

Ultimate Guitar Gear

Kens Column

Trainwreck thinking *by ken Fischer*

I'd like to thank Ultimate Guitar Gear, and particularly Fredrik Heghammar, for inviting me to write on the UGG website.

Before I start, I would like to say, that the perfect tone is different to each person. Therefore, I don not expect everyone to agree with everything I say. You must thrust your own ears when choosing guitar gear. I have been at this for 45 of my 57 years, so you may be able to learn a little from me. I am also still learning, so I would be happy to learn from you too.



Chapter one:

I am going to talk about everything that is a part of the ultimate guitar tone in the future. First though, I would like to give you some of my thoughts on the relative importance, of a few of the things, that make up a great guitar tone. Let us say that you now own the best sounding 1959 Les Paul Standard ever made. Now you got to go to your local music store and buy a 10 watt solid state amplifier from China to use with your 1959 Les Paul. How well would you expect that guitar to sound through that amplifier? Not good at all, is correct answer. Now let say you own the best sounding Marshall amplifier ever made, with matching speaker cabinet. However, now you do not own a guitar! So you purchase an Epiphone LP-Std, that was made in Korea. How would this setup sound compared to the first example? The correct answer is much better.

The point to be understood is a good amplifier and speakers, will be more important for a good tone, than a great guitar, but a poor amplifier/speaker system. Also, it happens that a good amplifier tends to cost less than a good guitar.

Of course if you have the 59 Les Paul of the first example and the Marshall of the second example, the combination will be even better yet. There is a catch of this! If you modify the Epiphone guitar with J.M Rolph 59 pretender pickups, and better controls, switch, jack, and wiring, the EPI still not match the 59 Les Paul, but it will be a lot closer than it was from the factory.

Let us review, we have learned that the amplifier is often more important the guitar when trying to get a great tone. We have also learned that once the amplification is right, then a good guitar will also make a big difference. We also learned that an average guitar might be made to sound very good by installing top notch pickups, electronic components, and I will add here, that better hardware will help too.

On a visit to my home, in the 1980's, Mike Doyle, (author of two books on Marshalls) and I had an interesting conversation about how that time, everybody credit Eric Clapton's tone on the Bluesbreakers album to his Les Paul. Guitarist seems to pay little attention to his amplifier, which Mike and I consider to be at least half, (we though more than half) of Eric's sound. Evan today, many players think nothing of paying huge sums of money for great guitars, but refuse to pay modest sums of money for great amplifiers. Now that you know my thinking on this subject, I will not mention it again in future articles. Starting with the next article I will try to cover one subject a time in detailed fashion.

Until the next time, I wish you all the best, **Ken Fischer**

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The Unauthorized History of Trainwreck Circuits

Foreword:

This history will be made up by using both the recollections of Ken Fischer, founder of Trainwreck, and stories told by the voices in his head. Ken is a professional and is guided through the voices by Fireplace (Leona) a Lenape Native American Medicine Woman of the Turtle Tribe. DO NOT TRY THIS AT HOME.

The Childhood Years:

Sarah: Ken's mom was a typical housewife during the years he was growing up. He was the first of three children and was born in May of 1945. He has a brother named Scott and a sister named Mona. Their dad worked as both a machinist and a mechanic.

Ken: I remember as a young kid my dad worked for American LaFrance. American LaFrance was to fire engines what Rolls Royce is to automobiles. Part of my dad's job was to drive these fire engines to their new home. Often my dad would take me along on these rides. Back in the Fifties a fire engine held great wonder to the boys in Bayonne, NJ where I grew up. Riding on a roaring 12 cylinder monster, decked out in twenty coats of red lacquer, and chrome work deep enough to swim in really turned me on to things mechanical. Toys such as Erector Sets didn't hurt this fascination with motors and gears and such to be sure. My best friend Vinny had a fantastic set of Lionel "O" Gauge Electric trains. Here was the mechanical stuff I loved along with electrical wiring.

VG (Voices of Girls): At age 12 Ken moved to Colonial, NJ with his family. His dad made friends with an electronics engineer from Lockheed who lived two blocks away. Ken's dad would take him along to this "guru's" house. Pat had radio gear, stereo gear, and a Harley in his garage. Pat would give Lenny's boy boxes of electronic parts and instruct him on building all sorts of neat electronic devices to experiment on. At age 15 Ken took on two new interests, guitars and girls! While he was given a guitar and lessons, he wasn't given girl lessons. Then he went on to take electronics at the vocational high school. That's where he first met Dennis Kager (Sundown Amplifiers). Years later these two would work together at Ampeg in Linden, New Jersey.

Ken: One summer I got a job at Marcus Transformer company. They were in Avenel, New Jersey along with the RCA Tube Factory. Marcus made transformers for the big electric utility companies. While they made some "small" transformers, they also made power station transformers so large that they had doors and hallways built into them for service and inspection. After Marcus, I took electronics as my vocation and studied the subject for real in New York. Back then, every male had to serve in the military and when my turn came I joined the U.S. Navy.

Klaatu: I came to Earth to stop such nonsense, but Ken was out of the Navy by the time I visited your planet a second time. I found him working in Washington D.C. running a dry cleaning store. I got him a job with Diamond T.V., a sales and repair chain with stores in Virginia, Maryland, and the main shop in D.C. He became a T.V. repairman, on the road in both states and the district. This is hard to believe, but the T.V. repair industry is not always honest. Ken took a very dim view of this fact and soon left the T.V. repair game, Washington D.C. and moved back to New Jersey.

The Middle Period:

Ken: While I worked in Washington D.C., I lived in both Silver Spring and Wheaton, Maryland. Up the road from where I lived was a Yamaha motorcycle dealer. I had a deposit on a Rotary Jet 80. When I made the decision to move back to Jersey, I packed my car, picked up the bike and headed north. That Yamaha was my first motorcycle, but at that point it was just a new toy and I wasn't yet hooked. Back in New Jersey I moved back into my family home and just hung out and relaxed for a while.

After a while my cash was running low so I bought a newspaper and looked for a job. Ampeg was hiring assembly line help so I went down to Linden and got that job. After a couple of weeks the people on the assembly line to the higher ups, "Hey, this guy really knows electronics!" I was called into the front office and questioned. and the next thing I knew I was the repair tech for the final test room. Later I was inducted into the engineering department. I worked there a few years but quit the very day Ampeg was sold and no longer under the control of musicians.

Also, by this time I was hooked on motorcycles. While working at Ampeg, I saved the money I needed to buy a bright red and chrome BSA Lightning Rocket. Everyone wanted Triumph Bonneville's back then but the BSA had the American LaFrance look of my childhood. As fate would have it my car died, so the money was split between buying a 1963 Ford and a Honda Superhawk. The Superhawk wasn't all that super, but I was hooked on motorcycles.

Victor Frankenstein: Motorcycles turned Ken into a real monster. He was in love with the freedom one feels when riding a bike. Unlike myself, he never had a mishap on his machines. Unlike myself, he never had to endure being stitched back together. Ken decided to use his skills and became a motorcycle mechanic. After all, every time you tune-up or fix a bike you have to take it for a test ride! What more could one ask for? He rode with guys who all had riding names. Ken's riding name was "Trainwreck."

Through the Seventies motorcycles were everywhere and he was kept busy. By the Eighties bikes had all but vanished from the scene and times were hard. Ken always did repairs and mods to his friends amplifiers and with some prodding from Steve "Whammy" Hayes, a local guitar builder and repairman, placed an ad in a local musician's newspaper offering his repair and modification services.

Trainwreck Circuits:

I started Trainwreck Circuits in 1981. By the time a year had passed I was doing too much business to remain underground. On March 12, 1982, I registered the Trainwreck Circuits name at the county office for such things. I started a Trainwreck business account at the bank, and got my state sales tax number. By the end of 1982 word of

mouth about my repairs and mods was so strong, I stopped all advertising. At Ampeg I had developed my own troubleshooting system. This system works so well that on the average it takes longer to remove and replace the chassis from a combo or head than it takes to find the problem. With that edge, anyone who wanted to could wait and watch while I did their amp's repairs. Of course, if I had to order a part like a transformer, the amp would stay until the part came in. This "fix me while you wait" policy had people driving to me from hundreds of miles away, and soon set up appointments to handle this work.

I also was doing modifications, but had a real disdain for the typical universal mods being done at the time. I would work to give each amp the best voice it was capable of. That generally means having to engineer a different custom mod for each individual amp. Along about this time I got a call from "String King" Dean Farley. At the time he was a Groove Tubes salesman, Dean and Aspen (owner of Groove Tubes) set me up with a GT dealership. Thought brought in even more amp repairs and mods and I soon became a "tube amp only" shop. From that point I stopped all transistor amp, PA, and keyboard repair. Groove Tubes were the standard tubes in Trainwreck amps for years. When Aspen switched to the EL-34 from China, I started matching my own tubes. There hasn't been a tube from China to this day that I've ever liked. Groove Tubes always had good EL-84's and I'd recommend them for any EL-84 equipped amp. Grade #4 for a "Wreck," and grade #6 for a J.M.I. Vox.

In 1982 I ran across some NOS (new old stock) Ampeg 2 X 12 cabinets. They had no logos, so my friend Rich Levitch designed and made me the first Trainwreck logos. It's this logo that I've always used on my amps. When Rich designed the logo I wasn't even thinking of building amps yet. They were made to put on "Trainwreck" Ampeg cabinets! It would take a new friend to persuade me to build him an amp of my own design.

Casper McCloud: I came over from England to play John Lennon in the original production of "Beatle mania" at the Winter Garden. Marshall Crenshaw and I alternated, one of the other, playing John in either the early or late show each day. I left my J.M.I. AC-30's over in England, but did bring a J.M.I. AC-50 head. After "Beatle mania," I landed a deal with Atlantic Records. Janis Roeg, who worked for Atlantic, was best friends with Ken's sister Mona, and she arranged for me to visit him at his shop. Ken and I became friends. I told Kenny that I needed a high gain amp for my new album. Atlantic had purchased a new Boogie for me and whilst it had the gain, the tone wasn't the same as my AC-30's where were still back in England. I finished the album using the Boogie, but I worked with Ken on developing a high gain class "A" EL-84 amp for my personal use. In late 1982 he had a 15-watt prototype built on a gutted Fender chassis. By the first month of 1983 the 30-watt version built on his own chassis was complete. He named this amp "Ginger" after my wife.

When other players heard my amp they wanted him to build them one too. I wanted it to be called "The Kenny Amp," but he chose the name "Liverpool 30." He picked this name because the amplifier sounded like a British amp. He didn't foresee that people would connect Liverpool with the Beatles, and of course the Beatles with Vox. For year's people thought the Liverpool was a Vox copy, when in fact it is an entirely unique amp completely of Ken's design.

Ken: After I built the first Liverpool I got many requests from my friends to build them one too. The money from repairs and mods was far greater than the profit on a 'Pool, so I only built them in my spare time. My brother's second ex-wife Debi came up with the wood-burned faceplates. She's also the one who suggested using hardwood cabinets for the heads. She liked the looks of the hardwood Boogies that I worked on, and hated the looks of all the "ugly black boxes," like Fender, Vox, Marshall and other classics! I decided to give them names instead of serial numbers to keep it on a personal level. In fact, many of my best friends I've met through selling them a Trainwreck Amp.

Les Krygier: I saw Ken's ad in a local musician's paper and had heard about his reputation, for hot rodding Marshall amplifiers, by word of mouth. I always had at least six Marshall Super Lead, Model 1959, 100-watt heads and scores of cabinets on hand. The sound I was going for at the time was the tone on the first Van Halen album.

Ken dialed that one right in, but said he though he could do better on the solo tones if he modded an amp just for lead work. With six heads I had nothing to lose, and within a few weeks he had developed a one channel, one input pre-amp and phase inverter for one of my heads. The modified amp had more gain on two than it did stock on ten. It was very thick and very loud, and harmonics literally jumped out of it.

When my band started playing the Marshalls were too loud. Ken converted them to 6V6 output tubes run on a variac at 95 volts. This was nice, but I really like the EL-34 sound. I had played his Liverpool amp and really liked it, but still wanted EL-34 power. By the first month of 1984 the Express amp was born. I bought two and sold all my Marshall heads except one that had been modded. Later I also bought a Liverpool head and a Strat with single coils.

Ken: When repairing and doing mod work on guitar and bass amps you soon find who stands behind their products with easy-to-obtain parts and technical support. I wish I could list all the companies from best to worst, but the worst are just so awful I couldn't tell you about them without being hit with a lawsuit. I can say I never had a parts or technical support problem with Mesa Boogie or Carvin. That's not to say there may have been companies like these two out there. I worked on several brands that I never needed factory parts or technical support from. The point is by the mid 1980's many companies started saying to me, "We can no longer sell you parts unless you become an authorized warranty service center." Imagine a company that won't sell your favourite tech the parts needed to fix your amp (even if it's out of warranty). Shows how much they care about you once they've made their sale! Sounds like a sad tale, but because they were giving me such a hard time about obtaining their parts, I stopped doing repairs and mods and went to building Trainwreck Amps full time. It looks like I even owe the "Bad Guys" some thanks!

About My Health

In 1988 I caught a bad case of the flu. This left me with chronic fatigue syndrome and a vestibular (balance) disorder. In July 1994 I added bleeding ulcers to this list. Kill the rumours, not me. I don't have AIDS or a brain tumour! The CFIDS and vestibular disorders continue. I build amps when I feel up to it. Who was that doctor who cured Leo?!

Derek Jan: Originally I'd go to Trainwreck to get my Boogie services. The Boogie was a good amp, but I was interested in controlling my sound from the guitar. On a large stage I didn't want to have to run back to a footswitch to go from clean to dirty.

Ken interjects: Boogie now makes amps you can control from your guitar.

Derek: I bought a Trainwreck Express first. If you ever listened to T.V., radio, or MTV, you've heard my Express! It was used on many major commercials, and I rented it to major rack artists who used it on their hit recordings. It was also a Guitar Player magazine product review amp. After a while I also picked up a Liverpool 30 and really got into the Class "A" EL84 sound.

Then one day in 1990 I was visiting Ken and saw a Trainwreck amp with four knobs instead of the normal five. When I asked him about it he said "This one's not for production, I built it for myself." I asked him to please build just one

more for my personal use, and Ken agreed to do so. I'm always in major studios and on international tours, and everywhere I went people wanted a "Rocket" like mine. Blame me for starting the demand for the Rocket. It's become my favourite "Wreck".

Ken: There are lots of people who helped Trainwreck on the way to becoming what it is today. Too many to list here. I'd like to thank all the people who have helped me to build the Trainwreck name into what it has become. I'd especially like to thank the people who use Trainwreck Amplifiers as part of their musical creativity. Finally, you might ask why I did my own history and interview? SOMEONE HAD TO DO IT!

Ken Fischer

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Trainwreck thinking by ken Fischer

As we start chapter two, I would like to mention that, what you are about to read, is based on my experience gained in the United States. Since this article is on an internationally read website, your experience, in a different country may, or may not be the same as mine. I am always happy to learn from anyone who has information to contribute. Knowledge promotes understanding in all areas of life.

Chapter two:

In this chapter I am going to talk about pickups. When a string is made to vibrate, the pickup converts that vibration to an electrical signal that can then be amplified by an electronic circuit. Just as there are many types of microphones, such as dynamic, condenser, ribbon, and others so are there many types of pickups. The most common for electric guitar is the magnetic pickup. This type corresponds to the dynamic microphone, in that it generates its electric output by varying a magnetic field. The dynamic microphone has a diaphragm with a voice coil that move in the magnetic circuit. The magnetic guitar pickup uses the string vibration to vary the magnetic field from the pickup. Of course this means that musical instrument strings must be made of materials that will react to the field of the pickup, such as iron or steel.

Before we go on, a little history of the first guitar pickups, that I know of, might be of interest, as they pre-date the magnetic type.

When I was a young boy, the first electronic phonographs, were on the 78 RPM type. They used lacquer records as vinyl did not yet exist. To "pickup", the signal contained in the grooves, a cartridge, with a piezo crystal connected to a stylus, (commonly a phonograph needle), was used. When the needle vibrated the piezo crystal, a voltage was produced and amplified by the electronic circuits to drive a speaker. As an aside, Enrico Piezo was an Italian geologist, who discovered that his piezo crystals could be used to measure small movements of the earths crust. The 78 cartridge had a thumbscrew to make it easy to change the needle that wore out rather quickly.

The 78 cartridge became a guitar pickup when someone got the idea to jab the needle into a guitar, and the affix the cartridge to the needle using the thumbscrew. A long wire was connected between the cartridge and the phonograph. The phonograph became the first, "guitar", amplifier.

Back to the magnetic pickups. There are several forms of magnetic pickups. The most common ones we see to day have one or two coils of wire, with one or two magnetics beneath the coils, and polepieces carrying the magnetic field to the strings.

A less common type, called a contact pickup, uses a diaphragm that is placed against the instrument. As the diaphragm vibrates, a coil with a magnetic polepieces generates signal voltage. A variation of this, used on the Ampeg Baby Bass, has the bridge resting on a diaphragm, with a coil and polepeice below. An early pickup design, used on the Rickenbacker guitars and basses, used a, "horseshoe", magnet. The coil was mounted to the body, and the magnet was brought up and over the strings. The strings were therefore between the magnet and the coil. The main disadvantage to this setup is that you can not pick the string over the coil because the magnet blocks your access.

Common, modern pickups are the humbuckers, single coil, low impedance, and active electronics types. Let us start with high impedance, passive types, as these are by far the most widely used types. The single coil, as the name implies, uses a single coil of wire. This type offers excellent fidelity, fast pick attack, and tend to have the best clean tones. Typical single coil pickups are used on Strats, Telecasters, and the Gibson P-90 pickup. The main disadvantage is that they pickup hum from stray electrical fields. The Humbucker pickup uses two coils of wire in series. These coils are arranged so that they are, "in phase", to the string vibration, but, "out of phase", to stray electronic fields. When used in a stray electrical field, each coil generates an equal, but opposite voltage, and since the noise voltage are opposite polarity, they cancel out, and the pickup is quiet, but does sound different. Due to technical reasons that I will not get into here, the humbucker also weakens some string information due to cancellation in the coils. The side by side coil humbucker tends to, "read", a longer portion of the string than a single coil, again giving it a unique voice.

There are common misconceptions about pickups. The most common one is that you can judge the output, or fidelity, of a pickup by taking, or looking at the published data on the pickups Ohm reading. This is totally incorrect. Pickups are complex devices. They have inductance, capacitance, and resistance. In other words they are tuned circuits all by themselves. Pickups use many types of magnets, which can be charged to different strengths. 5000 turns of 42 gauge wire wound will read less Ohms than 5000 turns of 43 gauge wire wound so that total footage is the same. Pickups, both old and new can come with or develop shorted turns. A few shorted turns will not be seen on the Ohm meter, but the eddy currents in shorted turns can have a drastic affect on output, and tone. The way the wire is wound on the bobbin will change the output, and tone of a pickup. The type of wire, and the wires insulation will effect output, and tone. The material in the non-magnet polepiece will have an affect. Blade versus individual polepieces performs on different ways. As you can see many factors affect pickup design. Active pickups are yet a whole other subject.

As this is Ultimate Guitar Gear, I guess you might like some advice on pickup selections. First as I have said before, THRUST YOUR OWN EARS! Ask questions, talk to friends, if possible play guitars with pickups you have interest in. There are too many good, and bad, pickup makers for me to list. Also, there are many brands I have not heard. What I will do, is tell you the brands of pickups I have in my current guitars. It's only a starting point.

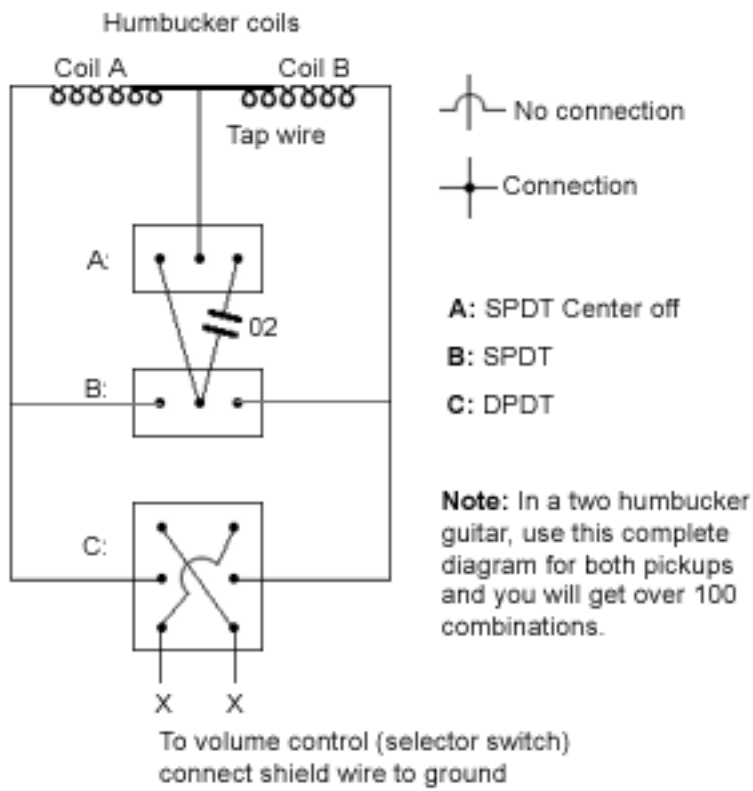
My personal guitars are currently equipped with, Lindy Fralin, J.M. Rolph, Bill Lawrence, Duncan Custom Shop, (EVH), and Gibson P-90 pickups. I use both single coil and humbucker pickups. I almost forgot a brand! In the 1980's I was an ESP guitar dealer. I use both the LH200 and LH150 model humbuckers they made at the time. I don't know if these pickups still are being made.

Multi-sound Humbucker wiring

Below you can see a schematic on a very useful Multi-sound Humbucker wiring for a Studio situation. With this you can

get over 100 different sound/combinations in you guitar with only two humbuckers.

Multi-Sound Humbucker Wiring
By Ken Fischer, Trainwreck



(click here for bigger picture)

Sound list for each pickup:

1. Humbucker in phase
2. Humbucker out of phase
3. Coil A off + in phase coil B
4. Coil A off + out of phase coil B
5. Coil B off + in phase coil A
6. Coil B off + out of phase coil A
7. Coil A bottom end only + coil B in phase
8. Coil A bottom end only + coil B out of phase
9. Coil B bottom end only + coil A in phase
10. Coil B bottom end only + coil A out of phase

Until the next time, I wish you all the best, **Ken Fischer**.

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Trainwreck thinking by ken Fischer

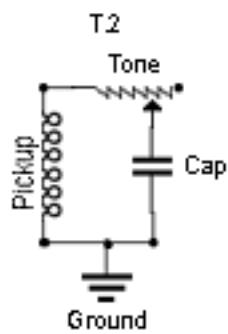
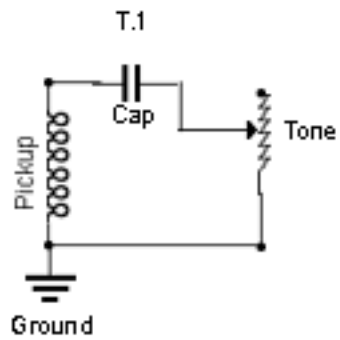
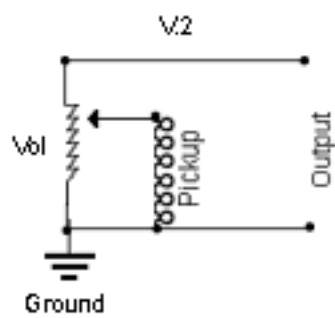
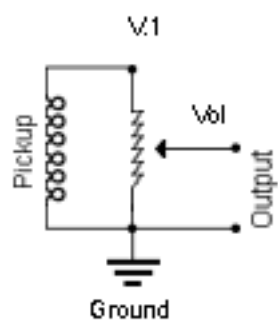
Chapter 2.1

I will now talk about controls for pickups. These are potentiometers, commonly called, "pots". I will use the term pots, in this article, to keep it simple. Most people pay little attention to the pots, used for controls, in their guitars. Pots have a number of parameters we should know about. The obvious ones are the physical size of the pot. Also, we want to know the mounting bushing length, and diameter, to insure it will fit the hole it will be mounted in. We also want to know the length of the shaft, and the type of shaft, to be sure the pot will accept the control knobs we plan to use. This is simple if you keep in mind that there are two main standards for these parameters. There is the American, (really English), and the metric standards.

The unseen parameters are wattage, taper, ohmic value, degrees of rotation, and the material the resistive element is made of. The typical pot in a vintage American guitar is a half watt carbon type. Some guitars use a linear taper, and some an audio taper. A linear taper is just that, linear. For every 10% of rotation, you get 10% of the pots value. If you rotate a 100 ohm pot 60%, you will get 60 ohms. There are several audio tapers. For my example I will use a true audio log taper. A true audio log taper will give you 10% of the pot's value at 50% of shaft rotation. For example, a 100 ohm true audio log taper will give you just 10 ohms at 50% rotation, compared to 50 ohms at 50% rotation for a linear pot. This is done because the human ear is not linear in response to increasing volume levels. The audio taper tries to match the volume curve to the human ear. Perfect! Then why the use of linear pots in some guitars? Pickups do not have a linear output. Most guitar amps and speaker do not have a linear output. Linear pots are sometimes used to sound like you are getting an even audio response with certain amplifiers, when these amps are played clean. Compression changes everything! I should note here that common wattage values for metric pots, as used in guitars, are, 1/2 watt, 1/4 watt and, 1/8 watt. The lower the wattage, usually the smaller the physical size of control. here are some terms you will encounter, relating to ohmic value. "K" equals 1000, "M" equals 1,000,000. For example, a 500K pot is 500,000 ohms. A 1M pot is 1,000,000 ohms, or 1000K. The ohmic value is most critical parameter for choosing a pot, followed by taper. A typical vintage Gibson guitar would have 500K pots. Fender used 250K pots in most of their vintage guitars. Here is where it gets interesting. The first Fender Jazzmaster guitars used 250K pots. In the sixties, the pots in the Jazzmaster were changed to 1M (1000K). The change gave the Jazzmaster much brighter, and a much thinner voice. The pickup being a tuned circuit is also further tuned by the value of the control, and how the control is used in the circuit. As a general rule, a higher value pot gives more highs and less mids. A lower value pot gives less high end, but more mids. This is not the case 100% of the time, but a useful general guide. When the pot is used for a tone control, the general rule is, the higher value of the control, the more high end you will get. The down side of this is, the control will seem to have less effect, until you turn it down a lot more than a lower value control. When the control is turned down all the way down, all values sound the same, as now capacitors is directly across the pickup.

There is one more parameter, I have not yet mentioned in regard to potentiometers. The resistive element has a tolerance specification, which is plus or minus a percentage of the ohmic value. For example, a 500K pot, with a 20% tolerance can be as low as 400K, and as high as 600K. This can be a downfall, to getting consistent results, when wiring a guitar. It can also be a fine tuning trick, if you measure each pot, and know how to use the results. You should also know, that a pot tends to increase in value with wear. An old trick used for vintage guitars, with a worn volume pot, is to switch the volume pot, with a little used tone pot, from the same guitar. This way, all the pots remain original. Of course the sound will change a bit, as the unused tone pot will be a lower value than the worn pot it is switched with. Choosing pots as a tuning tool is really great way to fine tune your guitar. You can test various for your guitar using test leads. BE AWARE THAT: touching any original solder connection in a vintage instrument will reduce the resale value.

There are two common ways to hook up a volume control. There are also two common ways to hook up a tone control. In diagram V.1, we see the most common volume wiring. This method, keeps the resistive load, of the pot, constant. The only downside is in a two pickup, two volume control guitar, with both pickups on. In this case, shutting off one pickup with a volume control will also shut off the other pickup. In diagram V.2, as used in a Jazz Bass, and some brands of guitars, the hot lead is connected to the pots slider. The signal is taken from, the "hot", terminal of the pot. This type of wiring has the advantage of not requiring a selector switch when using two pickups. This is because, turning off one of the controls will not turn off the other pickup as in diagram V.1. A selector switch can still be used with this circuit if desired. The main downside to this wiring type is, as you turn down the volume, you also decrease the resistive loading of the pickup, "loading it down". In affect, you change the tuning of the pickup, depending on the volume setting. Some people like the tonal variation with volume setting, and some do not. These two methods also affect the amplifier's input loading in different ways when using the control.



(click here for bigger picture)

As if things could not get more complex, there are two main ways used to hook up a tone control. In diagram T.1, the tone capacitor is put between the pickup and the control. This is common on Gibson guitars. In diagram T.2, the control is placed between the pickup and the capacitor. This is common in Fender guitars. Not to get too technical, a capacitor creates a phase angle shift. In a circuit with a resistor (pot) in series with a capacitor, this angle lags or leads, depending on the order of hook up. A personal note, never use a disc type cap in a guitar. They do not resonate right in a guitar circuit. A proper tone control should also add resonant tone as it is used, not simply flatten the high end.

Well, this voodoo is all beyond my personal understanding, so until next time, All the best, **Ken Fischer**

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Trainwreck Thoughts by ken Fischer

Chapter 2.1 version 2.2

Before I get into the main subject matter, I would like to make a few comments.

For those who don't know, I became sick in 1988. It started with CFIDS, also known as M.E. outside the USA. Since that time my body has become a magnet for serious illness. I am disabled by these conditions, and have extremely low energy levels. If I do not respond to all questions, requests and things like that, do not feel I have ignored you. I literally just am able to take care of my daily needs for my self. Thank you for understanding.

I do not own, have access to, or even no how to operate a computer. I know this is the computer age. I guess I am a caveman! The picture of me on this website is an old one taken many years ago by "Pink strat".

Ultimate Guitar Gear receives my articles by air mail, not e-mail. By the time something appears on the website, I have read, or given copies to friends. When you read the website, I may reply to articles not yet posted. Do not let that confuse you. As it all gets posted it will become clear (I hope!)

Well, a bunch of questions!

In chapter one I mention J.M Rolph pickups. I have been asked if these are the closest to original PAF pickups. Jim, also known as, "pickup maker to the stars", makes pickups that are the sonic equal to the originals. Jim is also the best at making pickups look aged, to look like originals. There may be others out there that can do this, but I am not aware of them.

Lindy Fralin, on the other hand, makes single coil pickups with the most chime, bell like, and complex tone I have found. It is really a matter of choice. Personally, I use both, as they both are excellent. Lindy also makes humbuckers and P-90 pickups.

The Bill Lawrence pickups I use are the L90XL series. These are no longer being made. The series that replaced it are the L-500 pickups. The 500 series lacks the aggressive chord crunch of the L-90 series. The 500 series does have a very violin like lead tone, and like all Lawrence pickups, huge output signal.

I also use two Duncan humbuckers, the custom shop EVH is in my opinion the best Duncan humbucker in his lineup. I also use a Pearly Gates Plus. This pickup is made by Duncan just for Fender. It has Strat string spacing, and the standard Alnico 2 magnet used in the regular Pearly Gates, is replaced with Alnico 5. The plus has a very crunchy power cord, tight bottom, but tends to be a bit bright and thin on the high end. This characteristic does make it fit well in a guitar with single coils as the other pickups, the way Fender uses them.

I hope that clears those questions up. By the way there are many other pickups I like and have used, such as Filtertrons, lipstick tubes, and so on. The question was asked about what I currently have in my personal guitars.

In chapter 2.1 I said, "Never use a ceramic disc as a tone cap in a guitar". Of course the question became what I should use? I don't know!!! O.K., I do know! (You guys, and gals are sharp)

First capacitors come in multitude of types, values, and voltages. The Sprague Black Beauty, also known as "bumble bee caps", are really great. Of course they don't make them any more.

I have heard that Gibson has had these caps made again for the 2003 Gibson Historics, but are not being as an aftermarket item. If you have a 50's Gibson, the .02 (really .022) Black Beauty was used. I used an old Fender value, Black Beauty in my Tele. It is a .047, (Fender calls for .05, which is for our purpose, the same thing). These caps were nicknamed Bumble Bee because they had color code bands around a black body. They look sort of like a giant Bumble bee.

Let's get to the important points of choosing a modern cap. First you want the correct value. Of course, feel free to try other values than traditional ones, if you are after something different. Most humbuckers use .022 (.020), and most single coils .05 (.047). You want separate film foil, not metallized types. Mylar and polyester film works better than polypropylene film.

Since pickups put out very low voltage, the voltage rating should not matter, but it does seem to have an affect.

Traditional voltage values are commonly, but not always, 200 or 400 volt ratings.

The Black Beauty caps used in old guitars were typically the 400 volt type. Another interesting point is that, if you reverse the cap end to end, it will sound different in use. I jump mine in with test clips, run the tone control through its range, and use directions my ear choose. Also, if you have many of the same type, try a bunch of them. They will vary slightly from cap to cap. It's worth the time to choose one you really like with your gear.

Lastly, some people put a bright cap from hot to slider on the volume control. This is so the highs do not roll off when turning the control down. This is very amplifier/speaker dependent.

In any case, a silver mica type is my choice, if you use one. The value judged by ear, using your guitar with your amplifier. 30PF to 220PF is the most common range. Fender once did a Tele with a .001 (1000PF) --- OUCH!

Well I hope this clears up some questions. Until the next time, All the Best. **Ken Fischer**

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Trainwreck, what again? by ken Fischer

Before I continue, I would like to thank those people that provide me feedback, and questions, dealing with this column. I will continue with the subjects of pickups, controls, and wiring. That's because there seems to be some additional question about what I have written so far.

Chapter 3.0, the valley of doom!

What is a valley of doom? Something I should have mentioned at the outset of the pickup article. NEVER USE A SOLDERING GUN NEAR PICKUPS!!! Soldering guns are a powerful transformer that can weaken, and demagnetize certain magnets, that are commonly in used pickups. For an example, a soldering gun can erase most alnico magnets just as well as a tape eraser clears a recording tape. Soldering is a whole subject itself. I will say one thing about soldering equipment. That is to properly solder guitar pickups I personally, would only use a transformer operated, low voltage, temperature controlled, solder station, in the 25 to 50 watt range. Keep the main transformer of the station off to the side, at least a foot (25cm) away from any magnets. If you do not own, or have access to such a soldering station, bring your work to a professional who does. About 700 degrees-F, or 350 degrees -C is right for this kind of work. The same can be said for alnico magnets speakers. Although you are less likely to harm these with a soldering gun, why take chances?

One question I was asked by an owner of a Les Paul was, "I have a brightness cap on each volume control of my guitar. When both pickups are together, and I turn down one volume knob too far, it actually cuts high end. Did I make a wiring mistake?" the Trainwreck answer is no. volume "bright caps" are best used on one volume control guitars. They can be used on each volume control in a guitar such as your Les Paul. However, with both pickups on, the bright cap on the pickup you turn down a bit, starts acting as a tone cap. It shunts highs to ground. Also, as you turn down the volume pot, it loads the pickup that is used on full, increasing this effect.

How about for a change of pace, I reply to an amplifier question? On another website, M...mentioned, that I had told him that 220K was the correct value for the grid return resistors, in a fixed bias, Fender, 6L6 equipped amp. To reply to M..., I'd like to say that the RCA tube manual says that 100K is the design max for this part. However, Fender, and most others have used 220K resistors, and these cause no problems at all. What can be noted is, that the resistor and the coupling cap from the phase inverter, from a RC network. The 100K value therefore makes for a faster response. Decreasing the typical .1 coupling caps to .02 will tighten the bass on these amps, for guitar, and also increase the response speed. When CBS took over Fender, they soon changed the 220K resistor, to 68K resistors in the Silverface Twin Reverb amp. Isn't that the amp everyone wants converted to blackface specs?

Back to the pickups wiring! Since we are talking wiring, let's talk wire. What type of wire is good to wire a guitar with? We first have to deal with the fact that two main styles of wire are used in guitars. One type is shielded wire. Shielded wire has one or more insulated conductors inside a tube of shielding material. This is most commonly tinned, braided copper. Sometime this shield is un-insulated, such as the wire used on classic Gibson pickups, and to wire their guitars. Sometimes the shield is insulated, as the wire in modern multi-conductor pickups is. The other wire commonly used is single conductor, non -shielded. This may be insulated or non-insulated in addition, in may be one solid strand, or a strand composed of many fine strands twisted into a single conductor. The wire is made of copper, but may be tinned to make it easy to solder. Teflon insulated wire is silver plated copper, instead of tinned. Teflon wire is rarely used in guitars. Cotton and PVC insulation is most often used. Cotton insulation can be pushed back to expose the conductor. PVC wire must be stripped of its insulation, as must Teflon, to be soldered. I myself would not use cotton wire in amplifiers, where it has many problems. (But it doesn't rattle like PVC and Teflon wire in combo amps, hence its use) I don't find any problems with cotton wire in guitars, unless you live in a very damp area. PVC and Teflon do not absorb moisture, salts, and rust like cotton, an advantage in that regard.

The next thing we need to know about wire for a guitar, is its gauge. The gauge is the diameter, or thickness of the wire, the gauge is very important when dealing with current, as too thin a gauge can overheat, burn out, or cause too much loss. A guitar pickup puts out so little voltage and current, that the gauge is usually chosen for ease of wiring. Typical wire gauges in guitars are 20, 22, 24, 26, and 28 gauges. The higher the number, the thinner the wire. 42 gauge is a common wire gauge in pickup winding, to give an example of scale. Resist the urge to use lamp cord (typically 16 or 18 gauge) as guitar wire. It is too thick for many switch and potentiometer terminals, and looks awful inside your instrument.

I will not get into wiring diagram, as most pickup makers post these on their websites. The 120 sound diagram posted with this column, was a sort of by accident. I sent it in to ask if the website had the ability to post such things. I guess we know the answer! In any case there wasn't an explanation sent by me for it. It is meant for a special purpose recording guitar, for studio players. You can take one guitar to the studio, and have a sound for almost any requirement. Used on a Les Paul for example, you would have 7 switches, and 4 controls to deal with. Of course this makes it quite complex to use during a live performance, which wasn't the idea. Of the many wired over the years, only two were used for stage performance.

I have a post office box address which you can write to with questions, comments, or suggestions. Be aware, I rarely get to this box, and because of many health problems, rarely send back replies. I will however read everything sent. My address is: Trainwreck PO Box 261, Colonia, NJ 07067-0261 USA.

Until next time, all the best, **Ken Fisher**

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