



## **Choosing and Using Vacuum Tubes**

*Includes information on replacement tubes  
for hundreds of amplifiers!*

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**4th Edition • \$14.99**

## About Groove Tubes®

For over 30 years, Groove Tubes have been trusted and demanded by touring professionals and their techs around the world. Groove Tubes started in southern California, and through innovative design, rigorous selection and testing, GT-powered amps have rocked the world in some of the most famous rigs ever played from studio to stage. Combining our passion for music with the science of sound, the Groove Tubes team still employs the same testing, grading and matching disciplines that continue to deliver flawless performance every time.

## Tube Cross Reference Basics

There have been a myriad of tubes types and styles made over the years for industrial, military and commercial use. Many of these use European nomenclature. A cross reference is included here:

Groove Tubes	Industrial	European		Groove Tubes	Industrial	European
GT-12AT7	6679	ECC81		GT-6CA4	-	EZ81
GT-12AU7	6189	ECC82		GT-ECC83	7025	ECC83
GT-12AX7	7025	ECC83		GT-6L6	5881	KT66
GT-5AR4	-	GZ34 / GZ37 / U54 / U77		GT-6V6	7048 / 5871	-
GT-5U4	-	GZ32 / GZ31 / U51 / U52		GT-6550	6550	KT88
GT-5Y3	6853	GZ30 / U50		GT-EL34	-	6CA7 / KT77
GT-7025	7025	ECC83		GT-EL84	-	6BQ5

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For the latest information on Groove Tubes, visit our web site at [www.groovetubes.com](http://www.groovetubes.com)



**GROOVE TUBES**  
HEAR THE DIFFERENCE™

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## Introduction to Vacuum Tubes

Electric guitar and bass players over the past 50 years have been linked by a single critical piece of equipment: The tube amp. With all of the advances in transistor and digital technology, professionals still prefer tube amps as part of their musical arsenal from studio to stage. There are many reasons for this, and we will explore many of these factors in plain language, throughout in this guide.

Tubes have provided the foundation for musical and audio circuits that have produced much of the world's greatest rock, jazz, blues and country music during the last century. Ironically, tube-driven circuits are not necessarily a perfect "reproducer" of sound. They are actually a "producer" of part of the musical output by adding definite, subtle, tactile and sonic characteristics to the signal path of instrument amps.

So, why do tube amps sound and feel different?

First, tubes are imperfect. They each have unique performance characteristics and designs. They respond to signal input in a softer, slower and less precise manner than digital circuits. This provides the soft feel, or touch that many players enjoy in great tube amps. This is due to the natural "compression" that tube inefficiency creates. Unfortunately, they also degrade over time and use, which is why many professionals re-tube their amps before each tour and maintain spares for road use.

Second, tubes tend to distort in a very non-linear way. If you look at tube circuit distortion on test equipment, you would see a slightly rounded waveform as the tube starts to distort. This is different from a solid-state or digital waveform which tends to appear square, distorting all frequencies at the same time.

In tube circuits, low frequencies tend to distort first, and higher frequencies stay clean longer. Because of the way we hear sounds, this is more pleasing, less harsh. The harmonics that tend to distort in a tube circuit are also more musical and are the reason that when you "grab" a note on a guitar at high volumes and the amp distorts, it will feed back in a musically useful and pleasing way.

Finally, even though tubes are made of glass, and have little metal parts inside, they are actually pretty durable, and with proper testing, rather predictable. Over the years, there are many specific amp designs that have been associated with an "American" sound, a "British" sound, etc... Many high-end boutique products use these reference sounds from tubes in their circuit designs to achieve signature tones.

## What is a Tube?

A tube is an electronic gain producing device consisting of a minimum of four active elements: a heater (filament), a cathode, a grid and a plate. These are all sealed in a vacuum glass enclosure to prevent parts from burning. Once heated, the cathode begins to emit electrons, which flow from the cathode (which is negatively charged) toward the plate (which is positively charged). The grid's purpose is to control this flow, in effect, acting as a "valve". This is one reason that tubes are called "valves" in the UK.

## What is the difference between preamp tubes and power tubes?

When the guitar's pickup produces a small voltage (the result of the string vibrating in the pickup's magnetic field), this signal goes into the "preamp" part of an amp circuit. It is applied to the grid, which causes a larger current flow from the cathode to the plate. Preamp tubes are usually the main tone generators in an amp circuit and you can experiment with the gain and tone of your amp easily by trying different preamp tubes. GT makes it easy by providing clear, intuitive descriptions of these tubes.

Power tubes provide the major horsepower in an amp circuit, and will have their greatest impact on tone as they distort. This means you have to run amps pretty loud to get the maximum benefit from the tube distortion in the power amp section. That explains the popularity of small, lower power tube amps which distort nicely at lower volumes. Keep in mind, there are several styles of power tubes available. You must use the specific style (EL34, 6V6, 6L6, etc...) that the circuit was designed to accommodate.

## What is “biasing”?

Bias refers to the adjustment (generally in the power tube section) that controls the voltage of the grid of a tube. When the grid bias is properly set, the tubes are balanced in the circuit and produce a clean, powerful signal. It is like matching the engine RPM to the proper gear in a race car to achieve optimum performance for the desired speed.

If the bias is not set correctly, the amp may not perform properly, or the tubes may wear out more quickly. If you install a set of tubes with very different outputs or strengths from each other, it may not be possible to adjust the bias to achieve maximum performance from all power tubes. You will get a compromise on all tubes, and none will perform to their proper potential or specification.

Fortunately, many manufacturers use power tubes that fall in the same specification as “Medium” (4-7 fine scale) of Groove Tubes as their stock tubes. The amplifier’s bias control is adjusted at the factory for tubes in this power range. Tubes in this power range are widely available at all times from Groove Tubes.

If you want to change the performance of your amp to distort more quickly, or stay clean longer, you can use Groove Tubes in the Low (1-3 fine scale), or High (8-10 fine scale). If so, you should have a qualified service tech re-bias your amp for the new tubes. The good news, is that once this is done, you should be able to replace your power tubes with Groove Tubes of the same type and rating without bias adjustment.

Preamp circuits and many tube power amp designs today feature an “auto’biasing” circuit. You can check with the amp manufacturer to see if your amp has “auto-bias”. If so, no further adjustments are needed.

## Groove Tubes® Power Tubes – Dynamically Energized™ and Performance Matched™

These pass every Groove Tubes premium certification for micro-physics, hum, noise floor, physical operation and performance characteristics. We also analyze and match the gain-to-distortion ratio on a dynamic basis, assuring a powerful, singing tone that is rich in harmonics and balanced for longer sustain, wider frequency response and a more musical amplification experience.

Groove Tubes are quite simply the best tubes you can buy that are specifically designed and tested for musical instrument amplification. Sold as single tubes, matched duets, quartets and sextets, Groove Tubes are standard equipment on professional Fender® tube amps.

Matching power tubes has been part of tube history since the beginning. Power tubes usually work in pairs, and we have developed proprietary selection and matching procedures. This includes special fixtures, processes and software, exclusive to Groove Tubes.

Many companies test power tubes for POWER output only. In reality, the POWER output of tubes varies little, so testing strictly for power output is a rather meaningless exercise. What we do at Groove Tubes is a much more involved test of the distortion and TONAL characteristics of the tube. Surprisingly, this is where tubes can vary quite a bit, even within the same model, factory and production run.

Groove Tubes has developed a procedure that combines valid, scientific comparison and exclusive methods that take into account the tonal characteristics of tubes for use in instrument amplification.

## The Groove Tubes Warranty

**Preamp Tubes** - Warranted to be free of burn out for 180 days from date of purchase.

**Power Tubes** - Warranted to be free of burn out for 90 days from date of purchase.

## Tube Replacement? When, Why and How?

Glass, metal, lots of little parts... tubes are subject to mechanical problems and are not meant to last a lifetime. The harder you work your tubes, the faster they wear out. Plus, there are a number of other factors that make tubes one of the easiest and least expensive “fixes” for your tube amp.

1. Tubes are subject to vibration damage. The inside of a combo tube amplifier is a super-abusive environment for tubes because you crank up the volume, create a huge amount of sonic vibration, directly couple the tubes to the chassis of your amp and then stick the chassis inside the speaker cabinet!
2. When tubes operate, the metal parts on the inside of the tube begin to glow. That means that they are really hot, like molten metal. When metal is heated enough to glow, it gets soft. Excessive vibration can create a situation where the metal becomes fatigued or stressed.
3. If you are at a gig with your amp, you run it hard and then take it outside and place it in the back of your car while the internal components are still warm and soft, the bouncing around while you are driving can cause damage to the tube.
4. The reason that it is called a “vacuum tube” is that the air is sucked out of the inside of the tube when it is manufactured. This creates a “vacuum” inside the tube and this lack of oxygen allows the metal parts to heat up without actually burning. If the tube develops a leak, or the seal is broken air will leak back into the tube and the components could smoke, smolder or burn.
5. Tubes are inexpensive compared to transformers, speakers, etc... and a lot easier to replace!
6. When one tube starts to go, it drags the others down with it, decreasing the overall efficiency of the amp, which adversely changes the tone and reduces sustain.
7. You can keep spare tubes with you in case something happens at a gig. With Groove Tubes you can even make sure that you have a spare power tube set with the exact same rating.
8. Many manufacturers have started producing small, inexpensive tube amps. While many of these are really cool, sometimes a manufacturer will cut corners on the tubes that come in the amp. Groove Tubes preamp and power tubes can really punch up the performance of these amps.
9. With the easy-to-understand descriptions of GT preamp tubes, you can experiment with different styles and types to achieve a wide variety of different gain structure and tone.
10. Audio troubleshooting. Change tubes if your amp experiences any of the following:
  - a. Loss of tone, clarity, sustain and harmonic richness.
  - b. Poor output-level balance.
  - c. Lack of midrange punch and definition.
  - d. Rattling, whistling or humming.
  - e. Feedback or metallic sound on certain notes
  - f. Weak sound and power loss.
  - g. To experiment and change amp tone characteristics.
11. When you have decided to change tubes in your amp, go to [www.groovetubes.com](http://www.groovetubes.com).

## Preamp Tubes

These pass every Groove Tubes premium certification for microphonics, hum, physical characteristics and function. Quite simply the best preamp tubes you can buy — specifically designed and tested for musical instrument amplification and standard equipment on Fender amps. Outstanding and consistent performance for mixing and matching to get a signature tone from your amp.



### GT-12AX7-C Preamp Tube

Great chiming tone with sweet, warm midrange excellent for Marshall and Fender amps. Smooth distortion characteristics and one of the highest-output preamp tubes in the GT 12AX7 line, with very consistent quality.



### GT-12AX7-M Preamp Tube

Dual-triode vacuum tube based on the highly sought-after Mullard 12AX7, which went out of production in the late 60's. Some consider the Mullard one of the ultimate vintage 12AX7 tubes, and this reissue gives you the chance to get "that tone." Its unique triple mica design reduces tube hum and microphonics, and gives performance stability under the most demanding conditions, such as high gain tube guitar amps sitting on 4x12 cabs. This tube delivers rich, harmonically complex tone and midrange warmth.



### GT-12AX7-R Preamp Tube

The most widely used design in new amplifiers today. Extremely rugged, consistent and forgiving, it's a great all-around replacement given its inherently darker tone and relatively low gain. Can be slightly harsh when overdriven, but its warmth makes it a good choice for higher-gain and brighter amps and for keeping unwanted feedback and over-the-top overdrive under control.



### GT-12AX7-R2 Preamp Tube

Longer-plate-structure version of the standard "R" series tube, which produces brighter tone. Larger plate makes this tube slightly more prone to microphonic issues when used with high-gain amps. Suggested for use in darker amps to brighten tone. Very live and responsive, with good clarity.



### GT-12AX7-R3 Preamp Tube

The highest-gain output tube in the "R" series, this tube is similar to the R2 and has similar output, but with a shorter plate, higher gain, and a more consistent quality variance score. An extremely consistent tube useful in most applications.

## Preamp Tubes (Continued)



### GT-ECC83-S Preamp Tube

Our highest-gain preamp tube, this tube has a huge amount of gain, with terrific output that makes it a great choice for driving modern, complex high-gain circuits. It has a relatively high quality variance (making Groove Tubes pre-testing procedures especially important in this case), with a tight, strong and relatively bright tone that can really liven up a weak or tired old vintage amp or a new amp with grade-quality tubes.



### GT-12AU7 Preamp Tube

Our lowest-gain preamp tube. Can sub for a 12AX7 to lower gain and produce a very creamy, warm tone. Great for harp or blues when softer, more compressed distortion at lower volumes is desired. Very low gain and very mellow output.



### GT-12AT7 (ECC81) Preamp Tube

Durable phase splitter or driver tube. Excellent in vibrato or reverb circuits where consistent, high output power is desired.



### GT-12AY7 Preamp Tube

Low-gain tube used in very early Fender amps. Can sub for a 12AX7 to lower gain and produce a slightly warmer tone. Great for harp or blues where softer, more compressed distortion at lower volumes is desired. Medium / soft gain.

## Rectifier/Specialty Tubes

These pass every Groove Tubes premium certification for microphonics, hum, noise floor, physical operation and characteristics. Includes rectifier tubes, phase inverters and specialty kits specifically designed and tested for musical instrument amplification applications as noted.



### GT-5AR4-R Rectifier Tube

Our highest-output rectifier tube. Originally used in early higher-powered Fender amps (40 watts or more) with tube rectifiers; also used in the Vox AC30.



### GT-5U4 Rectifier Tube

Medium-output rectifier tube originally used in early medium-power Fender amps with tube rectifiers.



### GT-5Y3 Rectifier Tube

Low-output rectifier tube originally used in early low-power Fender amps with tube rectifiers (Champ, Princeton and Deluxe). May also substitute for a 5AR4 or 5U4 for lower output levels.



### GT-6CA4 Rectifier Tube

The lowest-output rectifier tube in the GT line; commonly used during the '60s in student and practice amplifiers.

## Special Applications Group – High Performance Exclusive GT Testing, Matching, Grading



### SAG-AT7-MPI Specialty Tube

Selected and matched for critical audio and guitar/ bass amplifier use, where a match of the two sides of the triode are desired for phase inverter or driver use.



### SAG-AX7-MPI Specialty Tube

Selected and matched for critical audio and guitar/ bass amplifier use, where a match of the two sides of the triode are desired for phase inverter or driver use.



### SAG-MHG Marshall Hi Gain Kit

Two selected high gain ECC83 tubes optimized for the preamp stage of Marshall amplifiers which use a dual triode in the first gain stage. Includes two preamp tubes and one SAG-AT7-MPI matched phase inverter.

### SAG-FHG Fender Hi Gain Kit

Two selected high-gain ECC83 tubes optimized for the preamp stage of Fender amplifiers that use a dual triode in the first gain stage. Includes two preamp tubes and one SAG-AT7-MPI matched phase inverter.

### SAG-FST Fender Soft Touch Kit

Two selected lower-gain, slow rise time 12AX7 tubes optimized for the preamp stage of Fender amplifiers that use a dual triode in the first gain stage. Includes two preamp tubes and one SAG-AT7-MPI matched phase inverter.

## 6V6 Power Tubes

The 6V6 is a low-output power tube (12-18 watts) often used in Fender amplifiers, including the Champ, Deluxe, Dual Professional, Vibro-King, Princeton, Vibrolux and others. It has a very warm, round and soft response with rich harmonics, and distorts easily. One of the best choices ever produced for rehearsal and recording amplifiers. Available as singles, pairs and quartets; stocked in "medium" power ratings. Also available by special order with "low" and "high" power ratings and fine scales ranging from 1 through 10.



### GT-6V6-C Power Tube

Classic design and the most affordable choice in the GT 6V6 line. Warm overdrive and soft distortion character.



### GT-6V6-S Power Tube

Our most premium design, for long life and professional performance. The choice for many pro players who use Groove Tubes in their favorite amps for recording and rehearsal; fully captures the spirit and sound of tube amps from the '50s and '60s to the present.



### GT-6V6-R Power Tube

Solid, predictable performance, the most used widely used tube design in stock amplifiers from major manufacturers in the 6V6 line.

## 6L6 Power Tubes

A medium-output power tube (generally 20-25 watts) often used in Fender professional amplifiers including the Bassman, Bandmaster, Concert, Dual Showman, Hot Rod Series, Pro Series, Super Reverb, Tremolux, Twin, Vibrolux, Super Sonic, Blues Deluxe, Blues DeVille and others. Available in many variations, its response is round, with a pronounced midrange character; strident and chesty with a super-bright and clean, powerful punch. Perhaps the most recognized signature tone for U.S. guitar music of all styles from the '60s onward.



### GT-6L6-CHP Power Tube

EXCLUSIVE GT design. This black-plate (carbonized nickel) design features extended heatsink wings. Has strong and focused output, and is highly recommended for enlivening any stock Fender or Marshall that uses a standard 6L6. High-performance design delivers 30 watts, with very high performance/headroom. An outstanding replacement for any tube amp with 6L6 power tubes.



### GT-6L6-GE Power Tube

EXCLUSIVE GT design. The GE is a faithful reproduction of the original "clear top" 6L6. The flagship of the GT 6L6 line, it looks and sounds exactly like the original G.E. tube used by Fender in the '50s and '60s. It took more than four years to develop, and has stunning clarity and power.



### GT-6L6-R Power Tube

Solid and consistent performance; very sturdy and reliable. AKA 5881.



### GT-6L6-S Power Tube

Great dynamics and a very sweet, punchy tone with enhanced power rating and performance. More brilliant top end and a very full, pronounced and round low-frequency output. A solid replacement for stock performance.

## EL34 Power Tubes

The original power platform behind most high-powered British guitar stacks from the '60s onward. Output is generally between 20 and 25 watts, with pronounced midrange punch, tight low end and crisp top end that breaks up relatively smoothly and gets a little crunchy when pushed hard. It provides a great voice that stands out in a band mix as the mids tend to power their way through an overall mix. Big brother to the EL84. Stocked in "medium" power ratings; also available as special orders with "low" and "high" power ratings and fine scales ranging from 1 through 10.



### GT-EL34L Power Tube

EXCLUSIVE GT design. The heat wings attached to the plate give our version of the original EL34 15-20 percent more power. Interchanges in any EL34 application and stays tight and robust all the way up to full power. Highly dynamic, big low end and runs cooler for longer life. Amazing headroom, killer tone and all of the great features and characteristics of the EL34 design.

### GT-EL34M Power Tube

The GT EL34 is based on the original Mullard EL34 of the '60s — the stock tube in all early Marshall and Hiwatt amps. Mullard produced it for about 15 years, and this is a faithful reproduction of the classic XF2 dual-getter version. It has a big, fat and well-defined tone and really "wakes up" reissue amps to perform like the originals. As close as you can get to vintage Marshall power tube heaven.



### GT-EL34R Power Tube

A more modern implementation of the original at an affordable price, and currently standard issue on many U.K. amps. Very durable and consistent, which is good for manufacturing, but the distortion can be slightly harsh, and it lacks a little high end. This makes it more forgiving, but can sound a little dull.

## EL84 Power Tubes

Exhibits many of the same characteristics as the EL34, but with a power output of roughly 5-8 watts. Very creamy and smooth; used in many modern class "A" amps. Nearly every modern tube amp company produces a small amp, and Groove Tubes EL84s are a perfect upgrade for any stock tube in these amps. Great for recording and rehearsal; with a soft and tactile touch, rich harmonic response and pleasingly musical top end. Stocked in "medium" power ratings; also available as special orders with "low" and "high" power ratings and fine scales ranging from 1 through 10.



### GT-EL84-R Power Tube

A solid performer — good quality and long lasting. Tends to be a little more aggressive and edgy when pushed into overdrive. This version is a little brighter, but still has a nice smooth top end. Unique character with moderate output.

### GT-EL84-S Power Tube

The warmest Groove Tube in this family. It remains very buttery, with relatively high power output and very even response. A great replacement for many modern stock amps, overcoming a variety of design issues and limitations in inexpensive tube amps. A great way to upgrade your amp and step up to Groove Tubes tone with one of our best sellers.

## 6550 / KT88 Power Tubes

One of the highest-output pentodes available. Originally manufactured in the United States by G.E., it delivers 35 to 50 watts per tube and was original equipment in Ampeg SVT and Marshall amps during the '70s and early '80s. A big, clean, tight tube with amazing headroom and performance and great power and dynamics. A similar tubes is the KT88 (used by Sunn and others). The highest-output power tube in this family. Stocked in "medium" power ratings; also available as special orders with "low" and "high" power ratings and fine scales ranging from 1 through 10.



### GT-6550C Power Tube

Our softest 6550 is easier to push into distortion than the "R" version or the original. Has a nice character that breaks up slightly earlier, which some players prefer in a Marshall. A 6550 standard, this tube will produce a stock signature distortion at lower levels than the "R" version.

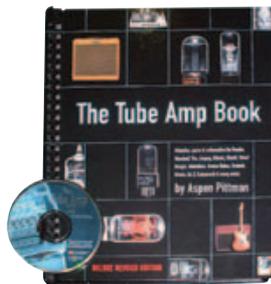


### GT-6550R Power Tube

Our highest-output 6550 is slightly easier to push into distortion than the original G.E. version and has a harder response than the "C" for tighter, quicker response. Good for bass amps and metal, when more pronounced note definition is desired with just a touch of distortion.

### GT-KT88SV Power Tube

EXCLUSIVE GT design. This is the highest-output power tube in the 6550/KT88 family, with special heat dissipation wings on the plate that let it reach the same power specs as the original Gold Lion KT88 of the '60s. The best, most durable and most powerful tone in the family, with outstanding dynamic response and big bottom end. The definitive tube for bass amps, country, jazz, metal and any situation in which most of the tone shaping occurs in the preamp, pedals or effects. Amazing high-horsepower delivery of clean tone.



### Tube Amp Book

This deluxe revised edition of Aspen Pittman's The Tube Amp Book contains 40% new material. Features a CD-ROM with 800 available schematic and layout diagrams. Hardcover with convenient enclosed spiral binding.

## SPECIAL ORDER TUBES

### Matched Power Tube Sets

Our stock matched-power tubes sets are offered in the "medium" range. We use a 10-point scale (10 being the highest output); "medium" tubes fall in the 4-7 range and are most similar to stock tubes for many amplifiers, especially Fender. For amp service techs or those wishing to customize amplifiers to achieve specialized tone, "high" (8-10) and "low" (1-3) tube sets are available. These may require amp re-biasing by a qualified service technician. Please contact your Groove Tubes Retailer to purchase matched sets with ratings other than "medium."

### Non-Stock Tubes

There are many other tubes in the Groove Tubes lineup that are non-standard for use in amplifiers today and are not included on this pricelist. These include preamp, rectifier, power amp and microphone tubes such as the 6205, 6922, 7027, 7591, 5881C, KT66, KT77, etc. Please contact your Groove Tubes Retailer to check availability of these tubes and for information on your other special-order needs.

**SILVER SERIES** 

ELECTRON TUBE

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# SILVER SERIES

In a world of “Good, Better, Best” choices, Silver Series tubes are the “Better” choice. They are excellent workhorses in many amplifier circuits in reverb driver, phase inverter or other applications, and can also be an excellent choice in the audio chain in most positions. Silver Series tubes are fully functional and pass many of the same exhaustive tests of premium Groove Tubes. They exceed all basic industry specifications for performance and provide a very affordable alternative for use in non-critical applications. Silver Series power tubes are perfect for single power tube (non-matched) use, as spares or use in project amplifiers. Silver Series preamp tubes are great for “sampling” different preamp tube performance characteristics and to experiment with your sound. Please contact your Groove Tubes Retailer for information on current availability, pricing and special opportunities to purchase Silver Series tubes.

PRODUCT	STOCK NUMBER
Silver Series preamp tubes - various	Call for Availability
Silver Series rectifier tubes - various	Call for Availability
Silver Series power tubes - 6550	Call for Availability
Silver Series power tubes - KT88, KT66	Call for Availability
Silver Series power tubes - KT77	Call for Availability
Silver Series power tubes - EL34R, 6L6S, 6L6R	Call for Availability
Silver Series power tubes - 6L6CHP, 6L6C, 6L6GE, 6L6R, 6V6S, E34LS, EL34M	Call for Availability
Silver Series power tubes - 6V6R, EL34C, EL84R, EL84S	Call for Availability

## Warranty

Warranted to be free of burn out for 30 days from date of purchase.

## TUBE/AMPLIFIER REFERENCE

To use this guide, locate the manufacturer of your amplifier or other tube-based audio product (listed in alphabetical order), and then search for the model. The full complement of Groove Tubes replacement tubes will be listed next to the model name. If you can't find your amplifier model in this guide, contact Groove Tubes for more information.

### 65amps

London	2-12AX7, 1-EF86, EL84 Duet, EZ81
Marquee Club	2-12AX7, 1-EF86, EL84 Quartet, GZ34
SoHo	2-12AX7, 1-EF86, EL84 Duet, EZ81
Royal Albert	3-12AX7, KT77 Duet or 6V6 Duet, SS plugin or 5Y3 or 5U4 or GZ34/5AR4

### Acoustic

160	2-12AX7, 2-12AT7, 6L6 Quartet
160	3-12AX7, 1-12AT7, 6L6 Quartet
164/165	2-12AX7, 2-12AT7, 6L6 Quartet
164/165	3-12AX7, 1-12AT7, 6L6 Quartet
G-100T	3-12AX7, 1-12AT7, 6L6 Quartet
G-60T	2-12AX7, 2-12AT7, 6L6 Duet
Tube 60	2-12AX7, 2-12AT7, 6L6 Duet

### ADA

MB-1	2-12AX7
MP-1	2-12AX7
T-100S	2-12AX7, 6CA7 Quartet

### Alembic

Preamp	2-12AX7
F/X	1-12AX7

### Ampeg

Jet-12 - early	2-6K11, 7591 Duet
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*Note: some older Jet-12s used 6BK11s instead of 6K11s. This tube is no longer available, and there is no adequate substitute.*

Jet-12	2-12AX7, 7591a Duet
Jet-12R	2-12AX7, 1-6U10, 7591a Duet
GS-12R Rocket II	3-12AX7, 1-6U20, 7591a Duet
G-12 Gemini 12	3-12AX7, 1-6CG7, 1-7199, 7591a Duet
G-15 Gemini 12 - early	4-12AX7, 1-6CG7, 1-7199, 7591a Duet
G-15 Gemini 12	4-12AX7, 1-6CG7, 1-7199, 7027 Duet
GV-22 Gemini	4-12AX7, 1-6CG7, 1-7199, 7027 Duet
SB-12	2-12AX7, 6L6 Duet, 5AR4
B-25	2-12AX7, 1-7100, 7027 Duet, 5AR4
B-22X	4-12AX7, 1-6CG7, 1-7199, 7027 Duet, 5AR4
B-42X	4-12AX7, 1-6CG7, 1-7199, 7027 Duet, 5AR4
GV-12	1-12AX7, 1-6U10, 1-12DW7, 7591
AC-12	1-12AX7, 1-6U10, 1-12DW7, 7591
AX-44C	1-12AX7
AX-70	1-12AX7
B-12XT	4-12AX7, 7027 Duet, 5AR4
VT-40 - later	1-12AX7, 2-12DW7, 1-6AN8, 1-6CG7, 7027 Duet
VT-40	3-12AX7, 1-6K1 1, 1-12DW7, 1-6AN8, 1-6CG7, 7027 Duet
VT-22 - later	1-12AX7, 3-12DW7, 1-6CG7, 1-6AN8, 7027 Quartet

## Ampeg (Continued)

VT-22	3-12AX7, 1-6K11 1, 1-12DW7, 1-6AN8, 1-6CG7, 7027 Quartet
VT-60	4-12AX7, 1-12AU7, 6L6 Duet
VT-120	4-12AX7, 1-12AU7, 6L6 Quartet
V-2	3-12AX7, 1-12DW7, 1-12AU7, 1-6K1 1, 1-6CG7, 7027 Duet
V-3	4-12AX7, 1-12AT7, 6550 Duet
V-4	3-12AX7, 1-12DW7, 1-12AU7, 1-6K1 1, 1-6CG7, 7027 Quartet
V-4B	2-12AX7, 1-12DW7, 1-12AU7, 1-6K1 1, 7027 Quartet
V-5	3-12AX7, 6550 Quartet
V-7	4-12AX7, 1-12AT7, 6550 Quartet
V-9	1-12AX7, 4-12DW7, 1-6CG7, 2-12BH7, 6550
B-15 - early	2-6SL7, 1-7199, 6L6 Duet, 5AR4
B-15N	3-6SL7, 6L6 Duet, 5AR4
B-18	2-6SL7, 1-7199, 7027 Duet

## Audio Research

SP-3 Series	8-12AX7
SP-6 A and B	6-12AX7
SP-6E	4-12AX7, 2-ECC88
SP-8	4-12AX7, 2-ECC89, 1-12BH7
SP-10	12-ECC88, 1-ECC81, 2-6L60S Duet
D75A and D76	4-12AX7, 8-6CG7, 1-6550A, 1-6550 Quartet
D79, D150, D-70/115/250	Call the Groove Tubes Sales Department with your serial number

## Bedrock

1200	5-12AX7, 1-EL34 Duet
1400	3-12AX7, 1-EL34 Duet
1600	6-12AX7, 1-EL34 Quartet

## Benson

300	3-12AX7, EL34
400	3-12AX7, EL34

## Bogner

Shiva	7-12AX& EL34 or 6L6 Duet depending on output transformer
Ubershall	6-12AX7 EL34 Quartet
Ecstasy	6-12AX7 EL34 or 6L6 Quartet depending on output transformer
Metropolis 15	5-12AX7, 1-EL84 (reverb) EL84 Duet
Metropolis 30	5-12AX7, 1-EL84 (reverb) EL84 Quartet
Duende	5-12AX7, 6V6 Duet, 5AR4 or 5Y3 Rectifier

## Budda Super Drive Series

18	2 x 12AX7, 2 x EL84, 1 x 5U4
30	2 x 12AX7, 4 x EL84, 1 x 5U4
45	3-12AX7, 1-5U4 Rectifier, 2 x KT66
80	3-12AX7, 1-5U4 Rectifier, 4 X 6L6
Twin Master	2 x 12AX7, 2 x EL84, 1 x 5U4

## Carr

Raleigh	2 X 12AX7, 1 X EL-34
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## Carr (Continued)

Mercury	2 X 12AX7, 1 X 12AT7, 1 X EL34
Viceroy	3 X 12AX7, 1 X 12AT7, 2 X 6L6
Rambler	3 X 12AX7, 1 X 12AT7, 2 X 6L6
Slant 6V	4 X 12AX7, 2 X 12AT7, 4 X 6V6, 1 X 5AR4
Hammerhead	2 X 12AX7, 2 X EL34

## Carvin

VTR 2800 50-watt	1-12AT7, 6CA7 Duet
VTR 2800 100-watt	1-12AT7, 6CA7 Quartet
VTX 100	3-12AX7, 6L6 Quartet
X-B12 30-watt	3-12AX7, 6L6 Duet
X-T12 60-watt	3-12AX7, 6L6 Duet
X-V112 100-watt	3-12AX7, 6L6 Quartet
X-VI12 - later	3-12AX7, EL34 Quartet
X-V212 100-watt	3-12AX7, 6L6 Quartet
X-V212 - later	3-12AX7, EL34 Quartet
X-V212E 100-watt	3-12AX7, 6L6 Quartet
X-60 60-watt	3-12AX7, EL34 Quartet
X-60B 60-watt	3-12AX7, 6L6 Duet
X-100 100-watt	3-12AX7, 6L6 Quartet
X-100B 100-watt	3-12AX7, 6L6 Quartet
X-100B - later	3-12AX7, EL34 Quartet

*Note: Some Carvin amps may not be able to use EL34 tubes since pin 1 and 8 were not always wired together. Check your amp if it's an older model. See the 6L6-to-EL34 mod: Service and Mod Section under Fender amps in Aspen Pittman's The Tube Amp Book.*

## Champion

R&R 10-watt	1-12AX7, 6V6 Duet
R&R 20-watt	1-12AX7, EL34 Duet

## Conn

Strobe Tuner	2-6AQ5, 1-6X4, 1-5879, 1-12AT7, 1-12AU7
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## Conrad Johnson

Premier One	4-6CG7, 1-5751, 2-6550 Sextets
Premier Three	2-12AX7, 5-5751, 2-5965
MV-75A	2-6CG7, 1-5751, 6550 Quartet

## Cornford

Harlequin	2-2AX7, EL84 Single
Hellcat	5-12AX7, EL84 Quartet
Hurricane	4-12AX7, EL84 Duet
M.K.50 H	4-12AX7, 6L6 Duet
R.K. 100	4-12AX7, EL34 Quartet

## Crate

V5	1 X EL84
V18	2 X EL84
V33	4 X EL84
V50	2 X 6L6

## Crate (Continued)

V100 4 X 12AX7, 4 X EL34

## Demeter

TGA-3 6-12AX7, 6550 Quartet

TGP-3 6-12AX7

VTBP/201 6-12AX7

VTDB-2 1-12AX7

## Diaz

CD-100 3-12AX7, 1-12AT7, 6L6 Quartet

## Diezel

VH4 & VH4S 4-12AX7, 4 X 6L6, KT66, KT88, 6550, EL34

HERBERT 4-12AX7, 6 X 6L6, KT66, KT88, 6550, EL34

EINSTEIN 4-12AX7, 4 X 6L6, KT66, KT88, 6550, EL34

SCHMIDT 4-12AX7, 4 X 6L6, KT66, KT88, 6550, EL34

## Divided by 13

LDW 17/39 12AX7, 2 X EL34

EDT 13/29 12AX7, 12AT7, 2 X KT66, 1 X 5AR4

CJ 11 2 X 12AX7, 2 X 6V6, 1 X 5AR4

FTR 37 12AX7, 4 X 6V6, 1 X 5AR4

SJT 10/20 12AX7, 2 X 6V6, 1 X 5AR4

TBL 200 12AX7, 4 X KT88

JTR 9/15 12AX7, 2 X EL84 2 X 6V6, 1 X 5AR4

RSA 23 12AX7, 2 X KT88, 1 X 5AR4

RSA 31 12AX7, 4 X EL84, 1 X 5AR4

JJN 50/100 12AX7, 4 X EL34

## Dr. Z Amps

CARMEN GHIA 1 X 12AX7, 1 X 5751, 2 X EL84, 1 X 5Y3

EZG 50 2 X 12AX7, 2 X 12AT7, 2 X 6L6

GALAXIE 3 X 12AX7, 2 X 6L6, 1 X 5U4

JAZ 20/40 5 X 12AX7, 1 X 12AT7, 4 X 6V6

MINI Z 1 X 12AX7, 1 X EL84

REMEDY 3 X 12AX7, 4 X 6V6

## Dynaco

PAS Series 4-12AX7, 1-12X4

Stereo 70 2-7199, 1-5AR4, EL34 Quartet

MKIII 1-6AN8, 1-5AR4, 6550 Quartet

## Fender

1959 Bassman - reissue 3-12AX7, 6L6 Duet

Bandmaster VOS 1-12AY7, 2-12AX7, 6L6 Duet, 5U4

Bandmaster OS 6-12AX7, 6L6 Duet

Bandmaster NS 3-12AX7, 1-12AT7, 6L6 Duet

## Fender (Continued)

<b>Bandmaster/Reverb</b>	4-12AX7, 2-12AT7, 6L6 Duet, 5U4
<b>Bantam Bass</b>	2-12AX7, 1-12AT7, 6L6 Duet, 5U4
<b>Bassman 4x10 OS 1</b>	1-12AY7, 2-12AX7, 6L6 Duet, 5U4
<b>Bassman 4x10 OS 2</b>	1-12AY7, 2-6925, 6L6 Duet, 2-5U4
<b>Bassman 4x10 OS 3</b>	2-12AY7, 1-12AX7, 6L6 Duet, 2-5U4
<b>Bassman 4x10 OS VOS</b>	1-6SC7, 1-6SL7, 6L6 Duet, 5U4
<b>Bassman Top 50-watt</b>	3-12AX7, 1-12AT7, 6L6 Duet, 5U4
<b>Bassman Top 70-watt</b>	3-12AX7, 1-12AT7, 6L6 Duet
<b>Bassman Ten 70-watt</b>	2-12AX7, 1-12AT7, 6L6
<b>Bassman 100</b>	2-12AX7, 1-12AT7, 6L6 Quartet
<b>Bassman 135</b>	2-12AX7, 1-12AT7, 6L6 Quartet
<b>Champ OS</b>	1-6SJ7, 6V6, 5Y3
<b>Champ OS</b>	1-12AX7, 6V6, 5Y3
<b>Champ 12 - 1990</b>	1-12AX7, 6L6
<b>Concert</b>	6-12AX7, 6L6 Duet, 5U4
<b>Concert</b>	6-12AX7, 6L6 Duet
<b>Concert 1983</b>	5-12AX7, 2-12AT7, 6L6 Duet
<b>Deluxe 5C3</b>	1-6SC7, 1-12AY7, 6V6 Duet, 5Y3
<b>Deluxe 5D3</b>	1-12AY7, 1-12AX7, 6V6 Duet, 5Y3
<b>Deluxe 5113</b>	2-12AX7, 6V6 Duet, 5Y3
<b>Deluxe Brown</b>	3-12AX7, 6V6 Duet, 5Y3
<b>Deluxe Reverb</b>	4-12AX7 (12AX7), 2-12AT7, 1-5AR4 6V6 Duet
<b>Deluxe Reverb - 1983</b>	5-12AX7, 1-12AT7, 6V6 Duet
<b>Dual Showman</b>	3-12AX7, 1-12AT7, 6V6 Quartet
<b>Dual Showman Head - 1990</b>	4-12AX7, 1-12AT7, 6V6 Quartet
<b>Dual Showman Reverb</b>	4-12AX7, 2-12AT7, 6V6 Quartet
<b>Fender 30</b>	4-12AX7, 2-112AT7, 6L6 Duet, 5U4
<b>Fender 75</b>	3-12AX7, 2-112AT7, 6L6 Duet
<b>Fender 100 PA</b>	4-12AX7, 2-112AT7, 6L6 Duet
<b>Fender 160 PS</b>	3-12AX7, 1-12AT7, 1-12AU7, 1-6CA8, 6L6 Sextet
<b>Fender 300 PS</b>	2-12AX7, 1-12AT7, 6V6, 6550 Quartet
<b>Fender 400 PS</b>	6-12AX7, 1-12AT7, 6L6, 6550 Sextet
<b>Fender Blues Jr</b>	3-12AX7, 1-EL84 Duet
<b>Fender Dual Professional</b>	5-12AX7, 1-6V6GT, 6L6 Quartet
<b>Fender Hot Rod Deluxe</b>	3-12AX7, 6L6 Duet
<b>Fender Hot Rod Deville</b>	3-12AX7, 6L6 Duet
<b>Fender Tonemaster</b>	3-12AX7, 6L6 Quartet
<b>Fender Pro Series Twin</b>	7-12AX7, 1-12AT7, 6L6 Quartet
<b>Fender Pro Series Concert</b>	7-12AX7, 1-12AT7, 6L6 Duet
<b>Fender Pro Series Pro Reverb</b>	7-12AX7, 1-12AT7, 6L6 Quartet
<b>Fender Vibrosonic</b>	4-12AX7, 2-12AT7, 6L6 Duet
<b>Fender Vibro-King</b>	5-12AX7, 1-6V6 (EL-84 early models), 6L6 Duet
<b>Fender Vibrolux Reissue</b>	5-12AX7, 1-12AT7, 6L6 Duet
<b>Fender 63 Vibroverb Reissue</b>	5-12AX7, 1-12AT7, 6L6 Duet

## Fender (Continued)

Harvard	1-12AX7, 6V6, 5Y3
Harvard	1-12AX7, 1-6AT6, 6V6 Duet, 5Y3
Musicmaster Bass	1-12AX7, 6V6 Duet
Princeton VOS	3-6SC7, 6L6 Duet, 5U4
Pro OS	2-12AY7, 1-12AX7, 6L6 Duet, 5U4
Pro Brown	6-12AX7, 6L6 Duet
Pro	3-12AX7, 1-12AT7, 6L6 Duet, 5AR4
Pro Reverb	4-12AX7, 2-12AT7, 6L6 Duet, 5AR4
Quartet Reverb	4-12AX7, 2-12AT7, 6L6 Quartet
Rack Amp RPWI	2-12AX7, 1-12AT7, 6L6 Quartet
Rack Guitar Preamp	2-6C10, 4-12AX7, 2-12AT7
Rack Bass Preamp	2-6C10, 4-12AX7
Rack 200-watt amp	2-12DW7, 2-12BH7, 2-12AX7, 6550 Sextet
Reverb Unit OS	1-12AX7, 1-12AT7, 1-6K6
Reverb Unit	1-12AX7, 1-12AT7, 6V6
Showman OS	6-12AX7, 6L6 Quartet
Showman	3-12AX7, 1-12AT7, 6L6 Duet, 5U4
Super 2x10 V front	2-12AY7, 6V6 Duet, 5U4
Super 2x10	1-12AY7, 2-12AX7, 6L6 Duet, 5U4
Super VOS	3-6SC7, 6L6 Duet, 5U4
Super OS	1-12AY7, 10-12AX7, 6L6 Duet, 5U4
Super Brown	5-12AX7, 6L6 Duet
Super Reverb	4-12AX7, 2-12AT7, 6L6 Duet, 5U4
Super Reverb	4-12AX7, 2-12AT7, 6L6 Duet
Super Champ - 1983	1-12AX7, 1-12AT7, 1-6C10, 6V6 Duet
Super Twin	2-12AX7, 1-12AT7, 1-6CX8, 1-6C10, 6L6 Sextet
Super Six	4-12AX7, 2-12AT7, 6L6 Quartet
Super 60 - 1990	2-12AX7, 1-12AT7, 6L6 Duet
Super 112 - 1990	2-12AX7, 1-12AT7, 6L6 Duet
Super 210 - 1990	2-12AX7, 1-12AT7, 6L6 Duet
Tone Master - new model	3-12AX7, 6L6 Quartet
Tremolux VOS	1-12AY7, 2-12AX7, 6L6 Duet, 5AR4
Tremolux OS	4-12AX7, 6L6 Duet, 5AR4
Twin Cream/Brown	6-12AX7, 6L6 Quartet
Twin Reverb	4-12AX7, 2-12AT7, 6L6 Quartet
Twin Reverb - 1983	5-12AX7, 2-12AT7, 6L6 Quartet
Vibrolux VOS	2-12AX7, 6V6 Duet, 5Y3
Vibrolux OS	3-12AX7, 1-12AT7, 6L6 Quartet
Vibrolux Brown	4-12AX7, 6L6 Duet, 5AR4
Vibro Champ	2-12AX7, 6V6, 5Y3
Vibroverb Brown	4-12AX7, 2-12AT7, 6L6 Duet, 5U4
Vibro King - new model	5-12AX7, 1-EL84, 6L6 Duet, 5AR4
59 Bassman LTD	3-12AX7, 6L6GC Duet, 5AR4
Bassman 300 Pro	1-12AX7, 1-12AT7, 1-6550 Sextet
Pro Junior	2-12AX7, EL84 Duet

## Fender (Continued)

<b>Super-Sonic</b>	6-12AX7, 2-12AT7 6L6 Duet
<b>Super-Sonic (head)</b>	5-12AX7, 1-12AT7 1-6550 Sextet
<b>57 Deluxe (reissue)</b>	2-12AX7, 6V6 Duet, 5Y3
<b>57 Twin (reissue)</b>	4-12AX7, 6L6 Duet, 2-5U4
<b>Blues Deluxe</b>	3-12AX7, 6L6 Duet
<b>Blues DeVille</b>	3-12AX7, 6L6 Duet
<b>64 Vibroverb Custom</b>	4-12AX7, 2-12AT7 6L6 Duet, 5AR4
<b>Princeton Recording Amp</b>	3-12AX7, 1-12AT7 6V6 Duet
<b>EC Twinolux</b>	4-12AX7, 6L6 Duet, 2-5U4
<b>EC Tremolux</b>	3-12AX7, 6V6 Duet, 5Y3GT
<b>EC Vibro-Champ</b>	2-12AX7, 6V6, 5Y3GT
<b>Machete Combo &amp; Head</b>	5-12AX7, 1-12AT7, 6L6 Duet
<b>Super Sonic 22 Combo</b>	3-12AX7, 2-12AT7, 6V6 Duet
<b>Super Sonic 60 Combo</b>	6-12AX7, 2-12AT7, 6L6 Duet
<b>Super Sonic 60 Head</b>	5-12AX7, 1-12AT7, 6L6 Duet
<b>Super Sonic Twin Combo</b>	7-12AX7, 2-12AT7, 6L6 Quartet
<b>Super Sonic 100 Head</b>	7-12AX7, 2-12AT7, 6L6 Quartet
<b>Super Champ X2 Combo &amp; Head</b>	1-12AX7, 6V6 Duet
<b>Greta</b>	1-12AX7, 12AT7
<b>Excelsior</b>	2-12AX7, 6V6 Duet
<b>Champion 600</b>	1-12AX7, 6V6
<b>'65 Princeton Reverb Reissue</b>	3-12AX7, 1-12AT7, 6V6 Duet, 5AR4
<b>Super Champ XD</b>	1-12AX7, 6V6 Duet
<b>Vibro-Champ XD</b>	1-12AX7, 6V6
<b>Bassman 100T Head</b>	2-12AX7, 1-12AT7, 6L6 Quartet
<b>Super Bassman Head (2012)</b>	3-12AX7, 1-12AT7, 6550 Sextet
<b>'65 Twin Reverb Reissue</b>	4-12AX7, 2-12AT7, 6L6 Quartet
<b>'65 Deluxe Reverb Reissue</b>	4-12AX7, 2-12AT7, 6V6 Duet, 5AR4
<b>'94 Twin Amp</b>	5-12AX7, 3-12AT7, 6L6 Quartet
<b>The Twin</b>	5-12AX7, 2-12AT7, 6L6 Quartet
<b>'65 Super Reverb Reissue</b>	4-12AX7, 2-12AT7, 6L6 Duet, 5AR4
<b>Princeton Reverb II</b>	3-12AX7, 1-12AT7, 6V6 Duet
<b>Bandmaster VM Head</b>	2-12AX7, 6L6 Duet
<b>Deluxe VM Combo</b>	2-12AX7, 6L6 Duet
<b>Twin Custom 15</b>	4-12AX7, 2-12AT7, 6L6 Quartet
<b>TBP-1</b>	2-12AX7

## Gibson

<b>Atlas Medalist</b>	2-6EU7, 1-6C4, 6L6 Duet
<b>Atlas IV</b>	2-6EU7, 1-6C4, 6L6 Duet
<b>BA-15RV</b>	3-6EU7, 1-12AU7, 6V6 Duet, 5y3
<b>Bass 30</b>	2-6EU7, 7591 Duet
<b>Bass 50</b>	2-6EU7, EL34 Duet
<b>BR-3</b>	2-7B4, 1-W5, 6V6 Duet, 5Y3
<b>BR-6</b>	1-6SL7, 1-6SN7, 6V6 Duet, 5Y3

## Gibson (Continued)

<b>BR-6F</b>	1-6SJ7, 1-6SN7, 6V6 Duet, 5Y3
<b>BR-9</b>	1-6SN7, 6V6 Duet, 5Y3
<b>Duo-Medalist</b>	3-6EU7, 1-12AX7, 2-12AU7, 7591 Duet
<b>Falcon</b>	3-6EU7, 1-12AX7, 2-12AU7, 7591 Duet
<b>Falcon</b>	4-12AX7, EL84 Duet
<b>GA-Custom</b>	3-6SJ7, 2-6SQ7, 2-05, 6L6 Duet, 5U4
<b>GAART-1</b>	1-12AX7, 1-6BM8, 5Y3
<b>GA-IRVT</b>	1-7100, 1-6EU7, 1-6BM8, 5Y3
<b>GA2-RVT</b>	4-6EU7, 1-12AU7, 6V6 Duet, 5Y3
<b>GA-4RE</b>	2-6EU7, 1-12AU7
<b>GA-5</b>	1-12AX7, 6V6, 5Y3
<b>GA-5T</b>	2-6EU7, 1-6AQ7, 6X4
<b>GA-6</b>	1-12AY7, 1-6SL7, 6V6 Duet, 5Y3
<b>GA-6 newer</b>	2-12AX7, 6V6 Duet, 5Y3
<b>GA-8</b>	1-6EU7, 1-6C4, 1-6BQ5, 6CA4
<b>GA-8T</b>	1-12AX7, 2-6BM8, 5Y3
<b>GA-9</b>	1-6SJ7, 6V6 Duet, 5Y3
<b>GA-14</b>	2-12AX7, 6V6 Duet, 5Y3
<b>GA-15</b>	1-12AX7, 1-6SL7, 6L6 Duet, 5Y3
<b>GA-15RVT</b>	2-6EU7, 1-12AU7, 1-EL84 Duet
<b>GA-16T</b>	1-12AX7, 6V6 Duet, 5Y3
<b>GA-17RVT</b>	2-6EU7, 1-12AX7, 2-6AQ5, 6CA4
<b>CA-18T</b>	2-6EU7, 1-6CA4, EL84 Duet
<b>GA-19RVT</b>	3-6EU7, 1-7199, 6V6 Duet, 5Y3
<b>GA-20</b>	1-6SL7, 2-6SJ7, 6V6 Duet, 5Y3
<b>GA-20T</b>	1-12AY7, 1-12AX7, 1-5879, 1-6SQ7, 6V6 Duet, 5Y3
<b>GA-20RVT</b>	3-6EU7, 2-12AU7, EL84 Duet, 5Y3
<b>GA-25</b>	1-6SJ7, 2-05, 6V6 Duet, 5Y3
<b>GA-25RVT</b>	4-6EU7, 1-12AU7, 6V6 Duet, 5Y3
<b>GA-30</b>	1-6SC7, 2-6SJ7, 6V6 Duet, 5Y3
<b>GA-30 Invader</b>	2-12AX7, 1-12AU7, 6V6 Duet, 5Y3
<b>GA-30RV Invader</b>	3-6EU7, 1-12AU7, 6V6 Duet, 5Y3
<b>GA-30RVT Invader</b>	4-6EU7, 2-12AU7, 7591 Duet, 0A2
<b>GA-30RVT Lancer</b>	1-12AX7, 2-6EU7, 2-12AU7, 7591 Duet, 0A2
<b>GA-40 early</b>	1-6SN7, 3-6SJ7, 6V6, 6V6 Duet, 5AR4
<b>GA-40 Les Paul</b>	2-5879, 1-12AX7, 1-6SQ7, 6V6 Duet, 5Y3
<b>GA-40T</b>	3-6EU7, 1-12AU7, 7591 Duet, 5AR4
<b>GA-45RVT Saturn</b>	4-6EU7, 1-12AU7, 1-6CG7, 6L6 Duet, 0A2
<b>GA-46 Accordion Pre</b>	3-12AX7, 2-5879
<b>GA-46 Accordion Amp</b>	1-6SN7, 6V6, 6550 Duet, 5AR4
<b>GA-50</b>	2-6SJ7, 2-W5, 6L6 Duet, 5AR4
<b>GA-50T</b>	3-6Si7, 1-6SN7, 1-6SL7, 6L6 Duet, 5V4
<b>GA-55</b>	2-12AY7, 1-6SC7, 6L6 Duet, 5V4
<b>GA-55RVT Ranger</b>	4-6EU7, 1-12AU7, 1-6CG7, 6L6 Duet, 0A2
<b>GA-60</b>	2-6EU7, 7591 Duet, 5AR4

## Gibson (Continued)

<b>GA-70 Country-Western</b>	1-12AX7, 1-12AY7, 1-12AU7, 6L6 Duet, 5V4
<b>GA-75 Recording</b>	2-6EU7, 1-6CG7, 6L6 Duet, 6C4
<b>GA-75W</b>	1-12AX7, 2-6SC7, 1-6W7, 6L6 Duet, 5V4
<b>Super Medalist</b>	2-6EU7, 2-12AU7, 1-6AU7, 1-12AX7, 7591 Duet
<b>Thor Bass Amp</b>	2-6EU7, 1-6CA7 Duet
<b>Titan 1, 11 and 111</b>	3-6EU7, 2-12AU7, 1-0A2, 1-6FQ7, 6L6 Quartet
<b>Titan Medalist</b>	3-6EU7, 2-12AU7, 1-0A2, 1-6FQ7, 6L6 Quartet
<b>Hawk</b>	3-12AX7, 1-EL84 Duet
<b>Les Paul TV or JR</b>	1-6SJ7, 6V6, 5Y3
<b>Skylark T</b>	1-6X4, 2-12AX7, 1-EL84
<b>Skylark</b>	1-12AX7, 1-6X4, 1-EL84
<b>SG Systems 100</b>	1-12AX7, 1-8417 Duet
<b>SG Systems 200</b>	1-7015, 1-8417 Sextet
<b>EH-150</b>	3-6SQ7, 1-6N7, 1-5U4, 6L6 Duet
<b>Echoplex</b>	2-6EU7, 1-6C4
<b>XFL-3</b>	2-12AX7, 1-12AT7
<b>XFL-60/60</b>	4-12AX7, 2-12AT7, 6L6 Duet r EL34 Duet

## Greer

<b>THUNDERBOLT 30</b>	2-12AX7, EL34 Duet (some with 6L6 Duet), 5AR4
<b>CAM 18</b>	2-12AX7, 6V6 Duet (some with 6L6 Duet), 5AR4
<b>Special 20</b>	2-12AX7 (some w/5879 in V1), 6V6 Duet (some w/5881 Duet), 5AR4
<b>Rev 50</b>	3-12AX7, EL34 Duet, 5AR4
<b>NTG 15</b>	2-12AX7, EL84 Duet, 5Y3
<b>MARAUDER 35</b>	2-12AX7, 6L6 Duet, 5AR4
<b>UNDERDOG 15</b>	2-12AX7, 6V6 Duet, 5Y3

## Groove Tubes

<b>STP-B</b>	1-12AX7
<i>NOTE: The following Groove Tubes Electronics products accept a wide variety of tubes without modifying the amp. The owner can customize his/her own amp and change the sound characteristics as desired.</i>	
<b>TRIO</b>	5-12AX7
<b>STP-G</b>	4-12AX7, 6V6 Duet or EL34 Duet
<b>STA-1 Preamp</b>	6-12AX7, 2 output Duets - EL34, 6L6, 6550, KT88
<b>D-75 Dual amp</b>	4-12AX7, 2 output Duets - 6L6, EL34, 6550, KT88
<b>D-120 Dual amp</b>	4-12AX7, 2 output Duets - 6L6, EL34, 6550, KT88
<b>D-75 Studio</b>	4-12AX7, 2-Duets - 6550, KT88 or KT90
<b>Soul-o 75</b>	5-12AX7, Duet - 6L6, EL34, 6550, KT88 or KT90
<b>Soul-o 150</b>	5-12AX7, Quartet - 6L6, EL34, 6550, KT88 or KT90
<b>Soul-o 45</b>	3-12AX7, 1-12AU7, 1-12AT7, Duet - 6L6, EL34, 6550, KT88
<b>Soul-o Single</b>	2-12AX7 or any combination of 12AX7, 12AT7, 12AU7, 12AY7, Single output tube - 6V6, 6L6, EL34, 6550, KT88, EL84 in 928 adaptor
<b>Soul-o 30</b>	5-12AX7, 6L6 Duet
<b>Soul-o 50</b>	5-12AX7, 6L6 or EL34 Duet

## Hammond

<b>B-3 Preamp</b>	1-12BH7, 2-6AU6, 2-6C4, 1-6X4, 1-12AX7, 1-12AU7
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## Hiwatt

<b>30W</b>	4-12AX7, EL84 Quartet
<b>30WR</b>	4-12AX7, EL84 Quartet
<b>50</b>	4-12AX7, EL34 Duet
<b>100</b>	4-12AX7, EL34 Quartet
<b>200</b>	4-12AX7, EL34 Sextet
<b>400</b>	5-12AX7, KT-88 (6550) Sextet
<b>C520</b>	4-12AX7, EL84 Duet
<b>D50L</b>	4-12AX7, EL34 Duet
<b>D50LR</b>	4-12AX7, EL34 Duet
<b>D50LRC</b>	4-12AX7, EL34 Duet
<b>D100L</b>	4-12AX7, EL34 Quartet
<b>D100LR</b>	4-12AX7, EL34 Quartet
<b>PRE-1</b>	3-12AX7
<b>PW50</b>	4-12AX7, EL34 Quartet
<b>S50</b>	4-12AX7, EL34 Duet
<b>S50LC</b>	4-12AX7, EL34 Duet
<b>S100L</b>	4-12AX7, EL34 Quartet

## Jim Kelly

<b>Single Channel</b>	2-12AX7, 6V6 Quartet
<b>Single Channel Reverb</b>	3-12AX7, 1-12AT7, 6V6 Quartet
<b>Foot-Actvtd Channel-Switching</b>	3-12AX7, 1-12AT7, 6V6 Quartet

## Kasha

<b>KA-150</b>	3-12AX7, 6550 Quartet
<b>Rockmod-1</b>	4-12AX7
<b>Rockmod-2</b>	5-12AX7
<b>Rockmod-3</b>	5-12AX7

## KMD

<b>GV-60</b>	Transistor preamp with 6L6 Duet
<b>GV-100</b>	Transistor preamp with 6L6 Quartet
<b>GV-100S</b>	Transistor preamp with 6L6 Quartet

## Korg

<b>SV1</b>	1 X 12AX7
<b>TRITON EXTREME</b>	1 X 12AU7
<b>EMX1</b>	2 X 12AX7
<b>ESX1</b>	2 X 12AX7
<b>TP2</b>	2 X 12AU7
<b>TPB2</b>	2 X 12AU7
<b>Krank</b>	
<b>KRANKENSTEIN 50</b>	3 X 12AX7, 2 X 6L6
<b>REV. STANDARD AND PRO</b>	3 X 12AX7, 2 X 6L6
<b>REV. SST</b>	3 X 12AX7
<b>KRANKENSTEIN +</b>	4 X 12AX7, 4 X 6550
<b>REV. +</b>	4 X 12AX7, 4 X 6550

## Laney

A50	4-12AX7, EL34 Duet
A100	4-12AX7, EL34 Quartet
PT-50	4-12AX7, EL34 Duet
PT-100	4-12AX7, EL34 Quartet
PT-30	3-12AX7, 6V6 Duet
PT-50 MV	3-12AX7, EL34 Duet
PT-50 AOR	4-12AX7, EL34 Duet
PT-100 MV	3-12AX7, EL34 Quartet
PT-100 AOR	4-12AX7, EL34 Quartet
ST-30	4-12AX7, 6V6 Duet

## Legend

G-50 and G100	3-12AX7 with transistor amp
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## Leslie

Model 147	1-12AU7, 1-OC3, 6550 Duet
Model 122	2-12AU7, 1-OC3, 6550 Duet

## Marantz

Model 7	6-12AX7
Model 8	2-6CG7, 2-6BH6, EL34 Quartet
Model 9	1-6CG7, 2-ECC88, 2-EL34 Quartets

## Markley

40 SR	1-12AX7 with transistor amp
80 SR	1-12AX7 with transistor amp
40 DR	1-12AX7 with transistor amp
80 DR	1-12AX7 with transistor amp
150 DR	1-12AX7 with transistor amp
T 60-watt	3-12AX7, 6L6 Duet
T 120-watt	3-12AX7, 6L6 Quartet
CD-40	3-12AX7, 6L6 Duet
CD-60	3-12AX7, 6L6 Duet
CD-120	3-12AX7, 6L6 Quartet
CD-212	4-12AX7, 6L6 Quartet
RM100 MT	2-12AX7, 6L6 Quartet
Preamp DR	1-12AX7
Preamp DB	1-12AX7

## Marshall

JVM 410 H & C	5 X 12AX7, 4 X EL34
JVM 210 H & C	5 X 12AX7, 4 X EL34
JVM 205 H, C	5 X 12AX7, 2 X EL34
JVM 215C	5 X 12AX7, 2 X EL34
2466	4 X 12AX7, 4 X KT66
226 & 2266C	4 X 12AX7, 2 X KT66
1923 & 1923 C	4 X 12AX7, 2 X EL34
DSL 100, DSL 100MLB	4 X 12AX7, 4 X EL34
DSL 50	4 X 12AX7, 2 X EL34

## Marshall (Continued)

DSL 401	4 X 12AX7, 4 X EL84
DSL 201	4 X 12AX7, 2 X EL84
TSL 100	4 X 12AX7, 4 X EL34
TSL 122	4 X 12AX7, 4 X EL34
TSL 60	4 X 12AX7, 2 X EL34
TSL 601	4 X 12AX7, 2 X EL34
TSL 602	4 X 12AX7, 2 X EL34
1959 SLP, SLPX	3 X 12AX7, 4 X EL34
1959 HW	3 X 12AX7, 4 X EL34
1959 RR	3 X 12AX7, 4 X EL34
1987 X, XL	3 X 12AX7, 2 X EL34
2245 (JTM 45)	3 X 12AX7, 2 X 6L6, 1 X 5AR4
JTM45100 (40TH ANNIVERSARY)	3 X 12AX7, 4 X KT66
JTM450S	3 X 12AX7, 2 X KT66, 1 X 5AR4
1962	3 X 12AX7, 2 X 6L6, 1 X 5AR4
SUPER 100 JH	3 X 12AX7, 4 X KT66
2203 X	3 X 12AX7, 4 X EL34
2203 KK	3 X 12AX7, 4 X KT88
MF 350	2 X 12AX7
CLASS 5	2 X 12AX7, 1 X EL84
MA100H, C	3 X 12AX7, 4 X EL34
MA50 H, C	3 X 12AX7, 2 X EL34
MHZ40C	3 X 12AX7, 2 X EL34
MHZ15C	3 X 12AX7, 2 X 6V6
AVT SERIES (HEADS & COMBOS)	1 X 12AX7
MB 60	1 X 12AX7
MB150	1 X 12AX7
MB4210	1 X 12AX7
MB4410	1 X 12AX7
MB450H	1 X 12AX7
VBA 400	3 X 12AX7, 1 X 12AU7, 8 X 6550
EL34100100	2 X 12AX7, 2 X 12AT7, 8 X EL34
EL345050	2 X 12AX7, 2 X 12AT7, 4 X EL34
EL842020	2 X 12AX7, 1 X 12AU7, 4 X EL84
JMP1	2 X 12AX7
1992LEM	3 X 12AX7, 4 X EL34

## McIntosh

C-22	6-12AX7
MC-30	1-12AX7, 1-12AU7, 1-12BH7, 6L6 Duet, 5U4
MC-40	1-12AX7, 1-12AU7, 1-12BH7, 6L6 Duet, 5AR4
MC-60	1-12AX7, 1-12AU7, 1-12BH7, 6550 Duet
MC-75	1-12AX7, 1-12AU7, 1-12BH7, 6550 Duet
MC-240	3-12AX7, 2-12AU7, 2-12BH7, 6L6 Duet, 2-5U4
MC-260	3-12AX7, 2-12AU7, 2-12BH7, 2-6550 Duets, 2-5AR4
MC-275	3-12AX7, 2-12AU7, 2-2-12BH7, 2-6550 Duets
MC-3500	2-12AX7, 2-6DJ8, 1-6CG7, 1-6BL7, 6L6 Octet

## Mesa/Boogie

Studio 22	5-12AX7, EL84 Duet
Studio Preamp	4-12AX7, 1-12AT7
Quartet Preamp	8-12AX7
MK-1 60 - early	2-12AX7, 1-12AT7, 6L6 Duet
MK-1 60 Reverb - early	4-12AX7, 1-12AT7, 6L6 Duet
MK-1 60 EQ - early	2-12AX7, 1-12AT7, 6L6 Duet
MK-1 60 Reverb/EQ - early	3-12AX7, 2-12AT7, 6L6 Duet
MK-I 10t - early	2-12AX7, 1-12AT7, 6L6 Quartet
MK-I 100 Reverb - early	2-12AX7, 2-12AT7, 6L6 Quartet
MK-I 100 EQ - early	2-12AX7, 1-12AT7, 6L6 Quartet
MK-I 100 Reverb/EQ - early	3-12AX7, 2-12AT7, 6L6 Quartet
MK-I 100 Reverb - reissue	4-12AX7, 1-12AT7, 6L6 Quartet
MK-II 60	4-12AX7, 6L6 Quartet
MK-II 60 Reverb	4-12AX7, 1-12AT7, 6L6 Duet
MK-II 100	4-12AX7, 6L6 Quartet
MK-II 100 Reverb	4-12AX7, 1-12AT7, 6L6 Quartet
MK-IIB 60	4-12AX7, 6L6 Duet
MK-IIB 60 Reverb	5-12AX7, 6L6 Duet
MK-IIB 100	4-12AX7, 6L6 Quartet
MK-IIB 100 Reverb	5-12AX7, 6L6 Quartet
MK-IIB 300	2-12AX7, 2-12AT7, 6L6 Sextet
MK-IIB 300 Reverb	2-12AX7, 3-12AT7, 1-6FQ7, 6L6 Sextet
MK-IIB 300 Cascode 60	4-12AX7, 6L6 Duet
MK-IIB 300 Cascode 60 Reverb	4-12AX7, 1-12AT7, 6L6 Duet
MK-IIB Cascode 100	4-12AX7, 6L6 Duet
MK-IIB Cascode 100 Reverb	4-12AX7, 1-12AT7, 6L6 Quartet
MMIC 60	4-12AX7, 6L6 Duet
MMIC 60 Reverb	5-12AX7, 6L6 Duet
MK-IIC 100	4-12AX7, 6L6 Quartet
MMIC 100 Reverb	5-12AX7, 6L6 Quartet
MMIC Simul 75 Reverb	5-12AX7, 1-EL34 Duet, 6L6 Duet
MMIC 300	3-12AX7, 1-12AT7, 1-6FQ7, 6L6 Sextet
MMIC 300 Reverb	4-12AX7, 1-12AT7, 1-6FQ7, 6L6 Sextet
MK-II 300 Simul Reverb	4-12AX7, 1-12AT7, 1-6FQ7, 1-EL34 Duet, 6L6 Quartet
MK-III 60	4-12AX7, 6L6 Duet
MK-III 60 Reverb	5-12AX7, 6L6 Quartet
MK-III 100 Reverb	5-12AX7, 6L6 Quartet
MK-III Simul 75 Reverb	5-12AX7, 6L6 Duet, EL34 Duet
MK-IV	4-12AX7, 1-12AT7, 6L6 Quartet
Satellite 60	2-12AX7, 6L6 Duet
Simul-Satellite	2-12AX7, 6L6 Quartet
Simul-Class 290 Stereo	3-12AX7, 2-6L6 Quartets
Simul-Class 295	4-12AX7, 6L6 Quartet and EL34 Quartet
Simul-Class 395 Stereo	4-12AX7, 2-6L6 Quartets
Strategy 400	4-12AX7, 6L6 Octet and EL34 Quartet
Strategy 500 Stereo	4-12AX7, 1-6550 Quartet and 2-6L6 Quartets
SOB 60 - early	2-12AX7, 1-12AT7, 6L6 Duet

## Mesa/Boogie (Continued)

<b>SOB 60</b>	3-12AX7, 6L6 Duet
<b>SOB 60 Reverb</b>	4-12AX7, 6L6 Duet
<b>SOB 100 Reverb</b>	4-12AX7, 6L6 Quartet
<b>D-180 - early</b>	2-12AX7, 2-12AT7, 6L6 Sextet
<b>D-180</b>	3-12AX7, 1-12AT7, 6L6 Sextet
<b>Bass-400</b>	4-12AX7, 6L6 Sextet
<b>Bass-400 Plus</b>	4-12AX7, 2-6L6 Sextet
<b>50150 Power Amp</b>	2-12AX7, 6L6 Quartet
<b>TriAxis Preamp</b>	5-12AX7
<b>Dual Rectifier Solo Head</b>	5-12AX7, 2-5U4 6L6/EL34 Quartet
<b>Triple Rectifier Solo Head</b>	5-12AX7, 3-5U4 6L6/EL34 Sextet
<b>Dual Rectifier Trem-O-Verb</b>	6-12AX7, 2-5U4 6L6/EL34 Quartet
<b>Dual Caliber 50</b>	6-12AX7, 6L6 Duet
<b>Dual Caliber 30</b>	6-12AX7, 1-6BQS/EL34 Quartet

*NOTE: MK-11C and early MK-III Simul-Class models were shipped with a Quartet of 6L6s. MESA/Boogie recommends that these Simul-Class units be retrofitted with two 6L6s and two EL34s. The EL34s should be placed in the outer-left and outer-right tube sockets, with the 6L6s in the middle. No mods required when making this change. Early Strategy 400 amps used twelve 6L6s. Some Bass 400s were shipped with a sextet of 6550s. 6550s and 6L6s are compatible with the early Bass 400s - no modifications are required.*

<b>20/20</b>	3 - 12AX7/12AX7/12AX7 2 Duets EL84
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## Metalhead

<b>Elan MK 11</b>	5-12AX7
<b>Elan MK III</b>	5-12AX7

## Mitchell

<b>Pro 100</b>	4-12AX7, 6L6 Quartet
<b>Pro 100 EQ/Reverb</b>	5-12AX7, 6L6 Quartet
<b>Pro 100 EQ/Reverb</b>	3-12AX7, 1-12DW7, 6L6 Quartet
<b>Deluxe</b>	4-12AX7, 6L6 Duet

## Mojave Amps

<b>Coyote</b>	3-12AX7, GZ34/5AR4, EL84 Duet
<b>Sidewinder</b>	3-12AX7, GZ34/5AR4, EL84 Quartet
<b>Plexi 45</b>	3-12AX7, GZ34/5AR4, 6L6 / KT666 Duet
<b>Scorpion 50 watt</b>	4-12AX7, EL34 Duet
<b>Peacemaker 100 watt</b>	4-12AX7, EL34 Quartet

## Musicman

<b>RD 50</b>	1-127, 6L6 Duet
<b>RD 65</b>	6L6 Duet (transistor preamp)
<b>RD 100</b>	6L6 Duet (transistor preamp)
<b>RD 112</b>	6L6 Duet (transistor preamp)
<b>RD 120</b>	6L6 Duet (transistor preamp)
<b>RP 65</b>	6L6 Duet (transistor preamp)
<b>RP 100</b>	6L6 Duet (transistor preamp)
<b>RP 115</b>	6L6 Duet (transistor preamp)
<b>Seventy-Five</b>	1-12AX7, 6CA7 Duet
<b>One-Thirty</b>	1-12AX7, 6CA7 Quartet
<b>75</b>	6L6 Duet (transistor preamp)

## Musicman (Continued)

**150** 6L6 Quartet (transistor preamp)

*NOTE: Early model used 6CA7, check amp.*

## Musitech

**Stereo 240** 5-12AX7, 1-12AT7, 1-5AR4, 6L6 Duet, EL34 Duet

**Stereo 215** 5-12AX7, 1-12AT7, 6V6 Duet, EL84 Duet

## Nomad

**50-watt Channel-switching** 4-12AX7, 1-12AT7, EL34 Duet

**100-watt Channel-switching** 4-12AX7, 1-12AT7, EL34 Quartet

**50 Reverb** 6-12AX7, 1-12AT7, EL34 Duet

**100 Reverb** 6-12AX7, 1-12AT7, EL34 Quartet

## Orange

**40TH ANNIVERSARY** 2 X ECC83, 2 X EL84

**ROCKER 30 & 30 COMBO** 3 X ECC83, 2 X EL84

**ROCKER VERB 50** 4 X ECC83 2 X 12AT7, 4 X 6V6

**ROCKER VERB 50 COMBO** 3 X ECC83, 2 X 12AT7, 4 X 6V6

**ROCKER 100** 4 X ECC83, 2 X 12AT7, 4 X EL34

**THUNDERVERB 50** 4 X ECC83, 2 X 12AT7, 2 X EL34?????

**THUNDERVERB 200** 4 X ECC83, 2 X 12AT7, 2 X 6550 / KT88

**AD5** 1 X ECC83, 1 X EL84

**AD30 HTC & TC** 4 X ECC83, 2 X EL84, 1 X 5AR4

**DUAL TERROR** 4 X ECC83, 4 X EL84

**TINY TERROR COMBO & HEAD** 3 X ECC83, 2 X EL84

**TERROR BASE 500** 2 X ECC83

**AD 200B MKIII** 2 X ECC83, 1 X 12AT7, 4 X 6550 / KT88

**AD 50 H** 2 X ECC83, 2 X EL34

**RETRO 50** 2 X ECC83, 2 X EL34

## Peavey

**Classic 60** 2-12AX7, 6L6 Duet

**Classic 60/60** 3-12AX7, 2-6L6 Duet

**Classic 120** 3-12AX7, 6L6 Quartet

**Classic 120/120** 4-12AX7, 2-6L6 Quartet

**Classic and VTX** 6L6 Duet (transistor preamp)

**SDuce** 6L6 Quartet (transistor preamp)

**Heritage** 6L6 Quartet (transistor preamp)

**Mace** 6L6 Sextet (transistor preamp)

**MX** 6L6 Quartet (transistor preamp)

**Roadmaster - early** 6550 Quartet (transistor preamp)

**Roadmaster - later** 4-12AX7, 2-12AT7, 6L6 Sextet

**Rockmaster** 3-12AX7, 6L6 Quartet

**Rockmaster - later** 3-12AX7, 6L6 Quartet

**Encore 65** 3-12AX7, 1-12AT7, 6L6 Duet

**TG RAXX** 4-12AX7

**TB RAXX** 4-12AX7

**Triumph 60** 4-12AX7, 1-12AT7, 6L6 Duet

## Peavey (Continued)

Triumph 120	4-12AX7, 1-12AT7, 6L6 Quartet
Butcher	3-12AX7, 6L6 Quartet
Vintage - early	2-6C10, 6L6 Quartet
Vintage - later	6L6 Quartet (Transistor Preamp)
VTA 400	3-12AX7, 1-6AN8, 6550 Quartet
VTA 800	3-12AX7, 1-6AN8, 6550 Octet
VTB 300	2-12AX7, 1-6AN8, 6550 Quartet
VTG 300	2-12AX7, 1-6AN8, 6550 Quartet
Classic 30	3-12AX7, EL84 Quartet
Bravo	3-12AX7, EL84 Quartet
XXX	3-12AX7, 6L6 Quartet (Option of EL-34 Quartet)
5150	5-12AX7, 6L6 Quartet (NOTE: V4 is the phase inverter in this amp - not V5)

## Polytone

Fusion	4-12AX7, 1-12AU7, 1-12AT7, 6L6 Quartet
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## Randall

RGTES	4-12AX7, 1-12AT7, 6L6 Quartet
RGT100	4-12AX7, 1-12AT7, 6L6 Quartet
RGT100HT	4-12AX7, 1-12AT7, 6L6 Quartet

## Rivera

TBR-1 - Rudolf Schenker	8-12AX7, 2-KT77 Duet
TBR-1 - Ted Nugent	6-12AX7, 1-12AT7, 2-KT77 Duet
TBR-1	7-12AX7, 2-EW4 Duet
TBR-1M	7-12AX7, 2-EW4 Duet
TBR-ISL	7-12AX7, 2-EW4 Duet
TBR-2	7-12AX7, 2-6550 Quartets
TBR-2M	7-12AX7, 2-6550 Quartets
TBR-2SL	7-12AX7, 2-6550 Quartets
TBR-2 - John Sykes	7-12AX7, 2-6550 Quartets
TBR-2 - Jerry Garcia	5-12AX7, 2-12AU7, 2-6550 Quartets
TBR-2B	5-12AX7, 2-12AU7, 2-6550 Quartets
TBR-3 Hammer 120	4-12AX7, 2-6550 Quartets
TBR-4 Preamp	6-12AX7, EL84 Duet
TBR-5 Hammer 320	4-12AX7, 2-6550 Duets
TBR-6 Preamp	4-12AX7
TBR-7 Power Amp	4-12AX7, 2-5881 Duets
M60 Combo	5-12AX7, 2-EL34 Duets
M100 Combo	5-12AX7, EL34 Quartet
M100 Combo - Jerry Garcia	5-12AX7, 6550 Quartet
S120 Combo	6-12AX7, 2-EL34 Duets

## Roland

Bolt 30	1-12AT7, 7391 Duet
Bolt 60	1-12AT7, 6L6 Duet
Bolt 100	1-12AT7, 6L6 Quartet

## Seymour Duncan

60-watt Combo/head	3-12AX7, 2-12AU7, EL34 Duet
60-watt Convertible	3-12AX7, 2-12AU7, EL34 Duet
100-watt Combo/head	6-12AX7, 2-12AU7, EL34 Quartet ,5U4
100-watt Convertible	6-12AX7, 2-12AU7, EL34 Quartet ,5U4
8440	3-12AX7, EL34 Duet
KTG-1	2-12AX7, 1-12AU7
KTG-2100	2-12AX7, 2-12AU7, KT88 Quartet

## Silvertone

50-watt Reverb	4-12AX7, 2-6CG7, 6L6 Duet
100-watt Reverb	4-12AX7, 2-6CG7, 6L6 Quartet

## Sound City

Bass 150	2-12AX7, 1-12AT7, 6550 Quartet
Concord	3-12AX7, 2-12AT7, EL34 Quartet
GT-50	1-12AX7, 1-12AT7, EL34 Quartet
PA-400	3-12AX7, 2-12AT7, EL34 Quartet
PA-200	3-12AX7, 2-12AT7, 6550 Quartet
MK-IV 120	4-12AX7, 1-12AU7, EL34 Sextet
LB-50 Plus	3-12AX7, 1-12AT7, EL34 Duet
LB-200 Plus	4-12AX7, 1-12AT7, 6550 Quartet
50 watt	3-12AX7, EL24 Duet
100 watt	3-12AX7, 1-12AT7, EL34 Quartet
200 watt	3-12AX7, 1-12AT7, 6550 Quartet

## Spectra

30 T	3-12AX7, 6V6 Duet
60 T	3-12AX7, 6V6 Duet
120 T	3-12AX7, 6L6 Quartet
2-12 T	4-12AX7, 6L6 Quartet

## Sundown

Formula 50	4-12AX7, 6L6 Duet
Rebel 50	3-12AX7, 6L6 Duet
Artist Combo	5-12AX7, 6L6 Quartet
Rebel 100	3-12AX7, 6L6 Quartet
Artist 30 Combo	5-12AX7, 6L6 Duet
SD1012C	5-12AX7, 6550 Duet
SD1000H	5-12AX7, 6550 Duet

## Sunn

Coliseum PA	3-12AX7, 1-6AN8, 6550 Quartet ,5AR4
Model A	4-12AX7, 6550 Quartet
Model A212	4-12AX7, 6550 Duet
Model T	4-12AX7, 6550 Quartet
Sceptre	1-12AX7, 1-12AU7, 1-6AN8, 6550 Duet
Sentura	1-12AX7, 1-12AU7, 1-7199, 6CA7 Duet
Sonic	1-12AX7, 1-12AU7, 1-6AN8, 6550 Duet
Solos I	2-12AX7, 1-12AU7, transistor-powered

## Sunn (Continued)

<b>Spectrum I</b>	1-12AX7, 1-7199, 6CA7 Duet
<b>Solarus (190L)</b>	1-12AX7, 1-12AU7, 1-6AN8, 6550 Duet
<b>100S</b>	1-12AX7, 1-12AU7, 1-6AN8, 6550 Duet
<b>200S (190B)</b>	1-12AX7, 1-6AN8, 6550 Duet
<b>1000S</b>	1-12AX7, 1-12AU7, 1-6AN8, 6550 Quartet
<b>1200S (350L)</b>	1-12AX7, 1-12AU7, 1-6AN8, 6550 Quartet
<b>2000S (350B)</b>	1-12AX7, 1-6AN8, 6550 Quartet

*NOTE: Later models may use 7199. Earlier models may use 6CA7.*

## THD

<b>4-10</b>	1-12AY7, 3-12AX7, 6L6 Duet
<b>2-10</b>	1-12AY7, 3-12AX7, 6L6 Duet
<b>V-Front</b>	1-12AY7, 3-12AX7, 6L6 Duet
<b>Tweed Head</b>	1-12AY7, 3-12AX7, 6L6 Duet
<b>4-10 Reverb</b>	1-12AY7, 3-12AX7, 1-12AT7, 6L6 Duet
<b>2-10 Reverb</b>	1-12AY7, 3-12AX7, 1-12AT7, 6L6 Duet
<b>V-Front Reverb</b>	1-12AY7, 3-12AX7, 1-12AT7, 6L6 Duet
<b>Tweed Head Reverb</b>	1-12AY7, 3-12AX7, 1-12AT7, 6L6 Duet
<b>50-watt Rack Head</b>	1-12AY7, 4-12AX7, 1-12AT7, 6L6 Duet
<b>100-watt Rack Head</b>	1-12AY7, 4-12AX7, 1-12AT7, 6L6 Duet

*NOTE: 12AX7 can be substituted for 12AYs for increase in gain. EL34s, 6CA7s, KT88s and 6550s can be substituted for 6L6s with a simple bias-voltage adjustment.*

## Thunderfunk

<b>50B</b>	5-12AX7, 1-12AT7, 6550 Duet
<b>100B</b>	5-12AX7, 1-12AT7, 6550 Duet
<b>SOELS</b>	6-12AX7, 2-12AT7, EL34 Duet
<b>100ELS</b>	6-12AX7, 2-12AT7, EL34 Quartet
<b>50LS</b>	6-12AX7, 2-12AT7, 6550 Duet
<b>100LS</b>	6-12AX7, 1-12AT7, 6550 Quartet

## Trace Elliot

<b>Hexavalve</b>	3-12AX7, 6550 Sextet
<b>Quatavalve</b>	3-12AX7, 6550 Quartet
<b>Twinvalve</b>	3-12AX7, 6550 Duet
<b>VA350</b>	3-12AX7, 6550 Sextet
<b>VR350</b>	3-12AX7, 6550 Sextet
<b>GP12XV</b>	3-12AX7

## Trainwreck

<b>Liverpool 30-watt</b>	3-12AX7, EL34 Quartet
<b>Express 22-watt</b>	3-12AX7, 6V6 Duet, some with EL34 Duet
<b>Liverpool Rocket</b>	3-12AX7, EL84 Quartet, 1-5AR4

## Two Rock

<b>CUSTOM REVERB V2 50</b>	4-12AX7, 1-12AT7, 2 X 6L6
<b>CUSTOM REVERB V2 100</b>	4-12AX7, 1-12AT7, 4 X 6L6
<b>10TH ANNIVERSARY</b>	4-12AX7, 1-12AT7, 4 X 6L6

## Victoria

518-T	1-12AX7, 6V6, 5Y3
20112-T	1-12AY7 or 5751, 1-12AX7, 6V6 Duet, 5Y3
DOUBLE DELUXE	1-12AY7 or 5751, 1-12AX7, 6V6 Quartet, 5Y3 or 5AR4
35210-T	2-12AY7, 1-12AX7, 6L6 Duet, 5U4
35115-T	2-12AY7, 1-12AX7, 6L6 Duet, 5U4
35310-T	2-12AY7, 1-12AX7, 6L6 Duet, 5U4
45410-T	1-12AY7, 2-12AX7, 6L6 Duet, 5AR4
80410-T	1-12AY7, 2-12AX7, 6L6 Quartet, 5AR4
50212-T	1-12AY7, 2-12AX7, 6L6 Duet, 5AR4
80212-T	3-12AX7, 6L6 Quartet, 5AR4
VICTORI-ETTE	3-12AX7, 2-12AT7, EL84 Duet, 5AR4
VICTORILUX	3-12AX7, 2-12AT7, EL84 Quartet or 6L6 Duet, 5AR4
SOVEREIGN	2-12AX7, 1-12AT7, 1-EF86, 1-6BM8, EL34 or 6L6 Duet, 5AR4
Regal	3-12AX7, 1-12AT7, Use any octal based output tubes or rectifier
Trem de la trem	3-12AX7, 6V6 Duet, 5U4

## Voodoo Amps

V-Plex 25	3-12AX7, 6V6 Duet
V-Plex 50	3-12AX7, EL34 Duet
V-Plex 100	3-12AX7, EL34 Quartet
WITCHDOCTOR 10 watt	2-12AX7, 6V6 (single), 5Y3 Rectifier
V-Rock 50	3-12AX7, KT77 Duet
V-Rock 100	3-12AX7, KT77 Quartet
V-Reck 50	3-12AX7, KT77 Duet
V-Reck 100	3-12AX7, KT77 Quartet

## Vox

AC15TB & TBX	5 X ECC83, 2 X EL84, 1 X 5Y3
AC15CC1 & AC15CC1X	2 X 12AX7, 2 X EL84
AC15H1TV & AC15HTVH	3 X 12AX7, 1 X EF86, 2 X EL84, 1 X 6CA4
AC30/6TB & AC30/6TBX	5 X 12AX7, 1 X 12AU7, 4 X EL84, 1 X 5AR4
AC30HW AC30HWH	5 X 12AX7, 4 X EL84, 1 X 5AR4
AC30CCH, CC1, CC2, CC2X	3 X 12AX7, 4 X EL84, 1 X 5AR4
AC30H2, HH	3 X 12AX7, 4 X EL84, 1 X EF86, 1 X 5AR4
AC50CPH, CP2	4 X 12AX7, 2 X EL34
AC100CPH	4 X 12AX7, 4 X EL34
VALVTRONIX (MOST MODELS)	1 X 12AX7
AD120VTX	2 X 12AX7
TONELAB SERIES	1 X 12AX7
COOLTRON SERIES	1 X 12AU7
V9159 (CAMBRIDGE 15)	1 X 12AX7
V9130 (CAMBRIDGE 30 REVERB)	1 X 12AX7
V9320 (CAMBRIDGE REVERB 30 TWIN)	1 X 12AX7



## Groove Tubes Process

### Acquisition

- There are very few tube factories in the world, GT only sources from the best
- GT only purchases raw tubes that meet specs for low hum, noise and microphonics
- Tubes are shipped to GT global facilities for further selection and grading

### Preamp Tubes

- The first step is a burn-in period which lasts approximately 2 hours

- This “settles the tubes”, burns off impurities and stabilizes components

- All processes and computer programs are proprietary to Groove Tubes

- “House of Pain” - The Human Element

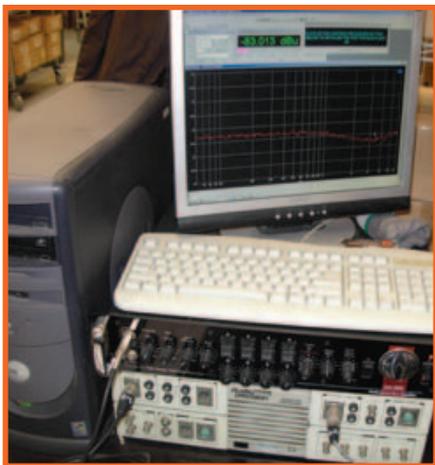
- Tubes placed in amplifiers hooked to hum/volt meters and speakers

- Amps run at very high levels of Gain, EQ and “ping” tested for microphonics

- “The Brain / Black Box” - Scientific evaluation of *overall* tube performance

- Tone Generator runs a frequency sweep through an amplifier into the Black Box

- Output from Black Box signal is connected to GT software and monitor



# Groove Tubes Process

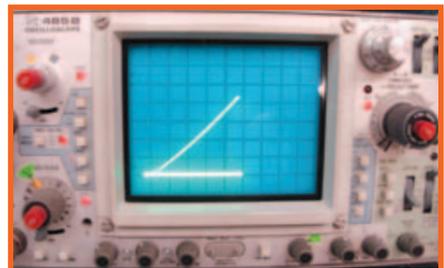
## Preamp Tubes Continued

- GT proprietary program tests for smooth frequency response, gain and output
- Tubes are tested for hum and noise level, results are displayed in graphic form
- The Kennedy Amplitrex AT-1000 - *Internal* tube function revealed
- GT proprietary program further dissects and measures tube performance
- Evaluates plate resistance, current, voltage, bias draw, transconductance
- Provides numeric values for gain and voltage for each triode
- The Hagerman Vacu-Trace and 465-B Oscilloscope - the final refinement
- Tubes are matched for Special Application Group kits during this phase
- Matched Phase Inverter (MPI) tubes must pass this test
- Provides visual reference matching for two sides of triode
- The two curves must visually lay on top of each other to be a perfect match



Parameter	Value	Unit	Min	Max
Plate Resistance	10000	ohms	1000	10000
Plate Current	10	mA	5	15
Plate Voltage	250	V	200	300
Bias Draw	10	mA	5	15
Transconductance	1000	uS	500	1500
Gain	10	dB	5	15
Hum	10	dB	5	15
Noise	10	dB	5	15

The image shows a screenshot of a software interface displaying a table of test results. The table has columns for Parameter, Value, Unit, Min, and Max. The data is as follows:





## Groove Tubes Process

### Power Tubes

- Groove Tubes features proprietary matching and grading of power tubes
- Tubes must meet the same rigorous manufacturing specs as preamp tubes



- Tubes are placed in a fixture and “Dynamically Energized™”
- Only Groove Tubes does “Dynamically Energized™” testing of power tubes
- Measures cathode filament voltage, plate voltage, wide variety of other specs



- The GT “Mothership” contains all coding information on unique GT testing
- Tubes are graded according to distortion levels on a scale from 1 to 10
- Tubes with similar distortion levels are matched in pairs, quartets and sextets
- This creates opportunity to properly bias amp to maximize tube performance



- High graded tubes have more headroom and less distortion - fine scale is 8 - 10
- Medium graded tubes most commonly used in stock amps - fine scale is 4 - 7
- Low graded tubes are softest and quickest into soft clipping - fine scale is 1 - 3



## Groove Tubes Display

*Look for this display at your local Groove Tubes retailer  
to find the tubes that are right for you and your amp!*

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## MY AMPLIFIERS / TUBES REFERENCE:

(use pencil)

### Amplifier One

Date tubes changed: \_\_\_\_\_

Amp Brand \_\_\_\_\_

Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Year \_\_\_\_\_

Preamp tubes (QTY / TYPE) \_\_\_\_\_

Rectifier tubes(QTY / TYPE) \_\_\_\_\_

Power tubes (QTY / TYPE ) \_\_\_\_\_

POWER RATING \_\_\_\_\_

# MY AMPLIFIERS / TUBES REFERENCE:

(use pencil)

## Amplifier Two

Date tubes changed: \_\_\_\_\_

Amp Brand \_\_\_\_\_

Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Year \_\_\_\_\_

Preamp tubes (QTY / TYPE) \_\_\_\_\_

Rectifier tubes(QTY / TYPE) \_\_\_\_\_

Power tubes (QTY / TYPE ) \_\_\_\_\_

POWER RATING \_\_\_\_\_

## Amplifier Three

Date tubes changed: \_\_\_\_\_

Amp Brand \_\_\_\_\_

Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Year \_\_\_\_\_

Preamp tubes (QTY / TYPE) \_\_\_\_\_

Rectifier tubes(QTY / TYPE) \_\_\_\_\_

Power tubes (QTY / TYPE ) \_\_\_\_\_

POWER RATING \_\_\_\_\_

# MY AMPLIFIERS / TUBES REFERENCE:

(use pencil)

## Amplifier Four

Date tubes changed: \_\_\_\_\_

Amp Brand \_\_\_\_\_

Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Year \_\_\_\_\_

Preamp tubes (QTY / TYPE) \_\_\_\_\_

Rectifier tubes(QTY / TYPE) \_\_\_\_\_

Power tubes (QTY / TYPE ) \_\_\_\_\_

POWER RATING \_\_\_\_\_

## Amplifier Five

Date tubes changed: \_\_\_\_\_

Amp Brand \_\_\_\_\_

Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Year \_\_\_\_\_

Preamp tubes (QTY / TYPE) \_\_\_\_\_

Rectifier tubes(QTY / TYPE) \_\_\_\_\_

Power tubes (QTY / TYPE ) \_\_\_\_\_

POWER RATING \_\_\_\_\_

## MY AMPLIFIERS / TUBES REFERENCE:

(use pencil)

### Amplifier Six

Date tubes changed: \_\_\_\_\_

Amp Brand \_\_\_\_\_

Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Year \_\_\_\_\_

Preamp tubes (QTY / TYPE) \_\_\_\_\_

Rectifier tubes(QTY / TYPE) \_\_\_\_\_

Power tubes (QTY / TYPE ) \_\_\_\_\_

POWER RATING \_\_\_\_\_

### Amplifier Seven

Date tubes changed: \_\_\_\_\_

Amp Brand \_\_\_\_\_

Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Year \_\_\_\_\_

Preamp tubes (QTY / TYPE) \_\_\_\_\_

Rectifier tubes(QTY / TYPE) \_\_\_\_\_

Power tubes (QTY / TYPE ) \_\_\_\_\_

POWER RATING \_\_\_\_\_



For the latest information on  
Groove Tubes, visit our website at

**[www.groovetubes.com](http://www.groovetubes.com)**



**GROOVE TUBES**  
HEAR THE DIFFERENCE™

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This comprehensive quick guide provides complete and accurate information on replacement tubes for hundreds of amplifiers from vintage classics through the newest and coolest models!

We have also included a section on tube basics, from troubleshooting to biasing. Also included are descriptions of the performance characteristics of the most commonly used tube types and the Groove Tube versions of these tubes.