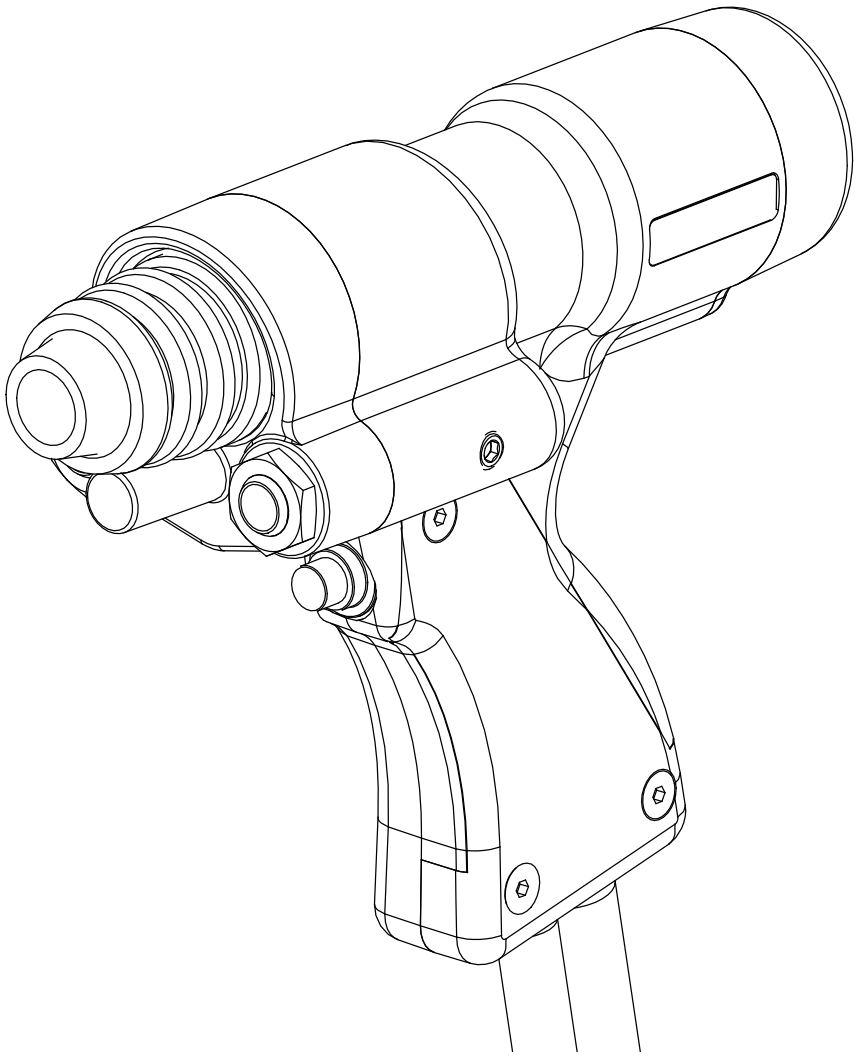
WTS
May, 2011

Operation Manual

Instruction and Maintenance Manual for Image Industries Standard Duty Model Stud Welding Tools



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.

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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 it's 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.

Section 1 Safety Precautions

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.

PROTECT YOURSELF AND OTHERS -

Some welding, cutting, and gouging processes are noisy and require ear protection. The arc, like the sun, emits ultraviolet (UV) and other radiation and can injure skin and eyes. Hot metal can cause burns. 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 welding helmets, face shields and goggles are also required.
2) Use a face shield fitted with the correct filter. Cover sparks and rays of the arc when operating or observing operations. 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, cuff less 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.
5) Protect other personnel from arc rays and hot sparks with suitable nonflammable partitions or curtains.
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.

FIRES AND EXPLOSIONS -

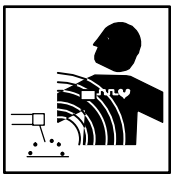
Heat from flames and arcs can start fires. Hot slag or sparks can also cause fires and explosions. Therefore:

1) Remove all combustible materials well away from the work area 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.
2) 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.
3) 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. Do not do hot work on closed containers. They may explode.
4) 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.
5) Do not use equipment beyond its ratings. For example, overloaded welding cable can overheat and create a fire hazard.
6) 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.
7) 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

ELECTRICAL SHOCK -

Contact with live electrical parts and ground can cause severe injury or death. DO NOT use welding current in damp areas, if movement is confined, or if there is danger of falling.

1) Be sure the power source frame (chassis) is connected to the ground system of the input power.
2) Connect the work piece to a good electrical ground.
3) Connect the work cable to the work piece. A poor or missing connection can expose you or others to a fatal shock.
4) Use well-maintained equipment. Replace worn or damaged cables.
5) Keep everything dry, including clothing, work area, cables, torch/electrode holder and power source.
6) Make sure that all parts of your body are insulated from work and from the ground.
7) Do not 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.
8) Put on dry, hole-free gloves before turning on the power.
9) 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.



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) Operators 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) Operators 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.

FUMES AND GASES -

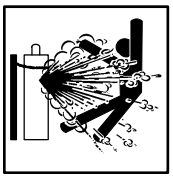
Fumes and gases can cause discomfort or harm, particularly in confined spaces. Do not breathe fumes and gases. Shielding gases can cause asphyxiation. Therefore:

1) Always provide adequate ventilation in the work area by natural or mechanical means. 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.
2) Do not operate near de greasing and spraying operations. The heat or arc rays can react with chlorinated hydrocarbon vapors to form phosgene, a highly toxic gas, and other irritant gasses.
3) If your 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.
4) Refer to ANSI/ASC Standard Z49.1 (see listing on next page) for specific ventilation recommendations.

ELECTRICALLY POWERED EQUIPMENT

Faulty or improperly electrified 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 perform such work.
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) Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacture's recommendations.
4) Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.



CYLINDER HANDLING -

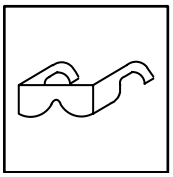
Cylinders, if mishandled, can rupture and violently release gas. Sudden rupture of cylinder, valve, or relief device can injure or kill. Therefore:

1) Use the proper gas for the process and use the proper pressure reducing regulator designed to operate from the compressed gas cylinder. Do not use adaptors. Maintain hoses and fittings 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 on a cylinder.
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

HEARING PROTECTION -

Prolonged Noise from Capacitor Discharge welding applications can damage hearing if levels exceed limits specified by OSHA. Therefore:

1) Use Approved ear plugs or ear muffs if noise level is high.
2) Warn others nearby about noise hazard.
3) For additional information, refer to OSHA Safety Standards 3074.



EYE PROTECTION -

Flying metal can injure eyes. Welding, chipping, wire brushing and grinding can cause sparks and flying metal. As welds cool, they can throw off slag. Therefore:

1) Wear approved safety glasses with side shields even under your welding helmet.
2) Warn others nearby about flying metal hazard.

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 perform such work.
2) Before performing any maintenance work inside a power source, disconnect the power source from the incoming electrical power.
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.

MOVING PARTS CAN CAUSE INJURY -

Electric fan can start at any time without warning and cause severe injury, therefore:

1) Always disconnect electrical power prior to service to prevent the fan from starting unexpectedly.
2) Keep all doors, panels, covers, and guards closed and securely in place.
3) Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4) Keep hands, hair, loose clothing, and tools away from moving parts.
5) Reinstall panels or guards and close doors when servicing is finished and before reenergizing welder.

ADDITIONAL SAFETY INFORMATION -

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

The following publications, which are available form the American Welding Society, 550 N.W. LeJuene Road, Miami, FL 33126, are recommended to you:

1) ANSI/ASC Z49.1 - *"Safety in Welding and Cutting"*
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 That Have Held Hazardous Substances."*

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.

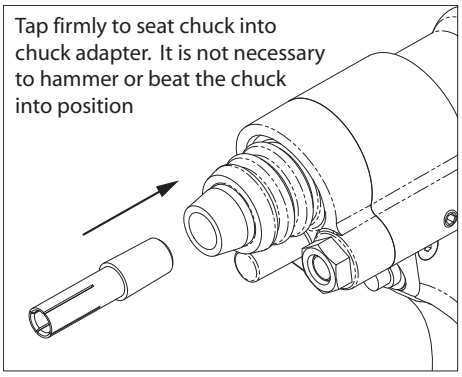
DANGER Used to call attention to immediate hazards which, if not avoided, will result in immediate, serious personal injury or loss of life.

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.

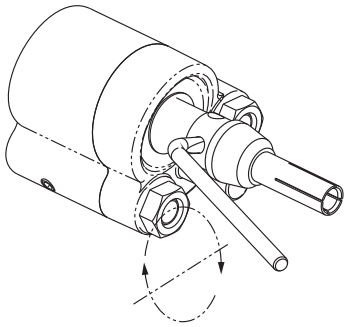
Section 2 Installation & Set Up

CHUCK REMOVAL & INSTALLATION



To install a chuck, position the chuck into the front of the chuck 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.

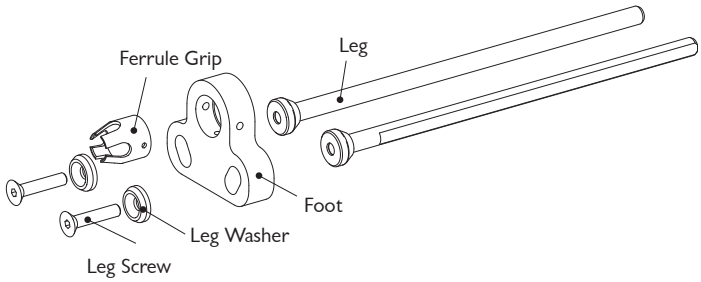
There is a unique chuck for every diameter of stud. Rectangular and other special shape studs will require specialized chucks. There is also a depth stop inside of the chuck. The depth stop should be adjusted so that you are retaining a good portion of the stud you are setting up to weld. Typically, this is one third to one half of the length of the stud you are welding.



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. You may have to move the rubber bellows to clearly see the holes in the side of the chuck adapter. Rotate the chuck key either clockwise or counter clockwise and the chuck will pop out of the chuck adapter. Do not use a prying motion. This will damage the chuck, chuck adapter and the chuck ejection key. Always use a rotating motion and the chuck will eject easily.

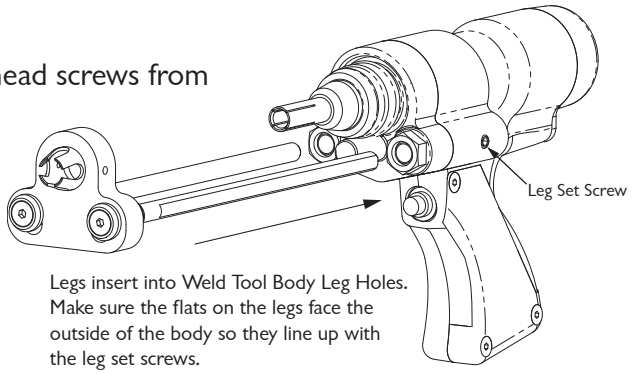
FOOT & LEG SET UP

The foot comes in 3 different sizes (small, medium and large) and 2 different configurations (closed and split). Typically, a split foot is only used when welding headed anchors and sheer connectors. The standard weld tool ships with a small foot and 9" legs. The medium & heavy duty weld tools ship with a medium foot and 14" legs.



Foot Size	Stud Range	Part #
Small	up to ½ inch	FTS20
Medium	5/8-3/4	FTM20
Large	7/8 and larger	FTL20

The foot is installed on the ends of the legs. Unscrew the flat head screws from the ends of the legs. Place the trim washers on the flat head screws and place the screws through the adjustment slots in the foot. Reattach the screws to the legs.



Insert the legs into the weld tool body leg retainers. 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. 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 retainer anymore.

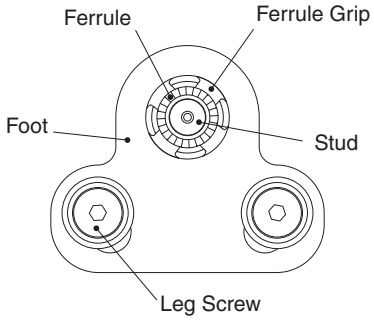
Section 2 Installation & Set Up

FERRULE GRIP / SPARK SHIELD REMOVAL & INSTALLATION

There are two set screws (some feet have three) that retain the ferrule grip or spark shield in the foot. Loosen both set screws in the foot. Push the grip or spark shield into the foot. The grip is sometimes a tight fit so press it firmly into the foot so it seats against the back stop of the foot. 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. These screws simply retain the grip by having the points go through the holes in the grip and do not "screw into" the grip.

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

FOOT 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 perfectly aligned in the ferrule. Retighten the flat head screws.

CONNECTING TO A POWER SUPPLY

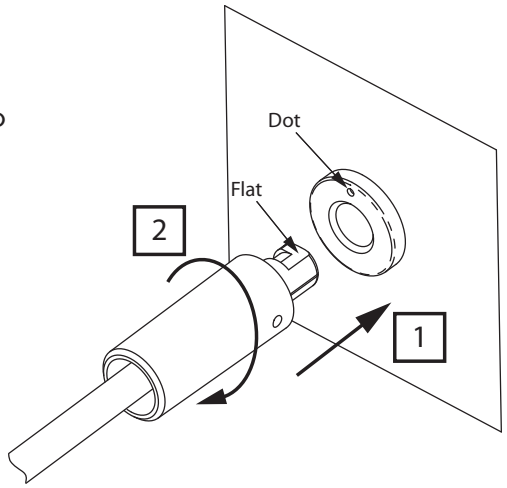
Hooking the stud weld tool to a stud welding power supply is straight forward.

There are two steps:
1. The weld cable and
2. The control cable.

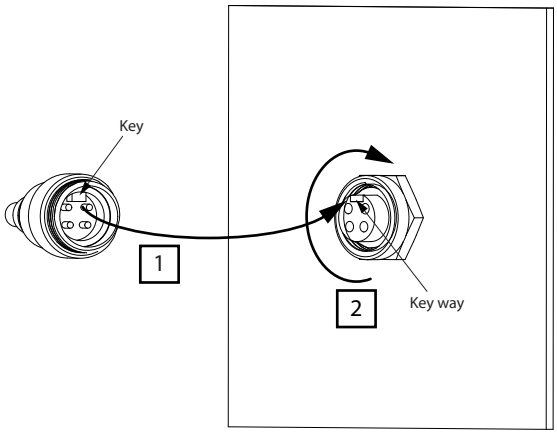
These same instructions apply if you are connecting to an extension cable instead of directly into a power supply.

1. Connecting the weld cable
   Align the flat on the weld cable connector with the indicator dot on the front panel of the machine. Push the connector into the receptacle until the cable insulator contacts the receptacle. Turn the cable connector to the right until it is tight.

   The weld tool will connect to the black output terminal. If both terminals are black, the weld tool will connect to the one labeled gun, negative or "-".



2. Connecting the control cable
Connecting the control cable will vary with the style of control cable control cable that is on your new weld tool. There are 4 basic types:



A. Screw Style (this mates to Image Industries equipment)
There is a key inside the end of the control cable connector. Align the key in the connector with the key way inside the connector on the front of the power supply. Push the connectors together. Begin turning the retaining nut on the control cable clockwise. When the nut is snug the connection is complete.

To remove, unscrew the connector fully and pull out of the receptacle.

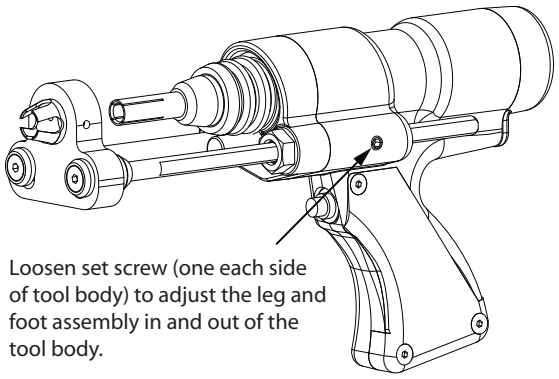
B. R&S (4 pins Nelson, Erico, KSM & Proweld Equipment)
Align the bump on the shell of the connector with the relief in the receptacle. Push the cable connector firmly into the receptacle.

To remove, twist the outer shell of the cable connector counter clockwise. While holding the shell in a counter clockwise position pull the connector straight out.

C. Cannon (6 pins Older Nelson Equipment)
On the cannon connector there is a notch which lines up with a release lever on the power supply receptacle. Line the two up and just push the connectors together. To remove, press the release lever on the receptacle and pull the connector out of the receptacle.

D. Hubble (2 pin Nelson)
To connect a 2 pin style connector, line up the wide tab with the wide slot. Push forward on the connector when the connector housing contacts the receptacle turn the connector body 1/8 turn clockwise.

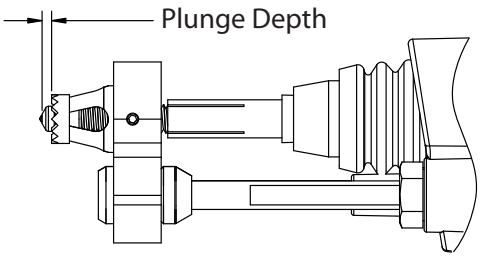
PLUNGE ADJUSTMENT


Loosen set screw (one each side of tool body) to adjust the leg and foot assembly in and out of the tool body.

Plunge Settings When Using Ferrules

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.

Stud Diameter	Plunge
.25-.625	.125
.75 and up	.188



To adjust the plunge, loosen the leg set screws in the weld tool body. Move the foot towards the tool or away from the tool to increase or decrease plunge. The plunge measurements are from the end of the stud and do not include the flux load.

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). For standard time duration Gas Arc the plunge should be set at about 2 flange thicknesses or 2mm.

ADJUSTING WELD TOOL LIFT (ARC LENGTH)

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.

Single phase equipment	1/8" lift for most applications.
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

Measuring Lift

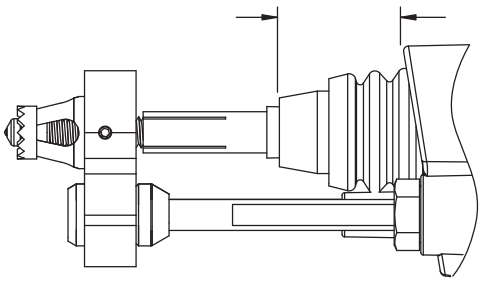
It is straight forward to measure lift.

WARNING

For safety from accidental activation, always disconnect the weld cable from the power supply before making any weld tool adjustments or performing any service on the weld tool.

To measure weld tool lift, hold a scale against some fixed part of the tool. The front cover or the foot will work well. Press the trigger so the tool activates the lift mechanism. Now measure again. The lift is the difference between the two measurements.

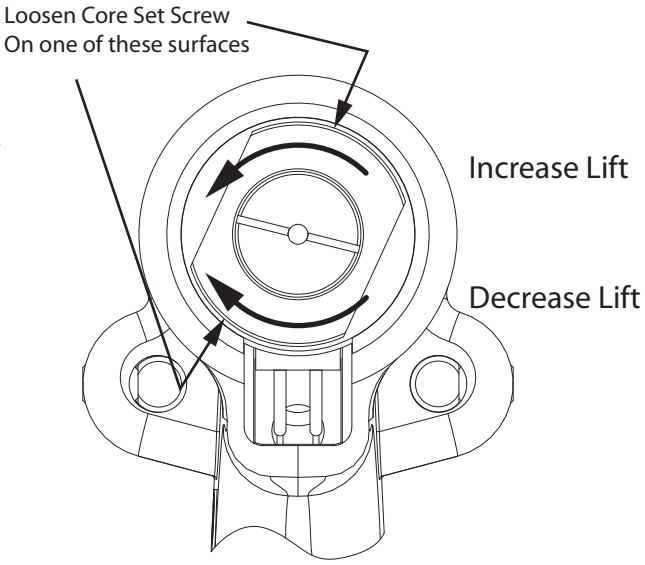
Measure from a fixed point on the tool body to a moveable piece of the lift mechanism. Press the trigger and measure the difference after lift.



Adjusting Lift

To adjust lift, remove the slotted screw holding the rear cap in place. Put the rear cap aside. Loosen the nylon tipped set screw that holds the adjustable core in place. To increase lift, turn the adjustable core screw counter clockwise. To decrease lift, turn the adjustable core screw clockwise. Each half turn is .025".

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



Section 3 Normal Operation

STUD WELD TOOL FUNCTIONS

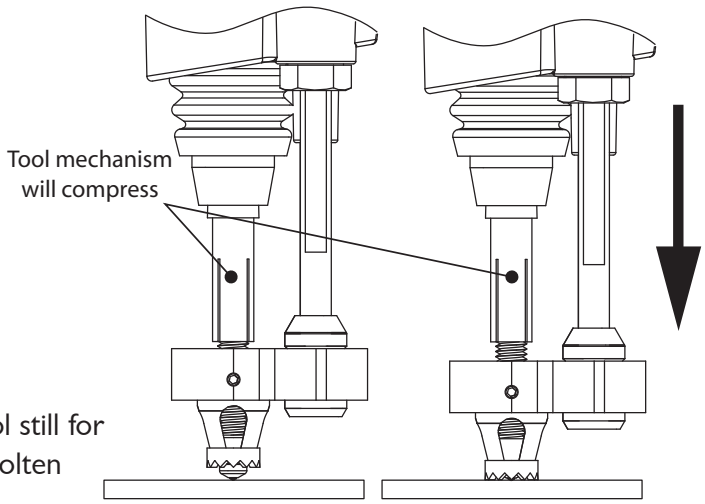
The stud weld tool automates the stud welding process. It performs several key function:
1. It holds the stud
2. It holds the ferrule, spark shield or gas delivery system
3. It strikes the arc.
4. Establishes the arc length (lift distance)
5. Via the power supply, the weld tool controls the arc time
6. Controls the rate of plunge of the stud into the base metal

STUD WELDING STEPS

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, 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.

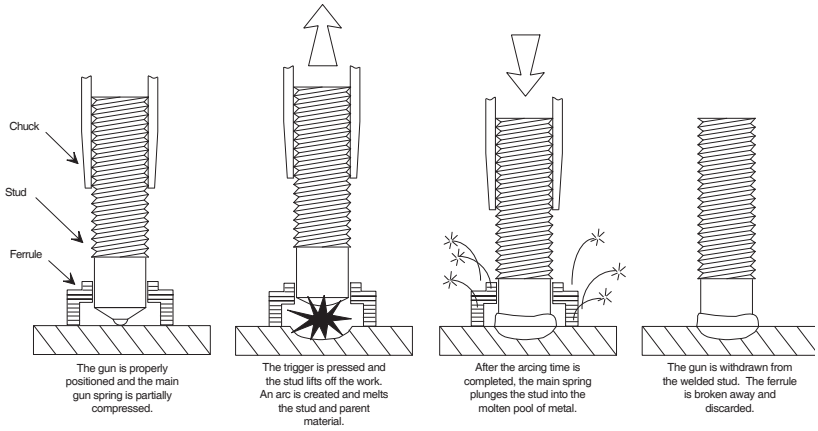
Once you have set up as described in Section 2, the actual welding process is straight forward.

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. Position the end of the stud onto the location where you want it welded
4. Press the weld tool downward so the ferrule is sitting on the base metal
5. Pull the trigger to begin the weld sequence.
6. Hold the tool still during the arcing process
7. After the weld has completed continue to hold the tool still for 1 second (or until red glow disappears) to allow the molten metal to solidify.
8. Remove the tool from the welded stud. Be sure and pull the tool straight off of the welded stud to prevent damage to the weld chuck.
9. Break away the ferrule and inspect the weld. (Only applies if ferrule was used)



Section 3 Normal Operation

Welding Sequence



Current / Time

Each piece of stud weld equipment has its own method of adjusting weld time and weld current. Consult the user manual for that piece of equipment for specific procedures.

Recommended Settings

Stud Size	Current	Time	Stud Size	Current	Time
1/4	350 A	.250 sec	6mm	350 A	.250 sec
5/16	420 A	.310 sec	8mm	420 A	.310 sec
3/8	530 A	.380 sec	10 mm	580 A	.430 sec
1/2	800 A	.500 sec	12 mm	720 A	.500 sec
5/8	1000 A	.680 sec	14 mm	880 A	.590 sec
3/4	1325 A	.750 sec	16 mm	1040 A	.660 sec
7/8	1680A	.830 sec	20 mm	1440 A	.780 sec
1	2000 A	.870 sec	24 mm	1900 A	.850 sec

These settings will vary with the weld tool's lift and plunge settings. Typical values are 3/32" for lift and 1/8" for plunge. Also the settings listed are for Image Industries equipment. Different manufacturers' equipment may have different setting recommendations. The values listed above will be good for initial set up.

Section 4 Options & Accessories

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).

Stud Diameter	Recommended Dampener	Part #
3/8 or less	None	
3/8 to 3/4	Soft Dampener	GAM21D
3/4 to 1	Medium Dampener	GAM21E

Hard (GAM21F) dampeners are typically only used for large diameter or exteremely heavy studs.

Foot

Foot Size	Stud Range	Part #
Small	up to ½ inch	FTS20
Medium	5/8-3/4	FTM20
Large	7/8 and larger	FTL20

Legs

Length	Part #
9"	L37-9
14"	L37-14
18"	L37-18

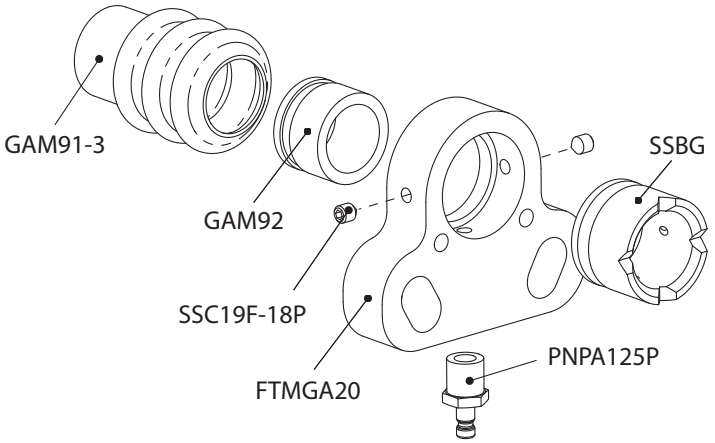
Chucks

Stud Size	Std Chuck	Long Chuck
1/4	C25	CL25
5/16	C31	CL31
3/8	C37	CL37
1/2	C50	CL50
5/8	C62	CL62
3/4	C75	CL75
7/8	C87	NA
1	C1	NA

Grips

Stud Size	Std Grip	Split Grip	Long Split Grip
1/4	G25	GS25	GSL25
5/16	G31	GS31	GSL31
3/8	G37	GS37	GSL37
1/2	G50	GS50	GSL50
5/8	G62	GS62	GSL62
3/4	G75	GS75	GSL75
7/8	G87	GS87	NA
1	G1	GS1	NA

Gas Foot (used for gas arc stud welding)



Complete Assembly FTMGAA

Section 5 Trouble Shooting

	Observed Problem	Possible Remedy
1	Hang Up. Stud Looks like it's sitting on a pedestal with an hour glass shape.	Check alignment of the foot.
		Service the weld tool to ensure lift/release actions are functioning properly.
2	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 section 3 for base line power recommendations.
3	A lot of splatter or bb's shoot out from the weld zone.	Too much plunge. Decrease the amount of stud extending past the end of the ferrule or spark shield.
		Dampener Required. If you have a dampener the dampener may have worn out and need replacement. See optional equipment in Section 4.
		Too much Current or Time. Check section 3 for base line power recommendations.
4	Stud Breaks off and weld zone looks "crystallized".	Not enough weld current or time. Check section 3 for base line power recommendations.
5	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 in the end of the stud. If there is flux present, follow recommendations in #4
6	No Lift.	Check weld tool coil connections.
		Check for weld tool coil short or open. There should be 19 ohms of resistance in the weld tool coil.
		Check adjustable core and make sure it is not bottomed out (turned in too far clockwise).
		Check trigger circuit for opens or shorts.
7	Short Stud and can't get enough to extend past the ferrule.	Adjust the internal stop in the chuck.
8	Arc Extinguishes, or just get a tiny arc but no weld.	Too much lift. Review set up procedures in Section 1.
		Check Ground path from the power supplies. All joints must be very tight.
9	No Weld.	Broken Weld Cable.
		Broken or bad Ground Cable/connection.
		Check weld tool lift.
10	Weld Tool Shaft does not move freely when compressed by hand.	Dirt is binding the mechanism. Service weld tool.
11	Weld Tool Spindle is sloppy and has a lot of free play.	The front bearing may be worn out or missing. Replace bearing.
		Front cover may be loose. Tighten nuts.

Section 6 System Maintenance

WHEN IS MAINTENANCE REQUIRED?

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

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 plastic bearings or cables wear out and need to be replaced for good weld results and SAFETY.
3. Improper Use. Components can arc out by inadvertently placing them against grounded materials during a weld sequence. Also using the tool itself as a hammer to test welds will damage parts and require maintenance.

Maintenance Steps

The proper maintenance procedure is to:

1. Disassemble the 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.

Disassembly / Assembly Instructions

The item numbers referenced here are from the exploded diagram on page 20. Assembly is the reverse of disassembly.

1. Be sure and disconnect the weld tool from the power supply before adjusting or servicing the tool. This is a safety precaution to prevent accidental activation.

2. Remove all accessories from the weld tool before servicing.
   To remove the legs loosen the set screws (23) in the side of the tool body 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 ejection key (50) into the chuck adapter (02) and turn the key 180 degrees. Inspect the chuck for damage. Pay special attention to where the stud seats. If it looks like there are threads inside of the chuck then the chuck is worn out and needs to be replaced.

3. Remove the dust bellows (03)
The rubber dust bellows just slides over the end of the chuck adapter. It is a snug fit so it may take a bit of work. The dust bellows is important because it keeps dirt and other contaminants out of the internal mechanisms of the tool. If the bellows has holes in the sides or is torn or missing, it should be replaced.

4. Remove the chuck adapter (02)
The chuck adapter is unscrewed counter clockwise off the cable clamp adapter. It is very important that the chuck adapter be very tight on the cable clamp adapter so it will be a good electrical connection. An effective way of removing it is to insert a round rod (a phillips screw driver works well) through two of the chuck eject holes. There is .5 inches of threads so it will take several turns to remove the chuck adapter from the cable clamp adapter.

If the inside surface of the chuck adapter is pitted, it needs to be replaced. Also inspect the threads that hold the chuck adapter onto the cable clamp adapter. If the threads are pitted or damaged the chuck adapter should be replaced.

5. Remove the front cover nuts (01)
The front cover is held on with two nuts; use a 3/4 inch open end wrench and remove them.

6. Remove the front cover (05)
If the weld tool is equipped with a plunge dampener (07) it is housed in the front cover. Inspect the front cover. If the front cover is cracked it should be replaced. The front cover keeps dirt out of the internal mechanism and maintains alignment of internal components. Inspect the plastic bearing (04) for damage or excessive wear.

7. Remove the plunge dampener (07)
The dampener (optional) 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.

8. Remove the cable clamp adapter (08)
Remove two #10-32 x 5/8 socket head cap screws (06) from the cable clamp adapter. The cable clamp adapter will separate from the lifting rod. You should be able to maneuver the cable clamp adapter forward between the leg inserts in the tool body. Remove the #8-32 x 1/2 cap screw (11) on the back of the cable clamp adapter (08). There is a lock washer (10) on this screw so be careful not to loose it.

Inspect the threads on the cable clamp adapter. If the threads are damage replace the cable clamp adapter. This item transfers all the weld current. If there is damage on the threads the arcing will continue and potentially fuse all the components together.

9. Remove the lifting mechanism
The lifting mechanism consists of the lifting rod (12), main spring (13), lift release (14), moveable core (15-20) and core return spring (21). To disassemble press the lift release ring tight against the moveable core and pull the lifting rod out of the assembly. All of the components, listed above, will come apart.

10. The Lifting Rod (12)
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 (a Teflon based grease).

11. Disassembly of the moveable core (15-20)
Remove the snap ring (20) on the shaft (18) of the core assembly. This snap ring acts as a spring seat and is important to maintain proper spring tension. Where the core assembles into the bearing housing there is another retaining ring (19). This retaining ring can be removed with a small flat bladed screw driver or a razor tip. After removing the second retaining ring the bearing housing (15) 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 cage must be oriented toward the lift bearing spring (balls toward the opening in the bearing housing). Put a light film of a light grease (such as a Teflon based grease) over the lift bearing and the lift bearing spring.

12. Remove the Handle Cover (35)
Remove 3 flat head screws (36-37) that retain the handle cover. Inspect the handle cover for breakage.

13. Remove the Weld cable (40)
The weld cable can slide out of the tool body. Be careful unthreading the internal weld cable (09) from inside the body. The internal and external weld cables can be unscrewed from the weld cable anchor plate (32). Note the orientation of the weld cable anchor plate. The radius corner goes toward the top of the body.

Inspect the internal weld cable for fraying or broken wires. If it is starting to fray, the internal cable should be replaced.

Inspect the weld cable for fraying. Also inspect the strain (38) relief for tears. Inspect the cable jacketing for breaks, cuts or tears. If the cable shows signs of damage or wear it should be replaced. Also inspect the Cam-lok connector (39). If brass connector is pitted or damaged it should be replaced. Inspect the weld cable to cam-lok joint to ensure there is no fraying of the weld cable.

14. Remove the Control Cable (43) (if desired)
The control cable is removed by snipping the wires by the splice connectors. Inspect the control cable for damage. This includes the strain relief (41) and the insulating jacketing. If damaged, replace the control cable.

When reinstalling the control cable, there are typically two different color schemes.
Black and White wires connect to the trigger.
Blue and Brown Wires connect to the coil (polarity does not matter).

the other scheme:

Black and White wires connect to the trigger.
Red and Green wires connect to the coil (polarity does not matter).

Make sure all crimp connections are tight and there is no opportunity for electrical shorting.

15. Remove the Trigger Switch (31)
The trigger switch is a screw in style. Grabbing it can be difficult. A 1/2" collect is the ideal removal tool. Use an ohm meter to check trigger functionality.

16. Unscrew and remove the rear cap (29)
The rear cap is important because it prevents dirt and other contaminates from entering into the tool mechanism. Many operators unfortunately use the rear of the tool as a hammer to "check" studs and this damages many rear caps.

17. Remove the Adjustable Core (28)
Loosen the nylon tipped set screw (27) in the rear coil yoke holding the adjustable core. Completely unscrew and remove the adjustable core.

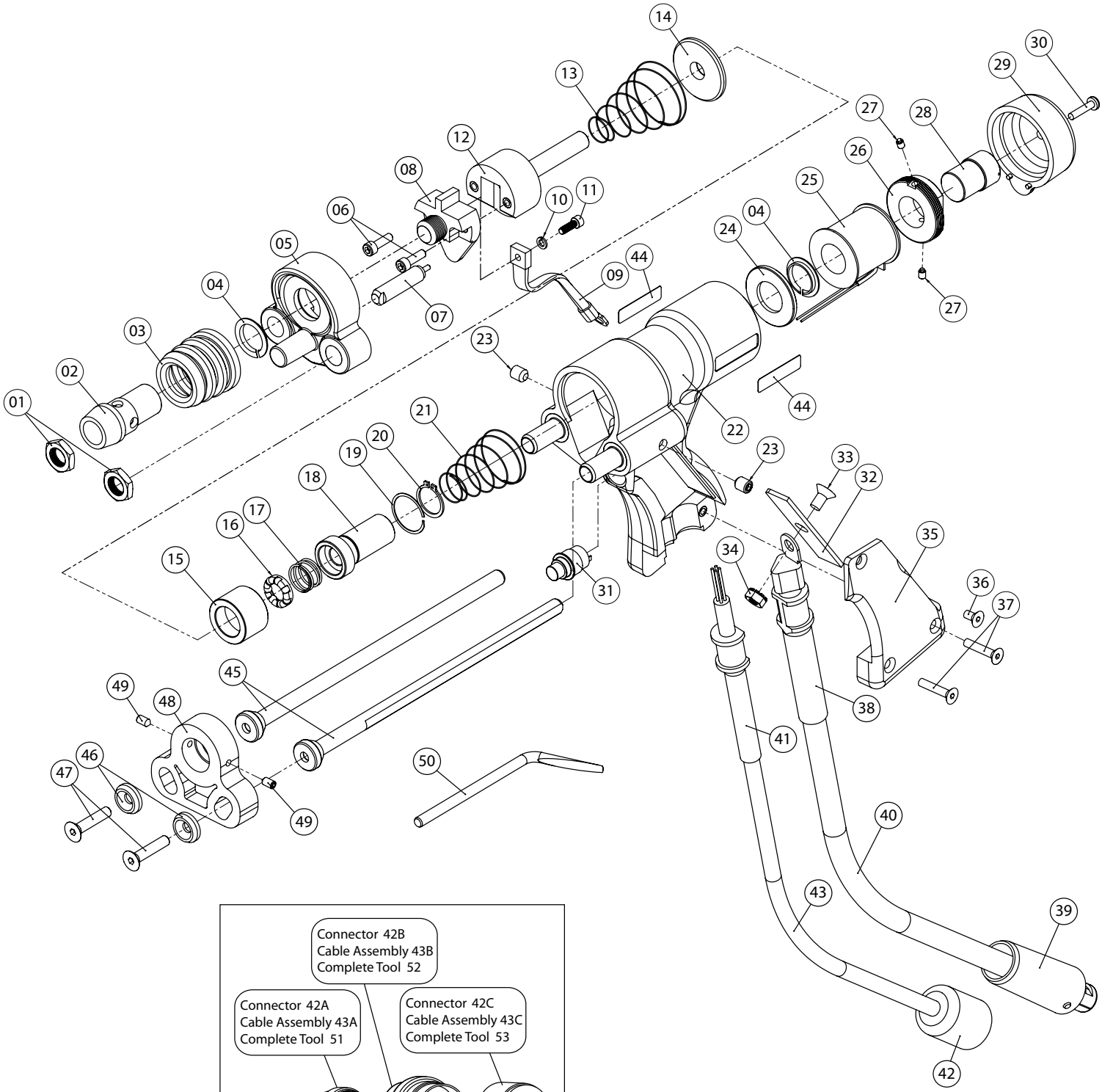
18. Remove the Rear Coil Yoke (26)
Loosen the nylon tipped set screw (27) holding retaining the rear coil yoke. To do this the hex key will have to go into the opening at an angle to reach the set screw. Once the retaining screw is loosened use a large wrench to unscrew the rear coil yoke.

19. Remove the Coil (25)
The coil wires (black and red or green and red inside the tool handle) must be cut prior to coil removal. This is done inside the handle. After the coil wires are free, the coil can be pulled straight out of the rear of the tool. If there is a question of the coil condition check to make sure there is no varnish odor (a sign of overheating), heavy discoloration (another side of overheating) and verify coil resistance at 19 ohms +/- 1 ohm.

20. Remove the Front Coil Yoke (24)
In front of the coil is the front coil yoke. This is a tight fit and may be a little difficult to remove. The front coil yoke contains a plastic bearing (04). This bearing should be inspected for wear or damage and replaced if necessary. During reassembly, make sure the bearing flange is seated in the counter bore on the front coil yoke. When putting the front coil yoke back into the coil housing, make sure that the bearing flange is facing the rear of the weld tool.

Section 7

Parts List



Section 7 Parts List

	Part Description		Part Number		Item	Part Description		Part Number
1	Front Cover Jam Nut	2	NJC50FZP		34	Anchor Plate Kep Nut	1	NKC25ZP
2	Chuck Adapter	1	GAM12		35	Handle Cover	1	10308
3	Dust Bellows	1	GAM14		36	Handle Cover Upper Screw	1	FHC19-37
4	Nylon Bushing	2	GAM15		37	Handle Cover Lower Screw	2	FHC19-1
5	Front Cover	1	GAB16		38	Weld Cable Strain Relief	1	GAM50
6	Cable Clamp Adapter Screw	2	SHC19-62		39	Male Weld Cable Connector	1	CCL1/0AMB
7A	Plunge Dampener Soft (optional)	1	GAM21D		40	External Weld Cable Complete	1	CW2FC-09
7B	Plunge Dampener Medium (optional)	1	GAM21E		41A	Cable Strain Relief (.340 Dia black control wire)	1	GAM51
7C	Plunge Dampener Hard (optional)	1	GAM21F					
8	Cable Clamp Adapter	1	GAM18		41B	Cable Strain Relief (.280 Dia yellow control wire)	1	GAM52
9	Internal Weld Cable	1	GAE29					
10	Internal Weld Cable Lock Washer	1	WLC16BO		42A	Screw Style Connector	0	CSS4AM
11	Internal Weld Cable Screw	1	SHC16-50		42B	Control Connector (R&S)	0	CRS4AM
12	Lifting Rod	1	GAM22		42C	Control Connector (2 Wire Nelson)	0	CHB2GAM
13	Main Spring	1	GAM23		43A	Control Cable (Screw Style) Complete	1	CC2BA-10
14	Lift Release	1	GAM24		43B	Control Cable (R&S) Complete	0	CC1B2-09
15	Moveable Core Bearing Retainer	1	GAM10A		43C	Control Cable (2 Wire Nelson) Complete	0	CC1C8-09
16	Lift Bearing	1	GAM8		44	Decal, Weld Tool Model	2	GAD1
17	Lift Bearing Spring	1	GAM9		45	Leg Assembly Complete	2	L37-9
18	Moveable Core Shaft	1	GAM10B		46	Leg Washer	2	LWB37
19	Shaft Retainer	1	VH-100		47	Leg Screw	2	FHC25-125
20	Shaft Spring Seat	1	SHI-75		48	Foot, Small Complete	1	FTS20
21	Core Return Spring	1	GAM11		49	Foot, Grip Retention Screw	2	SSC19F-37P
22	Gun Body	1	10301		50	Chuck Ejection Key	1	CEK
23	Leg Set Screw	2	SSC31-37C		51A	Weld Tool Complete (Screw Style)	0	WTSSC-09
24	Front Coil Yoke	1	GAM2		51B	Weld Tool with Dampener Complete (screw style)	0	WTSSCS-09
25	Gun Coil	1	GAE3					
26	Rear Coil Yoke	1	GAM4		52A	Weld Tool Complete (R&S)	0	WTSRC-09
27	Rear Coil Yoke Set Screws	2	SSC16-18N		52B	Weld Tool with Dampener Complete (R&S)	0	WTSRCS-09
28	Adjustable Core	1	GAM5					
29	Rear Cap	1	10307		53A	Weld Tool Complete (2 Wire Nelson)	0	WTSHC-09
30	Rear Cap Screw	1	PSC16-75ZP		53B	Weld Tool Complete with Dampener (2 Wire Nelson)	0	WTSHC-09
31	Trigger Switch Complete	1	GAE1					
32	Weld Cable Anchor Plate	1	GAM31		54	Trigger Module (2 Wire Nelson) Not Shown	0	GAE27B
33	Anchor Plate Screw	1	FHC25-50					

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