

Yamaha Model GA1 Low Tenor String Retrofit Kit

Introduction:

Yamaha manufactures great pianos and their engineering is superb throughout all models. However, the Grand Model GA1, sold from approximately 2002 to 2005, has a string scale design weakness of abnormal string tension and inharmonicity in the bottom plain wire notes 27 through 30 and, to a lesser degree, notes 31 and 32.

Tension: Plain piano wire with less than about 120lbs. of tension can be distinctly heard as sounding "Flabby" or "Weak" tonally. This can also be perceived in plain wire tensions up to about 125lbs.

The GA1 low tenor plain wires have approximately the following individual wire tensions:

Note 27 Plain Wire - 90lbs. of tension - B2
Note 28 Plain Wire - 99lbs. of tension - C3
Note 28 Plain Wire - 100lbs. of tension - C#3
Note 30 Plain Wire - 110lbs. of tension - D3
Note 31 Plain Wire - 115lbs. of tension - D#3
Note 32 Plain Wire - 124lbs. of tension - E3

If one starts playing at B2 and ascends chromatically one will hear a gradual improvement in tonal quality as one arrives at notes 32 and 33 (E3 and F3).

Inharmonicity: Furthermore, there are also tuning issues in this area where 4:2 and 6:3 Octave tests for a given Octave will just not agree. The inharmonicity in these plain wire notes 27 through 32 is high and thus presents tuning anomalies.

If notes 27 through 32 plain wire notes are replaced with bichord bass strings, tension and inharmonicity may be brought into respectable ranges for good tonal and tuning results.

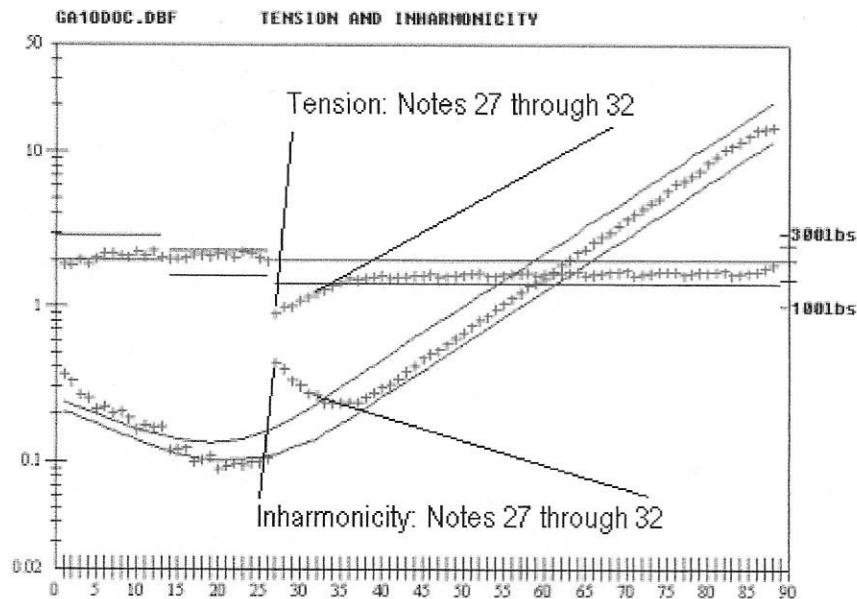
The GA1-6 String Retrofit Kit is custom designed to replace Notes 27 - 32 with bichord bass strings. Thus, the lowest plain wire tension (note F 33) is an acceptable 128.8 lbs.

Disclaimer:

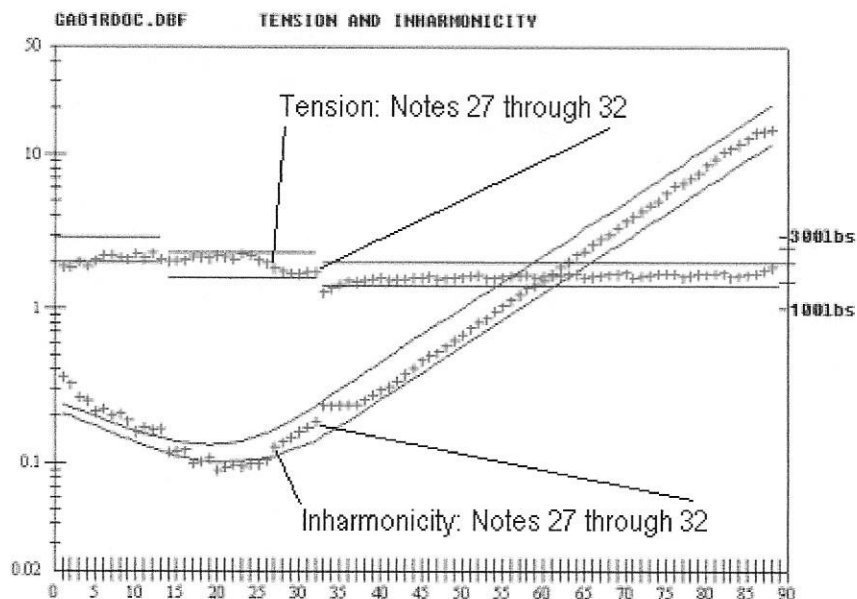
As the GA1-6 Retrofit Kit is a 6 note modification of the factory produced Yamaha Model GA1 grand piano, **Sierra Software Services, Tremaine Parsons, and any manufacturer of Bass Strings supplied in the GA1-6 String Retrofit Kit, shall not, under any circumstances, assume any liability whatsoever for any ramifications of installing any String Retrofit Kit to a Yamaha Model GA1.** In addition, a modification of this nature could also be argued as to "void warranty". However, I believe a valid argument could be made with Yamaha that the tensions and inharmonicity of the plain wire in this area are too anomalous to produce good tonal and tuning output. Furthermore, the GA1-6 adds less than 180lbs. of additional tension spread over notes 27 through 32 replacing plain wire notes that are already under significantly less than average plain wire tension. Finally, Yamaha warranty (10 Yr.) for the GA1 expired in, or shortly after, 2015.

Retrofit Theory and Discussion

The below graphs plot tension (red) and inharmonicity (blue) of the Factory GA1 and the GA1 with the GA1-6 note String Retrofit Kit. The horizontal and hockey stick black guide lines represent an average of upper and lower tension / inharmonicity of well scaled American pianos. The upper graph is the factory GA1 and the lower, the GA1-6 String Retrofit Kit.



Above: The Model GA1 Factory Tension and Inharmonicity



Above: The GA1-6 String Retrofit Tension and Inharmonicity

Fact: Piano Scales where the Inharmonicity graph (blue) generally plot within, or near, the upper and lower black "hockey stick" lines will have 4:2 and 6:3 octave tests that, for the most part, agree with each other on any given octave tuning test.

Retrofit Theory and Discussion (Continued)

The rather high inharmonicity of plain wire notes 27 through 32 present tuning anomalies. Many piano owners will not notice this but many discerning musicians are able to pick up on these anomalies. So, if you have a customer that questions the octave tuning of B2 - B3, C3 - C4, C#3 - C#4, etc., then this document may help you explain to the customer that there are tuning anomalies due to inharmonicity in notes 27 through 32.

Let me be clear. I think the GA1 is a fine piano and consider notes 27 through 32 to be a design "weakness". Perhaps, it exists because the GA1 was a transition model to the improved GB1 (notes 27 through 31 are replaced with bichord bass strings) or the weakness was allowed to maintain some separation from the higher priced models. It does not matter. The GA1 is a fine instrument and the GA1 String Retrofit Kit will correct this weakness in scale design.

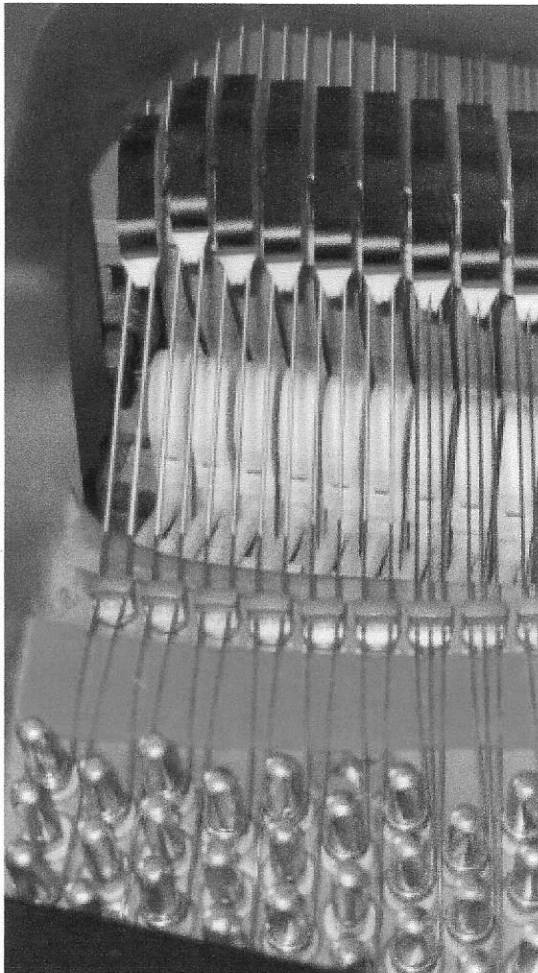
In order to keep the retrofit as simple as possible, some bass strings will share a single hitch pin. At first thought, some technicians might find this uncomfortable as it is contrary to what we are used to seeing. However, the majority of hitch pins on a modern piano carry two plain wires anyway. In addition, the plate casting in this area has a "riser" in front of the hitch pin so downbearing is removed as an issue. Finally, the total tension of two bass strings on a single hitch pin is no greater than many other hitch pins carrying plain wire on the GA1.

The GA1 Retrofit Kit is also designed so that the piano can easily be returned to factory specification. I can't imagine why one would go backwards to reverse an improvement other than a resale situation where some uninformed Piano Technician might use the modification as a bargaining tool for a potential buyer. However, I also like the concept of easily returning to factory specification on general principle. In this regard, the Retrofit Kit bass strings use the outside bridge pins of the replaced note, the outside agraffe holes of the replaced note, and the fore and aft tuning pins of the replaced note. The center tuning remains without a wire attached and the trichord wedge damper felt will fit nicely within the bichord bass strings.

I have done several low tenor plain wire changeovers over the years and I actually prefer to share hitch pins where practical as opposed to adding hitch pins. Even though the change over is correcting a scale weakness, I prefer the elegance of being able to return the piano to exact factory specification should any reason arise in the future. This would be extremely unlikely.

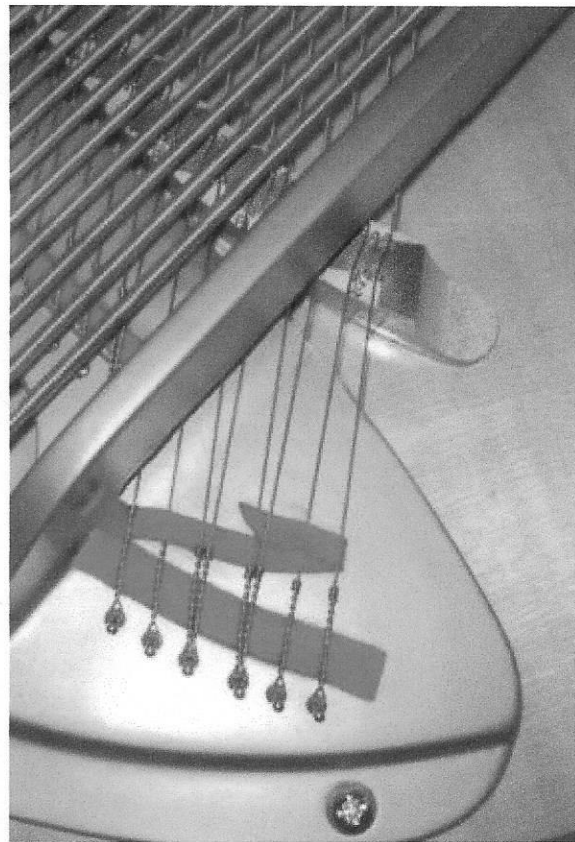
Tremaine Parsons RPT
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Strings +168.00 plus Shipping and Handling – John at JD Grandt has all specs.
Optional: Make a donation to me at www.goptools.com (for research and white paper)
Installation Labor \$400.00 (4 hrs@ \$100.00)
Re-tuning \$ 80.00 (2 visits @ \$40.00)
Approximate Total Cost \$650.00 – 700.00



Installed 6 Bichords - Tuning View

Trichord Damper Wedge Felt sits
perfectly within Bichords



Installed 6 Bichords - Hitch View

Notes 28, 29, and 31 Bichords
share a Hitchpin