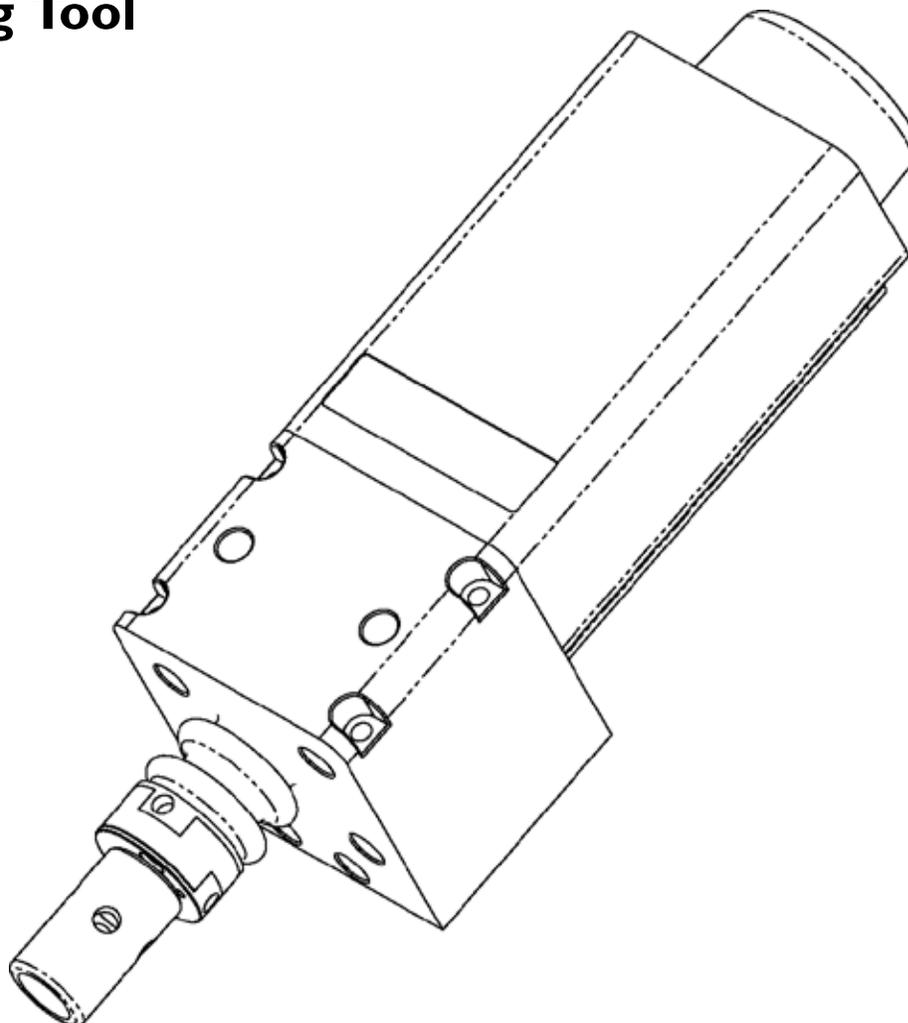


ILM003C
January, 2007

Price \$5.50 USA

Operation Manual

Instruction and Maintenance for Production Model Stud Welding Tool



BE SURE THIS INFORMATION REACHES THE OPERATOR. EXTRA COPIES ARE AVAILABLE THROUGH YOUR SUPPLIER.



CAUTION

THESE INSTRUCTIONS ARE FOR EXPERIENCED OPERATORS. If you are not fully familiar with the principles of operation and safe practices for arc welding equipment, we urge you to read AWS SP - "Safe Practices" available from the American Welding Society.

DO NOT permit untrained persons to install, operate, or maintain this equipment. **DO NOT** attempt to install or operate this equipment until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your supplier for further information. Be sure to read the Safety Precautions before installing or operating this equipment.

Table of Contents

SECTION 1:	Safety Precautions	3
SECTION 2:	Installation & Set Up	8
SECTION 3:	Normal Operation	13
SECTION 4:	Optional Features	14
SECTION 5:	Trouble Shooting	15
SECTION 6:	System Maintenance	16
SECTION 7:	Mechanical Dimensions	20
SECTION 8:	Parts List	22

WARRANTY

Image warrants that the goods sold will be free from defects in workmanship and material. This warranty is expressly in lieu of other warranties, expressed or implied or for fitness for a particular purpose. The liability shall arise only upon return of the defective goods at Buyer's expense after notice to Image. The warranty shall be limited to replacement with like goods or, at Image's option, to refunding the purchase price. Image will not accept receipt of equipment returned unless buyer has previously afforded Image's personnel a reasonable opportunity to inspect and repair said equipment. Image will warrant components for 1 year and labor for 180 days from date of shipment. Image shall not be liable for any consequential damages including improper set up by customer.

USERS RESPONSIBILITY

This equipment will perform in conformity with the description contained in this manual and accompanying labels and/or inserts when installed, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Defective equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, the manufacturer recommends that a telephone or written request for service advice be made to the Authorized Distributor from whom purchased.

This equipment or any of its parts should not be altered without the prior written approval of the manufacturer. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than the manufacturer or a service facility designated by the manufacturer.



This symbol appearing throughout this manual means
ATTENTION! BE ALERT!
Your safety is involved.

The following definitions apply to **DANGER, WARNING, CAUTION** found throughout this manual.



DANGER

Used to call attention to immediate hazards which, if not avoided, will result in immediate, serious personal injury or loss of life.



WARNING

Used to call attention to potential hazards which could result in personal injury or lost of life.



CAUTION

Used to call attention to hazards which could result in minor personal injury.



WARNING: These Safety Precautions are for your protection. They summarize precautionary information from the references listed in the Additional Safety Information section. Before performing any installation or operating procedures, be sure to read and follow the safety precautions listed below as well as all other manuals, material safety data sheets, labels, etc. Failure to observe Safety Precautions can result in injury or death.

Section 1

Safety Precautions



ARC RAYS CAN BURN EYES AND SKIN -

The arc, like the sun, emits ultraviolet and infrared (visible and in-visible) and other radiation and can injure skin and eyes. Sparks and hot metal can fly off the weld. Training in the proper use of the processes and equipment is essential to prevent accidents. Therefore:

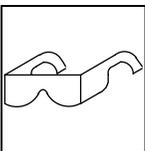
- 1) Always wear safety glasses with side shields in any work area, even if wearing a welding helmet, face shields and goggles are also required.
- 2) Always use a face shield fitted with the correct shade of filter to protect your face and eyes when welding or watching (See ANSI Z49.1 and Z87.1 listed in Safety Standards). Cover sparks and rays of the arc when operating or observing operations.
- 3) Use protective non-flammable screens or barriers to protect others from flash and glare. Warn bystanders not to watch the arc and not to expose themselves to the rays of the electric-arc or hot metal.
- 3) Wear flameproof gauntlet type gloves, heavy long-sleeve shirt, cuffless trousers, high topped shoes, and a welding helmet or cap for hair protection, to protect against arc rays and hot sparks or hot metal. A flameproof apron may also be desirable as protection against radiated heat and sparks.
- 4) Hot sparks or metal can lodge in rolled up sleeves, trousers cuffs or pockets. Sleeves and collars should be kept buttoned, and open pockets eliminated from the front of clothing.
- 6) Use goggles over safety glasses when chipping slag or grinding. Chipped slag may be hot and can fly far. Bystanders should also wear goggles over safety glasses.



ELECTRIC AND MAGNETIC FIELDS -

Electric and Magnetic Fields may be dangerous. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding and cutting current creates EMF around welding cables and welding machines. Therefore:

- 1) Welders having pacemakers should consult their physician before welding. EMF may interfere with some pacemakers.
- 2) Exposure to EMF may have other health effects which are unknown.
- 3) Welders should use the following procedures to minimize exposure to EMF:
 - A) Route the electrode and work cables together. Secure them with tape when possible.
 - B) Never coil the torch or work cable around your body.
 - C) Do not place your body between the torch and work cables. Route cables on the same side of your body.
 - D) Connect the work cable to the work piece as close as possible to the area being welded.
 - E) Keep welding power source and cables as far away from your body as possible.



FLYING METAL CAN INJURE EYES -

- 1) Welding, chipping, wire brushing and grinding can cause sparks and flying metal. As welds cool, they can throw off slag.
- 2) Wear approved safety glasses with side shields even under your welding helmet.



BUILD UP OF GAS CAN INJURE OR KILL -

- 1) Shut off shielding gas supply when not in use.
- 2) Always ventilate confined spaces or use approved air-supplied respirator.



ELECTRICAL SHOCK -

Contact with live electrical parts and ground can cause severe injury or death. The electrode (the weld stud and chuck) and work circuit (ground) are electrically live whenever the output is on. The input power circuit and the machine internal circuits are also live whenever power is on. Improperly installed or improperly grounded equipment is a hazard.

- 1) Disconnect input power before installing or servicing this equipment. Lock-out/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- 2) Do not touch live electrical parts. Do not touch the electrode (stud) if you are in contact with the work, ground, or another electrode from a different machine.
- 3) Be sure the power source frame (chassis) is connected to the ground system of the input power.
- 4) When making input connections, attach proper grounding conductors first and then double-check connections.
- 5) Always verify the supply ground - check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- 6) Refer to ANSI/ASC Standard Z49.1 (listed on page 6) for specific grounding recommendations. Do not mistake the work lead for a ground cable.
- 7) Clamp work cable with good metal-to-metal contact (spring and/or magnetic clamps are not recommended) to work piece as near the weld as practical.
- 8) DO NOT use welding current in damp areas, if movement is confined, or if there is danger of falling.
- 9) Properly install and ground this equipment according to this Owner's Manual and national, state and local codes.
- 10) Connect the work cable to the work piece. A poor or missing connection can expose you or others to a fatal shock.
- 11) Keep everything dry, including clothing, work area, cables, torch/electrode holder and power source.
- 12) Wear dry, hole-free insulated gloves & body protection before turning on power.
- 13) Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- 14) Don't stand directly on metal or the earth while working in tight quarters or a damp area; stand on dry boards or an insulating platform and wear rubber-soled shoes.
- 15) Turn off all equipment when not in use.
- 16) Use well-maintained equipment. Frequently inspect input power cord and output weld cables for damage or bare wiring. Replace worn or damaged cables immediately; bare wiring can kill. Repair or replace damaged parts at once. Maintain this unit according to the manual.
- 17) Do not use worn, damage, undersized or poorly spliced cables.
- 18) Do not drape cables over your body.
- 19) If earth grounding of the work piece is required, use a separate cable.
- 20) Wear a safety harness if working above floor level.
- 21) Keep all panels and covers securely in place.
- 22) Insulate work clamp when not connected to work piece to prevent contact with any metal object.
- 23) Don't connect multiple electrodes or work cables to a single weld output terminal.

SIGNIFICANT DC VOLTAGE exists after removal of the input power on inverters. Turn off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.

Section 1

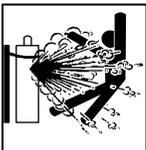
Safety Precautions



FUMES AND GASES -

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health, particularly in confined spaces. Do not breathe fumes and gases. Shielding gases can cause asphyxiation. Therefore:

- 1) Keep your head out of the fumes. Do not breathe the fumes.
- 2) If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
- 3) If ventilation is poor, use an approved air-supplied respirator.
- 4) Read the Material Safety Data Sheets (MSDS) and the manufacturer's instructions for metals, consumables, coatings, cleaners and degreasers.
- 5) Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch-person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- 6) Don't weld in locations near degreasing, cleaning or spraying operations. The heat & rays of an arc can react with vapors to form highly toxic & irritating gases.
- 7) Don't weld on coated metals, such as galvanized, lead or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.
- 8) Do not weld, cut, or gouge on materials such as galvanized steel, stainless steel, copper, zinc, lead, beryllium or cadmium unless positive mechanical ventilation is provided. Do not breathe fumes from these materials.
- 9) If you develop momentary eye, nose, or throat irritation while operating, this is an indication that ventilation is not adequate. Stop work and take necessary steps to improve ventilation in the work areas. Do not continue to operate if physical discomfort persists.
- 10) Refer to ANSI/ASC Standard Z49.1 for specific ventilation recommendations.



CYLINDER HANDLING -

Shielding gas cylinders contain gas under high pressure. If damaged or mishandled a cylinder can explode and violently release gas. Sudden rupture of cylinder, valve, or relief device can injure or kill. Since gas cylinders are normally part of the welding process, be sure to treat them carefully. Therefore:

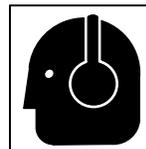
- 1) Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks and arcs.
- 2) Keep cylinders away from any welding or other electrical circuits
- 3) Never drape a welding tool over a gas cylinder
- 4) Never allow a welding electrode (weld stud) to touch any cylinder
- 1) Use the proper gas for the process and use the proper pressure reducing regulator, hoses and fittings designed to operate from the specific compressed gas cylinder. Do not use adaptors. Maintain hoses and fittings and other associated parts in good condition.
- 2) Always secure cylinders in an upright position by chain or strap to suitable hand trucks, undercarriages, benches, walls, post, or racks. Never secure cylinders to work tables or fixtures where they may become part of an electrical circuit.
- 3) When not in use, keep cylinder valves closed. Have valve protection cap in place if regulator is not connected. Secure and move cylinders by using suitable hand trucks. Avoid rough handling of cylinders.
- 4) Locate cylinders away from heat, sparks, and flames. Never strike an arc or weld on a cylinder; it will explode.
- 6) Turn face away from valve outlet when opening cylinder valve.
- 5) For additional information, refer to CGA Standard P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders", which is available from Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202



WELDING CAN CAUSE FIRES AND EXPLOSIONS -

Welding on closed containers, such as tanks, drums or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot work piece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating or fire. Check and be sure the area is safe before doing any welding. Therefore:

- 1) Protect yourself and others from flying sparks and hot metal.
- 2) Do not weld where flying sparks can strike flammable material.
- 3) Remove all combustible materials a minimum of 35ft away from the welding arc or cover the materials with a protective nonflammable covering. Combustible materials include wood, cloth, sawdust, liquid and gas fuels, solvents, paints and coatings, paper, etc.
- 4) Hot sparks or hot metal can fall through cracks or crevices in floors or wall openings and cause a hidden smoldering fire or fires on the floor below. Make certain that such openings are protected from hot sparks and metal.
- 5) Do not weld, cut, or perform other hot work until the work piece has been completely cleaned so that there are no substances on the work piece which might produce flammable or toxic vapors.
- 6) Be aware that welding on a ceiling, floor, bulkhead or partition can cause fire on the hidden side.
- 7) Do not weld on closed containers such as tanks, drums or pipes unless they are properly prepared according to AWS F4.1.
- 8) Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
- 9) Do not use welder to thaw frozen pipes.
- 10) Remove electrode (weld stud) from the stud weld tool when not in use.
- 11) Remove any combustibles, such as a butane lighter or matches from your person before doing any welding.
- 12) Have appropriate fire extinguishing equipment handy for instant use, such as a garden hose, water pail, sand bucket or portable fire extinguisher. Be sure you are trained for proper use.
- 13) Do not use equipment beyond its ratings. For example, overloaded welding cable can overheat and create a fire hazard.
- 14) After completing operations, inspect the work area to make certain there are no hot sparks or hot metal which could cause a later fire. Use fire watchers when necessary.
- 15) For additional information, refer to NFPA Standard 51B, "Fire Prevention in Use of Cutting and Welding Processes," available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269



NOISE CAN DAMAGE HEARING -

Noise from some processes or equipment can damage hearing.

- 1) Wear approved ear protection if noise level is high



FIRE OR EXPLOSION HAZARD -

- 1) Do not install or place unit on, over, or near combustible surfaces.
- 2) Do not install unit near flammables.
- 3) Do not overload electrical wiring - be sure power supply system is properly sized, rated and protected to handle the unit.

Section 1

Safety Precautions



FALLING UNITS CAN CAUSE INJURY -

- 1) Use lifting eye to lift unit only, NOT running gear, gas cylinders or any other accessories.
- 2) Use equipment of adequate capacity to lift and support unit.
- 3) If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of the unit.



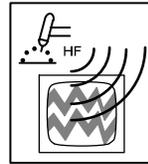
MOVING PARTS CAN CAUSE INJURY -

- 1) Keep hands, hair loose clothing and tools away from moving parts such as fans.
- 2) Keep all doors, panels, covers and guards closed and securely in place.
- 3) Always disconnect electrical power prior to service to prevent the fan from starting unexpectedly.



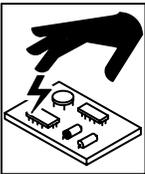
OVERUSE CAN CAUSE OVERHEATING -

- 1) Allow cooling period; follow rated duty cycle.
- 2) Reduce current or reduce duty cycle before starting to weld again.
- 3) Do not block or filter airflow to unit



H.F. RADIATION CAN CAUSE INTERFERENCE -

- 1) High-Frequency (H.F.) can interfere with radio navigation, safety services, computers and communications equipment.
- 2) Have only qualified persons familiar with electronic equipment perform this installation.
- 3) The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.



STATIC (ESD) CAN DAMAGE PC BOARDS -

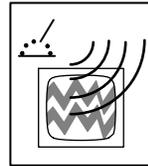
- 1) Put on grounded wrist strap BEFORE handling boards or parts.
- 2) Use proper static-proof bags and boxes to store, move or ship PC boards.

- 4) If notified by the FCC about interference, stop using the equipment at once.
- 5) Have the installation regularly checked and maintained.
- 6) Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.



WELDING WIRE CAN CAUSE INJURY -

- 1) Do not press weld tool trigger until instructed to do so.
- 2) Do not point weld tool toward any part of the body, other people or any metal when threading welding wire.



ARC WELDING CAN CAUSE INTERFERENCE -

- 1) Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- 2) Be sure all equipment in the welding area is electromagnetically compatible.
- 3) To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.



MOVING PARTS CAN CAUSE INJURY -

- 1) Keep hands, hair, loose clothing and tools away from moving parts.
- 2) Keep away from pinch points such as drive rolls.

- 4) Locate welding operation 100 meters from any sensitive electronic equipment.
- 5) Be sure this welding machine is installed and grounded according to this manual.
- 6) If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.



EQUIPMENT MAINTENANCE -

Faulty or improperly maintained equipment can cause injury or death. Therefore:

- 1) Always have qualified personnel perform the installation, troubleshooting, and maintenance work. Do not perform any electrical work unless you are qualified to do the work.



HOT PARTS CAN CAUSE SEVERE BURNS -

- 1) Do not touch hot parts with bare hands.
- 2) Allow cooling period before working on welding tool (gun or torch).

- 2) Before performing any work inside a power source, disconnect the power source from the incoming electrical power using the disconnect switch at the fuse box before working on the equipment.
- 3) Maintain cables, grounding wire, connections, power cord, and power supply in safe working order. Do not operate any equipment in faulty condition.
- 4) Do not abuse any equipment or accessories. Keep equipment away from:
 - heat sources such as furnaces
 - wet conditions such as water puddles and inclement weather
 - oil or grease
 - corrosive atmospheres.
- 5) Keep all safety devices and cabinet covers in position and in good repair.
- 6) Use equipment only for its intended purpose. Do not modify it in any manner.

EMF Information

Considerations about welding and the effects of low frequency Electric and Magnetic Fields (EMF):

Welding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgement, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting. See section on EMF on page 2.

California Proposition 65 Warnings

Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and , in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

For Gasoline Engines:

Engine exhaust contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

For Diesel Engines:

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

ADDITIONAL SAFETY INFORMATION -

For more information on safe practices for electric arc welding refer to the following publications:

American Welding Society

550 N.W. LeJuene Road, Miami, FL 33126, (phone 305-443-9353, website: www.aws.org)

- 1) ANSI/ASC Z49.1 - Safety in Welding, Cutting and Allied Processes
- 2) AWS CH5 - Recommended Practices for Stud Welding
- 3) AWS D1.1 - Structural Welding
- 2) AWS C5.1 - Recommended Practices for Plasma Arc Welding
- 3) AWS C5.6 - Recommended Practices for Gas Metal Arc Welding
- 4) AWS SP - Safe Practices - Reprint, Welding Handbook.
- 5) ANSI/AWS F4.1, Recommended Safe Practices for Welding and Cutting of Containers and Piping.

National Fire Protection Association

P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (phone 617-770-3000, website: www.nfpa.org and sparky.org)

- 1) NFPA Standard 70 - National Electrical Code
- 2) NFPA Standard 51B - Standard for Fire Prevention During Welding, Cutting and Other Hot Work

Compressed Gas Association

1735 Jefferson Davis Highway, Suite 1004; Arlington, VA 22202-4102 (phone 703-412-0900, website: www.cganet.com)

- 1) CGA Pamphlet P-1 - Safe Handling of Compressed Gas Cylinders

Canadian Standards Association

Standards Sales, 178 Rexdale Blvd, Rexdale, Ontario, Canada M9W 1R3 (phone 800-463-6727 in Toronto 416-747-4044, website: www.csa-international.org)

- 1) CSA Standard W117.2 - Code for Safety in Welding and Cutting

American National Standards Institute

11 West 42nd Street, New York, NY 10036-8002 (phone 212-642-4900, website: www.ansi.org)

- 1) ANSI Standard Z87.1 - Practice for Occupational and Educational Eye and Face Protection

U.S. Government Printing Office

Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (phone 312-353-2220, website: www.osha.gov)

- 1) Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, & Part 1926, Subpart J - Occupational Safety and Health Standards for General Industry

With any power source, it may or may not contain a battery which may contain hazardous materials. Please follow local battery disposal procedures when changing batteries or disposing of the power supply.

Section 2

Installation & Set Up

CHUCK REMOVAL & INSTALLATION

To install a chuck, position the chuck into the front of the chuck adapter. There is a morse taper on the end of the chuck and inside the adapter. Tap lightly on the end to seat the chuck into the adapter. It is not necessary to pound on the end of the chuck. This will only damage the chuck itself.

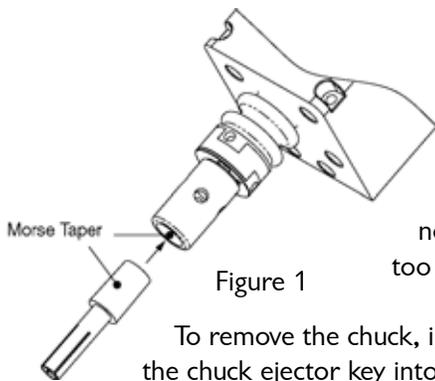


Figure 1

There is a unique chuck for every diameter of stud. Rectangular and other special shape studs may require specialized chucks. Typically, there is also a depth stop inside of the chuck. The depth stop should be adjusted so that you are retaining a good portion of the stud you are setting up to weld. Typically, this is one third to one half of the length of the stud you are welding. You may have to grip less for particularly short studs (3/4 inch or less). Be sure that the weld end of the stud is not too close to the end of the chuck. The chuck could melt or fuse to the stud if it is too close to the weld zone.

To remove the chuck, insert the short, tapered end of the chuck ejector key into one of the holes in the side of the chuck adapter. Be sure to insert the ejector key through the hole on the opposite side. Rotate the chuck key either clockwise or counter clockwise and the chuck will pop out of the chuck adapter. Do not try to use the ejector key as a pry bar and try to pry the chuck out of the adapter. This will only damage the chuck and the chuck adapter.

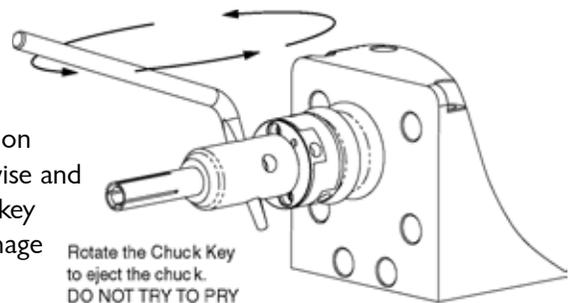


Figure 2

FOOT & LEG SET UP

The standard foot comes in 3 different sizes (small, medium & large) and 2 different configurations (closed & split). Typically, a split foot is used when welding headed anchors and sheer connectors. Many production weld tools are used in specialized applications so the standard leg & feet accessories may not be sufficient. These instructions generally apply, but may not exactly match your specific application.

Foot Size	Part No.	Stud Range
Small	FTS20	up to 1/2 inch
Medium	FTM20	5/8-3/4 inch
Large	FTL20	7/8 inch and larger

The foot is installed on the ends of the legs. Unscrew the flat head screws from the ends of the legs. Place the leg washers on the flat head screws and place the screws through the adjustment slots in the foot. Reattach the screws to the legs. Don't tighten up the screws yet as the legs need to be lined up when placed into the body.

Insert the legs into the weld tool body leg holes. Line up the flat on the leg with the set screw. The set screw will bite into the flat region and hold the leg securely (see figure 4). Tighten the set screws in the side of the legs. If the set screw bites into the round portion of the leg, it will damage the leg so it doesn't inset into the weld tool body leg hole any more.

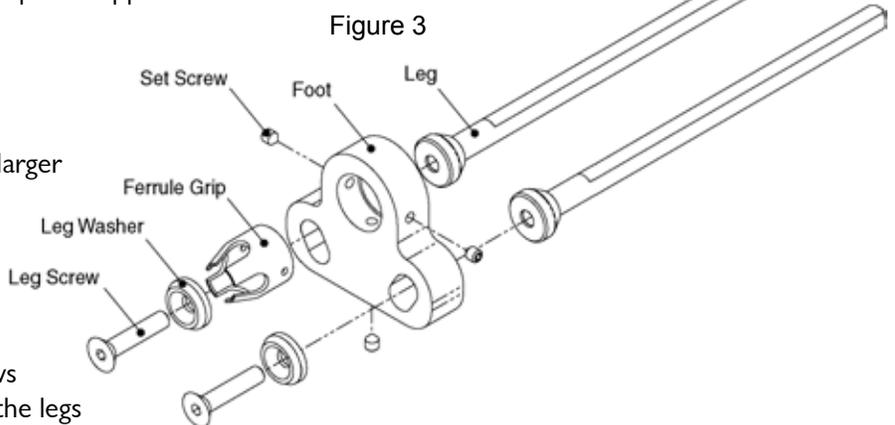


Figure 3

FERRULE GRIP / SPARK SHIELD REMOVAL & INSTALLATION

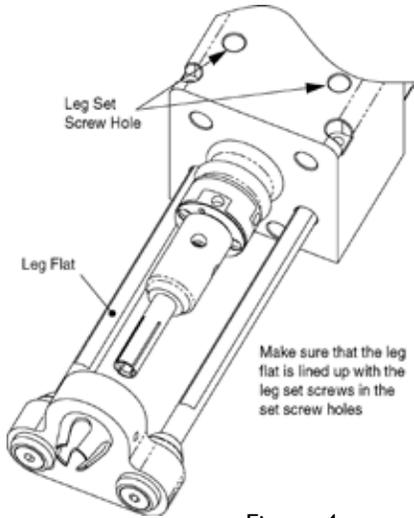


Figure 4

There are three set screws (two on a gas foot) that retain the ferrule grip or spark shield in the foot. Loosen all three set screws. Push the grip or spark shield into the foot (see Figure 3). The grip is sometimes a tight fit so press it firmly into the foot so it seats against the back stop. The two side holes in the ferrule grip should line up with the set screws in the foot. Tighten the set screws so they retain the ferrule grip. It is not necessary to make these extremely tight.

When a spark shield is being used, it is not necessary to align the spark shield with the set screws in the foot.

FERRULE ALIGNMENT

Alignment of the foot is very important, if the foot is not aligned properly it can create bad welds in the form of hang-ups. Place a stud into the chuck and a ferrule into the ferrule grip. The stud should sit perfectly in the center of the ferrule. If it does not, loosen the flat head screws on the legs holding the foot. Position the foot so the stud is centered in the ferrule. Retighten the flat head screws. The lift mechanism should be able to move freely with the ferrule in place. Activate the weld

tool's lift mechanism a couple of times. If the ferrule gets knocked out the alignment is not sufficient.

PLUNGE ADJUSTMENT

Plunge Settings When Using Ferrules

Plunge is the amount of stud extending beyond the end of the ferrule or spark shield. Plunge controls the amount of stud that is melted during the arc time. Too much plunge and the fillet will overfill the ferrule or create excessive splatter when using a spark shield. Too little plunge and there may be incomplete fillet formation. There should be approximately 1/8 of an inch of stud protruding past the end of the ferrule. A bit less for smaller studs, a bit more for larger studs. Do not include the flux in your measurements.

Stud Diameter	Plunge
1/4-5/8	1/8
.75 and up	3/16

To adjust the plunge, loosen the leg set screws in the weld tool body. Move the foot towards the weld tool to increase plunge or away from the weld tool to decrease plunge.

Note: These are instructions for standard ferrules. For reduced fillet ferrules (only recommended for very specific applications) decrease the amount of plunge by half.

Plunge Settings For Short Arc or Gas Arc Stud Welding

For Short Arc or Gas Short Arc the stud should protrude past the end of the spark shield by about 0.04" or 1mm. This is about the same as the flange thickness on flanged style studs (AP style for Image Industries, AT style for Nelson Stud Welding). For standard time duration Gas Arc the plunge should be set at about 2 flange thicknesses or 2mm.

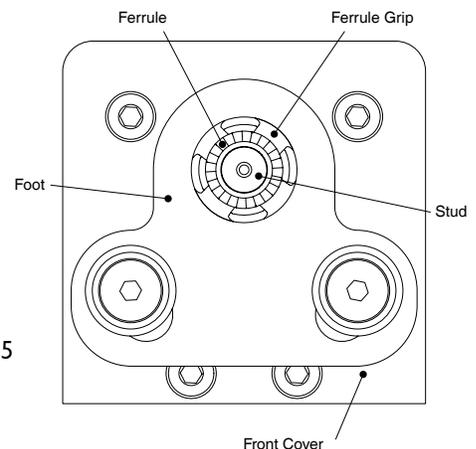


Figure 5

Section 2

Installation & Set Up

ADJUSTING WELD TOOL LIFT

The lift controls the arc length and thus is one factor in controlling the heat of the welding process.

For Image Industries equipment lift should be set at 3/32 or .094" (2.5 mm).

Other equipment typically requires lift adjustment for different studs diameters.

Three phase equipment 1/16" lift for studs up to 5/16" diameter
 3/32" lift for studs over 5/16" to 1/2" diameter
 1/8" lift for studs over 1/2" diameter

It is straight forward to measure lift.

To adjust lift, remove the slotted screw (29) holding the rear cap (28) in place. Put the rear cap aside. Loosen the nylon tipped set screw (25) that holds the adjustable core in place. To increase lift, turn the adjustable core screw (27) counter clockwise. To decrease lift, turn the adjustable core screw clockwise. Each half turn is .025". Place a scale against the front cover and measure to the back edge of the isolation spud (2) approximately 1 inch (25.4 mm). Activate the weld tool (be sure the weld cable is disconnected). Measure to the new position. The difference between the two is the lift setting. Turn the adjustable core (27) until the desired lift is achieved.

After properly setting the lift, retighten the nylon tipped set screw (25) to keep the adjustable core in place. Replace the rear cap (28) and tighten the rear cap screw (29). It is important that the rear cap is in place as the prevents dirt and other contaminants from entering the weld tool and fouling the lift mechanism.

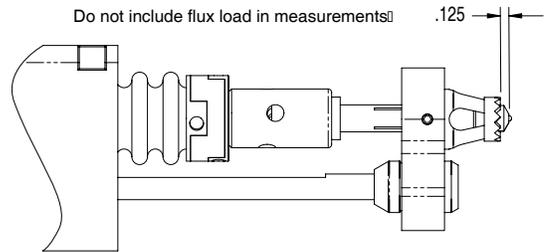
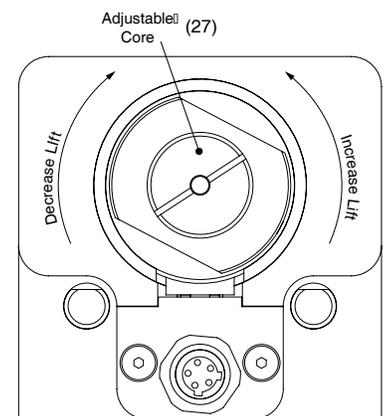


Figure 6



Rear View with Rear Cap Removed

Figure 7



WARNING

Potential Source of Arcing. To prevent accidental activation, always disconnect the gun weld cable from the power supply before making any gun adjustments or performing any service on the gun.

CONNECTING TO A POWER SUPPLY

Connecting the stud weld tool to a stud welding power supply is straight forward. There are two steps:

1. The weld cable
2. The control cable.

1. Connecting the weld cable

The weld cable lug is pinched between the Chuck adapter (1) and the Isolation Spud (2). Remove the chuck adapter (see disassembly instruction #4 on page 16). Place the weld cable lug over the threaded stud on the Isolation spud (2) and reinstall the chuck adapter (1). The chuck adapter must be tight. Do NOT forget to use the Spud wrench included. If the chuck adapter (1) is not tight there is a potential source of arcing and can damage components as well as result in low quality welds.

Section 2

Installation & Set Up

The other end of the weld cable plugs into the front of the power supply. Line up the flat on the brass, male end with the pin on the inside of the panel receptacle. Typically the pin location is identified by a dot on the outside flange. Be sure and connect the weld tool to the Negative (marked by a black connector, a “-” sign or the word weld tool) terminal on the front of the power supply. Note: Stud welding is typically done DCEN or Direct Current Electrode Negative. Push the male connector straight in as far as it will go (this may take a small amount of wiggling of the male connector). Once the connector is seated, Turn the male connector clockwise as far as it will go. This connection should also be tight. No tools are required here, just turn as tight as possible.

2. Connecting the control cable

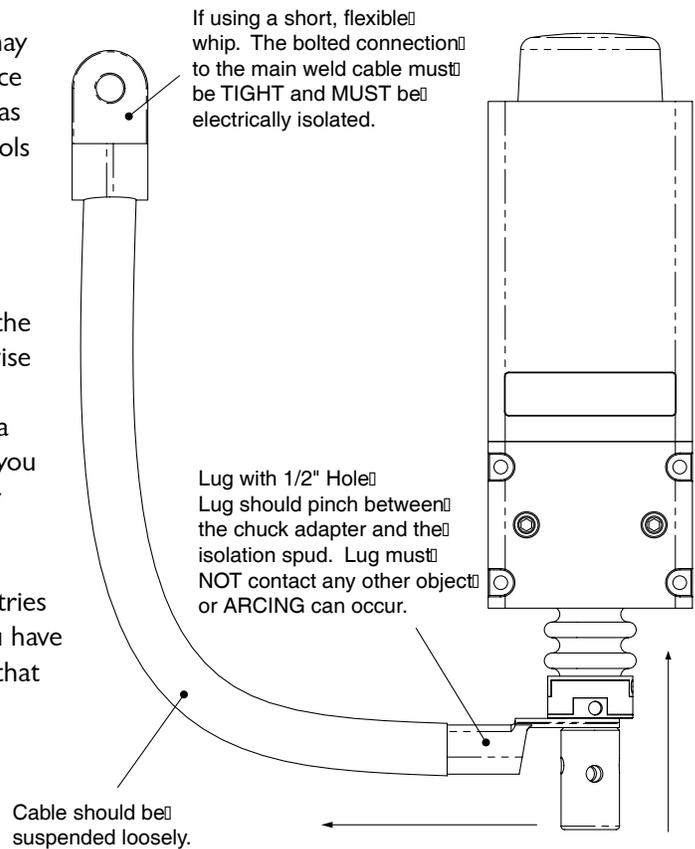
The control cable screws into the back of the weld tool. Be sure and line up the keys on the cable with the key ways on the connector. Screw the outer ring of the control cable clockwise until the cable is snug against the connector. This same process applies to the front of the power supply if you have a screw style connector (Image Industries power supplies). If you do not have a screw style connector the connectors typically push directly into the power supply. In any arrangement the connector for the weld tool can not be confused with the connector for the power supply. Please consult Image Industries if you have questions regarding installation and set up. If you have unique equipment situation Image will be glad to assist with that situation as well.

WIRING TO SWITCH BOXES OR AUTOMATION

SEQUENCE DESCRIPTION

The stud weld tool automates the stud welding process. It performs several key functions:

1. It holds the stud.
2. It holds the ferrule, spark shield and/or gas delivery system.
3. It automatically strikes the arc.
4. Establishes the arc length (lift distance).
5. Via the power supply, the weld tool controls the arc time.
6. Controls the placement of the fastener
7. Controls the rate of plunge of the stud into the base metal.



Section 2

Installation & Set Up

Before you begin to weld anytime it is important to review the set up. By making sure that the weld tool is set up properly (according to the previous set up instructions), you will have the best welding results. 95% of all stud welding problems are due to improper weld tool set up or improper power settings. Once you have set up the weld tool as described in Section 2, the actual welding process is straight forward.

		Cable from Welder		Controller or Switch Box	Cable to Weld Tool	
		Yellow Insulation	Black Insulation		Green	Not Used
Wire Colors	A	Black	Black	Short Black & White wires together via relay or push button to initiate weld sequence.	Red with White Stripe	Connect to wire C on Cable from welder.
	B	White	White		No Connect	
	C	Brown	Red	No Connect	Red with Black Stripe	Connect to wire D on Cable from welder.
	D	Blue	Green			

1. Place the stud to be welding into the weld chuck.
2. Place a ferrule into the ferrule grip (this step is not necessary if you are using a spark shield)
3. Lower the weld tool so the end of the stud is on the location where you want it welded
4. Continue to lower the weld tool downward so the ferrule (or spark shield) is sitting on the base metal. The ferrule (or spark shield) must be sitting on the surface to be welded. Do not apply too much pressure or the ferrule will crack. This step is important to achieve quality welds.
5. Press the trigger (or activate automation sequence) to begin the weld sequence.
6. Make sure your fixturing holds the weld tool still during the arcing process.
7. After the weld has completed continue to hold the weld tool still for 1 second (time will vary based on the weld base diameter) to allow the molten metal to solidify.
8. Raise the weld tool from the welded stud. Be sure and pull the weld tool straight off of the welded stud to prevent damage to the weld chuck. This is typically not an issue with production weld tools as they are mounted on a slide mechanism that ensures linearity.
9. Break away the ferrule and inspect the weld. (Only applies if ferrule was used.)

POWER SUPPLY SET UP / RECOMMENDED SETTINGS

Please refer to the power supply documentation for recommended time and current settings for particular applications

PLUNGE DAMPENER

The plunge dampener controls how fast the melted stud drops into the molten weld pool. There are three typical dampeners: soft (D rating), medium (E rating) or hard (F rating). Note: the production gun ships standard with a soft dampener.

Stud Diameter	Recommended Dampener
3/8 or less	None
3/8 to 3/4	Soft Dampener 'D'
3/4 to 1	Medium Dampener 'E'

Hard ('F' rating) dampeners are typically only used for large diameter, extremely heavy studs.

GAS FOOT

This weld gun can also be used with gas arc process. To use this gun with gas arc, only the foot needs to be changed to a gas arc foot.

Accessories required for gas arc welding

FTGA20-3	Gas Foot Assembly for up to 1 3/4 (45mm) long stud.
CG134-11	15' gas hose between Above gas foot and Image Industries welder

Consult the Factory or your local Distributor for assistance with special applications.

Section 5

Trouble Shooting

Possible Cause	Possible Solutions
Hang up. Stud looks like it is sitting on a pedestal with an hour glass shape.	Check alignment of the foot to ferrule and stud.
	Too little plunge. Increase the amount of stud extending past the end of the ferrule or spark shield.
	Service the weld tool to ensure lift/release actions are functioning properly.
Undercutting or lack of fillet.	Too little plunge. Increase the amount of stud extending past the end of the ferrule or spark shield.
	Too little weld time or current. Check power supply manual for base line power recommendations.
	Check alignment of the foot to ferrule and stud.
A lot of splatter or BBs shoot out from the weld zone.	Too much plunge. Decrease the amount of stud extending past the end of the ferrule or spark shield.
	Too much current or time. Check power supply manual for base line power recommendations.
	Dampener Required. If you have a dampener the dampener may have worn out and need replacement. See optional equipment in Section 4.
Stud breaks off and weld zone looks "crystallized".	Not enough weld current or time. Check power supply manual for base line power recommendations.
Bubbles in weld fillet.	If you are attempting short arc you may not be able to eliminate this condition. To improve this situation shorten time and increase current. If the results continue to be unsatisfactory then you may need to add a shielding gas.
	Check your gas flow/type of shielding gas.
	If you are using flux loaded studs, check to make sure there is a flux load present on the end of the stud.
	Be sure the operator is using a ferrule if using fluxed studs.
No lift.	Check alignment of the foot to ferrule and stud.
	Check for weld tool coil short or open. There should be 19 ohms of resistance in the gun coil.
	Check weld tool coil connections.
	Check adjustable core and make sure it is not bottomed out (turned in too far clockwise) or backed out too far (turned too far counterclockwise).
	Check trigger circuit for opens or shorts.
Short stud and can't get enough to extend past the ferrule.	Adjust the internal stop in the chuck.
Arc extinguishes, or just get a tiny arc but no weld.	Too much lift. Review set up procedures in Operation Manual.
	Check ground path from the power supplies. All joints must be very tight.
No weld.	Broken weld cable.
	Broken or bad ground cable/connection.
	Check weld tool lift.
Tool's shaft doesn't move freely when compressed by hand.	Dirt is binding the mechanism. Service weld tool.
	Check alignment of the foot to ferrule and stud.
	Front cover missing alignment dowels and lift mechanism binding. Service weld tool.
Weld tool spindle is sloppy and has a lot of free play.	The front bearing may be worn or missing. Replace bearing.
	The chuck, chuck adapter, isolator spud or spindle may be loose.
	Front cover may be loose. Tighten screws.

MAINTENANCE SCHEDULE

Maintenance requirements will vary with environment and usage. Dirty work areas or high volume stud welding will require more frequent maintenance.

Typical Environments

Full tear down service	Annual
Intermittent service and cleaning	6 months

For high volume or dirty environments:

Full tear down service	6 months
Intermittent service and cleaning	Monthly

There are three prime reasons for maintenance:

1. **Dirt.** Dirt can enter the lifting mechanism and cause erratic lift and plunge operations. Typically, cleaning is all that is required.
2. **Wear.** Components do wear out over time. Typically, items such as the bearing or cables wear out and need to be replaced.
3. **Improper Use.** Components can arc out by inadvertently placing them against grounded materials during a weld sequence.

MAINTENANCE PROCEDURES

The proper maintenance procedure is to

1. Disassemble the weld tool.
2. Inspect all parts for wear or damage.
3. Replace worn or damaged components.
4. Clean all components
5. Reassemble
6. Adjust settings and test.

Intermittent Service and Cleaning

Follow the instructions for Complete Disassembly and perform the following steps

Steps: 1, 2, 3, 8, 10, 12

Wipe down the weld tool spindle (main shaft) with a soft rag. Spray down the lifting rod (12) and the moveable core (15) with a degreaser. Clean all parts and inspect for wear. Place a light film of a light grease such a lithium based grease on the shaft of the lifting rod (12). Reassemble.

Complete Disassembly / Assembly Instructions

Note Part numbers from the exploded diagram on page 20 are placed in ()

1. Be sure and disconnect the weld tool from the power supply before adjusting or servicing the weld tool. This is a safety precaution to prevent accidental activation.
2. Remove the weld tool from the mounting will make service much easier. The weld tool is located with 3/16 x 3/4 dowel pins to facilitate removal and installation. The weld tool is retained via 4 #10-32 socket head cap screws in the front cover (6).
3. Remove all accessories from the weld tool before servicing.
To remove the legs loosen the set screws (7) in the front cover (6) of the weld tool that retain the legs and pull them straight out. Inspect the legs for damage and straightness. Bent legs should be replaced.

To remove the chuck insert the chuck key into the chuck adapter and turn the key 180 degrees. Inspect the chuck for damage. Pay special attention to where the stud is inserted. If it looks like there are threads or pitting on the inside of the chuck then the chuck is worn out and needs to be replaced. The chuck must hold the item to be welded firmly. If there is a loose fit, the chuck needs to be replaced.

4. Unscrew the chuck adapter (1)
Place a pin (the non tapered end of the chuck key works well) through the holes in the chuck adapter (1). Place the spanner wrench (33 supplied when the weld tool was originally shipped) in the lower most holes in the isolator spud (2). Using the spanner wrench, hold the spud fixed and rotate the chuck adapter off of the isolator spud. There is .5 inches of threads so it will take several turns to remove the chuck adapter from the isolation spud. Once the chuck adapter is remove the weld cable can be slid off the end.

Also inspect the threads that hold the chuck adapter onto the isolation spud. If the threads are pitted or damaged the chuck adapter should be replaced.

5. Unscrew the isolator spud (2)
Slide the dust bellows (3) away from the front cover (6) and place a 5/8 open end wrench onto the wrench flats on the spindle (4). Use the spanner wrench in the top set of holes on the isolator spud. Hold the spindle still and use the spanner wrench to unscrew the isolator spud (2).
6. Remove the dust bellows (3)
The rubber dust bellows just slides over the spindle (4). The dust bellows is important because it keeps dirt and other contaminants out of the internal mechanisms of the weld tool. if the bellows have holes in the sides or is torn or missing, it should be replaced.
7. Unscrew the spindle (4)
Use a 5/8 open wrench on the wrench flats on the spindle. Unscrew the spindle (4) from the cable clamp adapter (10). Carefully, pull it straight out of the front of the weld tool. When reinstalling the spindle be careful as to not damage the linear bearing. Do not lubricate the spindle.
8. Remove the front cover (6)
The front cover is held on with four socket head cap screws (5). Remove all 4 screws from the front cover. Pulling gently, the front cover will separate from the body (20). The body and front cover are aligned by two 3/16 x 3/4 dowel pins (19).

9. Remove the plunge dampener (10)
The dampener is simply placed inside the front cover. It pulls straight out and pushes straight back in. When the plunge dampener is activated by your finger it should offer continuous resistance over the entire range of travel. The plunger should then return, by itself, to full extension. If this is not the case the dampener needs to be replaced.
10. Remove the lift mechanism (11, 12, 13, 14, 15, 16, 17, 18)
The assembly will easily come out of the front of the weld tool body (20) as a complete assembly.
11. Remove the Cable Clamp Adapter (11)
Remove cap screws (5) from the cable clamp adapter (11) and the cable clamp adapter will separate from the lifting rod (12)
12. The Lifting Rod (12)
Push the lift release (14) firmly against the moveable core (15) and the lifting rod will pull straight out. Inspect the lifting rod for wear or damage. The brass inserts should show no signs of loosening. The steel shaft should not have any nicks on it. Run your fingers over the shaft. If you can feel grooves from the lifting bearing then the lifting rod is worn out. Typically the lifting rod and lift bearing should be replaced as a set. When reassembling, the shaft should have a light film of a light grease such as a lithium based grease.
13. Disassembly of the moveable core (15)
Remove the snap ring (15d) on the shaft of the core assembly. This snap ring acts as a spring seat and is important to maintain proper spring tension. The bearing retainer (15a) and the moveable core shaft (15b) are held together by a retaining ring (15c). This retaining ring can be removed with a small flat bladed screw driver or a razor tip. After removing the retaining ring (15c) the bearing housing will separate from the core shaft. The lift bearing (16) and the lift bearing spring (17) can now be removed.

When reassembling, the lift bearing balls (16) must face away from the lift bearing spring (17). Put a light film of a light grease (such as a lithium based grease) on the lift bearing (16) and the lift bearing spring (17).
14. Unscrew and remove the rear cap (28).
Use a flat bladed screw driver to remove pan head screw (29) which retains the rear cap (28). The rear cap is important because it prevents dirt and other contaminants from entering into the weld tool mechanism.
15. Remove the Adjustable Core (27)
Loosen the nylon tipped set screw (25) in the rear coil yoke (26) holding the adjustable core (27). Completely unscrew and remove the adjustable core (27).
16. Remove the Rear Coil Yoke (26)
Loosen the nylon tipped set screw (25) holding retaining the rear coil yoke. To do this the hex key will have to go into the opening on an angle to reach the set screw. Once the retaining set screw is loosened use a wrench to unscrew the rear coil yoke (26). When reassembling, only tighten the rear coil yoke (26) until there is no free play in the coil. There should not be any compression on the coil.
17. Remove the Connector Retainer (30)
Unscrew the flat head screws (31). The connector retainer & connector will separate from the body (20).

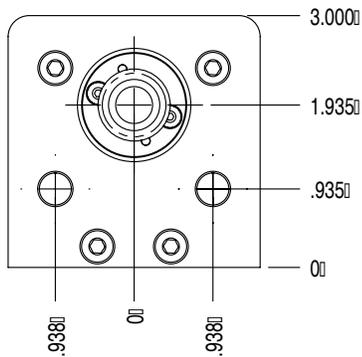
18. Remove the Coil (24)
The coil can be pulled straight out of the rear of the weld tool. If there is question of the coil condition check to make sure there is no varnish odor (a sign of overheating), heavy discoloration (another sign of overheating) and verify coil resistance at 19 ohms +/- 1 ohm.
If the coil to connector wires are cut, the coil wires connect to the red and white stripe and the red and black stripe wires.
19. Removal of the Control Cable Connector (32)
If necessary (it typically is not necessary), cut the wires connecting the coil to the control cable connector. Once these wires are cut the control cable connector (32) can unscrew from the connector retainer (30).
19. Removal of the Front Coil Yoke (22)
In front of the coil (24) is the front coil yoke (22). The front yoke should pull directly out of the rear of the weld tool body (20).
20. Removal of the Rear Bearing (23)
Squeeze the flange together at the split and the rear bearing will come out of the front coil yoke (22). Notice the counter bore on the front coil yoke (22) that the flange of the rear bearing (23) fits into. When reassembling be sure that the flange of the rear bearing (23) faces the rear of the weld tool or coil (24).

Be sure and inspect the bearing as this is a typical wear item.

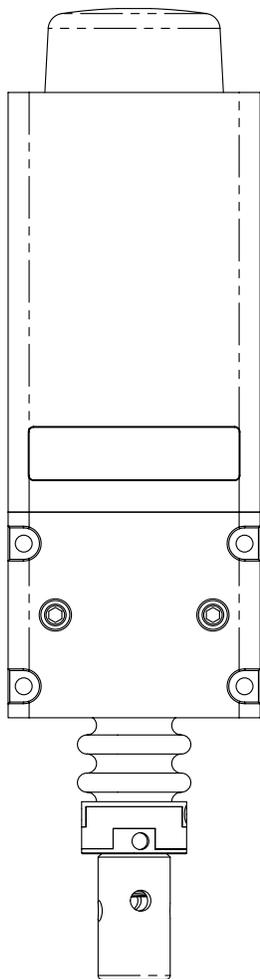
To reassemble, reverse the steps above.

Section 7

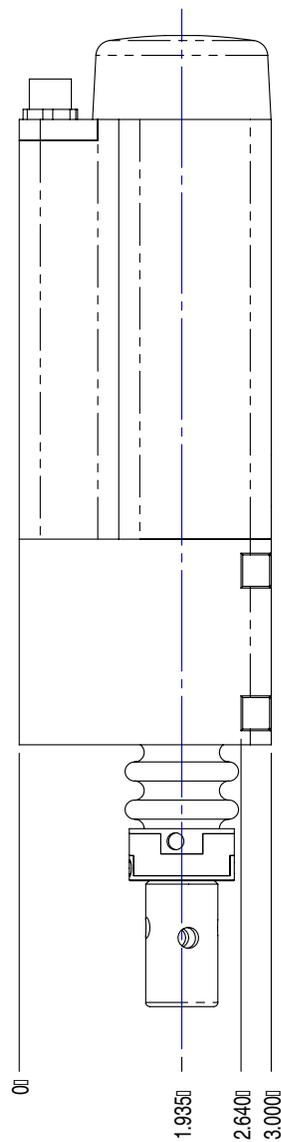
Mechanical Dimensions



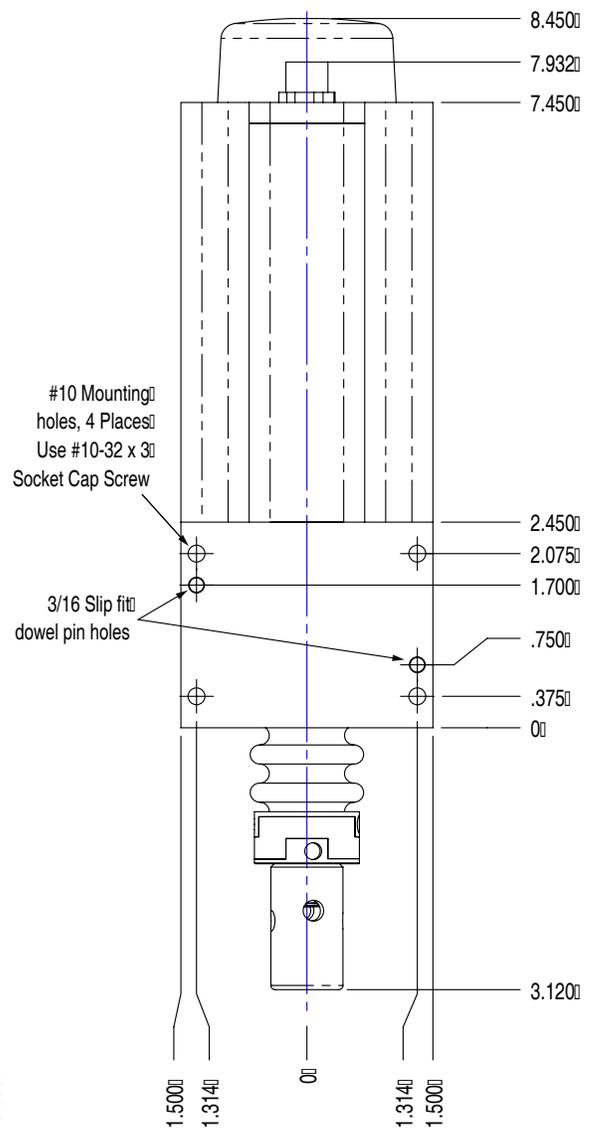
Front View



Top View



Side View

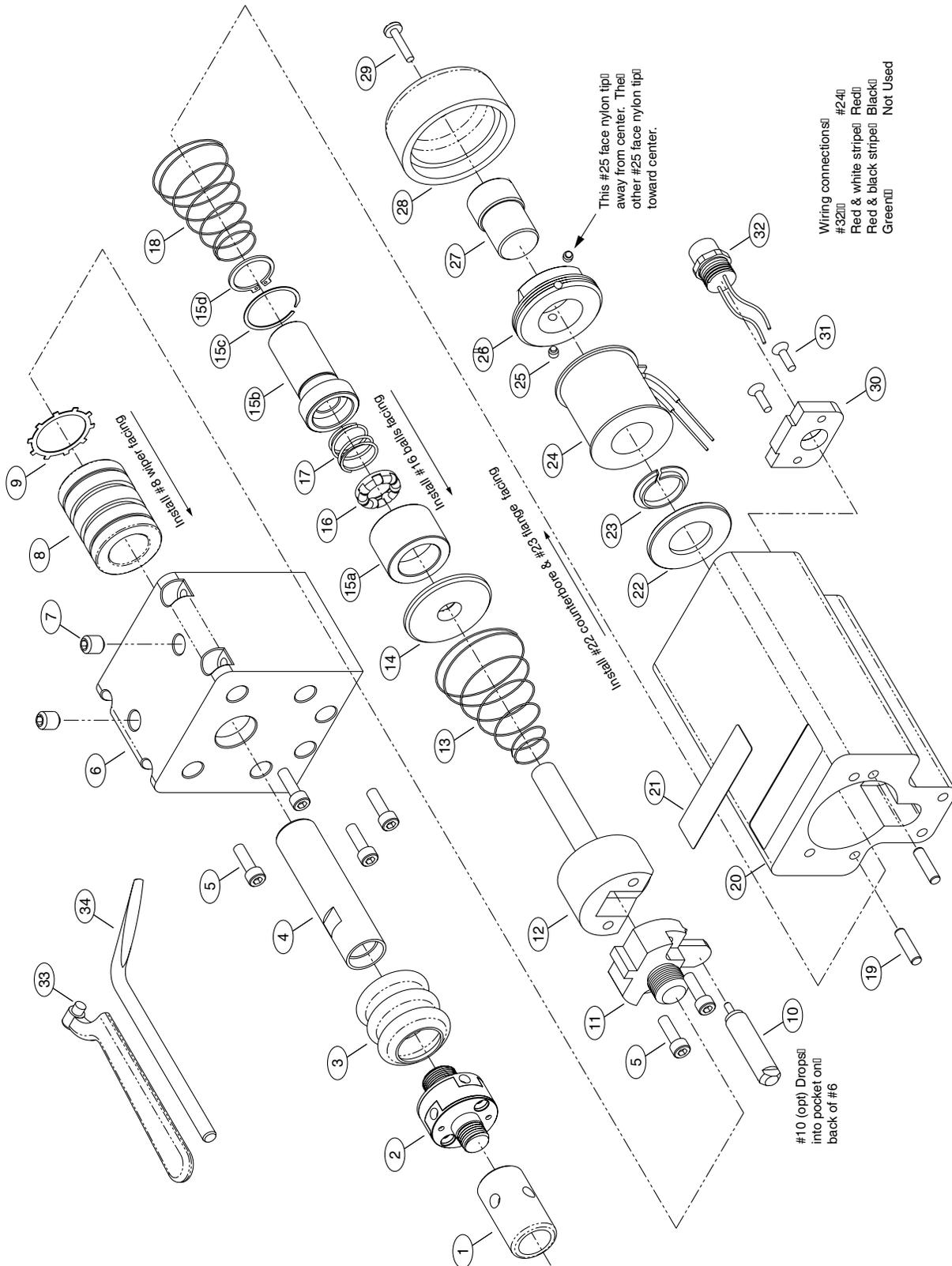


Bottom View



Section 8

Parts List



Section 8

Parts List

Item	Description	Part Number
01	Chuck Adapter	GHM12
02	Isolation Spud Assembly	GHM36
03	Dust Bellows	GHM14
04	Spindle	GHM801
05	Socket Head Cap Screw #10-24 x 5/8	SHC19-62
06	Front Cover	GHB16
07	Leg Retention Set Screws	SSC31-37CP
08	Linear Bearing with Wiper	BLF75-125
09	Linear Bearing Retainer	BLR-1
10	Plunge Dampener (D soft, E medium, F hard)	GAM21D
11	Cable Clamp Adapter	GHM18
12	Lifting Rod Assembly	GAM22
13	Main Spring	GAM23
14	Lift Release	GAM24
15	Moveable Core Assembly	GBM10
15a	Lift Bearing Retainer	GBM10A
15b	Moveable Core Shaft	GBM10B
15c	Retaining Ring	VHS-100
15d	Spring Seat	SHI-75
16	Lift Bearing	GAM8
17	Lift Bearing Spring	GAM9
18	Core Return Spring	GAM11
19	Dowel Pin 3/16 x 3/4	DPC19-75
20	Weld Tool Body	GHB1
21	Decal	GHD1
22	Front Coil Yoke	GAM2
23	Nylon Bushing	GAM15
24	Coil	GAE3
25	Set Screw #8-32 x 3/16 Nylon Tip	SSC16-18N
26	Rear Coil Yoke	GAM4
27	Adjustable Core	GBM5
28	Rear Cap	GHB6
29	Pan Head, Slotted #8-32 x 3/4	PSC16-75ZP
30	Connector Retainer	GHM701
31	Socket Flat Head #6-32 x 1/2	FHC13-50
32	Control Cable Connector	CSS3MR
33	Isolation Spud Wrench (Spanned Wrench)	SW20-125-450
34	Chuck Ejection Key	CEK
35	Weld Cable Tang	GHM43
36	Plunge Damper Access Screw	GHM120
37	Optional Flexible Weld Cable Whip	

Please visit us on the web at www.imageindustries.com



IMAGE INDUSTRIES INC.

11220 E. Main Street • Huntley, IL 60142 USA

Tel: (847) 659-0100 • (800) 722-7883 • Fax: (847) 659-0108

www.imageindustries.com • email: sales@imageindustries.com