

# **REFURBISH YOUR 208, 298 OR 398 HIGH END EMPIRE TURNTABLE**



# Empire Turntable Refurbishing

## BASIC INFORMATION TO CONSIDER

### Buying a used Empire Turntable.

Which model is right for you? If you are interested in getting a high end turntable at a budget price, you will want to look for a Model 208 through 398. They are reasonably priced and a modern tone arm can provide you with a very nice unit. 498's and 598's are wonderful units, but use a suspension system that makes it less desirable to audiophiles. The suspension units offer some great dust cover systems and look very high end when redone properly. I prefer the look of the suspension units, but we are after sound quality and not esthetics.

### Why we prefer the 208 through 398 models?

For one, solid tweak able damping. It is one solid unit and can be tweaked to minimize vibrations. Well, it's not solid because the plinth attaches with screws, but we don't want to bore you with disclaimers through out this document.

This unit lends itself well to user DIY modifications and can produce audiophile quality sound. The wood base can look very attractive providing there are only minor imperfections and not deep gouges.

The aluminum construction lends itself well to machining. It is very easy to modify the tone arm mount area to accommodate a modern arm. An arm such as the SME 3009 is still affordable and sounds great with a suitable cartridge.

PRICE- You can probably afford to refurbish one of these units on just about any budget if you take your time and do one thing at a time. If you are on a very strict budget, manage the project to do one process every week, or two weeks. Check your local recycling center for free products. Some people drop off unused and unopened stain,



lacquer and other usable products. Don't use anything dated or half used. It might be contaminated.

**-Black Finish Plinth.**

## **Sources of used Empire Turntables.**

The most obvious is Ebay. The prices have risen quite a bit over the last 3 years, but you can still get a good deal if the unit is complete. If the seller does not state the platter turns, avoid it. One of the reasons these are great is because of the high quality motor. Without a good motor, it is useless unless you plan on using an external motor.

Estate Sales are excellent sources. The best are actual estate sales and not the advertised sales that end up being a “tag” or “garage sale” misnamed.

Another great source is your local “Thrift Store”. It is amazing what people donate to charity. You have to be tenacious because they do go quick.

## **Do you actually want to redo it yourself?**

**Expense-** If you don't have an air compressor this will be your largest cash outlay. If you go minimum you will spend about \$340.00 for a Craftsman or similar. Be forewarned... look for the amperage rating on the motor. Many companies over market the unit and there's no way a 6 HP compressor will run on the 15 amp circuit they recommend. If it runs on 15 amps it is probably a 1-1/2 HP over-rated to 6 HP. So use a bit of trepidation when looking at these because you want at least 6.5 Cubic Feet per Minute at 90 PSI unless you have an hour to sand blast a 4" square area.

Do you have a drill press or very steady hands? Aluminum machines easily so if doing custom tone arm mounts you will want precision.

This is just preliminary; we will cover tool costs later on. For now analyze your shop inventory and keep in mind what you will have to spend to DIY.

**Time-** Do you realistically have the time to spend hour upon hour on this unit? Will your labor savings justify the money you don't spend having someone do it?

## **2 Questions-**

1. Do I have more money than time? Have someone do it.
2. Do I have more time than money? Do it yourself.

**Bottom Line-** Compare your time and tool cost and compare that to having someone do it for a flat fee. If you have never done a turntable refurbishing, you will be amazed at the time involved. Some people don't mind the time or expense. You may find you will own some tools you did not have before and doing it yourself can give you a lot of satisfaction. You may even find a better way to do it than we recommend.

## Disassembly

### Tools-

1. Nut Drivers.
2. Screw Driver.
3. Pliers.
4. Bubble Wrap.
5. Paper Towel.
6. Parts Bags.

To get a starting point, let's say you bought a turntable on Ebay and the seller had no clue how to ship it. So he boxed it up intact without anything removed. The motor is still mounted.

Remove the Platter.

Wipe off excess oil from the spindle bearing so it does not contaminate the plinth as you move it to a new safe location.



Remove the 3 screws attaching the lower part of the spindle bearing to the plinth. Drain any residual oil and store the lower bearing in a sealable plastic bag till you can wipe out all the old oil.

Find a box that you can use to place the unit upside down so the mounted tone arm does not get damaged.

If the tone arm has been removed, you can just place the plinth face down on a soft cloth surface.

Document the layout. Take digital pictures and written notes or drawings on the layout of wiring, screw locations, etc. Note the spiral oil groove which raises the oil upwards towards the platter for lubrication.



Unplug the Tone Arm Wiring Harness. Remove the (3) nuts holding the Tone Arm assembly to the Plinth and lower the Tone Arm from the bottom and designate a box for all the Tone Arm parts. You can now place the unit face down on a soft cloth or soft work surface.

Remove the Capacitor hold down screw, the wire harness clamp screws and Ground Wire.

Remove the Pilot Light/On-Off Switch assembly. This is spring loaded so make sure the spring does not fly out and become invisible some where on the floor.



With your hand underneath press the Motor Grommets inward towards the center of the hole, rotating your fingers around the Grommet until each has been pushed out of the hole.

Remove the complete harness and store safely for future refurb and/or reinstallation. Be careful not to damage the wiring.

## **Remove the Plinth from the wood base.**

Unscrew the wing nuts holding the plinth to the L-Brackets which are attached to the wood base. If the wing nuts will not come off without rotating the screws, you will need to hold the top of the screw with a screwdriver while using the pliers to remove the wing nuts. If the screw slot is damage and the wing nuts are sticking, find a rubber washer to protect the screw while you hold the screw tight with a pair of pliers. Preferably a small (6") needle nose vise grip. You will have (4) angle brackets to remove.

Mark the location of the L-Brackets with a sharpie (both on the wood and on the bracket 1-4) attached to the wood case before removing them if you intend to reuse them as intended.

## **Refinish The Wood Base**



**-Sand Side Panels with Parallel Strokes Length Wise.**

### **Tools-**

1. Finish stripper.
2. Brushes
3. Scraper.

I won't go into this too far because there is plenty of great information available on the Internet about wood refinishing. I will give you my preferences and hopefully some tips that are useful.

## Stripping-

Lay down a tarp, garbage bag or the like to protect the surface you will be working on. There are many brands of stripper available. Use what makes sense to you. An environmentally friendly stripper is always a good thing. Gloves and a face mask are always recommended.

If on a budget, check your local recycling center's reuse room. This can save a buck or two and stripper is usually poured into a second container and not contaminated. You might also find some free stain or clear coat. If you do find some freebies, always pour into a container and check the clarity before using it on your vintage treasure.

We like to use foam brushes because they are inexpensive and disposable. Apply a thin coat and use light pressure or the brush will separate. Remove the stripper with a window scraper. The scraper I am trying to describe uses a single edge razor blade. I don't push the scraper. That can catch on the wood and cause a defect. Pull towards you.

When you have removed the majority of the finish, allow the wood base to dry for a day.



## **Sanding-**

Before you start sanding, consider how you want the finished base to look. Woodworking books will tell you to progressively sand with finer and finer grits. This is great for a really smooth finish. But the smoother the wood, the lighter the stain will be. If you want a dark finish, you don't want to end with a 220 grit paper. We have had some nice dark stain colors come out by final sanding with 100 grit without going courser. 100 grit should be adequate if you have done a good job on the stripping.

Sand with the grain of the wood. That means lengthwise on the sides and up and down on the wood corners. Empire did add some putty on the machined end blocks but it seems to take dark stain well.

After sanding blow off well with compressed air and wipe off dust with a cloth. If you feel the need to use a tack cloth, make one. Take a clean lint free cloth (best is cheese cloth) and apply a small amount of whatever solvent is recommended for your stain type. Use just enough solvent to attract sawdust and not leave a layer of solvent on the wood.

In between sanding you may have some holes or gouges that require adding a bit of putty to fill them in. Whatever you do, don't use a cheap off the shelf consumer putty. You will not be happy with the results. A very fast dry alcohol based putty will give you the least visibility of the defect. If you have the time, you can experiment by retaining the sanding dust and mixing it with a small bit of quality wood glue. This can be tricky so experiment on a scrap piece of wood. Stain over your DIY filler and see how it will take your stain.



**Sand Corners Vertically.**

## **Staining-**

I prefer MinWax stains. Since your wood base is most likely Walnut, the Dark Walnut stain is an excellent choice. This brand is relatively

forgiving as to wiping time and recoating. If you make a mistake, you can most likely correct it. Other stains are not as forgiving.



Apply several coats of stain if you wish to have a dark color. Start with the top edges. Immediately wipe off any excess that drips on to the side panel. Then wipe the edges that you have just stained.

Next apply stain to the corner blocks. Always wiping as you sanded- in the same direction as the grain. You may have to wipe vertically to fill in voids, but always finish in the direction of the grain. Continue to wipe the overlapping edges so the stain does not darken the adjoining section.

Lastly, apply stain to the main panels. Continue wiping the edges to remove excess. Repeat these procedures until you have achieved the darkness level you desire. Allow the stain to dry and place in a garbage bag or suitable container until you are ready to clear coat.

### **Clear Coating the Wood Base-**

I prefer just oiling the stained finish. It looks rich but takes more effort to oil it every so often. If you have to clear coat, I recommend you use a clear coat from the same manufacture of the stain that you chose. Many different brands are compatible, but again, test on scrap before you commit. I will cover clear coating more in the aluminum section.

Linseed Oil adds a nice semi gloss finish if done in the right amount. Try to avoid any product that contains a silicone. The silicone can cause a problem if you decide to refinish the base again at a later date. You will have to totally strip it or the silicone will cause orange peel and your new finish will be terrible.

## Aluminum Finishing-



**Clear Coated Motor Cover with Raw Sandblasted Plinth. Walnut Stain on Base.**

**First a brief discussion** of sand blasting and the finish. If you have a small air compressor you will have a problem. Aluminum oxidizes as soon as you open up the finish. If you

can't do the sandblasting in one session, you will have oxidation. Nothing major but the point is it oxidation starts immediately. This is a good argument for buying the largest compressor you can afford.

## Abrasive Types

**DON'T USE THE BASIC SILICA SAND** unless you have complete protection. This media gives off chemicals that will hurt your lungs. I can't stress this enough. Protect yourself first at all costs. Try to choose a media with the least amount of Silica.

The major types of abrasives are Glass Bead, Grit Types such as Aluminum Oxide and Walnut Shells. There are others but for the sake of this discussion, these types are what are recommended. The condensed version is that the finish you desire will dictate which medium to use.

For a **Bright Sparkling Finish** use Aluminum Oxide angular abrasives which cut very well. The best is White Aluminum Oxide which will not leave a residue such as the Black Aluminum Oxide will. The trade off is price. The White Aluminum Oxide will be more expensive but will provide a better finish for clear coating. The Black Oxide will leave a residue and require more cleaning before the clear coat.

For a Satin Finish use Glass Bead. Glass Bead tends to leave a Satin Type finish. Prices vary from the source. 20 pounds can cost as low as \$20.00 or as high as \$40.00.

For a **Buffed Satin Finish** use Walnut Shells. These are more available than you might think. The shells are a softer more forgiving media but the dullest finish of the three types.

## Finish Brightness

The clear coat will add a grayish tint to the final look of the aluminum. So a general rule of thumb, no matter which abrasive you chose, is that the coarser the grit the brighter your finish will be.

Buy the **Best Protection** that you can afford. Minimum is a good respirator and face shield. If you can invest in a complete hood so much the better. You will be amazed where sand will land. In your ears, nose and open pockets of your jeans. If you can afford or already have a blasting cabinet you have it made.

## Budget Sand Blasting

1. Air Compressor. Min. 6 CFM at 90 PSI (est. \$300.00)
2. Siphon Sand Blasting Gun (est. \$30.00)
3. Water Trap. (est. \$20.00)
4. Respirator. (est. \$28.00)
5. Face Shield. (est. \$12.00)

**Total Estimate Budget Blasting Outfit - \$400.00**  
(No Enclosure)



**Air Compressor-** Try not to buy an oil - less compressor with the motor mounted directly to the compressor unless it is basically meant for light home use and an occasional project such as this one. In most cases the motor is proprietary and finding a replacement is difficult. If you have the time to find a replacement, it will be overpriced compared to your initial outlay. We had a Craftsman 30 Gallon that blew out. The compressor was \$300.00 and the replacement motor was \$229.00. It was also “Rated at 6 HP” but the motor was 15 amps. Do the math on that one. The motor was about a 1 to 1-1/2 at that current rating. The “Rated at Horse Power” is not the motor Horse Power

Rating. In all fairness, it did last 4 years and saw heavier than normal use for a home type compressor driving air tools, spray painting and sandblasting.

If you can afford it look for a belt driven compressor with a separate compressor section. If you need to replace the motor you will have an easier time.

**Sand Blasting Gun-** A budget gun is inexpensive but uses a lot of air. It uses a siphon to draw the blasting media up a tube and out the front of the gun. The pickup tube allows you to place it in a container. Glass bead generally comes in a plastic container, so you can just place the pickup tube in the container. A pressure system is more efficient, but more costly. You should get at least one extra tip. Check availability on tips. If you can't get parts you may have a problem in the future.

**Water Trap System-** A device to remove water from the air line. Water forms when you compress air. You will need to drain the tank before and after each use and filter the air with this device. Water will facilitate the oxidation of your aluminum surface and cause random discoloration.

**Respirator-** Enough said. Protect your lungs. The dust is so minute that you will find you inhaled dust if you just use an inexpensive face mask. Try the inexpensive mask and then see what may come out of your nose. Protect yourself.

**Face Shield-** Try blasting without it. It hurts. You will probably be in close proximity to your work piece and you will feel some pain.



## Pro-Style Sand Blasting

1. Air Compressor. Min. 9 CFM at 90 PSI (est. \$500.00)
2. Pressure Sand Blasting Bin (est. \$100.00)
3. Water removal.(est. \$20.00)
4. Respirator. (est. \$28.00)
5. Hood. (est. \$30.00 to )

**Total Estimate Pro Blasting Outfit - \$688.00**  
**(No Enclosure).**



**Air Compressor-** Buy the best you can. A pressurized system requires a minimum of 6 CFM minimum and can require up to 25 CFM per average product literature.

**Sand Blasting Pressure System-** Pushes the sand rather than pulls it.

**Water Trap System-** A device to remove water from the air line. Water forms when you compress air. You will need to drain the tank before and after each use and filter the air with this device. Water will facilitate the oxidation of your aluminum surface and cause random discoloration.

**Respirator-** Enough said. Protect your lungs. The dust is so minute that you will find you inhaled dust if you just use an inexpensive face mask. Try the inexpensive mask and then see what may come out of your nose. Protect yourself.

**Full Head Hood-** Total face and head Protection.



## Sand Blasting Enclosure

If you plan on reclaiming any abrasive you will need some type of container to restrict the sand from flying all over your work area. Not to mention that the fine dust can get into table saws and equipment. Even the dust is still an abrasive so it can cause problems.

**Budget Enclosure-** Hang some eye hooks from your garage ceiling in a square pattern based on the spacing of the eyelets on the tarp. Use budget tarps to contain your work area. 5 will do nicely. 4 sides and one on the bottom. (est. \$25.00) 5 feet by 8 to 10 feet hung length wise.

**DIY Enclosure-** Build one yourself. Just basically a box with a hinged top. Use budget glass in the top for visibility and provide arm holes and an access point for your blast equipment in the front.

**Buy One-** There are many enclosures available. Cost will vary and it can get pricey. You do save money on face protection with the enclosure. Some will include the gun and hose connection with attached gloves.



## Sand Blasting Procedure

**Testing-** Start with a scrap piece of aluminum for testing. If you don't have scrap, start with the Motor Cover. It is smaller and you can redo it if you make a mistake.



**Procedure-** If you are starting with the motor cover, sand blast left to right. The machining marks are usually horizontal. Try to cover a half inch at a pass. When that surface has been done horizontally, blast vertically to promote uniformity. Use the pressure recommended by the manufacturer of the abrasive you are using. If in doubt, email us with the question. At this point, we recommend you move to cleaning and clear coating to see

what you get as a finished product. If it is not satisfactory to you there is no point in moving on to doing a large plinth.

**Plinth Procedure-** Same as above, but the machining marks on the plinth are circular rather than squared. Use the above procedure and add a circular blasting pattern afterward if you want to retain the original machining marks. Note that the gold finish unit will give you more problems than the natural finish table. The analogy would be if you finish a piece of wood in natural, you need the highest quality wood you can get. If you finish a piece of wood in a dark concealing stain, you can get by with a lower quality wood. Likewise with the gold finish. It may conceal some defects.

**Hole Concealment-** To cover holes left when you removed the tone arm rest, you can add some hex head screws that look pretty good. Take a small piece of wood or plastic and drill a hole for the screw diameter. Just a jig to hold the screws from flying when you hit it with the blaster.



**Tone Arm-** If you really want to use the original arm be advised that the gold unit is heavily plated and will take many more blasting sessions than the table itself. A Tongue-In-Cheek description would be to buy a blaster that can use 1/4" rocks. The plating is heavy so don't expect the results you get on the plinth. We recommend a new and updated Tone Arm for any serious Audiophile.

## Cleaning the Sandblasted Surface

**This procedure** will vary with your budget. It will also vary with your time availability. Since the aluminum will start oxidizing when the surface is opened up by the blasting, it is best to clean the surface as soon as possible. This is not a rapid visible oxidation, but just to make a point that it starts upon contact with the air.

**Professional Products-** If you have chosen a profession system such as DuPont, etc. You will have some very specific instructions. This is the preferred method but can be costly. (see products list).

**Acetone-** Clean the surface with clean compressed air. Wipe gently with a clean lint free cloth. You can wipe the surface with a white lint free cloth and Acetone. Use caution since Acetone is highly flammable. As you clean you will be able to monitor how much you are removing from the aluminum by the color of the white cloth.

**Consumer Type Cleaner-** Another cleaning method is to use “Duro Aluminum Jelly – Cleaner and Brightener”. This method is a brush on and rinse off procedure. It is a Phosphoric Acid mixture so use caution. Use Gloves, Respirator and Eye Protection and rinse in an area that will not be affected by the mixture.

**Wiping considerations-** First wipe in small circular patterns to get good penetration from all directions. Then wipe in the direction of the machining marks. For the Plinth, the machining is a circular pattern. For the Motor Cover the machining marks are more of a straight pattern.

**Dry Time-** Follow the manufacturer’s recommendations if not using a standard solvent. Allow about 4 hours for the solvent to “flash-off” if using something like Acetone. Be sure it is dried in a clean dust free area. Dust off to remove any cloth “hairs” that might have stuck to the piece and store in a plastic bag.

## **Clear Coating**

**Methods-** This will depend on the equipment you have available and the time you want to spend on it. The important thing is that you get a finish that protects the aluminum and the finish does not oxidize to a variation of colors that looks like a weather map in a storm. You have a compressor so spraying the clear is an option. This is probably the method of choice if you have chosen a professional product.

**Spray Gun-** I prefer a DeVillbiss or Binks touch up gun. You have the ability to use a small spray pattern and use small quantities of your spray material. Parts availability is good and service is there if you need it.

You might be tempted to purchase a discount gun on Ebay or at a Chinese tool outlet because of price. The problem there is parts. If that is the gun you chose, be sure to clean it completely with the solvent recommended for your coating. The needle needs to be precision and a build up will render the gun useless. These guns generally have a packing that needs to be oiled. You can imagine the problems when a precision oiled packing meets a needle that has built up media on it. The gun is basically shot. The Chinese import might seem like a good deal, but to replace one part might be more than what the gun costs.





**Spray Cans-** You can get good budget results. Don't rely on your finger to get precision results. Use a spray can handle that allows you to spray as you would with a spray gun and practice. These can be found for a couple of bucks up to \$10. I keep one on hand just for small quick jobs.

If you don't have experience painting, visit your local recycling center and get some spray paint. It's free and you can practice the proper distance and feel of the spray pattern. Be sure to read the label and spray at the distance they recommend. Spray cans easily cause runs and sanding them out can be a problem. We cover sanding out runs later.



## Spraying the Plinth

**Setup-** Place the Plinth on a box or suitable support so the edges are not contacting any other surface. If you lay it flat on a piece of cardboard, it will stick at the edges and you will ruin your surface. A rotating turntable is excellent so you can stay in one position and move the unit for the next surface while retaining your light source.

**Lighting-** Adequate lighting is essential. A large lighting stand with dual halogens is excellent. You will want to see exactly where your coat is hitting.

**Prep-** Place some masking tape on the inside of the on/off switch hole so that clear coat build up will not impede the switch from moving up and down. It is a tight fit and you still might end up sanding the hole with 320 Grit Wet Dry paper to get the switch to move properly. Like wise with the platter where the 45 adapter will need to move freely.

**Spraying the Unit-** You want to give the edges some quick coats first. This is where your sags will most likely happen. Observe the recommended distance. For a rule of thumb, do a first coat at about 10-12 Inches and wait about 15-20 minutes for a second coat. Do 2 coats on the edges first.

The top of the Plinth is easier since the spray can lay flat if your work surface is flat. I like to start at the sides of the unit spraying forward for the first coat. Do both sides. Wait 15 minutes, if your surface looks good, spray from the back to the front. Wait another 15 minutes, if your surface still looks good, spray from front to back.

Here is where you need to use your judgment. If things look good. Stop here and wait the specified time for a second coat. If you have some problems, wait about 2 days until your coat flashes off and sand out the defects. (refer to the clear coat sanding section).

You can build up your coats but don't go to excess. Depending on how much fine/wet sanding you do, you may need more coats.

Ideally you have built up multiple high quality coats of your clear coat and a very high quality finish. Every time you recoat, the solvent that they add opens the surface and prepares it to accept another coat providing you have used the same product from the same manufacturer.

## Wet/Dry Sanding Between Coats

**Benefits-** Every time you spray, the temperature, humidity and other factors come in to play. So if you get a defect it may not be your fault. You can correct them. You can sand between each coat. It brings to mind the finishes applied to Muscle Cars in the 60' and 70's as in 25 coats of Candy Apple red.

**Wet Sanding-** Allow adequate time for the finish to dry before wet sanding. Use a 320 to 400 grit paper and tip it in water as you sand. The water carries away the particles, and

levels the finish. You can also use a spray bottle of water. Try to use distilled water if your local water supply contains iron or the like. You will need to wait until the water has evaporated before you add another coat. This can take some time. Your main concern is leveling the surface and not removing all the coating you just laid down.

**Sags-** Sags can happen on a top surface also but generally happen on vertical surfaces. Allow the surface to dry for 1-2 days. Use a sanding board that does not flex with 400 Grit Wet/Dry. Apply water liberally. You want to bring the built up surface down to the main surface level and patience is the key here. Work slowly and take a day or two with frequent breaks. You are going for precision. The alternative is stripping the whole unit and starting over. You can do it.... No problem, if you take your time.

## Polishing the Surface

Now we have come up with a really nice looking surface. To protect it I recommend Meguiar's Mirror Glaze. Mother's is also a great brand. A Teflon based polish is also excellent.

## Re-Assembly

**Hole Concealment-** If you choose to use a Tone Arm externally and not mounted on the Plinth, you can add some nice looking hex head screws and a cover for the original large tone arm hole.

You can also use a metal plug and sand blast it to more closely match the plinth. Both style plugs should be available at your local hardware store.



## Electrical

**AC Plug Polarity Check-** The most important upgrade you can do and it's free. You will need to measure from your ground on the turntable to a reliable ground on an outlet. Make a note of the voltage. Reverse your plug in the socket and note that voltage. Which ever voltage is lower is the correct polarity to help eliminate hum. Make a small mark with a sharpie so you will remember the correct orientation of the AC plug.

I had a retired Power Company Engineer stop over one day and I thought I would pick his brain about polarity. I mentioned this test and he told me that polarity was irrelevant with modern power service. He could not even believe the different readings from prong to prong. The point is not to put down the knowledge of the Power Company. The point is they don't work with sound and we do.

**Polarity Switch-** Use a DPDT (double pole double throw) switch so you can reverse the position of the (2) AC legs rather than switching the AC plug position in the socket.

**Signal Cable Upgrade-** I use a Teflon coated mini Coax that we sell in our Ebay Store. Teflon is a great insulator and the wire is silver coated. It is a bit stiff so you will want to add some strain relief.

**Power Cable and Socket Upgrades-** You can add an IEC socket. The socket that we offer has an on/off switch, line conditioning section and fused lines. We also offer a unit without the On/off Switch. This can be mounted in a small box if you don't want to cut holes in your vintage wood base.



**Cable-** Almost anything you do will be an upgrade to the original power cord. We also offer Teflon insulated wire. To make your own power cord, use 3 wires and braid it. The concept behind this is the same as Pro Sound cable setups. If wires must touch or be in proximity to each other, they should be run at 90 degree angles to each other. This is what the braiding will try to accomplish.

Be forewarned, the braiding process is tough on the hands. The tighter the braid the better. Take 3 lengths of #20 or #22 Teflon Jacket Silver coated wire and braid to your desired length. Add about 30 percent for the length. This is one of the 3 that you will need. At this point you can choose to braid those 3 into one or leave them separate. If

separate, you may choose to run them through Teflon Tubing. A budget method would be to wrap each in Teflon plumbers tape.

### **Braided Silver Coated Wire for Power Cable**



### **Silver Coated Wire with Teflon Jacket for Signal**



**Connectors-** These vary in price. You can start out with a basic plug and upgrade to more expensive and exotic plugs. These can run from \$10 to well over \$100 depending on your choice of quality and plating.

Here is a basic female IEC connector for use in the IEC fused socket.



Here is a budget AC Plug that we offer in our Ebay Store. Both AC prongs are the same size so you can cut off the ground and rotate it in the outlet for correct polarity. We don't offer this as a High End solution, just a budget priced convenience.



**Electrical service-** varies widely by location but as we mentioned, any upgrade is good. Your best bet is to use your meter and tweak things based on the polarity check. If your cord will always be plugged into the same outlet, you can just wire the plug for the correct polarity.

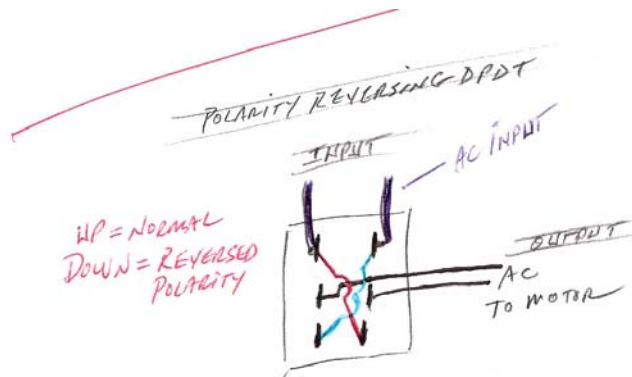
**Ground Loops-** This is one aspect that can become complicated. Ground loops can cause panic for even the most seasoned sound engineer. If you are using modern equipment that uses 3 prong plugs and you have noise, it is probably a ground loop. I have had seasoned tube amp re-builders mention too much noise with turntables. Well, guess what, something is wrong somewhere and your meter can tell you what it is. I hate to beat a dead horse here, but I can't stress this enough. It is going to be your choice of using the 3

prong or 2 prong based on your measurements. Since you are grounding your turntable to the amp, I personally avoid a 3 prong plug.

This inexpensive **Receptacle Tester** can tell you if your wiring is consistent or if your ground is missing. You never know if someone wired a socket opposite of the other sockets. Just look at the lights for a potential fault. Some even test the GFI's. This is a bargain at less than \$10.



### Wiring for a DPDT Polarity Reversing Switch. (Back View).



**Test it out before use. You should have Continuity no matter what position your switch is in. If it does not test with your meter, don't place it in service. This replaces monitoring your plug position. If you have hum, reverse the switch.**

## Set- Up

If you have removed the plinth to base “L” brackets, reinstall them to the wood base. If using the original holes, place a small dab of wood glue on the screws. Use delicate pressure tightening the screws. Use just pressure enough to snug them up. The glue will provide a tight fit if the holes are not damaged.

Replace the mounting screws to the plinth. Apply a small bit of low strength Loctite to the threads so removal will be easy down the line. I would recommend you use a small neoprene washer between the plinth and the “L” bracket. Place the wood base on the plinth and put the original washer and wing nut on each of the (4) “L” brackets. Just tighten them enough to keep the plinth from damaging your new wood finish.



Mount the lower bearing housing with the (3) required screws.





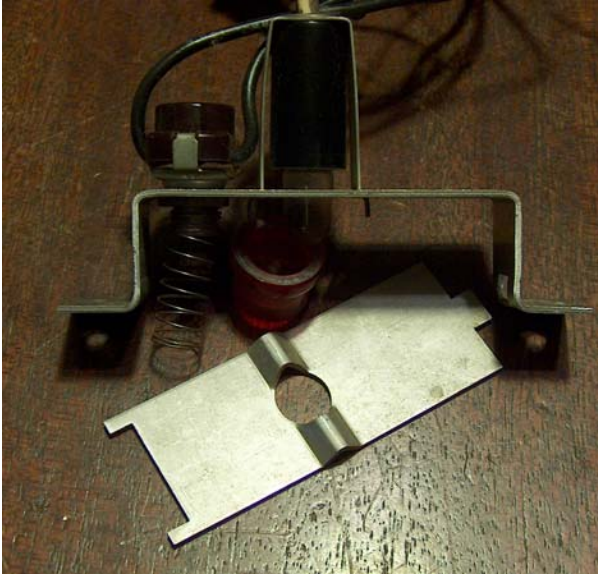
Place the turntable plinth up and install the motor isolation grommets. Start at one side of the grommet and gently work into the hole. Lubricate the motor swivel washer with white lithium grease. Here's an example of one we received with a bit too much grease.



Place the plinth face down and push the motor screws through the grommets. Tilt the turntable so you can install the motor mounting screws. Be sure to support the motor from underneath during this procedure. Install the knurled nut for the front adjustment motor screw.



Re-attach the On/Off switch. See the specification page for size if the screws were not marked. Test the red button to be sure it fits in the hole. Like I mentioned previously, spray build up can cause binding. Sand with wet/dry sand paper until you have removed any binding.



The spring goes over the switch. The plate at the bottom of the picture has a node that fits into a cut out on the switch bracket. The left side shows the cut out that allows the mechanism to move up and down. The red piece goes face up into the hole.

Attach the capacitor to the plinth. This procedure can be tricky and has potential for thread damage. You will need to compress the capacitor hold down clamp and precisely attach the screw. You can use a small cable tie to compress it and then cut it off after the screw is started.

Attach the power cable strain relief screws. Minimum you should also add a large cable tie to provide more strain relief to the AC cord.

You should have (2) ground wires, one to the plinth and one to a motor post. There should be one lug of the (4) on the motor that does not have a washer. Attach the motor ground to that post. Both of these wires should be attached and run to a ground on your preamp or amp.

If every thing is attached, place the unit in the user position and tilt it to finalize the plinth to wood base alignment. You will need to eye ball the alignment as you tighten the wing nuts.

Plug in and test the motor. See the section on Polarity Checks.

Mount your Tone Arm according to the manufactures instructions.

Add ½ teaspoon of “3 in 1” type sewing machine oil to the lower bearing housing and place the platter in position. Place the belt around the platter and with both fore fingers gently stretch the belt slightly to pull over the motor pulley while pushing the adjustment screw towards the platter with your thumbs. Spin the platter by hand to center the belt. Retest and adjust the front motor adjustment nut for correct platter speed.

When placing the motor cover on the plinth use caution. This is where most scratches will occur because the motor cover has metal mount pins.

### **Platter Speed**

A speed tester is an excellent way to test your turntable speed. The KAB SpeedStrobe has very high ratings and goes for about \$90.00. It is battery operated so the unit does not rely on your house current which might be off specs.

Empires have crowned pulleys and have a screw adjustment on the outside screw of the motor mounts to shift the belt on the pulley. It is a knurled knob.

To adjust the speed, if the platter is moving slowly, move the pulley further from the platter, if the platter is moving too fast, move the pulley closer to the platter,

## Budget Conscious Tips

If you have the money, buy the best products that you can. The purpose here is to give some tips to get your unit up and running on whatever budget you have. You will have to analyze your finances and decide where you will invest. Any tips here will give you a High End Turntable that performs excellent and will make you wonder why you listen to CD's.

**Cartridges-** Of course buy the best your budget allows. I am a big fan of Grado. Bang for the buck is excellent. If you can't spend \$200 for a Gold Cartridge, the Silver is close and the Gold is the cream of the crop of the Silver version. Many old Grado Cartridges are compatible with the new stylus so check their compatibility chart.

**Ebay-** Still a good source but the prices are rising (\$350.00 currently), since we bought our first 208 for \$30.00. Know what you are buying and have patience. Prices do change. You can buy a belt for \$11.00 or \$30.00. Track the prices and take your time. Deals come up and as more people add items, the prices come down.

**Estate Sales-** Look for listings that mention an old TV Repairman's Estate or old stereo equipment. Even a console stereo might be a lead. Empire did sell turntables for mounting in an existing console. Vintage products rarely get mentioned in the ad. They think it is old and not worth much. That's a big advantage. Besides, who plays records any more?

**Stylus Scale-** Use a budget digital scale to set your stylus pressure. We offer one for less than \$30 in our Ebay Store. You may find one at the same cost locally. Some dealers charge up to \$240.00 for a stylus pressure gauge. This unit is accurate to .1 of a gram. Very usable for a budget scale.



**Thrift Stores-** Check for budget LP's. We have purchased many Vinyl Recordings still sealed in the original packaging for .99 cents since the hordes shifted to CD's. You also find an occasional audio product. We have purchased EV corner horns for as little as \$5.00 because they were painted and looked bad. Rummage sales are great too.

# Empire Specifications and Tips

## Empire Models-

### 208

The 208 did not include an arm or base. It was sold without a base so it could be included in a console. Many Hi-Fi Retailers in the day sold cabinets for placement of your custom selected components.

The value in the 2xx and 3xx models is the dense platter and plinth. This lends itself well for upgrades making it a viable candidate for a High End Audio System.

208 - Turntable Only.

288 - Turntable and 98 Arm.

298 - Turntable, 98 Arm and Base.

388 - Turntable and 980 arm.

398 - Turntable, 980 arm and Base.

All Empire units came standard with the Satin Clear Anodized Aluminum. Models numbers added a G for the Gold Finish.

### 498 & 488

The first suspension based Empires. The 498 retained the heavier Platter that the previous models were known for. Basically a suspended 398.

### 598

The 598 added Auto-Lift, built in strobe and the 990 Arm.

## Hole (Filling) Dimensions

**Arm Hole Diameter-** Use a 7/8" plug.

**Arm Attachment Holes-** To fill holes use.

#6 Stainless Screw- .

#6 Washer or LK Washer

#6 Nut

**Arm Rest Hole Diameter-** To fill hole.

#8 Stainless Screw

#8 Washer or LK Washer

#8 Nut

## Empire Turntable Specifications – 208

### Weight

Mat	0.44#
Motor	1.84#
Motor Cover	0.70#
Platter	5.78#
Plinth	5.30#
Tone Arm	1.14#
Wood Base	3.30#

**45 Adapter-** Install the small part of the spring upwards during reassembly. To Play 45's twist the spindle clockwise, to retract, push down and turn counterclockwise.

### Motor

#### Pabst Brand

105-125 VAC 60 Cycles Only.

Hysteresis Synchronous. 4 Pole – Dynamically Balanced. The speed is linked to 60 Cycles not calibrated for European 50 Cycle use.

### Parts

#### Parts Specs.

Belt – (Empire A124)

Bulb NE-51

Capacitor 05–600V

(3) Motor Mount Holes	.750"		
(3) Lower Bearing Screws	#8-32	5/8"	Length
(2) Plinth Screws On/Off	#6-32	1/4"	Length
(2) Plinth Screws AC Cable	#6-32	5/16"	Length
(1) Plinth Screw Capacitor	#6-32	5/16"	Length
(4) Plinth to Base Screws	#10-32	1-1/2"	Length
(3) Tone Arm Screws	#6-32	3/4"	Length
(1) Knurled Adjust. Knob	#10-32		

### Spindle

Note that the Empire Spindle is a bit larger than most turntables. Empire's measure about .283" to .284".

This picture shows the stock feet from Empire and the Optional larger feet. The stock feet are the smaller ones. The optional feet were available for \$2.50 as an accessory kit. PN SM/208.



### **Belt Size**

This is standard for these units, but listed for additional information you may need for other turntables.

#### **Measure the belt's dimensions.**

Pinch both ends of the belt.

Measure its length in inches and multiply by two.

Measure the Belt width.

If the turntable uses a Round or Square belt, measure its thickness.

#### **If your table does not have a belt-**

Use a piece of string to tightly follow the belt's path.

Measure the length of the string in inches.

Measure the distance between the rims of the motor drive gear for width.

## Products Mentioned- Safety & Info Links

**Duro Aluminum Jelly Brightener and Cleaner-** Loctite Corporation.

**Minwax-** (Wood Finishes)

<http://www.minwax.com/>

**PPG-** (Pro Finish Clear Coat).

DX-533 Cleaner

DX-501 Conditioner

DAU-75 Clear Coat

Harder (2nd Part) for Clear

**Quiet Coat** (Damping)

QC-118

<http://www.quietcoat.com/>

**See Also-** (Damping)

Dow Corning 3110 or General Electric RTV11.

**Rustoleum-** (Budget Clear Coat).

Crystal Clear

**Link to Household Products Database.** This will give you some insight into what chemicals are in a given product.

<http://www.householdproducts.nlm.nih.gov>

Products are Trademarks of their respective companies. We do not specifically endorse any certain product and urge you to determine suitability of any product for your particular application.



## New Motor Grommet Installation

1. Prep the turntable. Remove Head Shell with Cartridge. Tape or secure the Tone Arm.
2. Remove the Motor Cover, Belt and Platter.
3. Wad up some paper towel and stuff it in the lower bearing to prevent oil from dripping onto your work surface. Or you can just remove the lower bearing.
4. Remove the Motor Speed Adjustment Knob, loosen but do not remove the other (2) Motor Screws. Place unit on its side and remove the (2) screws while holding the motor from flopping down. Remove the Motor Adjustment spring.



5. Place the unit right side up and remove the old grommets. Remove the Spacers from the screws if the Spacers did not come off when you removed the Screws. If the Spacers are stuck to the Screws, hold the Spacers with a pair of pliers while backing the screw out with a large thick screw driver.



6. Prepare the new Grommets by pushing the Ferrule until fully seated at the lowest level possible.

7. Insert the new Grommets. Bend sideways and push one edge in. Using your finger nail or a blunt object, push the bottom rim of the Grommet under the plinth to properly seat them. (Add some Lithium Grease to the swivel area on the Motor Bracket).



8. Turn the unit on its side again. Insert the (2) screws and replace the Spacers. Replace the Motor Spring and position the Motor with the adjustment screw thru the front Grommet. Replace the Adjustment Nut. Screw the (2) screws into the screw holes on the Motor Frame.
9. If all the oil has drained from the lower bearing, replace  $\frac{1}{2}$  teaspoon using a "3 in 1" Type oil.
10. Replace Platter, Belt, etc.
11. Adjust speed as necessary.
12. You should now have a more precise Motor Speed and improved Motor Isolation.



Estimated Installation Time is about an hour. Take your time and prep to eliminate any damage to the unit during this process. Pay particular attention to securing the Motor to prevent any damage to your wiring.

## Plinth to Wood Base Kit



### **We offer this kit to add mass to the Plinth to Wood Base Connection.**

The idea is that to eliminate ping and resonance, the denser the material the better. The Brass or Copper Washers allow a tight fit for the nuts to secure the Plinth. The rubber washers allow the Plinth to be “Isolated” without the resonance of the later 498 and such suspension units.

The stock hardware was just steel or whatever they used. Very prone to rust and/or oxidation. The attaching wing nuts were thin steel. This is a major upgrade to what came with the original unit.

I was amazed at the sound difference with the new Grommets and this Mount Kit. These 2 modifications did make a big difference.

## Empire 980

Stereo wired pick-up arm with low fundamental resonance, exact cartridge positioning, height adjustment, a 5-wire circuit to avoid ground loops, maximum compliance and low inertia.



### Description

The new Empire 980 tone arm combines the two most sought after qualities in arm design, free suspension and perfect dynamic balance.

Perfect dynamic balance is achieved by placing the pivot points at the precise centre of the arms mass. Once in balance in one plane, it is balanced in all planes.

Even the application of stylus force does not upset this balance, for in the 980 the force is not adjusted by moving a counterweight, and thus shifting the centre of mass.

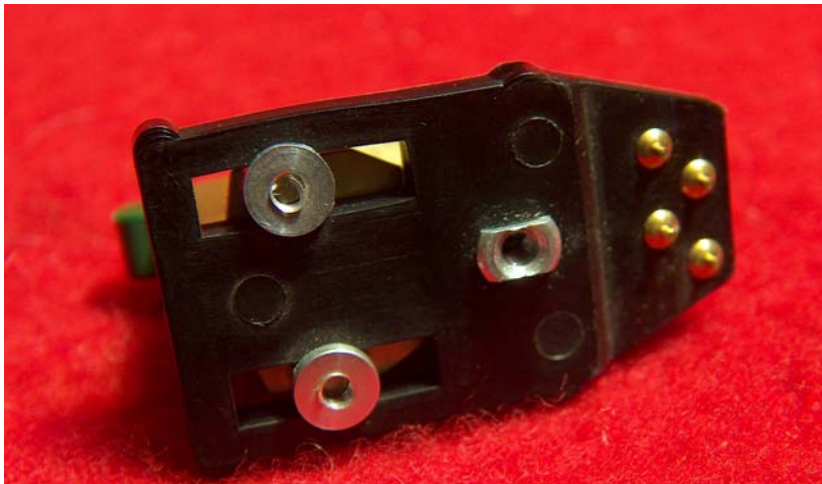
A linear torque coil spring acts directly on the pivot shaft at the centre of the arms mass and stylus force is dialed in with a calibrated knob.



**Empire 980 Arm**

Easily identified with the knurled mount screw on the head shell. The 98 arm did not have one.

**Removable cartridge mount with wiring.**



### **Tone Arm Connection Male**



The arm featured a 5<sup>th</sup> leg as a Tone Arm ground to help eliminate ground loops. The connections are off set so the cable is orientated properly.

### **Tone Arm Cable Connection Female**



## Empire 298 Troubador

Belt-driven, 3-speed transcription turntable with cast aluminum platter and manual speed change



### Description

The Empire 298 turntable, record playback system is an outstanding example of the precision engineering design and workmanship to be found in modern stereophonic high fidelity components. The handsome and functional design of the Troubador system will enhance any room, blend in with decor and match the appearance of the other components in your system. You can connect the Troubador system as easily as plugging in a lamp cord. We are happy to have you join the rapidly growing family of Audio Empire product users. We are sure you will enjoy many hours of listening pleasure.



## **Supplements-**

- 1.) 298 Manual
- 2.) 290 Tone Arm Manual