HTP America Inc.

MTS 160

Owner's Manual

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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 new MTS 160 welding machine to be free from defects in material and workmanship under normal use and service for two 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.
2. The swan neck, nozzle spring, contact tips, gas nozzles, and liners are consumable items, WHICH CARRY NO WARRANTY.

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Introduction

We congratulate you on the purchase of your new HTP MTS 160 MIG, TIG, and Stick Welder. Your HTP welding machine will allow you to weld items you wouldn't have thought possible to weld. 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 ULTRA-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 PRACTICE FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTIONS, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018.
3. American 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 MTS 160 will only operate when PROPERLY connected to a 220 volt, single phase power source wired for a minimum of 25 amps. All electrical connections should be done by a qualified electrician in accordance with the National Electrical code and local codes and ordinances. Due to the large number of 220-volt receptacles, the MTS 160 is supplied without a plug. When installing the plug, the green or yellow-green wire MUST BE CONNECTED TO GROUND, OR SERIOUS INJURY MAY RESULT. The blue and brown wires are the hot leads.

Front Panel Controls

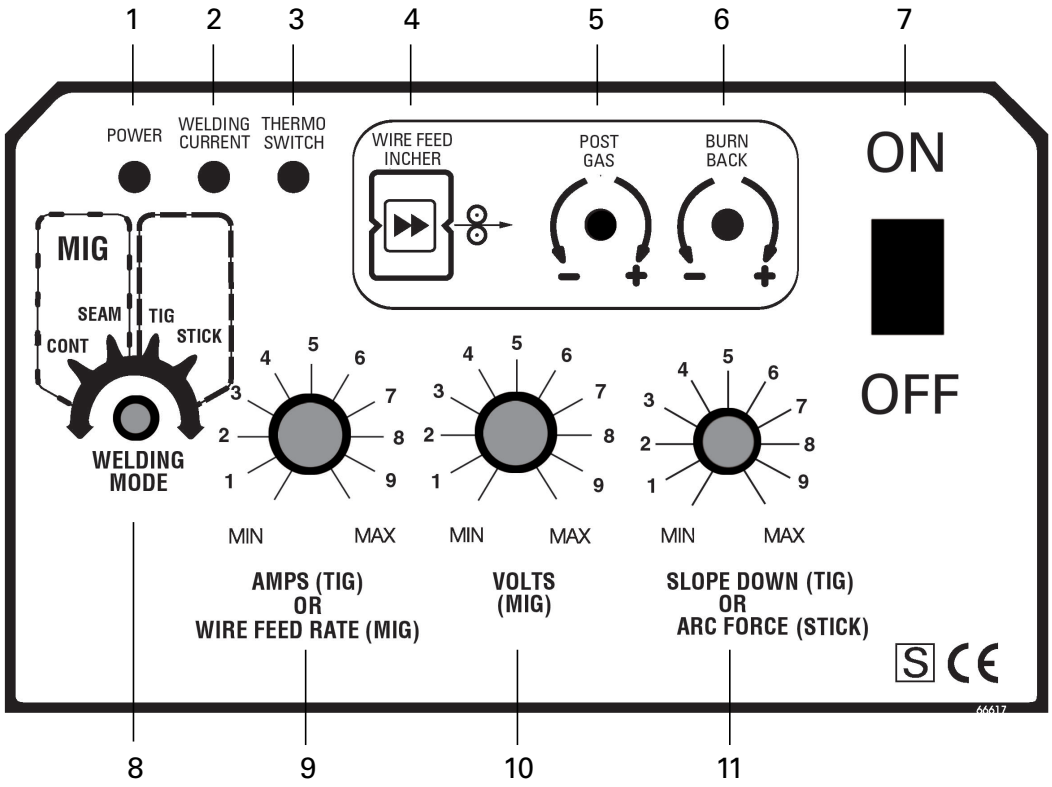


Figure 1

1) Power Indicator Lamp
This lamp is illuminated when the On-Off switch (#7) on the front of your MTS 160 is turned to the on position and the machine is connected properly to a 220-volt power supply.

2) Welding Current Indicator Lamp
When the trigger switch on either the TIG torch or the MIG gun is depressed, welding current will be applied to the welding torch and the Welding Current Indicator Lamp will be illuminated.

If your MTS 160 is in the stick-welding mode, the welding current indicator lamp will be illuminated all the time.

3) Thermoswitch Indicator Lamp
The thermoswitch indicator lamp will light up when the duty cycle of your MTS 160 has been exceeded. When this lamp is illuminated, the machine will no longer weld because the machine has overheated. Leave the machine plugged in and turned on so the cooling fans can cool the unit down. Allow the machine to cool for 15 to 30 minutes, the thermoswitch should reset automatically and your MTS 160 will be ready to weld.

4) Wire Feed Incher
The wire feed incher allows you to feed welding wire into the welding gun with out wasting shield gas. Depressing the wire feed incher will start the drive motor, feeding the welding wire. Note the welding wire will only feed with the side panel closed.

5) Post Gas Flow
The post gas flow is adjustable from 1 sec to 4 sec. Post gas flow is necessary during TIG welding, because after the arc is extinguished if the gas stopped flowing immediately, there is a possibility the molten weld puddle would come in contact with the atmosphere, causing weld defects. Additionally it prevents the tungsten from becoming contaminated by the atmosphere. The gas flow should run long enough to allow the orange color of the tungsten to disappear. It is important to remember not to remove the TIG torch from the weld until the post gas cycle has been completed. If you are welding at higher amperages or on more critical alloys it may be necessary to increase the post gas flow to a higher value.

6) Burn Back Time
When MIG welding, 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 stopped turning, there is a chance the welding wire would “freeze” in the molten welding puddle as it solidified. If there is too much Burnback Time, the wire will melt to the contact tip.

Using a screwdriver to turn the Burnback Time adjustment 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 adjustment 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 work piece and does not melt to the contact tip.

7) 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 fuse at the rear of the welder.

8) Welding Mode Switch
The welding mode switch lets you select between MIG "seam" welding and "continuous" welding, lift arc DC TIG welding, and stick welding.

MIG Seam 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.

MIG Continuous Welding
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.

TIG Welding Mode
When the MTS 160 is in the TIG welding mode, it is possible to perform DC lift arc TIG welding of steel and stainless steel material. The optional TIG welding torch must be attached to the central adapter block on the front panel of the welder.

Stick Welding Mode
When the MTS 160 is in the stick welding mode, it is possible to perform DC stick welding. Plug the optional electrode holder into the positive output receptacle on the front of the unit for electrode-positive (reverse polarity) stick welding and plug the ground cable into the negative output receptacle.

Plug the optional electrode holder into the negative output receptacle on the front of the unit for electrode-negative (straight polarity) stick welding and plug the ground cable into the positive output receptacle.

9) Amperage Adjustment (TIG and Stick Welding Modes)
Wire Feed Rate (MIG Welding Mode)
This knob has two different functions depending on the welding mode.

In the TIG and STICK welding mode, this adjusts the welding amperage of the machine. The higher the amperage, the thicker the material you can weld. Minimum is 5 amps, 5 is 80 amps and max is 160 amps. Use the following chart as a rough guide for setting the amperage for TIG welding steel based on the thickness of the material you will be welding.

Thickness	Tungsten Diameter	Welding Amperage	Amp Setting	Filler Diameter
.030"	.040"	30-40	2	.035"
.050"	1/16"	45-55	3	.035"
.062" (1/16")	1/16"	55-65	4	1/16"
.093" (3/32")	1/16"	80-90	5	1/16"
.125" (1/8")	1/16"-3/32"	110-120	7	1/16"
.187" (3/16")*	3/32"	130-140	9	1/16"
.250" (1/4")*	3/32"-1/8"	150-160	max	3/32"

In the MIG welding mode, this knob adjusts the 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 welding voltage. 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.

10) Voltage Adjustment
This knob controls the welding voltage in the MIG welding mode. It is infinitely adjustable. The higher the welding voltage the thicker you will be able to weld. Your MTS 160 will let you weld from 24-ga steel up to 5/16" in mild steel.

11) Slope Down (TIG Mode) Arc Force (Stick)
In the TIG welding mode, this control adjusts the slope down. The slope down is the amount of time it takes your MTS 160 to go from the preset welding current to off. A longer slope down time will gradually cool your weld and help to prevent "cratering". The slope down is adjustable from .1 sec to 10 sec.

In the Stick welding mode, this control adjusts the Arc Force. The arc force is how "hard" or "soft" the welding arc is. The minimum setting produces a softer arc, while the maximum setting produces a "harder" arc with more "driving" force behind it. The "harder" arc may produce more spatter.

Front Panel Receptacles

Figure 2

1) Adapter Block
This is where the MIG welding gun or the TIG torch connects to the machine. This single connection houses the power, welding wire, shield gas, and the trigger wires.

To install the welding gun or TIG torch, 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.

2/3) Power Output Receptacles
3 is the positive power output receptacle and 2 is the negative power output receptacle. These control the polarity of the machine. For most MIG welding applications with shield gas, the ground cable will be connected to the negative receptacle (2). For most MIG welding applications with flux cored wire and most TIG welding applications, the ground cable will be connected to the positive receptacle (3).

If you have 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.

This is also where you will install your optional electrode holder if you are arc welding. If you will be arc welding DC electrode positive, then the electrode holder will go in the positive receptacle (3) and the ground will be installed in the negative receptacle (2). If you will be arc welding DC electrode negative, then the electrode holder will go in the negative receptacle (2) and the ground will be installed in the positive receptacle (3).

When inserting the end of the ground cable into either power output receptacle, secure the ground cable by twisting it clockwise 1/2 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.

Polarity Adjustment

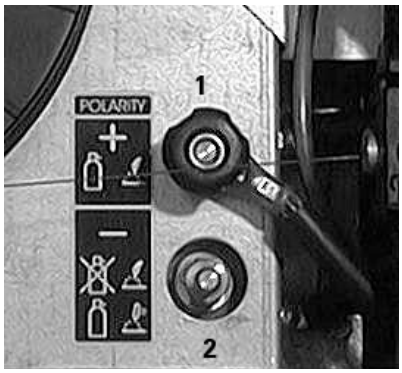


Figure 3

The polarity must be adjusted correctly for MIG welding with shielding gas, flux cored MIG welding, and TIG welding. This connection is located in the wire feed compartment. The wire connected to the polarity terminal goes to the adapter block and determines the polarity of the adapter block.

For most MIG welding applications using shielding gas, the polarity wire will be connected to the positive terminal (1) as shown. This would make the welding gun positive and the ground cable would be plugged into the negative output receptacle on the front of the welder (see Fig 3).

For most flux cored MIG welding and TIG welding, the polarity wire will be connected to the negative terminal (2). This will make the torch negative. The ground cable would be connected to the positive output receptacle on the front of the welder (see Fig 3).

To change the polarity from positive to negative, unplug the welder from the power supply. Remove the insulated nut. Remove the polarity wire from the positive terminal, and install it on the negative terminal. Tighten the insulated nut securely on the negative terminal.

Feeding the Welding Wire

(See Fig. 4, 5, 6)

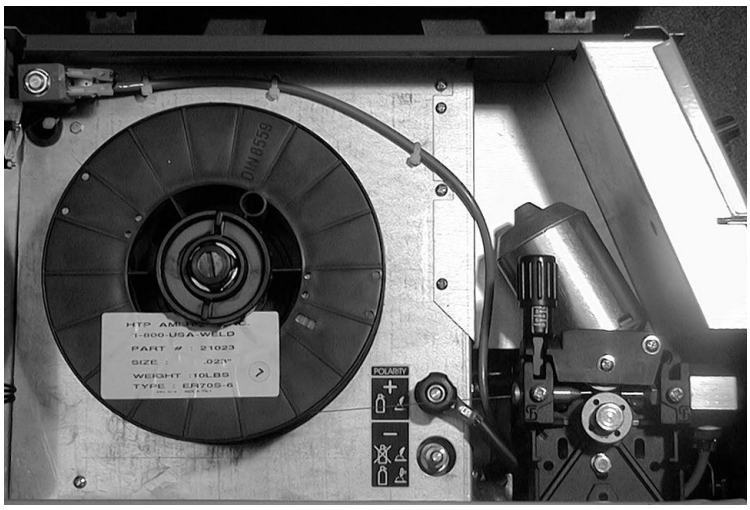


Figure 4

Figure 5
Spool Holder
A) Spool Retaining Nut
B) Drive Brake Tensioner

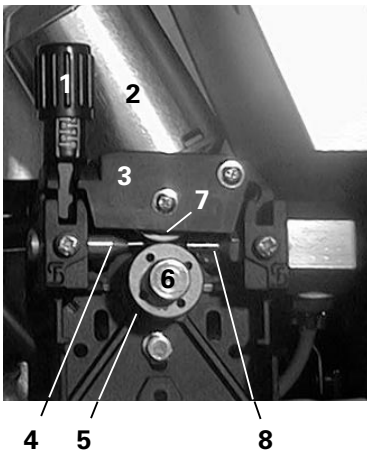


Figure 6
Wire Drive
1) Pressure Release Handle
2) Drive Motor
3) Pressure Roller Assy
4) Inlet Wire Guide
5) Drive Roller
6) Drive Roller Retaining Screw
7) Pressure Roller
8) Guide Tube

1. Your MTS 160 is designed to use standard 8" diameter 10 lb spools of welding wire. Remove the spool retaining nut (A) from the wire drive brake. Place the wire on the spool holder so it unravels from the bottom. Install the spool retaining nut (A) and tighten.
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 the pressure roller assembly (3) will swing up and out of the way.
4. Install the guide tube (8), which is taped to the bottom of the machine into the adapter block though the front of the adapter block. See figure 2 page 6.
5. Feed the wire into the inlet wire guide (4), across the drive roll (5), and into the guide tube (8). (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. Note that the drive roller is designed to "float" on the shaft of the wire drive motor.
6. Swing the pressure roller assembly (3) back into position. Make sure that the wire is positioned in the groove of the drive roll (5). Unscrew the pressure release handle (1) until most of the pressure on the pressure roller has been released.
7. 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.
8. 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 spool holder is a square plastic bolt (B) with a slot for a large screwdriver. This plastic 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, adjust the tension on the wire drive brake so the spool will continue to rotate 1/8 to 1/4 turn after you have released the trigger. This can be adjusted by hand if the spool retaining nut (A) is removed.
9. 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.

SHIELD GAS - MIG WELDING

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.

Gas Bottle

HTP also has available small 55 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.

SHIELD GAS - TIG WELDING

TIG welding requires the use of 100% argon shield gas for all ferrous materials. The flow rate should be set at 20 to 30 cfh, depending on the welding conditions.

MIG WELDING WITH YOUR MTS 160

Connect the MIG welding gun to the adapter block. Connect the proper shield gas to the fitting at the rear of the unit and adjust the flow to the correct setting. Plug the ground cable into the negative receptacle.

There are two control points which have to conform: the power setting (Volts) and the wire feed rate. The voltage 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 and fine-tune your machine from there.

.023" Diameter Wire

Volt Setting	No Load Voltage	Wire Feed Rate	Output Amperage	Material Thickness
2	18.0	1 1/2	24	24gauge
3	19.5	2	31	22 gauge
3 1/2	19.8	2 1/4	36	20 gauge
5	22.1	3 3/4	50	18 gauge
7	24.3	5 3/4	65	16 gauge
Max	28.2	Max	110	1/8"

.030" Diameter Wire

Volt Setting	No Load Voltage	Wire Feed Rate	Output Amperage	Material Thickness
3	19.5	2	48	22 gauge
4	20.0	3	68	20 gauge
5	22.1	4	88	18 gauge
6	23.0	5	100	16 gauge
8	27.0	7	120	1/8"
9	28.0	8	135	3/16"
Max	28.2	Max	150	1/4"

Chart #3

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.

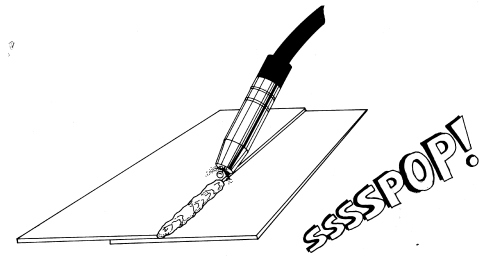


Figure x

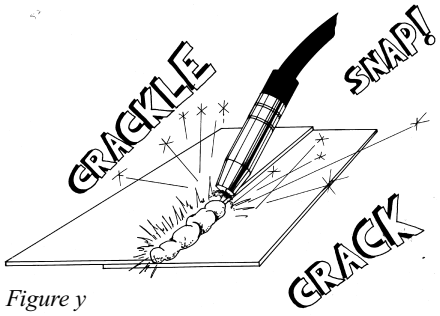


Figure y

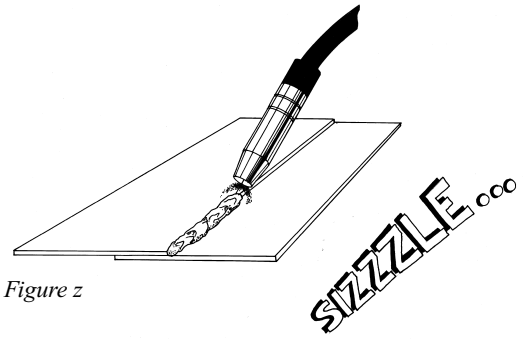


Figure z

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 tune 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. Start with the Voltage setting at #4, as it has a nice, crisp sizzle. Once you have mastered tuning in the machine on Voltage Setting #4, practice tuning in the machine on different Voltage Settings.

It is highly recommended that you practice with your welder at different Voltage Settings so that you will become familiar with your welder. This is important to do prior to welding on your project so you will know which voltage setting to select for an application.

SEAM WELDING

Install the conical nozzle (Part #15105) 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. Select the correct voltage setting based on Chart 3 for the material you are welding.

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.

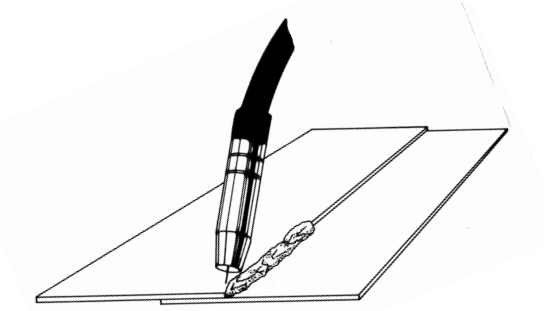


Figure 4 “Pushing the Weld”

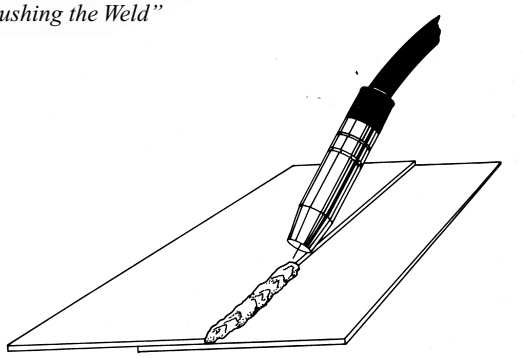


Figure 5 “Pulling the Weld”

STITCH WELDING

Your HTP MTS 160 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 it 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 the conical nozzle (15105), small conical nozzle (15108), or the cylindrical nozzle (15104) 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.

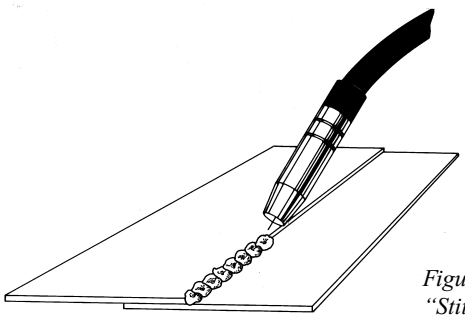


Figure 6
“Stitch Welding”

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.

SPOT WELDING

Install the spot weld nozzle (Part #15106) 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.

Select the correct voltage setting from the chart 3 (page 8) and increase by approximately 2 numbers. 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 for spot welds which are vertical down, however, do not reduce the wire feed rate when performing overhead spot welds. Place the welding gun over the punched hole so that the welding wire is centered over the punched hole (See Fig. 7). Depress the trigger on the welding gun. Release the trigger as soon as the hole is filled. Examine the spot weld. If the hole is not completely full, either the welding wire was not centered over the hole or the trigger was released too soon. If the spot weld is

not flat and has excessive metal build-up, then the trigger was held too long, the wire feed rate is too fast, or the power is not high enough. The correct power setting, welding time and wire feed rate will produce spot welds which will lie flat and require little, if any, finishing.

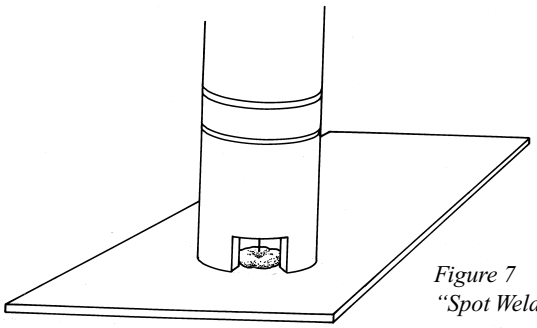


Figure 7
"Spot Welding"

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 voltage setting for hole filling is one to two settings below seam welding.

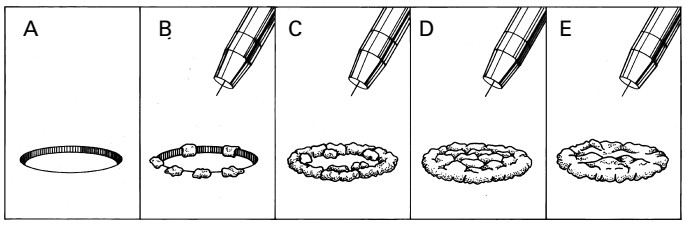


Figure 8 "Hole Filling"

WELDING ALUMINUM

It is possible to MIG aluminum with your MTS 160. 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, or it may be necessary to use the RSG250 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 when it makes 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 spool gun will allow you to get 25' away from your MTS 160. If you will be repairing aluminum trailers, the spool gun is probably a must, as it will allow you to weld on the trailer while leaving the MTS 160 and tank on the ground. 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 #15104) 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 #15044) 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 wire 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) 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.

STUD WELDING

With the purchase of the optional DENT PULLER KIT (Part #12015), your MTS 160 Welder makes it possible to pull dents without drilling holes in the dented panel. The dent puller kit comes complete with one stud weld nozzle (Part #15007), one box of 500 studs (Part #12038) and a special slide hammer.

Install the stud weld nozzle on the welding gun. Set the voltage to 5, 6, 7, or 8 depending on the thickness of the material. Tune in the wire feed rate to the proper setting. Invert the welding gun and insert a stud in the tube protruding from the gas nozzle. The head of the stud will prevent the stud from falling out of the nozzle.

Grind away paint and rust from dented area to be pulled. Place welding gun against dented area so that the stud will be welded in the desired position. Place your finger over the end of the stud protruding from the nozzle so that the stud comes in contact with the dented panel. Depress the trigger on the welding gun while maintaining pressure on the stud. The stud will begin to melt. Continue welding until your finger has reached the gas nozzle and no more stud can be pushed into the panel. Allow the weld to cool. Remove gas nozzle from the stud.

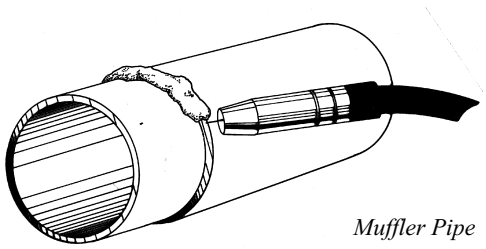
Install the slide hammer on the stud. Pull the dent. After the dent has been pulled, remove the stud from the slide hammer.

The stud may be removed from the dented panel by grinding, clipping off with side cutters, or simply bending it from side to side until it snaps off.

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.

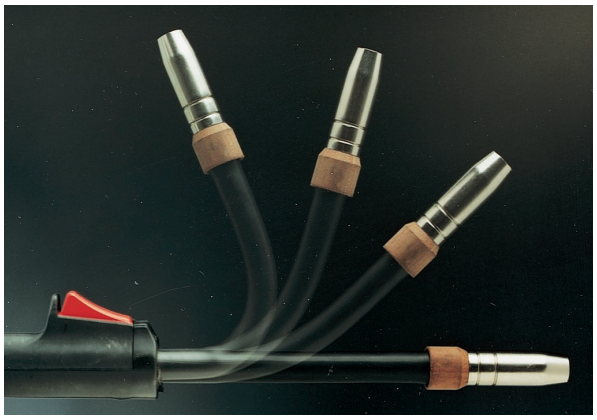
Have 1/4" to 1/2" of welding wire protruding from the end of the gas nozzle. Have the welding gun inclined at a 45-degree angle to the pipe. Aim the welding wire at the spot to be tacked and momentarily depress the trigger. Hold the trigger long enough for the welding sound to smooth out (approximately one to two seconds). Since exhaust tubing is generally 16 ga tubing, the voltage setting will be between 6 and 7. (See chart 3)



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 MTS 160 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 voltage at 7 or 8. 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 voltage to 4 or 5 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.

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 MTS 160 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. However, the preferred method for welding cast iron would be TIG welding. This MIG filler, although thin, works excellent as a TIG rod for 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 given 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.

TIG WELDING WITH YOUR MTS 160

In order to TIG weld, remove the MIG welding gun from the MTS 160 and install the optional TIG welding torch (Part # SR17-12.5MTS) on the machine. Generally speaking, except for very rare instances, you will TIG weld DCEN, or DC electrode negative. If you were MIG welding with shielding gas, you will have to change the polarity from electrode positive to electrode negative. (See page 6, Polarity Adjustment)

Plug the ground cable into the positive output receptacle. Use 100% argon shielding gas.

Setting Up The Torch
Lets assume we will be welding some .060" mild steel. Selecting a 1/16" 2% Ceriated tungsten, we grind a point on the end of the tungsten (remember always grind the tungsten longitudinally, never radially). Select a 1/16" collet and insert the tungsten so the pointed end of the tungsten comes out through the slit in the collet. Next insert the collet/tungsten assembly into the threaded end of the collet body, so the pointed end of the tungsten comes out through the sized hole of the collet body. (See Fig 8A) Thread the assembly into the torch head and tighten the collet body snugly by hand. Install the back cap, but do not tighten at this point. Install a #6 alumina cup on the collet body and tighten snugly by hand. Have the tungsten protruding from 2 to 3 times its diameter from the end of the cup (in this instance 1/8" to 3/16" (See Fig 8B). Tighten the back cap.

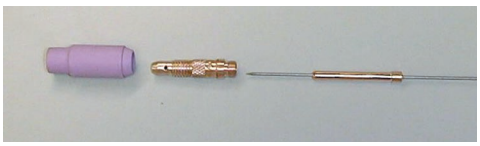
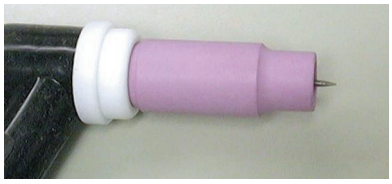


Figure 8A

Figure 8B



Holding The Torch
It is recommended that you use TIG welding gloves like our BL25 gloves. These are thinner than standard welding gloves and will give you a much better "feel" and make it easier to work the filler rod. Grip the torch somewhat like a pencil, as indicated in figure 8C. The torch must be positioned almost perpendicular to the work and in such a manner that the tungsten is kept 1/8" to _" off the work. The tungsten should only contact the work when starting the arc. Once the arc is started, the tungsten should never contact the work. Use the edge of your hand and little finger to hold the torch steady.

Figure 8C

Set the amperage to about 60 amps (#4 on the amperage selector). Connect argon to the machine and set the flow rate to about 20 cfh. Push the trigger switch to start the current flow. Gently touch the tungsten electrode to the work and then lift it off the work. HTP's touch start circuitry will start the arc. Initially, just practice moving the tungsten in a straight line, at a constant speed, and keeping it a constant distance off the work piece. Remember that Rome wasn't built in a day, so don't expect to master TIG welding in 15 minutes. PRACTICE, PRACTICE, PRACTICE.

Once you have mastered just running a bead in a straight line without adding any filler metal, the next step is to do the same thing but to add filler metal. Dip the filler metal into the molten puddle (do not try to melt the filler metal into the work) and NEVER allow the filler metal to touch the tungsten. If the filler metal comes in contact with the tungsten, or if the tungsten contacts the work, you must stop and sharpen the tungsten. Remember, practice, practice, and practice.

To make my life easier, and so I am not always stopping to sharpen tungsten, I keep a package of 10 tungsten of each diameter sharpened in the box. That way, when I need a new tungsten, I can just take a sharp one and put the contaminated one in the box. When I have used them all, I will sharpen them all at once.

Now, once you have practiced laying a bead and adding filler metal, then you can practice welding two pieces of metal together. Start with a butt weld, as this is the easiest. Master this technique before you continue to other joints. Compared to MIG welding, TIG welding is much harder and will require a lot of practice to become proficient.

Tungsten Electrodes
HTP recommends the following premium quality tungsten electrodes ground to a high quality finish for use with your MTS 160. All tungsten is 7" long and can be purchased individually.

2% Thoriated Tungsten (TT2) – red tip - This tungsten is the most common tungsten currently used. Generally used for DC welding of steel and stainless steel. Draw back is it has a low level radiation hazard. Offers good overall performance.

2% Ceriated Tungsten (TC2) – grey tip – 2% Ceriated is an excellent substitute for 2% thoriated tungsten and works excellent with inverter power sources such as your 160DC. More popular for thinner materials because it requires less amperage to start. Offers a stable arc.

2% Lanthanated Tungsten (TL2) – blue tip – 2% lanthanated is also an excellent substitute for 2% thoriated tungsten. It offers good arc starting characteristics and longer life than 2% thoriated.

Tungsten Type	Diameter			
	.040" (1.0mm)	1/16" (1.6mm)	3/32" (2.4mm)	1/8" (3.2mm)
2% Thoriated	TT2-7040	TT2-7116	TT2-7332	TT2-718
2% Ceriated	TC2-7040	TC2-7116	TC2-7332	TC2-718
2% Lanthanated	TL2-7040	TL2-7116	TL2-7332	TL2-718
Amperage	15-50	50-120	80-150	130-250

The electrode should be sharpened to a point with a fine grinding wheel. If the stone used for sharpening the electrode is not clean, contaminants could lodge in the electrode and dislodge when welding. The grinding wheel used for tungsten electrodes should not be used for any other materials. When grinding the electrode to a point, a 15 to 30 degree angle is desired. The grinding marks should run lengthwise with the point, opposed to in the direction of the diameter.

The HTP Tungsten Sharpener is an excellent tool for precisely sharpening tungsten electrodes without any fear of contamination.

HTP
Tungsten Sharpener

General Welding Parameters
Following are some "rule of thumb" welding parameters, tungsten diameters and amperage settings for welding different thicknesses of steel. Keep in mind these are general settings and the specific application may require more or less power to get the job done.

Steel

Thickness	Tungsten Diameter	Welding Amperage	Filler Diameter
.030"	.040"	30-40 (2)	.035"
.050"	1/16"	45-55 (3)	.035"
.062" (1/16")	1/16"	55-65 (4)	1/16"
.093" (3/32")	1/16"	80-90 (6)	1/16"
.125" (1/8")	1/16"	110-120 (71/2)	1/16"
.187" (3/16")*	1/16"-3/32"	130-140 (9)	1/16"
.250" (1/4")*	3/32"	150 (Max)	3/32"

** May require beveling – depends on joint*

Filler Rod for TIG Welding
HTP offers you high quality filler rods in affordable quantities. All filler rod is packaged in 1lb airtight plastic tubes to keep your filler rod fresh and contaminant free. The tubes are completely re-sealable.

In TIG welding, the filler rod is fed into the molten puddle by hand. The choice of filler rod is extremely important as the rod must correctly match the material and alloy you will be welding. The thickness of the material to be welded determines the diameter of the filler rod.

HTP
Filler Rod

Here are some good rules of thumb to help you select the correct filler metal:

1) ER70S-6 is generally used for mild steel welding.
2) ER70S-2 is highly recommended for welding 4130 chrome-moly tubing in many applications.
3) ER80S-D2 is recommended for welding 4130 chrome-moly tubing if a higher strength, less ductile weld is required. If your weld will be heat treated to obtain optimum strength, then use a filler metal which matches the chemistry of your tubing, which neither 70S-2 nor 80S-D2 wires do.
4) Generally speaking, use a 1/16" diameter filler rod for applications where the material is 1/8" and less. Use a 3/32" diameter rod for 1/8" and thicker.

The following Filler Rod is available from HTP in 1 lb. tubes which are tightly sealed to prevent oxidation.

Filler Rod

Part #	Material
308L-035-1	308L Stainless Steel Wire - .035" x 36"
308L-1/16-1	308L Stainless Steel Wire 1/16" X 36"
70S6-1/16-1	ER70S-6 Steel Wire 1/16" X 36"
70S6-3/32-1	ER70S-6 Steel Wire 3/32" X 36"
70S2-1/16-1	ER70S-2 Steel Wire 1/16" X 36"
80SD2-1/16-1	ER80SD-2 Steel Wire 1/16" X 36"

ARC WELDING WITH YOUR MTS 160

You can arc weld with your MTS 160 if you have purchased the optional electrode holder # 22315-ARCMTS. If you will be welding Electrode Negative (Straight Polarity) insert the electrode holder into the negative output receptacle and the ground cable into the positive output receptacle. If you will be welding Electrode Positive (Reverse Polarity) insert the electrode holder into the positive output receptacle and the ground cable into the negative output receptacle.

Make sure material you are welding is clean, and attach the ground cable to the workpiece. Select the correct rod type, diameter and amperage for your application. (See Chart E1)

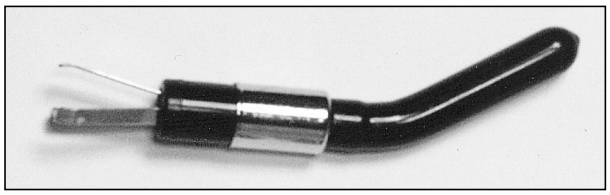
To strike the arc, drag the electrode across the work as if you were trying to strike a match. Lift the electrode off the work slightly. If the electrode sticks to the work, give it a sharp twist to break it free. If the arc goes out after it has started, you have lifted the electrode too high off the work. Try to incline the electrode at a 10 deg to 30 deg angle from perpendicular in the direction of motion.

MAINTENANCE 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.



Nozzle Reamer

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.

Electrode Selection and Amperage Range

Electrode	Polarity	Penetration	Position	Diameter	Amperage Range 40	50	60	70	80	90	100	110	120	130	140	150
6010	EP	DEEP	ALL	3/32"	■	■	■	■	■	■						
				1/8"				■	■	■	■	■	■	■		
				5/32								■	■	■	■	■
6011	EP	DEEP	ALL	3/32"	■	■	■	■	■	■						
				1/8"				■	■	■	■	■	■	■		
				5/32								■	■	■	■	■
6013	EP,EN	LOW	ALL	3/32"	■	■	■	■	■	■						
				1/8"				■	■	■	■	■	■	■		
				5/32								■	■	■	■	■
7014	EP,EN	MEDIUM	ALL	3/32"				■	■	■	■	■				
				1/8"								■	■	■	■	■
				5/32												■
7018	EP	LOW	ALL	3/32"			■	■	■	■	■					
				1/8"							■	■	■	■	■	■
				5/32												■
7024	EP,EN	LOW	FLAT	3/32"							■	■	■	■	■	
				1/8"											■	■
308L	EP	LOW	ALL	3/32"	■	■	■	■								
				1/8"				■	■	■	■	■	■	■	■	■
				5/32								■	■	■	■	■

Chart E1

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.

In Figure 11 is a deformed nozzle spring pointing outward, so it will come in contact with the inside of the gas nozzle. In Figure 12, the nozzle spring is wound down around the base of the swan neck. These deformed springs are caused by improper removal of the gas nozzle. This again will cause the welding current to be transmitted to the exterior of the gas nozzle, once again causing a short circuit. THE NOZZLE CAN ONLY BE REMOVED BY TWISTING IN A CLOCKWISE DIRECTION WHILE PULLING IT OFF.

Figure 9
Spatter Build Up Symptoms

Figure 10
Spatter Build Up

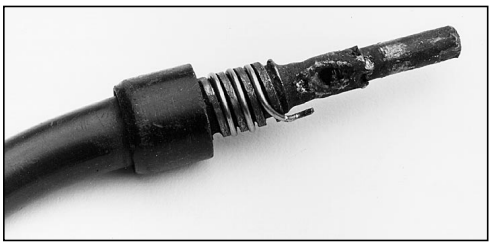


Figure 11
Spatter Damaged Swan Neck

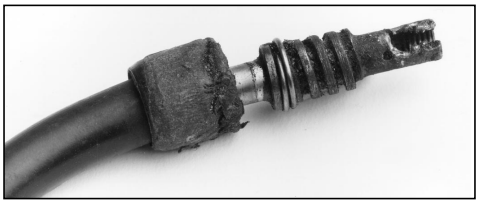


Figure 12
Spatter Damaged Swan Neck

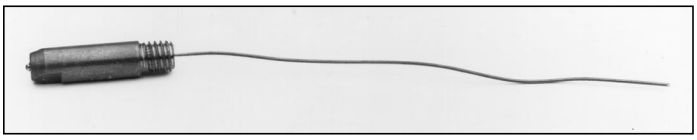


Figure 16

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.

CHANGING THE CONTACT TIP

The contact tip 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
15040B	.040" 1.0 mm
15045B	.045" 1.2 mm

CHANGING THE GAS NOZZLE

The gas nozzle is removed by simultaneously twisting the gas nozzle and pulling it off. The gas nozzle can only be twisted in a clockwise direction. Twisting the nozzle in a counter-clockwise direction will damage the nozzle spring. To install the gas nozzle, simply twist the nozzle in the same clockwise direction while pushing it on the swan neck. The following gas nozzles are available for your welding gun:

Part #	Description	Application
15105B	Conical Nozzle	General Welding
15004B	Cylindrical Nozzle	Aluminum Welding
15106B	Spot Weld Nozzle	Spot Welding
15108B	Small Conical Nozzle	Corner Welding

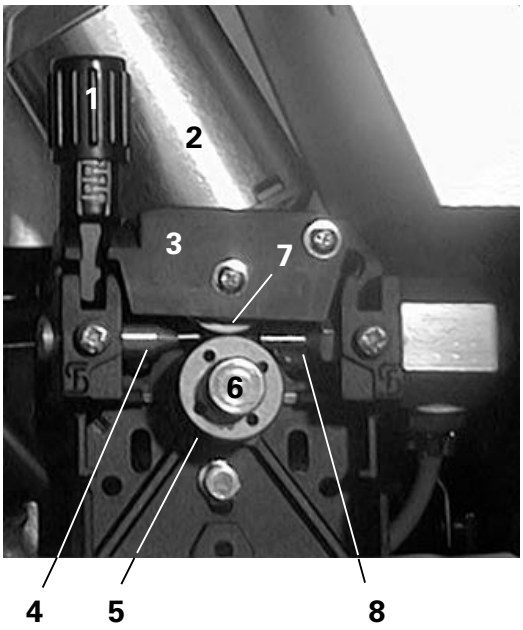


Figure 6
Wire Drive
1) Pressure Release Handle
2) Drive Motor
3) Pressure Roller Assy
4) Inlet Wire Guide
5) Drive Roller
6) Drive Roller Retaining Screw
7) Pressure Roller
8) Guide Tube

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 (1) out of the way and lift the pressure roller assembly (3) up and out of the way.
2. Loosen the wire from the spool. Feed the wire into the inlet wire guide (4), across the drive roll (5) and into the guide tube (8). 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 assembly (3) 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.
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 will 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. 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.
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.

CHANGING THE DRIVE ROLL

The drive roll has two grooves on it. The narrower of the two grooves is marked 0.6 and is used for .023" wire. The wider groove, marked 0.8, is used for .030" wire.

To change the drive roll, simply remove the drive roll retaining screw (6) and remove the drive roll (5) 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 (4) and the guide tube (8). Install drive roll retaining screw.

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 if the line is defective:

1. Feed 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, 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. 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) Coil the welding gun, and cut an additional 1/8" to 3/16" from the liner. Install the correct size contact tip.

Part #	Description
15040	Steel liner - for flex neck or standard swan new - steel welding only
15044	Teflon liner - for flex neck or standard swan neck - aluminum welding only

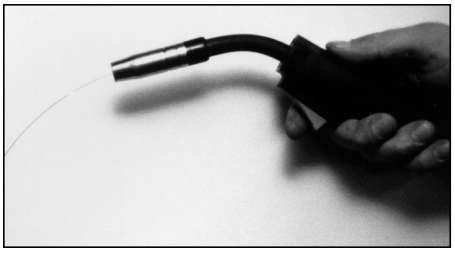


Figure 17

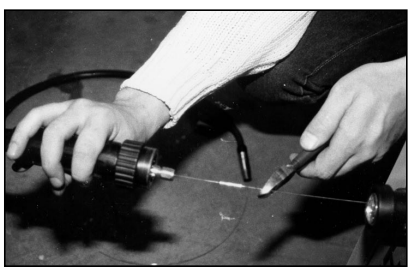


Figure 18

Figure 19

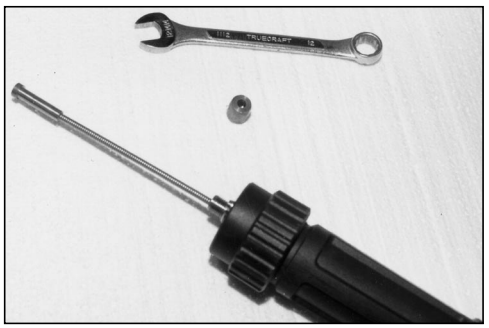


Figure 20

Figure 21

Figure 22

MONTHLY MAINTENANCE

Your HTP MTS 160 is a very hardworking piece of equipment and is very simple to maintain. However, your HTP MTS 160 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 Welder is equipped with a thermoswitch to protect the internal components of you welder 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. The indicator light will remain on, the wire will not feed, and on the machines equipped with cooling fans, the fans will remain on. When the machine cools down (approximately 20 minutes) the thermoswitch will automatically reset itself 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.

WELDING WIRE

HTP has a wide variety of welding wire available. For autobody repair, we strongly recommend the following wires:

Application	Part #	Description
Steel	21023	.023" E70S-6 Steel wire
Aluminum	40230	.030" 5356 Alloy Aluminum Wire

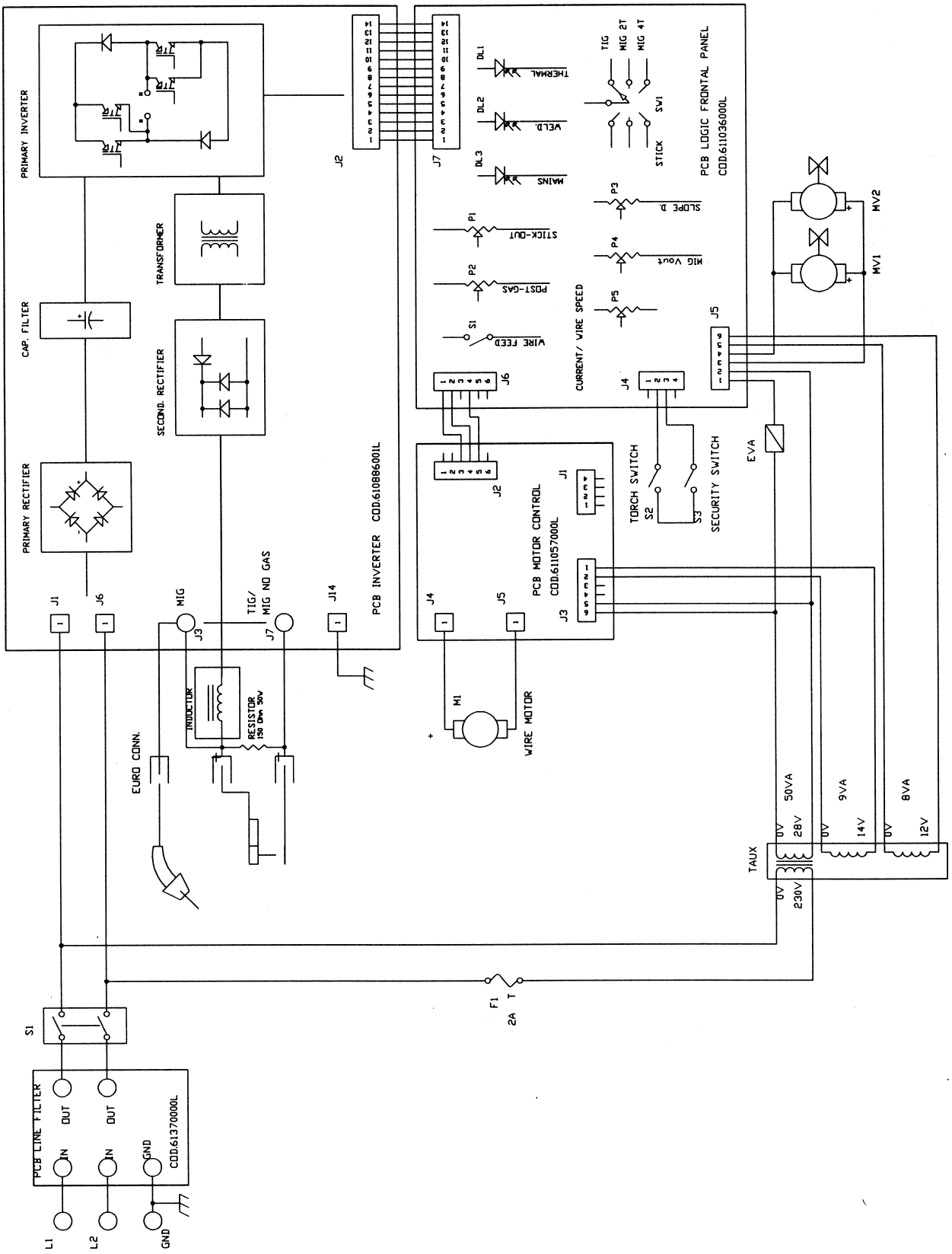
We are typically finding body panels being made from 22 gauge (.0299" thick), 24 gauge (.0239" thick) and 26 gauge (.0179" thick) steel. When welding this thin metal, the secret to minimizing distortion and burn-through is by using a wire which will require the least amount of heat to melt. This would be the thinnest wire available, .023" diameter in steel and .030" diameter in aluminum.

For muffler work and general repair welding, we are generally working on thicker materials. We therefore recommend using part #21030, .030" steel wire. This wire will give greater penetration and less feeding problems.

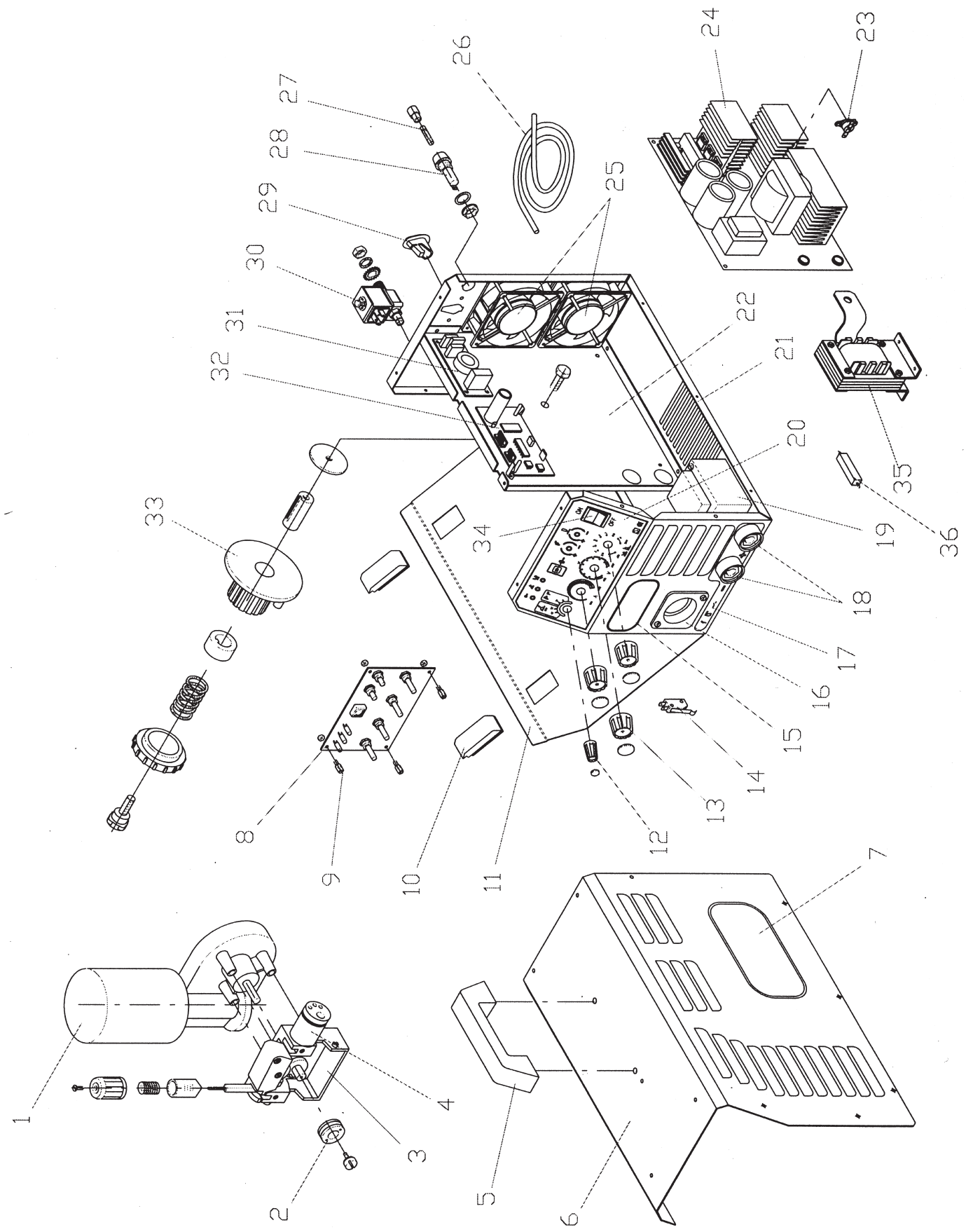
Application	Part #	Description
Steel (30 ga -1/8")	21023	.023" E70S-6 Steel Wire
Steel (16 ga - 1/4")	21030	.030" E70S-6 Steel Wire
Steel (14 ga -1/2")	21035	.035" E70S-6 Steel Wire
Aluminum (24 ga -1/8")	40230	.030" 5356 Alloy Aluminum Wire
Aluminum (16 ga - 1/4")	40235	.035" 5356 Alloy Aluminum Wire
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

For other applications, use the following chart as a guide:
All HTP steel welding wires are AWS grade E70S-6. This is a high quality welding wire with additives to reduce spatter and offer better wetting characteristics on rusty material. Also, this is the only grade of welding wire that is compatible with the High Strength Low Alloy steels found in today's unibody vehicles.

Wiring Diagram – MTS 160



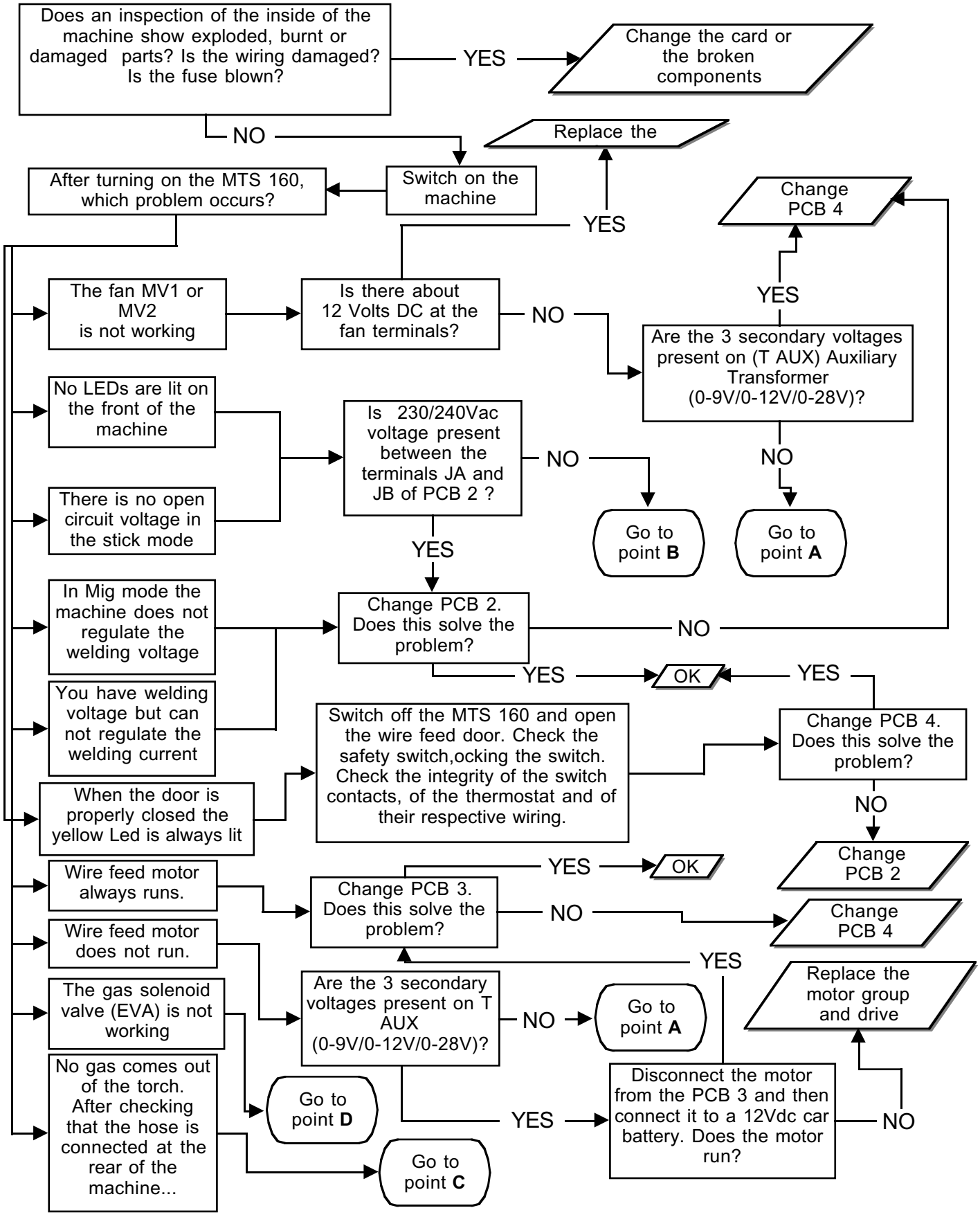
Parts Breakdown – MTS 160

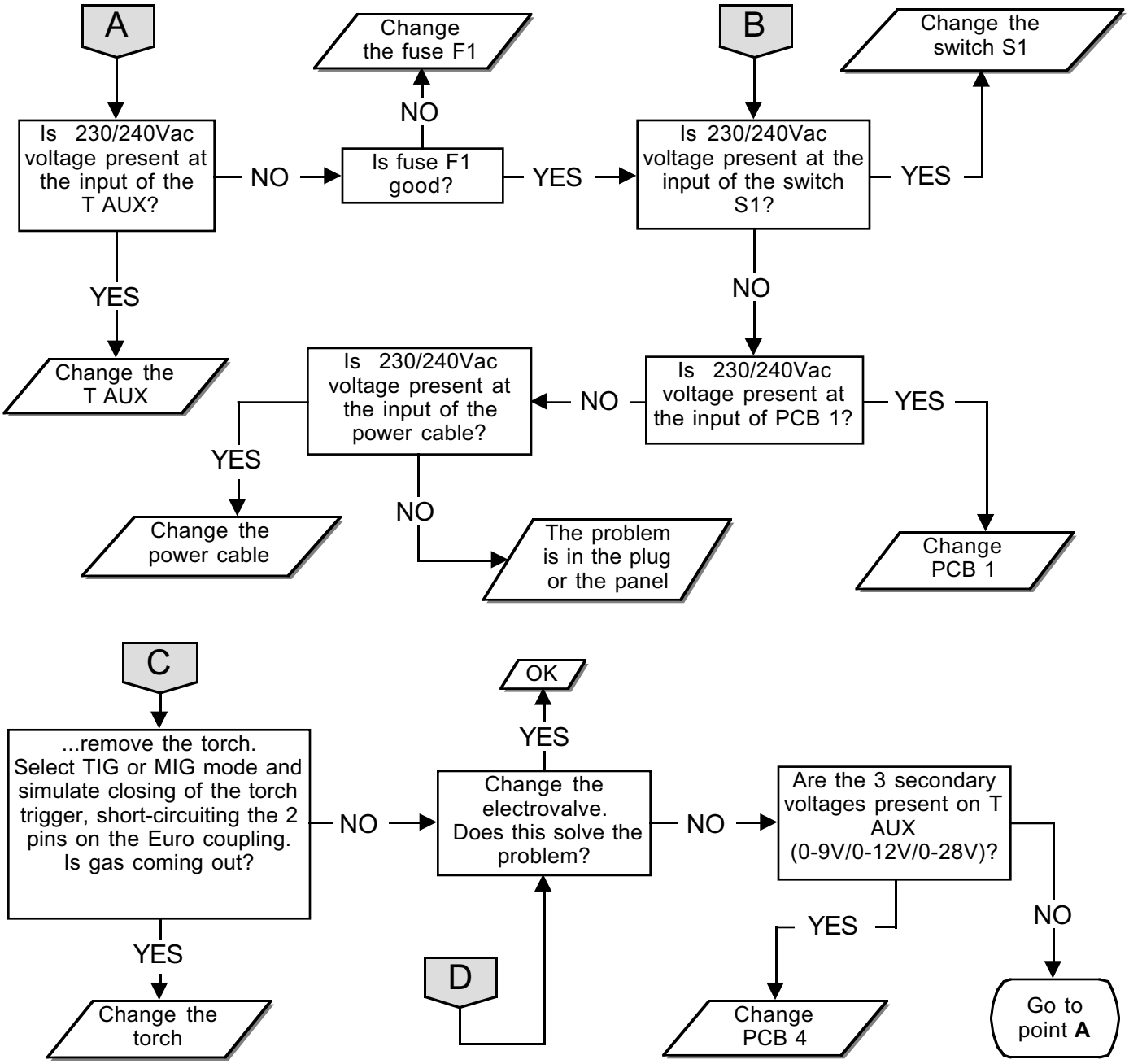


MTS 160 Parts List

1	Wire Drive Motor	64239
2	Drive Roller - .023" - .030"	63160
3	Wire Drive Bracket	66535
4	Adapter Block-Female	20205
5	Handle	66112
6	Outer Panel	62654
7	Label, Side Panel	66620
8	PCB front panel	614380005L
9	Spacer	63131
10	Latch (2)	66471
11	Side Panel	6265500040
12	Knob (dia. = 15mm)	66081
13	Knob (dia. = 22mm)	66121
14	Microswitch	64132
15	Label, Front Panel	66619
16	Adapter Support	66462
17	Connections plate	66618
18	Male Plug	22312
19	Transformer	65844
20	Lable - Control Panel	66617
21	Cabinet	62653
22	Center Panel	62656
23	Thermoswitch (70°C)	64215
24	PCB inverter	610886
25	Cooling Fan	64217
26	Power Cord	20139
27	Fuse 2A	64250
28	Fuse holder	64180
29	Strain Relief	66525
30	Gas Solenoid Valve	64102
31	Line filter	61319
32	PCB motor	61437
33	Wire Drive Brake	66486
34	On-Off Switch	64042
35	Choke Coil	61291

Trouble Shooting Guide – HTP MTS 160




A
Is 230/240Vac voltage present at the input of the T AUX?
NO
Is fuse F1 good?
NO
Change the fuse F1
YES
B
Is 230/240Vac voltage present at the input of the switch S1?
YES
Change the switch S1
YES
Change the T AUX
NO
Is 230/240Vac voltage present at the input of PCB 1?
NO
Is 230/240Vac voltage present at the input of the power cable?
YES
Change the power cable
NO
The problem is in the plug or the panel
YES
Change PCB 1
C
...remove the torch. Select TIG or MIG mode and simulate closing of the torch trigger, short-circuiting the 2 pins on the Euro coupling. Is gas coming out?
NO
Change the electrovalve. Does this solve the problem?
YES
OK
D
NO
Are the 3 secondary voltages present on T AUX (0-9V/0-12V/0-28V)?
YES
Change PCB 4
NO
Go to point A
YES
Change the torch

Parts Breakdown — 15 Series Welding Gun

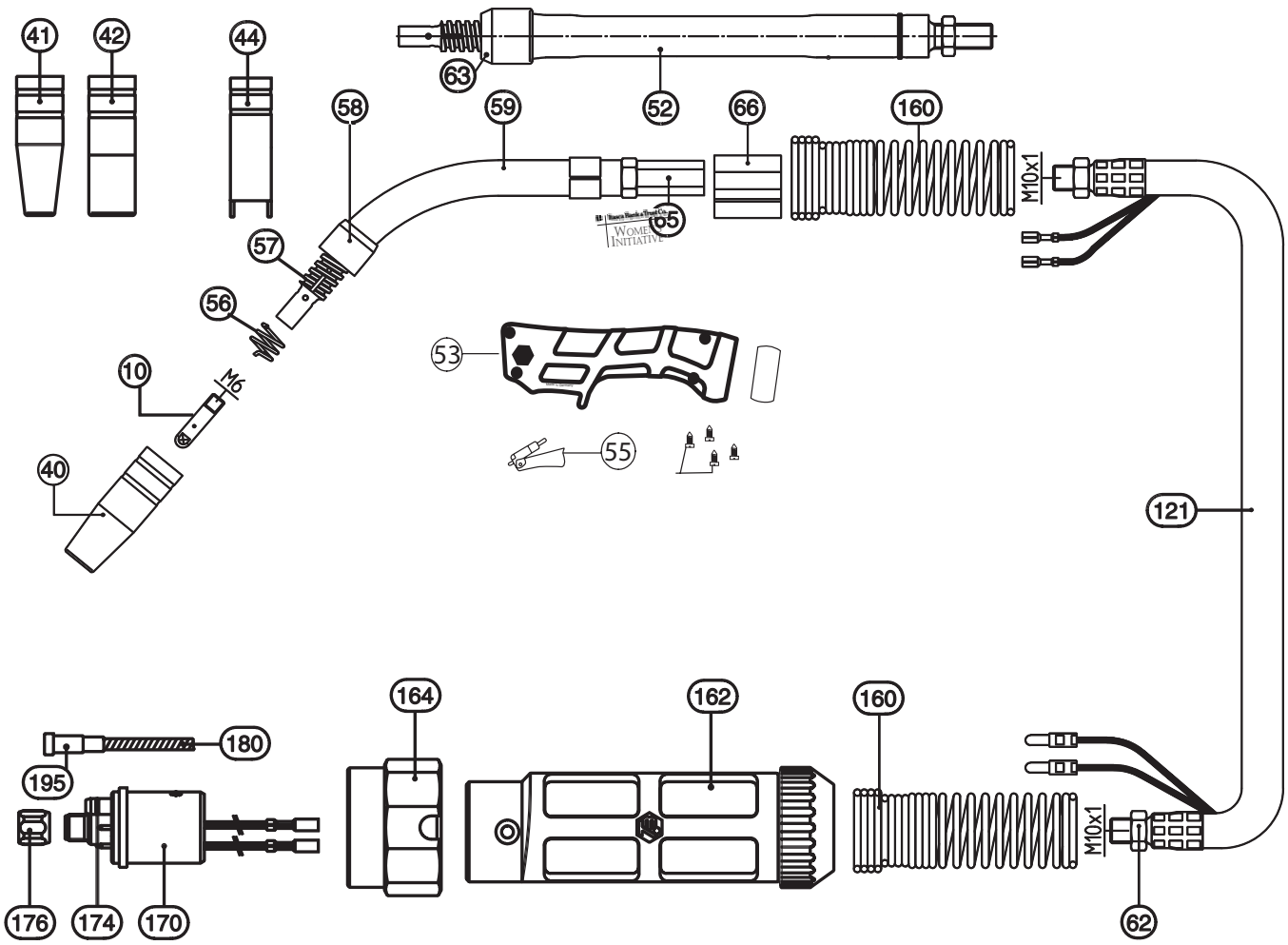
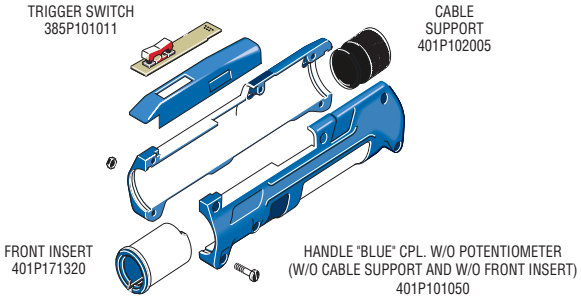
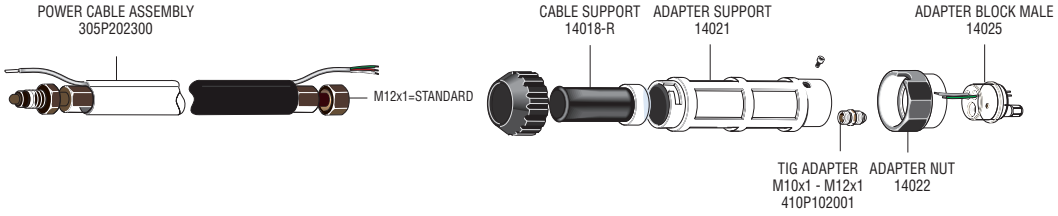


Illustration	Part #	Description
10	15023	.023" Contact Tips
	15030	.030" Contact Tips
	15035	.035" Contact Tips
41	15105	Conical Nozzle
42	15104	Cylindrical Nozzle
44	15106	Spot Weld Nozzle
	15007	Stud Nozzle
	15108	Small Conical Nozzle
52	15500	Flexible Swan Neck
53	15008	15AK Handle Assembly
55	15067	Hex Coupler
55	14009	Trigger Switch
56	15062B	Nozzle Springs
57	13002-DLT	Gas Diffuser (Left Hand Thread)
58	14058	Head Insulator - Std neck

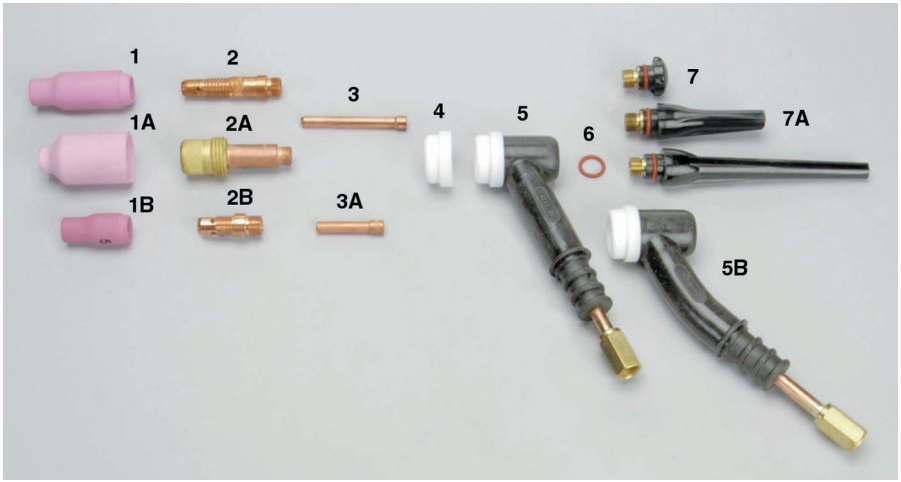
Illustration	Part #	Description
59	15002	Swan Neck
63	15058	Head Insulator - Flex Neck
86	15072	Body Insulator
121	15010	10' 15AK Power Cable
	15012	12' 15AK Power Cable
	15015	15' 15AK Power Cable
160	14018-S	Cable Support (Spring Style)
162	14021	Adapter support
164	14022	Adapter Nut
170	14025	Adapter Block
174	14000	O-Ring
176	14041	Liner Position Nut
180	15040	Steel Liner (16')
	15044	Teflon Liner (16')
	15100	10' 15AK Welding Gun
	15120	12' 15AK Welding Gun
	15150	15' 15AK Welding Gun

MTS 160 TIG Torch Parts Breakdown

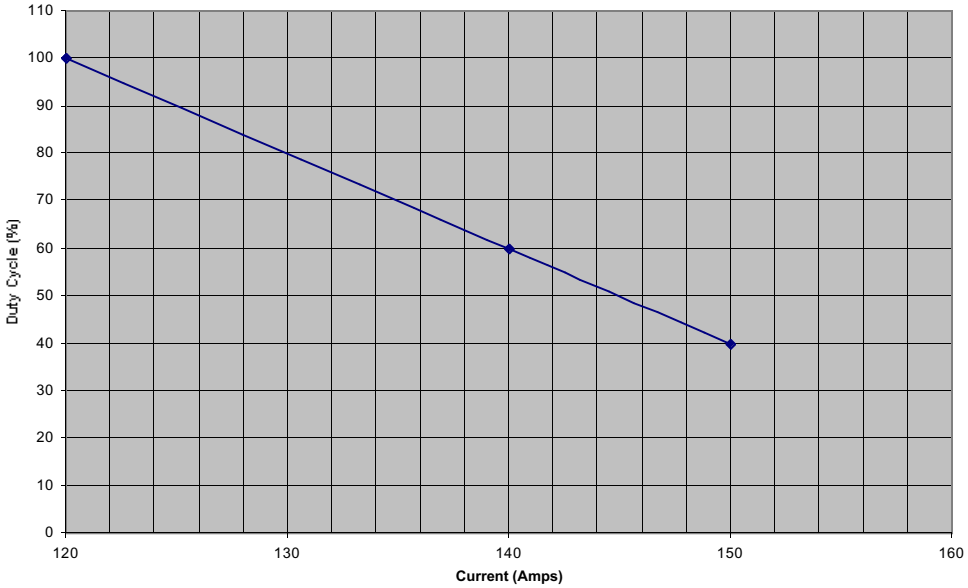




Illus #	Description	Tungsten Diameter 0.040"	1/16"	3/32"	1/8"
Standard Configuration					
1	Alumina Nozzle	10N49	10N48	10N47	10N46
2	Collet Body	10N30	10N31	10N32	10N28
3	Collet	10N22	10N23	10N24	10N25
Gas Lens Configuration (optional)					
1A	Alumina Nozzle	54N17	54N16	54N15	54N14
2A	Gas Lens Collet Body	45V24	45V25	45V26	45V27
3	Collet	10N22	10N23	10N24	10N25
Short Configuration (optional)					
1B	Alumina Nozzle	13N08	13N09	13N10	13N11
2B	Collet Body	17CB20	17CB20	17CB20	17CB20
3B	Collet	13N21	13N22	13N23	13N24
Following parts fit all tungsten diameters					
4	Cup Gasket (Std & Short)	18GC			
	Cup Gasket (Gas Lens)	3GHS			
5	Torch Head	SR-17			
5A	Flexible Torch Head	SR-17F			
6	O-Ring	98W18			
7	Short Back Cap	57Y04			
7A	Medium Back Cap	300M			
7B	Long Back Cap	57Y02			
8	Handle	H-100			



Duty Cycle - HTP MTS 160



Volt/Amp Curve - HTP MTS 160