HTP America Inc.

2400 Owner's Manual

Model 60240-24

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MANUFACTURER'S WARRANTY

It is expressly agreed that there are no warranties, expressed or implied, made by either the Salesman, Dealer, or HTP America, Inc. on products or parts furnished hereunder, except the Manufacturer's Warranty against defective materials or workmanship as follows:

HTP America, Inc. warrants each MIG 2400 welding machine to be free from defects in material and workmanship under normal use and service for three years after delivery to the original purchaser. HTP America, Inc. will repair and replace, at its factory, any part or parts thereof, products to be returned to HTP America, Inc. with transportation charges prepaid and which its examination shall disclose to its satisfaction to have been thus defective. This warranty being expressly in lieu of all other warranties, expressed or implied, and all other obligation or liabilities on its part and it neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale of its machines.

This warranty shall not apply to any welding machine which has been repaired or altered by unauthorized service departments in any way so as in the judgement of HTP America, Inc. to affect its stability and reliability, nor which has been subjected to misuse, negligence or accident.

HTP America, Inc. shall not be liable in any event, unless HTP America, Inc. receives notice of alleged breach of warranty within 30 days after the discovery, actual or construction alleged breach of warranty specifying the claimed defect.

HTP America, Inc. has reserved the right to make changes in design or add any improvements to its products at any time without incurring any obligation to install same on equipment.

This warranty is void unless warranty card is sent to HTP America, Inc. within 15 days from the date of purchase.

NOTE: Exclusions To Warranty:

1. The welding gun is warranted for a period of ninety (90) days against defects in material and workmanship.

The swan neck, nozzle spring, contact tips, gas nozzles, gas diffusers and liners are consumable items, WHICH CARRY NO WARRANTY.

Introduction

We congratulate you on the purchase of your new HTP MIG 2400 Welder. Your HTP MIG Welder will allow you to weld items you wouldn't have thought possible to weld. Your HTP MIG Welder can weld steel, stainless steel, aluminum, cast iron, HSLA steels and even braze steel. With proper care and maintenance, your new HTP MIG Welder will deliver years of trouble-free service. However, it is very important that you read the following manual completely.

Safety Suggestions

ELECTRIC ARC WELDING PRODUCES ULTR-VIOLET RAYS WHICH ARE HARMFUL TO SKIN AND EYES. ULTRA-VIOLET RADIATION CAN PENETRATE LIGHTWEIGHT CLOTHING, REFLECT FROM LIGHT-COLORED SURFACES AND BURN THE SKIN AND EYES. WEAR FLAMEPROOF WELDING GLOVES WHICH ARE NOT OILY OR GREASY. THE OIL OR GREASE ON THE GLOVES MAY IGNITE.

- Wear a heavy, pocketless, long sleeve shirt, cuffless trousers, and high-topped work shoes. Wear a full-face welding helmet with a number eight or darker lens and a cap. These precautions will protect eyes, hair, face, and skin from arc rays and hot material.
- To avoid fire, do not weld on wood, plastic tile, or carpeted floors. Concrete or masonry floors are safest.
- Do not weld on drums, barrels, tanks or other containers until they have been cleaned as described in AWS Standard A6.01.
- Provide adequate ventilation in the welding area at all times. Do not weld on galvanized zinc, cadmium or lead beryllium materials unless you are POSITIVE that sufficient ventilation is provided. These materials produce toxic fumes.
- Do not weld in areas close to degreasing or spraying operations. Chlorinated hydrocarbon vapors may react with the ultra-violet rays and form highly toxic phosgene gas.
- If you develop momentary eye, nose or throat irritation during welding, stop welding immediately. This is an indication that ventilation is not adequate. Do not continue to weld until ventilation is improved.
- Exposed, electrically hot conductors or other bare metal in the welding circuit, or ungrounded electrically hot equipment can fatally shock a person whose body becomes a conductor. Do not stand, sit, lie, lean on or touch a wet surface when welding.
- Frequently inspect cables for wear, cracks, and damage. Replace those with excessively worn insulation to avoid a possible lethal shock from bared cable.

For more information, refer to the following standards and comply as applicable.

1. ANSI Standard Z49.1 SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 2051 NW 7th St., Miami, FL 33125
2. ANSI Standard Q87.1 SAFE PROACTICE FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTIONS, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018.
3. America Welding Society Standard A6.0 WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable same as item 1.
4. NFPA Standard 51. OXYGEN-FUEL GAS SYSTEMS FOR WELDING AND CUTTING, obtainable from the National Fire Protection Assoc., 470 Atlantic Avenue, Boston, MA 02210.
5. NFPA Standard 51B. CUTTING AND WELDING PROCESSES, obtainable same as item 4.
6. CGA Pamphlet P-1. SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
7. OSHA Standard 29 CFR, Part 1910 subpart Q, WELDING CUTTING AND BRAZING.

Electrical Connection

Your HTP MIG 2400 will only operate when PROPERLY connected to a 220 volt, single phase power source wired for a minimum of 40 amps. A qualified electrician in accordance with the National Electrical code and local codes and ordinances should do all electrical connections. When connecting your MIG 2400 the green or yellow-green wire MUST BE CONNECTED TO GROUND, OR SERIOUS INJURY MAY RESULT.

The welder has a line voltage adjustment on the main transformer similar to Fig. 1. The correct line voltage must be selected in order for your welder to operate properly.

To set your line voltage adjustment, be sure the welder is unplugged. Remove the left-hand side panel as you are facing the front of the welder. Locate the line voltage adjustment. Measure your input line voltage with a voltmeter. If your voltage measures 225 volts or less, the metal tabs (a) should be set to the 208-v position as shown in fig. 1. If you line voltage is 226 volts or higher, the metal tabs (a) should be moved to the 240-v position. In order to move the metal tabs, it is necessary to remove two 7mm nuts first.

Note: Your welder has a circuit breaker installed at the rear of the machine, just above where the input power cord goes into the welding machine. If, after connecting the machine to a 220 volt power supply and turning the power switch on, the machine does not come on, be sure the circuit breaker is in the ON position.

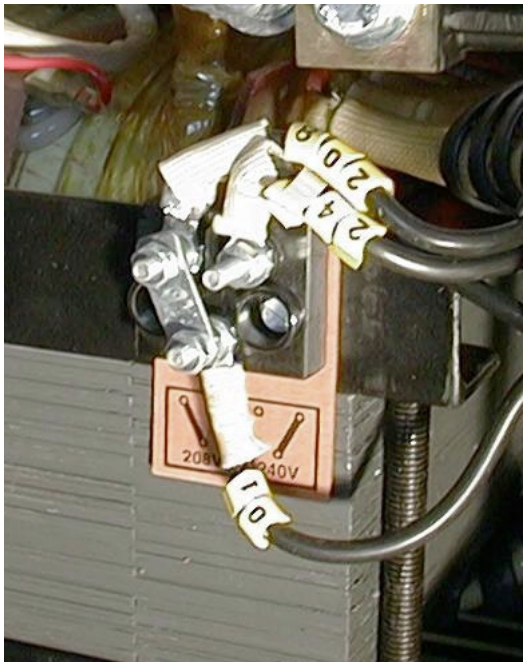


Figure 1

Front Panel Controls

1. **Wire Feed Rate** – the wire feed rate is infinitely adjustable and controls the wire speed. Minimum is the slowest and maximum is the fastest. The wire feed rate will depend on the wire diameter and the power switch position. The wire speed setting is tuned into the proper welding sound. A hissing, blowing sound with a ball of molten wire forming at the end of the wire and then dropping off indicates the wire feed rate is too slow. A loud cracking noise with the wire pushing the nozzle away from the work indicates the wire feed is too fast. The proper wire feed rate is obtained when a steady buzzing noise is heard while welding.

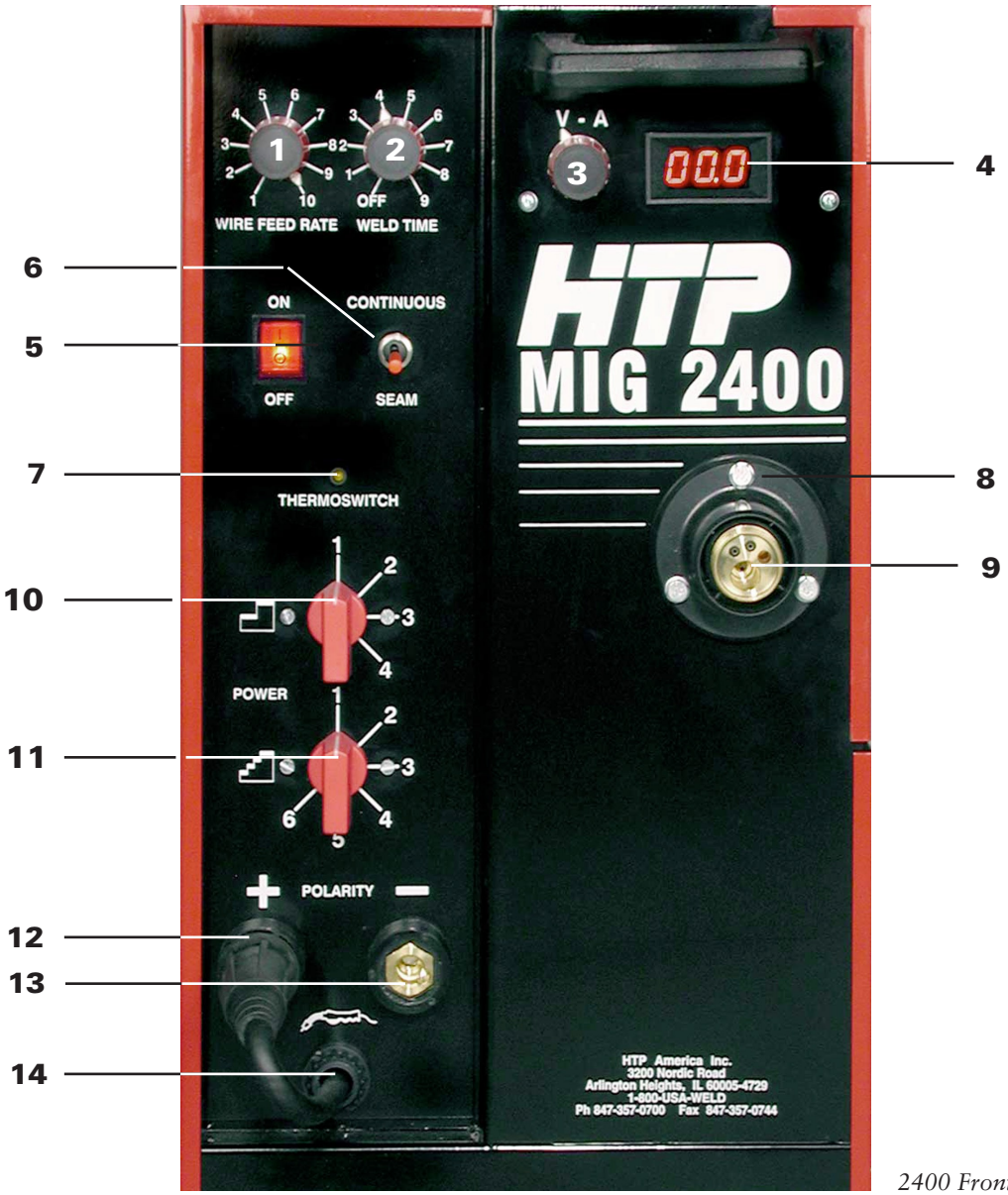
2. **Weld Time** – When the weld time knob is switched ON, the welding machine is in the spot welding mode. In the spot weld mode, the welder will weld for a predetermined time period and stop. The welder will not weld again until the trigger is released and depressed. The spot weld time is determined by the weld time knob. Position 1 is a weld time of approximately 1/2 second and position 9 is a weld time of approximately 2 1/2 seconds.

3. **Digital Display Selector Switch** – When this switch is set to the "V" setting, the digital display (#4) will display the welding voltage. When this switch is set to the "A" position, the digital display will display the welding amperage.

4. **Digital Display** – The digital display will display either the welding voltage when the digital display switch (#3) is set to "V", or the welding amperage when the digital display switch (#3) is set to "A". This allows you to more precisely monitor your welding parameters.

5. **On-Off Switch** – This switch controls the input power to your welder. The On-Off switch allows you to turn the welding machine off, leaving all the settings intact, ready for your next use.

   Turning the switch to the ON position will illuminate an indicator lamp in the On-Off switch and activate the cooling fan. If the indicator lamp is not lit when the On-Off switch is in the ON position, check to make sure that the machine is properly connected to an electrical outlet in good working order. Also be sure to check the circuit breaker at the rear of the welder is in the ON position.



2400 Front Panel

6. **Welding Mode Switch** – The welding mode switch lets you select between “seam” welding and “continuous” welding.

   The most common welding mode is the “seam” welding mode. When you depress the trigger, the machine will weld, when you release the trigger, the machine stops.

   The continuous welding mode is selected when welding long seams and it is desired not to keep the trigger on the welding gun depressed. Depressing the trigger and releasing it will activate the welding machine. The welding machine will continue welding until the trigger is depressed and released again. This is very similar to a "lock-on" trigger on a drill or a grinder.

7. **Thermoswitch Indicator Light** – Your Mig 2400 has a duty cycle of 35% @ 240 amps and 100% @ 142 amps. In the unlikely event you have welded long enough to exceed the duty cycle, the thermoswitch indicator light will become illuminated.

8. **Adapter Flange** – the adapter flange houses the adapter block and is bolted to the front panel of the welder.

9. **Adapter Block** – This is where the welding gun connects to the machine. This single connection houses the power, welding wire, shield gas, and the trigger wires.

   To install the welding gun, simply insert the male central adapter block (on welding gun) into the female central adapter block (on welding machine). These will only fit together in one way. Tighten the adapter nut securely by hand.

10. Course Power Switch – This switch controls the welding current and has 4 settings. The higher the number, the higher the welding current. Each setting increases the amperage between 20 and 100 amps, depending on the wire diameter and the setting you are moving between. For example, welding with .023" wire, going from coarse setting 1 to coarse setting 2 will increase the amperage by 20 amps. When welding with .035" wire, going from coarse setting 3 to coarse setting 4 will increase the amperage by 100 amps.

WARNING: DO NOT CHANGE SWITCH POSITION WHILE WELDING. THIS WILL CAUSE THE CONTACTS TO ARC DAMAGING THE SWITCH.

11. Fine Power Switch – the Fine Power switch has 6 positions. 1 is the lowest while 6 is the highest. This means the 2400 has 6 different heat setting inside of each of the 4 coarse heat settings on the coarse power switch (#10) for a total of 24 heat settings. For example if the power switch is set to 2, then the lowest heat setting for heat 2 would be set to Fine Power switch 1. Let's call this setting 2,1. The next setting would be to set the fine power switch to position 2, or 2,2. Then it would be 2,3, 2,4, 2,5, and finally 2,6. If you still want a higher power setting, you would increase your power switch to 3, an then turn the fine power switch down to position 1 for a setting 3,1.

12/13. Power Output Receptacles – 12 is the positive power output receptacle and 13 is the negative power output receptacle. These control the polarity of the machine. For most welding applications, the ground cable will be connected to the negative receptacle (#12) and the welding gun lead (#14) will be connected to the positive receptacle (#13).

When using flux cored wire the polarity should be reversed. The ground cable would then be connected to the positive receptacle and welding fund lead would be connected to the negative receptacle.

If you have having burn-through problems when welding on extremely thin material with a solid wire and shielding gas, you may want to reverse the polarity as this will reduce the penetration and make it easier for you to weld thin material.

When inserting the end of the ground cable into either power output receptacle, secure the ground cable by twisting it clockwise _ turn. It is important that the ground clamp be connected to a good, clean, surface. Failure to do so will cause poor quality welds. Place the ground clamp as close as possible to the area to be welded.

14. Welding Gun Lead – The welding gun lead takes the power from either power output receptacle and runs it to the welding fun. Secure it by twisting it clockwise 1/2 turn. For general welding, the welding gun lead will be connected to the positive power output receptacle.

Controls in the Wire Feed Compartment

1. Burnback Time – As soon as you release the trigger on the welding gun, the wire feed motor stops turning immediately. The Burnback Time is the amount of time your welder is still applying welding current to the welding wire after the wire feed motor has stopped feeding the welding wire. If the current stopped at the same time the motor wire stopped turning, then there is a chance the welding wire would "freeze" in the molten welding puddle as it solidified. If there is too much Burnback Time, then the wire would melt to the contact tip.

Turning the Burnback Time knob counter clockwise shortens the amount of time welding current is applied to the wire, LENGTHENING the amount of wire sticking out past the contact tip. Turning the burnback time knob clockwise increases the amount of time welding current is applied to the wire, SHORTENING the amount of wire sticking out past the contact tip.

Higher amperages and aluminum wire require a shorter burnback time. To set the burnback time, a good starting point is to rotate the burnback time knob approximately 25% in the clockwise direction. The burnback is set correctly when the welding wire does not stick to the workpiece and does not melt to the contact tip.

2. Wire Feed Accelerator – The wire feed accelerator has 3 positions, normal, medium, and slow. This controls how fast the wire drive motor accelerates to the speed you have the wire feed rate set to. The Mig 2400 has this feature since it can handle large diameter wires fed at high speeds and at high welding amperages.

For example, when using a .035" or .045" diameter steel wire with the machine set at 240 amps, you would want the wire to begin to feed slowly into the work piece and then gradually accelerate to speed. This provides more consistent arc starting with less hesitation.

Using a .023" diameter with the machine set at 60 amps, the normal acceleration setting would be used. Adjust the wire feed accelerator to suit your personal welding preference.

Feeding the Welding Wire (See Fig. 3)

1. When using 10 lb., 8" diameter spools, remove the red nut and install the spacer on the shaft. Do not use the spacer on 30 lb. spools. Place the welding wire on the spool holder so it unravels from the bottom. Install the red nut. When using 10 lb. spools, the pin in the shaft will not engage the roll of wire.
2. Loosen the wire from the spool. Be extremely careful not to let the end of the wire go. Cut off the bent end of the wire to expose a piece of straight wire.
3. Swing the pressure release handle (1) down, and lift the pressure roller assemblies (2) up and out of the way.
4. Feed the wire into the inlet wire guide (3), across the drive rolls (4), and into the guide tube (5). (At this time it is a good idea to check that the drive roll is set to the correct groove for the wire size you are using. If not, see Changing the Drive Roll. Continue to feed the wire into the guide tube until two or three inches of straight wire protrudes from the front of the central adapter block.
5. Swing the pressure roller assemblies (2) back into position. Make sure that the wire is positioned in the groove of the drive rolls (4). Unscrew the pressure release handle (1) until most of the pressure on the pressure roller has been released.
6. Remove the contact tip and gas nozzle from the welding gun. Turn the wire feed rate to 6. Depress the trigger on the welding gun. At this point, the wire feed should not be consistent because there is not enough pressure on the pressure roller. Slowly tighten the pressure roller adjusting screw until the wire feeds evenly without slipping. Then tighten an additional 1/4 turn for steel. No additional tightening is necessary for aluminum. DO NOT OVERTIGHTEN!

   Continue feeding the wire until it appears at the tip of the welding gun. Check your wire size and install the correct contact tip. Install the gas nozzle.
7. Next, the tension on the wire drive brake must be set correctly. The wire drive brake keeps the spool of wire from continuing to rotate after we have stopped welding. In the center of the shaft on which the wire mounts, is a bolt. This bolt puts tension on a spring, which in turn puts tension on the shaft, acting as a brake for the spool of wire. Set the wire feed rate to maximum, and using a 1/2" socket, adjust the tension on the wire drive brake so the spool will continue to rotate 1/4 to 1/2 turn after you have released the trigger, but not rotate so much that the wire begins to fall off the spool. If you are using 10 lb. 8" diameter spools, more than likely you will have to reduce the tension on the drive brake.
8. Bend the welding wire 90 degrees and hold the welding gun perpendicular to a non-conductive surface (concrete floor) so the wire will not feed. While looking at the wire feed mechanism, momentarily depress the trigger. The drive roll should slip and act as a clutching mechanism. If not, the drive roll will push the wire out between the roller and the guide tube. This is known as "bird nesting". If bird nesting occurs, the pressure roller has been adjusted too tightly. When properly adjusted, the drive roll will slip, and “bird nesting” will never occur.

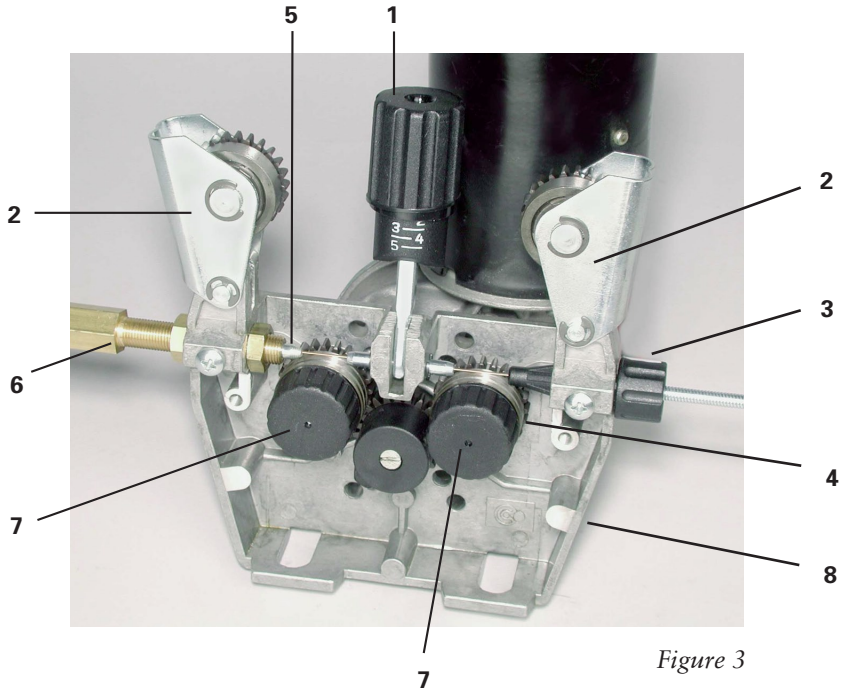


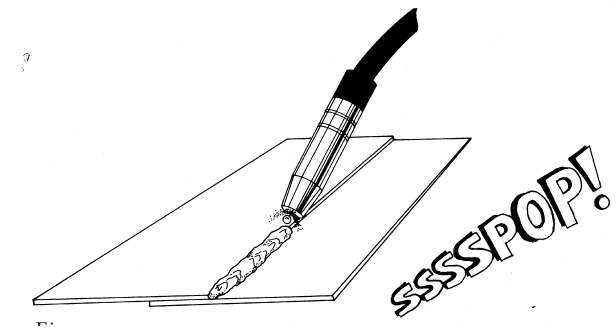
Figure 3

Adjusting the Welding Machine

In order to operate properly, the welding machine must be adjusted properly. Your HTP MIG Welder is very simple to adjust, and with a few minutes of practice, adjusting the controls will become instinctive.

There are two control points which have to conform: the power setting and the wire feed rate. The power setting is determined by the thickness of the material which is being welded (see Chart 3), and the wire feed rate is then "tuned in" to the power setting. The correct setting of the power and the wire feed rate can be seen in an even and calm arc and heard as a steady frying noise.

When selecting your power setting, if the weld doesn't appear to be penetrating the metal, then turn up your power setting. If you are burning a hole in what you are trying to weld, then it will be necessary to turn down your power setting. If you are on the lowest heat setting and still having problems with burn-through, then you may want to reverse the polarity of your welder. Use the following chart as a guide.



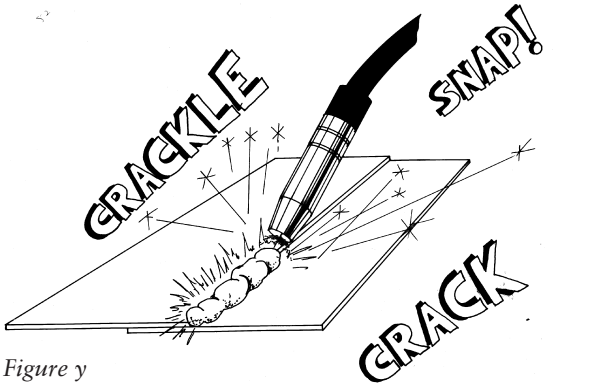


Figure y

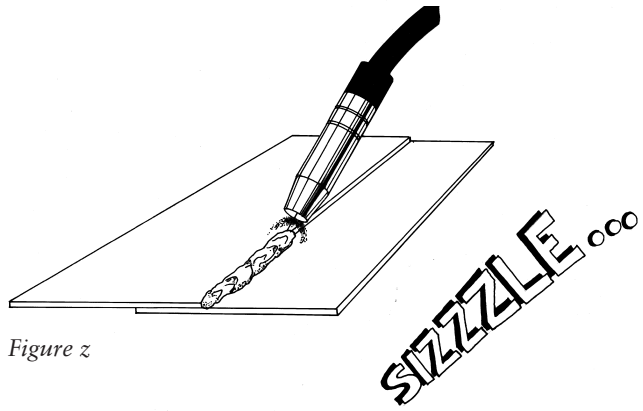


Figure z

.035" Diameter Wire

Heat Setting		Wire Feed	Material
Coarse	Fine	Rate	Thickness
4	6	8 1/4	1/2"
4	4	7	3/8"
4	2	6.5	1/4"
3	6	5.75	3/16"
3	3	4.5	1/8"
2	6	3.25	16 gauge
2	2	2.25	18 gauge
1	4	2 1/8	20 gauge

.030" Diameter Steel Wire

Heat Setting		Wire Feed	Material
Coarse	Fine	Rate	Thickness
4	6	max	1/2"
4	4	6 1/2	3/8"
4	2	6	1/4"
3	6	5 1/2	3/16"
3	3	4 3/4	1/8"
2	6	3 3/4	16 gauge
2	2	2 3/4	18 gauge
1	5	2 1/2	20 gauge
1	1	2 1/8	22 gauge

.023" Diameter Wire

Heat Setting		Wire Feed	Material
Coarse	Fine	Rate	Thickness
4	4	max	5/16"
4	2	8 1/2	1/4"
3	6	7	3/16"
3	4	5 3/4	1/8"
3	3	5 1/2	16 gauge
2	4	3 1/4	18 gauge
1	6	2 7/8	20 gauge
1	4	2 3/4	22 gauge
1	1	2 3/8	24 gauge

A hissing, blowing sound with a ball of molten wire forming at the end of the wire and then dropping off indicates the wire feed rate is too slow (See Fig. X). This means that the wire is melting before it reaches the metal. A loud, cracking noise with red hot wire coming out of the gun and the wire pushing the gun away from the work indicates the wire feed rate is too fast (See Fig. Y). This means that the wire is melting beyond the weld and is not melting properly. When "tuned in" properly, a steady frying noise can be heard (See Fig. Z). This means that the wire is melting properly, and is melting right at the surface of the weld.

When tuning in your welding machine, it is best to start with the wire feed rate too high. On the highest power setting, you may actually want to start with the wire feed rate set at maximum. Gradually decrease the wire feed rate until the steady frying noise is heard. A common problem many people have when trying to tun the wire feed rate is that they turn the knob too rapidly. Many people never turn the wire feed rate down low enough and then start to increase it again. If the wire feed rate is slowly decreased, then eventually you will cross the point where the machine will be tuned in. It is a good idea to practice tuning in the welding machine. Power setting #2, 3 is an ideal heat setting for this, as it has a nice, crisp sizzle. Once you have mastered tuning in the machine on power setting #2, 3, practice tuning in the machine on different heat settings.

It is highly recommended that you practice with your welder at different power settings so that you will become familiar with your welder. This is important to do prior to welding on a project so that you will know which heat setting to select for the job.

Seam Welding

Install the conical nozzle (Part #S4328) on the welding gun. The conical nozzle is used because it is much easier to see the welding process due to the taper in the nozzle. Have 1/4" to 1/2" of welding wire protruding from the end of the gas nozzle.

Prior to running a seam weld, it is recommended that tack welds be placed every 2 to 3 inches along the seam, even closer for extremely thin panels. Tack welds will help to hold the panel in place while welding, as well as to prevent panel separation caused by warpage.

Hold the welding gun at a 45-degree angle and use the edge of the gas nozzle to hold the two panels together, aim the welding wire at the spot to be tacked. Momentarily press the trigger (approximately 1 second) and tack the two panels together. Do not lift up the welding gun until the weld has set. Tack welding is done at the same power setting at which seam welding is done. (1 or 2 on the course setting for sheet metal, 3 or 4 for heavier material.)

When you have the panel tacked into place, you are ready to seam weld. Once again, have 1/4" to 1/2" of welding wire protruding from the gas nozzle. The welding gun is generally held at a 45-degree angle to the work piece. It may also be tilted at a 45-degree angle to the side. Rest the gun nozzle on the work piece and have the wire pointing at the spot where the welding is to begin. Press the trigger and begin welding. It is important that you can see the welding wire coming out of the gas nozzle and the small halo formed at the end of the welding wire where it is melting. This halo will provide the light necessary to see through your helmet while welding.

The direction in which the welder travels will affect the characteristics of the weld. When "pushing the weld" the welding gun is tilted away from the direction of travel (see fig. 4). When "pulling the weld" the welding gun is tilted toward the direction of travel (see fig. 5).

As you gain expertise with your welder, you will find that is possible to reduce warpage when welding sheet metal by welding at a higher power setting and moving faster along the seam. In this way, you are reducing the amount of time welding, therefore reducing the amount of heat which is put into the panel.

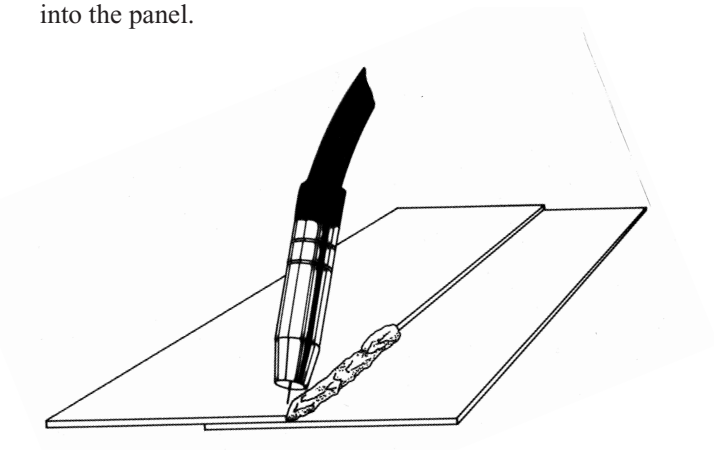


Figure 4 "Pushing the Weld"

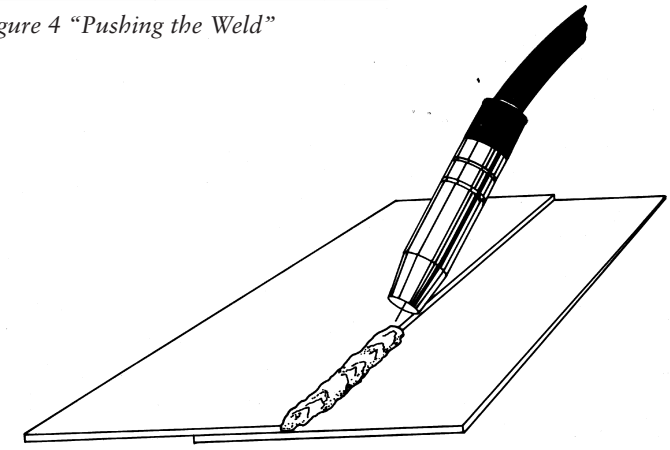


Figure 5 "Pulling the Weld"

Stitch Welding

Your HTP MIG 2400 can perform a manual stitch weld. Stitch welding refers to a method of welding where you will weld, pause, weld, pause and continue in this cycle. This method produces a welded seam which is actually a series of overlapping spot welds that give the appearance of "Fish Scales". Stitch Welding is recommended for use on very thin materials, such as thin body panels or rusty exhaust pipe and in areas where is desired to keep warpage to a minimum. Stitch welding is also good for welders who have a problem keeping a steady hand, or maintaining a constant travel rate.

Stitch welding is performed with either the conical nozzle (#S4328) or the cylindrical nozzle (#S4330) and the decision is up to the operator. For manual stitch welding, the trigger on the welding gun is depressed until 3/16" diameter puddle of metal is deposited on the workpiece. Release the trigger and move the welding gun so that the center of the next puddle will lie on the edge of the first puddle. Wait for the orange glow from the first puddle to disappear and deposit the second puddle of metal. Continue this process until the seam is completed.

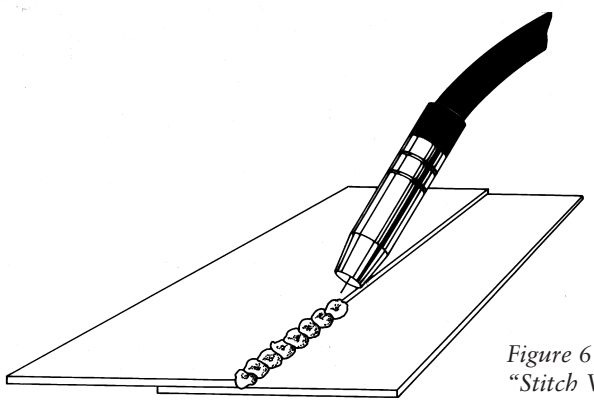


Figure 6
"Stitch Welding"

For a given thickness of metal, stitch welding is performed at the same or one power setting lower than seam welding. Stitch welding can be done on both steel and aluminum, and is recommended under 120 amps. Stitch welding at higher power settings can result in serious burnback problems.

Metal Shrinking

Metal Shrinking is done with the optional shrinking attachment (Part #15003). Remove the contact tip. Release the pressure on the pressure roller and swing pressure roller out of the way. Reel enough welding wire back onto the spool so that the shrinking attachment can be screwed into the swan neck. Turn off the shield gas. You are now ready to shrink.

Shrinking with your shrinking attachment is similar with any oxy-acetylene torch; the area is alternately heated and cooled until properly shrunk. The advantage to the shrinking attachment is that the heat is applied directly, the heat is much more concentrated, and there is less chance of fire because there are no open flames.

WARNING: SHRINKING SHOULD ONLY BE DONE WITH THE COARSE POWER SWITCH IN POSITION 1 AND THE FINE POWER SWITCH IN POSITION 1

Spot Welding

Install the spot weld nozzle (Part #S4329) on the welding gun. Using the Punch & Flange Tool (Part #12005 {5/16"} or #12003 {3/16"}) or the Heavy Duty Hole Punch (#12009) punch holes in the upper panel to be spotted on. Feed some welding wire out past the end of the spot weld nozzle. Using sidecutters, clip the welding wire off flush with the end of the spot weld prongs. This will aid you in centering the gas nozzle over the punched hole.

Use a relatively high power setting, probably a minimum of 3 on the coarse setting, but it all depends on the thickness of sheet metal you are working with.

Turn the power selector to position 3 on the coarse setting and setting 3, 4, 5 or 6 on the fine setting (3 or 4 for thin sheet metal, 6 for heavier sheet metal). Tune in the wire feed rate until the proper frying noise is heard. Reduce the wire feed rate just until the machine begins to sound out of tune. A slightly slower wire feed rate will produce flatter spot welds, however, do not reduce the wire feed rate when performing overhead spot welds. Turn the spot weld timer on to approximately 2. Place the welding gun so that the welding wire is centered over the punched hole (see fig. 7). Depress the trigger on the welding gun. Your welder will stop automatically. Examine the spot weld. If the hole is not completely full, either the welding wire was not centered over the hole or there was not enough spot weld time. The spot

weld time should be set to the minimum amount of time that will completely fill the hole. If the spot weld is not flat and has excessive metal build-up, there is an excessive amount of spot weld time, the wire feed rate is too fast, or the power is not high enough. The correct power setting, spot weld time and wire feed rate will produce spot welds which will lie flat and require little, if any, finishing.

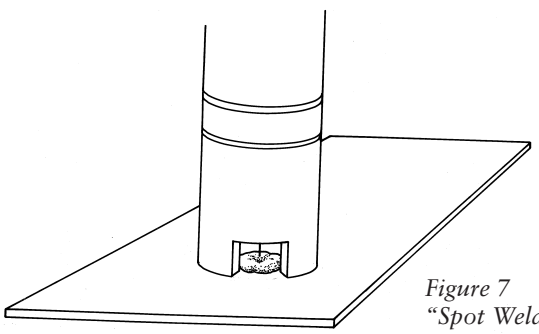


Figure 7
"Spot Welding"

Hole Filling

Before you begin to fill holes, you must look at the reason why there are holes. If the holes are due to burn-through, you should remember that this was caused by too much heat input. Therefore, if you are welding a seam and burn-through occurs, continue welding and finish the seam. This will give the burn-through area time to cool and make it easier to fill the hole. It is not recommended to try to fill holes over 1/2" diameter; weld in a new piece of metal.

First, the perimeter of the hole must be built up. This is accomplished by randomly placing puddles of metal (similar to manual stitch welding) around the perimeter of the hole (See Fig. 8B). Once this has been completed, again place puddles around the area which has just been welded (See Fig. 8C). Continue to lay in the puddles until the hole is filled (See Fig. 8D & 8E). The power setting for hole filling is one to two settings below seam welding.

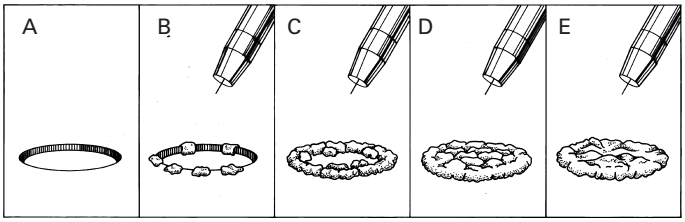
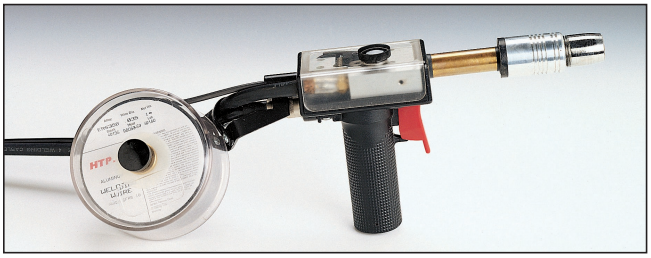


Figure 8 "Hole Filling"

Welding Aluminum

It is possible to weld aluminum with your MIG 2400. Depending on your application, you may be able to get away with pushing aluminum welding wire through a 10ft welding gun, using our aluminum welding kit #40011-T#1, or it may be necessary to use the RSG250-2400 spool gun. Pushing aluminum welding wire though a 10-ft welding gun is not a foolproof situation. There is the possibility the welding wire will bird's nest while you are welding. You have to determine at what point does it make economic sense to invest in a spool gun. We generally recommend using the standard 10' welding gun if you would only be doing 1 small repair job per month. If you are welding more aluminum than that, you might want to consider the spool gun.

40011 Aluminum Kit



RSG 250

The RSG250-2400 spool gun will allow you to get 25' away from your MIG 2400. If you will be repairing aluminum trailers, the spool gun is probably a must, as it will allow you to weld on the trailer without having to lift your Mig 2400 into the trailer. Since the spool gun has the wire and the drive roller right in the handle, the wire is only getting pushed 6" and it is highly unlikely that this gun would birdnest using any welding wire.

Due to the difference between aluminum and steel, a few simple changes must be made prior to welding aluminum.

Shield Gas – The shield gas required for welding aluminum is 100% Argon. Due to the rate at which aluminum oxidizes, the flow rate of the Argon gas must be increased to 25 cubic feet per hour (cfh) or more. The cylindrical gas nozzle (Part #S4330) is recommended for use on the standard welding gun when welding aluminum. The larger opening area of the nozzle will result in a wider dispersion of the shield gas, insuring adequate gas coverage of the weldment.

Liner – a Teflon liner (part #15041) is the preferred liner for welding aluminum. To change the liner, see "Testing and Changing the Liner".

Welding Wire – To weld aluminum, aluminum welding wire must be used. HTP has aluminum wire available in two diameters; Part #40230 - .030" diameter and Part #40235 - .035" diameter. The .030" wire is recommended for thin gauge to 1/8" material, while the .035" is recommended for .060" material and thicker. For installation of the aluminum wire, see "Feeding the Wire."

Cleanliness – aluminum is very sensitive to impurities. Therefore, it is extremely important that the surfaces to be welded are clean from paint, grease and dirt. The only method that will properly clean aluminum is the use of a stainless steel wire brush (Part #40112 or #40110).

Technique – Aluminum also requires a slightly different technique when welding. The gas nozzle should be held perpendicular to the welding surface and inclined 5 to 15 degrees away from the direction of travel. The motion of the welding gun should be consistent and at a greater speed than used for welding steel. To minimize the chances of producing a black, sooty weld, you should always "Push the Weld".

Aluminum will require a much higher were feed rate than steel for the same heat setting and same wire diameter.

Aluminum also has a very narrow heat range in which it can be welded. When you first start to weld, you will notice the weld has a tendency to sit up on top of the metal and not penetrate. If you keep welding you may see that it begins to penetrate fine and you will get a great weld. As you continue to welding, all of the sudden, you have overheated the metal and blow a big hole. This is one of the problems of welding aluminum and just requires practice to overcome.

The end of the welding wire should always be clipped off with side cutters to aid in striking the arc.

The thermal conductivity of aluminum is much higher than that of steel. Therefore, when welding thin gauge aluminum a heat sink (HTP's Heat Sponge, Part #12080 or #12084) should be used. Aluminum hoods and trunk lids may require the stitch welding technique if burn-through is a problem.

The tendency for aluminum spatter to adhere to the swan neck, contact tip and gas nozzle is much greater than that for steel. Therefore, use of the nozzle spray is extremely important. However, the nozzle spray will act as a contaminant, so after treating the nozzle, it is important to test weld on a piece of scrap aluminum to "burn off" the nozzle spray.

When welding thick sections of aluminum (Cylinder Head), many times it is helpful to preheat the area with an oxy-acetylene welding torch. Using a rosebud tip set the torch acetylene rich and blacken the area to be welded with a light coat of soot. Set the torch correctly, and begin to evenly heat the part. Let the heat within the part (not the torch) burn off the soot. When the soot has burned off, the part has been sufficiently preheated.

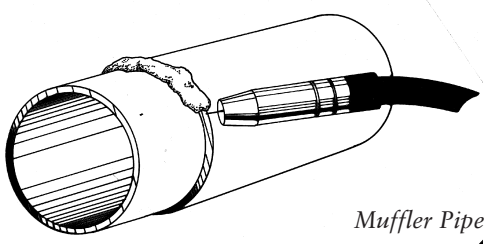
CAUTION – Aluminum does not change color when hot.

Welding Muffler Pipe

Muffler pipe welding is generally done with the conical nozzle installed on the welding gun. The conical nozzle is used because the taper in the nozzle makes it easier to see the welding process and allows you to weld in tighter spots.

Prior to welding two pieces of muffler pipe together, it is recommended that two to three tack welds be placed around the pipe. The tack welds will help hold the pipe in place while welding, and also prevent gaps caused by warpage.

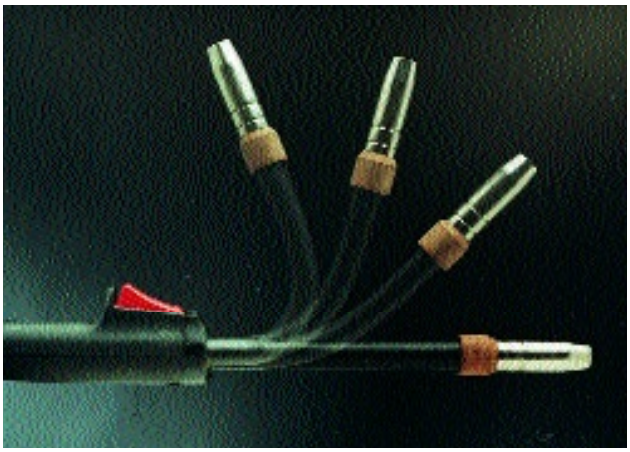
Have 1/4" to 1/2" of welding wire protruding from the end of the gas nozzle. Have the welding gun inclined at a 45-degree angle to the pipe. Aim the welding wire at the spot to be tacked and momentarily depress the trigger. Hold the trigger long enough for the welding sound to smooth out (approximately one to two seconds). Tack welding is generally done at the same power setting that normal pipe welding would be welded.



Muffler Pipe

Now that the pipe is tacked into place, you are ready to weld the pipe. Once again, have 1/4" to 1/2" of welding wire protruding from the gas nozzle. Again, the welding gun is generally held at a 45-degree angle to the pipe. It also may be tilted at a 45-angle to the left or right. Rest the gas nozzle on the pipe and have the wire pointing at the spot where the welding is to begin. Press the trigger to begin welding. Slowly move the welding gun along the weld at a constant rate. A jerky, inconsistent, or too rapid rate will cause arc instability and a sputtering welding sound. A rate that is too slow will cause burn-through. It is also important that you position the welding gun so that you can see the welding wire as it comes out past the gas nozzle. The light produced from the wire coming in contact with the work is the only thing that will allow you to see the "seam" through the welding helmet. If the gas nozzle is blocking your view of the wire, then there will not be sufficient light to see the welding process.

HTP has a flexible swan neck welding gun available (Part #13510) available for welding muffler pipe. The flexible swan neck makes it possible to bend the swan neck to get into hard to reach places and to get up over the top of the muffler pipe.



Flex Neck

Broken Stud Removal

Your HTP MIG Welder can be used to remove exhaust manifold studs which have broken off flush or are protruding slightly from the exhaust manifold. In many instances, it is not even necessary to remove the exhaust manifold from the car.

Start with the power set at 4,1 or 3,6. This will ensure good adhesion of the molten wire to the stud. Point your wire directly at the stud and momentarily depress the trigger. Weld long enough to deposit a small puddle of molten wire on the stud and then allow it to cool. Repeat the process until you have built up a small puddle of molten wire on the stud and allow it to cool. Repeat the process until you have built up a small amount of weld. Reduce the power to 3,2 or 2,6 and continue building the weld until 1/4" to 1/2" is protruding from the exhaust manifold. The lower power setting will allow you to build up the weld faster. Now take a 5/8" or 3/4" nut and place it on the stud. Weld the nut to the stud.

Allow the stud to cool completely. Heat the exhaust manifold as you normally would and remove the stud. Shops have proven this process works 80% of the time.

Welding Cast Iron

Your HTP MIG Welder has the ability to weld cast iron using 75% Argon – 25% CO2 shielding gas and cast iron welding wire (Part #50235). The cast iron welding wire will also allow you to weld mild steel to cast iron.

When welding with the cast iron wire, welding techniques are the same as the welding techniques for mild steel. Due to the .035" diameter, wire feed rates for cast iron welding wire will be lower for a give power setting than the .030" diameter steel wire. However, the machine is tuned in the same way as with the steel wire, listening for the "sizzling" noise.

Depending on the thickness of the material, it may be desirable to preheat the casting to ensure adequate penetration. When welding a crack, it may be beneficial to "vee" out the crack. In order to reduce the possibility of further propagation; drill small holes at both ends of the crack. It is also a good idea to make short welds to reduce the possibility of overheating the cast iron around the weld area. Then immediately after welding, lightly tap (peen) the weld with a ball-peen hammer to stress relieve the weld area.

The more time spent in surface preparation of cast iron welds (cleaning the surface, veeing out cracks, etc.) the better the results and the stronger the weld will be.

Maintance and Service

Introduction

90% of the problems with MIG welders are wire feed/welding gun related. 98% of these problems are due to owner/operator abuse, misuse or ignorance.

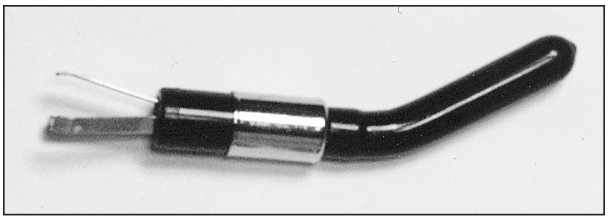
The welding gun is exposed to the heat and spatter of welding. The NOZZLE SPRAY (Part #12021) should be sprayed on the inside of the gas nozzle, contact tip and swan neck with every use. The function of the nozzle spray is to prevent the spatter from adhering to the gas nozzle, contact tip and swan neck, making it easy to keep these parts clean. However, using the spatter spray does not eliminate the need to frequently clean the spatter from the gas nozzle. For this reason, HTP has available a NOZZLE REAMER (Part #12025). The nozzle reamer makes it very easy to keep your tips and nozzles clean.

Figure 9 shows the early symptoms of spatter build up. The exterior of the nozzle has arc marks on it from shorting out. You will also notice the nozzle sticking to the work and inconsistent weld quality when the nozzle shorts out.

Figure 10 shows a cutaway of a nozzle with spatter build up. This nozzle is ruined because the operator allowed the spatter to build up excessively, so the spatter has now welded itself to the inside of the gas nozzle.

Figures 11 and 12 show what will happen to the swan neck if you do not keep your nozzle clean. Both figures illustrate that in extreme cases, shorting out the nozzle will burn holes completely through the swan neck requiring its replacement.

Figure 16 shows the effect of a wire drive mechanism that has been set just a little bit too tight. As you can see, the wire has been spiraled into the liner, resulting in the curvy wire. When the wire got to the contact tip, it could not pass through the contact tip smoothly, hence burning back to the tip. Since the wire could not pass through the tip, this same situation (spiraling wire) has now occurred at the other end of the welding gun. When it passes 10 feet through the welding gun, the wire will not be able to pass through the tip smoothly. If resetting the tension on the drive roller does not remedy this problem, then the liner should be replaced.



Nozzle Reamer

Figure 9
Spatter Build Up Symptoms

Figure 10
Spatter Build Up

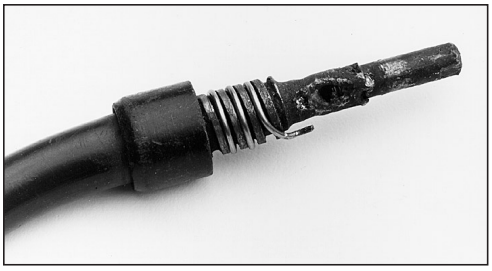


Figure 11
Spatter Damaged Swan Neck

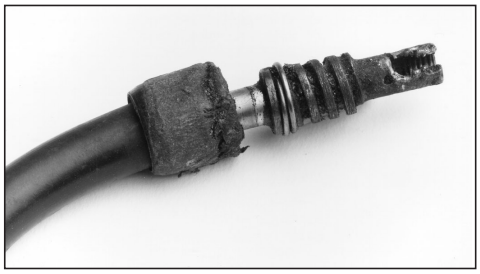


Figure 12
Spatter Damaged Swan Neck

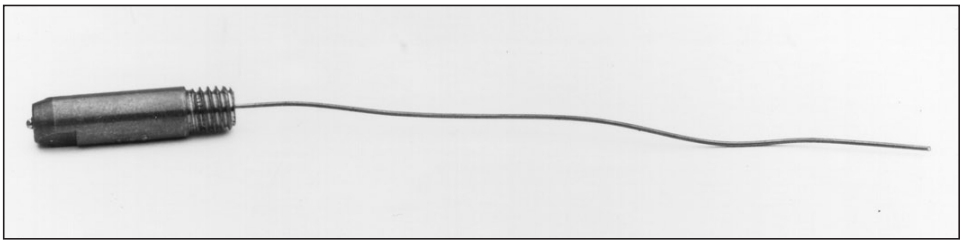


Figure 16

Changing the Contact Tip

The contact should be regarded as a wearing part and therefore requires periodic replacement. Since steel wire is passing through a copper tip, the wire will have a tendency to wear away the copper tip, causing it to become oblong or excessively oversized. This one-inch piece of copper is all that is taking the welding amperage and transferring it to the welding wire. Therefore, an excessively worn tip will cause poor electrical contact between the wire and the tip, resulting in a welder that will not weld smoothly.

To remove the contact tip, clip off the burnt wire at the end of the welding gun. Unscrew the contact tip. Install the new tip by feeding the wire through the hole in the center of the tip and screw the tip into the swan neck.

Part #	Fits	Wire Size
15023B	.023"	0.6 mm
15030B	.030"	0.8 mm
15035B	.035"	0.9 mm
15045B	.045"	1.2 mm

Changing the Gas Nozzle

The gas nozzle is removed by unscrewing the nozzle from the gas diffuser in a counter clockwise direction. If the nozzle and the gas diffuser come off together, spatter has fused the two together. To install the gas nozzle, simply twist the nozzle in a clockwise direction and screw it back on to the gas diffuser. The following gas nozzles are available for your welding gun:

Part #	Description	Application
S4328	Conical Nozzle	General Welding
S4330	Cylindrical Nozzle	Aluminum Welding
S4329	Spot Weld Nozzle	Spot Welding
21-37F	Small Conical Nozzle	Tight Corners

Changing the Drive Roll

The drive roll has two grooves on it. The narrower of the two grooves is marked 0.9 and is used for wire .035". The wider groove, marked 1.2 is used for .045" wire.

To change the drive roll, simply remove the drive roll retaining screws (7) and remove the drive rolls (4) from the adapter ring. Select the correct groove, and install the drive roll so that the proper groove lines up with the inlet wire guide (3) and the guide tube (5). Install the drive roll retaining screw.

Replacing the Printed Circuit Board (PCB)

The PCB is a very reliable part of your HTP welder. Should failure occur, it usually happens within the first five minutes of operation and is caught during the initial test period at the factory. However, should failure occur, replacement is very simple.

1. UNPLUG MACHINE.
2. Remove the two screws, which hold the side panel on.
3. Remove the orange and yellow wires for the burnback adjustment by gently pulling on them. The orange wire is on the top and the yellow wire is on the bottom.
4. Pry the two plastic retaining clips, which hold the circuit board in the groove back and slide the circuit board up about 1/2 way.
5. I have found that with the PCB 1/2 way out of the groove, it is much easier to gently disconnect the multi-pin connector from the circuit board.
6. With the multi-pin connector disconnected, you can now completely remove the board.
7. Installation is the reverse of the above.

Setting the Pressure on the Pressure Roller

Prior to readjusting the pressure roller, check the following:

1. Are the drive roller and pressure roller clean? If not, clean with a suitable solvent.
2. Is the liner worn, dirty or kinked, causing a restriction to the wire feed? (See testing and changing the liner.) If so, replace the liner.
3. Is the guide tube lined up properly with the drive roll? If not, align the guide tube.
4. Is the guide tube coming in contact with the drive rolls? If so, remove the guide tube and shorten it by grinding.

If all of the above mentioned conditions are in good working order, then it may be necessary to reset the pressure on the pressure roller.

1. Loosen the pressure roller adjusting screw (1), pull the pressure release handle out of the way and lift the pressure roller assemblies (2) up and out of the way.
2. Loosen the wire from the spool. Feed the wire into the inlet wire guide (3), across the drive rolls (4) and into the guide tube (5). Check to be sure that the groove in the drive roll is the correct groove for the wire diameter you are using. Feed the wire until two or three inches of straight wire protrudes from the central adapter block.
3. Swing the pressure roller assemblies (2) back into position, making sure the wire is positioned in the groove of the drive roll (5). Tighten the pressure roller adjusting screw just enough to keep the wire in the groove. DO NOT OVERTIGHTEN!
4. Insert the wire protruding from the central adapter block into the end of the welding gun. Install the welding gun on the welding machine.

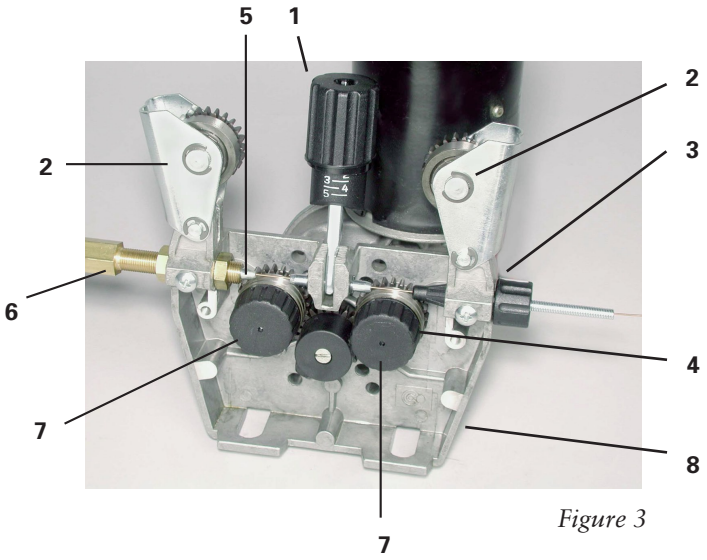


Figure 3

1) Pressure Release Handle/Pressure Adjusting Screw
2) Pressure Roller Assemblies
3) Inlet Wire Guide
4) Drive Roller
5) Guide Tube
6) Adapter Plug
7) Drive Roll Retaining Screw
8) Wire Drive Bracket

5. Remove the contact tip and gas nozzle from the welding gun. Turn the wire feed rate to 6. Depress the trigger on the welding gun. At this point, the wire feed may be inconsistent because the majority of tension has been removed from the pressure roller. Slowly tighten the pressure roller adjusting screw until the wire feeds evenly without slipping. Then tighten an additional 1/4 turn for steel. No additional tightening is necessary for aluminum. Using your fingers like a hand brake on a bicycle, squeeze the outside edges of the wire spool. You want enough tension to pull the wire when you put a drag on the spool, but not so much tension that is requires a large amount of force to stop the wire from feeding or stall the motor.

   Continue feeding the wire until it appears at the tip of the welding gun. Check your wire size and install the correct contact tip. Install the gas nozzle.

6. Bend the welding wire 90-degrees and hold the welding gun perpendicular to a non-conductive surface (concrete floor) so that the wire will not feed. While looking at the wire feed mechanism, momentarily depress the trigger. The drive roll should slip and act as a clutching mechanism. If not, the drive roll will push the wire out between the roller and the guide tube. This is known as "bird nesting." If bird nesting occurs, the pressure roller has been adjusted too tightly. When properly adjusted, the drive roll will slip, and "bird nesting" will never occur.

Testing and Changing the Liner

Should feeding problems occur, the first item to be check should be the liner. The following check should be made to determine is the line is defective:

1. Fee 12’ to 18" of fresh wire out of the welding fun. (See Fig. 17.)
2. Disconnect the welding gun from the machine with the wire still threaded in the gun. Pull the gun 6" away from the machine and clip the wire so that 6" of the wire is extending out of the welding gun. (See Fig. 18.)
3. Push the wire in and out of the welding gun as shown in Fig 19. The wire should move freely in the gun with little or no resistance. If there is a great deal of friction, the liner should be replaced.

To replace the liner, loosen the allen screw which is accessible through a small hole in the handle of the welding gun. Remove the liner positioner nut with a 12mm wrench and pull the old liner completely out of the welding gun (See Fig. 20). Remove the gas nozzle and contact tip. If installing a Teflon liner, install the collet on the liner. If the liner has plastic insulation on it, it is important that the plastic insulation is stripped back at least 2 feet from the front end of the welding gun. Slowly push the new liner into the welding gun. (See Fig 21.) Be careful not to try to push too much liner into the gun at one time, or the liner may kink. Lay the welding gun out straight and install the liner positioner nut. Clip the excess liner off flush with the end of the swan neck. Use a razor blade on Teflon liners. (See Fig 22.) Install the correct size contact tip. The contact tip should butt into the end of the liner.

Part #	Description
X040	Steel liner - steel welding only
15041	Teflon liner - aluminum welding only

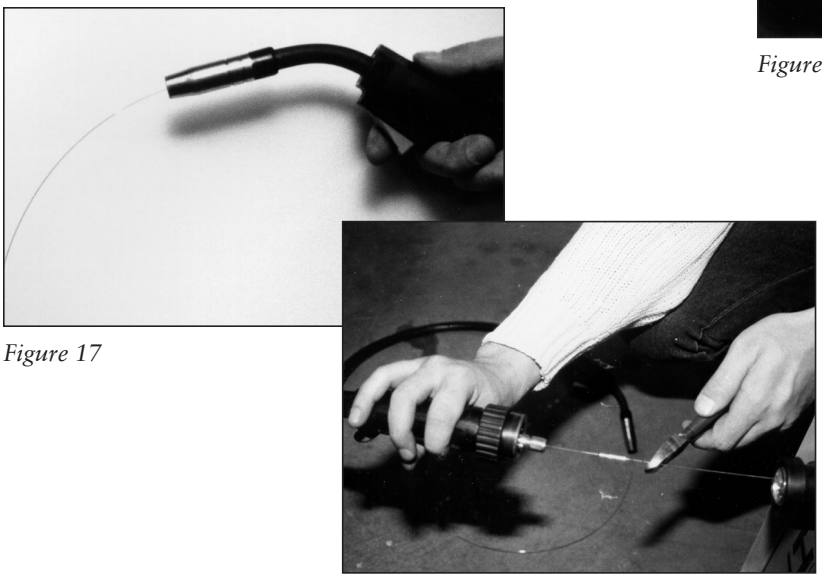


Figure 17

Figure 18

Figure 19

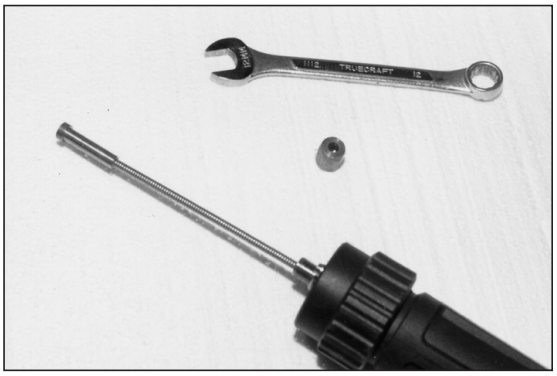


Figure 20

Figure 17

Figure 18

Monthly Maintenance

Your HTP MIG Welder is a very hardworking piece of equipment and is very simple to maintain. However, your HTP MIG Welder is more complicated than other types of welding equipment. It is very important that these simple maintenance procedures be followed to keep your welder operating trouble free.

1. Wire Drive System – The guide tube and inlet wire guide should be check periodically to ensure that they are in correct alignment with the drive rolls. Misalignment will result in the copper plating of the wire being rubbed off. This copper dust will be carried into the liner resulting in increased friction causing wire feed problems.

2. Welding Cable – You should not allow heavy equipment to run over the welding cable. Avoid pulling the machine by the cable.

Do not pull the welding cable over sharp edges.

3. Transformer and Internal Components – Your MIG 2400 is equipped with a thermoswitch to protect the internal components of the machine should the duty cycle be exceeded. The thermoswitch is placed in the low voltage circuit, so that when the duty cycle is exceeded, the main relay will not operate, preventing power from going to the main transformer, and the wire feed motor will not turn. The indicator light will remain on, and the cooling fans will remain on. The thermo indicator lamp will light up yellow, indicating the duty cycle has been exceeded. When the machine cools down (approximately 20 minutes) the thermoswitch will automatically reset, the thermoswitch light will go out, and the machine will be ready for use.

To keep the cooling system of your welder operating at peak performance, it is necessary to remove the side panel and blow this area out with dry, compressed air. This will remove dirt and dust from the internal components.

Sheild Gas

Since no flux is used for solid wire MIG welding, the proper shield gas must be used. Different materials require different shield gases. Use the chart below for a guide.

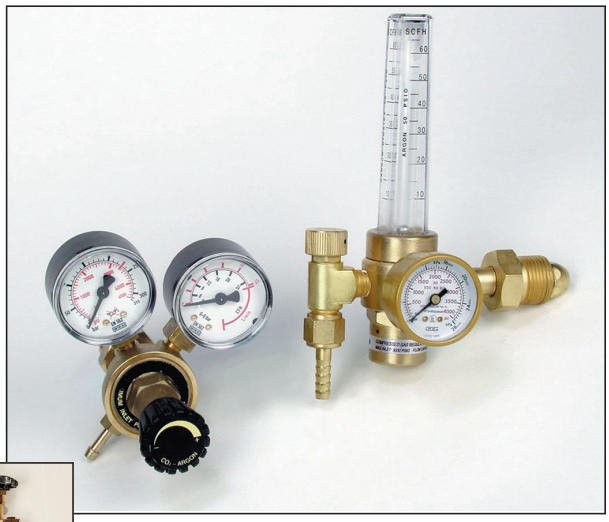
Material	Shield Gas	Flow Rate
Steel	75% Argon - 25% CO2	10 – 25 cfh
Aluminum	100% Argon	25 – 50 cfh
Stainless Steel	90% Helium + 7.5% Argon – 2.5% CO2	15 – 35 cfh
Brazing	100% Argon	15 – 35 cfh
Cast Iron	75% Argon - 25% CO2	25 – 35 cfh

Use a gas regulator such as HTP Part #12020 or a flowmeter such as HTP Part # 12020F which is compatible with both Argon and C-25 gas cylinders and has a barbed fitting for the delivery hose. Connect the gas hose to the brass fitting at the rear of the machine and to the barbed fitting on the regulator.

HTP also has available small 60 cubic foot gas bottles (Part #99900), which are ideal for use with your welder. These bottles stand approximately 30" high and weigh less than 40 pounds, making your welder very easy to move around the shop. Be sure to check with your local gas supplier about filling these tanks before ordering.

If you already have a large cylinder, you can fill the small cylinder from the large cylinder using the transfer manifold (HTP Part #99905).

NOTE: 75% Argon – 25% CO2 may be used for stainless steel welding. Stainless steel can also be welded with steel wire and 75% Argon – 25% CO2 gas, however, these welds will not be as corrosion resistant as welds made with stainless steel wire.



12020

Gas Bottle

Welding Wire

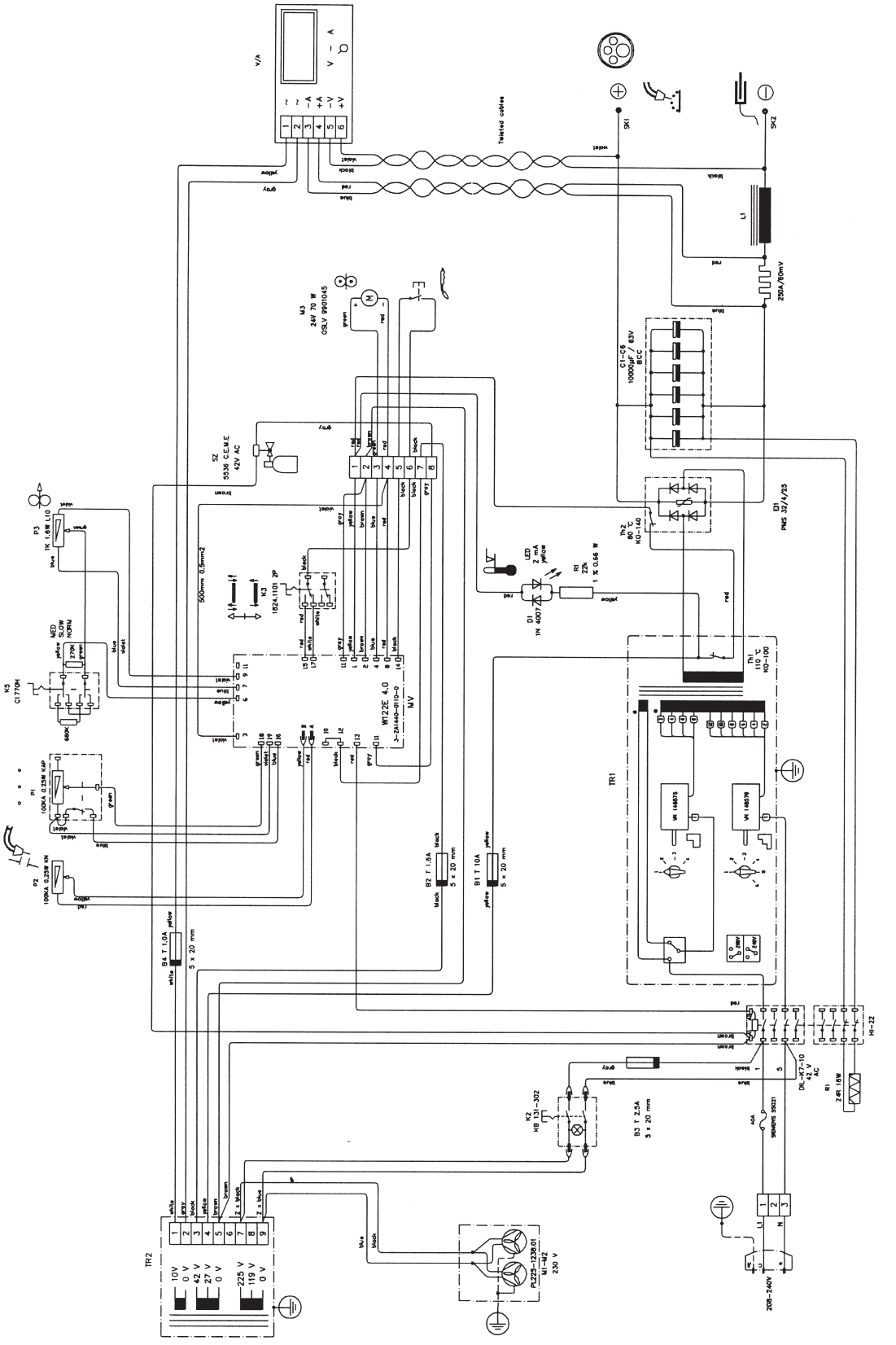
HTP has a wide variety of welding wire available. Use the following chart as a guide:

Application	Part #	Description
Steel (30 ga -1/8")	21023	.023" E70S-6 Steel Wire
Steel (16 ga - 1/4")	21030	.030" E70S-6 Steel Wire
Steel (14 ga -1/2")	21035	.035" E70S-6 Steel Wire
Aluminum (24 ga -1/8")	40230	.030" 5356 Alloy Aluminum Wire
	40230-4043	.030" 4043 Alloy Aluminum Wire
Aluminum (16 ga - 1/4")	40235	.035" 5356 Alloy Aluminum Wire
	40235-4043	.035" 4043 Alloy Aluminum Wire
Stainless Steel (24 ga -1/8")	38223	.023" Stainless Steel Wire
Stainless Steel (18 ga -1/4")	38230	.030" Stainless Steel Wire
Cast Iron	50235	.035" Cast Iron Wire
Brazing	50230	.030" Silicon Bronze Wire
Steel W/O Gas (16 ga -1/4")	61030	.030" Flux cored Wire
Steel W/O Gas (16 ga -1/4")	61035	.035" Flux Cored Wire

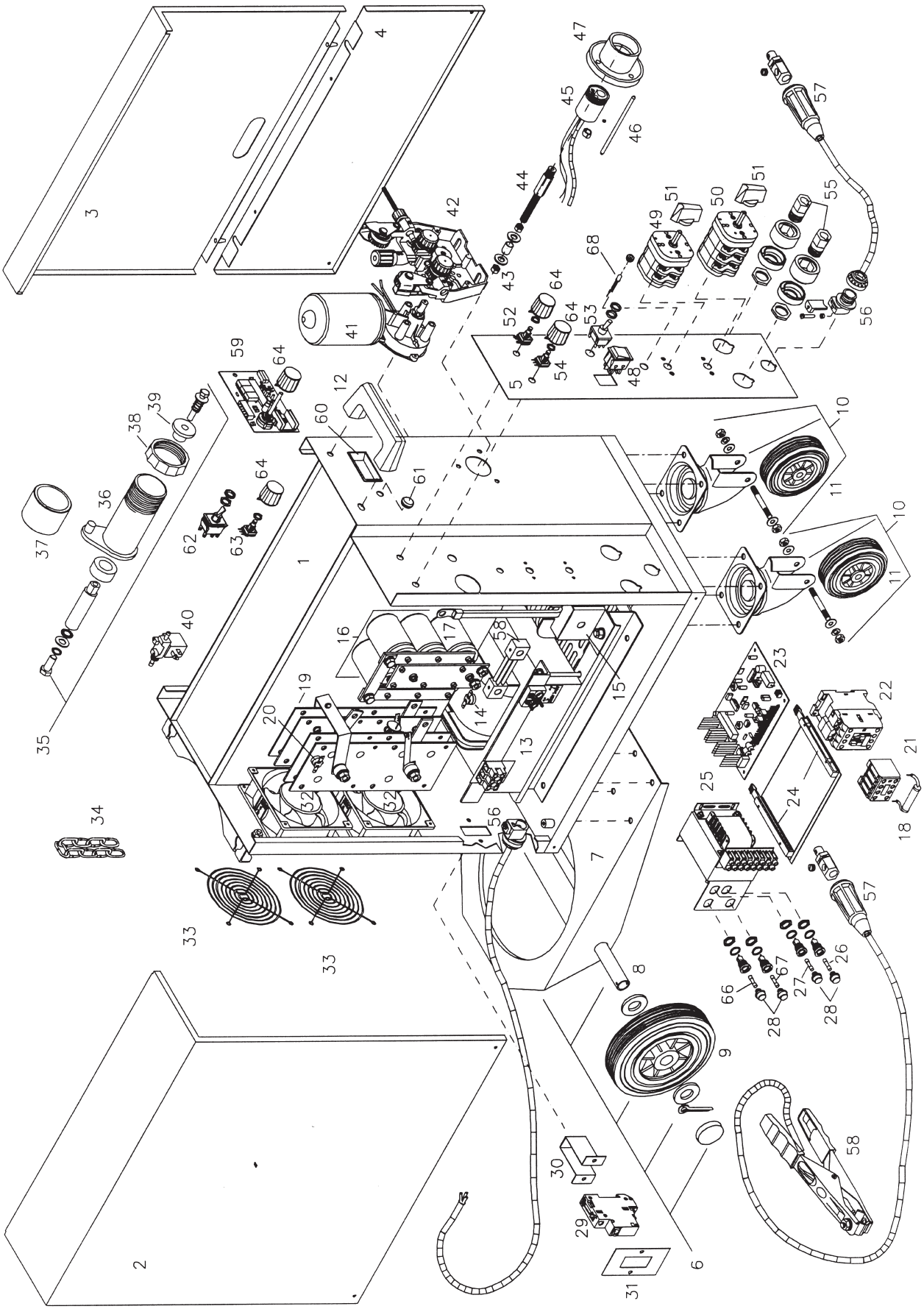
Welding Wire

			.035" Diameter Wire			.030" Diameter Wire			.023" Diameter Wire		
Heat Setting Coarse	Fine	No Load Voltage	Wire Feed Rate	Output Amperage	Material Thickness	Wire Feed Rate	Output Amperage	Material Thickness	Wire Feed Rate	Output Amperage	Material Thickness
4	6	42	8 1/4	240	1/2"	max	240	1/2"			
4	5	40.6	7.5	230		7	225				
4	4	39.1	7	220	3/8"	6.5	200	3/8"	max	165	
4	3	37.6	6.75	206		6	190		max	160	
4	2	35.6	6.5	199	1/4"	6	180	1/4"	8.5	150	1/4"
4	1	35.3	6	185		5.5	175		8	125	
3	6	34.8	5.75	179	3/16"	5.5	160	3/16"	7	115	3/16"
3	5	33	5.25	170		5 1/4	150		6	110	
3	4	32.3	4.75	145		5	140		5.75	105	1/8"
3	3	31.4	4.5	135	1/8"	4 3/4	130	1/8"	5.5	90	16 gauge
3	2	30.3	4	120		4 1/2	120		5	75	
3	1	28.8	3.75	109		4	110		4.5	70	
2	6	27.5	3.25	100	16 gauge	3.75	100	16 gauge	3.5	65	
2	5	26.9	3	85		3.5	95		3.5	60	
2	4	25.9	2.875	80		3/1/08	85		3.25	50	18 gauge
2	3	25.4	2.75	75		3	75		3	45	
2	2	24.9	2.75	70	18 gauge	2.75	55	18	3	40	
2	1	23.2	2.5	60		2-5/8"	50		2-7/8"	37	
1	6	23	2.5	56		2-5/8"	48		2-7/8"	35	20 gauge
1	5	22.8	2.25	49		2.5	45	20 gauge	2.75	33	
1	4	21.8	2.25	45	20 gauge	2 3/8	40		2.75	30	
1	3	21.3				2.5	37		2.5	27	
1	2	20.7				2.25	33		2.5	24	
1	1	20				2-1/8"	25	22 gauge	2-3/8"	20	24 gauge

HTP MIG 2400 Wiring Diagram



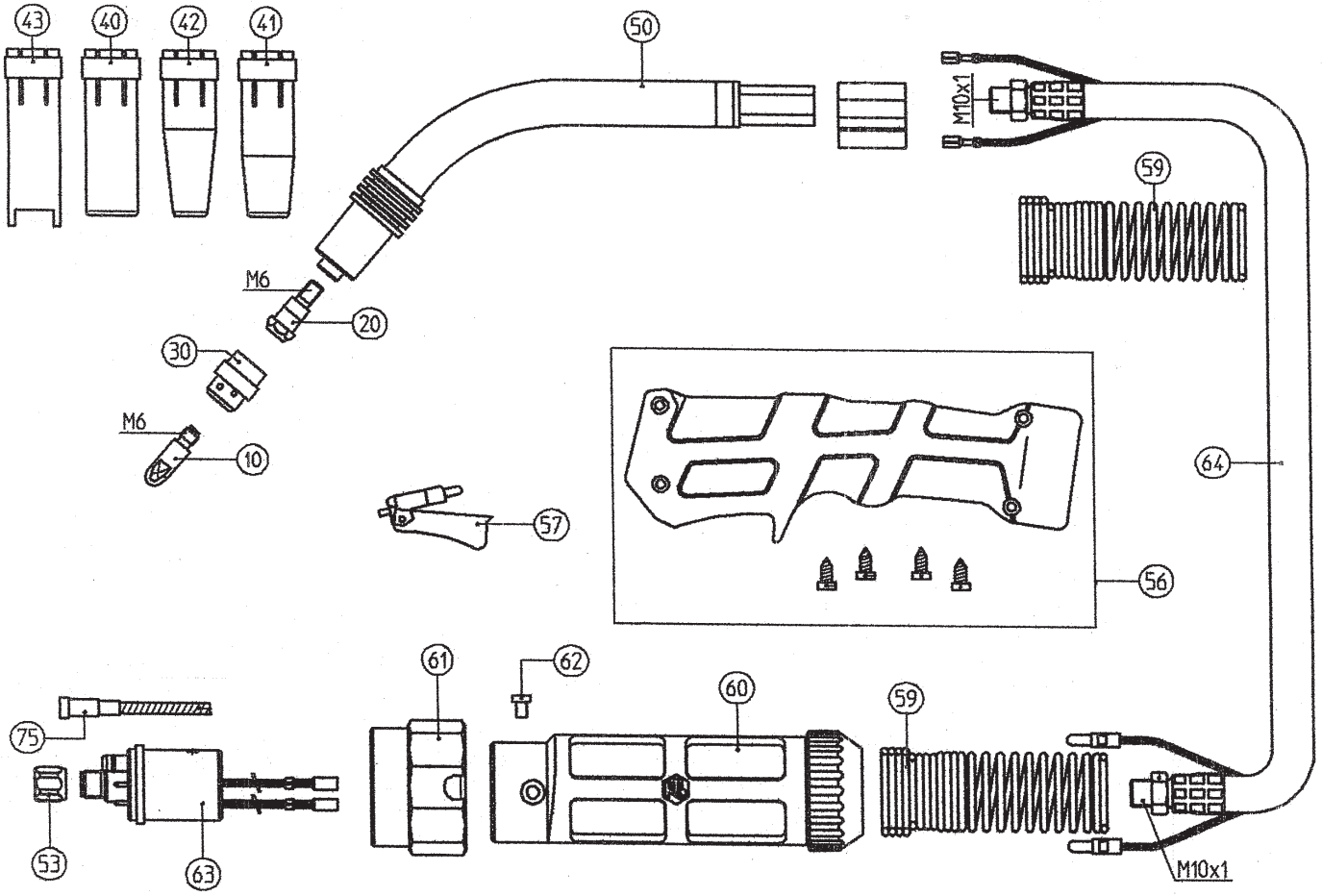
Parts List – MIG 2400



Illus #	Part #	Description
2	3-2H2070-1231-0	Left Hand Side Panel
3	3-2H2070-1221-0	Right Hand Side Panel
4	3-2H0030-1240-0	Right Hand Side Panel Lower
6	3-2H0030-1470-0	Rear Wheel Assy
7	4-2786415211	Rear Wheel Bracket
8	3-2H0030-1474-0	Rear Axle
9	T2619010030	Rear Wheel
10	T4719150001	Front Caster
12	1-702010-0000-1	Handle
13	3-2H0060-3000-0	Main Transformer
14	1-503110-KO10-3	Thermoswitch
15	T4278703000	Choke Coil
16	3-0A0000-6101-0	Capacitor Bank Complete
17	1- 560155-0127-1	Capacitor
18	1-560011-0021-1	Resistor
19	1-562302-3240-3	Rectifier
20	1-503080-KO14-3	Thermoswitch
22	1-505130-0421-1	Main Contactor
23	3-ZA1440-0110-0	Printed Circuit Board W122
24	1-70C100-1002-1	Rail for PCB
25	3-2H2070-4120-0	Control Transformer
26	1-522110-1610-1	Fuse 1.6 amp
27	1-522110-1010-1	Fuse 1.0 amp
28	1-522216-1450-3	Fuse Holder
29	1-504940-0001-1	Circuit Breaker
30	3-0A00AQ-1541-0	Circuit Breaker Holder
31	3-0A0000-1652-0	Insulator f/ Circuit Breaker
32	1-525010-2200-3	Fan
33	1-525014-0100-3	Fan Guard
34	1-706341-1701-1	Chain

Illus #	Part #	Description
35	T1496004088	Wire Drive Brake Assy
37	3-2H0020-1789-0	Spacer
38	1-70C090-1010-1	Spindle Nut
40	1-506040-0330-3	Gas Solenoid Valve-42V AC
41	1-526047-0600-3	Wire Feed Motor - 24V/60W
42	1-722500-5451-1	Wire Feed Plate
43	3-0A0000-7200-0	Nut for Adaptor Plug M10x1
44	3-0A0000-7100-0	Adapter Plug
45	1-730201-0000-3	Female Adaptor Block
46	3-0A0020-7909-7	Guide Tube
47	1-70C030-2000-1	Adaptor Flange
48	1-502304-0210-1	On/Off Switch
49	1-501014-8575-3	4 Position Main Switch
50	1-501014-8576-3	6 Position Main Switch
51	1-520101-1052-1	Knob f/ Main Switch
52	1-51C110-0002-1	Weld Time Potentiometer
53	1-502601-1000-1	Continuous/Seam Switch
54	1-512100-1011-1	Wire Feed Potentiometer
55	1-5281107010-1	Female Recepticle
56	T1234567890	Strain Relief
57	22313	Large Male Ground Plug
58	3-0A0000-5720-2	Shunt
58	22310-3	Ground Clamp
59	3-ZA3120-0120-1	Digital Meter Kit 250 A
62	1-502601-4000-1	Wire Feed Acceleration Switch
63	1-51B110-0002-1	Burnback Potentiometer
64	3ZC010129000	Knob
66	1-522110-2510-1	Fuse 2.5 amp
67	1-522111-0010-1	Fuse 10 amp
68	1-630000-1614-1	Yellow LED

24 Series Welding Gun Parts Breakdown



Item #	Part #	Description
10	15023B	.023" Contact Tip (Pkg 5)
	15030B	.030" Contact Tip (Pkg 5)
	15035B	.035" Contact Tip (Pkg 5)
	15045B	.045" Contact Tip (Pkg 5)
20	24002-TH	Tip Holder
30	24002-DIF	Gas Diffuser/Insulator
40	24104B	Cylindrical Nozzle (Pkg 3)
41	24105B	Conical Nozzle (Pkg 3)
42	24108B	Small Conical Nozzle (Pkg 3)
43	24106	Spot Weld Nozzle
50	24002	Swan Neck
56	15008	Handle Assy - Blue Ergo (does not include trigger)

Item #	Part #	Description
57	14009	Trigger
59	14018-S	Cable Support - Spring
60	14021	Adapter Support
61	14022	Adapter Nut
63	14025	Adapter Block
64	24010	Cable Assy - 10 ft
	24012	Cable Assy - 12 ft
	24015	Cable Assy - 15 ft
75	15040-16	Liner - .023-035
	15040-16-035	Liner - .035-045
	24100	10 ft 24 Series Gun
	24120	12 ft 24 Series Gun
	24150	15 ft 24 Series Gun

Parts Breakdown – #1 Style Welding Gun

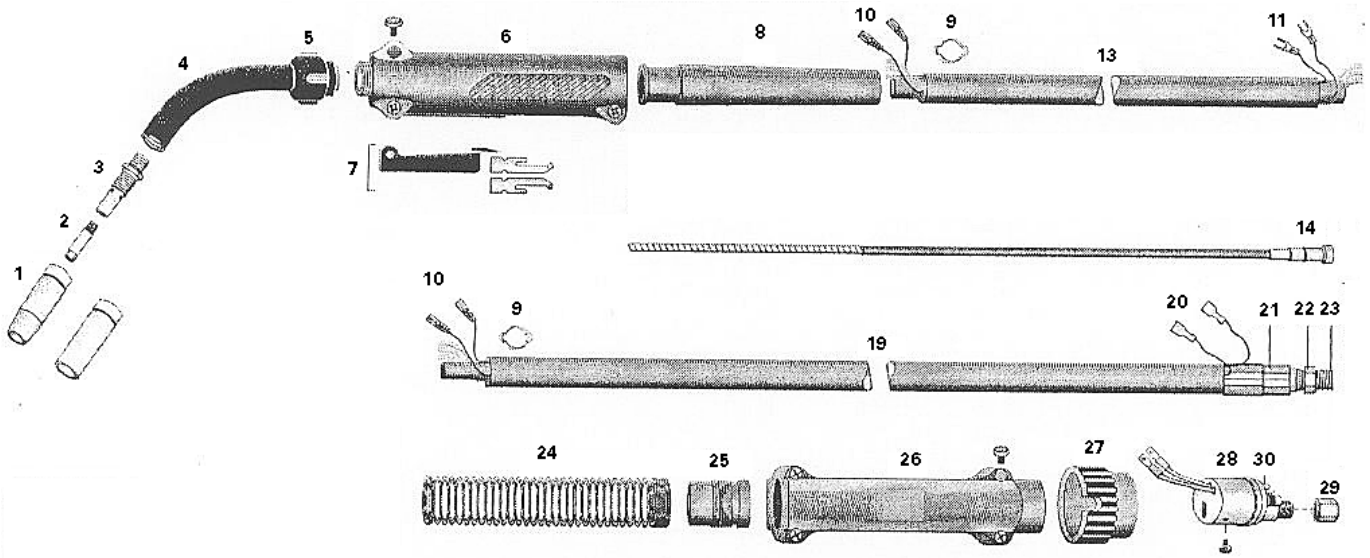


Illustration	Part #	Description
1	S4328	Conical Nozzle
	S4329	Spot Weld Nozzle
	S4330	Cylindrical Nozzle
2	15023	.023" Contact Tips
	15030	.030" Contact Tips
	15035	.035" Contact Tips
	15045	.045" Contact Tips
3	S4228-1	Gas Diffuser f/Tweco #1
4	61-60	Conductor Tube 60 Degree
5	K61R	Conductor Tube Retaining Nut
6	K81TWC	Handle w/Screws
7	K91	Trigger Switch w/blades
8	K141-6	Cable Support (Rubber)
14	X040	Steel Liner (16')
	15041	Teflon Liner (16')
19	K200-10E	Power Cable - 10'
	K200-12E	Power Cable - 12'
	K200-15E	Power Cable - 15'
24	02.30.01	Cable Support Spring
25	02.30.02	Spring Connector
26	02.30.03	Adapter Support
27	K174X-2	Adapter Nut
28	K174EX-1	Adapter Block
29	K174X-1C	Liner Position Nut
	X110	Complete 10' #1 Style Gun
	X112	Complete 12' #1 Style Gun
	X115	Complete 15' #1 Style Gun