 <p>International Welding Technologies, Inc. (856) 753-8126</p>	<p>Operational Procedure For Gap Stud Welding</p> <p><i>For Internal Use Only</i></p>	<p>Date: 4/11/06 Prepared for: Prepared by: J. Wilkinson Revision: 2 Pages: 6</p>
<p>TITLE: Gap Stud Welding Set-up and Procedure</p>		

Purpose: To establish proper set-up and welding procedure used for GAP stud welding.

Procedure

1. Stud Welding Processes:

There are two methods of Capacitor Discharge (C.D.) stud welding: (See figure 1)

Method	Description	Advantages	Disadvantages
Gap	Arc is initiated away from the material and stud is driven into the metal	Best method for welding all weldable materials and leaves least reverse side marking	None
Contact	Stud tip is in contact with the work surface and arc is formed	Simplest method and easy to master	Poor for welding exotic material such as aluminum and brass

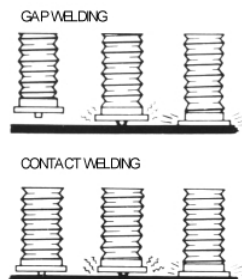


Figure 1

2. Material Preparation:

C.D. stud welding only penetrates the surface of the material (See figure 2). Most sheet metals are weldable without material preparation; however, the base material must be free from all contaminants. Contaminates include: marking pens/ink, cutting oils, grease, oxidation and/or mill scales.

- A. In the case of oxidation or mill scale, it may be necessary to prepare the material by sanding or grinding the area being welded.
- B. If oil/grease is present on the material, it is mandatory to clean the base material with alcohol or similar product to clean.

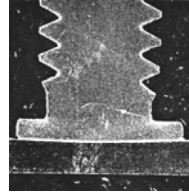


Figure 2

3. Machine Inspection

- A. Inspect all weld cables, connectors and clamps for arcing and fraying.
- B. Check to ensure that the rubber boot is attached to gun body and chuck nut.
- C. Inspect the brass foot, ensuring that there is not an excess build-up of weld splatter.
- D. Depending on shop environments, the inside of the unit should be cleaned with compressed air annually.
- E. Capacitors should be inspected and torqued to 35 inch pounds annually.
 - 1. Contact International Welding Technologies or your Maintenance Manager if the machine needs servicing.

4. Machine Set-up for Gap Stud Welding:

- A. Installation of Welding Cables
 - 1. At the start of each use, the unit's connectors must be checked to ensure tightness. The gun and ground cable connectors should be turned clockwise; otherwise, a loose connectors will arc and cause damage to the machine.
- B. Set-up of Chuck/Collet (See figure 1 in the appendix1).
 - 1. Engage stud into the chuck. Note: A 1/8" protrusion is required to avoid the stud welding itself to the chuck. This is adjusted by the backstop set screw.
- C. Set-up of Gap Gun
 - i. Aluminum/Brass (See figure 2 in the appendix1)
 - 1. Insert chuck into gun and tighten chuck nut.
 - 2. Adjust the legs by using the four set screws located on the bottom of the faceplate.

3. Adjust the legs so only the flange ($1/32''$) of the stud is beyond the brass ring of the foot.
 4. Adjust the spring pressure to **3** by using the slot screw located in the back of the gun (be sure not to over tighten).
- ii. Stainless/Carbon Steel (See figure 3 in the appendix1)
1. Insert chuck into gun and tighten chuck nut.
 2. Adjust foot piece legs by using the four set screws located on the bottom of the faceplate.
 3. Adjust the legs so that $3/32''$ of the stud (including the flange) is beyond the brass ring of the foot.
 4. Adjust the spring pressure to **1** by using the slot screw located in the back of the gun (be sure not to over tighten).

D. Grounding the Material

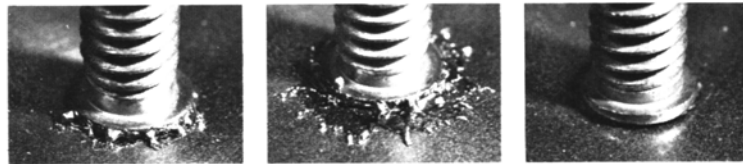
The welding should take place between the grounds. This will minimize arc blow. Arc Blow is the phenomena of the arc drawing away from the grounds. To establish the best grounding situation, do the following.

1. Use both Grounds
2. Ground directly to the work surface.
3. Place grounds on diametrically opposite corners

E. Setting the Voltage

The voltages located on the machine are estimated settings and should only be use as starting points. Usually an Aluminum/brass fastener needs to be welded at a high voltage than it's steel counterpart. A good rule of thumb is 5-15 volts higher for aluminum and brass.

1. Find the setting table located on the front of the machine. Dial in the voltage based on the Diameter of the stud, using the potentiometer or arrow keys.
2. Adjust the voltage to emulate the figure below on scrape material (See figure 3)
3. The fastener should have a visual weld 360 degrees around the flange.



GOOD

HOT

COLD

Figure 3

5. Testing the Weld

Before welding onto the “work surface”, weld a total of ten studs on a piece of scrape off-cut from the “work surface”. Use a torque wrench or a bending bar to test the welds.

1. Fasteners tested with a torque wrench should receive the load strength equal to the chart in appendix 2.
2. Fasteners tested with a bending bar should take at least a 15-degree bend.
3. If all the welds pass the testing procedure then it is suitable to weld on the “work surface”.

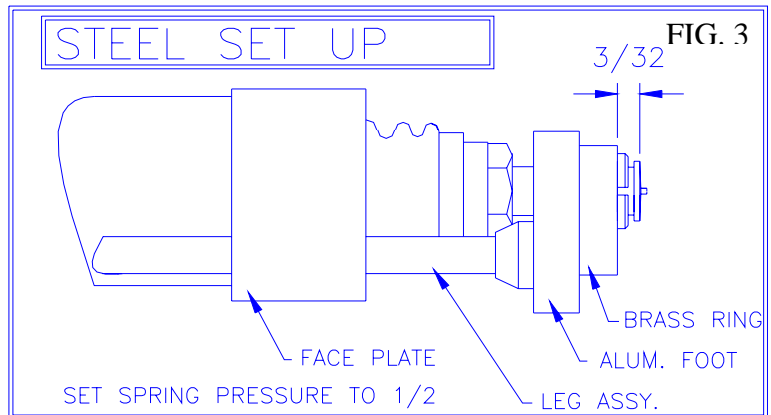
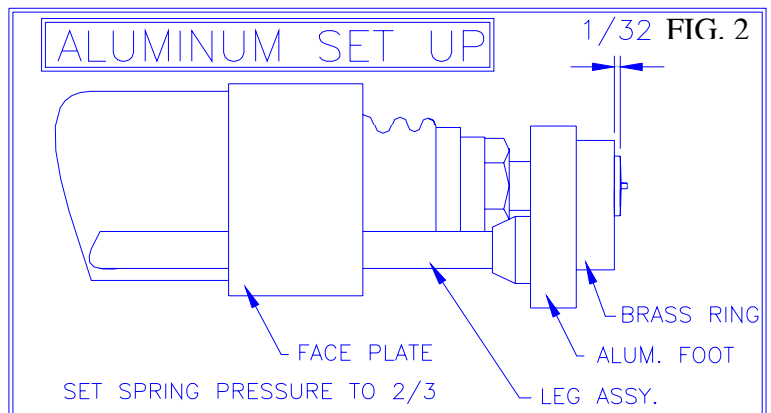
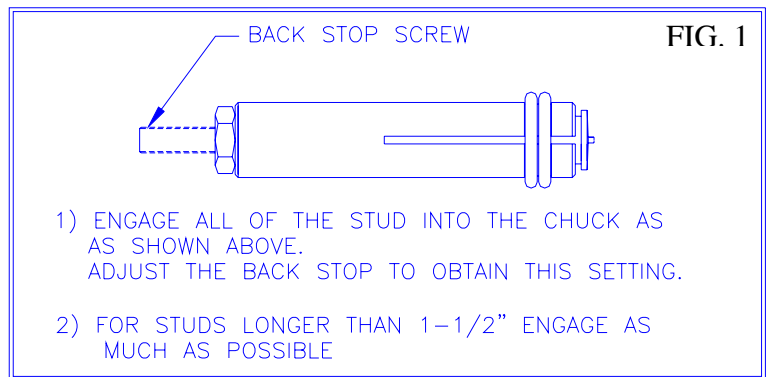
Appendix 1

1-2-3 EASY SET-UP GUIDE TO GAP WELDING

Refer to Figures 1, 2 and 3 to the right.

Figure 1 depicts the optimal set-up for the fastener in the chuck. To set the stud in the chuck, loosen the backstop screw until the fastener extends approximately $\frac{1}{8}$ inch from the front of the chuck. Tighten the backstop locking nut to preserve this setting. For fasteners longer than 1- $\frac{1}{2}$ inch, back the stop all the way out to obtain as much engagement in the chuck as possible.

If you are welding to aluminum, the set-up of the gun will be as depicted in Figure 2. First follow the directions for Figure 1. Then fully insert the chuck into the gun and tighten the chuck-locking nut. Loosen the two legs by releasing the four (4) set screws in the faceplate. Adjust the legs so that only the flange (approximately $\frac{1}{32}$ inch) of the fastener is observed beyond the brass ring. Tighten the four (4) set screws in the legs. Finally, adjust the spring pressure at the slot screw in the rear of the gun. The pressure should be set to 3.



If you are welding to mild (carbon) or stainless steel, the set-up of the gun will be as depicted in Figure 3. First follow the directions for Figure 1. Then fully insert the chuck into the gun and tighten the chuck-locking nut. Loosen the two legs by releasing the four (4) set screws in the faceplate. Adjust the legs so that approximately $\frac{3}{32}$ inch of the fastener is observed beyond the brass ring. Tighten the four (4) set screws in the legs. Finally, adjust the spring pressure at the slot screw in the rear of the gun. The pressure should be set to 1. The gun set-up is now complete.

Appendix 2

Standard C.D. Load Strength

Stud Material	Stud Size	Maximum Fastening* Torque (Lbs)	Ultimate Tensile* Load (Lbs)	Maximum Shear* Load (Lbs)
Low-carbon copper-flashed steel	6-32	6	500	375
	8-32	12	765	575
	10-24	14	960	720
	¹ / ₄ -20	43	1750	1300
	⁵ / ₁₆ -18	72	2900	2200
	³ / ₈ -16	106	4300	3250
Stainless steel: 304	6-32	10	790	590
	8-32	20	1260	940
	10-24	23	1530	1150
	¹ / ₄ -20	75	2880	2160
	⁵ / ₁₆ -18	126	3750	2800
	³ / ₈ -16	186	4850	3600
Aluminum alloy: 5000 series	6-32	3.5	375	235
	8-32	7.5	585	365
	10-24	10	735	460
	¹ / ₄ -20	40	1360	850
Brass 70-30; 65-35	6-32	8	600	390
	8-32	16	860	560
	10-24	18.5	1040	680
	¹ / ₄ -20	61	1950	1275
	⁵ / ₁₆ -18	102	3280	2140
	³ / ₈ -16	150	4800	3160

*This information should be used only as a guide.