fighting so much to be the main note heard that they are cancelling each other out!

One of the musicians should make an effort to get rid of the "wah's" by making adjustments to the way they are playing their instrument or by physically adjusting something on their instrument. If the musician makes the right adjustment, the "wah's" will start to disappear and the note will be in tune. However if the wrong adjustment is made, the "wah's" will move faster.

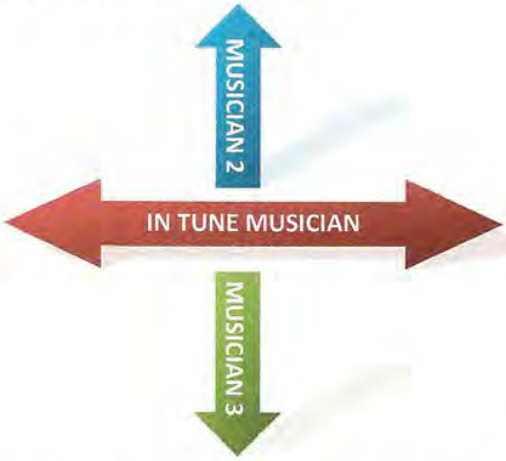
## Flat vs. Sharp[29]

Musicians think of intonation as a vertical concept. The straight line below represents In Tune Musician, a musician who always plays in tune.


[27] (Pitch (music))
[28] (Hein, 1981)
[29] (Pitch (music))

Now, another musician will play the same note along with In Tune Musician.


Finally, a third musician will play the same note with the other musicians.




Even though all three musicians were playing the same note, Musicians 2 and 3 were playing their notes at different frequencies.

Musician 2's note was played at a slightly higher frequency than In Tune Musician. Even though the both musicians were playing the same note, Musician 2's note sounds a little higher than In Tune Musician's. When notes vibrate at a slightly higher frequency than 440 hz, they are considered sharp. Musician 2 will have to lower his frequency so he can play at the same frequency as In Tune Musician.


What about Musician 3? Well, his note was played at a slower frequency than In Tune Musician's. He sounds a little lower because his note vibrates slightly slower than 440 hz. When notes vibrate at slightly slower frequencies, they are considered flat. Musician 3 will have to raise his frequency so he can play in tune with the others.


## How to Improve Intonation

Intonation will not get better by itself; it is something that will constantly need to adjust no matter your musical experience. Professional musicians struggle with intonation issues even with all the experience they have. Constant practice and reinforcement will help you understand intonation. Here are some suggestions to help you improve your intonation:

**Fill out the Pitch Tendency Chart.** The chart will tell you what notes are the notes you need to focus on. As you advance in your playing, your pitch tendencies may change. Continue to fill the chart out every four to six months to see if there are any changes.

**Practice making the adjustments!** Remember, it is your responsibility as a member of the ensemble to play in tune. If you do nothing to improve intonation, nothing will get better. Your brain will train itself to make the adjustment automatically once you've found what works and practice making those adjustments every time you see

the note. If you focus on improving only five notes a week in your practice time, you will see huge improvements in your playing.

**Use a friend, an electronic tuner, or a tuning CD to help train your ear.** If your ear doesn't know what bad intonation sounds like, then you will always play out of tune. Here are some ways to help train your ear:

- Have a friend help you by having them play each note as the In Tune Musician. If you have the "wah's", then you need to adjust to cure yourself. Have them play again and see if you adjusted correctly. Remember, if the "wah's" get better, you made the correct adjustment!
- An electronic tuner will give you a visual measurement of how flat or sharp you are. Play a note you're your eyes closed and guess if it's flat or sharp. Electronic tuners are usually around $25 and can be purchased at any music store or website. Korg brand tuners are the most common.
- Some electronic tuners also have a function where they can produce pitches so you can check for the "wah's". This is a great function to use if you are by practicing by yourself.
- "The Tuning CD" is available for download on iTunes and can be purchased online. It is a CD containing all the notes of the chromatic scale that you can play along with to check the "wah's".

**Memorize your pitch tendencies.** You can do this by creating flashcards or writing the tendencies in your music.

## The Results...

Poor intonation doesn't fix itself and is not pleasant to listen to. If you focus and stay consistent in your efforts to improve your intonation, you will also hear improvement in your tone quality. It will start to become second nature to you and you will begin to adjust your pitch without even thinking about it.

# Electronic Tuner How-to Guide


1. Turn your tuner on by pushing the on/off button.
2. Check the upper left-hand corner to see if your tuner is calibrated to 440 hz. If it is not, push either the calibration up button or the calibration down button until you see 440 on the screen.
3. Set the tuner on your stand so the screen is facing you. Make sure the microphone (indicated by the word "mic") is not covered up.
4. Play a note to move the needle. The concert pitch letter name of the note you are playing will be shown in the upper right-hand corner of the screen.
5. If you are...
   ...flat, the needle will move to the left and the light next to the flat sign will light up.
   ...in tune, the needle will stand straight up and the green light will light up.
   ...sharp, the needle will move to the right and the light next to the sharp sign will light up.
6. If your tuner has the option and wish to have the tuner produce a sound while you are playing, hit the sound button on the tuner. Hitting the sound button again will turn off the sound.
7. Turn your tuner off by pushing the on/off button when you are finished using it.

The meter on a tuner measures pitches in cents. In tune notes are measured at zero cents, which makes the needle stand straight up. As a note gets progressively flatter, the needle will move to the left measuring the note in negative cents. When a note gets increasingly sharper, the needle will move to the right measuring the note in positive cents.

# Completing Your Pitch Tendency Chart

## *Make sure you have someone to help you complete this!*

1. Fill out the top portion of the guide as completely as you can. Ask your band director for help if you have questions about the brand of your instrument or reed.
2. Warm up for at least ten minutes to allow your instrument to adjust to your body temperature.
3. Give the tuner and your Pitch Tendency Chart to your partner so they can fill it out while you play.
4. It is best to start at concert B-flat and work your way down and then start again at concert B-flat and work your way to the top to get the most accurate reading. Have your partner tell you what note to play. Play the note and have your partner write down what your pitch tendency is based on the chart below.

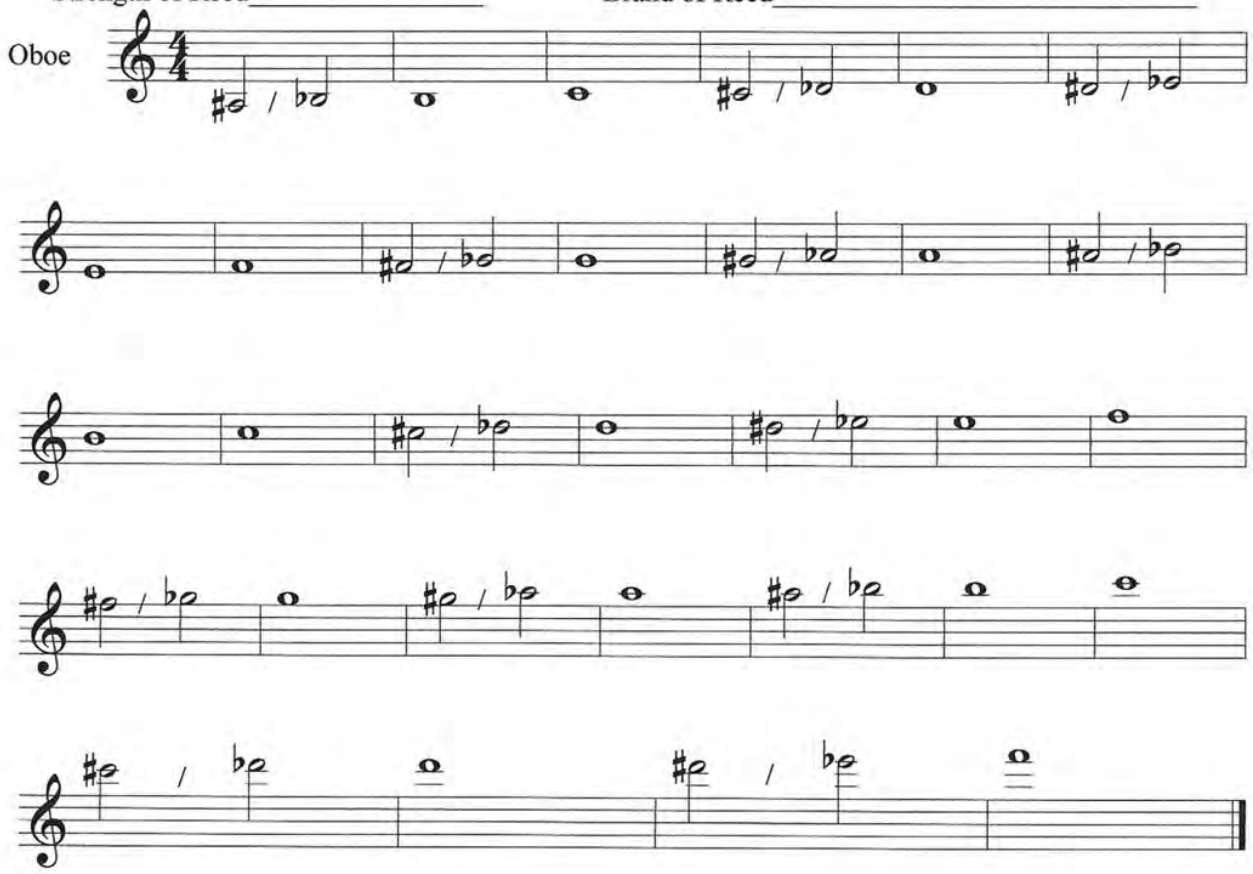
| Pitch Tendency Category | Cents |
|---|---|
| Slightly flat (Sb) | -1 to -10 cents |
| Moderately flat (Mb) | -11 to -25 cents |
| Very flat | -25 cents to -50 cents |
| Slightly sharp (S#) | +1 to +10 cents |
| Moderately sharp (M#) | +11 to +25 cents |
| Very sharp (V#) | +25 cents to +50 cents |

5. Once you have completed the chart, return it to your director. A copy will be made for their files and your completed chart will be returned to you.
6. Using the *Oboe Quick Fixes* chart and an electronic tuner, find the tricks for each note that will make them in tune. Make a note of what works and use those tricks each and every time you play.

# Oboe Pitch Tendency Chart

Name_____ Make of Instrument_____

Strength of Reed_____ Brand of Reed_____



# Oboe Quick Fixes

## If the note sounds sharp....

- ☑ Your embouchure might be too tight putting too much pressure on the reed. Relax your embouchure a little to reduce pressure.
- ☑ You may have too much reed in your mouth. Put less reed in.
- ☑ The reed may be too hard. Play on a softer reed or ask your director to make an adjustment to the reed.
- ☑ Make sure you are holding the oboe at a forty degree angle.
- ☑ If the music is written at forte or louder, relax your embouchure and slow the speed of air entering the oboe.
- ☑ Check to see if any keys on your oboe are opening too far. Have your band director make any adjustments if they are.

## If the note sounds flat....

- ☑ Your embouchure might be too relaxed. Tighten your embouchure a little to increase pressure around the reed.
- ☑ You may not have enough reed in your mouth. Take a little more reed in.
- ☑ The reed may be too soft. Ask your band director to make an adjustment on the reed or play on a harder reed.
- ☑ The reed may be too old. Ask your band director for a newer reed.
- ☑ Make sure you are holding the oboe at a forty degree angle.
- ☑ If the music is written at piano or softer, increase the amount of pressure around the reed and slow down the speed of air entering the oboe.
- ☑ Check to see if any keys on your oboe are too close to the tone hole. Have your band director make any adjustments if they are.

# Clarinet

## Sound Production[30]

The clarinet is a single reed instrument that cannot produce sound unless the reed is forced to vibrate against the mouthpiece by air. Once the correct clarinet embouchure is formed around the mouthpiece, the player blows air into the mouthpiece. Air enters the small space between the mouthpiece and reed as low-pressure air. The force of the bottom lip against the outside of the reed and air moving inside the mouthpiece causes the reed to press against the mouthpiece. The wave of low-pressure air moves down the bore of the clarinet and arrives at the first open hole.

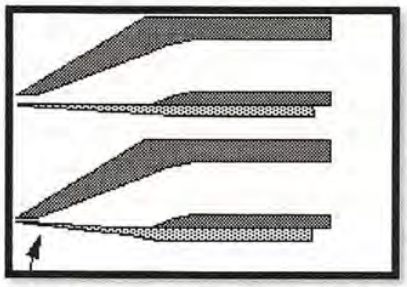


Figure 12: The movement of a clarinet reed when air moves through.

Outside air is sucked into the bore by the air moving inside the clarinet mixing with the low-pressure air to create high-pressure air. The air then moves back toward the mouthpiece, changing all the air inside the clarinet to high-pressure air and returning the reed to its original position. Another dose of low-pressure air from the player collides with the returning air and all the air moves toward the first open hole. It arrives at the open hole and forces air that is coming into the bore to exit through the hole. This continues to happen until the player stops air flow into the clarinet.

[30] (Wolfe, Music Acoustics, Physics, UNSW, 2010), (Clarinet Acoustics, 2011)

Figure 13: The process of air moving through the clarinet to create sound.

Reed vibration controls air flow into the clarinet just as much as air flow controls reed vibration–too much air flow or reed vibration will completely sop the sound. In the same light, not enough air flow or reed vibration is not enough to create a sound.

Pitch is changed when players cover tone holes and press down keys. Lower sounds are created when more tone holes and keys are covered. It will take air longer to travel through the instrument forcing it to move slower. As keys or tone holes are released, air will move faster because the air column will get shorter and sound will gradually get higher.

## Natural Tendencies[31]

The clarinet's octaves break down as follows:

- The first octave occupies the fundamental.
- The second octave occupies the third partial.
- The third octave occupies the fifth partial.

The clarinet is unique in that it produces only the odd-numbered partials in its sound, making it over-blow a twelfth when the register key is used. For example, when the register key is added to the fingering for chalameau A, it sounds twelve notes higher as fourth-space E. Using the register key

[31] (Westphal, 1990)

eliminates the fundamental frequency from the clarinet sound causing the clarinet to vibrate in two parts—from the mouthpiece to the register key and then through the rest of the instrument. Air will exit through the register key which is small in diameter so air will continue to the first open tone hole. The same effect occurs when the first finger is lifted, but the third octave is heard instead.

Figure 14: The register key on clarinet.

The clarinet has several notes that teachers and students need to be familiar with to maintain good intonation. Figure 15 shows the typical tendencies of the clarinet. Most notes on the clarinet tend to be sharp, especially in the throat tone notes, and only a couple notes that are considered flat. Like on the flute, there is no set pattern when figuring out if a note is flat or sharp. Because the clarinet over-blows a twelfth instead of an octave, it tends to have more intonation problems than other woodwinds.

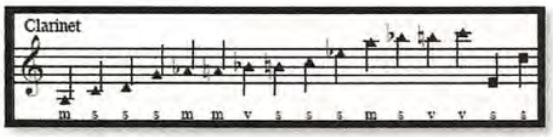
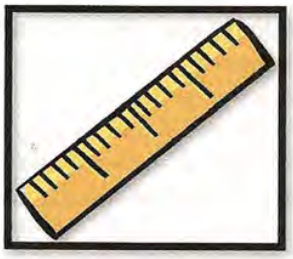



Figure 15: Pitch tendencies of the clarinet. The notes with triangle note heads are sharp notes. Notes with square note heads are flat notes. S stands for slightly, M stands for moderately, and V stands for very. The first note would be slightly sharp. Notes that are left off are considered in tune.

There are many factors contributing to poor clarinet intonation. If students are able to anticipate a problem before it happens, the overall intonation of the section and the band will improve. Directors should be aware of the clarinet's natural tendencies and be able to teach students how to fix out of tune notes. However, what may be a problem for one student may not be an issue for another because students play on different equipment. Students should be provided with an individualized tuning plan so they understand how to make every note in tune.[32]

## General Tuning Procedure[33]

Before accurately tuning individual notes, the player must first get the clarinet in tune with itself to prevent the natural tendencies from getting worse. Students should follow this procedure:



1. **Adjust the barrel so that it is pulled out an eighth of an inch.**

[32] See page 54 for the Clarinet Pitch Tendency Packet.
[33] (Clarinet Tuning Chart, 2011), (Allen, 2002-2007)

Clarinets are not made to be played with the barrel pushed all the way in. Pulling the barrel out an eighth of an inch will allow the player space to adjust if they need it. If the barrel is pushed in all the way and the student needs to adjust, they cannot make the proper adjustment.

2. **Warm up for at least ten minutes.**

Cold instruments tend to play flat. By warming up for at least ten minutes, the clarinet will adjust to the player's body temperature and the reed will be vibrating properly. Avoid tuning if players have been sitting in rehearsal for a short amount of time. The reed will begin to dry out and the clarinet will start to cool down to the temperature of the room.

3. **Using a good tone, play clarion C at mezzo forte.**

Dynamics greatly affect the clarinet's intonation. A mezzo forte dynamic affects intonation the least and requires very little manipulation by the player. Students should always focus on using their best tone because a poor tone quality results in poor intonation. Clarion C (concert B-flat) is the best pitch for a clarinet to tune to because it involves all sections of the clarinet and the throat tones will be closer in tune.

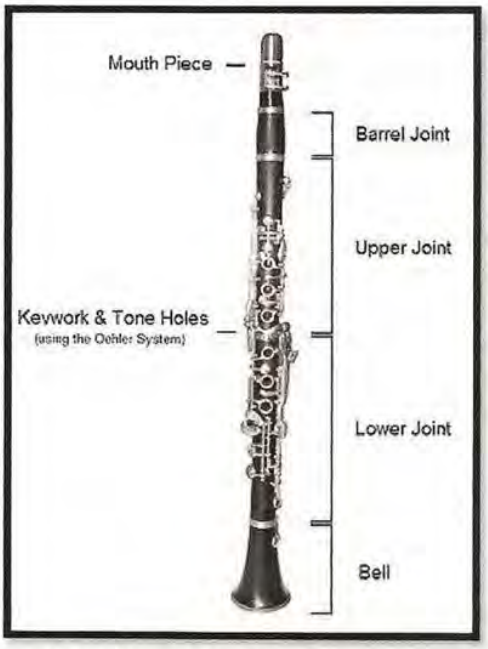



Figure 16: The barrel of the clarinet is located between the mouthpiece and upper joint.

4. **Adjust the barrel by pulling out if the C is sharp and pushing in if the C is flat.**

The clarinet can adjust its general tuning by pulling out or pushing in the barrel. Doing so will put the clarinet at a different length which will slightly change the frequency of the tuning note. It is recommended to adjust the barrel *only* for the purpose of getting the clarinet in tune with itself. If every out of tune note was adjusted with the barrel, the intonation of the natural tendencies would get worse. There are schools of thought that insist on also adjusting the middle joint of the clarinet; however this will cause the bridge key to not function properly.

## Causes and Solutions to Intonation Problems[34]

### Embouchure

A strong clarinet embouchure should be emphasized from the first sounds and should continue throughout a student's playing career. The embouchure is the controlling factor of intonation as well as tone quality. If the embouchure is too loose, pitch will be flat while a tight embouchure will be sharp.

If there is too much mouthpiece in the mouth, overall intonation will be flat and tuning individual notes will be very difficult. In the same light, too little mouthpiece will make clarion and high register notes sound sharp. To find the correct amount of mouthpiece that should go inside the mouth, insert a piece of paper into the space between the reed and mouthpiece. The spot where the paper stops dictates where the lips should be placed on the mouthpiece. This will give students a visual idea of how much mouthpiece need to go into their mouth. But keep in mind that small adjustments to that amount will need to be made based on the natural tendencies of the horn.

The clarinet needs to be held at a forty-degree angle so the embouchure can control the tone and support the reed. If the horn is held too close to the body, there will be too much lower lip on the reed causing the pitch to be sharp. If the horn is held above a forty-degree angle, the embouchure cannot provide the correct amount of pressure on the reed, making intonation flat. This can be verified by having a student sustain a throat tone G while moving the instrument back and forth so they can hear the change in pitch.

[34] (Westphal, 1990)

Figure 17: A clarinet reed.

### Reed

Like saxophone, oboe, and bassoon, a soft reed tends to make the clarinet sound flat while a stiff reed tends to make the clarinet sound sharp. If a student has to pull the barrel out a large amount, their reed is too stiff. Sanding the student's reed or giving them a softer reed will help. Soft reeds emphasize the clarinet's natural pitch tendencies and they do not respond well to embouchure adjustments. The director can clip the tip of the student's reed a little to make it harder or give the student a stiffer reed.

Good reeds are more likely to play in tune for the entire range of the instrument. Monitor students' reeds so that they are constantly playing on newer reeds. Older reeds tend to be softer as well and embouchure adjustments will be difficult to control. Adjustments to an old reed will also be ineffective.

### Dynamics

Changes in dynamics also affect intonation. Maintaining good breath support and making subtle embouchure adjustments will help alleviate these issues. As a clarinet

gets louder, the intonation will get flatter because lower lip pressure becomes more relaxed. Lip pressure should increase around the entire embouchure to bring the pitch up. The maximum length of the reed will then vibrate and the pitch will rise. Students tend to pinch the reed with their lower lip when playing soft causing less of the reed to vibrate which also raises pitch. If they relax the lower lip to create more of an "O" shape with their mouth, more of the reed will vibrate and the pitch will naturally lower.[35] It is important to remember that when playing pianissimo and fortissimo, the amount of adjusting needs to increase to accommodate for intonation changes.

**Mechanical Factors**

Students should regularly be taught to monitor the condition of keys, pads, and rods on their clarinet. This will not only keep the instrument in good playing condition, but will also help intonation. Unadjusted keys will affect intonation the most when they are the first open key of a fingering. All keys should close and open at the same height. A key that is too close to the tone hole will flatten the pitch and a key that is too open will raise the pitch. Bent keys will also contribute to the flatness of a pitch. If there are mechanical problems, the band director or repair technician should fix them by tightening or loosening adjustment screws.

Dirt tends to build up in the open tone holes and can be prevented by swabbing out the instrument on a daily basis. If a mouthpiece is dirty, it can also affect intonation. Regular cleaning of the mouthpiece will remove the dirt and help intonation.

[35] (McKee, 1987)

# Alternate Fingering Chart (Clarinet)

## Purpose of Alternate Fingerings

Alternate fingerings are used primarily for technical ease on clarinet. However, there are fingerings that can be used to improve intonation for some notes. Using alternate fingerings to adjust the pitch of a note should be used as a "last resort" method. Students should be taught how to make intonation adjustments with the embouchure and reed with standard fingerings before alternate fingerings are taught. Not all of the fingerings included in this chart include every note on the Pitch Tendency Chart[36] nor will they be useful to every player. Some of the fingerings will be out of tune to a greater or lesser degree for some players.

## How to Read the Alternate Fingering Chart

- The first column shows the note the alternate fingering affects.
- The second column shows the typical tendency of the note.
- The third column shows the alternate fingering.
- The fourth column explains how the alternate fingering will improve the intonation of that note.

The pitch tendency symbols used in this fingering chart will explain the typical tendency of a note.


shows that a note tends to be slightly flat.


shows that a note tends to be slightly sharp.


shows that a note tends to be moderately sharp.

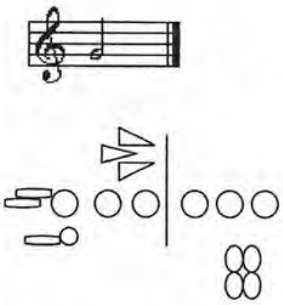

shows that a note tends to be very sharp.

Most fingerings in this chart are actually slight deviations from the standard fingering. If a key is used in the standard fingering, it will be colored in black.

When a key is not typically used in the standard fingering, it will be colored in yellow.

## Examples of Alternate Fingerings

The act of closing one or more tone holes in addition to those that are normally closed in a standard fingering is called dampening.[37] Doing so will slightly lower the pitch of a note and adjust the length of the air column. For example, throat tone G requires no tone holes to be covered when using the standard fingering, forcing air to exit at the top of the horn.

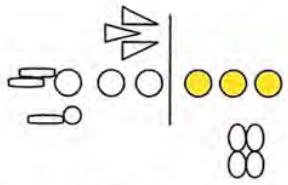


To lower the pitch of this note, add fingers four, five, and six to close the open tone holes on the lower joint of the clarinet. Air

[36] See page 61 for the Clarinet Pitch Tendency Chart.

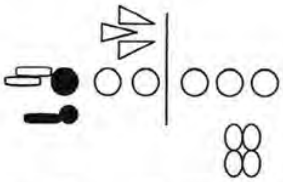
[37] (Westphal, 1990)

will then be forced to exit out of the upper joint of the clarinet and lower the pitch of this slightly sharp note.[38]

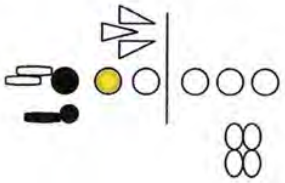


Shading is another technique clarinet players use to help improve intonation. To do this, the key of the first open tone hole is gently pushed down until the note sounds in tune. Players have to listen carefully or rely on an electronic tuner when using this technique. If the key is pushed down to completely cover the tone hole, the note will change pitch.

This technique is used to help lower the pitch of high B, which is a very sharp note. The standard fingering for this note is:

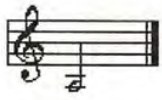
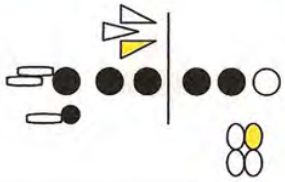
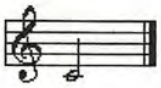
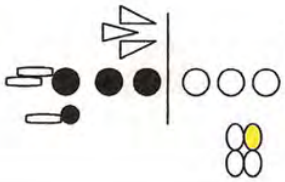
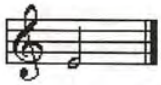
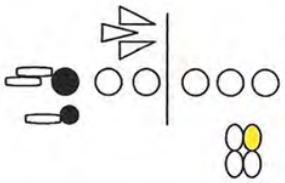
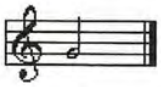
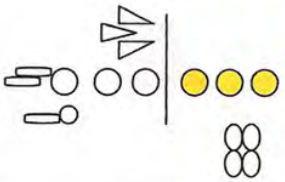
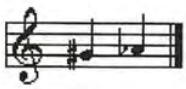
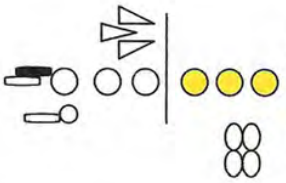
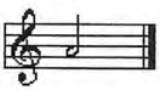
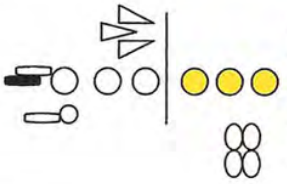


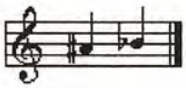
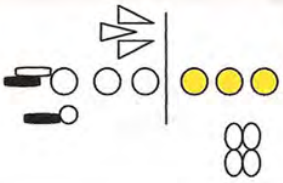
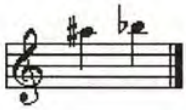
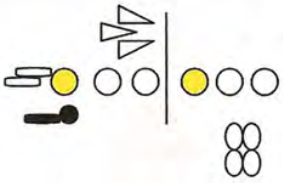
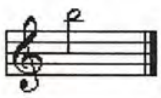
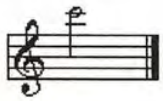
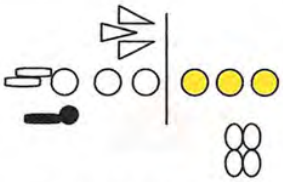
The fingering below shows finger two shading the tone hole to lower the pitch of high B:[39]



As stated earlier, this chart is to be used as a last resort. Whether or not this fingering chart will be distributed to students is at the discretion of the director because students may mistake alternate fingerings for the standard ones. Also, this chart would not be appropriate for students who are in the first couple years of their playing career. These students need to learn the basics of clarinet playing and how to make intonation adjustments with their embouchure.

[38] (Clarinet Fingerings, 2008)
[39] (Clarinet Tuning Chart, 2011)

| Note | Tendency | Fingering | How It Helps |
|---|---|---|---|
|  |  |  | Adding the right hand F key and left hand E key will lower the pitch of this moderately sharp note. |
|  |  |  | Adding the right hand F key will lower the pitch of this slightly sharp note. |
|  |  |  | Adding the right-hand F key will raise the pitch of this slightly flat note. |
|  |  |  | Adding fingers 4, 5, and 6 will lower the pitch of this slightly sharp note. |
|  |  |  | Adding fingers 4, 5, and 6 will lower the pitch of this moderately sharp note. |
|  |  |  | Adding fingers 4, 5, and 6 will lower the pitch of this moderately sharp note. |

| | | | |
|---|---|---|---|
|  |  |  | Adding fingers 4, 5, and 6 will lower the pitch of this very sharp note. |
|  |  |  | Using the fingering of 1 and 4 will help to lower the pitch of this slightly sharp note. |
|  |  |  | Gradually shade finger 2 over the tone hole until the pitch of this very sharp note will lower. |
|  |  |  | Adding fingers 4, 5, and 6 will lower the pitch of this very sharp note. |

(Clarinet Fingerings, 2008) (Clarinet Tuning Chart, 2011) (Kollman) (The Woodwind Fingering Guide, 1998-2005)

# Pitch Tendency Packet (Clarinet)

Name_____
Date_____

**Materials needed:**

1. Instrument
2. Pencil
3. Electronic Tuner
4. Someone to help you (either a friend, parent, or band director)

**Knowing the tendency of each note is important!**

Playing the general tuning note and making a physical adjustment is not enough to play in tune. Each note on your instrument will play flat, sharp, or in tune. The purpose of the Pitch Tendency Packet is to teach you what notes are in tune and out of tune on your instrument. Once you discover what the out of tune notes are, you can manipulate the notes to play in tune by making small adjustments when you are playing.

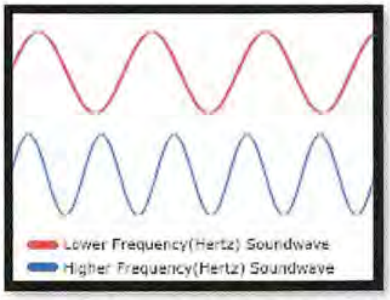
This packet will help you develop an individualized plan for tuning. As you discover which notes need special attention, it is your responsibility as a musician to figure out how **you** can play the note in tune. The tricky thing about this process is what gets you to play in tune may not work for your stand partner! Things like dynamics, reeds, embouchure, and even the brand of instrument can cause one person to play a note in tune while another plays the same note out of tune.

The last page of this packet will provide you with some tricks of the trade that you can experiment with those tricks to improve those out of tune notes. You will notice that once you start focusing on making those out of tune notes sound in tune, your tone will improve and your musician's instincts will start to anticipate intonation problems before they happen.

## What is intonation?[40]

A musical pitch you hear is actually a sound wave going through your instrument. The sound wave can travel at different speeds, or frequencies, depending on what finger combinations you are using. More fingers usually means a lower pitch and a slower sound wave, but adding playing the note at a higher octave will make the sound wave move faster.

Frequency is measured in cycles per second, or Hertz (hz). One cycle per second is equal to one Hertz. Musicians have a standard frequency that we agree will make us sound the most in tune. That frequency is measured at 440 hz. Anything higher or lower than that will not agree with the musicians' or the audience's ears.




An example of sounds at different frequencies.

## A Case of the "Wah's"[41]

If two musicians are playing the same note at exactly the same time, they're playing in tune, right? Not really. Have you ever heard two musicians play the same note at the exact same time, but instead it sounds like "wah-wah-wah"? This means the musicians have a case of the "wah's", a disease that cause musicians to play out of tune!

You are actually hearing the musicians play out of tune with each other. Each note's sound wave is moving at a slightly different frequency, making the sound waves clash. Both notes are fighting so much to be the main note heard that they are cancelling each other out!

One of the musicians should make an effort to get rid of the "wah's" by making adjustments to the way they are playing their instrument or by physically adjusting something on their instrument. If the musician makes the right adjustment, the "wah's" will start to disappear and the note will be in tune. However if the wrong adjustment is made, the "wah's" will move faster.

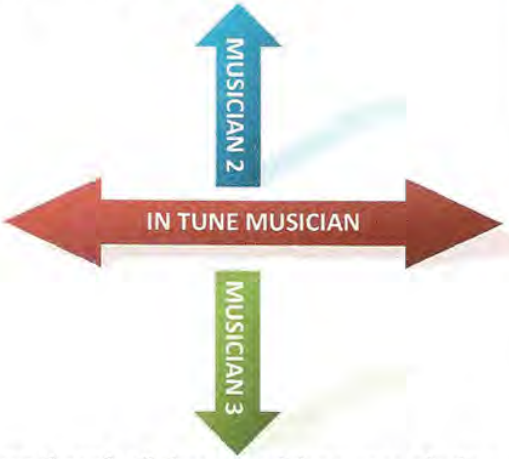
## Flat vs. Sharp[42]

Musicians think of intonation as a vertical concept. The straight line below represents In Tune Musician, a musician who always plays in tune.


[40] (Pitch (music))
[41] (Hein, 1981)
[42] (Pitch (music))

Now, another musician will play the same note along with In Tune Musician.


Finally, a third musician will play the same note with the other musicians.




Even though all three musicians were playing the same note, Musicians 2 and 3 were playing their notes at different frequencies.

Musician 2's note was played at a slightly higher frequency than In Tune Musician. Even though the both musicians were playing the same note, Musician 2's note sounds a little higher than In Tune Musician's. When notes vibrate at a slightly higher frequency than 440 hz, they are considered sharp. Musician 2 will have to lower his frequency so he can play at the same frequency as In Tune Musician.


What about Musician 3? Well, his note was played at a slower frequency than In Tune Musician's. He sounds a little lower because his note vibrates slightly slower than 440 hz. When notes vibrate at slightly slower frequencies, they are considered flat. Musician 3 will have to raise his frequency so he can play in tune with the others.


## How to Improve Intonation

Intonation will not get better by itself; it is something that will constantly need to adjust no matter your musical experience. Professional musicians struggle with intonation issues even with all the experience they have. Constant practice and reinforcement will help you understand intonation. Here are some suggestions to help you improve your intonation:

**Fill out the Pitch Tendency Chart.** The chart will tell you what notes are the notes you need to focus on. As you advance in your playing, your pitch tendencies may change. Continue to fill the chart out every four to six months to see if there are any changes.

**Practice making the adjustments!** Remember, it is your responsibility as a member of the ensemble to play in tune. If you do nothing to improve intonation, nothing will get better. Your brain will train itself to make the adjustment automatically once you've found what works and practice making those adjustments every time you see

the note. If you focus on improving only five notes a week in your practice time, you will see huge improvements in your playing.

**Use a friend, an electronic tuner, or a tuning CD to help train your ear.** If your ear doesn't know what bad intonation sounds like, then you will always play out of tune. Here are some ways to help train your ear:

- Have a friend help you by having them play each note as the In Tune Musician. If you have the "wah's", then you need to adjust to cure yourself. Have them play again and see if you adjusted correctly. Remember, if the "wah's" get better, you made the correct adjustment!
- An electronic tuner will give you a visual measurement of how flat or sharp you are. Play a note you're your eyes closed and guess if it's flat or sharp. Electronic tuners are usually around $25 and can be purchased at any music store or website. Korg brand tuners are the most common.
- Some electronic tuners also have a function where they can produce pitches so you can check for the "wah's". This is a great function to use if you are by practicing by yourself.
- "The Tuning CD" is available for download on iTunes and can be purchased online. It is a CD containing all the notes of the chromatic scale that you can play along with to check the "wah's".

**Memorize your pitch tendencies.** You can do this by creating flashcards or writing the tendencies in your music.

## The Results...

Poor intonation doesn't fix itself and is not pleasant to listen to. If you focus and stay consistent in your efforts to improve your intonation, you will also hear improvement in your tone quality. It will start to become second nature to you and you will begin to adjust your pitch without even thinking about it.

# Electronic Tuner How-to Guide


1. Turn your tuner on by pushing the on/off button.
2. Check the upper left-hand corner to see if your tuner is calibrated to 440 hz. If it is not, push either the calibration up button or the calibration down button until you see 440 on the screen.
3. Set the tuner on your stand so the screen is facing you. Make sure the microphone (indicated by the word "mic") is not covered up.
4. Play a note to move the needle. The concert pitch letter name of the note you are playing will be shown in the upper right-hand corner of the screen.
5. If you are...
   ...flat, the needle will move to the left and the light next to the flat sign will light up.
   ...in tune, the needle will stand straight up and the green light will light up.
   ...sharp, the needle will move to the right and the light next to the sharp sign will light up.
6. If your tuner has the option and wish to have the tuner produce a sound while you are playing, hit the sound button on the tuner. Hitting the sound button again will turn off the sound.
7. Turn your tuner off by pushing the on/off button when you are finished using it.

The meter on a tuner measures pitches in cents. In tune notes are measured at zero cents, which makes the needle stand straight up. As a note gets progressively flatter, the needle will move to the left measuring the note in negative cents. When a note gets increasingly sharper, the needle will move to the right measuring the note in positive cents.

# Completing Your Pitch Tendency Chart

## *Make sure you have someone to help you complete this!*

1. Fill out the top portion of the guide as completely as you can. Ask your band director for help if you have questions about the brand of your instrument or reed.
2. Warm up for at least ten minutes to allow your instrument to adjust to your body temperature.
3. Turn the electronic tuner on and get your instrument in tune with itself using the following procedure:

> 1. Adjust the barrel so it is pulled out an eighth of an inch.
> 2. Using a good tone, play C at a mezzo forte volume with no vibrato.
> 3. Adjust the barrel by pulling out if the note was sharp or pushing in if the note was flat.
> 4. Continue this process if your first attempt was not in tune.

4. Give the tuner and your Pitch Tendency Chart to your partner so they can fill it out while you play.
5. It is best to start at concert B-flat and work your way down and then start again at concert B-flat and work your way to the top to get the most accurate reading. Have your partner tell you what note to play. Play the note and have your partner write down what your pitch tendency is based on the chart below.

| Pitch Tendency Category | Cents |
|---|---|
| Slightly flat (Sb) | -1 to -10 cents |
| Moderately flat (Mb) | -11 to -25 cents |
| Very flat | -25 cents to -50 cents |
| Slightly sharp (S#) | +1 to +10 cents |
| Moderately sharp (M#) | +11 to +25 cents |
| Very sharp (V#) | +25 cents to +50 cents |

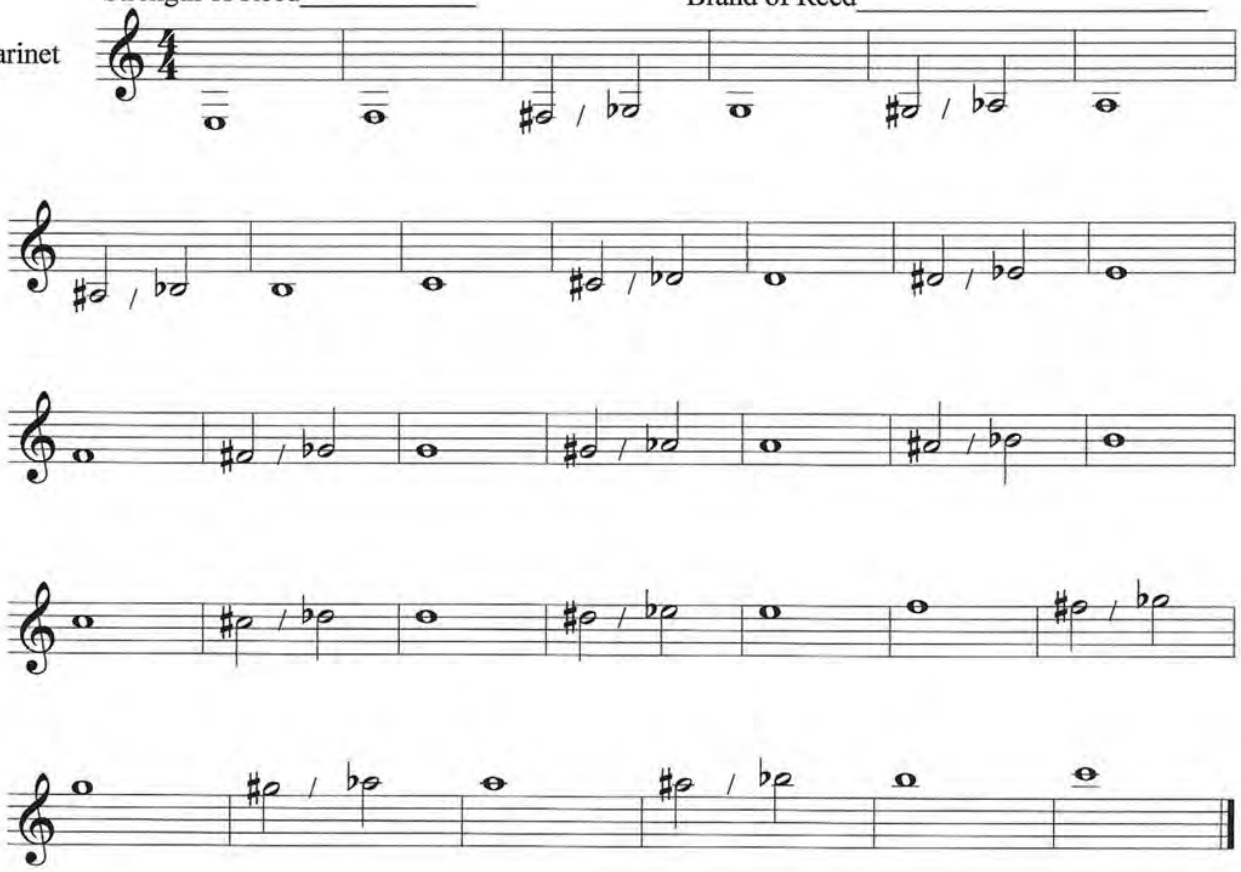
6. Once you have completed the chart, return it to your director. A copy will be made for their files and your completed chart will be returned to you.
7. Using the *Clarinet Quick Fixes* chart and an electronic tuner, find the tricks for each note that will make them in tune. Make a note of what works and use those tricks each and every time you play.

# Clarinet Pitch Tendency Chart

Name_____ Brand of Instrument_____

Strength of Reed_____ Brand of Reed_____

B♭ Clarinet



# Clarinet Quick Fixes

## If the note sounds sharp....

- ☑ Your embouchure may be too tight. Lip the note down by relaxing the lower lip slightly.
- ☑ You may not have enough mouthpiece in your mouth. Put more mouthpiece in your mouth.
- ☑ The reed may be too hard. Ask your band director for a softer reed or if they can sand the reed for you.
- ☑ Make sure the clarinet is held at a forty degree angle.
- ☑ If the music calls for a soft dynamic, relax the embouchure slightly and slow down the speed of air entering the clarinet

## If the note sounds flat....

- ☑ Your embouchure may be too loose. Lip the note up by increasing lower lip pressure on the reed.
- ☑ You may have too much mouthpiece in your mouth. Put less mouthpiece in your mouth.
- ☑ The reed may be too soft. Ask your band director for a harder reed or if they can clip the tip for you.
- ☑ The reed may be too old. Ask your band director for a new reed.
- ☑ Make sure you are blowing fast enough air into the clarinet.
- ☑ Make sure the clarinet is held at a forty degree angle.
- ☑ If the music calls for a loud dynamic, increase the pressure of your lower lip against the reed.

# Saxophone

## Sound Production[43]

The saxophone is a single reed instrument that cannot produce sound unless air forces the reed to vibrate against the mouthpiece. Once the correct saxophone embouchure is formed around the mouthpiece, air is blown into the instrument where it moves towards the bell of the saxophone or first open tone hole. Low-pressure air is created when air from the player's mouth is forced through the small opening between the mouthpiece and reed. The force of the bottom lip against the outside of the reed and air moving inside the horn causes the reed to press against the mouthpiece. The wave of low-pressure air moves down the bore of the saxophone and arrives at the first open tone hole. Outside air is forced into the saxophone where it combines with low-pressure air.

The air mixes together to form high-pressure air and moves back up the bore. As it progresses towards the mouthpiece, all of the air inside the saxophone changes to high-pressure air and the reed returns to its original position. Another dose of low-pressure air from the player collides with the returning air and it moves toward the first open hole. It arrives at the open hole and forces air coming into the bore to exit through the hole. This is a very speedy process and happens numerous times to create a musical sound.

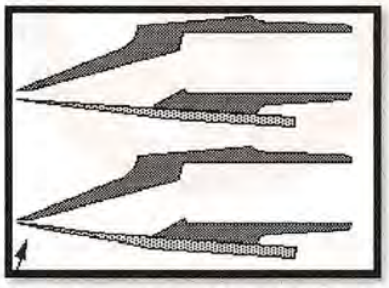


Figure 18: Saxophone reed opening and closing when air moves through the mouthpiece.

[43] (Wolfe, Music Acoustics, Physics, UNSW, 2010), (Clarinet Acoustics, 2011)

It is important to note that if the lower lip squeezes too much against the reed and presses the reed on the mouthpiece, air flow will cease. Conversely, a weak air flow will not make the reed vibrate. Pitch is changed when players press down keys to close and open tone holes. More keys and tone holes used to create a pitch will take air longer to travel through the saxophone. In this case, the human ear will hear a low sound. As the amount of keys used to create a note decreases, the bore of the saxophone is not as large. Air will travel faster through the bore and a high sound is heard.

## Natural Tendencies[44]

The saxophone's natural overtone series breaks the octaves down in the following way:

- The first octave occupies the fundamental.
- The second octave occupies the second partial.
- The last few notes of the range use a combination of the second and third partials.

Opening the octave key on saxophone will force the instrument to vibrate at the top of the neck and also at the first open tone hole on the horn's body. The octave key is relatively small in diameter so air will travel through the body of the saxophone to the first open tone hole. While the fingers combine to play a specific note, adding the octave key will make the note sound eight notes higher. This breakdown causes the extreme low and high notes to be sharp while the upper portion of the second octave tends to be flat.

[44] (Westphal, 1990)

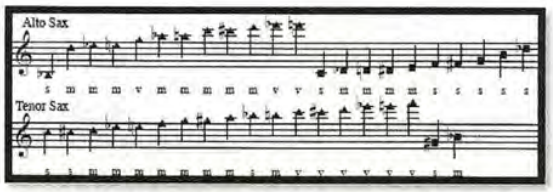



Figure 19: Pitch tendencies of alto saxophone (top) and tenor saxophone (bottom). The notes with triangle note heads are sharp notes. Notes with square note heads are flat notes. S stands for slightly, M stands for moderately, and V stands for very. The first note would be slightly sharp. Notes that are left off are considered in tune.

When broken down as individual pitches, however, there is no specific pattern to find the tendencies of the alto saxophone, but the tenor saxophone notes are mostly sharp. Figure 19 displays the typical tendencies of the alto and tenor saxophones. Each note on the chart should be played using the standard fingering with adjustments being controlled by the player. Alternate fingerings can be used, but as a last resort.[45]

It is important to mention that the natural tendencies for the saxophone presented in this book are *typical* and are not experienced by all saxophone players. A very sharp note on one saxophone could be perfectly in tune on another. Because of this, saxophone players need to be made aware of natural pitch tendencies and monitor them regularly so they understand what affects them individually.[46] The band director also should know what the natural tendencies are and provide students with techniques to play notes in tune. This will help improve the intonation as well as tone for all saxophone sections.

## General Tuning Procedure[47]

Before accurately tuning individual notes, the player must first get the saxophone in tune with itself to prevent the natural tendencies from getting worse. Students should follow this procedure to set the overall intonation:

1. **Adjust the mouthpiece so that about half of it covers the cork.**

Saxophones are not made to be played with the mouthpiece all the way on the cork. Putting the mouthpiece on so it covers about half the cork will give the player some room to make adjustments if they sound flat or sharp.

2. **Warm up for at least ten minutes.**

A cold saxophone is extremely flat. By warming up for at least ten minutes the saxophone will adjust to the player's body temperature and the reed will vibrate properly. Avoid tuning if players have been sitting in rehearsal for a short amount of time. The reed will start to dry out and the horn will start to adapt to the temperature of the room.

3. **Using a good tone, play the tuning note at mezzo forte with no vibrato.**

Dynamics greatly affect the saxophone's intonation. A mezzo forte dynamic affects intonation the least and requires very little

[45] Alternate fingerings can be found on page 68.
[46] See the Pitch Tendency Packet for Saxophone on page 74.
[47] (Thomas, 2003), (Allen, 2002-2007)

manipulation by the player. Students should always focus on using their best tone because a poor tone quality results in poor intonation. Alto saxophones should use a top line F-sharp (concert A) while baritone saxophones use the lower F-sharp. Tenor saxophones should use second line G (concert F). The notes mentioned are the best notes for players to get their horn in tune with itself because they are naturally in tune notes and will require little adjustments with the embouchure. Vibrato should be avoided because it actually causes the pitch to move between flat and sharp to create the pulses.

4. **Adjust the mouthpiece by pulling out if the tuning note is sharp and pushing in if the tuning note is flat.**

The saxophone is an instrument that can adjust its general tuning by pulling out or pushing in the mouthpiece. Doing so will put the saxophone at a different length to change the frequency of the tuning note. It is recommended to adjust the mouthpiece *only* for the purpose of getting the saxophone in tune with itself. If every out of tune note was adjusted with the mouthpiece, the intonation of the natural tendencies would get worse.

## Causes and Solutions to Intonation Problems[48]

Figure 20: A saxophone reed.

### Reed

Good reeds will more likely play in tune for the entire range of the instrument. Monitor students' reeds so that they are constantly playing on newer reeds because old reeds make intonation difficult to control. Also, monitor the strength of the reed students are using and adjust as they advance. Soft reeds have difficulty responding to embouchure adjustments and are generally flat. A student playing on a softer reed should be given a harder reed to raise the pitch. Harder reeds tend to be sharper in pitch, but also stiffer making it difficult to adjust intonation problems.

### Embouchure

Like the other woodwind instruments, a good embouchure will control intonation. A strong embouchure should be emphasized from the first sounds and should continue throughout a student's playing

[48] (Westphal, 1990)

career. If the embouchure is too loose, pitch will be flat while a tight embouchure will be sharp.

The amount of mouthpiece a student puts in their mouth will also affect intonation. If students put too little mouthpiece in their mouth, the reed cannot vibrate properly. As a result, the normally sharp upper range will be flat. Students who do not have enough mouthpiece in their mouth tend to "bite" on the reed with their lower jaw in an effort to play in tune. Too much mouthpiece in the mouth will cause the overall intonation of the horn to be flat. The vibrating area of the reed is too far in the mouth making embouchure adjustments ineffective.

To find the correct amount of mouthpiece needed inside the mouth, insert a piece of paper into the space between the reed and mouthpiece. Where the paper stops dictates how much mouthpiece should go into the mouth. This will give the student a visual idea of how much mouthpiece should go into the mouth. Keep in mind that small adjustments will still need to be made based on the natural tendencies of the horn.

The process of "lipping" a note flat or sharp can be done with the embouchure to make slight adjustments to an individual pitch. "Lipping down" a note will make a note flatter and is done by slightly relaxing the lower jaw. The opposite effect of "lipping up" is done by slightly increasing pressure of the lower jaw on the reed to make a note sharper.

**Mouthpiece Angle**

The upward angle of the mouthpiece as it enters the mouth affects intonation and is controlled by the angle the horn is held. If the horn is held too far forward, the mouthpiece will go straight into the mouth. The embouchure cannot support the reed and pitch will be flat. Students who hold the saxophone too far back will play with an overall sharp pitch. The mouthpiece will be at too much of an upward angle causing the lower lip to not support the reed. To find a student's correct playing angle, have the student sustain third-space C-sharp while moving the instrument back and forth to hear the change in pitch.

**Dynamics**

As saxophones play louder, they tend to flatten because pressure from the lower lip decreases. To raise the pitch, the player should open the embouchure and increase the pressure of both lips around the mouthpiece. In softer dynamics, the saxophone tends to play sharp because the player will bit with their lower jaw. To lower the pitch, drop the lower jaw and slow the speed of air entering the horn down. Dropping the lower jaw slightly will also allow the reed to vibrate at the correct speed.

**Mechanical Factors**

Students should be taught to regularly monitor the condition of keys, pads, and rods on their saxophone. Not only will intonation remain stable, but the horn will remain in good playing condition. All keys should open and close at the same height. Unadjusted keys will affect intonation the most when they are the first open tone hole of a fingering. A key that is too close to the tone hole will flatten the pitch, but a key that is too open will raise the pitch. Leaky keys will interfere with response and also cause the notes to be sharp. Make sure adjustments screws on each finger key are allowing keys to seal properly and check post screws to see if they are properly adjusted. Bent keys will also contribute to the flatness of a pitch. If a mouthpiece is dirty, it can also affect intonation. Regular cleaning of the mouthpiece will remove the dirt and help improve intonation.

# Alternate Fingering Chart (Saxophone)

## Purpose of Alternate Fingerings

Alternate fingerings are used primarily for technical ease on the saxophone. However, there are fingerings that can be used to improve intonation for some notes. Using alternate fingerings to adjust the pitch of a note should be used as a "last resort" method. Students should be taught how to make intonation adjustments with embouchure adjustments using standard fingerings before alternate fingerings are taught. Not all of the fingerings included in this chart include every note on the Pitch Tendency Chart[49] nor will they be useful to every player. Some of the fingerings will be out of tune to a greater or lesser degree.

## How to Read the Alternate Fingering Chart

- The first column shows the note the alternate fingering affects.
- The second column shows the typical tendency of the note.
- The third column shows the alternate fingering.
- The fourth column explains how the alternate fingering will improve the intonation of that note.

The pitch tendency symbols used in this fingering chart will explain the typical tendency of a note.


shows that a note tends to be moderately flat.


shows that a note tends to be slightly flat.

[49] See page 81 for the Saxophone Pitch Tendency Chart.


shows that note tends to be moderately sharp.


shows that a note tends to be very sharp.

Most fingerings in this chart are actually slight deviations from the standard fingering. If a key is used in the standard fingering, it will be colored in black.

When a key is not typically used in the standard fingering, it will be colored in yellow.

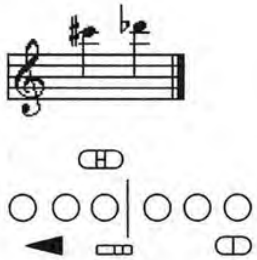
There are instances where eliminating one key from the standard fingering will improve intonation. The eliminated key will have a red X placed over it.

Some notes will have the more than one fingering for a note. The first fingering will always be the best option. Each fingering will adjust intonation, but will not be as helpful as the first fingering.

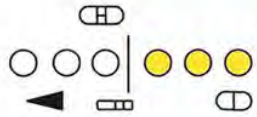
## Examples of Alternate Fingerings

The act of closing one or more tone holes in addition to those that are already used in a standard fingering is called dampening. Pitch will be slightly lowered when using this technique. An example of lowering the pitch of a sharp note with dampening is high C-sharp. The standard fingering for this note does not require any

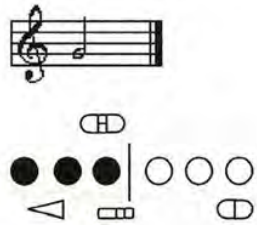
tone holes to be closed causing this note to be very sharp.[50]



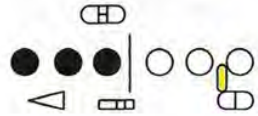
If the player uses fingers four, five, and six to close the tone holes, the pitch of this note will lower significantly.



Opening, or venting, tone holes in addition to those used in the standard fingering will help raise the pitch of typically flat notes. Second line G is a slightly flat note when played with the standard fingering:



Adding the chromatic F-sharp key will help raise the pitch.[51]



Westphal suggests some basic principles when considering venting and dampening:

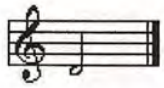
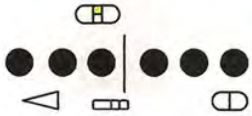
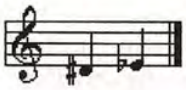
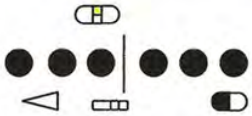
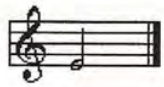
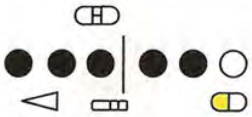
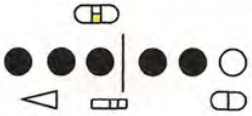
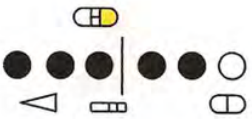
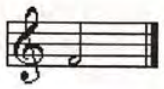
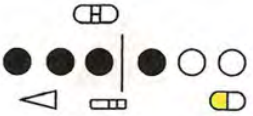
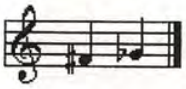
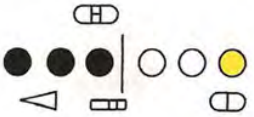
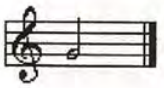
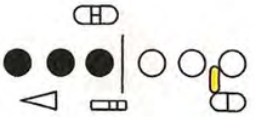
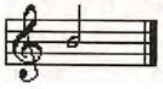
1. In general, opening tone holes will raise the pitch and closing tone holes will lower the pitch.
2. At least one tone hole, preferably two, below the last tone hole involved in the fingering must remain open.
3. The closer to this tone hole that additional holes are opened or closed, the greater the effect on the pitch; the farther from this tone hole, the less effect on the pitch.
4. One or more fingers may be added to the basic fingering to correct the pitch.
5. The amount of correction needed, if any, varies with the dynamic level being used.

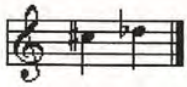
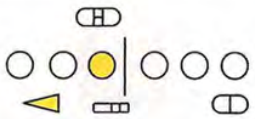
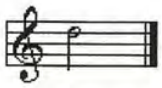
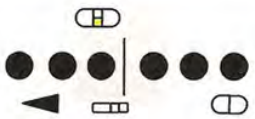
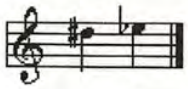
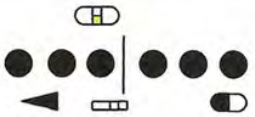
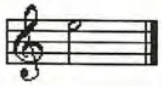
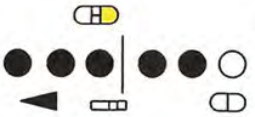
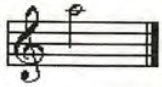
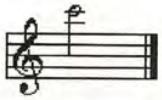
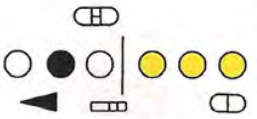
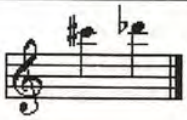
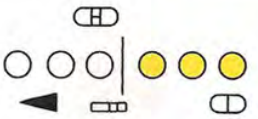
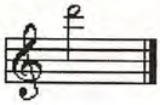
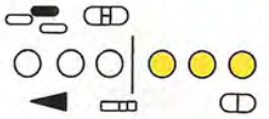
He also mentions that the use of venting and dampening varies from player to player and should only be used when embouchure and mouthpiece adjustments have not improved intonation.[52]

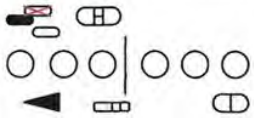
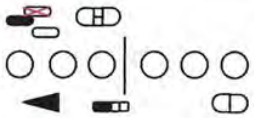
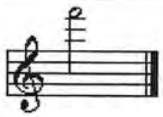
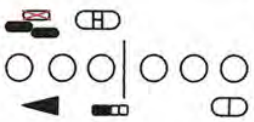
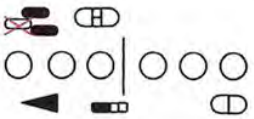
As stated earlier, this chart is to be used as a last resort. Whether or not this fingering chart will be distributed to students is at the discretion of the director because students may mistake alternate fingerings for the standard ones. Also, this chart would not be appropriate for students who are in the first couple years of their playing career. These students need to learn the basics of clarinet playing and how to make intonation adjustments with their embouchure.

[50] (The Woodwind Fingering Guide, 1998-2005)
[51] (Saxophone Fingerings, 2008 )

[52] Westphal, pg. 142

| Note | Tendency | Fingering | How It Helps |
|---|---|---|---|
|  | Mb |  | Adding the C# key will help raise the pitch of this moderately flat note. |
|  | Mb |  | Adding the C# key will help raise the pitch of this moderately flat note. |
|  | Mb |  | Adding the Eb key will help raise the pitch of this moderately flat note. |
| | |  | Adding the B key will help raise the pitch of this moderately flat note. |
| | |  | Adding the left hand Bb key will help raise the pitch of this moderately flat note. |
|  | Sb |  | Adding the Eb key will help raise the pitch of this slightly flat note. |
|  | Sb |  | Using finger 6 instead of finger 5 will raise the pitch of this slightly flat note. |
|  | Sb |  | Adding the chromatic F# key will raise the pitch of this slightly flat note. |
|  | Sb |  | Adding the left hand Bb key will raise the pitch of this slightly flat note. |

| | | | |
|---|---|---|---|
|  |   |  | Adding finger 3 and the right hand middle side key will raise the pitch of this slightly flat note. |
| | |  | Adding the octave key and finger 3 will raise the pitch of this slightly flat note. |
|  |   |  | Adding the B key will raise the pitch of this moderately sharp note. |
|  |   |  | Adding the B key will raise the pitch of this moderately sharp note. |
|  |   |  | Adding the Bb key will help raise the pitch of this moderately sharp note. |
|  |   |  | Adding finger 6 will help lower the pitch of this moderately sharp note. |
|  |   |  | Adding fingers 4, 5, and 6 will help lower the pitch of this moderately sharp note. |
|  |   |  | Adding fingers 4,5, and 6 will help lower the pitch of this moderately sharp note. |
|  |   |  | Adding fingers 4, 5, and 6 will help lower the pitch of this moderately sharp note. |

| | | | |
|---|---|---|---|
|  |  |  | Eliminating the use of the first palm key will help lower the pitch of this very sharp note. |
|  |  |  | Eliminating the use of the first palm key will help lower the pitch of this very sharp note. |
|  |  |  | Eliminating the use of the first palm key will help lower the pitch of this very sharp note. |
| | |  | Eliminating the use of the second palm key will help lower the pitch of this very sharp note. |
| | |  | Eliminating the use of the first and second palm keys will help lower the pitch of this very sharp note. |

(Saxophone Fingerings, 2008 ) (The Woodwind Fingering Guide, 1998-2005)

# Pitch Tendency Packet (Saxophone)

Name_____
Date_____

**Materials needed:**

1. Instrument
2. Pencil
3. Electronic Tuner
4. Someone to help you (either a friend, parent, or band director)

**Knowing the tendency of each note is important!**

Playing the general tuning note and making a physical adjustment is not enough to play in tune. Each note on your instrument will play flat, sharp, or in tune. The purpose of the Pitch Tendency Packet is to teach you what notes are in tune and out of tune on your instrument. Once you discover what the out of tune notes are, you can manipulate the notes to play in tune by making small adjustments when you are playing.

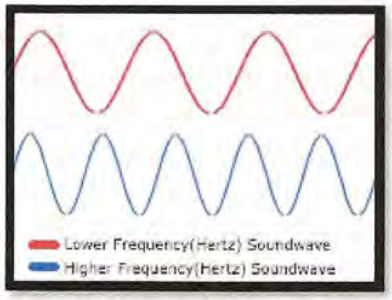
This packet will help you develop an individualized plan for tuning. As you discover which notes need special attention, it is your responsibility as a musician to figure out how **you** can play the note in tune. The tricky thing about this process is what gets you to play in tune may not work for your stand partner! Things like dynamics, reeds, embouchure, and even the brand of instrument can cause one person to play a note in tune while another plays the same note out of tune.

The last page of this packet will provide you with some tricks of the trade that you can experiment with those tricks to improve those out of tune notes. You will notice that once you start focusing on making those out of tune notes sound in tune, your tone will improve and your musician's instincts will start to anticipate intonation problems before they happen.

## What is intonation?[53]

A musical pitch you hear is actually a sound wave going through your instrument. The sound wave can travel at different speeds, or frequencies, depending on what finger combinations you are using. More fingers usually means a lower pitch and a slower sound wave, but adding playing the note at a higher octave will make the sound wave move faster.

Frequency is measured in cycles per second, or Hertz (hz). One cycle per second is equal to one Hertz. Musicians have a standard frequency that we agree will make us sound the most in tune. That frequency is measured at 440 hz. Anything higher or lower than that will not agree with the musicians' or the audience's ears.




An example of sounds at different frequencies.

## A Case of the "Wah's"[54]

If two musicians are playing the same note at exactly the same time, they're playing in tune, right? Not really. Have you ever heard two musicians play the same note at the exact same time, but instead it sounds like "wah-wah-wah"? This means the musicians have a case of the "wah's", a disease that cause musicians to play out of tune!

You are actually hearing the musicians play out of tune with each other. Each note's sound wave is moving at a slightly different frequency, making the sound waves clash. Both notes are fighting so much to be the main note heard that they are cancelling each other out!

One of the musicians should make an effort to get rid of the "wah's" by making adjustments to the way they are playing their instrument or by physically adjusting something on their instrument. If the musician makes the right adjustment, the "wah's" will start to disappear and the note will be in tune. However if the wrong adjustment is made, the "wah's" will move faster.

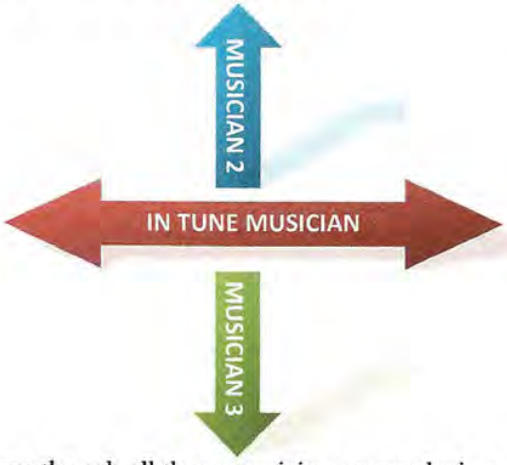
## Flat vs. Sharp[55]

Musicians think of intonation as a vertical concept. The straight line below represents In Tune Musician, a musician who always plays in tune.


[53] (Pitch (music))
[54] (Hein, 1981)
[55] (Pitch (music))

Now, another musician will play the same note along with In Tune Musician.


Finally, a third musician will play the same note with the other musicians.




Even though all three musicians were playing the same note, Musicians 2 and 3 were playing their notes at different frequencies.

Musician 2's note was played at a slightly higher frequency than In Tune Musician. Even though the both musicians were playing the same note, Musician 2's note sounds a little higher than In Tune Musician's. When notes vibrate at a slightly higher frequency than 440 hz, they are considered sharp. Musician 2 will have to lower his frequency so he can play at the same frequency as In Tune Musician.


What about Musician 3? Well, his note was played at a slower frequency than In Tune Musician's. He sounds a little lower because his note vibrates slightly slower than 440 hz. When notes vibrate at slightly slower frequencies, they are considered flat. Musician 3 will have to raise his frequency so he can play in tune with the others.


## How to Improve Intonation

Intonation will not get better by itself; it is something that will constantly need to adjust no matter your musical experience. Professional musicians struggle with intonation issues even with all the experience they have. Constant practice and reinforcement will help you understand intonation. Here are some suggestions to help you improve your intonation:

**Fill out the Pitch Tendency Chart.** The chart will tell you what notes are the notes you need to focus on. As you advance in your playing, your pitch tendencies may change. Continue to fill the chart out every four to six months to see if there are any changes.

**Practice making the adjustments!** Remember, it is your responsibility as a member of the ensemble to play in tune. If you do nothing to improve intonation, nothing will get better. Your brain will train itself to make the adjustment automatically once you've found what works and practice making those adjustments every time you see

the note. If you focus on improving only five notes a week in your practice time, you will see huge improvements in your playing.

**Use a friend, an electronic tuner, or a tuning CD to help train your ear.** If your ear doesn't know what bad intonation sounds like, then you will always play out of tune. Here are some ways to help train your ear:

- Have a friend help you by having them play each note as the In Tune Musician. If you have the "wah's", then you need to adjust to cure yourself. Have them play again and see if you adjusted correctly. Remember, if the "wah's" get better, you made the correct adjustment!
- An electronic tuner will give you a visual measurement of how flat or sharp you are. Play a note you're your eyes closed and guess if it's flat or sharp. Electronic tuners are usually around $25 and can be purchased at any music store or website. Korg brand tuners are the most common.
- Some electronic tuners also have a function where they can produce pitches so you can check for the "wah's". This is a great function to use if you are by practicing by yourself.
- "The Tuning CD" is available for download on iTunes and can be purchased online. It is a CD containing all the notes of the chromatic scale that you can play along with to check the "wah's".

**Memorize your pitch tendencies.** You can do this by creating flashcards or writing the tendencies in your music.

## The Results...

Poor intonation doesn't fix itself and is not pleasant to listen to. If you focus and stay consistent in your efforts to improve your intonation, you will also hear improvement in your tone quality. It will start to become second nature to you and you will begin to adjust your pitch without even thinking about it.

# Electronic Tuner How-to Guide


1. Turn your tuner on by pushing the on/off button.
2. Check the upper left-hand corner to see if your tuner is calibrated to 440 hz. If it is not, push either the calibration up button or the calibration down button until you see 440 on the screen.
3. Set the tuner on your stand so the screen is facing you. Make sure the microphone (indicated by the word "mic") is not covered up.
4. Play a note to move the needle. The concert pitch letter name of the note you are playing will be shown in the upper right-hand corner of the screen.
5. If you are...
   ...flat, the needle will move to the left and the light next to the flat sign will light up.
   ...in tune, the needle will stand straight up and the green light will light up.
   ...sharp, the needle will move to the right and the light next to the sharp sign will light up.
6. If your tuner has the option and wish to have the tuner produce a sound while you are playing, hit the sound button on the tuner. Hitting the sound button again will turn off the sound.
7. Turn your tuner off by pushing the on/off button when you are finished using it.

The meter on a tuner measures pitches in cents. In tune notes are measured at zero cents, which makes the needle stand straight up. As a note gets progressively flatter, the needle will move to the left measuring the note in negative cents. When a note gets increasingly sharper, the needle will move to the right measuring the note in positive cents.

# Completing Your Pitch Tendency Chart

## *Make sure you have someone to help you complete this!*

1. Fill out the top portion of the guide as completely as you can. Ask your band director for help if you have questions about the brand of your instrument or reed.
2. Warm up for at least ten minutes to allow your instrument to adjust to your body temperature.
3. Turn the electronic tuner on and get your instrument in tune with itself using the following procedure:

> 1. Adjust the mouthpiece so it is halfway on the cork.
> 2. Using a good tone, play your tuning note at a mezzo forte volume with no vibrato.
>
> Alto sax–top line F#
> Tenor sax–2nd line G
> Bari sax–1st space F#
>
> 3. Adjust the mouthpiece by pulling out if the note was sharp or pushing in if the note was flat.
> 4. Continue this process if your first attempt was not in tune.

4. Give the tuner and your Pitch Tendency Chart to your partner so they can fill it out while you play.
5. It is best to start at concert B-flat and work your way down and then start again at concert B-flat and work your way to the top to get the most accurate reading. Have your partner tell you what note to play. Play the note and have your partner write down what your pitch tendency is based on the chart below.

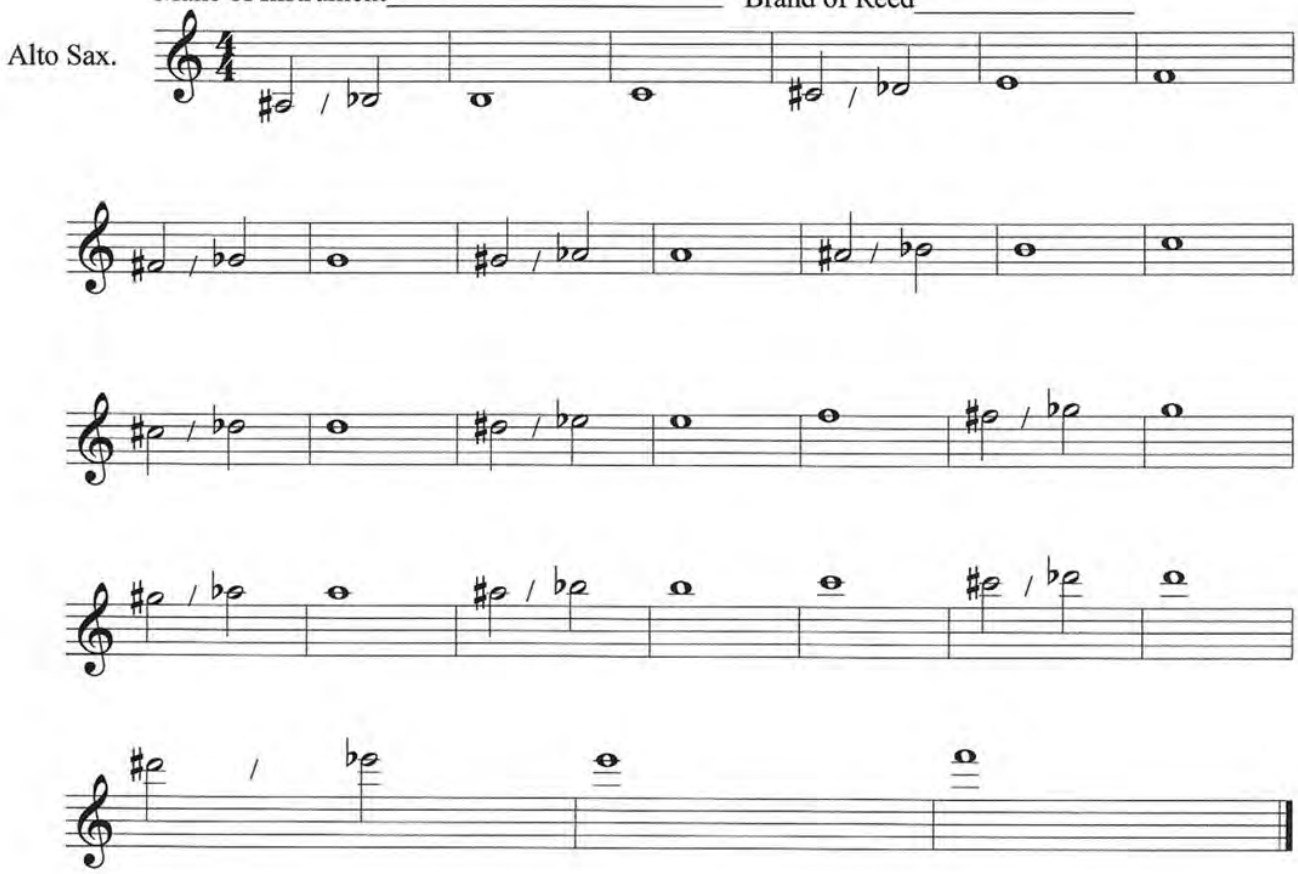
| Pitch Tendency Category | Cents |
|---|---|
| Slightly flat (Sb) | -1 to -10 cents |
| Moderately flat (Mb) | -11 to -25 cents |
| Very flat | -25 cents to -50 cents |
| Slightly sharp (S#) | +1 to +10 cents |
| Moderately sharp (M#) | +11 to +25 cents |
| Very sharp (V#) | +25 cents to +50 cents |

6. Once you have completed the chart, return it to your director. A copy will be made for their files and your completed chart will be returned to you.
7. Using the *Saxophone Quick Fixes* chart and an electronic tuner, find the tricks for each note that will make them in tune. Make a note of what works and use those tricks each and every time you play.

# Saxophone Pitch Tendency Chart

Name_____ Type of Saxophone_____ Strength of Reed_____

Make of Instrument_____ Brand of Reed_____



# Saxophone Quick Fixes

## If the note sounds sharp....

- ☑ Your embouchure may be too tight. Lip the note down by relaxing lower lip pressure on the reed.
- ☑ Your reed may be too hard. Ask your band director for a softer reed or if they can make adjustments to the reed.
- ☑ Make sure your mouthpiece is entering your mouth at a slightly upward angle.
- ☑ If the music calls for a soft dynamic, open your embouchure slightly and slow down the amount of air entering the saxophone.
- ☑ Check to see if any keys are too open or if you have felt bumpers missing from the key guards. Ask your band director to make adjustments to your horn.

## If the note sounds flat....

- ☑ Your embouchure may be too relaxed. Lip the note up by increasing lower lip pressure on the reed.
- ☑ Your reed may be too soft. Ask your band director for a harder reed or if they can make adjustments to the reed.
- ☑ Your reed may be too old. Ask your band director for a newer reed.
- ☑ Make sure your mouthpiece is entering your mouth at a slightly upward angle.
- ☑ You may have the wrong amount of mouthpiece in your mouth. Use the paper test to determine how much mouthpiece should go into your mouth.
- ☑ If the music calls for a loud dynamic, open the embouchure slightly and increase the pressure of both lips around the mouthpiece.
- ☑ Check and see if keys are too closed. Ask your band director to make adjustments to your horn.

# Bassoon

## Sound Production

The bassoon is a double reed instrument that cannot produce sound unless both blades of the reed are forced to vibrate against each other. Like all wind instruments, air is important in producing sound on a bassoon. Air is blown into the reed when the player uses the correct embouchure. Low-pressure air is created because of the tiny space between the blades of the reed, allowing a small amount of air to enter the instrument. The pressure of the lips around the reed and the air moving inside the reed causes the blades of the reed to vibrate against each other. The wave of low-pressure air moves down the bore of the bassoon and arrives at the first open tone hole. Outside air gets sucked in by the air inside the bassoon and mixes with the low-pressure air to make high-pressure air.

Figure 21: Side view of a vibrating double reed.

The air then moves back toward the reed changing all the air inside the bassoon to high-pressure air and returns the blades of the reed to its original position. Another dose of low-pressure air coming from the player mixes with the returning high-pressure air and moves towards the first open tone hole. It arrives at the open hole and forces air that is coming into the bore to exit through the hole. This continues to happen at a rapid pace until the player ends the air flow. Reed vibration controls air flow into the bassoon just as much as air flow controls reed vibration—too much or too little of each does not produce a sound.

Pitch is changed when players cover tone holes by pressing down keys. The bassoon has tone holes similar to those on clarinet and sound cannot be produced if a tone hole is not properly covered. If several tone holes are covered when playing a note, the air takes longer to travel through the bassoon. A low sound is heard by the listener. If the bassoonist wants to create a high sound, they cover less tone holes. This will force the air through the bassoon faster because there is less room for the air to move.

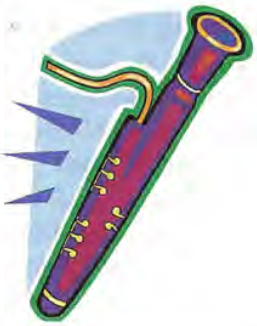
## Natural Tendencies[56]

The bassoon's natural overtone series break octaves down in the following way:

- The first octave occupies the fundamental.
- The second octave occupies the second partial.
- The third octave occupies a combination of the second and third partials.

There are compromises in the design of the bassoon that allows it to play all octaves with a good embouchure.

Bassoons are not equipped with octave or register keys so higher notes are created by covering half of the tone hole on the first finger or flicking a left thumb key to play higher notes. When the bassoonist half-holes, the fundamental frequency is eliminated from the sound and the second partial is heard. The bassoon then is letting air escape at two points—the open portion of the first finger and at the first open tone hole. The same effect happens when flicking notes in the third octave although the third partial is heard.



[56] (Westphal, 1990)

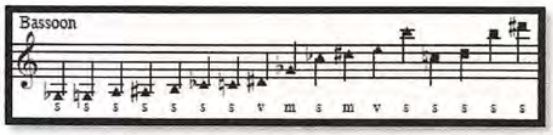



Figure 22: Bassoon pitch tendencies. The notes with triangle note heads are sharp notes. Notes with square note heads are flat notes. S stands for slightly, M stands for moderately, and V stands for very. The first note would be slightly sharp. Notes that are left off are considered in tune.

Figure 22 displays the typical tendencies of the bassoon. When broken down as individual pitches, most notes tend to be sharp however notes in the middle range of the instrument tend to be flat. Each note on the chart should be played using the standard fingering with adjustments being controlled by the player. Alternate fingerings can be used, but as a last resort.[57]

It is important to mention that the natural tendencies of the bassoon presented in this book are *typical* and are not experienced by all bassoon players. An out of tune note on one bassoon could be perfectly in tune on another. A reed could make a note sound in tune one day and terrible the next. Because of this, bassoon players need to know the instrument's natural pitch tendencies and monitor them regularly so they understand what affects them individually. The band director also should know what the natural tendencies are and provide the players with tools to improve them. This will help improve the intonation and tone for the bassoon section.

## General Tuning Procedure[58]

After soaking the reed for a few minutes, the player should then warm up for about ten minutes. A cold bassoon will sound flat until it adjusts to the player's body temperature. Bassoons cannot make physical adjustments to intonation like other woodwinds because of the sensitivity of the reed. Therefore it is extremely important for the player to be aware of the natural tendencies of their instrument and how those respond with the reed that is used.[59] In this situation, it is best for students to develop their ear by playing with another instrument or an electronic pitch.

Dynamics greatly affect the bassoon's intonation. A mezzo forte dynamic affects intonation the least and requires very little manipulation by the player. Students should always focus on using their best tone because a poor tone quality results in poor intonation. Vibrato should be avoided because the pitch is actually fluctuating from flat to sharp to create the pulses heard.

Avoid tuning if players have been sitting in rehearsal for a short amount of time because the reed will dry out and the instrument will adapt to the temperature of the room.

## Causes and Solutions to Intonation Problems[60]

Figure 23: Bassoon reeds.

### Reed

The reed will ultimately control intonation on the bassoon. Good reeds will

[57] Alternate fingerings are found on page 88.
[58] (Allen, 2002-2007)
[59] See page 93 for the Bassoon Pitch Tendency Packet.
[60] (Westphal, 1990)

more likely play in tune for the entire range of the instrument. Monitor students' reeds so that they are constantly playing on newer reeds because old reeds make intonation difficult to control. Also, monitor the strength of reed students are using and adjust as they advance. The student's ability to stay in tune and play with a good tone will get worse if they are kept on the same reed if they are not allowed to play on a stronger reed.

Soft reeds tend to play flat, especially in the high register. Any adjustment to the reed or with the embouchure cannot be controlled so students should be given a newer reed. Clipping a tiny amount of the tip will make a soft reed stiffer. However, avoid doing this if a reed is old. Any adjustments made to old reeds will not make a difference in intonation or tone. If a student is playing on a harder reed the overall pitch will be sharp, but especially in the low register. Scraping the channels of the reed will help to soften the reed.

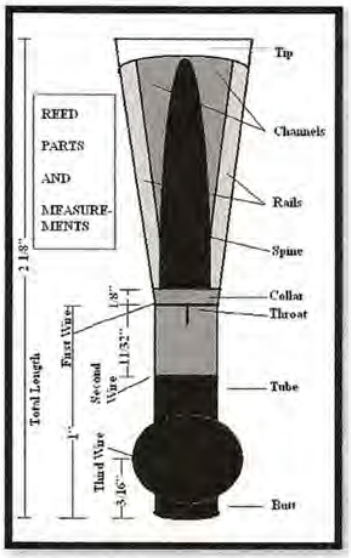



Figure 24: The parts of a bassoon reed. The channels are located below the tip.

Directors should let students experiment with different brands of reeds to find which sound the best to the players. Hand-made reeds are better than machine-made reeds because they respond well to adjustments made to improve intonation.

### Embouchure

A bad embouchure will lead to poor intonation and tone. Emphasizing good embouchure habits continually and consistently throughout a player's career is important when dealing with intonation. Most solutions to individual pitch problems on bassoon use corrections made with the embouchure. The bassoon embouchure primarily supports the reed and slight changes to this support can improve intonation. Students who use a tight embouchure or "bite" on the reed are using the lower jaw to apply pressure to the reed. This will give the player a very small dynamic range and be very sharp. To fix, have the student play a second line B using the second space C fingering. The only way the pitch will drop is by using a very relaxed embouchure or dropping the lower jaw.[61] Lower notes on the bassoon will need this relaxed embouchure to play in tune while higher notes will need a tighter embouchure.

The embouchure can make very slight adjustments to pitch by adding pressure with the lips. To raise the pitch of a flat note, squeeze the embouchure around the reed to increase support. If a note is too sharp, the pressure of the embouchure needs to be relaxed. The lower jaw can also help intonation by moving back and forth. Pulling the jaw back a little will flatten pitch while moving it forward will make pitch sharp. Combining lower jaw adjustments with the amount of reed in a player's mouth will improve intonation more. However, players should not put so much reed in their mouth that it touching the first wire because pitch will then become sharp.

[61] David Rachor 2010 ABC lecture, page DR-8.

**Dynamics**

The bassoon has a tendency to play sharp when notes are loud because of increased air speed and the use of a tighter embouchure. To lower pitch, the student should maintain the faster air speed, but relax the embouchure to allow for a bigger tip opening. To raise the pitch of softer and typically flatter notes, firm the embouchure slightly to close the tip opening while using the same speed of air.

**Playing Position**

The bassoon needs to be held in a way that the reed enters the mouth at a slightly upward angle. If the reed is at an incorrect angle, the pressure on the reed is uneven and intonation problems are difficult to control. This can be prevented by always encouraging students to sit with the correct posture so the bassoon is held at the correct angle.

**Mechanical Factors**

Teaching students to regularly monitor the condition of keys, pads and rods on their bassoon will not only keep the instrument in good playing condition but also help intonation. All keys should open and close at the same height. Unadjusted keys will affect intonation the most when they are the first open key of a fingering. A key that is too close to the tone hole will flatten the pitch, but a key that is too open will raise the pitch. Bent keys will also contribute to the flatness of a pitch. Make sure adjustments screws on each finger key are allowing keys to seal properly and check post screws to see if they are properly adjusted. Dirt tends to build up in the open tone holes and can be prevented by swabbing out the instrument on a daily basis.

# Alternate Fingering Chart (Bassoon)

## Purpose of Alternate Fingerings

Alternate fingerings are used primarily for technical ease on the saxophone. However, there are fingerings that can be used to improve intonation for some notes. Using alternate fingerings to adjust the pitch of a note should be used as a "last resort" method. Students should be taught how to make intonation adjustments with embouchure and reed adjustments using standard fingerings before alternate fingerings are taught. Not all of the fingerings included in this chart include every note on the Pitch Tendency Chart[62] nor will they be useful to every player. Some of the fingerings will be out of tune to a greater or lesser degree.

## How to Read the Alternate Fingering Chart

- The first column shows the note the alternate fingering affects.
- The second column shows the typical tendency of the note.
- The third column shows the alternate fingering.
- The fourth column explains how the alternate fingering will improve the intonation of that note.

The pitch tendency symbols used in this fingering chart will explain the typical tendency of a note.


shows that a note tends to be slightly flat.


shows that a note tends to be slightly sharp.


shows that a note tends to be moderately sharp.


shows that a note tends to be very sharp.

Most fingerings in this chart are actually slight deviations from the standard fingering. If a key is used in the standard fingering, it will be colored in black.

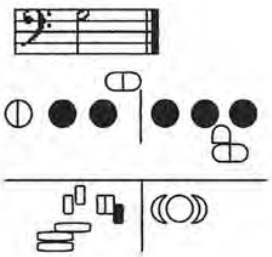
When a key is not typically used in the standard fingering, it will be colored in yellow.

Half-holed notes will be represented as:

## Examples of Alternate Fingerings

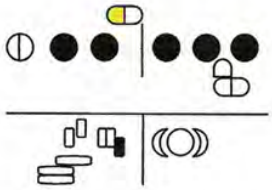
Most alternate fingerings that help intonation on the bassoon involve the standard fingering and the addition the E-flat key used by the left pinky. Adding the E-flat key will lower the pitch of a sharp note by slightly changing where air exits the bassoon. Slight changes to the air will lower the frequency of the note slightly to make it more in tune.

For example, fourth-space G is usually very sharp if just the standard fingering is used:



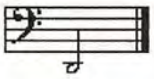
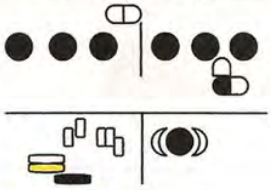
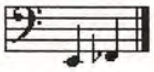
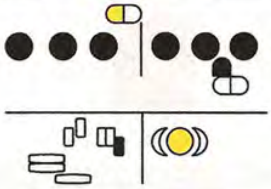
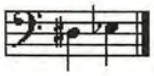
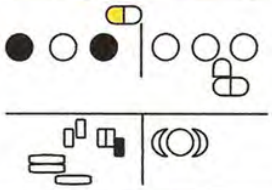
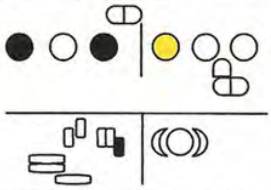
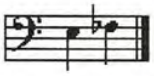
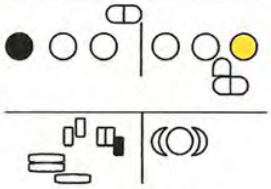
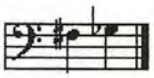
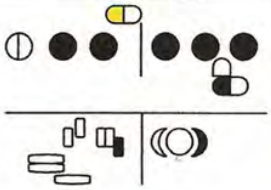
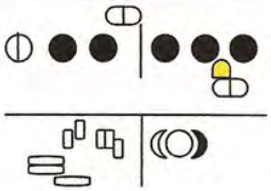
[62] See page 100 for the Bassoon Pitch Tendency Chart.

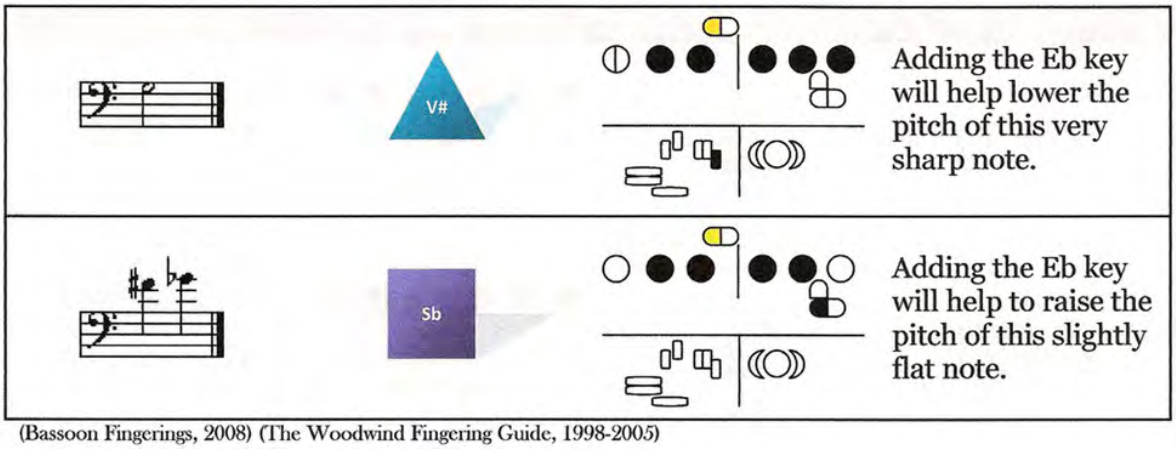
Since the E-flat key is normally closed when it is not used, air will not escape through that tone hole. Using the E-flat key to play fourth-space G will allow some air to exit out the now opened tone hole. The frequency of the air traveling through the bassoon will be slower, lowering the pitch of the note.[63]



As stated earlier, this chart is to be used as a last resort. Whether or not this fingering chart will be distributed to students is at the discretion of the director because students may mistake alternate fingerings for the standard ones. Also, this chart would not be appropriate for students who are in the first couple years of their playing career. These students need to learn the basics of flute playing and how to make intonation adjustments with their embouchure and air direction.

[63] (Bassoon Fingerings, 2008)

| Note | Tendency | Fingering | How It Helps |
|---|---|---|---|
|  |  |  | Adding the low B key will help lower the pitch of this slightly sharp note. |
|  |  |  | Adding the Eb key and the pancake key will help lower the pitch of this slightly flat note. |
|  |  |  | Adding the Eb key will help lower the pitch of this slightly sharp note. |
| | |  | Adding finger 4 will help lower the pitch of this slightly sharp note. |
|  |  |  | Adding finger 6 will help raise the pitch of this slightly flat note. |
|  |  |  | Adding the Eb key and opening more of the first finger will help lower the pitch of this moderately sharp note. |
| | |  | Adding the little finger F# key on the right hand will help lower the pitch of this moderately sharp note. |




(Bassoon Fingerings, 2008) (The Woodwind Fingering Guide, 1998-2005)

# Pitch Tendency Packet (Bassoon)

Name_____
Date_____

**Materials needed:**

1. Instrument
2. Pencil
3. Electronic Tuner
4. Someone to help you (either a friend, parent, or band director)

**Knowing the tendency of each note is important!**

Playing the general tuning note and making a physical adjustment is not enough to play in tune. Each note on your instrument will play flat, sharp, or in tune. The purpose of the Pitch Tendency Packet is to teach you what notes are in tune and out of tune on your instrument. Once you discover what the out of tune notes are, you can manipulate the notes to play in tune by making small adjustments when you are playing.

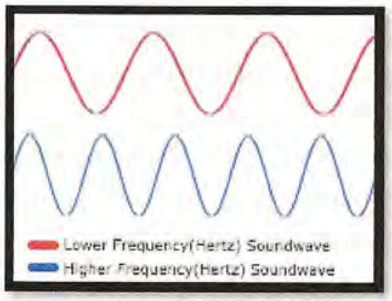
This packet will help you develop an individualized plan for tuning. As you discover which notes need special attention, it is your responsibility as a musician to figure out how **you** can play the note in tune. The tricky thing about this process is what gets you to play in tune may not work for your stand partner! Things like dynamics, reeds, embouchure, and even the brand of instrument can cause one person to play a note in tune while another plays the same note out of tune.

The last page of this packet will provide you with some tricks of the trade that you can experiment with those tricks to improve those out of tune notes. You will notice that once you start focusing on making those out of tune notes sound in tune, your tone will improve and your musician's instincts will start to anticipate intonation problems before they happen.

## What is intonation?[64]

A musical pitch you hear is actually a sound wave going through your instrument. The sound wave can travel at different speeds, or frequencies, depending on what finger combinations you are using. More fingers usually means a lower pitch and a slower sound wave, but adding playing the note at a higher octave will make the sound wave move faster.

Frequency is measured in cycles per second, or Hertz (hz). One cycle per second is equal to one Hertz. Musicians have a standard frequency that we agree will make us sound the most in tune. That frequency is measured at 440 hz. Anything higher or lower than that will not agree with the musicians' or the audience's ears.




An example of sounds at different frequencies.

## A Case of the "Wah's"[65]

If two musicians are playing the same note at exactly the same time, they're playing in tune, right? Not really. Have you ever heard two musicians play the same note at the exact same time, but instead it sounds like "wah-wah-wah"? This means the musicians have a case of the "wah's", a disease that cause musicians to play out of tune!

You are actually hearing the musicians play out of tune with each other. Each note's sound wave is moving at a slightly different frequency, making the sound waves clash. Both notes are fighting so much to be the main note heard that they are cancelling each other out!

One of the musicians should make an effort to get rid of the "wah's" by making adjustments to the way they are playing their instrument or by physically adjusting something on their instrument. If the musician makes the right adjustment, the "wah's" will start to disappear and the note will be in tune. However if the wrong adjustment is made, the "wah's" will move faster.

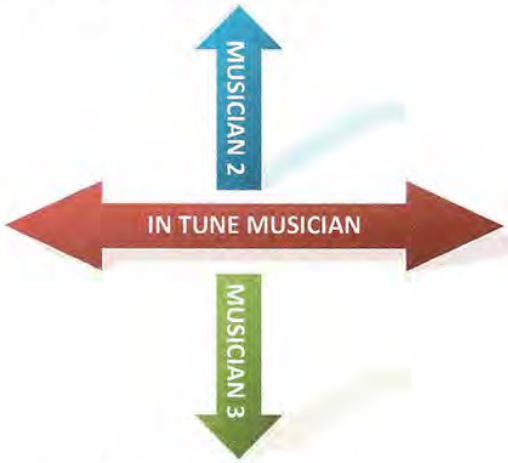
## Flat vs. Sharp[66]

Musicians think of intonation as a vertical concept. The straight line below represents In Tune Musician, a musician who always plays in tune.


[64] (Pitch (music))
[65] (Hein, 1981)
[66] (Pitch (music))

Now, another musician will play the same note along with In Tune Musician.


Finally, a third musician will play the same note with the other musicians.




Even though all three musicians were playing the same note, Musicians 2 and 3 were playing their notes at different frequencies.

Musician 2's note was played at a slightly higher frequency than In Tune Musician. Even though the both musicians were playing the same note, Musician 2's note sounds a little higher than In Tune Musician's. When notes vibrate at a slightly higher frequency than 440 hz, they are considered sharp. Musician 2 will have to lower his frequency so he can play at the same frequency as In Tune Musician.


What about Musician 3? Well, his note was played at a slower frequency than In Tune Musician's. He sounds a little lower because his note vibrates slightly slower than 440 hz. When notes vibrate at slightly slower frequencies, they are considered flat. Musician 3 will have to raise his frequency so he can play in tune with the others.


## How to Improve Intonation

Intonation will not get better by itself; it is something that will constantly need to adjust no matter your musical experience. Professional musicians struggle with intonation issues even with all the experience they have. Constant practice and reinforcement will help you understand intonation. Here are some suggestions to help you improve your intonation:

**Fill out the Pitch Tendency Chart.** The chart will tell you what notes are the notes you need to focus on. As you advance in your playing, your pitch tendencies may change. Continue to fill the chart out every four to six months to see if there are any changes.

**Practice making the adjustments!** Remember, it is your responsibility as a member of the ensemble to play in tune. If you do nothing to improve intonation, nothing will get better. Your brain will train itself to make the adjustment automatically once you've found what works and practice making those adjustments every time you see

the note. If you focus on improving only five notes a week in your practice time, you will see huge improvements in your playing.

**Use a friend, an electronic tuner, or a tuning CD to help train your ear.** If your ear doesn't know what bad intonation sounds like, then you will always play out of tune. Here are some ways to help train your ear:

- Have a friend help you by having them play each note as the In Tune Musician. If you have the "wah's", then you need to adjust to cure yourself. Have them play again and see if you adjusted correctly. Remember, if the "wah's" get better, you made the correct adjustment!
- An electronic tuner will give you a visual measurement of how flat or sharp you are. Play a note you're your eyes closed and guess if it's flat or sharp. Electronic tuners are usually around $25 and can be purchased at any music store or website. Korg brand tuners are the most common.
- Some electronic tuners also have a function where they can produce pitches so you can check for the "wah's". This is a great function to use if you are by practicing by yourself.
- "The Tuning CD" is available for download on iTunes and can be purchased online. It is a CD containing all the notes of the chromatic scale that you can play along with to check the "wah's".

**Memorize your pitch tendencies.** You can do this by creating flashcards or writing the tendencies in your music.

## The Results...

Poor intonation doesn't fix itself and is not pleasant to listen to. If you focus and stay consistent in your efforts to improve your intonation, you will also hear improvement in your tone quality. It will start to become second nature to you and you will begin to adjust your pitch without even thinking about it.

# Electronic Tuner How-to Guide


1. Turn your tuner on by pushing the on/off button.
2. Check the upper left-hand corner to see if your tuner is calibrated to 440 hz. If it is not, push either the calibration up button or the calibration down button until you see 440 on the screen.
3. Set the tuner on your stand so the screen is facing you. Make sure the microphone (indicated by the word "mic") is not covered up.
4. Play a note to move the needle. The concert pitch letter name of the note you are playing will be shown in the upper right-hand corner of the screen.
5. If you are...
   ...flat, the needle will move to the left and the light next to the flat sign will light up.
   ...in tune, the needle will stand straight up and the green light will light up.
   ...sharp, the needle will move to the right and the light next to the sharp sign will light up.
6. If your tuner has the option and wish to have the tuner produce a sound while you are playing, hit the sound button on the tuner. Hitting the sound button again will turn off the sound.
7. Turn your tuner off by pushing the on/off button when you are finished using it.

The meter on a tuner measures pitches in cents. In tune notes are measured at zero cents, which makes the needle stand straight up. As a note gets progressively flatter, the needle will move to the left measuring the note in negative cents. When a note gets increasingly sharper, the needle will move to the right measuring the note in positive cents.

# Completing Your Pitch Tendency Chart

## *Make sure you have someone to help you complete this!*

1. Fill out the top portion of the guide as completely as you can. Ask your band director for help if you have questions about the brand of your instrument or reed.
2. Warm up for at least ten minutes to allow your instrument to adjust to your body temperature.
3. Give the tuner and your Pitch Tendency Chart to your partner so they can fill it out while you play.
4. It is best to start at concert B-flat and work your way down and then start again at concert B-flat and work your way to the top to get the most accurate reading. Have your partner tell you what note to play. Play the note and have your partner write down what your pitch tendency is based on the chart below.

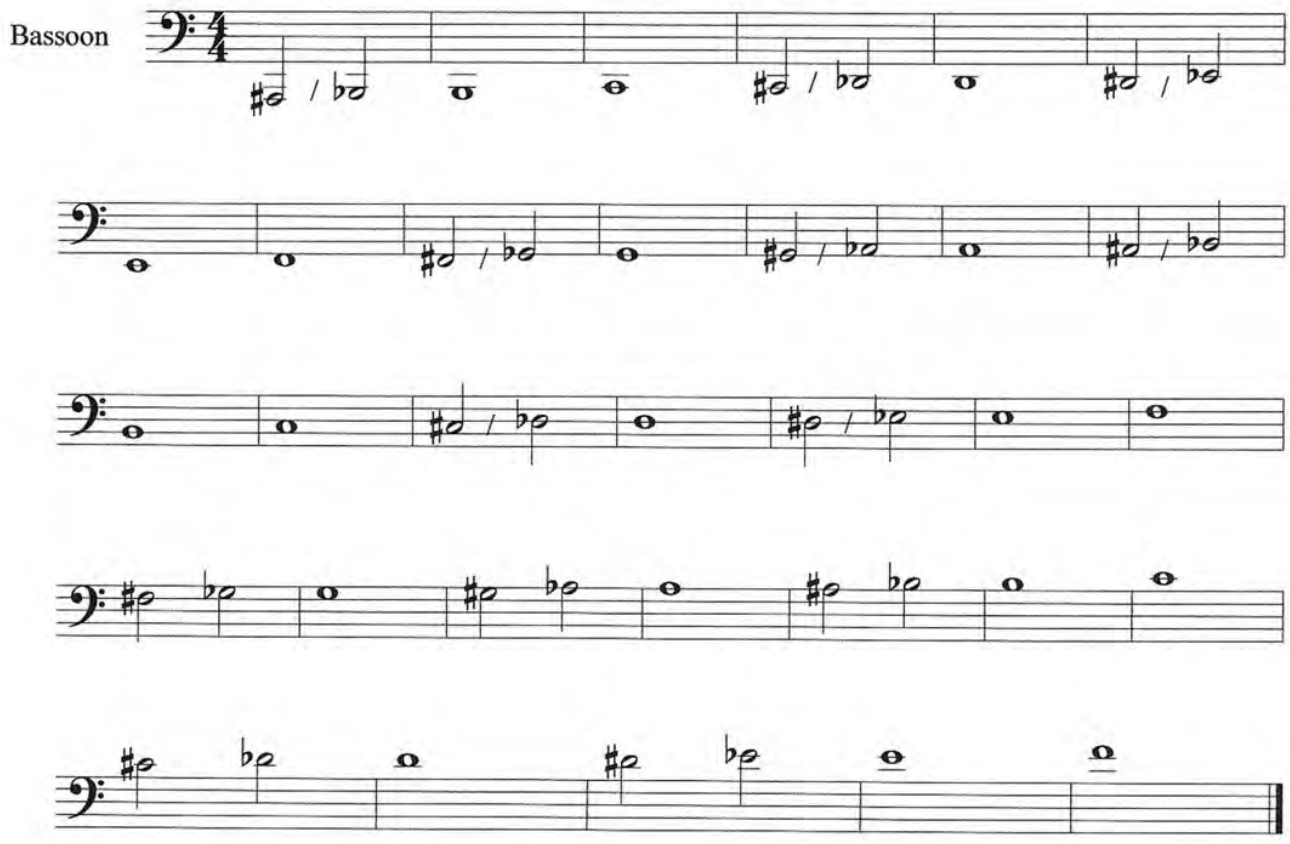
| Pitch Tendency Category | Cents |
|---|---|
| Slightly flat (Sb) | -1 to -10 cents |
| Moderately flat (Mb) | -11 to -25 cents |
| Very flat | -25 cents to -50 cents |
| Slightly sharp (S#) | +1 to +10 cents |
| Moderately sharp (M#) | +11 to +25 cents |
| Very sharp (V#) | +25 cents to +50 cents |

5. Once you have completed the chart, return it to your director. A copy will be made for their files and your completed chart will be returned to you.
6. Using the *Bassoon Quick Fixes* chart and an electronic tuner, find the tricks for each note that will make them in tune. Make a note of what works and use those tricks each and every time you play.

# Bassoon Pitch Tendency Chart

Name_____ Brand of Instrument_____

Strength of Reed_____ Brand of Reed_____



# Bassoon Quick Fixes

## If the note sounds sharp....

- ☑ Your reed may be too hard. Ask your band director for a softer reed or if they can make adjustments to the reed.
- ☑ Your lower jaw will need to be pushed slightly forward.
- ☑ Your embouchure may be too tight causing too much pressure on the reed. Relax your embouchure.
- ☑ You might not have enough reed in your mouth. Take more reed in your mouth.
- ☑ If the music calls for a loud dynamic, relax the embouchure.
- ☑ Check to see if you have any keys that are too open. Ask your band director to make adjustments.

## If the note sounds flat....

- ☑ Your reed may be too soft. Ask your band director for a harder reed or if they can make adjustments to the reed.
- ☑ Your lower jaw will need to be pulled slightly back.
- ☑ Your embouchure may be too loose and not enough pressure may be on the reed. Tight your embouchure slightly.
- ☑ You may have too much reed in your mouth. Put less reed in your mouth.
- ☑ If you are playing high notes, take more reed in your mouth. Be careful not to let the upper lip touch the first wire.
- ☑ If the music calls for soft dynamic, tighten the embouchure slightly.
- ☑ Check to see if you have any keys that are too close to the tone hole. Ask your band director to make adjustments.

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