When the notes sound strange, it's usually the student's fault, (but not always).

A handy reference guide on how to do quick and easy classroom repairs plus instrument maintenance tips to lower your repair costs.
INSTRUMENT CARE AND REPAIR FOR THE (busy) BAND DIRECTOR
UMEA Clinic February 4, 2011 - John Talcott

General Do’s and Don’ts

😊 DO remember the Physician’s Oath when attempting repairs PRIMUM NON NOCERE (first do no harm).
😊 DO use zip ties or twist ties to secure a broken brass brace or saxophone keyguard with missing screw(s).
😊 DO use post-it notes, blue masking, or teflon tape to replace or build up tenon, mouthpiece or neck corks.
😊 DO use a “Bobcat” style mouthpiece puller to for stuck mouthpieces.
😊 DO use penetrating oil and mild heat from a hand torch to remove a stuck tuning slide.
😊 DO use a plastic or rawhide hammer to loosen a stuck valve cap by tapping around the circumference.
😊 DO use only a needle fine tip oiler to oil woodwind keys and then only use it sparingly.
😊 DO use only smooth jaw flat and round nose pliers to straighten and adjust instrument keys.
😊 DO use Armor All to clean and protect case finishes.
😊 DO use Lemon Pledge to clean and polish lacquered finishes.

😊 DON’T use masking tape to put names on cases. The adhesive is difficult to get off. Luggage tags work best.
😊 DON’T use rubber bands to hold loose or broken parts together, they leave marks in the metal.
😊 DON’T use rubber bands to replace broken springs on silver or lacquered instruments, they leave marks.
😊 DON’T use Super Glue, Gorilla Glue, Epoxy, etc. on any instrument (thick super glue is ok for finger pearls).
😊 DON’T turn adjustment screws unless you are familiar with woodwind regulation, especially on oboes!
😊 DON’T use a screwdriver or any other tool to drive out a piston or rotary valve.
😊 DON’T use vice grips or serrated jaw pliers to try to turn or remove stuck parts.
😊 DON’T use a towel, belt, cloth or other implement to try to jerk out a stuck tuning slide.
😊 DON’T use the “valve oil” style woodwind key oiler as it deposits far too much oil that gets all over the body.
😊 DON’T use grease or oil to lubricate sax neck or flute tenons it will attract pieces of grit that can score the surface.
😊 DON’T wash hard rubber mouthpieces in hot water. They can turn a horrible army green color and smell bad.
😊 DON’T try to replace missing guard screws by forcing the wrong size screw or a metal tapping screw into the hole.
😊 DON’T assume students (or parents) already know how to properly care for their instruments—teach them!
😊 DON’T try to remove a stuck oboe swab or allow a student to try, ALWAYS take it to the shop.

AN OUNCE OF PREVENTION. . .

Save time at the end of class for students to empty the water out of brass and swab woodwinds before putting away.
Always keep saxophone and flute metal tenons and receivers clean and shiny—never use grease or oil.
Valves and casings on piston valve brass should be cleaned and stored dry (without oil) over the summer, case upright.
Encourage students to have instruments either in their hands or in its case at all times.

Only allow students to use neck straps that have a locking clasp rather than an open hook on the end.
Never allow students to leave their instruments unattended on chairs, the floor, music stands, or on bleachers.

Reinforce un-soldered braces immediately with twist ties or zip cable ties to prevent further damage to the tubing
Encourage students to check for loose foot joints, head joint crowns, bell tenon corks, BEFORE the parade or field drill.
Pull and grease all brass tuning slides prior to storing instrument for long periods of time.
Always remember to give rotary valves a generous dose of oil before storing for the summer.
Instruct students on the proper care and maintenance of their instruments, and remind them regularly.
Remind clarinet players to press a ring on the top joint and not press a ring on the bottom joint assembling joints.
Select a manufacturer of percussion hardware and always buy the same brand so that parts are interchangeable.
**Piccolo/Flute**

If the instrument suddenly won’t play certain notes or won’t play at all

- Check to see if any springs have come off the spring cradles—especially the trill keys. Use a spring hook to replace.
- Check the A key to see if it wobbles. With a well fitting screwdriver, tighten the rod until the A key binds and then back 1/4 turn. Your repair shop can fit the C screw rod to tighten snugly to stay in place without causing the A key to bind.
- Check the Ab key lever to see if it is bent and touching other keys. Using your fingers carefully bend the Ab key back into position so it doesn’t stay open.

If the instrument will play everything but low C

- Check to see if pressing the roller on the foot joint closes the C# key. Holding the C# key down with your finger use your pad slick to gently pry up on the low C key. Then check with a feeler gauge to see if both keys close when the roller is pressed. If you went too far push down and check again.

If the headjoint tenon is stuck or won’t go in

- There is either something lodged in the receiver or the parts are badly out of round. Take to the repair shop. Attempting to force the part will only cause further damage.

If the footjoint is loose and falls off

- The tenon is worn down and needs to be resized with the proper tools at the repair shop when convenient. Use a small piece of blue masking tape or a piece of a post it note on the tenon as a temporary fix.

If the headjoint cork is too loose

- Wrap with a layer of blue masking tape, or several turns of plumber’s teflon tape. Take to repair shop for new cork.

**Clarinet**

If the instrument suddenly stops playing or squeaks on every note

- Check to make sure there is a slight delay (lost motion) when the A key is pressed before it touches the Ab key. If there isn’t, use a well fitting screwdriver to back the adjustment screw on top of the A key out until there is a slight motion before it contacts the Ab key. To keep it from going out of adjustment again, back the screw out two complete turns and apply a tiny drop of purple thread lock to the screw and then readjust.
- Check the four right side keys to see if any are bent and staying open. Straighten the bent key(s) using fingers if possible or by using smooth jaw pliers and/or pad slick. An old trombone mouthpiece shank does a good job as well.

The 1 and 1 fingered Bb/Eb is stuffy or won’t play, OR none of the RH notes respond

- Check to see if pressing the first ring on the lower joint closes the inline Bb/Eb key pad on the upper joint AND the first pad on the lower joint at the same time. If not, use a pair of smooth jaw pliers to gently bend the bridge key up or down so that when the first ring on the bottom is pressed that the Bb/Eb pad closes at the same time as the first pad on the bottom joint. Check both pads closing with a feeler gauge. The upper pad can be adjusted a bit lighter than the lower.

If the notes low E and middle B are stuffy or unresponsive when pressing only the right or left hand E/B alone

- Check to see if pressing the RH E/B key closes the F/C pad completely. A common problem is that the F/C key gets bent down by using too much finger pressure. Holding the F/C pad closed gently lift the crow’s foot with your pad slick and test with feeler gauge to see if pressing the E/B key closes the F/C and the E/B pads with the same pressure. If you went too far, gently push down on the F/C lever to lower the crow’s foot and test again.

If all or part of a tenon cork breaks or falls off

- If parts of the cork are still attached remove the remaining cork with your fingernail. Clean the track with alcohol or Windex, cut a 3/8” strip of blue masking tape and keep wrapping around the tenon until the parts fit snugly together.
- If the cork is still intact, but has come loose on one end. Add a piece of blue masking tape to hold the cork together until it can be repaired. Do not use super glue to try to glue the cork back down.

If a pivot screw holding a key is missing.

- First have the player check inside the case and around where he/she sits. Insert the end of a paper clip through the post and into the key. Then bend the paperclip around the post to hold it in place and cut off the excess with wire nippers.
If the cleaning swab is stuck in the upper joint
- Use a golf tee in the thumb hole to nudge the cloth back out the way it came in. When you can reach it, try to grip the cloth through the bottom with long nose forceps. Do not try to force the swab out the top end or push it by hammering on a stick or screwdriver. Encourage students to buy or make a two string cloth and to pull the cloth through one joint at a time.

**Saxophone**

If the instrument will not play in the lower octave
- Check to see that there is at least a 1/16” gap between the neck octave key ring and the post extending from the body. To adjust, place your thumb between the ring and the body of the neck and then gently push down on the octave key. Should you go too far, place a pad slick or tongue depressor under the pad and carefully push back on the ring until the desired gap is achieved.

If the 4th line D does not play or goes to a higher note (overtone)
- Press the thumb octave lever hard without pressing any other keys and see if the neck octave key opens. As in the previous case, make sure there is a gap between the ring and the post. On some saxes with a “spongy” cork stopping the thumb octave lever a wider gap may be necessary.

If the notes down to low C respond but low C#, B, and Bb do not
- Keeping the bottom hand fingers down press the G# key to see if the G# pad opens slightly. Using your leak light or feeler gauge to check, turn the adjusting screw above the G# key cup until both the F# and G# pads close completely when the F key is pressed with the G# lever held down. Once the correct adjustment is found, turn back two full turns, add a small drop of purple thread lock, and then quickly readjust and recheck.

If the neck will not tighten
- First make sure the tightening screw is inserted into the unthreaded side first. If the neck still turns when the screw is tightened take it to the shop to have the neck tenon expanded and refit. Many saxes play stuffy because the neck leaks.

If all the notes work except G which is stuffy or won’t play
- Check to see if the G# pad is closing completely when the G# key is not pressed. While holding down the G# touchpiece press down slightly on the lever that closes the G# pad. There should be a slight “lost motion” when the low B and low C# keys are pressed before they touch the tabs on the G# touchpiece. If there is too much motion, bend the lever back up with your fingers or pad slick.

If the neck cork is broken or missing
- Wrap with enough blue masking tape to allow the tuned mouthpiece to fit snugly. Take to repair shop for new cork.

If key guard screws are missing
- Use plastic twist ties to secure guard. Do not force screw with wrong thread or metal tapping screw into hole.

If a key spring is broken or missing
- Try to hold the key open by rigging a ponytail elastic to the key arm. Do not use ordinary rubber bands. They will quickly mar the finish. This can be done on other woodwinds as well.

If keys are out of regulation (not closing together) because a cork is missing between the key foot and back bar
- First remove the guard or any side keys that are in the way. Then glue the appropriate thickness of cork to the top of the key foot using contact cement, or make a small patch the thickness of the cork by layering blue masking tape and cutting to size. Check the adjustment with a leak light. On models with adjusting screws, set the adjusting screw.

If all of a sudden some notes are not playing properly
- Check to make sure all pivot screws and screw rods are tightened all the way. Tighten with the correct size quality screwdriver. Check to insure keys still move freely. If a key binds, back the pivot screw out till the key releases and apply purple thread lock to keep the screw in place.

*To test the octave key adjustment on saxes---finger G and forcefully hit the thumb octave key several times watching the neck octave pad. It should not move if in good adjustment. Then finger from G to A while pressing the thumb octave. The neck and body octave keys should alternate opening and closing completely.*
DIAGNOSING AND REPAIRING COMMON BRASS PROBLEMS

Trumpet/Cornet/Baritone

If air won’t pass easily through the instrument and/or it won’t play
- Starting with the 3rd valve, remove each valve one at a time to make sure it is in the right casing and facing the right direction. The numbers usually face the mouthpiece. Reinstall the valves correctly and try again. Remember to teach beginning players to remove one valve at a time and that the numbers face front.

If a valve keeps spinning in the casing and won’t click into place
- Check each of the valve guides one at a time to make sure they are right side up and are not broken. Use another valve as a model if you are not sure. If the guide is broken, take to the repair shop.

If the valves move but are sluggish and stick occasionally
- Remove the valves and valve caps one at a time. Clean the valve casing with a soft cloth on a short cleaning rod. Clean the valve using a woodwind mouthpiece brush in warm soapy water. Dry thoroughly and replace with one or two drops of valve oil.
- If cleaning doesn’t solve the problem, look for dents and dings in the valve case. Take to shop.

If just the 2nd valve is binding
- Press the button of the 2nd valve slide in toward the valve casing. If it make the valve worse, then try the following. Remove the 2nd and 3rd valve slides. Put the 3rd valve slide where the 2nd valve slide normally goes. (This may not work on baritones). Pull carefully and gently toward the bell using the leverage of the 3rd valve slide to pull the valve casing back to where it was before it got pushed in. Another technique is to put a strap in the 2nd valve slide and while pushing the valve slide forward with your thumb, give the strap a sharp tug in the same direction. After two tugs take to shop.

If the upper or lower valve caps are stuck
- Tap around the circumference of the cap with a small rawhide or plastic hammer. If this fails apply a few drops of PB Blaster penetrating oil on the threads, wait an hour and try the first technique again. Once removed, clean the casing threads using valve oil and a Q-Tip and then apply a small amount of tuning slide grease to the threads before reinstalling.

If the tuning slide or a valve slide are stuck
- Try to remove by walking the slide back and forth as you pull on it. If this fails, add PB Blaster penetrating oil to the opening and then carefully heat the tubing with a small hand held torch, constantly moving the flame back and forth. If this fails add more PB Blaster and let sit overnight. Try again the next day first without heat and then with. If it remains stuck, take to the repair shop.

If the water key spring is weak.
- Using smooth jaw flat nose pliers, bend the “U” portion of the spring up towards the key.

If the water key spring is broken
- Take the slide out and use a pony tail covered or clear elastic around the key to replace the spring. Do not use regular rubber bands as they contain sulphur which will mar the finish.

If a mouthpiece shank is dent or out of round
- Use a mouthpiece truing tool (JLSmith.com $30.00) inserting and tapping around the outside with a plastic or rawhide mallet to reshape.
If the mouthpiece is stuck
- Use a “Bobcat” style mouthpiece puller. Do not try to remove using vice grips or serrated jaw pliers.

If a valve button pearl comes off
- Glue back on with thick (gap filling) super glue. This is the same on saxophones. This is the ONLY repair for which super glue is recommended. Keep a bottle of un-cure handy for when you use too much and glue your finger to the key.

If a brace breaks loose at the solder joint
- Secure the brace immediately with a plastic coated twist tie or plastic zip cable ties. A loose brace can create a domino effect causing damage that is much more expensive to fix—especially in the area of the leadpipe.

If something becomes stuck inside the tubing
- Poking and prodding inside an instrument can cause damage to the tubing and valves. Take to the repair shop.

Rotary Valve Brass - French Horn, Tuba, Trombone F Attachment

If a valve is stuck
- First, do not try to free the valve by forcing the lever. Carefully try to turn the valve stop arm with your fingers or smooth jaw pliers. Give the valve a healthy dose of valve oil using the following method. Pull the adjoining valve slide, empty the water, and place 8 - 12 drops of rotary valve oil into the valve slide itself. With the open tubes facing up, put the slide back onto the instrument and then turn the horn 180 degrees to let the oil run down into the valve. Wait for the oil to penetrate then work the valve stop arm vigorously to “clean” and oil the valve in its casing. Remember this is a stop gap measure. Take the instrument to the shop as soon as possible for a professional cleaning to remove corrosion and debris that are keeping the valves from moving freely. An alternate/additional way to oil the valve is to remove the valve cap, place oil on the gap around the circumference, and then pull the valve slide out (without depressing the valve) creating a suction that will draw the oil into the valve casing.

If a string is broken
- Loosen screws (C) and (E) with a small screwdriver. Cut a piece of string approximately nine inches long and tie a knot in one end. Begin by threading the string through the hole at the bottom of the rod (A). Start from the outside of the rod and thread toward the valve. The knot must provide a stop at the hole. With the stop arm (B) to the right of the rod (A), bring the string around the top of the rotor stem in a clockwise direction, then loop the string entirely around the small screw (C) in a counter clockwise direction. Continue around the bottom of the stop arm (B) to the hole (D) near the top of the rod. Thread the string through this hole and loop it under the head of the small screw (E) on the rod in a clockwise direction. Now pull the string fairly taut so that no lost motion occurs when depressing the trigger lever. Tighten screw (E) enough to hold the lever in place. Position the lever so the string rod is parallel to the rotor-casing top. Tighten the string screw.

[Copied with permission from Yamaha publication “How to Maintain Your Yamaha French Horn”]

Broken braces, dirty and corroded valve and tuning slides, stuck mouthpiece, stuck valve caps, things stuck inside tubing
- Use the same techniques as used on piston brass.

Trombone

If the main slide is stuck or does not move freely
- Thoroughly clean inner and outer slide using a soft cloth on a long cleaning rod. If this does not work to allow the slide to move freely, then the problem is a mechanical one. IMPORTANT: Most trombone main slide repairs require specialized tools and skills. Take to the repair shop as soon as possible. Continued use of a damaged slide can further damage the inner slide and reduce the life of the instrument.

Broken braces, dirty and corroded tuning slide, stuck mouthpiece, water key problems
- Use the same techniques as used on piston brass.
<table>
<thead>
<tr>
<th>ESSENTIAL TOOLS AND SUPPLIES</th>
<th>SOURCE</th>
<th>DESCRIPTION</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouthpiece puller*</td>
<td>votawtool.com</td>
<td>bobcat mouthpiece puller #2778</td>
<td>$45.00</td>
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<tr>
<td>Quality Screwdrivers</td>
<td>votawtool.com</td>
<td>4 most needed sizes #6707, 6710, 6713, 6716</td>
<td>$20.00</td>
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<tr>
<td>Quality pliers*</td>
<td>ottofrei.com</td>
<td>set of 3 Value Line 5 1/8” pliers</td>
<td>$24.00</td>
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<tr>
<td>Rawhide mallet*</td>
<td>musicmedic.com</td>
<td>small rawhide 1” diameter</td>
<td>$10.00</td>
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<td>Pad slick*</td>
<td>musicmedic.com</td>
<td>regular style</td>
<td>$2.00</td>
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<tr>
<td>Sheet cork (foot corks)*</td>
<td>musicmedic.com</td>
<td>3.5” x 1” - 6 thicknesses</td>
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<tr>
<td>Alcohol Lamp*</td>
<td>musicmedic.com</td>
<td>low heat for melting glue, heating keycups</td>
<td>$6.00</td>
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<tr>
<td>Rotor valve string*</td>
<td>wwbw.com</td>
<td>Yamaha yellow 2 meters #420332</td>
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<tr>
<td>Micro Pad and Cork Cement*</td>
<td>wwbw.com</td>
<td>good for replacing waterkey corks</td>
<td>$6.00</td>
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<tr>
<td>Leak Light*</td>
<td>Home Depot</td>
<td>12” flexible incandescent “rope light”</td>
<td>$4.00</td>
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<tr>
<td>Single edge razor blades</td>
<td>local hardware store</td>
<td>Package of 10 $2.00, of 100 $10.00</td>
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<tr>
<td>Yamaha powder paper</td>
<td>local music store</td>
<td>treated with a light powder</td>
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<tr>
<td>Contact cement*</td>
<td>Lowe’s Hardware</td>
<td>Weldwood 3 oz. Bottle with brush in cap</td>
<td>$5.00</td>
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<tr>
<td>Assortment of sewing needles*</td>
<td>local variety store</td>
<td>use medium to large</td>
<td>$3.00</td>
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<tr>
<td>Blue painters masking tape*</td>
<td>local hardware store</td>
<td>3M Scotch-Blue 3/4”</td>
<td>$6.00</td>
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<tr>
<td>Alphabet foam beads*</td>
<td>Walmart/craft store</td>
<td>a good substitute for waterkey corks</td>
<td>$3.00</td>
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<tr>
<td>Zip/Cable ties*</td>
<td>local hardware store</td>
<td>In electrical section</td>
<td>$3.00</td>
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<tr>
<td>Spring hook*</td>
<td>homemade</td>
<td>see: jbtsaxmusic.homestead.com/tools.html</td>
<td>$2.00</td>
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<tr>
<td>Feeler gauge</td>
<td>homemade</td>
<td>see: jbtsaxmusic.homestead.com/tools.html</td>
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<tr>
<td>Pin Vice</td>
<td>homemade</td>
<td>see: jbtsaxmusic.homestead.com/tools.html</td>
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**Sub Total** $164.00

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<th>USEFUL TOOLS AND SUPPLIES</th>
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<th>DESCRIPTION</th>
<th>COST</th>
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<tbody>
<tr>
<td>Quality Screwdrivers*</td>
<td>votawtool.com</td>
<td>set of 8 #6709 $37.00 (alternate to set of 4)</td>
<td>$37.00</td>
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<tr>
<td>Mouthpiece shank tool</td>
<td>jlsmithco.com</td>
<td>shank truing tool #700051</td>
<td>$30.00</td>
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<tr>
<td>Large duckbill pliers*</td>
<td>musicmedic.com</td>
<td>large smooth jaw pliers</td>
<td>$20.00</td>
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<tr>
<td>Pad slick*</td>
<td>musicmedic.com</td>
<td>double sided medium size</td>
<td>$5.00</td>
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<tr>
<td>Spring hook*</td>
<td>musicmedic.com</td>
<td>double sided in case</td>
<td>$7.00</td>
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<tr>
<td>Plastic mallet*</td>
<td>musicmedic.com</td>
<td>plastic 1.375” diameter</td>
<td>$10.00</td>
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<tr>
<td>Water key corks</td>
<td>jlsmithco.com</td>
<td>132 synthetic assortment #700048</td>
<td>$39.00</td>
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<tr>
<td>Blazer ES1000 Micro Torch</td>
<td>amazon.com</td>
<td>angled head, refillable w/ butane cartridges</td>
<td>$46.00</td>
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<tr>
<td>Miracle Cloth*</td>
<td>Ebay/Summerhays</td>
<td>all purpose polishing cloth</td>
<td>$4.00</td>
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<tr>
<td>Cotton pipe cleaners*</td>
<td>local tobacco store</td>
<td>Dills brand Yellow Pack non bristle</td>
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<tr>
<td>Q-Tip Cotton swabs</td>
<td>local pharmacy</td>
<td>off brands are not as strong</td>
<td>$5.00</td>
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<tr>
<td>Coated or clear ponytail bands*</td>
<td>local cosmetics store</td>
<td>does not contain sulphur like rubber bands</td>
<td>$5.00</td>
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<tr>
<td>Pivot and roller lubricant*</td>
<td>musicmedic.com</td>
<td>.50 oz syringe Ultimax</td>
<td>$7.50</td>
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<tr>
<td>Needle oiler*</td>
<td>musicmedic.com</td>
<td>10 ml medium viscosity</td>
<td>$7.50</td>
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<tr>
<td>Long nose forceps*</td>
<td>Ebay/ Harbor Freight</td>
<td>useful to remove stuck cleaning cloths</td>
<td>$8.00</td>
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<tr>
<td>LED Leak Light</td>
<td>homemade</td>
<td>see: jbtsaxmusic.homestead.com/leaklight.html</td>
<td>$10.00</td>
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<tr>
<td>Purple MXLOC 22 threadlock*</td>
<td>Harbor Freight</td>
<td>to secure pivot &amp; adjusting screws, use</td>
<td>$3.00</td>
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<tr>
<td>Blu-Tack or other reusable adhesive</td>
<td>office supply store</td>
<td>use to reattach pads that have come loose</td>
<td>$8.00</td>
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<tr>
<td>Plastic coated twist tie wire</td>
<td>household item</td>
<td>found on appliance electrical cords</td>
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</table>

**Sub Total** $254.00

* Recommended for a complete repair kit

Approximate cost of kit items $250.00
### Additional Sources of Tools and Equipment

- **musicmedic.com** consumer friendly, saxophone oriented, can order online
- **ferreestools.com** professional tools and supplies, site difficult to navigate, phone orders only
- **jlsmithtools.com** a large variety of brass and woodwind tools and supplies, can order online
- **votawtool.com** high quality tools that can be ordered online
- **micromart.com** called “the small tool specialists”, everything under the sun
- **ottofrei.com** quality tools for jewelers, metal smiths, technicians and hobbyists
- **micro-tools.com** a great selection of camera and watch repair tools and supplies
- **instrumentclinic.com** very overpriced tools and supplies, limited selections
- **thebandroom.biz** another overpriced site, but with a wider selection
- **doctorsprod.com** an excellent source for bore oil, quality cork grease, key oil, and pad cleaning solution

### Additional Sources of Band Instrument Repair Information

- **musicmedic.com** a large number of well written articles for the do-it-yourself saxophone player
- **probirt.com/forums** you don’t need to join to read the wealth of information in the forum
- **banddirector.com** click “products” then “band inst repair” in column on right, article and videos below
- **northgeorgiaband.com** click “resources” for an excellent compilation of videos and articles on repair
- **musictrader.com** Lars Kirmser’s excellent website has a potpourri of useful information
- **redwingmusicrepair.org** click “band program” then “resources” for a great list of videos, articles, handouts, and resources—please note that Krause Music Products only sells to professionals

### Books

- **Ferree’s Tools Eric Brand Band Instrument Repair Manual** available from WWBW.com $35.00
  - Although somewhat dated, this is an excellent reference for basic repair and contains a wealth of information

- **The Complete Woodwind Repair Manual** by Reg Thorpe available from NAPBIRT.com $73.00 + $8.00 shipping
  - This is the most complete and comprehensive book to date covering the repair of woodwind instruments.

- **Instrument Repair for the Music Teacher** [Paperback] by Burton Stanley available at Amazon.com $16.00
  - This book although a bit dated would be a good entry level text for those interested in learning more about repair.

- **Saxophone Manual: Choosing, Setting Up & Maintaining a Saxophone** by Stephen Howard Amazon.com $23.00
  - Stephen Howard is one of the best saxophone techs in the UK and shares his expertise in well written book.

### Miscellaneous tips and tricks

- Surgical tubing makes great clarinet thumb rest pads. Just fit over the thumb rest and trim with scissors.
- Brass valve oil makes a great cleaning agent to remove old oil from key rods and grease from tuning slides.
- For really sticky saxophone pads clean first with Naptha (lighter fluid) on a Q-tip then use 1000 grit sandpaper face down with a light coating of teflon powder on the back to pull between the pad & tonehole.
- Melted paraffin wax on tenon and neck corks makes corks last longer and reduces need for cork grease.
- Soak woodwind mouthpieces with calcium deposits in a closed tupperware container containing vinegar for several hours, then remove and use a mouthpiece brush with soapy water. Always insert the brush in the front.
- Saxophone and bass clarinet neck screws work better when wrapped with a few turns of teflon tape.
- A tongue depressor or craft stick makes a safe and effective tool to use as a fulcrum to straighten bent sax keys.
- A tiny ball of “Blue-Tack” works to temporarily reinstall a woodwind pad that has fallen out (not flute washer pads).
- After cutting the tip off a drumstick for a pin vice handle, drill a 1/8” hole in the end and use for flute cork installation.

### Instrument Repair Tech’s Prayer

God, grant me: the Humility to accept there are things beyond my ability to repair, the Courage to fix those things I can, and the Wisdom to know the difference.