



**When a bolt or stud breaks in a tapped hole, the remedy can be frustrating... But, patience and strict attention to detail can result in **SUCCESS!****

**1. Screw Extractors work best when the following four steps are performed:**

**Step 1: Penetrating oil has been allowed to help lubricate the threads of the bolt.**



**Step 2: Using a left-hand drill, the hole is drilled in the center\* of the broken bolt parallel with the tapped hole.**

**\*(Flatten the top of the broken bolt with a burr if necessary.)**



**Step 3: The screw extractor\* is inserted and maintained in a parallel position as well.**

**\*(Slide nut style screw extractors perform better in difficult situations than the tapered styles.)**



**Step 4: Perpendicular torque is applied to loosen the bolt, not break the extractor.**



**2. Sometimes, heating the assembly to expand the metal components and/or freezing with a "Chiller" product to shrink the bolt, will make removal easier.**

**3. Using a welding rod in a special way will often work, when all else fails. (see page 2)**

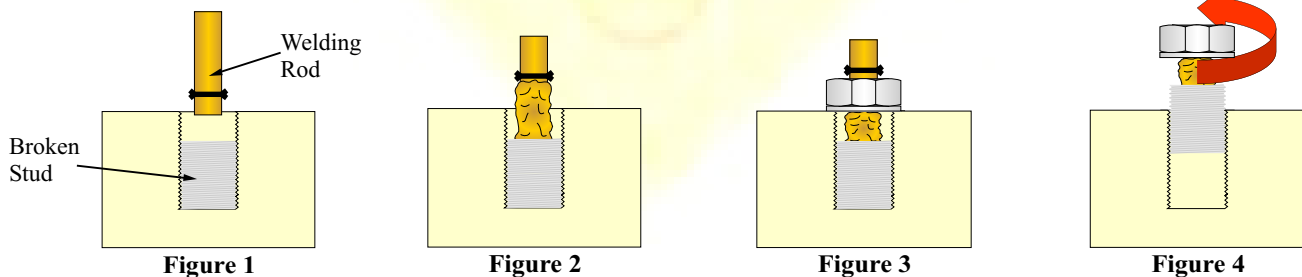
**4. Thread repair kits are very beneficial should the broken capscrew or stud need to be drilled out completely.**



# BROKEN BOLT/STUD PULLING PROCEDURE USING WELDING ROD

## FLAT POSITION:

1. Figure 1 is a cross section of a housing showing a stud broken off below the surface of the component.
2. As shown in Figure 1, place the Lawson Astromet Series 300 Electrode in the center of the threaded hole, and while keeping the electrode perpendicular, strike an arc in the center of the broken stud. Avoid tilting the electrode so as not to arc to the threads.
3. While maintaining a short arc, use a slight circular motion, (not to exceed 2 times the diameter of the electrode) fill the hole with weld deposit. As the electrode burns off, the flux will form a protective barrier between the weld deposit and the threads.
4. Continue the procedure to build-up a column of weld metal until it reaches the surface of the housing as shown in Figure 2. Break the arc by lifting the electrode straight up. Do not allow the weld deposit to roll over onto the housing surface.
5. Chip the slag away from the top of the weld deposit and place a washer (used for spacing) and a nut over the deposit as shown in Figure 3. The nut should be approximately equal to the diameter of the broken stud.
6. Weld the nut to the electrode deposit, completely filling the inside of the nut with weld metal.
7. Allow the stud, electrode deposit and welded nut to completely cool to room temperature. **DO NOT QUENCH.**
8. Using a hand wrench, remove the broken stud as shown in Figure 4.
9. After the broken stud is removed, chase the threads with the proper size tap to remove any remaining slag and to clean up the threads.



## **OVERHEAD APPLICATIONS:**

**Use the same procedure as for flat application, with the following exceptions:**

- 1. Amperage settings for removal of broken studs overhead might need to be reduced approximately 10% from the settings for flat applications.**
- 2. A continuous arc and build-up may not be possible. The build-up can be obtained with short intermittent welds, making sure to hold the electrode vertical so as not to arc the threads.**

## **HORIZONTAL APPLICATIONS:**

**A similar procedure for overhead applications may be used for horizontal applications, with the following additional steps to prevent the molten weld deposit from sagging (IF DIFFICULTIES ARE ENCOUNTERED):**

- 1. Sleeve the threaded hole with a copper tube.**
- 2. Place the electrode in the center of the hole, strike the arc and weld with a slight circular motion, maintaining as short an arc as possible.**
- 3. When (if) molten slag begins to run out of the hole, break the arc and let it cool. When the redness disappears, re-strike the arc and continue welding.**
- 4. Follow steps (5 through 9) above to complete the broken stud removal.**

<b>BROKEN STUD/BOLT REMOVAL GUIDE</b>					
<b>ASTROMET SERIES 300 WELDING ALLOY</b>					
<b>STUD/BOLT DIA.</b>	<b>LAWSON NUMBER</b>	<b>UNIT</b>	<b>LAWSON NUMBER</b>	<b>UNIT</b>	<b>RECOMMENDED AMPERAGE</b>
1/4 - 3/8	WR300-06	5 LBS	WR300-02	2 LBS	40 - 75
3/8 - 3/4	WR301-06	5 LBS	WR301-02	2 LBS	70 - 110
3/4 - 2	WR302-06	5 LBS	WR302-02	2 LBS	110 - 150