OM-1591 169 258B
December 1999

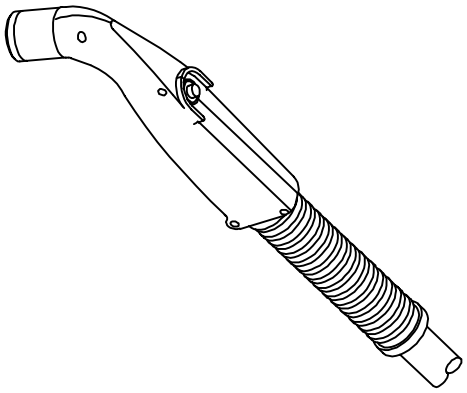
Processes

Air Plasma Cutting and Gouging

Description

Air-Cooled Arc Plasma Cutting Torches

ICE-50, ICE-70, ICE-100, ICE-70M, And ICE-100M



OWNER'S MANUAL

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This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite. We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide which exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.

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Miller
The Power of Blue.

TABLE OF CONTENTS

SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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1-1. Symbol Usage

Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ **Marks a special safety message.**

☞ *Means "Note"; not safety related.*

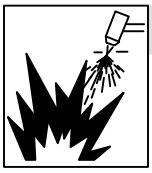
This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Plasma Arc Cutting Hazards

▲ **The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-4. Read and follow all Safety Standards.**

▲ **Only qualified persons should install, operate, maintain, and repair this unit.**

▲ **During operation, keep everybody, especially children, away.**



CUTTING can cause fire or explosion.

Hot metal and sparks blow out from the cutting arc. The flying sparks and hot metal, hot workpiece, and hot equipment can cause fires and burns. Check and be sure the area is safe before doing any cutting.

- Protect yourself and others from flying sparks and hot metal.
- Do not cut where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the cutting arc. If this is not possible, tightly cover them with approved covers.
- Be alert that sparks and hot materials from cutting can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that cutting on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not cut on closed containers such as tanks or drums.
- Connect work cable to the work as close to the cutting area as practical to prevent cutting current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
- Never cut containers with potentially flammable materials inside – they must be emptied and properly cleaned first.
- Do not cut in atmospheres containing explosive dust or vapors.
- Do not cut pressurized cylinders, pipes, or vessels.
- Do not cut containers that have held combustibles.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Do not locate unit on or over combustible surfaces.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any cutting.

ELECTRIC SHOCK can kill.

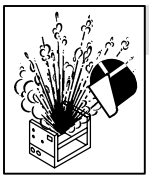
Touching live electrical parts can cause fatal shocks or severe burns. The torch and work circuit are electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. Plasma arc cutting requires higher voltages than welding to start and maintain the arc (200 to 400 volts dc are common), but also uses torches designed with safety interlock systems which turn off the machine when the shield cup is loosened or if tip touches electrode inside the nozzle. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not touch torch parts if in contact with the work or ground.
- Turn off power before checking, cleaning, or changing torch parts.
- Disconnect input power before installing or servicing this equipment. Lockout/tagout input power according to OSHA CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet – always verify the supply ground.
- When making input connections, attach proper grounding conductor first.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Inspect and replace any worn or damaged torch cable leads.
- Do not wrap torch cable around your body.
- Ground the workpiece to a good electrical (earth) ground if required by codes.
- Use only well-maintained equipment. Repair or replace damaged parts at once.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Do not bypass or try to defeat the safety interlock systems.
- Use only torch(es) specified in Owner's Manual.
- Keep away from torch tip and pilot arc when trigger is pressed.
- Clamp work cable with good metal-to-metal contact to workpiece (not piece that will fall away) or worktable as near the cut as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.

ELECTRIC SHOCK can kill.

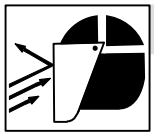
SIGNIFICANT DC VOLTAGE exists on internal parts of inverter power sources AFTER the removal of input power.

- Turn Off unit, disconnect input power, check voltage on input capacitors, and be sure it is near zero (0) volts before touching any parts. Check capacitors according to instructions in Maintenance Section of Owner's Manual or Technical Manual before touching any parts.



EXPLODING PARTS can injure.

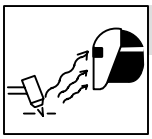
- On inverter power sources, failed parts can explode or cause other parts to explode when power is applied. Always wear a face shield and long sleeves when servicing inverters.



FLYING SPARKS can cause injury.

Sparks and hot metal blow out from the cutting arc. Chipping and grinding cause flying metal.

- Wear approved face shield or safety goggles with side shields.
- Wear proper body protection to protect skin.
- Wear flame-resistant ear plugs or ear muffs to prevent sparks from entering ears.



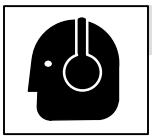
ARC RAYS can burn eyes and skin.

Arc rays from the cutting process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin.

- Wear face protection (helmet or shield) with correct shade of filter to protect your face and eyes when cutting or watching. ANSI Z49.1 (see Safety Standards) suggests a No. 9 shade (with No. 8 as minimum) for all cutting currents less than 300 amperes. Z49.1 adds that lighter filter shades may be used when the arc is hidden by the workpiece. As this is normally the case with low current cutting, the shades suggested in Table 1 are provided for the operator's convenience.
- Wear approved safety glasses with side shields under your helmet or shield.
- Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather and wool) and foot protection.

Table 1. Eye Protection For Plasma Arc Cutting

Current Level In Amperes			Minimum Shade Number
Below 20			#4
20 – 40			#5
40 – 60			#6
60 – 80			#8



NOISE can damage hearing.

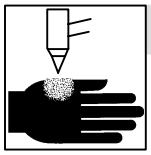
Prolonged noise from some cutting applications can damage hearing if levels exceed limits specified by OSHA (see Safety Standards).

- Use approved ear plugs or ear muffs if noise level is high.
- Warn others nearby about noise hazard.

FUMES AND GASES can be hazardous.

Cutting produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use exhaust at the arc to remove cutting fumes and gases.
- If ventilation is poor, use an approved air-supplied respirator.
- Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals to be cut, coatings, and cleaners.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Fumes from cutting and oxygen depletion can alter air quality causing injury or death. Be sure the breathing air is safe.
- Do not cut in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not cut on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the cutting area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes when cut.
- Do not cut containers with toxic or reactive materials inside or containers that have held toxic or reactive materials – they must be emptied and properly cleaned first.



PLASMA ARC can cause injury.

The heat from the plasma arc can cause serious burns. The force of the arc adds greatly to the burn hazard. The intensely hot and powerful arc can quickly cut through gloves and tissue.

- Keep away from the torch tip.
- Do not grip material near the cutting path.
- The pilot arc can cause burns – keep away from torch tip when trigger is pressed.
- Wear proper flame-retardant clothing covering all exposed body areas.
- Point torch away from your body and toward work when pressing the torch trigger – pilot arc comes on immediately.
- Turn off power source and disconnect input power before disassembling torch or changing torch parts.
- Use only torch(es) specified in the Owner's Manual.

CYLINDERS can explode if damaged.

Gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of metalworking processes, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flame, sparks, and arcs.
- Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
- Keep cylinders away from any cutting or other electrical circuits.
- Never allow electrical contact between a plasma arc torch and a cylinder.
- Never cut on a pressurized cylinder – explosion will result.
- Use only correct gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

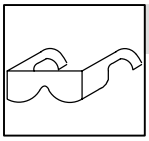
1-3. Additional Symbols For Installation, Operation, And Maintenance

HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on torch.

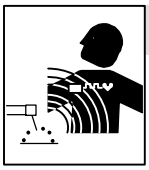
MOVING PARTS can cause injury.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.



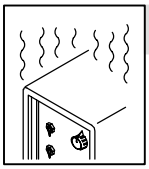
FLYING METAL can injure eyes.

- Wear safety glasses with side shields or face shield.



MAGNETIC FIELDS can affect pacemakers.

- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near plasma arc cutting operations.



OVERUSE can cause OVERHEATING.

- Allow cooling period; follow rated duty cycle.
- Reduce amperage (thickness) or reduce duty cycle before starting to cut again.

EXPLODING HYDROGEN hazard.

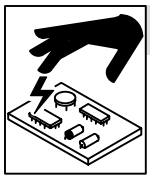
- When cutting aluminum underwater or with the water touching the underside of the aluminum, free hydrogen gas may collect under the workpiece.
- See your cutting engineer and water table instructions for help.

FALLING UNIT can cause injury.

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

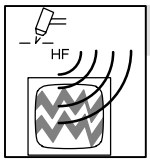
FIRE OR EXPLOSION hazard.

- Do not locate unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.



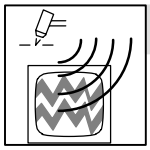
STATIC (ESD) can damage PC boards.

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



H.F. RADIATION can cause interference.

- High frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.



ARC CUTTING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- To reduce possible interference, keep cables as short as possible, close together, and down low, such as on the floor.
- Locate cutting operation 100 meters from any sensitive electronic equipment.
- Be sure this cutting power source is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the machine, using shielded cables, using line filters, or shielding the work area.

1-4. Principal Safety Standards

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Practices for Plasma Arc Cutting, American Welding Society Standard AWS C5.2, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices For Occupation And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting And Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1-5. EMF Information

Considerations About Welding Or Cutting And The Effects Of Low Frequency Electric And Magnetic Fields

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

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep cutting power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the cut as possible.

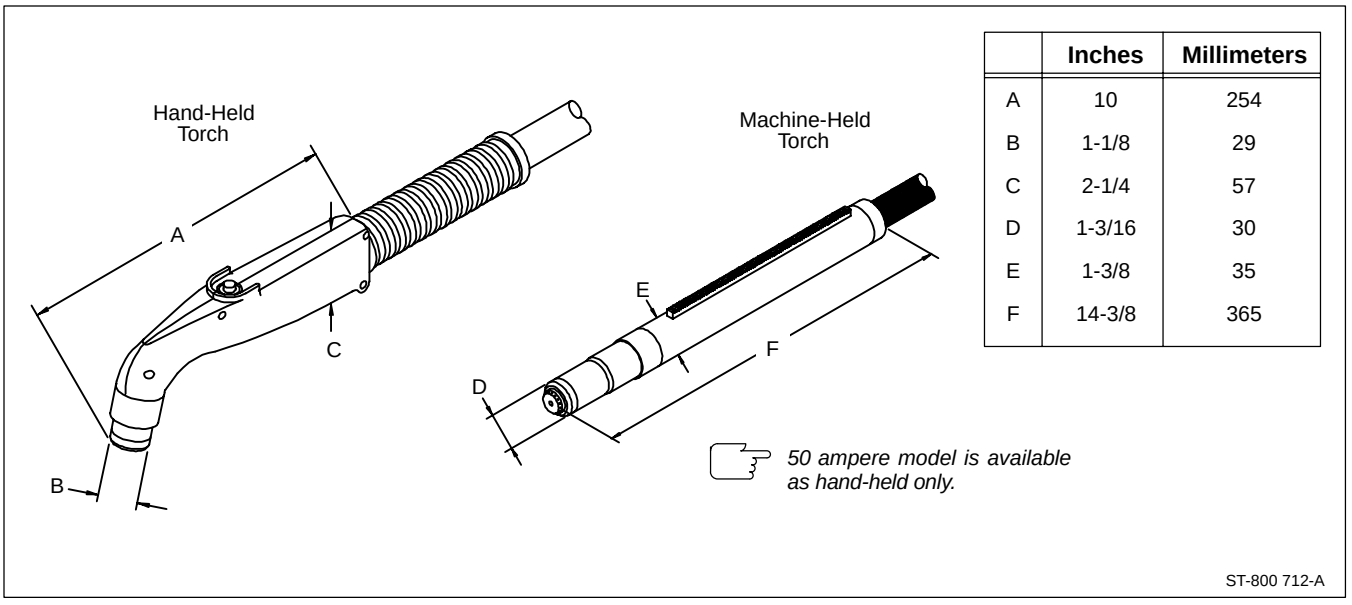
About Pacemakers:

Pacemaker wearers consult your doctor first. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – SPECIFICATIONS

Table 2-1. Cutting Torch

Specification	Description		
Cooling Method	Air		
Overall Dimensions	See Figure 2-1		
Cable Length	30 Or 50 ft (9.1 Or 15.2 m)		
Plasma Gas	Air Or Nitrogen		
	ICE-50	**ICE-70 And 70M**	**ICE-100 And 100M**
Plasma Gas Flow/Pressure	4.7 CFM (135 L/min) At 60 PSI (413 kPa)	7 CFM (198 L/min) At 70 PSI (483 kPa)	7 CFM (198 L/min) At 70 PSI (483 kPa)
Ampere Rating	Low Range: 35 Amperes At 100% Duty Cycle; High Range: 55 Amperes At 60% Duty Cycle (See Section 2-1)	70 Amperes At 100% Duty Cycle (See Section 2-1)	100 Amperes At 80% Duty Cycle (See Section 2-1)
Cutting Capacity	Up To 5/8 in (16 mm) Mild Steel And Stainless; Up To 3/8 in (10 mm) Aluminum	1 in (25 mm) Mild Steel, Stainless, And Aluminum	1-1/4 in (32 mm) Mild Steel, Stainless, And Aluminum
Gear Rack Pitch (Machine Torches Only)	Not Applicable	32	32
Weight	Net: 13-1/2 lb (6.1 kg)	Net: 10-1/2 lb (4.7 kg)	Net: 10-1/2 lb (4.7 kg)



	Inches	Millimeters
A	10	254
B	1-1/8	29
C	2-1/4	57
D	1-3/16	30
E	1-3/8	35
F	14-3/8	365

Figure 2-1. Overall Dimensions

2-1. Duty Cycle

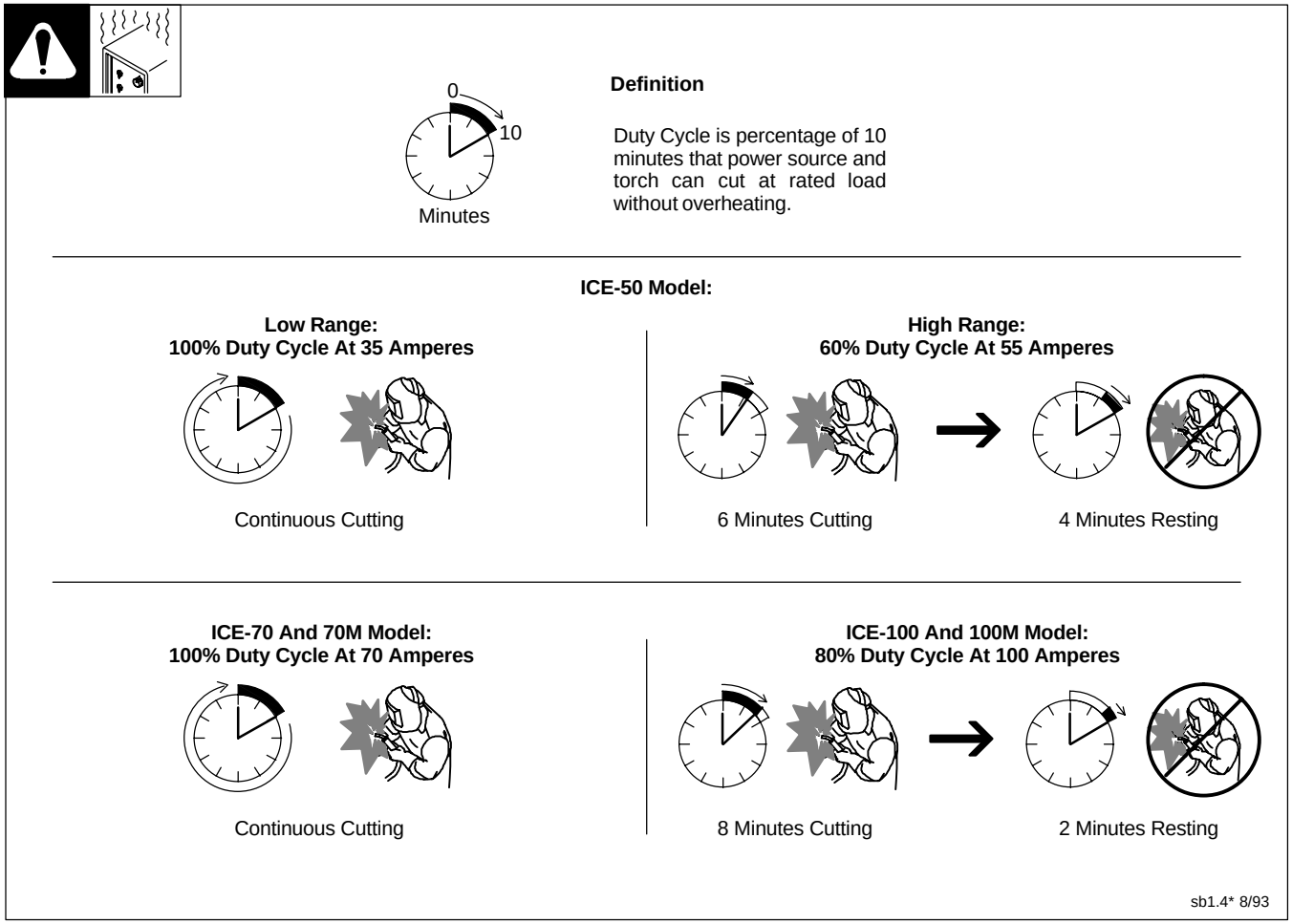


Figure 2-2. Duty Cycle

3-1. Installing ICE-50 Torch

Turn Off power source and remove input power. Remove left side panel.

1 Access Holes

Insert cables through access holes.

2 Work Cable

3 Work (+) Output Terminal

4 Torch Cable

5 Pilot/Air Safety Cable

6 Pilot (+) Output Terminal

7 Torch/Air Output Cable

8 Torch (–) And Gas/Air Output Connector

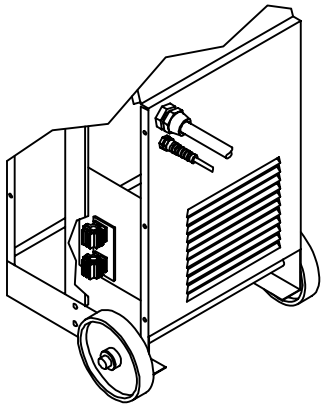
Connect cables as shown.

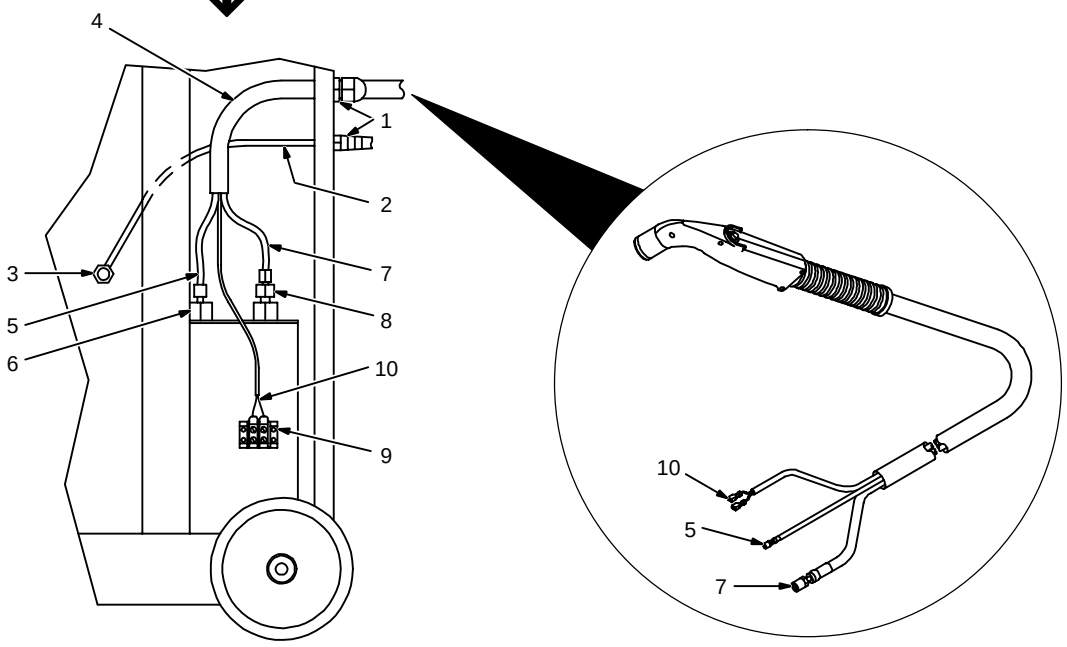
9 Terminal Strip 1T

10 Torch Switch Leads

Connect one lead to each terminal of 1T.

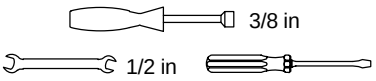
Reinstall side panel.





Side View

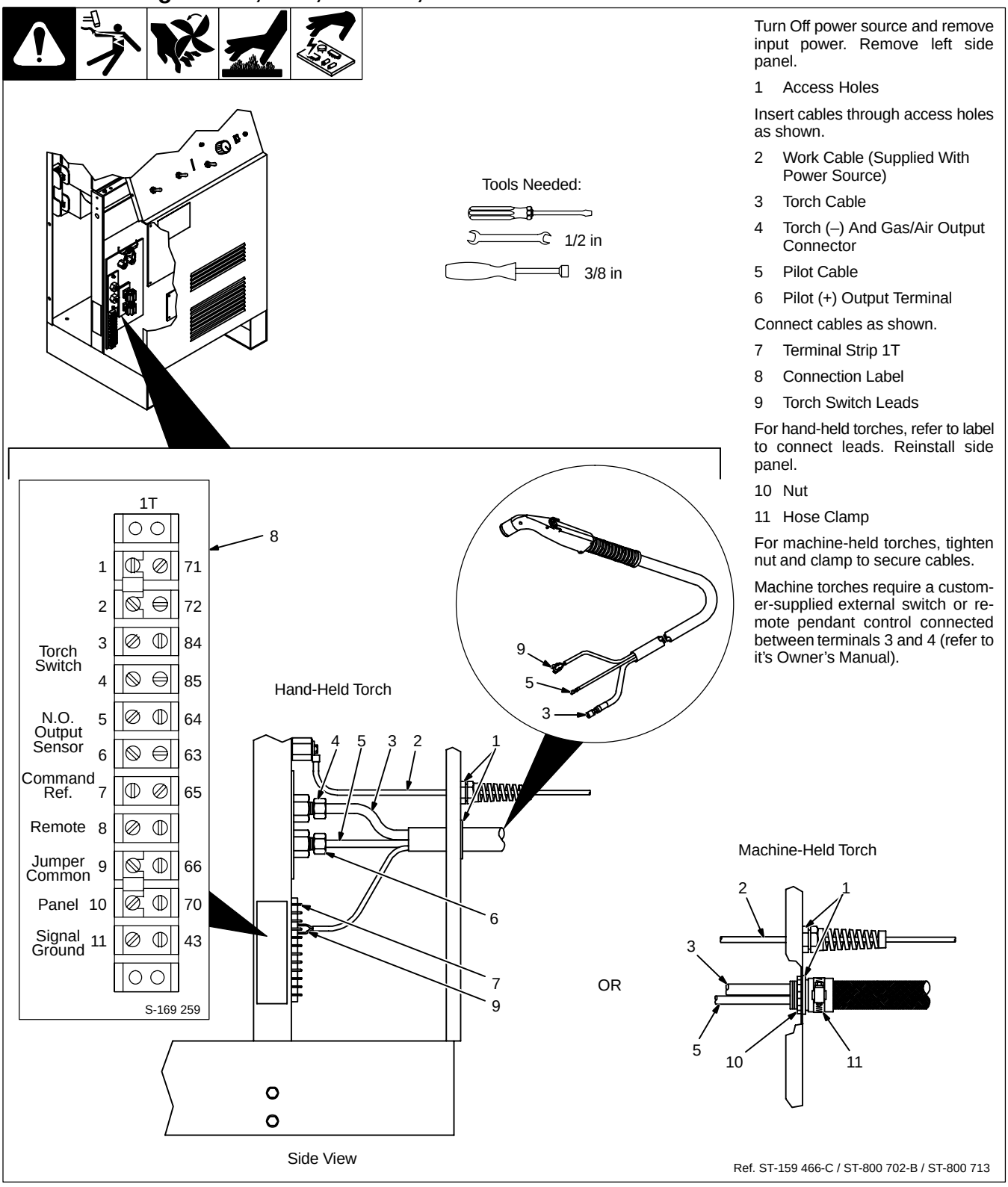
Tools Needed:



ST-800 783 / ST-800 784 / ST-800 713

Figure 3-1. Installing ICE-50 Torch Into Power Source

3-2. Installing ICE-70, 70M, ICE-100, And 100M Torches



Turn Off power source and remove input power. Remove left side panel.

1 Access Holes

Insert cables through access holes as shown.

2 Work Cable (Supplied With Power Source)

3 Torch Cable

4 Torch (–) And Gas/Air Output Connector

5 Pilot Cable

6 Pilot (+) Output Terminal

Connect cables as shown.

7 Terminal Strip 1T

8 Connection Label

9 Torch Switch Leads

For hand-held torches, refer to label to connect leads. Reinstall side panel.

10 Nut

11 Hose Clamp

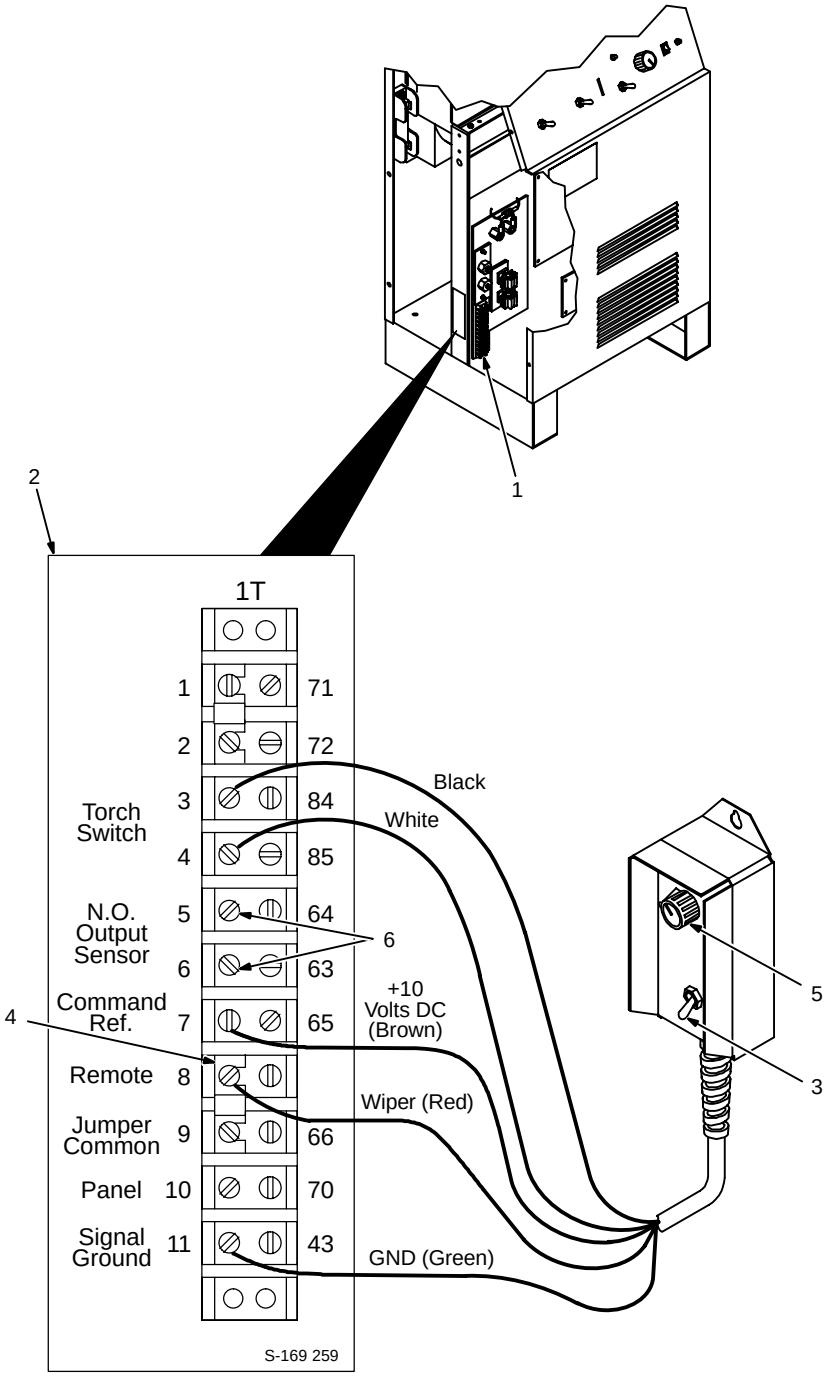
For machine-held torches, tighten nut and clamp to secure cables.

Machine torches require a customer-supplied external switch or remote pendant control connected between terminals 3 and 4 (refer to it's Owner's Manual).

Ref. ST-159 466-C / ST-800 702-B / ST-800 713

Figure 3-2. Installing ICE-70, 70M, ICE-100, And 100M Torches Into Power Source

3-3. Remote Control Connections For Machine-Held Torches



Turn Off power source and disconnect input power. Remove left side panel.

1 Terminal Strip 1T

2 Connection Label

Route leads through hole below torch and work cable access holes. Remove snap-in blank from hole, as needed. Refer to connection label and use 1T to make remote control connections to power source as follows:

Torch On/Off Connections:

3 Remote On/Off Switch

Connect black and white switch leads to terminals 3 and 4 as shown. Switch closure starts cutting arc.

Output Control Connections:

4 Jumper Link

For remote output control, remove jumper link between terminals 9 and 10, and reinstall between terminals 8 and 9 as shown. This disables Output Control on front panel of power source and enables remote thickness control.

5 Remote Thickness Control Potentiometer

Connect potentiometer leads to terminals 7, 8, and 11 as shown.

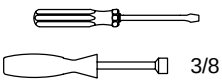
Output Sensor Connections:

6 Output Sensor Terminals

Terminals 5 and 6 connect to internal, normally-open contacts which close when cutting output is present. For example, use signal to start automatic fixture.

Reinstall side panel.

Tools Needed:



Ref. ST-159 466-C / Ref. ST-150 802-A

Figure 3-3. Remote Control Connections For Machine-Held Torches

SECTION 4 – OPERATING THE TORCH

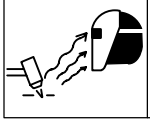
⚠ WARNING

ELECTRIC SHOCK can kill.

- Always wear dry insulating gloves.
- Insulate yourself from work and ground.
- Do not touch live electrical parts.
- Keep all panels and covers securely in place.

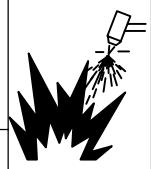
FUMES AND GASES can be hazardous to your health.

- Keep your head out of the fumes.
- Ventilate area, or use breathing device.
- Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for material cut.



ARC RAYS can burn eyes and skin; NOISE can damage hearing.

- Wear face protection with correct shade of filter.
- Wear correct eye, ear, and body protection.



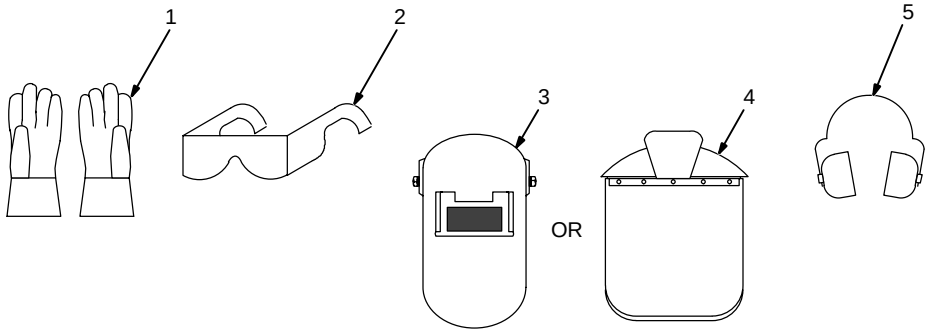
CUTTING can cause fire or explosion.

- Do not cut near flammable material.
- Provide protection from flying sparks.
- Watch for fire; keep extinguisher nearby.
- Do not locate unit over combustible surfaces.
- Do not cut on closed containers.
- Allow work and equipment to cool before handling.

MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep all doors, panels, covers, and guards closed and securely in place.

See Safety Precautions at beginning of manual for basic cutting safety information. swarn6.1* 10/91



Wear the following while cutting:

1 Dry, Insulating Gloves

2 Safety Glasses With Side Shields

3 Welding Helmet

4 Face Shield

Wear either helmet or face shield with correct shade of filter (See ANSI Z49.1).

5 Ear Muffs

Wear approved ear muffs or ear plugs if noise exposure exceeds OSHA limits.

sb3.1* 1/94

Figure 4-1. Safety Equipment

⚠ CAUTION

TIP AND ELECTRODE WEAR BEYOND RECOMMENDED VALUES or OPERATION WITHOUT TIP OR ELECTRODE can damage torch.

- Inspect retaining cup, tip, and electrode before cutting or whenever cutting speed has been significantly reduced (see Section 5-2).
- Do not operate torch without a tip or electrode in place.

INCORRECT PIERCING can damage torch.

- When piercing (starting a cut away from metal edge) use a slight standoff distance and hold torch at about 10° angle to prevent sparks from reflecting back at torch.

HITTING TORCH ON A HARD SURFACE to remove spatter can damage torch.

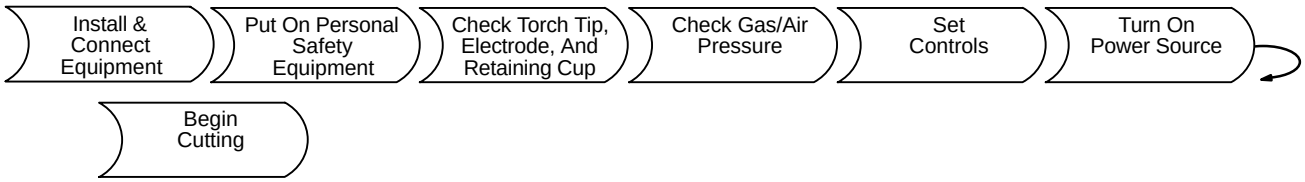
- Do not clean torch by hitting it against a hard surface.
- Hitting hard surfaces can damage torch parts and stop proper operation.

INCORRECT STANDOFF DISTANCE can damage torch.

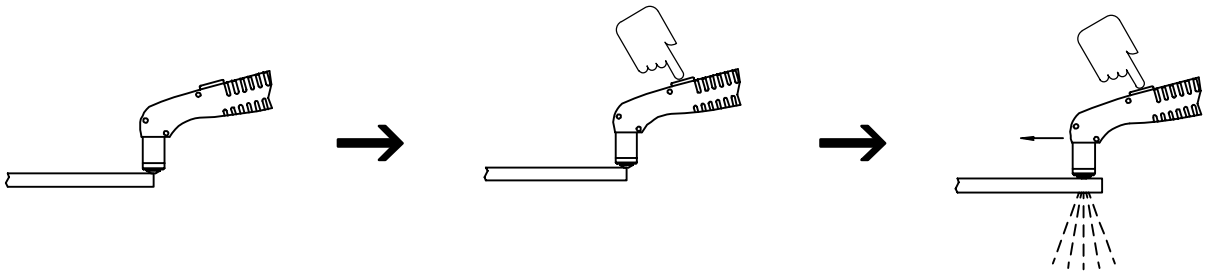
- For non-shielded cutting, always use a 1/8 in (3 mm) standoff distance between torch tip and workpiece.
- For 50 ampere torch, always use standoff guide when cutting with power source Range switch in High Range.

HAVING PILOT ARC TURN ON AND OFF REPEATEDLY, such as during the cutting of chain fence, will shorten tip, electrode, and torch life.

- Put a continuous piece of sheet metal under the fence to prevent pilot arc from cycling on and off.
- Avoid constant starting and restarting of the arc.



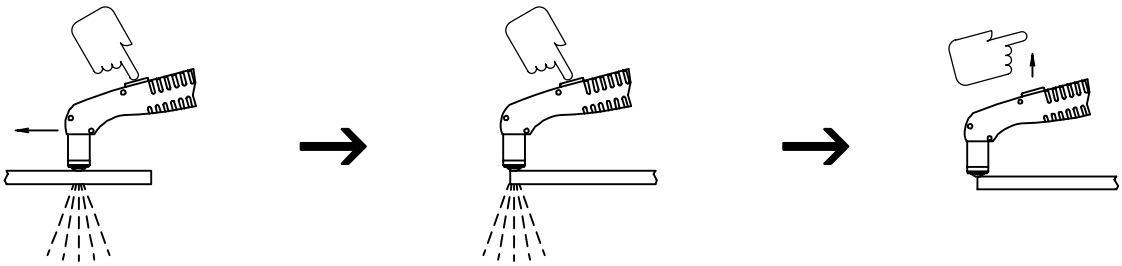
EXAMPLE Of Cutting Operation



Place drag shield on edge of metal, or allow correct standoff distance.

Press trigger. After 2 seconds of preflow, pilot arc starts.

After cutting arc starts, slowly start moving torch across metal.



Adjust torch speed so sparks go thru metal and out bottom of cut.

Pause briefly at end of cut before releasing trigger.

Postflow continues for 20 seconds after releasing trigger; cutting arc can be instantly restarted during postflow by pressing trigger.

ST-161 698-A

Figure 4-2. Sequence Of Plasma Arc Cutting (PAC)

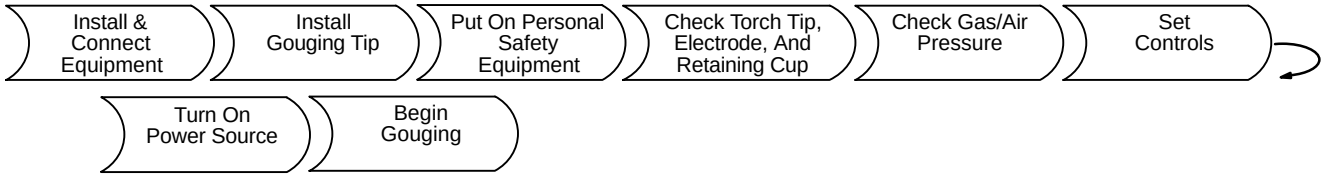
⚠ CAUTION

HITTING TORCH ON A HARD SURFACE to remove spatter can damage torch.

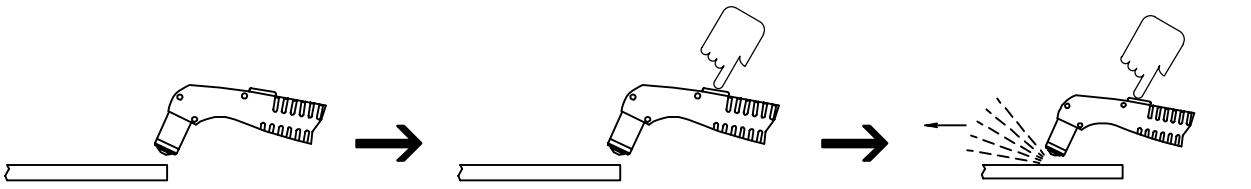
- Do not clean torch by hitting it against a hard surface.
- Hitting hard surfaces can damage torch parts and stop proper operation.

TIP AND ELECTRODE WEAR BEYOND RECOMMENDED VALUES or OPERATION WITHOUT TIP OR ELECTRODE can damage torch.

- Inspect retaining cup, tip, and electrode before cutting or whenever cutting speed has been significantly reduced.
- Do not operate torch without a tip or electrode in place.
- Use correct standoff distance.
- Do not cut with gouging tip.



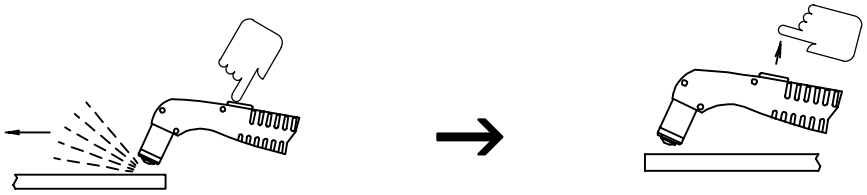
EXAMPLE Of Gouging Operation



Use approx. 1/8 in (3 mm) standoff at about a 40° angle.

Press trigger. After 2 seconds of preflow, pilot arc starts.

Establish arc length of 1 to 1-1/2 in (25 - 38 mm), and slowly start moving torch across metal.



Adjust torch speed, arc length and angle as needed. Direct sparks away from torch. Do not gouge too deeply in one pass; make repeated passes if needed.

Release trigger. Postflow continues for approx. 20 to 30 seconds. Gouging arc can be instantly restarted during postflow by pressing trigger.

Ref. ST-162 317-A / Ref. ST-161 876-B

Figure 4-3. Sequence Of Plasma Arc Gouging (PAG)

SECTION 5 – MAINTENANCE & TROUBLESHOOTING

5-1. Routine Maintenance

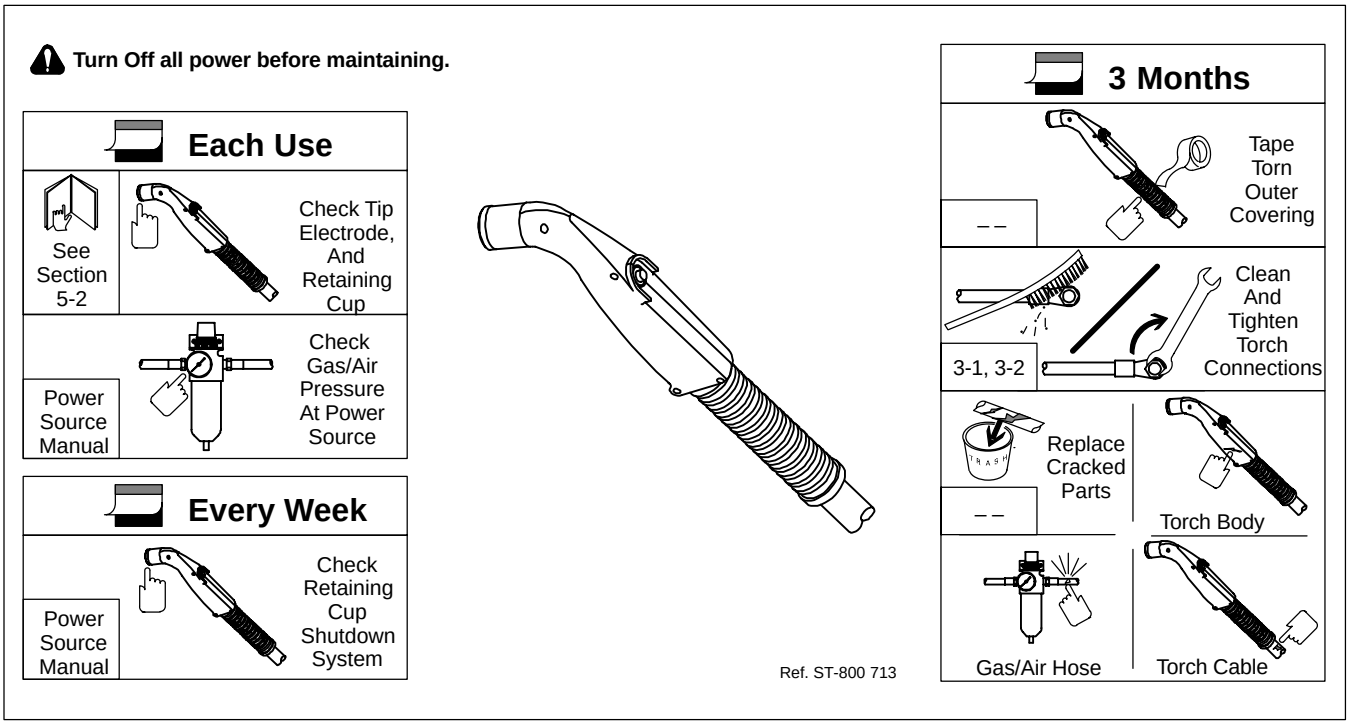
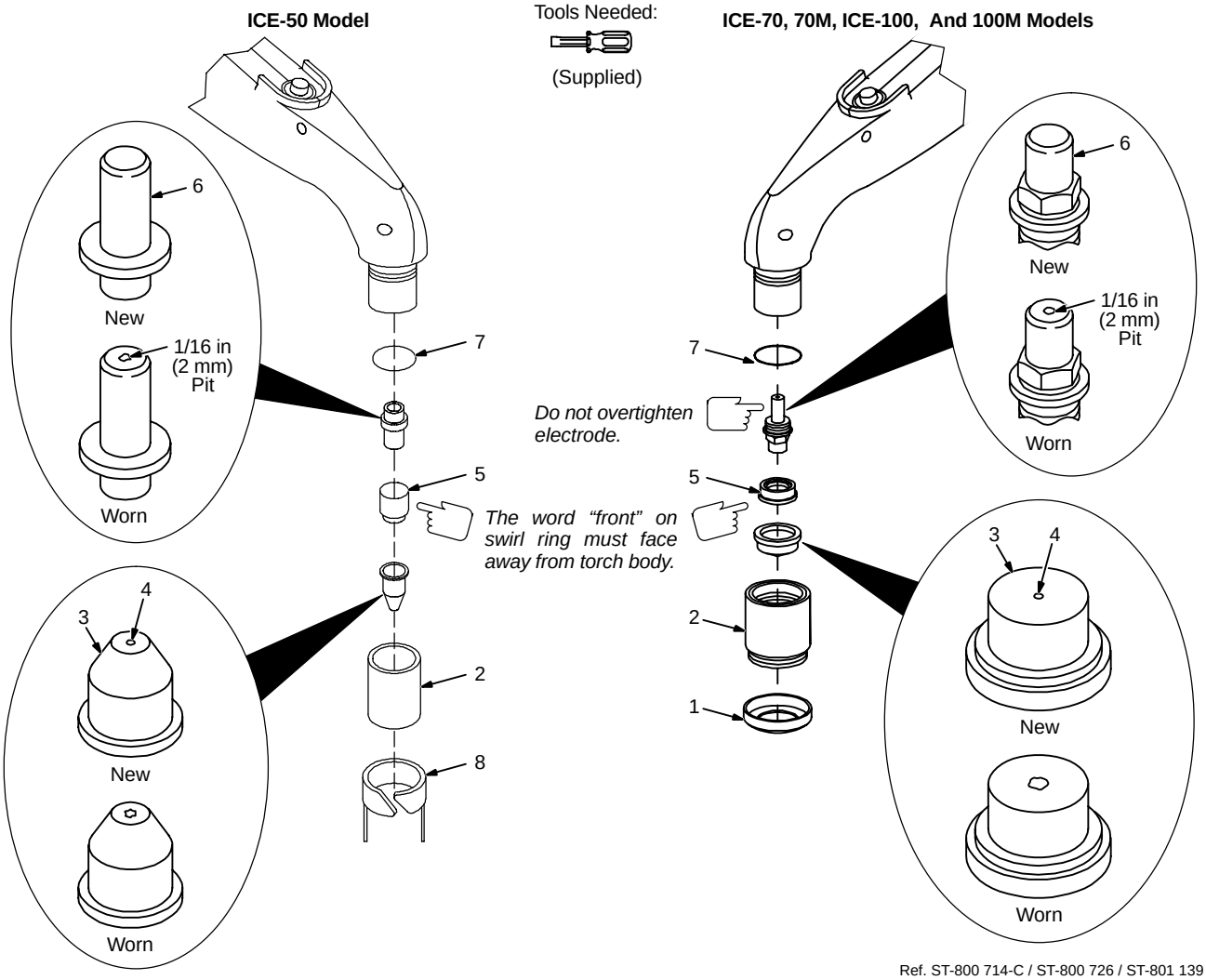


Figure 5-1. Maintenance Schedule

5-2. Checking/Replacing Retaining Cup, Tip, And Electrode

⚠ CAUTION	
OVERTIGHTENING will strip threads. ● Do not overtighten electrode, tip, and retaining cup during assembly. ● Do not cross-thread parts causing stripping. ● Use care during torch assembly and parts replacement.	**TIP AND ELECTRODE WEAR BEYOND RECOMMENDED VALUES or OPERATION WITHOUT TIP OR ELECTRODE can damage torch.** ● Inspect retaining cup, tip, and electrode before cutting or whenever cutting speed has been significantly reduced. ● Do not operate torch without a tip or electrode in place. ● Be sure to use genuine replacement parts. ● A good practice is to replace both the tip and electrode at the same time.



Ref. ST-800 714-C / ST-800 726 / ST-801 139

Turn Off power source, and disconnect input power.

1 Shield/Deflector

Remove shield/deflector. If necessary, clean metal or other debris off shield/deflector. If gas holes are blocked, clear by pushing pin from outside the cup to inside.

2 Retaining Cup

Remove retaining cup. Check retaining cup for cracks, and replace if necessary.

3 Tip

4 Opening

Remove tip. Check tip, and replace if opening is deformed or 50% oversize. If inside of tip is not clean and bright, clean with steel wool. Be sure to remove any pieces of steel wool afterwards.

5 Swirl Ring

Remove swirl ring. Check ring, and replace if side holes are plugged.

6 Electrode

Check electrode. If center has a pit more than a 1/16 in (2 mm) deep, remove and replace electrode using supplied wrench. Do not overtighten.

7 O-Ring

Check O-rings on torch. If needed, coat with thin film of supplied lubricant. Replace if damaged.

8 Standoff Guide

Remove excess slag buildup. Replace if legs are deformed or melted.

Carefully reassemble parts in reverse order. Swirl ring must be installed with word "front" facing away from torch body.

Thread size for electrode for ICE-70, 70M, ICE-100 and 100M models:

7/16 - 28

Figure 5-2. Checking/Replacing Retaining Cup, Tip, And Electrode

5-3. Troubleshooting

Table 5-1. Cutting Trouble

Trouble	Remedy	Section
Power source Torch-To-Tip Short trouble light On; no cutting output.	Check tip and electrode for a short. See also power source Owner's Manual.	5-2
	Check torch connections on power source terminal 1T. See power source Owner's Manual.	3-1, 3-2
Power source Gas/Air Or Shield Cup trouble light On; no cutting output.	Check o-ring, and lubricate if needed with supplied grease.	Figure 6-3, Figure 6-4
	Check for clean and sufficient gas/air supply pressure. See power source Owner's Manual.	– –
Sparks come out top of cut, or cut is not clean.	Torch travel speed too fast; reduce travel speed.	Figure 4-2
	Check torch tip and electrode, and replace if necessary.	5-2
	Metal being cut is too thick; increase power source output control setting. See power source Owner's Manual.	– –
	Be sure work clamp is securely attached. See power source Owner's Manual.	– –
Arc goes out while cutting.	Make sure torch tip is not touching metal while cutting (above 40 amperes only).	Figure 4-2
	Check torch tip and electrode, and replace if necessary.	5-2
	Be sure work clamp is securely attached. See power source Owner's Manual.	– –
Arc goes on and off while cutting.	Torch travel speed is too slow; increase travel speed.	Figure 4-2
	Check torch tip and electrode, and replace if necessary.	5-2
	Be sure work clamp is securely attached. See power source Owner's Manual.	– –

SECTION 6 – PARTS LIST

See Figure 6-3, Figure 6-4, or Figure 6-5 for additional torch consumables and parts.

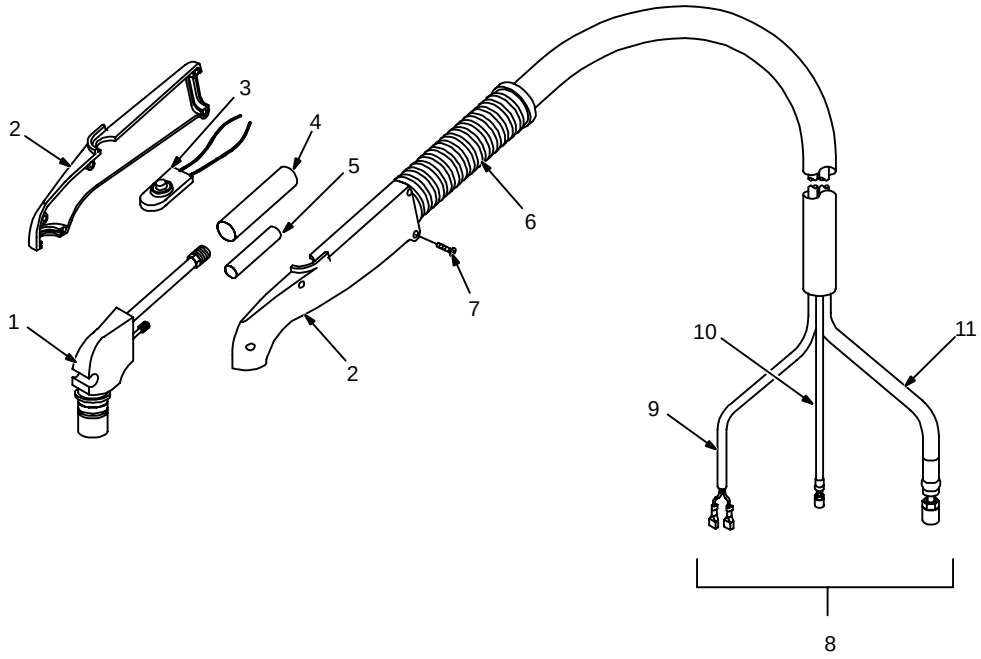
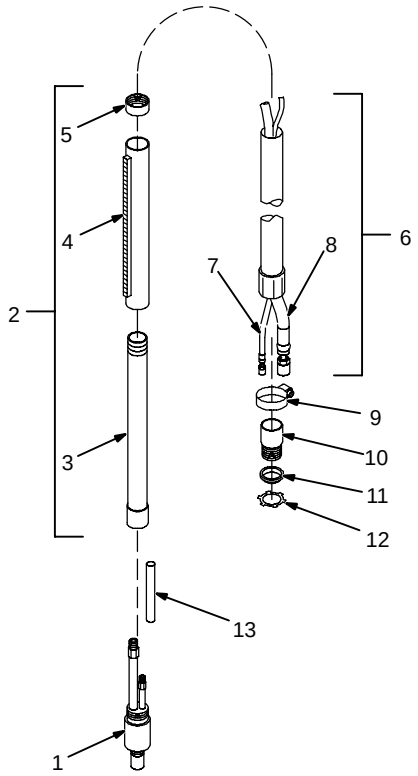


Figure 6-1. Torch, ICE-50/-70/-100

Item No.	Part No.	Description	Quantity
		Figure 6-1. Torch, ICE-50/-70/-100	
1	171 258	TORCH, main body (ICE-50 model)	1
1	171 257	TORCH, main body (ICE-70/-100 models)	1
2	171 246	HANDLE	1
3	171 248	PUSHBUTTON, switch	1
	171 255	SPLICE, 22-18 butt N-insul connector	2
4	171 263	LEAD INSULATOR, 5/8PVC 3.5 in long (ICE-50 model)	1
4	171 252	TEFLON TUBE, 11/16 ID x .030W x 3.5 in long (ICE-70/-100 models)	1
5	171 260	LEAD INSULATOR, 7/16PVC 3 in long (ICE-50 model)	1
5	171 251	TEFLON TUBE, 9/16 ID x .030W x 2.5 in long (ICE-70/-100 models)	1
6	171 259	BOOT, (ICE-50 model)	1
6	171 247	BOOT (ICE-70/-100 models)	1
7	171 256	HANDLE SCREW, No. 6 x 3/4ph	5
8	171 264	LEADS, 30ft (ICE-50 model) (consisting of)	1
9	180 504	LEADS, trigger	1
10	180 507	LEADS, pilot	1
11	180 506	LEADS, torch	1
8	171 253	LEADS, 30ft (ICE-70/-100 models) (consisting of)	1
9	180 504	LEADS, trigger	1
10	180 500	LEADS, pilot	1
11	180 501	LEADS, torch	1
8	171 265	LEADS, 50ft (ICE-50 model) (consisting of)	1
9	180 505	LEADS, trigger	1
10	180 509	LEADS, pilot	1
11	180 508	LEADS, torch	1
8	171 254	LEADS, 50ft (ICE-70/-100 models) (consisting of)	1
9	180 505	LEADS, trigger	1
10	180 498	LEADS, pilot	1
11	180 499	LEADS, torch	1

See Figure 6-6 or Figure 6-7 for additional torch consumables and parts.



ST-800 951-A

Figure 6-2. Torch, ICE-70M/-100M

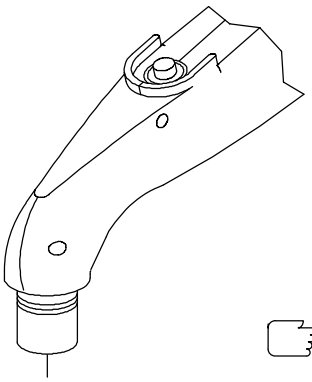
Item No.	Part No.	Description	Quantity
		Figure 6-2. Torch, ICE-70M/-100M	
1	171 245	TORCH, main body	1
2	171 241	TORCH ASSEMBLY, rack and sleeve (consisting of)	1
3	185 999	TORCH POSITION SLEEVE	1
4	186 000	COLLAR, brass	1
5	186 001	LOCKING RING	1
6	171 242	LEADS, 50ft (ICE-100M model) (consisting of)	1
7	180 498	LEADS, pilot	1
8	180 499	LEADS, torch	1
6	171 243	LEADS, 30ft (ICE-70M model) (consisting of)	1
7	180 500	LEADS, pilot	1
8	180 501	LEADS, torch	1
9	010 860	CLAMP, hose .750-1.750clp dia	1
10	170 993	COLLAR, brass	1
11	170 825	WASHER, shldr 1.251 ID x 1.750 OD x .125thk	1
12	010 907	NUT, 1.000-11	1
13	171 244	BLACK PVC, 5/8 ID x 3.5 long	1

Select correct consumables and parts for process being used as shown.

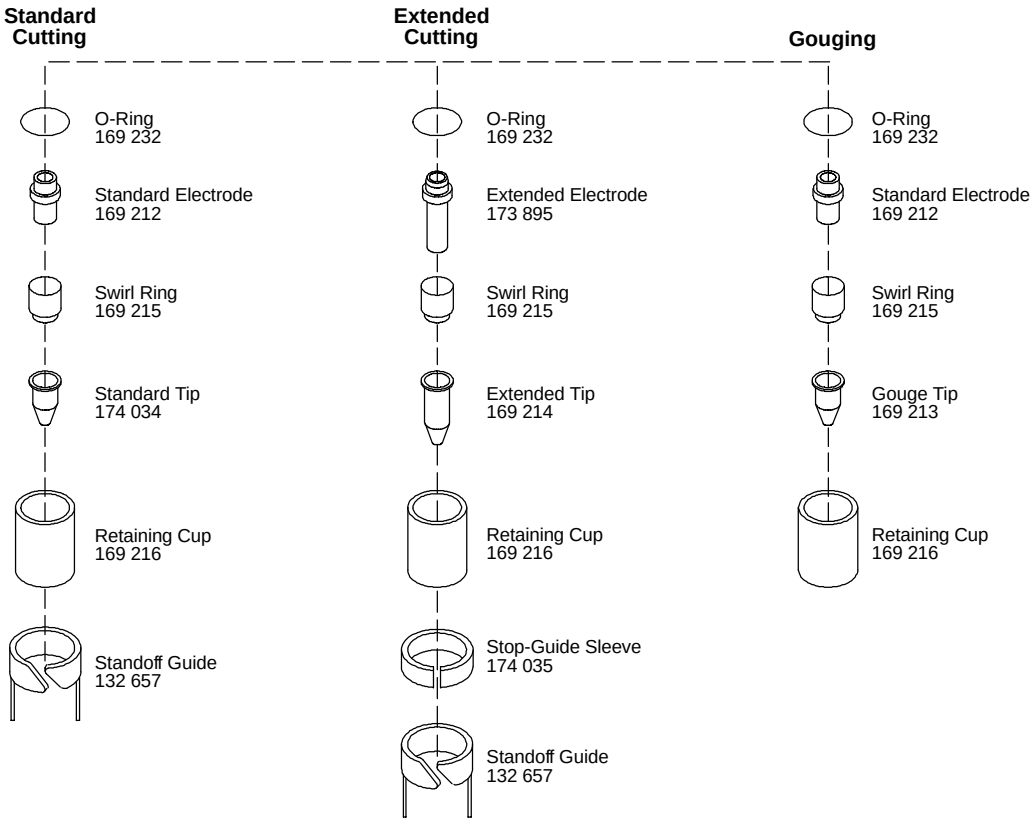
Apply a thin film of supplied grease (169 231) to O-ring before installing onto torch.

Always use standoff guide when cutting with power source Range switch in High Range. Install as shown. Standoff guide not required for Low Range cutting.

Torch is shipped with shielded cutting parts installed. Hand-held model shown.



The word "front" on swirl rings must face away from torch body.



Ref. S-170 648-C

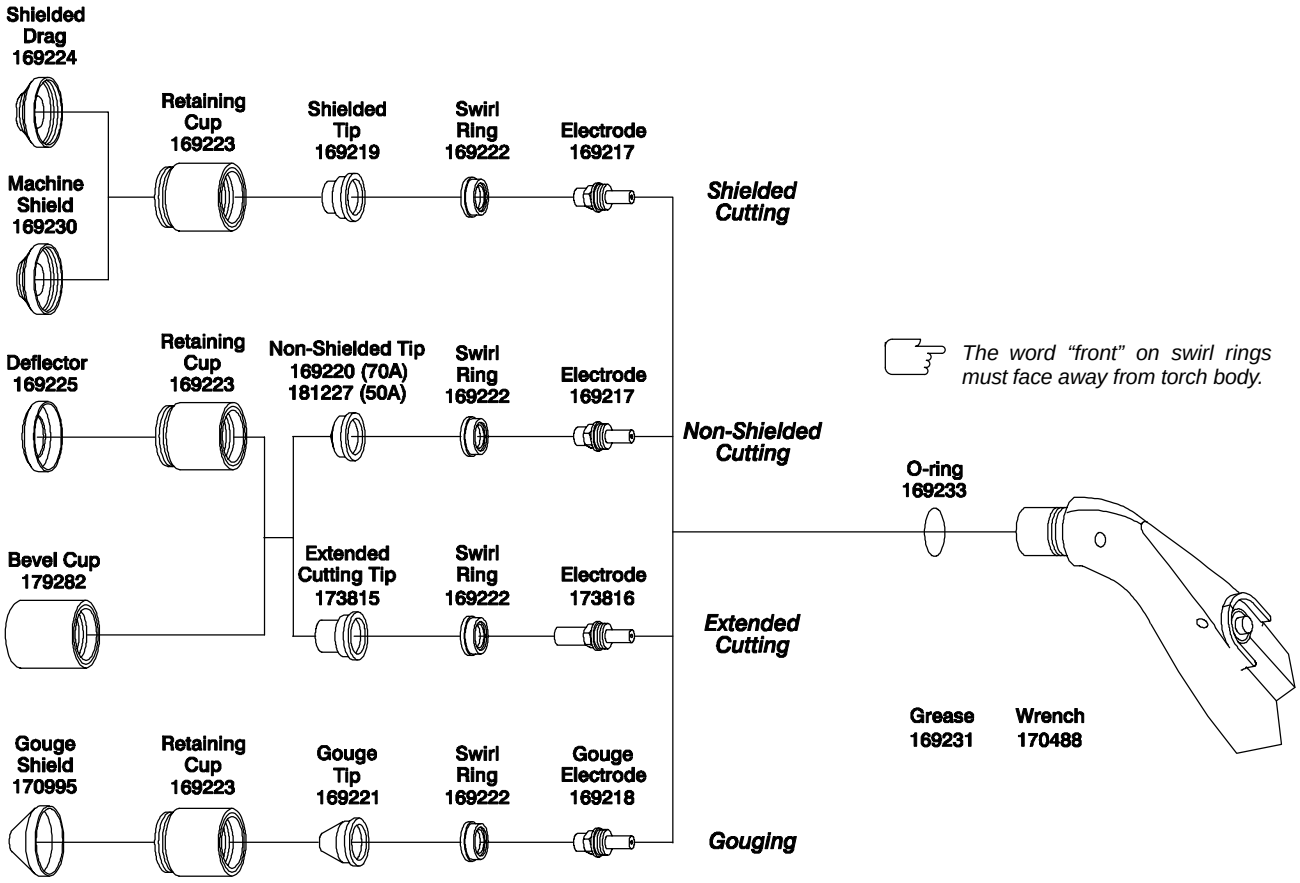
Figure 6-3. Consumables And Parts Supplied With ICE-50 Torch

Select correct consumables and parts for process being used as shown.

Apply a thin film of supplied grease (169 231) to O-ring before installing onto torch.

Set air pressure to 70 PSI.

Torch is shipped with shielded cutting parts installed.



The word "front" on swirl rings must face away from torch body.

Tools Needed:

(Supplied 170 488)

Ref. 170 650-D

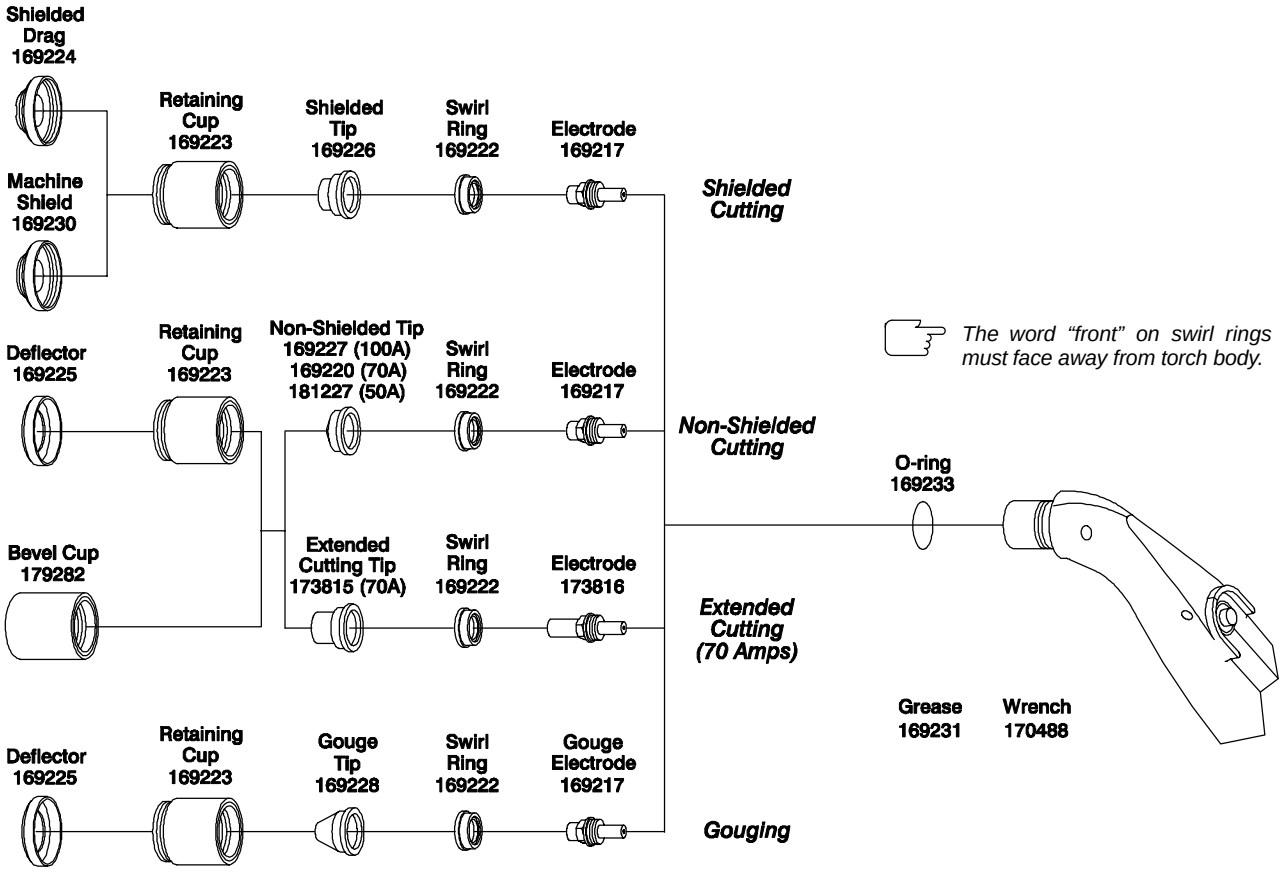
Figure 6-4. Consumables And Parts Supplied With ICE-70 Torch

Select correct consumables and parts for process being used as shown.

Apply a thin film of supplied grease (169 231) to O-ring before installing onto torch.

Set air pressure to 70 PSI.

Torch is shipped with shielded cutting parts installed.



The word "front" on swirl rings must face away from torch body.

Tools Needed:

(Supplied 170 488)

Ref. 170 652-C

Figure 6-5. Consumables And Parts Supplied With ICE-100 Torch

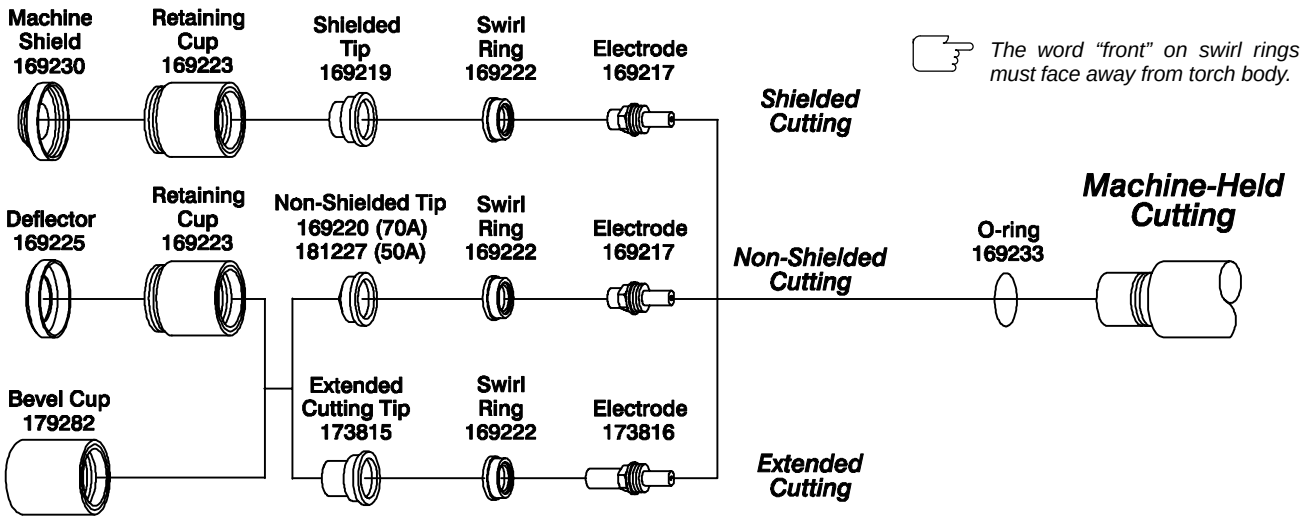
Select correct consumables and parts for process being used as shown.

Apply a thin film of supplied grease (169 231) to O-ring before installing onto torch.

Set air pressure to 70 PSI.

Torch is shipped with shielded cutting parts installed.

Grease **Wrench**
169231 **170488**



Tools Needed:

(Supplied 170 488)

Ref. 170 657-C

Figure 6-6. Consumables And Parts Supplied With ICE-70M Torch

Select correct consumables and parts for process being used as shown.

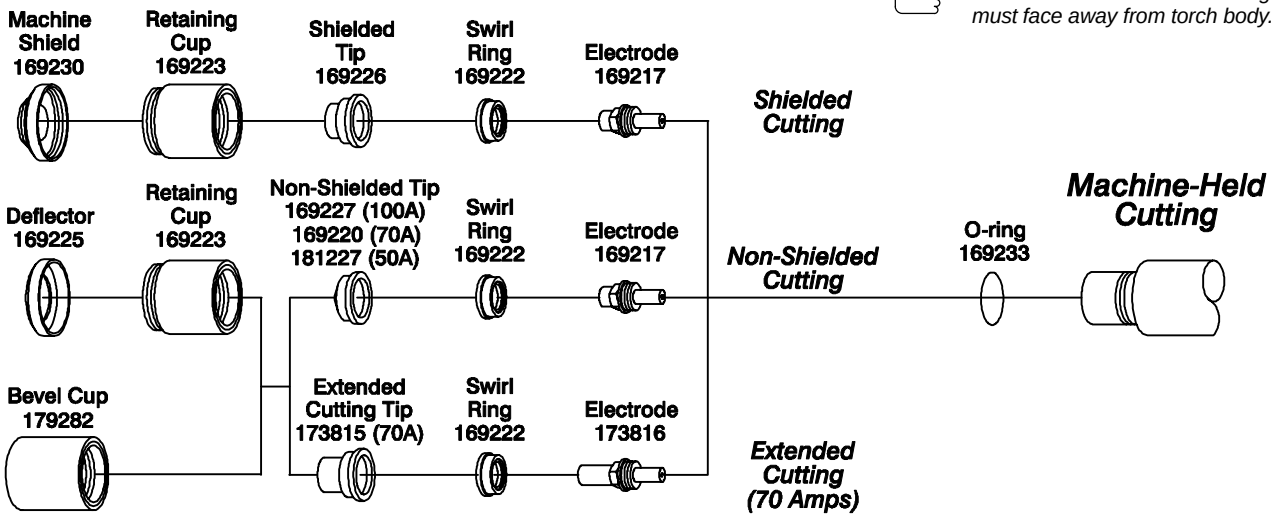
Apply a thin film of supplied grease (169 231) to O-ring before installing onto torch.

Set air pressure to 70 PSI.

Torch is shipped with shielded cutting parts installed.

Grease **Wrench**
169231 **170488**

The word "front" on swirl rings must face away from torch body.



Tools Needed:

(Supplied 170 488)

Ref. 170 658-C

Figure 6-7. Consumables And Parts Supplied With ICE-100M Torch

Warranty Questions?

Call
1-800-4-A-MILLER
for your local
Miller distributor.

Your distributor also gives you ...

Service
You always get the fast, reliable response you need. Most replacement parts can be in your hands in 24 hours.

Support
Need fast answers to the tough welding questions? Contact your distributor. The expertise of the distributor and Miller is there to help you, every step of the way.

Miller
The Power of Blue.

TRUE BLUE® WARRANTY

Effective January 1, 2000
(Equipment with a serial number preface of "LA" or newer)

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

LIMITED WARRANTY – Subject to the terms and conditions below, Miller Electric Mfg. Co., Appleton, Wisconsin, warrants to its original retail purchaser that new Miller equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by Miller. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed.

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to a North American distributor or eighteen months after the equipment is sent to an International distributor.

1. 5 Years Parts – 3 Years Labor
   * Original main power rectifiers
   * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
   * Transformer/Rectifier Power Sources
   * Plasma Arc Cutting Power Sources
   * Semi-Automatic and Automatic Wire Feeders
   * Inverter Power Supplies
   * Intellitig
   * Engine Driven Welding Generators **(NOTE: Engines are warranted separately by the engine manufacturer.)**
3. 1 Year — Parts and Labor
   * DS-2 Wire Feeder
   * Motor Driven Guns (w/exception of Spoolmate 185 & Spoolmate 250)
   * Process Controllers
   * Positioners and Controllers
   * Automatic Motion Devices
   * RFCS Foot Controls
   * Induction Heating Power Sources
   * Water Coolant Systems
   * HF Units
   * Grids
   * Maxstar 140
   * Spot Welders
   * Load Banks
   * Miller Cyclomatic Equipment
   * Running Gear/Trailers
   * Plasma Cutting Torches (except APT & SAF Models)
   * Field Options
     (NOTE: Field options are covered under True Blue® for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts
   * MIG Guns/TIG Torches
   * Induction Heating Coils and Blankets
   * APT, ZIPCUT & PLAZCUT Model Plasma Cutting Torches
   * Remote Controls
   * Accessory Kits
   * Replacement Parts (No labor)
   * Spoolmate 185 & Spoolmate 250
   * Canvas Covers

Miller's True Blue® Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear.**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller's option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. Miller's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a Miller authorized service facility as determined by Miller. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

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Owner's Record

Please complete and retain with your personal records.

Model Name Serial/Style Number

Purchase Date (Date which equipment was delivered to original customer.)

Distributor

Address

City

State Zip

For Service

Call 1-800-4-A-Miller or see our website at www.MillerWelds.com to locate a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:

- Welding Supplies and Consumables
- Options and Accessories
- Personal Safety Equipment
- Service and Repair
- Replacement Parts
- Training (Schools, Videos, Books)
- Technical Manuals (Servicing Information and Parts)
- Circuit Diagrams
- Welding Process Handbooks

Contact the Delivering Carrier for: File a claim for loss or damage during shipment.

For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

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