GOLD PLATING SERVICES
Turning Your World To Gold

Plating with Precious Metals

The Jewel Master HD Series *Gold Plating System*

Bench top Gold plating as easy as 1,2,3

A Guide for Plating with Gold and/or Rhodium

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Welcome

Congratulations on purchasing your *Jewel Master HD Series* bench-top plating system. With the *Jewel Master HD Series* you will be able to easily set-up and perform many important plating operations that were not feasible with any other plating system. The *Jewel Master HD Series* was designed to meet exacting specifications to allow professional plating results with a self contained, easy-to-use system.

First Step:
You should read the safety section of this manual, including the Safety Data Sheets.

Second Step:
We recommend that you read this manual to learn about the features and components of the *Jewel Master HD Series*. After you have familiarized yourself with the plating process using your new system, you should plate the sample pieces included with your Quick Start Guide to see how simple bench-top plating can be.

About the Jewel Master HD Series

The Jewel Master HD Series bench top electroplating system is the latest member of an extended family of portable and bench top gold plating systems. For nearly twenty five years Gold Plating Services has been making electroplating technology accessible to the non-technical user.

The Jewel Master HD Series is the culmination of years of development and refinement based on the needs and feedback from those that have a serious need for a small bench top electroplating system that can truly produce professional results.

We increased the power and plating capacity.

With the HD version you have to power to gold plate up to 50 square inches of area.

You have added power and control for the electro-cleaning and activation processes.

With the HD version you have the power and control to maximize the effectiveness of the electro-cleaning and activation pretreatment steps.

We made it easier to plate with a wider range of solutions.

We have standard packages for plating with Rhodium, Nickel, Copper, was well as plating with gold onto most stainless steel items.

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Safety

The person using the *Jewel Master HD Series* should read this safety section completely before beginning operation of the *Jewel Master HD Series*. The user should review and understand the Safety Data Sheets (SDS) for all the products being used prior to using the *Jewel Master HD Series* plating system. The "SDS" sheets should be kept in a location that will make them readily accessible in the event of accidental exposure or spillage of the product.

Using your Jewel Master Pro Series safely depends on following a few simple safety rules. While we have taken extensive measures to protect the user, there are several common sense rules that are important to follow in using your Jewel Master HD Series Plating system:

Personal Protection

The first safety consideration is the use of proper personal protection equipment such as a face shield, safety goggles or safety glasses. Whichever you choose, it is imperative that the solution is prevented from getting into the eyes. Should this happen, the eyes should be flushed with water and medical attention received as indicated on the Safety Data Sheet for the product that caused the exposure. We recommend the use of rubber or latex gloves to prevent contact of the solutions with the skin. It is also advisable to use chemical resistant sleeves and an apron to protect clothing since it is possible that some of the solutions may damage clothing. Certain processes such as electro-cleaning and activation as well as some plating operations may produce corrosive vapors that could irritate the eyes, nose, throat, and skin. **Use of the *Jewel Master HD Series* should be done in a well-ventilated area.** The use of a fan to disperse vapors can reduce the risk of excessive exposure to corrosive vapors.

Handling Chemicals Safely

The chemicals you will be using with your *Jewel Master HD Series* plating system are serious electroplating solutions that could provide a significant risk to personal health and safety. The solutions may be either a corrosive or toxic liquid or in some cases, both. Improper use of the solutions provided with your *Jewel Master HD Series* could lead to serious injury or death. Any of the solutions provided may be harmful or fatal if swallowed and could cause serious chemical burns to exposed skin. These solutions are intended for professional use, only to be used by responsible, trained adults. The person using the *Jewel Master HD Series* should read this safety section completely before beginning operation of the *Jewel Master HD Series*. This Safety section includes the Safety Data Sheets, (SDS) for the chemicals that come with the system. These sheets will inform you of many important aspects of the chemicals that you will be using.

Chemical Storage Safety

The chemicals provided with your *Jewel Master HD Series* plating system and the rinse water generated by using the *Jewel Master HD Series* must be properly stored in a secure, cool location that is not accessible to children or other un-authorized persons. **Never store any of these solutions in un-marked containers or in any container that could lead to improper use or disposal of the solutions or rinse water.** The rinse water produced by the plating operation may be considered a hazardous material that must be collected, stored and disposed of in accordance with all local, state and federal laws. If you are unsure of the applicable laws you can check with the local water reclamation district (sanitary sewer district), local or state environmental health and the federal Environmental Protection Agency.

Electrical Hazard

In the event the *Jewel Master HD Series* plating console fails to operate as indicated in this manual, call Gold Plating Services for recommendations on how to proceed. **Do not open the power supply or plating console, there are not any user serviceable components inside and opening the unit will revoke the warranty.**

Make sure the power supply is connected to a properly grounded outlet. If the *Jewel Master HD Series* is going to be used near fixed plumbing we recommend that the outlet be "Ground Fault Protected". The actual pretreatment and plating voltages are normally very low, usually less than 12 Volts Direct Current. The heater is electrically isolated and should not produce an electrical shock hazard under normal operating conditions. **Never immerse the power supply or plating console in water. Immersion of either of these units could damage the electrical components and void the warranty.** The AC power input cords should be maintained in good condition. The cord to the control can be replaced with any "computer style" cord if damaged. Should the white heater cord attached to the plating console become damaged, return the plating console to Gold Plating Services for replacement. When returning the plating console for repairs do not send any chemicals, busses, anodes, plating cells or beakers unless directed to do so by a representative of Gold Plating Services Technical Department, (see obtaining service in the warranty section).

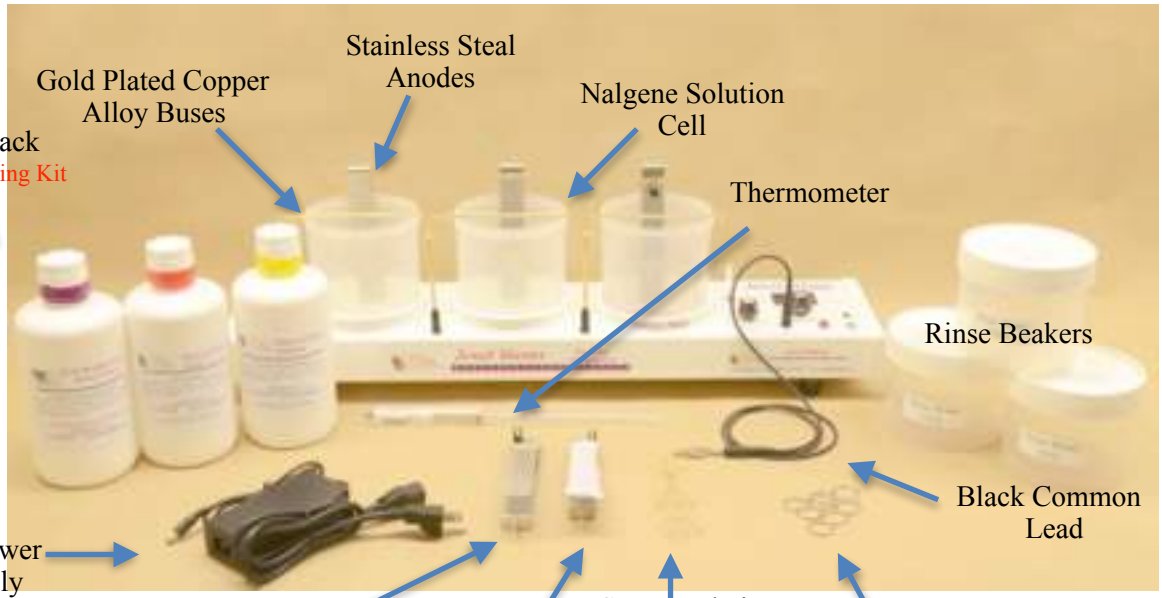
Storage of Chemicals When Not In Use

One of the most beneficial features of the *Jewel Master HD Series* is the ease with which it can be put away for short or long term storage when not in use. If you expect to use your *Jewel Master HD Series* within the next week or two then you should just make sure the lids on the plating cells are fairly tight. If you expect to be storing your *Jewel Master HD Series* for a longer period of time we recommend that the solutions be returned to the original containers.

Safety Data Sheets

The Safety Data Sheets (SDS) for the solutions provided with your system are supplied as an appendix to this manual. If you order other chemical products, be sure to ask for the appropriate SDS. You should keep the SDS information for the chemicals you use in a location that is readily accessible to the user of the *Jewel Master HD Series*.

Jewel Master HD Series Components



What to Expect in your Jewel Master HD Series Kit

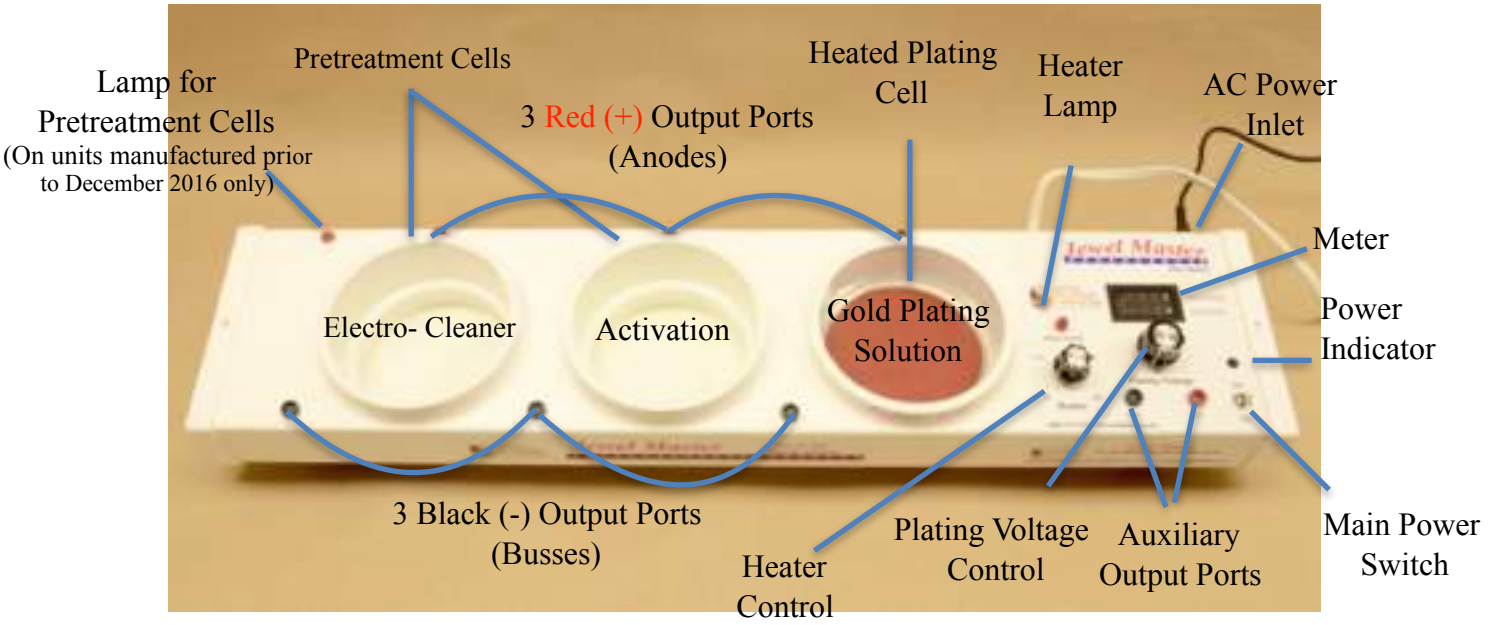
- ✓ *Jewel Master HD Series* plating console with three micro-controlled powered anode stations and ***Perfect Temp*** heating system for plating solutions.
- ✓ 10 Ampere AC Power Supply
- ✓ Easy Anode System **for gold** plating only kits will include 2 - Type 316 Stainless Steel Anodes and 1 - Type 316 Stainless Steel Anode with a Thermometer clip (For Plating Solution)
- ✓ Easy Anode system **for Rhodium** will include 2 - Type 316 Stainless Steel Anodes and 1 - Type 316 Stainless Steel Anode with a Thermometer clip (For Plating Solution) and 1 Platinum Plated Titanium Anode with a thermometer clip (For Plating with Rhodium)
- ✓ Easy Anode system for Woods Nickel Strike or Bright Nickel Plating will include a Bagged Nickel Anode Not included in Standard Gold package
- ✓ 3 - Titanium Busses (Older versions have gold plated brass busses)
- ✓ Black Common Lead
- ✓ 3 - 32oz Nalgene Solution Cells with re-closable lids. (4 with Rhodium kit.)
- ✓ 3 - 32oz Rinse Beakers with re-closable lids. (4 with Rhodium kit)
- ✓ Lab Thermometer.
- ✓ Sample Gold Plated Rack
- ✓ Sample Pieces to Plate
- ✓ Standard Gold Chemical pack includes: Electro-Cleaner, Surface Activator, 24 K Bright Gold Solution
- ✓ Chemical Packages for Brilliant Rhodium Plating Solution, Bright Nickel Plate and/or Woods Nickel Strike are available for purchase.

Gold Plating Package, Chemicals include:
Electro-Cleaner, Surface Activator, and 24K Bright Gold Solution

The Bright Gold and Rhodium Plating Package, Chemicals include: Electro-Cleaner, Surface Activator, 24K Bright Gold Solution, and Rhodium Solution. With a Platinum Titanium Anode.

Additional Chemicals Available:
Our Bright Nickel and/or Woods Nickel Strike With a Bagged Nickel Anode.

Overview of the *Jewel Master HD Series* Console



- ✓ Pretreatment Cells- Electro-cleaner & Activation
- ✓ Heated Plating Cell
- ✓ 3 Red (+) Output Ports (Anodes)
- ✓ 3 Black (-) Output Ports (Busses)
- ✓ Heater Control
- ✓ Heater Lamp
- ✓ Main Power Switch
- ✓ Red Power Indicator
- ✓ Plating Voltage Control
- ✓ Meter - Shows the plating voltage and current amperage
- ✓ 1 Red (+)Auxiliary Output Port
- ✓ 1 Black (-) Auxiliary Output Port
- ✓ AC Power Inlet
- ✓ Red LED lamp for Pretreatment Cells (Top left side of console) *Machines manufactured after December 2016 will not have this lamp.
- ✓ Heat Sink (Located on the Bottom Right of console.) *Caution- Can Heat up to 250 F Degrees. Allow adequate ventilation. Do not place on towel or other flammable surface.

Setting Up

What You Will Need To Begin

In addition to the components supplied with your *Jewel Master HD Series* plating system you may need a few other supplies before you start.

- ✓ Personal safety equipment such as rubber gloves, eye protection etc.
- ✓ Distilled water (available at most grocery stores)

Note: If you use non-distilled water, there may be metallic contaminates that could contaminate or effect the performance of the pretreatment or plating solutions.

- ✓ Paper towels
- ✓ Metal Polish such as Mother's Mag & Aluminum Polish
- ✓ Mild dish washing liquid for cleaning parts prior to electro-cleaning
- ✓ Magic Marker or felt tip marking pen

Choosing a Location to Work

You should choose a well-lighted, ventilated area to set up your *Jewel Master HD Series*. An un-congested workbench with ready access to AC power is preferable to running extension cords. While the *Jewel Master HD Series* can be moved with relative ease it is best to set up where you won't have to move it.

Connecting the Power Supply to the AC Power Source

Plug the small output cord from the AC power supply into the round power inlet connector on the left rear of the plating console. Next, plug the heater cord, (white AC cord), and the AC input cord from the power supply into an appropriate AC power outlet. The power supply requires a maximum of 250 Watts and the solution heater uses up to 35 Watts. Then flip the power switch to the "ON" position and make sure the red power indicator is illuminated.

Rotating the plating voltage control knob clockwise will increase the output voltage to the plating cell. The full range of output voltage should be between 0 VDC and 12 VDC when there is no plating load. The red LED on the left end of the console indicates that power is supplied to the two pretreatment cells.

Note: Machines manufactured after December 2016 will not have a Red LED on Left side of Carcass. The RED LED on the right side will indicate all cells.

Connecting the Heater to the AC Power Source

VERY IMPORTANT: The heating element, supplied by the white heater cord, must be connected to 120 Volts AC only! When working in an area with supply voltage higher than 120 Volts, an adaptor must be used that provides the proper voltage to the heater, (120 VAC only). Connecting the white heater cord to voltage higher than 120 Volts will result in **PERMANENT** damage to the heating element; this is a very expensive repair and is not covered by the warranty.

Filling the Plating Cells

Remove the caps from the plating cells and position them in the plating console. Carefully pour the electro-clean, surface activator, and appropriate plating solution into the cells as shown below.

*When used, rhodium solution should be placed in the plating solution cell.

For best results, the solution should be maintained to a level at the ring on the cell just below the cap screws. Over time, the heated plating solution will evaporate and should be replenished with **pure distilled water**. Once you have used a beaker or lid for any solution, it is best not to use it for another type of solution unless it is thoroughly cleaned with hot soapy water and then rinsed.

*We recommend that you mark the lid and beaker with a black magic marker to indicate the solution in the beaker. Additional beakers can be purchased for a small charge from Gold Plating Services.

Setting up Rinse Water

The other three beakers provided can be set up as your rinse water. **The rinse water must be free of any dirt, oil or anything else that could contaminate an expensive plating solution.** You will need one rinse beaker set immediately in front of each solution cell. These rinse beakers should be filled with "distilled water", the distilled water available at any grocery store will do. For higher volume plating you may want to set up an additional "rough" rinse beaker which would be the first rinse beaker you use after electro-cleaning, activation or plating. This rough rinse beaker will remove the bulk of the pre-treatment or plating solution. After rinsing in the rough rinse beaker then you should rinse in the distilled beaker before putting the part into the next solution. The rough rinse water should be the only water that will become contaminated. **It should be changed out when it becomes visibly contaminated with the solutions.**

Remember, this contaminated rinse water must be disposed of according to local, state and federal regulations. We can refer an excellent nation wide disposal company if you need help finding one in your area.

The distilled water is your final barrier to contamination of the plating solutions. Make sure it is clean and maintained as indicated in the "Rinse Cycle" section of "The Plating Operation" heading.

Installation of Anodes

One of the best features of the *Jewel Master HD Series* plating system is the Easy Anode system of attaching and electrifying the process anodes. It is a very simple matter to plug the anode into the red output port behind each of the cells. The anode with the thermometer clip will be placed in the red output port behind the plating cell.

Note: Before immersing the anode into the solution you should make sure the anode is clean and free of any dirt or other material; you can do this by rinsing the anode under clear running water. The anode that will go into the plating solution should also be rinsed in distilled water prior to being put into place.

***The electro-clean, surface activator and plating anodes must be in place for all of the processes.**

Special Anodes are Required for Some Solutions

The rhodium solution requires a platinized titanium anode. This anode looks very different than the stainless steel anodes. It is expanded metal with diamond shaped openings penetrating the material. *The bright nickel or woods nickel strike* required a bagged nickel Anode. See picture to the next page.

Once you have used an anode for any solution, it is best not to use it for another type of solution unless it is thoroughly cleaned with hot soapy water and then rinsed. We recommend that you mark an anode with the process you intend to use it for using a black magic marker on the vertical back of the anode just above the banana plug ledge.

Bagged Nickel Anode

Platinum Titanium Anode

Installation of Gold Plated Alloy Buss Bars – "Busses"

The titanium buss bars are a key component of the *Jewel Master HD Series* plating system. These "Busses" will not only hold your work for you but they will also provide the proper electrical charge. The busses are plugged into the black jacks in the front of the cells as shown below.
* Older versions of the Jewelmaster had gold plated bus bars.

It is important to keep these buss bars clean so that electrical contact can be maintained between the buss bar and the rack. There may be times when you won't use the buss bars; you may want to simply hold the work in the common lead with the alligator clip. In this event, you can plug your common lead into any of the black (-) output ports on the front of the plating console.

*Remove buss bars and clean with damp cloth after plating to prevent corrosion.

Installing the thermometer in the Heated Solution Plating Cell

The thermometer is to be mounted to the stainless steel, platinized titanium, or bagged nickel anode with the thermometer clip attached to it. By sliding it down through the black plastic clip as shown in the picture to the right.

Ready To Plate

This is how your *Jewel Master HD Series* should look when you are ready to plate with Gold.

Heating your Plating Solutions / Temperature Control

The *Jewel Master HD Series* plating console has a heating element under the plating cell. It is important that spilled solutions be removed from the heater cell with a paper towel or rag. **When cleaning the heating element surface, don't use excessive amounts of liquid cleaners or any abrasive cleaners**.

Under normal operation, the "High" setting on the heater control will keep the plating solution between 120° F and 130° F. This temperature is appropriate for rhodium or decorative nickel. Rotating the heater control knob to the "Low" setting will keep the plating solution between 95° F and 105° F. This temperature is correct for the 24K Hard acid gold. Variations in conditions can affect the actual solution temperature. If improper temperature is suspected, you may want to monitor the temperature using the supplied glass lab thermometer.

Because the ***Perfect Temp*** system is intended only to maintain proper solution temperature it will not quickly heat the solutions to operating temperature. **It can take up to 1 hour to raise the rhodium plating solution temperature from room temperature to 120° F.** Excessive solution warm-up periods can be avoided in several ways.

1. The opened container of solution can be heated in a microwave oven for 1 to 2 minutes. This will quickly bring the gold, rhodium or nickel up to operating temperature. The plating console heater will maintain it from there. **We do not suggest that any of the plating solutions be placed in a microwave that may be used for the preparation of food.** Remember the solutions are either corrosive or harmful and sometimes both.

2. The beaker with a lightly secured lid can be placed in a pan of shallow hot water. The pan of hot water can then be placed on a warm hot plate or stove to warm the solution.

3. The solution can be heated in a glass beaker directly on a hot plate or stove and then transferred to the plating cell.

Under no circumstances should the Nalgene-plating cell be placed directly onto any heat source such as a hot plate or stove that is more than 350°F. This could result in melting the beaker and releasing the solution. Never leave the *Jewel Master HD Series* plating console un-attended for long periods of time with the heating element in the "ON" position. Doing so could result in the evaporation of all of the plating solution, damage to the beaker and possible damage to the heating element.

The Plating Operation

What metals can be plated with the Jewel Master?

There are only a few commonly plated metals that can't easily be plated onto with the *Jewel Master HD Series* plating system. We will list the most common "Problem" metals along with those that can most easily be plated onto. If you want to plate onto a surface that is not listed in the table below or need father explanation on what else is needed to plate please feel free to call our technical support line. (801) 546-6200

Base Metal To Plate Onto	Easily Plated With *The Jewel Master HD Series*
Gold – all alloys	Yes
Silver plate and solid silver alloys	Yes
Copper Alloys (Brass, Bronze, etc.)	Yes
Nickel and nickel plate	Yes
Anything Chrome Plated	Yes – strip chrome first*
Pewter	Yes- Should be nickel plated first*
Iron alloys including steel	Yes - Requires copper & nickel pre-plate*
Stainless Steel	Yes - Needs wood's nickel strike*
Aluminum	No – Requires nickel under plate
Zinc	Yes - Must pre-plate with alkaline copper*
Tin Plated Items	Yes - Must strip the tin or use alkaline copper underplate*

*Requires solutions not included in the standard chemical packs. They can be order online at http: www.gold-plating.com or by calling the Technical Support line at (801) 546-6200

*For more information on how to plate these items with more detail and explanation feel free to call our Technical Support Line.

Preparation of Surface to be Plated

There have been entire books written on the polishing, finishing, and preparation of metal for plating. We have several technical data sheets available for specific types of metals. To keep this user's guide more general we want to stress the most important aspects of surface preparation. Should you have specific requirements or questions we encourage you to contact our technical support department. There are two very important steps for preparation of work in any electroplating operation.

The **first step** is pre-finishing. Pre-finishing involves preparation of the surface prior to the plating process and normally includes some form of polishing. The pre-finishing or polishing process determines the quality of the finished plate. For many plating applications that would likely be done with the *Jewel Master HD Series*, this pre-treatment will probably involve some form of abrasive polishing.

The **second step** for preparation of work to be plated is to insure that after the surface has been polished to the desired luster and quality of finish, the surface must be made accessible to the plating process solutions. What this means is that the surface is absolutely clean, completely free from grease, oil or dirt and free from corrosion, significant oxides or any other surface film. This crucially important step can be a little tricky because many of the methods of polishing can actually leave trace deposits that can seriously affect one or more of the plating processes.

In summary;

1. The finish of the pre-plated part should have the luster and brightness that you will be expecting in the final finish.

2. The part must be absolutely clean before you can begin the plating process.

Checking Initial Set-up and Solution Temperatures

When you have the parts polished, cleaned, and on the rack you are just about ready to plate. Now is the time to see that the plating solution is the correct temperature. The proper temperature for each plating solution is noted on the technical data sheet and the solution container. If you are plating with 24K bright gold, the heater should be on the "Low" position and the beaker will be barely warm, 95°F. to 100°F. If you are plating with 24K pure gold solution, 24K bright eco-gold solution, rhodium or decorative Nickel, the heater control knob should be in the "High" position and the beaker will feel warm 115°F. to 125°F.

Initial Voltage Settings

Your *Jewel Master HD Series* is supplied with a voltage controlled power supply. This power supply is electronically protected against short circuits and produces direct current. The process current density is controlled by the voltage applied so proper voltage is required to insure that the plating is consistent. Adjust the plating voltage output control knob so that the initial plating voltage is set to around 4.0 volts. This initial plating voltage is a good starting point. After the item being plated has been immersed in the solution the voltage can be set to the final voltage/current required.

Pretreatment Cells

The plating voltage control knob controls the voltage for all 3 cells and the auxiliary output plating ports. The voltage to be used for the two pretreatment cells is suggested to start at 7 Volts to provide the correct current density for the electro-cleaning and activation processes.

Racking Your Parts

With your *Jewel Master HD Series* you received a sample rack that is made of copper wire and then gold plated to insure that the copper making contact with the gold plated buss bars doesn't corrode causing interruption of the current during the pretreatment or plating process. The racks are usually made specifically for the parts you will be plating. You can fabricate the racks yourself or have our technical staff make them up for a nominal charge.

Electro-Cleaning

Electro-cleaning is the final cleaning to make sure the surface does not have any contamination that can cause water breaks or beading of the water. If this happens, there may be some oil, film or something on the surface that will prevent the part from being properly plated. After electro-cleaning when the part is pulled from the rinse water, the rinse water should sheet off the part evenly without any areas where the water beads up or forms break lines (hydrophobic surface areas). The entire surface must be hydrophilic, "wet out", so the electroplating steps will properly treat the surface of the part.

* There is an explanation below that will describe what "wet out" means if you are not sure.

Immerse the part into the electro-cleaning cell with the rack sitting on the buss bar. With the pretreatment voltage set at 7 (Suggested Starting Voltage), at this a level that should results in a light to medium amount of gassing (bubbles being formed and releasing) at the surface of the work. Once the gassing begins you will want to leave the rack or part in the electro-cleaner for 20 to 30 seconds. This should be sufficient as a final cleaning on a surface that has been properly pre-cleaned.

The Rinse Cycle

Remove the part from the electro-cleaning beaker and dip into the rinse beaker with distilled water you prepared earlier. Swish it around for 5 to 10 seconds to allow the electro-cleaner solution to be rinsed off. Pull it from the rinse beaker and hold it in the light so you can visually inspect the surface. This is where you will be able to detect any surface film or other surface condition that could negatively affect the plating process.

*If the part is properly cleaned, the water will sheet off evenly without any "Water Breaks". A water break occurs when the water beads off or dries from the surface in a given area more quickly than an adjacent area. A water break is an indication that there is something left on the surface of the part. **If you proceed with the plating after noting a water break, you will more than likely be able to detect a cloud or line in the final plating.** If there is a water break, you need to re-clean the part until there are no water breaks.

Surface Activation or Acid Dip - See following section if plating stainless steel

After you have determined that the surface is clean and the water sheets off evenly, dip the rack/part into the surface activator solution with the rack making contact with the gold plated buss bar. The surface activation voltage should remain at 7 volts prior to dipping the item into the solution. There should be light to medium amount of gassing (bubbles being formed and releasing) at the surface of the work. Once the gassing begins you will want to leave the rack or part in the surface activator solution for 20 seconds. This will neutralize any remaining electro-clean solution that may be on the part. In the case of plating onto nickel or copper, activation will also reduce or remove any fine oxides that could affect adhesion of the final plate. You will now repeat the rinse cycle.

Activation When Plating Stainless Steel

Plating onto stainless steel items is the same up to this point. The primary difference is in the activation of the work. For stainless steel items you will activate the surface using wood's nickel strike in the middle plating cell for 20-30 seconds in place of the surface activator. The voltage during activation with the wood's nickel strike should also be set to 7 volts. When contact is made with the buss bar or when the part connected to the grounding clip is immersed in the solution there should be light to moderate gassing at the work surface. **Please note that a bagged nickel anode is required for the wood's nickel strike.**

Plating with Gold

Plain and Simple – Skip the technical jargon go to "Starting the Gold Plating Process" on page 18

The Jewel Master Pro Series system is a very powerful plating system that can produce professional plating results for the non-technical user. If you want to skip the technical jargon for now you can go directly to the Plating Voltage and Time Table on page 19. You can always revisit the technical aspects later if you are interested.

A little More Technical – Not required for most users

Electroplating is a process of electrochemically depositing a metal onto a conductive surface. For this guide we will cover the important aspects of plating with gold, however the same general principals apply to most metals that can be plated with the *Jewel Master HD Series.*

Solution Options - There are many different gold plating solutions available that can be used with the *Jewel Master HD Series* plating system. Gold Plating Services offers three different types of gold plating solution. Each type of gold plating solution has distinct working conditions and produces different gold plating results. For more information on the operational conditions and deposit properties of any gold plating solution you should contact the solution's supplier. They can provide the technical data sheet for the solution.

The Technical Data Sheet, (TDS), should provide information about the general use of the plating solution, the properties of the deposit produced, and the plating solution's specifications and operational requirements such as temperature, voltage, current density, anode material, etc.

Thickness of The Plating

Two questions that come to mind when gold plating are: How thick is the gold? & What is the cost? Since gold is sold by weight and thicker plating weighs more, the answer to the question of cost is directly related to the thickness of the gold plating. You can control the thickness of gold plating using this important principal:

The thickness of an electroplated deposit is a function of the current density, the plating time, and the solution's efficiency.

How thick you want your electro deposited finish varies greatly on the purpose of the plating and the cost allowance. The gold thickness of a typical decorative gold plate is between 7 to 20 micro-inches. The gold solution that comes with the *Jewel Master HD Series* Plating system will plate up to 100 micro-inches or 2.5 microns (millionths of a meter). This is much heavier than is required for most applications. Plating a hardened gold thicker than 100 micro-inches can result in surface tension that could be detrimental to the quality of the deposit.

With the *Jewel Master HD Series* set at 2.5-3 volts, the 24K bright gold solution will be deposited at the rate of 5-7 micro-inches per minute. Generally speaking 2-3 minutes will give a heavy decorative gold plate. If a gold plate heavier than 100 micro- inches is required, a special non hardened gold plating solution can be ordered that will allow thicker deposits.

Rhodium is much harder than gold and is typically plated much thinner. A quick rhodium flash applied to some jewelry items may be as thin as 2 micro-inches, (0.000002"). We believe that a rhodium deposit of 20 micro-inches, (0.00002"), can be considered substantial enough to warrant for the life of the jewelry item.

Voltage and Current Density

Current density is the amount of electrical current, (measured in amperes) that is flowing between the solution and work - per unit area of work surface. Current density may be measured in amperes per square foot or amperes per square decimeter. With the *Jewel Master HD Series* plating system we usually reflect current density in milliamperes per square inch. We use this scale because the parts being plated are usually small and the area in square inches is easy to estimate. For example a quarter has a total surface area of approximately 1.5 square inches. The current density is a function of various factors such as the applied voltage, solution conductivity, distance from solution electrode etc. Under normal conditions, with a given system such as your *Jewel Master HD Series*, **if the applied voltage is correct, the current density will self adjust** for the size of the piece. This means that at the proper voltage if you change the surface area being plated, the total current will change to maintain the proper current density.

To make the process as simple as possible, we have indicated normal plating voltages for the solutions that you will be using. These are a good starting point and the current density range is usually quite broad. As you begin plating you will soon learn what works best for you. We recommend you keep a plating journal with notes about your plating experience.

Voltage and Current Meter Readings and What They Mean

After your work items are in the solution and the rack is resting on the gold plated buss your need to re-set the voltage to the value indicated on the solution's TDS or in the table on page ??? The total current will be indicated below the voltage. If you are interested in the current density and you know the area of the surface in the solution you can easily calculate that value using this formula:

Total Current/Surface Area = Current Density
For small systems expressed as milliamperes/square inch or ma/in^2

Let's take the example of plating (4) quarters

Plating a rack of four (4) quarters in 24K Bright Eco-Gold at 1.5 volts
produces a Total Current of 175 ma

Area of each quarter = 1.5 $inches^2$ x 4 quarters = 6 $inches^2$
Now add 2 $inches^2$ for the area of the rack for a total of 8 $inches^2$ plated area.

170 ma/8 $inches^2$ = 21 ma / $inch^2$ (we'll round to 20 ma / $inch^2$)

Note: It's important to note that the 24K bright eco-gold in the above example is an extremely efficient solution that operates at a much lower current density when compared to our hardened 24K bright gold solution where the current density is normally 55 ma / $inch^2$.

Starting the Gold Plating Process

At this point the item(s) you want to plate has been polished, cleaned, and activated and is hanging in the rack ready to plate. The plating voltage has been set to the recommend "initial voltage" and the solution temperature is within the recommended range.

How Long Does the Item Need to be Plated?

The amount of time you leave the work in the plating solution will depend on how thick you want the deposit. Below is a table that will give you a rough guide of the voltage required and how long to plate to achieve an approximate thickness. For the more technically oriented users our technical support staff can send an excel spreadsheet set up as a plating calculator for most of the solutions we sell. We can e-mail this file if you will call and request the plating calculator for your solutions.

Plating Voltage & Time Table

Plating Solution	Voltage	Deposit Rate Millionths of an inch/minute	Time For Normal Plate*
24K Bright Gold - 95°F. to 100°F	2-3	5-7	2 minutes
24K Bright Eco-Gold 115°F to 125°F	1.5	6	2 minutes
Rhodium - Room Temp	1-3	5	30 seconds
Silver – Room Temp	3-4	15	1 minute
Nickel - 115°F. to 125°F	2-4	30	2 minutes
Copper - Room Temp	1-2	25	2 minutes

*Normal plate for usual decorative applications

My Gold has a Dark or Dull Appearance? What Does This Mean?

If your gold has a dark or dull appearance this usually means that the gold has been burned. This is usually a result of having your voltage to high.

Can Burned Gold be Fixed?

Yes, it is easy to fix with a little baking soda (sodium bicarbonate) powder mixed with water into a paste. Brush the burned gold lightly with a toothbrush or soft cloth and the dark appearance will polish to a bright gold finish and then back the voltage down a little for your next item to be plated.

Did the Gold Adhere to My Item?

After you have plated and item you will want to easily check if the Gold adhered to the item. You Can do this by placing a piece of scotch tape onto the item and pulling it off. If no gold came off with the tape the gold has adhered to the item.

If the Gold came off onto the tape it did not adhere to the item correctly. You will want to buff off the item with a hand buffing cloth or buffing wheel. Then, carefully review/repeat the steps to make sure it adheres properly the next time. If you have any questions about this please feel free to call our Technical Support Line.

Post-Plating Treatment of Work

Typical post treatment of work plated with the *Jewel Master HD Series* is limited to careful rinsing and application of a carnauba-based polish or wax in some cases. Gold has a tendency to water spot quite easily so the application of a wax may help prevent spotting and fingerprints.

Plating with Rhodium

(Follow instruction on the label for best results)

Rhodium is a hard, white precious metal in the platinum family that is commonly used for plating onto jewelry or specialty technical applications*. Rhodium plate has a color similar to silver but, unlike silver, rhodium plate will never corrode under most normal conditions. With a density similar to lead, rhodium is hard, with a hardness about like chromium. Rhodium produces a deposit that is among the most chemically inert metals that are normally used for electroplating. Because of its hardness a normal decorative application is usually much thinner than gold. A normal decorative deposit of rhodium is usually 4-6 millionths of an inch, (0.1 – 0.15 microns).

*An important note of caution regarding plating with Rhodium:
Plating with rhodium is a specialty craft and somewhat risky undertaking. This is because rhodium plating is very sensitive to surface conditions, activation, and contamination of the solution. Problems in adhesion, cloudiness or uniformity can occur especially when learning the specifics of plating onto a new material or surface. One risk of plating with rhodium is that if a problem with the plating occurs it can be extremely or sometimes impossible to repair. Most metal plating such as gold, nickel, or copper can easily be polished off or chemically stripped from the substrate if a there are problems with the plated deposit. This is not the case with rhodium. Rhodium is so hard that it cannot be polished off most substrates without damaging the underlying material. Furthermore, it is generally considered impossible to chemically strip rhodium without damaging or destroying the underlying material.

Our Recommendation: If you want to plate with rhodium you should "practice" on items of little or no value that are very similar to what you want to rhodium plate. Only when you have successfully and consistently plated onto your practice pieces should you move onto plating your intended or valuable item with rhodium. Under no circumstances you should not practice on any item that you're not willing to throw away if it is damaged. In the rhodium plating community there are many stories about someone who's first attempt at plating with rhodium was on some priceless heirloom or valuable jewelry only to have the piece essentially destroyed by a peeling or mottled rhodium plate. Don't join these ranks, it is extremely discouraging and may be expensive. If you have any questions about rhodium plating contact our technical support department for information or advice.

When You Have Finished Plating

Shutting down

When you have completed your plating you should turn the power switch off, unplug the wall adaptor & turn off and un-plug the heater. Then you should remove and rinse the anodes and buss bars. After the plating solution has cooled to near room temperature. Replace the beaker lids and clean any spilled solution with a damp cloth.

Storage of System

If you plan on using the *Jewel Master HD Series* again in the next few weeks, the beaker lids are adequate for storage. If you are planning on a long-term storage, one month or more we recommend that you replace the solutions to the original containers and rinse the plating beakers.

Care and Cleaning of the *Jewel Master HD Series*

Cleaning of the *Jewel Master HD Series* should be done with a damp cloth.

Proper Disposal of Rinse Water and Spent Solutions

Note: It is your responsibility to ensure compliance with all local, state, federal or any other government regulations regarding disposal of process wastewater or spent solutions.

Finding a Disposal Company

Since the vast majority of the rinse water produced by using the *Jewel Master HD Series* is simply water, proper and legal disposal is easy and inexpensive. These disposal companies are normally experts in the industry and are a great resource for disposal of process residue and spent solutions. You can find companies in the yellow pages. One nationwide company that we have recommended in the past is *PSC Environmental Services*; an internet search will give you their home page with locations available around the country.

Troubleshooting Guide

Following are a few common problems that may arise when using your *Jewel Master HD Series* plating system. If you are trying to solve a problem listed in the "Problem" column we suggest you try the suggested action working from top to bottom. Contact technical support if you are unable to resolve the problem using this table.

	Problem	Possible Cause	Suggested Action	User's Guide Page #
1	The Plating Control is "DEAD" The RED Power lamp above switch does not light when the switch is on. Also, the voltage meter is blank.	The power supply is not receiving power from the outlet.	Using a light or some other device confirm that the outlet has power and that the cord from the outlet to the power supply is firmly plugged into the outlet.	6
		The low voltage cord from the power supply is not connected to the console.	Make sure the Low Voltage cord from the power supply is plugged into the console.	6
		Power supply failure	Contact Technical support.	28
2	The Heater Control is "DEAD" The RED "Solution Heating" lamp above the Heater control knob switch does not light when the knob is rotated fully to the right, (clockwise). Also, the heater plate in the bottom of the plating cell does not get hot or warm even after being in the "Hot" position for several minutes.	The heater is not receiving power from the outlet.	Using a light or some other device confirm that the outlet has power. Make sure that the WHITE heater cord is firmly plugged into the outlet.	6
		Internal problem with the heater control or heater.	Contact Technical Support	28

3	Plating voltage jumps or fluctuates during plating.	Poor connection between the plating busses and the plating rack.	Using a polishing cloth or baking soda paste clean the contact area of the gold plated busses. Check to make sure the contact area of the plating rack is not dirty or corroded. Try connecting the common lead directly to the rack; this may resolve a problem caused by a bad Buss/Rack connection.	12
4	Gold plating is too dark or brown. We call this “Burning the gold” or “Burned Gold”.	Voltage is too high	Make sure the initial and plating voltage is correct for the solution you are using.	15
		Solution is too hot	Make sure the temperature is correct for the solution you are using.	10 & 13
5	Gold Plating is dull or not shiny.	Burned Gold	See #4 above	19
		Improper polishing of surface to be plated.	The gold plated surface should have the same luster and finish quality after gold plating. The gold plating will not improve the shininess of the surface.	14
6	Gold plating does not stick to my work.	Improper cleaning	Polish off all gold and try again after cleaning the surface properly.	14 & 19
		Improper activation	Polish off all gold and try again after activating the surface properly.	
		Wrong activation process for material being plated.	Confirm with process table.	14
			Contact Technical Support	28

The Optional Brush Plating Add-On Kit

Many projects require gold plating onto surfaces that are too large or for some other reason cannot be immersed into the one liter pre-treatment and plating cells on the Jewel Master. Other projects require "fine select" plating onto a surface where only a carefully defined area is to be gold plated. We solved this problem by creating the Jewel Master "Brush Plating Add-On Kit". This optional kit can allow you to perform brush plating onto appropriate and properly prepared surfaces that can't normally be plated by immersion in the Jewel Master.

Items that could be purchased in your brush add-on kit Includes:

✓Red Combination Handle with Red Lead
✓1/8" Conversion Stainless Steel Plating Bit
✓1/8" to 1/4" Conversion Stainless Steel Plating Bit
✓Sleeves (assortment of sizes)
✓Ultra Fine/Medium Select Plating Tips
✓24k Brush Gold Solution
✓Electro-cleaner Solution
✓Surface Activator Solution
✓Beaker Tray

Note: We can customize your add-on brush kit to fit your needs.

Brush Plating/Fine Select Plating Using *The Jewel Master HD Series*

Items for Brush/Fine Select Plating are sold separate

Brush Plating

Set-up and Brush Plate with 24K Gold

When brush plating, the handle holding the plating solution and the solution have a positive (+) electrical charge relative to the work. Generally speaking, the activation step indicated below is rarely required. If the surfaces to be plated are dirty or visibly corroded then you will need to polish and clean the surface to be plated. It is imperative that the surface is free of any corrosion.

1. Plug the combination handle and red lead into the red (+) output port located on the right hand side of the machine underneath the plating voltage controller. Then plug the black common lead with an alligator clip into the black (-) output port located on the right hand side of the machine underneath the plating voltage controller.

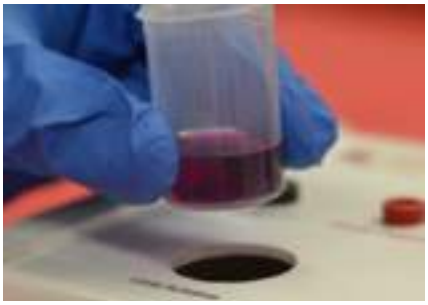
2. Plug the AC wall adaptor into a suitable outlet and insert the other end into the DC connecter located on the back of the *Jewel Master HD Series* Plating Kit.

3. Turn on the power switch and check to see that the red power indicator light is on.

4. Adjust the voltage control until the meter reads 4.0 voltage plating range.

- Too high of a voltage setting can cause the gold deposit to be dark brown and dull.
- Too low voltage will cause the gold to plate slowly.
- It is also **important** to keep the application sleeve or pen plating tip moving over the work during plating. **Stopping can "burn" the gold**. "Burned" is the commonly used term for a dark or dull gold deposit caused by too high plating voltage. If this happens, you can easily polish it out with a little baking soda mixed with water.

5. Dispense the solution you will be using into the working beaker. You should only fill the working beaker with a small amount of solution since having too much solution in the working beaker can cause you to waste the solution. Since the solutions tend to dry out more quickly in the working beakers, you should only dispense the amount of solution you will be using.



The normal level for the working beakers is about ½" Brush Gold Liquid

6. **You will need to pre-soak your working sleeves on the bit in the plating solution. (Do not remove plastic zip tie from bottom of the sleeve)** Before the sleeve/solution will be conductive, the working solution must have soaked through the sleeve to the stainless steel bit. **Make sure your sleeve is thoroughly soaked with distilled water prior to installing onto the stainless steel bit.** Pre-soaking the sleeve with distilled water is normally done by working the water into the sleeve by squeezing with your fingers while pouring distilled water over the sleeve. Pre-soaking will reduce the amount of time it takes for the solution to soak through a new dry sleeve.

   The first time the felt Pen Plating tips are used, they need to soak in the pen plating solution in the gold solution working beaker for at least 10 minutes prior to use. This will allow the gold solution time to soak up the tip and make contact with the handle. Once you have used a tip, you should pull it from the handle and allow it to dry out. Once a tip has been used it will soak up the solution and be ready to use almost immediately upon contact with the solution.

7. Slide the bit into the pre-soaked sleeve. (Do not remove plastic zip tie from sleeve) Install the bit into the application handle. Only about an inch of the bit will fit into the handle. Twist the red tightening screw snug; do not over tighten. Then place the end of the bit with the soaked sleeve into the working beaker with the solution.

Surface Preparation and Cleaning

There are two very important rules for preparation of work in any electroplating operation. The first is pre-finishing. Pre-finishing involves preparation of the surface prior to the plating process. The pre-finishing process determines the degree of quality of the finished plate.

The second rule for preparation of work to be plated is to ensure that once the surface has been polished to the desired luster and quality of finish, the surface is made accessible to the plating process solutions. What this means is that the surface is absolutely clean, completely free from grease, oil or dirt and free from significant oxides and any other surface film. This crucially important step can be a little tricky because many of the methods of polishing can actually leave trace deposits that can seriously affect one or more of the plating processes.

Before plating begins, the surface should be carefully inspected to make sure the water sheets off evenly and doesn't have any areas where the water beads up. If the water beads up in any area then the part must be cleaned again or electro-cleaned.

Generally, electro-cleaning is only performed when the part is exceptionally dirty or oily.

In summary:

1. The finish of the pre-plated part should have the luster and brightness that you will be expecting in the final finish.
2. The part must be absolutely clean before you can begin the plating process.
3. Brush plating with the sleeve and 24K Brush Gold Solution –The surface to be plated should be clean and free of grease dirt or other material that could prevent adhesion of the gold. If the parts are dirty or corroded after normal cleaning, the surface should be polished or cleaned to expose the clean substrate.

Note: Most clean bright surfaces can be plated without additional activation or pretreatment, however, some surfaces require special pretreatment or activation. These surfaces include stainless steel, chromium and old nickel finishes. Most copper alloy surfaces need to be shiny and bright and may benefit from activation or under plate. Some surfaces such as aluminum or zinc cannot be plated with this system without extensive under plating and or additional pretreatment that might not be able to be performed with this system. If you are having trouble plating onto a particular finish you should call Gold Plating Services' technical support for information on how to handle your specific case.

3. When you are setting up to plate you want to find an area that is comfortable with sufficient light. Most people like to have some local ventilation although there are not extensive fumes or vapors produced. You need to make electrical contact with the area you want to plate by attaching the alligator clip from the black common lead to it.

4. In this picture, we have clipped the pendant with the alligator clip from our black common lead. We will be brush plate this pendant with the 24K Brush Plating Gold Solution.

Note: If the area under the alligator clip is to be gold plated. You will need to reposition the clip in another spot during plating. A good technic is to move it about 3- 4 times in different locations on the item being plated during the plating process. This will allow a move even deposit of gold.

5. Plate the area with gold by lightly rubbing the gold sleeve over the surface in small circular motion with very light pressure. **Don't stop moving the sleeve or let it rest in one spot; this can cause the gold to form a dull brown deposit.** We call this burning. It is easy to fix burned gold but it is better if you don't have to.

6. When the gold becomes opaque it is approximately 3 micro-inches thick. After that point it is impossible to determine the thickness visually. To insure the most uniform thickness of around 10-12 micro-inches you should plate about 3 to 4 times as long as it took for the original opaque deposit.

   Example: Plating a Quarter
   Opaque 3 micro-inches thick = 10-15 seconds
   Opaque 10-12 micro-inches thick = 30-50 Seconds

   Note: The time it takes for the gold plating to appear opaque on an item being plated is determined by several different factors including the size, the material it is made of, the voltage used to plate, and the saturation of the sleeve.

7. When finished rinse off your gold piece so that no solution is left on it.

Fine Select Plating

Using the fine select plating tips will enable you to provide very detailed select plating. Gold Plating Services' brush plating solutions must have high metallic content. The high metal content also requires a higher concentration of the brighteners. In order to make sure that all of the components stay in solution, it is important to have the container warm (90 - 100 ° F or 38° C) prior to dispensing into the working beaker. Shake the warm solution and then dispense about ¼" of solution into the working beaker as indicated above.

The fine select felt tips come in two sizes, fine and medium. Begin by inserting the tip you want to use into the end of the application handle. The tip will fit tight and should push in about ¼".

After the tip is inserted into the application handle the tip must soak in the 24k Gold Brush Plating Solution until it is completely soaked through, normally 5-10 minutes for the first time used. Set the application handle into the gold solution working beaker.

When you pull the application handle out of the working beaker for use, let the excess solution drip off back into the working beaker. There is a lot of gold in that solution – don't waste it!

The fine tip will plate extremely high resolution such as the head of a quarter or a single finger on a printed circuit board as shown here. See picture to the Right.

With the quarter we are "grounding" the part by holding the quarter in the alligator clip on the common lead. For small areas such as a single finger of a printed circuit board, you can use a steel or copper probe to ground the surface to be plated.

Note: If the area under the probe is to be plated too; you will want to reposition it throughout the plating process.

The part you are going to selectively plate should be perfectly clean and polished to the brightness and luster you want in the final finish. For gold, you should adjust the output control between 4.5 - 6.0. The higher the voltage, the faster the gold will go on, however, with the voltage set higher in conjunction with the highly concentrated solution and small current area it is possible to burn the parts if you stop moving the tip over the part or if you apply excessive pressure. With a little bit of practice, you will soon learn the best voltage setting for your project. You should plate with as high of voltage as possible without burning. That point is determined by the size and shape of the part, how much you move the tip during plating and the temperature. **If you "burn" the gold, it will have a dark brown, dull appearance.** Don't worry; it is easy to fix with a little baking soda (sodium bicarbonate) powder mixed with water into a paste. Brush the burned gold lightly with a toothbrush or soft cloth and the dark appearance will polish to a bright gold finish and then back the voltage down a little.

When you are plating the part, don't apply too much pressure on the tip. Some people like to feel like they are rubbing the gold on and press to hard. Instead, think of using the tip to control the "puddle" of gold solution and continuously move the tip in circular motion over the part. When you are working up to an edge where you want the plating to stop, you can tip the work so the edge or line you are working to is higher than the tip, then it is very easy to control the puddle. When the gold just becomes opaque, the thickness is around 3 to 5 micro-inches. For a typical gold plate you should apply 4 to 5 times that much. With practice and a methodical approach it is easy to apply reasonably consistent plating with adequate thickness.

We suggest that you practice on items similar to the work you want to perform to get the feel of the plating process. If you have special questions or applications you aren't sure of feel free to call our toll free technical support line (800) 515-3131, or e-mail terry@goldplating.com .

Jewel Master HD Series Plating Kit

Limited Warranty

Gold Plating Services Inc., (Seller), warrants the *Jewel Master HD Series* Plating Kit internal components and external AC Wall Adaptor to be free from defects in material and workmanship for a period of one, (1), year from the date of purchase. If the internal components or the AC Wall Adaptor should prove defective in the material or workmanship Gold Plating Services, at its sole discretion, will repair or replace the defective item. Service under this warranty can only be obtained by receiving a warranty return authorization and then delivering or shipping the equipment with all shipping or delivery charges prepaid to:

Gold Plating Services
378 North Main #112
Layton, UT 84041

This warranty does not apply to any application handles, leads, power connectors, application bits, application sleeves or accessory components. This warranty does not apply to corrosion or shell damage caused by user failure to clean as required. This warranty does not apply to damage caused by accident, misuse, abuse, or neglect.

Gold Plating Services makes no express warranties, including any warranty of merchantability or fitness. This warranty expressly excludes all incidental and consequential damages. (Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitations or exclusions may not apply to you.) This warranty gives you specific rights and you may have other rights that vary from jurisdiction to jurisdiction.

Warning: The individual user should take care to determine prior to use whether this device is suitable, adequate and safe for the use intended. Since individual applications are subject to great variation, the manufacturer makes no representation or warranty as to the suitability or fitness of this equipment for any specific application except as explicitly described in the written material provided by Gold Plating Services Inc.

Technical Support

Call or Email for Free Technical Support
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