Great Lakes Spot Welder

Model 300 240-050

Great Lakes®
DENTAL TECHNOLOGIES

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6. **Specifications**

1. Setup

Remove the welder and accessories box from the shipping container. Optional accessories are also located in accessories box. The standard welder comes with:

1. AC cord
2. Foot pedal - MUST BE PLUGGED IN TO WELD
3. Electrode Allen key

Position the welder to allow convenient access to the spot welding hand rests.

- Plug the foot pedal into the 6-hole jack on the **back** of the unit.
- Plug the AC cord into the AC receptacle on the **back** of the welder and a protected AC outlet.
- The top spot welding electrode is positioned horizontally during shipment. Electrode adjustment is described in the Spot welding section.

NOTE: Standard laboratory safety glasses are recommended when welding.

2. Basic Controls

Figure 1 shows the front panel of the welder. The **Power** switch is used to turn power on and off. This switch is lighted to indicate that power is on.

Five levels of spot welding are selected using the **Spot Level** switch.

The red **Weld** light illuminates momentarily to show that a pulse of current has been released during spot welding.

The **locking lever** is depressed to keep the spot welding electrodes separated during heat treating. To lock open the **Swing arm**, fully depress the arm and press down the lock lever. Simply push the arm down again to release the arm.

3. Spot Welding

Spot welding (also called resistance welding) is used to permanently join two metal components. A weld is achieved by pinching the parts to be joined between copper electrodes and passing a short pulse of high current through the area to be joined. The electrical resistance of the metal causes the metal to heat and partially melt, which produces the weld. Multiple spot welds can be made between two pieces to create a permanent joint.

Most stainless steels (types 304, 18-8, and 316) and chrome-cobalt metals (Elgiloy™ and Duraloy™) can be spot welded since they are relatively poor conductors of electricity and heat significantly with high current. Metals that are better conductors such as aluminum, copper, silver, and gold do not spot weld very well.

Before welding, it is important to ensure that the electrodes are properly aligned and prepared, and that all surfaces to be welded are clean and in good contact.

Electrode Alignment
Figure 2 shows the proper electrode alignment for standard spot welding, using the pointed electrodes. When the electrodes touch, the swing arm should be horizontal to the table. The 1/8 inch (3mm) diameter welding electrodes are adjustable in the electrode holder by loosening the small set screw on the side of the holder. A 1/16-inch Allen key is provided.

NOTE: This set screw has a nylon tip to protect the soft electrode material.

DO NOT OVER-TIGHTEN.

The top and bottom electrode holders can be rotated by loosening the black plastic thumb screw on the sides of the holder. Other tip combinations can be achieved by rotating the electrode holders 180 degrees.

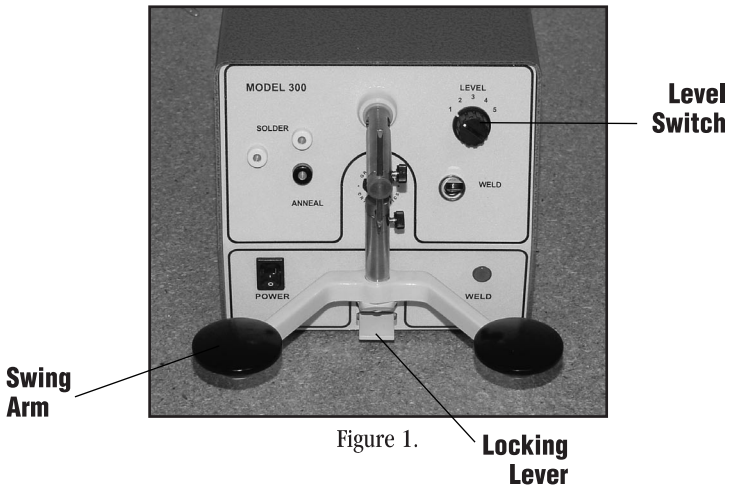


Figure 1.

TIPS

Needle-nose pliers may be used for fine adjustments of the electrodes. The copper electrode material is soft and easily bent to shape.

Medium grit sandpaper or a fine flat file may be used to flatten the faces of the electrodes to provide maximum contact between the electrodes. Electrode faces should be flat and square to each other.

Keep the electrodes clean, and free of oxidation and flux.

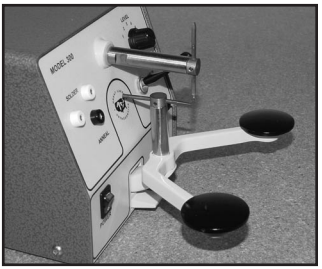
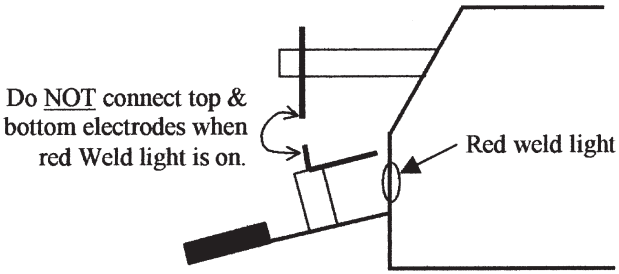


Figure 2.



Spot Welding Procedures

1. Place the Level switch on Level 1.

2. Depress the swing arm and position the parts to be welded between the electrodes.

3. To weld, depress either the foot switch or the paddle activation switch. The red neon Weld light briefly flashes when a weld is performed.

4. Reposition the parts to weld a new area and repeat the procedure as required. Use the Level switch to obtain higher power levels if needed.

TIP: Always begin at the lowest power setting before increasing to higher levels.

There is no danger of electric shock since the voltage between the welding electrodes is only about five volts. It is normal for a small amount of sparking to take place when spot welding. This is due to minute irregularities and gaps between the pieces to be joined. For maximum safety, it is recommended that users remove their hands from the metal pieces and swing arm when welding.

TIP: Parts joined by a single weld may be rotated slightly (without breaking the weld) for fine repositioning prior to making the joint permanent with additional welds.

4. Heat Treating

The same electrical current used for spot welding may be used to heat sections of wire for heat treating purposes. Heat treating techniques are used to 1) make metals dead soft (annealing), 2) relieve internal stresses and prevent spring-back after bending (stress relieving), and 3) harden certain metals to make them stiffer (heat hardening).

4.1 Annealing

Annealing involves raising the temperature of a metal to slightly below its melting point. Slow recrystallization takes place which generally softens metals and relieves stresses.

Typical annealing temperatures for stainless steel are approximately 2000˚F (about 1100˚C) which causes materials to glow bright red. All temper is permanently lost. Annealing can be performed using either the optional Annealing plug or optional Auxiliary cables.

Procedure using Annealing Plug

1. Insert the Annealing plug into the black and white jacks on the **front** of the welder. See Figure 3.

2. Place the Level switch in the #1 position

3. Lock down the swing arm by fully depressing the arm and pressing down the lock lever. POWER IS NOW AVAILABLE AT THE ANNEALING PLUG.

4. Place a section of stainless steel wire to be annealed between the copper elements of the plug. When the wire glows red hot, remove the wire from the annealing plug.

If the wire does NOT become bright red, place the Level switch in a higher position. **The #5 setting is not connected for external functions.**

Procedure using Auxiliary Cables

1. Configure both handles of the auxiliary cables with the grooved metal tips, and plug the cables into the black and top white jacks on the front of the welder. Tips should be clean to ensure good electrical contact.

2. Place the Level switch in the #1 position.

3. Lock down the swing arm by fully depressing the arm and pressing down the lock lever. POWER IS NOW AVAILABLE AT THE CABLE TIPS.

4. Place the metal tips on the wire to be annealed. Annealing will take place between the electrode tips. When the wire becomes red hot, remove one of the tips from the wire to break the circuit.

If the wire does NOT become bright red, place the Level switch in the #2, #3 or #4 position. **The # 5 setting is not connected for external functions.**

TIP: Positioning the clips close together will cause the wire to heat more rapidly.

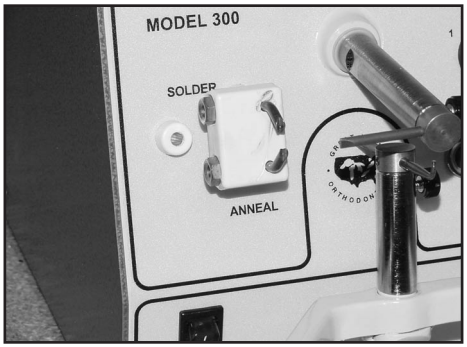


Figure 3.

4.2 Stress Relieving

Stress relieving involves eliminating the internal stresses created in metals as a result of cold working (primarily bending). These stresses tend to make metals want to revert to their original shape and increase brittleness. Heating stainless steel to approximately 800˚F (425˚C) allows a small amount of atomic rearrangement to take place at the sites of highest stress and brings the material to a lower energy state free of internal stresses.

NOTE: These temperatures will also harden chrome cobalt metals.

The metal should not be allowed to heat to annealing temperatures. Stress relieving may be performed on wires that are on models.

Procedure using Auxiliary Cables

1. Configure the handles with the grooved metal tips, and plug the cables into the black and top white jacks on the front of the welder (same as for annealing). The cables can also be plugged into the jacks on the annealing plug.

2. Place the Level switch in the #1 position.

   Higher power levels are available by placing the Level switch in the #2, #3 or #4 position. **The #5 position is NOT connected for heat treating.**

3. Lock down the swing arm by fully depressing the arm and pressing down the lock lever. The Weld light will illuminate. POWER IS NOW AVAILABLE AT THE CABLE TIPS. The lever is released by depressing the lever arm again.

4. Place the metal tips about 15-20mm apart on the wire to be stress-relieved. Heating will take place between the electrode tips. When the wire becomes a **straw color**, remove one of the tips from the wire to break the circuit.

5. If necessary, move the tips to an adjacent section of wire and repeat the procedure.

DO NOT ALLOW THE WIRE TO BECOME RED HOT

TIP: Wire that is in contact with a plaster model may require more time to heat.

4.3 Heat Hardening

Chrome cobalt-based metals can be made stiffer by heating to approximately 950°F (510°C.) using the same procedure used for stress relieving. The 300-series stainless steels (types 304 and 316), however, cannot be hardened by heat treating.

Procedure using Auxiliary Cables

1. Configure the handles with the grooved metal tips, and plug the cables into the black and top white jacks on the front of the welder (same as for annealing). The cables can also be plugged into the jacks on the annealing plug.

2. Place the Level switch in the #1 position.

   Higher power levels are available by placing the Level switch in the #2, #3 or #4 position. **The #5 position is NOT connected.**

3. Lock down the swing arm by fully depressing the arm and pressing down the lock lever. The Weld light will illuminate. POWER IS NOW AVAILABLE AT THE CABLE TIPS. The lever is released by again depressing the lever arm.

4. Place the metal tips about 15-20mm apart on the wire to be stress-relieved. Heating will take place between the electrode tips. When the wire becomes a ***dark straw color***, remove one of the tips from the wire to break the circuit.

5. If necessary, move the tips to an adjacent section of wire and repeat the procedure.

6. Higher heat setting are available by plugging the cables into both white jacks (instead of the black and white).

DO NOT ALLOW THE WIRE TO BECOME RED HOT.

TIP: Wire in contact with a plaster model may require more time to heat.

TIP: Temper-indicating paste may be used to acquaint the operator with the proper "straw" color. Place a spot of paste at intervals along the wire to be treated. The paste flashes when the wire reaches 950°F (510°C.)

5. Electrosoldering

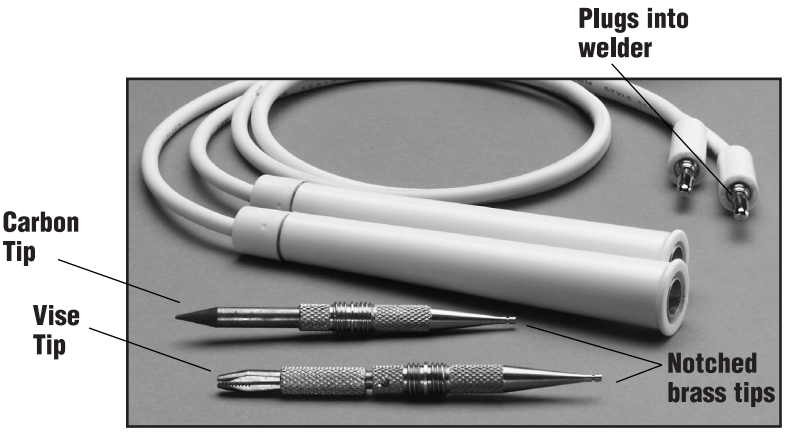
Electrosoldering (electric soldering) is a convenient alternative to traditional flame soldering which minimizes the possibility of overheating wires, and causing discoloration and annealing. Basically, electrosoldering is performed by electrically connecting to the wire/solder system and then using an auxiliary electrode fitted with a carbon tip to complete the circuit and heat the solder to melting.

Generally, two methods may be used to deliver the solder:
1) applying solder directly to the joint, and 2) using solder-tipped brass electrodes.

TIP: If possible, first weld the materials together to the desired placement. Alternatively, a small amount of acrylic or plaster may be used.

Auxiliary Cables

Refer to Figure 4. The brass inserts at the end of the cables may be unscrewed and reversed to obtain different configurations.



(Figure 4. Auxiliary Cables and reversible electrode tips.)

5.1 Applying Bar Solder Directly to the Joint

1. Configure one auxiliary cable with the carbon tip and the other with either the notched brass tip or the vise tip.

2. Plug both cables into the **white** auxiliary jacks on the **front** of the welder. The vise tip is generally used for freehand soldering of wires. For soldering on a model, the notched brass tip and carbon tip are generally used.

TIP: Clean and sharpen the carbon tip using medium grit sandpaper.

3. Flux the joint and drape a piece of solder over the joint.

TIP: Watery flux is best since it has better electrical conductivity than paste.

4. Place the Level switch in the #1 position. Lock down the swing arm by fully depressing the arm and pressing down the lock lever.

   Higher power levels are available by placing the Level switch in the #2, #3 or #4 position. **The #5 position is NOT connected.**

5. Clip the vise grip onto the heavier wire as close to the solder joint as possible. If using the notched brass tip, touch the tip to the metal, close to the joint.

TIP: Dip the carbon electrode in water prior to soldering to increase its electrical conductivity.

6. Touch the carbon tip to the solder. The carbon tip will heat and glow red. When the solder flows around the joint, remove the carbon tip.

5.2 Hand-Held Solder Application

1. Configure one auxiliary cable with the metal vise tip and the other with the carbon tip.

2. Plug both cables into the white auxiliary jacks on the front of the welder.

3. Place the Level switch in the #1 position. Lock down the swing arm by fully depressing the arm and pressing down the lock lever.

   Higher power levels are available by placing the Spot Level switch in the #2, #3 or #4 position. **The #5 position is NOT connected.**

4. Flux the joint and position the solder ball on the joint.

5. Touch the carbon tip to the solder. The carbon tip will heat and glow red. When the solder flows around the joint, remove the carbon tip.

TIP: Dip the tip of the carbon electrode in water prior to soldering to increase its electrical conductivity.

TIP: Clean and sharpen the carbon tip using medium grit sandpaper.

5.3 Vise Plug Fitted into Spot Welding Electrode

Figure 5. shows a solder electrode fitted to the top spot welding electrode. To mount the vise plug in the front electrode position:

1. Lock open the spot welding rocker arm by depressing fully and pressing down the lock lever. The lever is released by again depressing the lever arm.

2. Remove the top electrode holder by loosening the side plastic thumb screw and removing the top electrode.

3. Insert the optional vise grip into a black banana jack (not provided) and then into the top electrode. Lightly tighten the side thumb screw and insert a solder electrode into the vise tip.

TIP: Dip the tip of the carbon electrode in water prior to soldering to increase its electrical conductivity.

4. Plug the auxiliary cable fitted with the carbon tip electrode into **top** white jack on the front of the welder.

5. Place the Level switch in the #1 position. The Weld light will illuminate. POWER IS NOW AVAILABLE AT THE CABLE TIPS. ***FOR MORE POWER, use level 2, 3 or 4.***

6. Flux the joint.

7. Bring the part to be soldered up to the solder ball and touch the carbon tip to the solder. The carbon tip will heat and glow red. When the solder flows around the joint, remove the carbon tip.

TIP: Clean and sharpen the carbon tip using medium grit sandpaper.

TIP: Watery flux is best to use since it has better electrical conductivity than paste.

NOTE: Solder electrodes are available in four different sizes - small, medium, large, x-large. The size of the solder ball approximately doubles for each increment.

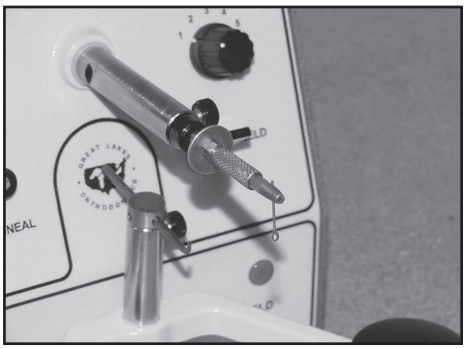


Figure 5.

6. Specifications

Power	110 VAC, 4 amps
Weight	10 lbs. (4.5 Kg)
Dimensions	7 x 6 x 7 1/2 inches (height x width x depth)
Maximum spot welding current	30 amps

Please note: Any modifications will void the warranty.