



## SMALL BRASSWIND OVERHAUL SCHEDULE

By Lars Kirmser

One of the more unsettling aspects for the musical instrument repair consumer these days is being able to know exactly what a so-called *Complete Overhaul* might consist of. In other words, what one shop considers to be a complete overhaul may be very different from the overhaul criteria of another shop. Naturally, one explanation for this would be that each technician will have acquired their professional skills from dissimilar or non-standardized resources. Another explanation might simply be general disagreement among technicians over exactly what elements a complete overhaul should include.

The following overhaul schedule represents what I consider to be a logical repair sequence for the complete overhaul of the Small Piston Valved Brasswinds. It is the schedule that we use routinely in my own shop. It is by no means meant to apply to all situations. When special or unusual conditions arise, the technician may find that it would be necessary to alter the sequence of the schedule. In such a case one would merely insert or delete any of the appropriate steps so as to conform to their unique situation.

**NOTE:** Steps marked with an asterisk “ \* ” will indicate that this operation is an optional or conditional element.

### I. DISASSEMBLY & PREPARATION OF INSTRUMENT PARTS

#### A. REMOVE SLIDES (1 min.)

- Main Tuning Slide
- 1st Tuning Slide
- 2nd Tuning Slide
- 3rd Tuning Slide
- Remove all sub-assemblies such as water keys and valve trigger mechanisms and place all the small screws and springs in a vial for safe-

keeping. Place all the slides and other parts in a repair tray.

#### \*B. FROZEN SLIDES

- Specific techniques may have to be employed for the removal of frozen slides. In as much as this is only a generic outline of the overhaul process, all technical processes and specific repair techniques will be presented in another discussion.

#### C. REMOVE AND DISASSEMBLE THE VALVE PISTONS (2 min.)

- 1st Valve
- 2nd Valve
- 3rd Valve
- Completely disassemble the valves down to their basic components and save all the old corks, felts, and springs in the parts vial for future reference. Always protect the individual valve pistons from damage by wrapping them in a soft towel prior to placing in the repair tray.

#### \*D. FROZEN VALVES

- Specific techniques may have to be employed for the safe removal of frozen or bent valves.

#### E. INVENTORY PARTS AND KEEP A COPY IN THE REPAIR TRAY (1 min.)

- You will be required to re-inventory your parts at a number of critical points during the complete overhaul process.

#### F. PLACE ALL PARTS TO BE STRIPPED IN THE COLD STRIP (2 min.)

- The parts will need to be completely submerged in the cold strip for 30 - 45 minutes.

#### \*G. ALTERNATIVE METHODS OF STRIPPING FINISH

- This task is most often performed by immersing the lacquered or epoxied parts in a formula of methylene chloride (cold strip) for approximately 30 minutes. Prior to the availability of this cold strip formula, most shops were required to boil-off the finish with a hot caustic lye bath. These days commercial cold strips are not as readily available because of the cost of shipping corrosive materials, so you may have to buy some methylene chloride (in bulk) along with methyl alcohol and mix 85% methylene chloride to 15% methyl alcohol. Unfortunately, the King "Red Lacquer" does not react to this cold strip solution and must be either boiled off with a caustic formula (i.e. Ferree's Z 15 Lacquer Removing Solution) or as an alternative, I have had reasonably good results by placing these King products in a fresh solution of "Slime-Away", "Exo-Kleen", or Etch Kleen for several hours. You must be cautious, however, and monitor the parts being stripped frequently and remove them as soon as the lacquer has been removed.

#### H. THOROUGHLY RINSE STRIPPED PARTS WITH WARM WATER (3 min.)

- To avoid contaminating your waste water with strip solutions, it is advisable that you rinse the dip basket and all stripped parts in an open (lined) barrel of plain water just prior to rinsing in your deep sink. Depending upon the volume of stripping your shop performs, the chemicals should dilute and eventually dissipate by evaporation if this intermediate rinse tank is left uncovered from time to time. Be sure to use adequate ventilation when performing this operation.
- Scrub the insides of all tubing and parts with a flexible brush (snake) as you flush with water.

#### I. BRIGHT DIP ALL METAL PARTS (5 min.)

- Dip all brass keys and body parts into chromic acid for a MAXIMUM of 15 seconds. If the parts are left in the chromic acid for an extended period, the acid will actually remove a substantial amount of the base metal. This can be disastrous when bright dipping precision parts such as valve casings and slides! Silver instrument parts (plated and solid) are NEVER to be immersed in chromic acid as they turn a bright red color and must be bright dipped in a solution of sodium cyanide or potassium cyanide to remove the heavy red corrosion. Normally, silver is routinely bright dipped in one or the other of these two cyanide solutions, however, the silver parts may be left in the "cyanide" bright dips safely for a longer period of time; perhaps as long as 15 or 20 minutes. To be on the safe side though, monitor the parts frequently whenever they are placed in any bright dip solution for any length of time.
- To avoid contaminating your waste water with strip solutions, it is advisable that you rinse the dip basket and all stripped parts in an open (lined) barrel of plain water just prior to rinsing in your deep sink. Depending upon the volume of stripping your shop performs, the chemicals should dilute and eventually dissipate by evaporation if this intermediate rinse tank is left uncovered from time to time. Be sure to use adequate ventilation when performing this operation.
- Scrub the insides of all tubing and parts with a flexible brush (snake) as you flush with water; dry all parts thoroughly with compressed air, and re inventory the parts before leaving the chemical strip area.

## II. DENT REMOVAL AND PRELIMINARY SURFACE PREPARATION

#### A. UNSOLDER NECESSARY SUB-ASSEMBLIES TO ACCESS DENTS (6 min.)

- Bell / Bell Bow (only if req.)
- Leadpipe (only if req.)

- Tuning Slides (only those which are req.)
- B. REMOVE DENTS AND SURFACE SCRATCHES / PITCHING (60 min.)
- Bell / Bell Bow section
  - Leadpipe section
  - Main tuning slide / crook
  - #1 tuning slide / crook
  - #2 tuning slide / crook
  - #3 tuning slide / crook
  - Valve casings (including all knuckles and outside slide tubes)
  - All braces and flanges
  - Attempt only to remove superficial etching and/or pitting. Do not remove more material than is absolutely necessary and NEVER attempt to completely polish out scratches or pitting at the expense of the instrument's structural integrity.
- \*C. REPLACEMENT OF DAMAGED OR MISSING PARTS
- On occasion you will find that it is less expensive (in the long run) to replace excessively damaged or corroded crooks and slides. It may also be necessary to install guard moldings and/or "pull knobs" on marginal crooks and bows (especially those that cannot be replaced). The extra charges for the replacement of such parts as the bell section, finger buttons, water key assemblies, and the fabrication or replacement of braces, etc., must be factored into the final charges.
- D. HARD BUFF ALL PARTS WITH TRIPOLI (20 min.)
- Hard buff these parts with tripoli applied to a double section of spiral stitched muslin buffing wheels. Use a medium to high speed on the buffing machine (2400 - 3000 RPM).
  - Follow the tripoli buffing with white compound on a separate set of a double section of spiral stitched muslin buffs. Use a medium speed of around 2400 RPM.
- E. POLISH AND CLEAN THE INSIDE OF ALL VALVE CASINGS (10 min.)
- F. POLISH & CLEAN THE INSIDE OF ALL SLIDE TUBES (5 min.)
- Steps E and F are very sensitive operations and should be performed carefully by using a firm bristle brush (a little larger than the I.D. of the valve casing or slide tube being cleaned). I prefer to use the "Soft Scrub" liquid cleanser, as cleanup is easier than if you use fine pumice and oil. In performing this operation, the brush is placed in the chuck of a variable speed cordless hand drill and rotated for a few seconds at relatively slow speeds. If done properly, this step will only remove the undesirable glazing and surface oxides, and will not attack the base metal.
- G. POLISH & CLEAN THE VALVE PISTONS (5 min.)
- This operation is performed by using a fine pumice and oil on the proper sized piston lapping block (hardwood). Again, a few seconds is all that should be required to remove the superficial oxides and/or glazing without affecting the precise dimensions of the valve piston. Place the piston valve stem in your bench motor chuck and gently close the charged lapping block against the rotating bearing surface of the piston. Work the lapping block back and forth along the piston for a few seconds being careful not to generate heat. Thoroughly scrub the pistons and portals in a cold degreaser followed by cleaning with soap and warm water; dry completely.
- H. CHECK EACH VALVE PISTON IN ITS RELATIVE CASING (5 min.)
- If you have any doubt as to how well a piston fits its relative casing, take the time to measure both the valve and the casing to get an idea of the tolerance present. A new valve piston (on better quality instruments) will have somewhere between .0005" and .001" clearance between the outside of the piston and its casing wall (in

other words, the piston will be somewhere between .001" and .002" undersized compared to the I.D. of the casing). Anything over .0015" or .002" difference will start to exhibit some leakage and may be noticed by an accomplished musician. Naturally, there is a wider range of tolerance among student instruments.

**\*I. MAKE ANY NECESSARY VALVE ADJUSTMENTS**

- It is at this time that any minor problems with valve action should be taken care of (i.e. key guide replacement, thread-chasing, burnishing casings, etc.). Usually the valves will operate fine, but we will want to verify this now since it is so much easier to address these types of problems at this time.
- If you have observed any significant valve casing wear or distortion, this is the time to take care of it by burnishing the valve casings back into round. On the other hand, if they are in reasonably good shape already, you need only "scrub" each casing with a firm bristle valve casing brush and some "Soft Scrub" cleanser. This will remove any buildup of glazing or grime without removing any metal.

**\*J. PREPARE THE VALVES AND VALVE CASINGS FOR REPLATING**

- Since most repair shops do not have the ability to replate valves, I would generally recommend that the valve section, along with the valves requiring replating be sent to Anderson Plating Co. in Elkhart, IN. Mike Anderson runs an exceptional service.

**K. CHECK INSIDE SLIDE TUBES WITH RELATIVE OUTSIDE TUBES (5 min.)**

**L. MAKE ROUTINE SLIDE ADJUSTMENTS (5 min.)**

- It is at this time that any problems with the relative slide actions should be taken care of. Again, usually, all the slides will already be in fairly good adjustment, however, we want to verify that each relative pair of slides is in excellent adjustment. (Slide alignment will be

performed at the time the instrument is reassembled)

**M. REINVENTORY ALL PARTS (1 min.)**

**III. REASSEMBLY OF THE INSTRUMENT AND SUB-ASSEMBLIES**

**A. ASSEMBLE - ALIGN - RESOLDER SLIDE - CROOKS (5 min.)**

- Use the granite leveling block to align, level, and resolder the slides/crooks into position. Levelness is achieved by laying the slides flat against the leveling stone, while the parallel state is achieved through the use of a dial caliper.
- Main Tuning Slide
  - a. slide tubes/ferrules to crook
  - b. brace (opt.)
  - c. waterkey assembly (trumpet)
- 1st Valve Slide
  - a. slide tubes/ferrules to crook
  - b. thumb ring/trigger assembly (opt.)
  - c. pull knob (opt.)
- 2nd Valve Slide
  - a. slide tubes/ferrules to crook
  - b. pull knob (opt.)
- 3rd Valve Slide
  - a. slide tubes/ferrules to crook
  - b. spacer (opt.)
  - c. water key assembly (opt.)
  - d. lyre holder (opt.)
  - e. finger ring / trigger assembly (opt.)
  - f. pull knob (opt.)
  - g. stop rod post (opt.)

**B. ASSEMBLE - ALIGN RELATIVE OUTSIDE SLIDE TUBES (15 min.)**

- In the event that alignment is required, the slide alignment of those slide tubes emanating from the valve core is achieved by remov-

ing any spacers (small braces) between the slide tubes and inserting the (previously) aligned slide crook about halfway into their relative outside slide tubes. The solder joints of the outside slide tubes are then heated to the point where the existing solder liquifies and allows the outside slide tubes to conform to the alignment of the preset slide crook.

- 1st Valve Outside Slide Tubes
  - a. remove small spacer between tubes (if present)
  - b. insert preset #1 slide crook halfway into outside slide tubes
  - c. heat (allow to “pop” into alignment) or resolder (if unsoldered) into position
  - d. position and resolder the spacer (if app.) into position (while slide crook remain inserted)
- 2nd Valve Outside Slide Tubes
  - a. these are rarely in need of adjustment
- 3rd Valve Outside Slide Tubes
  - a. remove small spacer between tubes
  - b. insert preset #3 slide crook halfway into the outside slide tubes
  - c. heat (allow to “pop” into alignment) or resolder (if unsoldered) into position
  - d. position and resolder the spacer (if app.) into position (while slide crook remain inserted)
  - e. solder the stop rod assembly into position (if app.)

#### C. ALIGN - SOLDER LEADPIPE & BELL SECTION INTO POSITION (10 min.)

- In the case of the leadpipe, the main tuning slide MUST be inserted all the way into its' relative outside slide tubes to establish the correct leadpipe-to-valve core position while the soldering is performed. The leadpipe is wired into position where the leadpipe-to-valve core spacers are placed.
- Leadpipe Setup
  - a. align - solder the mouthpiece receiver and tuning slide receiver onto the leadpipe (if app.)

- b. insert the preset main tuning slide all the way into the outside tubes
- c. with the small leadpipe-to-valve casing spacer(s) in place and properly contoured, wire the leadpipe in its' correct position with respect to the valve core
- d. solder the upper outside main tuning slide to the lower outside main tuning slide (brace) into position
- e. position and solder the finger hook onto the leadpipe

#### • Bell Section Setup

- a. align - solder the bell flare to bell bow (if separate ie. Getzen)
- b. with the small bell-to-valve casing spacer(s) in place and properly contoured, wire the bell into its' correct position with respect to the valve core and (already) wired leadpipe
- c. adjust and wire the 2 bell-to-leadpipe braces into position
- d. carefully check alignments from all angles (all tubes parallel - no “dog legs”)

#### • Solder the Bell and Leadpipe Assemblies into Position

- a. solder the bell-to-1st valve port ferrule
- b. solder the bell-to-#1 tuning slide receiver spacer into position
- c. solder the 2 bell-to-leadpipe braces into position
- d. solder the leadpipe-to-valve core spacer(s) into position

### IV. FINAL SURFACE PREPARATION

#### A. CLEAN UP ALL SOLDERED JOINTS AND SURFACES (15 min.)

- Carefully remove all physical traces of solder (solder scraper; emery stick). Be careful not to “round over” any of the edges of the flanges! They should end up looking sharp and crisp.
- Dip all the parts in the sodium or potassium cyanide for approximately 10 minutes to neutralize all acid pockets that may be present. Thoroughly rinse and dry before proceeding.

- B. RAG THE INSTRUMENT WITH TRIPOLI (15 min.)
- C. BUFF THE INSTRUMENT AND ALL PARTS WITH TRIPOLI (15 min.)
- Use a double section of spiral-stitched muslin buffs at medium to high speed (2400 - 3200 RPM)
  - Remove all traces of buffing compound before proceeding with clean shop rag and clean ragging tape
- D. RAG THE INSTRUMENT WITH WHITE COMPOUND (10 min.)
- E. BUFF THE INSTRUMENT AND PARTS WITH WHITE COMPOUND (10 min.)
- Use a double section of center-stitched muslin buff at a medium speed (+- 2400 RPM)
  - Remove all traces of buffing compound before proceeding with clean shop rag and clean ragging tape
- F. RAG THE ENTIRE INSTRUMENT WITH BURNS RED ROUGE (10 min.)
- Apply the rouge to the instrument with a cotton ball (or cloth) treated with alcohol
  - Rag with clean strips of soft cotton flannel (vs. ragging tape)
- G. BUFF THE INSTRUMENT AND PARTS WITH RED ROUGE (10 min.)
- Use a single full section of a center-stitched flannel color buff at slow speeds (+-700 RPM).
  - Carefully check all surfaces under excellent light BEFORE ending the buffing stage.
  - Use soft white gloves and be sure to cover your buffing pad with a soft cloth to avoid scratching the instrument during the final color buffing step.
  - Following the color buffing stage, blow out all tubes and parts with compressed air.
- H. DEGREASE INSTRUMENT AND PARTS IN HOT DEGREASER (10 min.)
- Following the degreasing, check the entire instrument for dirt or smudges from the degreasing fluid. a. all smudges in open areas can be individually wiped cleaned with a clean soft flannel rag, while tight spots may be cleaned up by using cotton swabs and alcohol.
- I. PREPARE THE INSTRUMENT FOR EPOXY FINISH (10 min.)
- Screw all top and bottom valve caps on the instrument
  - Put corks into all the exposed tube openings
  - Screw lyre screws and waterkey screws into their respective places
  - Place all crooks and other small parts (valve buttons & stems, waterkeys, etc.) on a spray parts board
- J. SPRAY THE INSTRUMENT AND PARTS WITH EPOXY (10 min.)
- K. BAKE THE FRESHLY SPRAYED INSTRUMENT AND PARTS (5 min.)
- Allow to bake at 250 degrees F. for 45 minutes.
  - Remove from oven and allow to cool (preferably hanging).
  - Remove corks from tubes.
  - Remove upper and lower valve caps.
  - Remove small screws in place on instrument.
- V. REASSEMBLY - LUBRICATION - FINAL INSPECTION
- At this point, a soft white cotton assembly glove should be worn on your least favored hand, and your work surface should be covered with a soft, clean, white bench cover (take all precautions to avoid bench damage!).
- A. PREPARE AND INSTALL SLIDES (5 min.)
- Main Tuning Slide

- a. install the water key assembly (trumpet) and check the slide for vacuum
  - b. in the case of a cornet, you may install the waterkey on the leadpipe now
  - c. lightly polish the bearing surface of the inside slide tubes to remove all traces of overspray and residual corrosion with strip of fine "Scotch Brite" abrasive pad (not emery cloth or sandpaper)
  - d. apply a modest amount of slide grease to the surface of the inside slide tubes (one at a time) and "work" each slide (individually) into its' relative outside slide receiver using a figure-8 motion.
  - e. after each slide operates smoothly, wipe the slide clean and reapply fresh clean slide grease and install the slide crook on to the instrument (be careful not to use so much slide grease so that it accumulates inside the slide tubes!)
- #1 Tuning slide
    - a. lightly polish the bearing surface of the inside slide tubes to remove all traces of overspray and residual corrosion with strip of fine "Scotch Brite" abrasive pad (not emery cloth or sandpaper)
    - b. apply a modest amount of slide grease to the surface of the inside slide tubes (one at a time) and "work" each slide (individually) into its' relative outside slide receiver using a figure-8 motion.
    - c. after each slide operates smoothly, wipe the slide clean and reapply fresh clean slide grease and install the slide crook on to the instrument (be careful not to use so much slide grease so that it accumulates inside the slide tubes!)
    - d. reinstall the trigger mechanism (if app.)
  - #2 Tuning Slide
    - a. lightly polish the bearing surface of the inside slide tubes to remove all traces of overspray and residual corrosion with strip of fine "Scotch Brite" abrasive pad (not emery cloth or sandpaper)
    - b. apply a modest amount of slide grease to the surface of the inside slide tubes (one at a time) and "work" each slide (individually) into its' relative outside slide receiver using a figure-8 motion.
    - c. after each slide operates smoothly, wipe the slide clean and reapply fresh clean slide grease and install the slide crook on to the instrument (be careful not to use so much slide grease so that it accumulates inside the slide tubes!)
    - d. reinstall the trigger mechanism (if app.)
  - #3 Slide
    - a. install the waterkey assembly
    - b. lightly polish the bearing surface of the inside slide tubes to remove all traces of overspray and residual corrosion with strip of fine "Scotch Brite" abrasive pad (not emery cloth or sandpaper)
    - c. apply a modest amount of slide grease to the surface of the inside slide tubes (one at a time) and "work" each slide (individually) into its' relative outside slide receiver using a figure-8 motion.
    - d. after each slide operates smoothly, wipe the slide clean and reapply fresh clean slide grease and install the slide crook on to the instrument (be careful not to use so much slide grease so that it accumulates inside the slide tubes!)
    - e. reinstall the trigger mechanism (if app.)
- B. INSTALL AND REGULATE THE VALVES (15 min.)**
- Thoroughly clean each valve casing with a clean lint free shop rag.
  - Ascertain the cork - felt thicknesses of the #2 valve.
    - a. the downstroke adjustment is established by direct viewing of the portal alignment when the #2 slide is removed
    - b. the upstroke (at rest) alignment is established by using a valve mirror (as you view the portal alignment through an adjacent valve casing), or by using a valve adjustment caliper
    - c. some manufacturers provide "cheater lines" on the valve stems to assist in the at-rest alignment, but it is always a good idea to verify the portal alignment with a mirror or caliper

- Duplicate the cork - felt arrangement on valves #1 & #2
- Lightly lubricate the threads of the lower valve caps and install them on all three casings.
- Install new valve springs in each piston or casing.
- Clean each valve piston thoroughly with soap and water, then lubricate with a few drops of quality valve oil before installing them into their relative casings (be sure the valve are inserted facing the right way!)
- Work each valve into its' casing by activating it fully 50 or 100 times.
- Adjust - Balance the valve springs (if necessary).

C. PLAY TEST THE INSTRUMENT (5 min.)

\*D. REPAIR CASE AS NECESSARY

- Blocking
- Hinges
- Latches
- Handles
- Compartments and general case continuity

E. BLOW OUT INSIDE AND CLEAN OUTSIDE OF CASE (3 min.)

F. WIPE DOWN INSTRUMENT AND PLACE IT IN ITS' CASE (1 min.)

G. SHIP IT!

**(Total time: 5 hrs. 30 mins.)**