

# BANJO SET-UP WORKSHOP ---Revised 7/6/09

By Gil O'Gawa & Jim Farquhar

**GOAL of WORKSHOP:** To increase your understanding of how to alter your banjo performance and tone quality to your liking! **We welcome your comments and participation.**

**Banjo sounds come from string vibrations transmitted** through bridge→to head→to air→ and reflected by resonator forward. The wood of the neck, pot, and the metal tone ring also color the sound.

Therefore the banjo variables are of two types:

- A. Those that come with that instrument: tone ring, pot material and construction, neck material and construction, resonator material and construction.
- B. Those which are **adjustable** on the banjo:
  1. **String** material and caliber.
  2. **Bridge** material, design, construction, weight, height, and position.
  3. **Tailpiece** weight, design, and down-pressure on strings toward the head.
  4. **Head** thickness and material.
  5. **Head tension** and evenness of hook tension.
  6. **Height of string action** off the finger board.
  7. **Angle of neck** fret board relative to the head surface (determines height of bridge needed to give desired string fingering action).
  8. Depth of **string grooves in nut** (affects string height off 1<sup>st</sup> fret).
  9. **Straightness** or concavity of the **neck** finger board.
  10. Evenness of **fret surface alignment**.
  11. **Picks**

## 1. String material and caliber:

- A. **Bronze wound** are brighter initially but dull quickly with use. Often this initial brightness becomes **unnecessary when banjo is adjusted to give greater brightness.**
- B. **Stainless steel** wound is more consistent in tone throughout a longer string lifetime.
- C. Larger caliber strings are louder but harder to press down on frets.
- D. Smaller caliber strings give less volume but are easier to press down on frets.
- E. **Tenor banjo** string sizes:

<u>Standard Tenor</u>	<u>Irish Tenor tuning</u>	<u>Guitar Tenor tuning</u> (apprx.)
1. LW .028" to .030" C string (rarely .032")	LW 0.036" to 0.044" G string	LW 0.028" D string
2. LW .022" to .024" G string (rarely .026")	LW 0.026" to 0.032" D string	LW 0.022" G string
3. L 0.013" to .014" D string (rarely .015")	L 0.016" to LW 0.022" A string	L 0.016" B string
4. L 0.010" to .011" A string (rarely .009")	L 0.012" to 0.013" E string	L 0.012" to 0.013" E string

## F. Plectrum banjo string sizes:

<u>Standard Plectrum</u>	<u>Guitar tuning</u> (approximate sizes)
1. LW .024" to .030" C string	LW .024"--.030" D string
2. LW .018" to .024" G string (.017" not wound)	LW .018"--.024" G str. (.016-.020 not wnd.)
3. L .012" to .014" B string	L .012"--.014" B string
4. L .010" to .012" D string (rarely .013")	L .010"--.012" E string

## Baritone tuning (approximate sizes)

- |                      |                      |
|----------------------|----------------------|
| 1. LW .039" G string | 3. LW .016" A string |
| 2. LW .026" D string | 4. LW .011" E string |

FARQUHAR BRIDGES

**2. Bridge material, design, construction, weight, height, and position:**

- A. Features that make for **brighter sound**: lighter weight bridge, thinner bridge, hard inserts like pearl, ivory or tagua nut, 2-legged bridge (instead of 3-legged) on some instruments.
- B. Features that make for **duller sound**: heavier weight bridge, thicker bridge, ebony strip without inserts or with soft plastic inserts, some 3-legged designs.
- C. Jim currently prefers Taguanut ivory inserts for bridges on most banjos.
- D. Bridge material: various types of hardwood, plastic, carbon fiber, other.
- E. String grooves should be 1/2 to 3/4 wound string diameter, groove angled down towards tailpiece.
- F. **Bridge height**: 1/2" to 5/8" usually. Bridge height is determined by neck angle (see # 7 below) and desired string action height (see # 6 below).
- G. **Bridge position**: Nut to bridge distance = 2x nut to 12th fret distance. When checked by pitch, bridge ends up slightly farther from the 12<sup>th</sup> fret than the 12<sup>th</sup> fret to nut distance because fretting the string tightens it.

**3. Tailpiece weight, design and down pressure towards head:**

- A. Tailpiece **design** and **weight** can affect the tone produced by the banjo.
- B. Oettinger type "finger" adjustment tailpiece allows adjusting each string down-pressure separately to best sound. (Important for Tenor Banjo because of A-string tension & pressure.)
  - 1. **Too little pressure** → weak sound (when fretted upper half of fret-board).
  - 2. **Too much pressure** → stifles sound (upper half of fret-board).
  - 3. **Correct pressure** → "open" ringing sound (upper half of fret-board).
- C. Other adjustable tailpieces move all strings at same time. Adjust them to best avg. string sound.

**4. Head thickness and material:**

- A. Thick Mylar head or frosted head (> .008") → duller sound. (Fyberskin = .012" > .018")
- B. Mylar head (.007") → brighter sound. (smooth white .0075", clear: .0070", Renaissance: .008")
- C. Calf skin head comes in various grades. It stretches and dulls when weather humid.

**5. Head tension & evenness of hook tension:** (inch-lbs. measurements **only valid** for freely moving nuts.)

- A. **Low tension** (about 2 inch-lbs.) accentuates the lower overtones, mutes the higher overtones and lets the bridge sink deeper into head, lowering the string action on frets.
- B. **High tension** (about 8 or 9 inch-lbs.) accentuates the higher overtones and reduces the depth the bridge sinks into the head, raising the string action on frets.
- C. **Excessive head tension** gives strange, ringing, echo sound.
- D. Drew Frech's technique of **tuning head pitch** to note of choice: with **resonator off**, hold banjo away from body, with strings muted---strike head with **felt mallet** midway between rim & center.
- E. Important to have all hooks about the same tension for best tone.
- F. **New head will stretch**. Therefore head tightening will need to be repeated 3 or 4 times over several weeks (to few months), till head tension stabilizes.
- G. Standard head diameter about 11" (flat or raised). (Vega: 10 15/16"; Paramount: 11 1/8")
- H. Large head diameter (11.5" or 12") accentuates the lower overtones.
- I. Raised tone ring decreases effective head diameter (8.25" Jany) accentuating high overtones.

**6. Height of string action off the frets on finger board:**

- A. Low action yields easy fingering (**5/64" between string & top of 12th fret**), but less volume and may buzz when strumming heavily. (Can use drill bits as a gauge for string height.)
- B. Medium action yields good tone, volume, and fingering (**5/64" or 6/64" @ 12th fret**)
- C. High action yields greater volume & freedom from string buzz when hitting strings hard (**7/64" to 8/64" @ 12<sup>th</sup> fret**), but harder fingering.

7. **Straightness or concavity of neck** (easiest to adjust for necks with internal neck adjustment rods like Gibson, Richelieu, Ome, & some others):
- Slight concavity is preferred by some (0.008" to .015" between string and middle frets when string pressed against 1st and last fret on fret-board or using a straight edge against 1<sup>st</sup> & last frets).
  - Perfectly straight neck may be preferred by a few.
  - I currently like slight concavity about .008" to .012".
  - For banjos with adjustment neck rods, don't let concavity get too far over .020" before reducing it, or it may not be reducible. To adjust, find the adjustment nut (either under a peg-head plate or at the heel of the neck) and turn clockwise to reduce concavity, or counter-clockwise to increase concavity. Turn only 1/8 to 1/4 of a turn at a time unless a large change is needed.
  - If no adjustable neck rod, concavity of over .030" is considered excessive and banjo needs to be sent to a **banjo luthier** to "straighten" the neck (heat treatment straightening may be only temporary). Full treatment involves removing fretboard and planing neck straight.
8. **Evenness of fret surface alignment:** (should be dressed at fret installation) When string tension is off the neck there should be even contact between a straight-edge and all frets (no high or low frets). Re-dressing the frets requires a true flat metal block and very fine emery paper, and is beyond what most banjoists care to attempt. (One technique is to use a "true flat" metal plate, 2" by 6", wrapped with wet-dry sandpaper: first # 360 grit, followed by # 600, and finally about #1600. Don't take off too much on the first pass, or you will speed up your need for a new fret job.)
9. **Angle of neck fret surface to head surface** determines what height bridge is needed to give the desired string height at 12<sup>th</sup> fret:
- Necks with double coordinator rods in pot** (like Gibson, Richelieu, Ome, & others) can adjust angle by changing rod pressure inside the pot. Pull in with rod farthest from the head to lower action (or change to lower bridge), push out to raise the action (or change to higher bridge). The greater the difference in rod pressure on the pot, the **more the pot and tone ring are distorted** from their round shape, **adversely affecting tone**, and adversely affecting fit of a "Silver Bell" type resonator.
  - Necks with dowel inside pot** (like B&D, Paramount, & some Vega banjos) have slight adjustment at the pin & yoke on the dowel. Since this adjustment is limited, **shims** between heel (top) of neck and strainer hoop may be necessary. Or a luthier may shave off heel of neck to change the angle. Luthier may also have to reset the dowel in the heel of the neck at the new angle. This latter approach is costly because of the labor plus shipping both directions.
10. **Depth of string grooves in nut** should be correct from the "factory", but not always so.
- Too shallow of a groove leads to relative high action at the first fret (**when action is set to the desired height at the 12th fret**).
  - Too deep a groove leads to string buzz (near the nut) when the string is strummed in open position (when the action is at the desired height at the 12th fret).
  - Proper groove depth (**approximately 0.020"** between string and 1st fret, (range: 0.015" to 0.024")) leads to easy fretting throughout the fingerboard and no string buzz when strummed open.
  - Deepening the groove requires the proper width "nut file" (edge cutting file) for given string size. (available widths: .010", .013", .016", .020", .025", .028", .032", .035", etc.)
  - Shallowing the groove requires filling in the groove with "nut material" sanding dust + cyanoacrylate glue, and then re-filing to proper depth after glue is well dried. Or one may shim the whole nut, or replace the nut with a new one.
  - Shape and angle of nut string grooves: should slope down towards tuning pegs.

**11. Pick material, thickness, shape** affects banjo tone. (Wide variation in preferences)

- A. Plastic, tortoise shell, metal.
- B. Thick, medium (preferred by many professionals), thin.
- C. Shape & size.

**12. Instrument Care.**

- A. Metal polish---Johnson's Klean 'n Shine is one good but gentle polish. On gold, usually just rubbing with a clean, wet cloth is all that is necessary.
- B. Waxing wood finish reduces wear. (Johnson's floor wax or Treewax or car paste wax)
- C. Tuning pegs returned from gold plating may be stiff. They can be soaked for a day or two in Marvel Mystery Oil to restore lubrication, working the gears a few times during the soak.

**13. Trouble Shooting instrument problems.**

- A. Sudden increase in string breakage --- Ask yourself: What have I changed?
  - 1. Am I strumming the strings harder &/or closer to the bridge?
  - 2. Have I drastically increased the angle of the strings over the bridge by lowering the tailpiece?
  - 3. Have I adjusted the neck back and put on a higher bridge, leaving the tailpiece height adjustment the same? (Thereby increasing the angle of strings over bridge.)
  - 4. Have I changed to a lighter gauge string?
  - 5. Is the bridge edge sharp towards the tailpiece where strings leave it?
- B. String buzz
  - 1. Low string action, less than 5 or 6/64" at 12th fret. You can raise string action by tightening a loose head, or raising the neck angle, or by putting on a higher bridge.
  - 2. If a wound string is on the light side of the gauge range, try a larger gauge.
  - 3. Bridge string groove too wide for string gauge: "cyanoacrylate treatment" or replace bridge.
  - 4. Check for a "high fret" on the fingerboard---use a 6" straight edge, up & down the fret board. Either tap the high fret in or dress it down if it won't tape in.
- C. String alignment off to one side on neck, bringing the outside string close to edge of neck:  
Correct by shimming the opposite side of the tailpiece between convex curve of strainer hoop and matching surface of tailpiece. This will move the bridge end of the tailpiece toward the shimmed side, thereby correcting the string alignment.
- D. Dowel stick coming loose from neck:  
The string height above the fret board gradually gets too high. After correcting height with a lower bridge, the string height gradually becomes too high again. You may also notice that the yoke and pin on the dowel has moved an additional distance from the shell. (This has happened to some of the best banjos.) When this happens, the dowel has to be pulled out, cleaned (including vent grooves), and reset in wood glue, making sure the rectangular part of the dowel is in proper alignment with the fret board of neck, so as not to produce a "twist" in final neck position.
- E. Knee mute noise while engaging pedal is often caused by a metal acorn nut under the pedal on the end of the rod that goes through the shell of banjo. Replace with a nylon acorn nut since nylon slides smoothly under the pedal with no scratch or noise.

**GILBERT O'GAWA (231) 347-9387**  
**319 LINCOLN PL.**  
**PETOSKEY, MI 49770**

**JIM FARQUHAR (706) 802-0811**  
**8 SHADOWBROOK DR.**  
**ROME, GA 30161**

**e-mail: [banjogil@sbcglobal.net](mailto:banjogil@sbcglobal.net) (may be changed in future, due to spam)**