

*Eastwood*

DO THE JOB RIGHT.

Part #20023

# GAS WELDING SYSTEM INSTRUCTIONS



Your **Eastwood Gas Welding System** is a precision engineered unit designed for years of efficient, trouble-free service. It features anti-blowback check valves on both oxygen and acetylene lines for safe welding, brazing and soldering, flame-cutting and general metal heating.

## SAFETY INFORMATION



### READ INSTRUCTIONS!

- Thoroughly read and understand this instruction manual before using this tool.



### EXTREME BURN & FIRE HAZARD!

- This torch is capable of producing more than 6000°F (3,500°C) and can instantly cause severe flesh burns and quickly ignite the surrounding work area! Do Not allow flame to come in contact with flesh or flammable material.



### EXPLOSION HAZARD!

- This unit uses highly explosive gas under high pressure. Be sure all connections are leak free and all valve setting procedures are followed precisely.
- **NEVER under any circumstances, operate the torch with the Acetylene regulator set at a pressure greater than 8 PSI! Acetylene pressures near 15 PSI can cause it to become unstable and ultimately result in an explosion.**
- Keep an approved and functioning fire extinguisher in the area.
- The assistance of an experienced assistant/fire spotter is strongly recommended.
- Never use a cigarette lighter to ignite torch. Always use a specially designed sparking torch igniter (included).
- Work only in an area with a fireproof floor, walls and work surfaces. If this is not feasible, use fireproof blankets or shielding to avoid accidental ignition from flame contact or by molten metal and sparks generated from welding or cutting.
- Make sure all work pieces and surfaces are clean and free from any oils, lubricants or coatings which can be ignited by the flame and act as fuel when combined with oxygen.
- Use this torch in a clean, well lit and well ventilated area free from combustible materials and objects. Be aware that some metals and coatings such as galvanizing can release toxic fumes when exposed to torch heat. The use of NIOSH approved breathing apparatus may be required. Before using welding, soldering or brazing materials, consult the manufacturers MSDS (Material Safety Data Sheet) for particular hazards.



## REQUIRED SAFETY EQUIPMENT!

- Use approved welding goggles with at least a #4 shading rating to protect eyes from intense light, radiation and sparks.
- Wear flame-retardant welding gloves and welding jacket. Constantly be aware of any stray sparks or molten slag that could burn through or ignite clothing.



## DANGER!

- Keep children and pets away from the work area.

## INCLUDES

- (1) Oxygen Regulator (Type CGA540 Right-Hand Thread Connection). "A" & "B"
- (1) Acetylene Regulator (Type CGA510 Left-Hand Thread Connection). "A" & "C"
- (1) 15' Twin Hose (Red Acetylene/Green Oxygen) with 9/16"-18 Fittings. "D"
- (1) Torch Handle. "E"
- (2) Anti-blowback check-valves. "M" & "N"
- (1) Welding Tip Adapter. "G"
- (1) Flame Cutting Attachment with Nozzle. "F"
- (1) #1 Welding Nozzle. "H"
- (1) #2 Welding Nozzle. "I"
- (1) #3 Welding Nozzle. "J"
- (1) Heating Nozzle Tube. "K"
- (1) Heating Nozzle. "L"
- (1) Sparking Igniter. "O"
- (1) Pair Welding Goggles. "Q"
- (1) Wrench. "P"

**NOTE:** This torch kit does not include oxygen or acetylene cylinders. These are available at your local welding supply retailer.



# INITIAL SET UP & CONNECTION

- Thread a “Tee” handled Regulator Key “**A**” into the threaded hole in the front of the Oxygen Regulator “**B**”. **NOTE:** Run this key in only about 3 turns to ensure the regulator is kept in the closed position.
- Thread a “Tee” handled Regulator Key “**A**” into the threaded hole in the front of the Acetylene Regulator “**C**”.

**NOTE:** Run this key in only about 3 turns to ensure the regulator is kept in the closed position.

**IMPORTANT: All apparatus connections related to acetylene will be reverse threads.**

- Thread the Anti-Blowback Check-Valve for Oxygen (with Green band) “**M**” onto the port marked “OX” of the Torch Handle “**E**” and tighten firmly.
- Thread a brass fitting from the “Green” side of the Hose Set, “**D**” onto the Anti-Blowback Check-Valve for Oxygen (with green band) “**M**” and tighten firmly.
- Thread the Anti-Blowback Check-Valve for Acetylene (with Red band) “**N**” onto the port marked “GAS” of the Torch Handle “**E**” and tighten firmly.
- Thread a brass fitting from the “Red” side of the Hose Set, “**D**” onto the Anti-Blowback Check-Valve for Acetylene (with Red band) “**N**” and tighten firmly.
- Working with the opposite end of the Hose Set “**D**” Thread a brass fitting from the “Green” side onto the port marked “OUT” of the Oxygen Regulator “**B**” and tighten firmly.
- Again, working with the opposite end of the Hose Set “**D**” Thread a brass fitting from the “Red” side onto the port marked “OUT” of the Acetylene Regulator “**C**” and tighten firmly.

## INSTALLING REGULATORS TO CYLINDERS

- Remove protective cap from the Oxygen Cylinder then slightly open the cylinder to dislodge any dirt that may be present then quickly close it. Repeat this same procedure for the Acetylene Cylinder.
- Thread the **female** threaded brass fitting of the “IN” port of Oxygen Regulator “**B**” into the **male** threaded Oxygen Cylinder outlet and tighten firmly. **NOTE:** Do Not use “white” Teflon thread sealing tape as thread sealant on Oxygen cylinders. If required, use “pink” Oxygen-Safe tape.
- Thread the **male reverse** threaded brass fitting of the “IN” port of Acetylene Regulator “**C**” into the **female reverse** threaded Acetylene Cylinder outlet and tighten firmly.

## TORCH CONFIGURATION FOR GAS WELDING

- Choose the appropriate size of the three Welding Tips included (“H”, “I” or “J”). Refer to the chart below:

Metal Thickness to be Welded	Tip Size	Nozzle/Drill Size
3/64” - 3/32”	#1 (“H”)	(.040”) 60
1/16” - 1/8”	#2 (“I”)	(.046”) 56
1/8” - 3/16”	#3 (“J”)	(.060”) 53

- Thread the chosen Welding Tip (“H”, “I” or “J”) into the Tip Adapter “G” and tighten firmly (FIG A).
- Thread the Tip Adapter “G” onto the Torch Handle “E”, rotate the nozzle opening so that it is pointing downward and tighten collar firmly (FIG A).

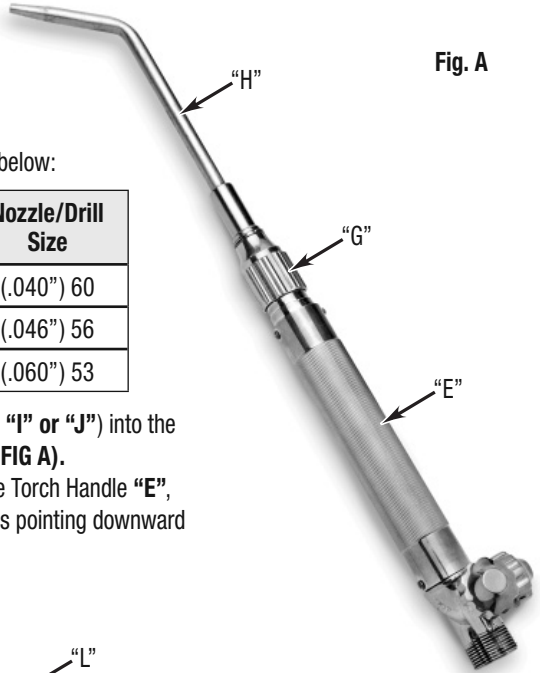


Fig. A

## TORCH CONFIGURATION FOR GENERAL HEATING & METAL BENDING

- Thread the Heating Nozzle “L” onto the Heating Nozzle Tube “K” and tighten firmly (FIG B).
- Thread the Heating Nozzle Tube “K” into the Tip Adapter “G” and tighten firmly (FIG B).

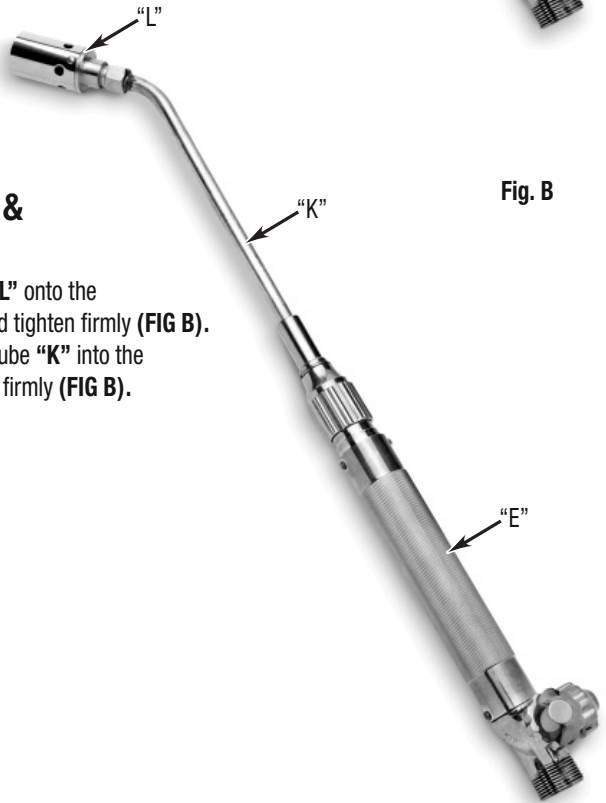
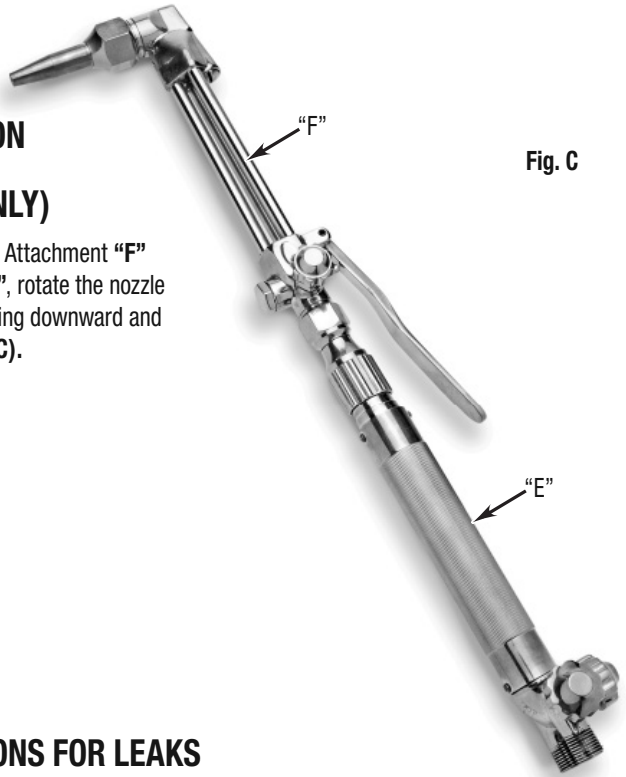


Fig. B

## TORCH CONFIGURATION FOR CUTTING (FERROUS METALS ONLY)

Fig. C

- Thread the Flame Cutting Attachment “F” onto the Torch Handle “E”, rotate the nozzle opening so that it is pointing downward and tighten collar firmly (FIG C).



## CHECKING CONNECTIONS FOR LEAKS

- Make sure all valves on the Cylinders and Torch Handle are closed.
- Keeping the Torch Handle “E” valves **closed**, open both Cylinder valves slightly. Check around the Cylinder/Regulator connections for leaks by applying soapy water. The presence of bubbling will indicate a leak. If a leak is found, resolve it before continuing.
- If no leaks are detected, open the Oxygen cylinder valve **fully**. Open the Acetylene cylinder valve **no more than 1/2 turn**.
- Turn the Regulator “Tee” handles inward (Clockwise) while reading the red, PSI scale of the Low Pressure (left hand) gauges. Stop when 3-5 PSI is achieved. Check around the Cylinder/Regulator/Hose/Torch Handle connections for leaks by applying soapy water.
- If no leaks are detected, proceed to operation.
- Below is a chart to provide some guidance on which Welding Tip to choose for a given metal thickness and the recommended Oxygen and Acetylene regulator settings:

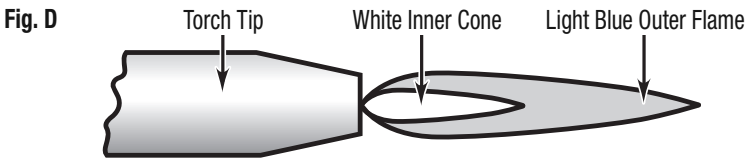
Metal Thickness	Tip Size	Oxygen (PSI)	Acetylene (PSI)
3/64” - 3/32”	#1 (“H”)	3 to 5	3 to 5
1/16” - 1/8”	#2 (“I”)	3 to 5	3 to 5
1/8” - 3/16”	#3 (“J”)	4 to 7	3 to 6

# OPERATION

**IMPORTANT NOTE: All steps MUST be followed carefully in the order presented to avoid possible explosion.**

## IGNITING THE TORCH FOR WELDING

- Open the Oxygen cylinder valve **fully**.
- Open the Acetylene cylinder valve **no more than 1/2 turn**.
- Turn both Regulator “Tee” handles inward (Clockwise) while reading the red, PSI scale of the Low Pressure (left hand) gauges. Stop when 3-5 PSI is achieved.
- Make sure the valve marked “OX” (Oxygen) is closed on the Torch Handle.
- Turn the Oxygen Regulator “Tee” handle inward (Clockwise) while reading the red, PSI scale of the Low Pressure (left hand) gauge. Set at 3 to 7 PSI (refer to Welding Chart for specific pressure).
- Turn the Acetylene Regulator “Tee” handle inward (Clockwise) while reading the red, PSI scale of the Low Pressure (left hand) gauge. Set at 3 to 6 PSI (refer to Welding Chart for specific pressure).
- Open the valve marked “GAS” (Acetylene) on the torch very slightly. A slight “hiss” should be heard.
- Place the Spark Igniter “O” near the Welding Tip Nozzle and strike a spark. A course, red, smoky flame should be visible. It may be necessary to open the “GAS” (Acetylene) valve slightly more to achieve a steady flame.
- Open the valve marked “OX” (Oxygen) **VERY SLOWLY** until the flame begins to change to a blue color, sharpen, smooth out and produce no smoke. If the flame goes out (an audible POP may be heard), close the “OX” (Oxygen) valve and start this step again and proceed more slowly.
- The goal is to achieve an ideal “neutral flame” which is recognized by a clearly defined inner white “cone” immediately at the nozzle outlet with a nearly invisible middle section and having a bluish-orange tip (**FIG. D**).



- Now you are cooking with fire! At this point, before working on an actual project, some practice is required to “fine-tune” the two valves and become familiar with creating the right mix that creates that perfect “neutral flame”.

## EXTINGUISHING TORCH

1. First, always close “OX” (Oxygen) valve
2. Once the “OX” (Oxygen) valve is completely closed, close the “GAS” (Acetylene) valve

## IGNITING THE TORCH FOR GENERAL HEATING & METAL BENDING

- The procedure for General Heating and Metal Bending with the Heating Nozzle “L”, is essentially the same as for Gas Welding. The chief difference is that the Heating Nozzle will produce a softer, broader, larger diameter, diffused flame which distributes the flame over a greater area.

## IGNITING THE TORCH FOR CUTTING

- Be sure the Flame Cutting Attachment “F” is properly attached to the Torch Handle “E”.
- Open the Oxygen cylinder valve **fully**.
- Open the Acetylene cylinder valve **no more than 1/2 turn**.
- Turn the Oxygen Regulator “Tee” handle inward (Clockwise) while reading the red, PSI scale of the Low Pressure (left hand) gauge. Set at 15 to 25 PSI.
- Turn the Acetylene Regulator “Tee” handle inward (Clockwise) while reading the red, PSI scale of the Low Pressure (left hand) gauge. Set at 5 to 7 PSI.
- **IMPORTANT NOTE: When using the Flame Cutting Attachment “F”, all Oxygen adjustments are controlled by the knob located on the Flame Cutting Attachment while all Acetylene adjustments are done with the Torch Handle “E”, “Gas” valve just as you would for Welding. Before igniting, make sure the knob on the Flame Cutting Attachment is closed, then open the Oxygen “OX” valve on the Torch Handle one full turn.**
- Open the valve marked “GAS” (Acetylene) very slightly. A slight “hiss” should be heard.
- Place the Spark Igniter “O” near the Cutting Attachment Nozzle and strike a spark. A coarse, red, smoky flame should be visible. It may be necessary to open the “GAS” (Acetylene) valve slightly more to achieve a steady flame.
- Open the knob on the Cutting Attachment Nozzle **VERY SLOWLY** until the flame begins to change to a blue color, sharpen, smooth out and produce no smoke. If the flame goes out (an audible POP may be heard), close the “OX” (Oxygen) valve and start this step again and proceed more slowly.
- The goal is to achieve an ideal “Neutral Flame” which is recognized by a clearly defined inner white “cone” immediately at the nozzle outlet with a nearly invisible middle section and having a bluish-orange tip.
- Just as with the Welding Nozzles, before doing actual cutting, some practice is required to “fine-tune” the two valves and become familiar with creating the right mix that creates that perfect “Neutral Flame”.
- Once the “Neutral Flame” has been achieved, pure Oxygen is introduced to the flame by depressing the Oxygen lever on the Cutting Attachment Nozzle. **USE EXTREME CAUTION: the introduction of pure oxygen will greatly accelerate the intensity of the flame;** depress the lever **VERY SLOWLY** until a level of comfort is achieved with the Cutting Flame. Be absolutely sure the Cutting Nozzle is not directed at anyone or anything.



# GAS WELDING BASICS

**NOTE:** This section is intended to provide the basic steps to get you started in Gas Welding with your new Eastwood Oxy-Acetylene Torch Kit. It is highly recommended to learn more about Gas Welding through available instructional videos, books or local evening tech school/high school course.

## BASIC INFORMATION

Gas welding is a time-honored method of joining similar metal by heating the adjacent surfaces to the melting point with an Oxy-Acetylene flame, and allowing the two pieces to fuse together with an added filler metal being required on material 3/16" thick or more. The resulting weld is as strong and the surrounding parent metal.

All metal should be thoroughly cleaned before welding. Oil, grease, rust, scale, paint, plating or any impurities will affect the weld quality or tensile strength. Metal which is 3/16" or thicker should be edge-beveled before welding, and when beveled sides are joined, a filler rod of the same material is required.

The following welding tip chart shows the proper Welding Tip size, Oxygen and Acetylene pressures related to the size material to be welded. If too large a tip is used and the flame is cut back, the tip heats up unnecessarily and is often accompanied by a popping sound which splatters the welding puddle. Too hot of a flame burns the steel and too small of a flame is not large enough to get the job done.

Welding rod or "filler rod" is available for all types of gas welding including mild steel, cast iron and aluminum. The size is determined by the type of weld, the material thickness and the amount of filler metal required.

Metal Thickness	Tip Size	Filler Rod Size	Oxygen (PSI)	Acetylene (PSI)
1/32-3/32" (.03-.04)	#1 ("H")	1/16"	3 to 5	3 to 5
1/16-1/8" (.06-.13)	#2 ("I")	1/16"	3 to 5	3 to 5
3/32-3/16" (.09-.19)	#3 ("J")	1/16"	4 to 7	3 to 6

A well tuned neutral flame is necessary for gas welding. The Oxy-Acetylene flame consumes all oxygen in the air surrounding the welding area which leaves an uncontaminated weld area and a weld of maximum strength.

## PRACTICE WELDING

Getting the "feel" - Starting with the #2 ("I") Welding Tip and 1/16" (.06") steel, set the pressures per the preceding chart. Point the flame directly onto the steel with the white flame cone just above the surface. When a puddle is formed, move the torch back and forth slowly moving the puddle across the steel. For a proper weld, it is necessary to achieve good penetration and this comes from a deep puddle. As you move the puddle, it is helpful to lean the tip about 45° away from the direction you want the puddle to move.

## **WELDING WITH A PUDDLE**

Place 2 practice pieces of 1/16" steel together at a 90° angle to each other. Working from the outside corner of the angle, make a puddle again and with a back and forth torch motion, move the puddle along the seam. Go slowly to achieve good weld penetration. This can be checked by turning the parts over. The weld penetration should be visible at the inside corner. Wait until the joined pieces have fully cooled then test your weld strength by attempting to tear the 2 pieces apart.

## **WELDING WITH FILLER ROD**

Repeating the same steps as above, take 2 fresh pieces of practice steel but add 1/16" welding or "filler" rod this time. While the flame is directed at the steel to form the puddle, put the rod into the flame. When it glows red, maintain this temperature by moving it in and out of the flame. Once the weld is started, dip the rod into the puddle. This builds up the weld to that the top is rounded instead of concave when no rod was used. Remember welding rod is required on all double joints and once you have gained sufficient experience, you will find that you prefer to use filler rod on all weld regardless of how thin or thick the steel. Also remember that all material 3/16" (.09) and thicker should be edge beveled before welding. A 30° bevel on each edge is preferred. This is necessary to obtain full penetration through the entire thickness. A rod is necessary filler metal on all welds made with beveled edges. Once you have mastered the proper torch movement puddle control you can make vertical, horizontal or flat welds.

## **BRAZE WELDING**

Braze welding differs from gas welding because the two pieces of metal are not fused together. The brazing rod melts at a lower temperature than the parent metal and is most commonly made of bronze. The brazed joint strength comes from the surface overlay of the brazing rod. The chief advantage of braze welding over gas welding is that it is the best way to join dissimilar metals or repair cast iron and it is a good method when the fit between two pieces to be joined is not close. Almost any two metals can be joined by brazing with the exception of aluminum and magnesium. Braze welding also requires the use of flux to allow the molten braze rod to "stick" to the metal surfaces being joined.

## **BRAZE WELDING PRACTICE**

The metals to be joined must be thoroughly cleaned then the neutral flame is washed over until the pieces glow a dull red color. Both pieces must be at an equal temperature or the braze rod will flow towards the hotter piece. Heat the braze rod by placing it into the flame then dip it into the flux can. The heat will cause the flux to stick to the braze rod. If a pre-fluxed braze rod is used, the heating and dipping step may be omitted. Once the braze rod is fluxed, and the metals brought to the proper temperature, touch the braze rod to the joint, put the flame into the rod and melt it. The braze rod then flows over the heated area bonding the metal together. Abundant flux must be used. Without sufficient flux, the rod does not "stick" to the metal.

# FLAME CUTTING STEEL

Flame cutting is a simple process that can quickly be mastered. Remember however that **ONLY** steel can be cut with the Oxy-Acetylene method since cast iron, stainless steel, aluminum, brass and other ferrous metal do not “burn” the way steel does.

The way to cut steel is first heat it to its “kindling” temperature (glowing a red color) then rapidly “burn” it with pure oxygen. A cutting torch provides both the pre-heat flame and the pure oxygen cutting stream. Acetylene and Oxygen are combined the torch head and burn at the torch tip with a 6000° flame. This is the pre-heat flame. Note: The size of the pre-heat flame determines how quickly the cut can be started. Often a smaller pre-heat flame is desirable to conserve the gasses and prevent inadvertent melting of the top edges of the cut.

The center hole in the cutting tip is the cutting oxygen hole through which pure oxygen, which is not mixed with acetylene, flows to cut or “burn” the steel after the metal is sufficiently pre-heated. This oxygen stream is controlled by depressing the oxygen lever on the Cutting Torch Attachment and will greatly increase the intensity and velocity of the flame.

To cut or “burn” steel – Once the correct cutting tip is tightly secured in the Cutting Torch Attachment, proper pressures set on the Regulators, and the fine tuning done to achieve a perfect neutral flame, continue with the following procedure to flame cut.

- Before lighting, open the Oxygen Valve on the Torch Handle, “**E**”, one full turn. Make all additional oxygen adjustments with the valve located on the Cutting Attachment “**F**”.
- Move the flame to the edge of the steel and position the preheat flame cone just above the steel.
- When the steel glows red, **SLOWLY** depress the oxygen lever of the Cutting Attachment “**F**” to release the pure oxygen stream to cut through the steel.
- Slowly move the torch in the direction of the cut. The correct cutting speed is accompanied by a “sputtering” sound and a steady stream of sparks. This results in a clean, slag-free cut with square top and bottom edges.
- Too fast a movement does not allow enough time for the pure oxygen stream to burn all the way through the steel. Slag fills the kerf and the two pieces are not severed.
- Too slow of a movement leaves a rounded top edge with slag sticking to the bottom of the steel.

# TROUBLESHOOTING

Problem	Cause	Fix
<b>Welding Tip "Popping" Sound</b>	Flame too low.	Increase gas pressures, consult Tip Chart.
	Tip too large.	Use smaller tip size.
	Tip too close to work.	Move tip further from surface.
<b>Flame Not Defined, Smooth or Even</b>	Dirty Tip Nozzle.	Clean out Nozzle with Tip Cleaner or replace Tip.
<b>Regulator Not Holding Constant Pressure</b>	Defective Seat in Regulator.	Replace Regulator.
<b>Cutting Tip "Popping" Sound</b>	Too loose.	Tighten Tip Ferrule.
	Nicked seat.	Replace Tip.
<b>Gas Leaking Around Valve</b>	Packing Nut loose.	Tighten Packing Nut on Valve.
<b>Difficult to Ignite</b>	Gas pressure too high.	Consult Tip Chart for proper pressures.
<b>Flame Changes While Cutting</b>	Oxygen Valve on Torch Handle partially closed.	Open Oxygen Valve on Torch Handle wider.
		Replace Tip.
	Oxygen Cylinder empty.	Refill Cylinder.

**If you have any questions about the use of this product, please contact**

The Eastwood Technical Assistance Service Department: 800.544.5118 >> email: [techhelp@eastwood.com](mailto:techhelp@eastwood.com)

PDF version of this manual is available online >> [eastwood.com/20023manual](http://eastwood.com/20023manual)

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