PRIME-CUT®

TACTICAL CUTTING TORCH KITS

PC/TAC
&
PC/MINI-TAC

OPERATING INSTRUCTIONS MANUAL

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Section I. INTRODUCTION

Section II. SCHEDULED MAINTENANCE

CHAPTER 1

GENERAL INFORMATION AND SAFETY PRECAUTIONS

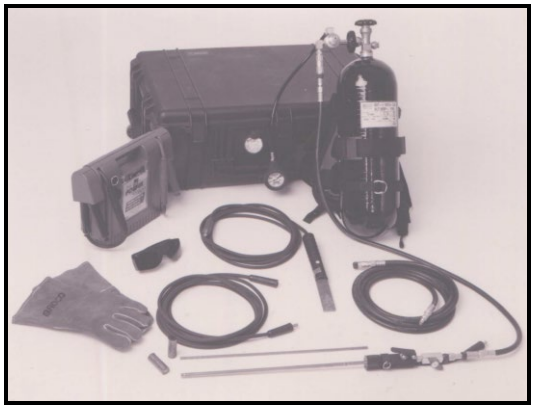
Section I. INTRODUCTION

Exothermic torches were originally conceived and configured for equipment maintenance applications involving the rapid cutting of thick metal, or unusual metal alloys. It was this capability which eventually led to the use of exothermic torches for the removal of metal barriers by military, law enforcement and rescue personnel.

1-1. THERMAL BREACHING. Thermal breaching involves the use of devices, tools, and materials that produce extremely high temperatures to melt, burn through, or vaporize objects and mechanisms to gain entry to secured areas or locations. The use of thermal tools is an expedient alternative when other methods are inappropriate for technical or tactical reasons. This breaching method has certain characteristics which must be considered during breach planning. This manual will describe general warnings, safety precautions and operating techniques to enable the user to make the best decisions concerning the deployment of thermal breaching equipment and its subsequent use.

1-2. PRIME-CUT TACTICAL TORCH KITS. Broco is the leading manufacturer of self contained lightweight exothermic systems for emergency rescue and salvage operations. These kits have the capability of quickly burning, melting, or vaporizing nearly any metallic, non-metallic, or composite material.

PRIME-CUT TACTICAL torch kits currently consist of the PC/TAC and PC/Mini-Tac. There are two versions of the PC/TAC. PC/TACMOD1 (export model PC/TACMOD2) utilizes a conventional industrial type oxygen regulator which may be submerged to a 20 feet of sea water (fsw) depth.
The PC/TAC-A version contains a depth compensating oxygen regulator which allows cutting operations to a depth of 60 fsw. PC/Mini-Tac (model PC/MTMOD1), the smallest exothermic cutting torch available, can be configured for use in a handheld mode or belt carried as a conventional exothermic torch.



PC/TAC CUTTING TORCH KIT

PC/MTMOD1 MINI-TAC TORCH KIT

1-3. WARNINGS. To avoid serious injury or death, all personnel shall heed these warnings.

WARNING

a. Never point the torch at anybody.

b. Never use the equipment unless you are familiar with acceptable industrial welding and cutting procedures and practices.

c. Always use this equipment following generally accepted industrial safety procedures and practices.

d. Always apply and adhere to ANSI/ASC Z49.1-88 Safety in Welding and Cutting standards, or similar locally prevailing standards when using this equipment.

e. Never remove, cover, or alter the warning labels attached to this equipment.

f. All users and their supervisory personnel must read and be thoroughly familiar with these operating instructions prior to using this equipment.

g. Never modify this equipment in any manner or use it in any way not specified in this manual.

1-4. SAFETY PRECAUTIONS.

WARNING

Failure to heed these safety precautions may result in death, severe bodily injury, or severe property damage. Protect yourself and others. Fumes and gases developed may be dangerous to your health. Ultra-violet rays and splatter can injure eyes and exposed skin. Electric shock can kill. Oxygen reacts explosively when mixed with oil or grease.

a. Always clear the work area of flammable materials.

b. Always clear the work area of bystanders.

c. The operator and all bystanders must always wear adequate protective (flame and/or spark resistant) clothing, footwear, and gloves when using this system.

d. Never operate this equipment without proper face and eye protection. Always use a number 5 or 6 shade filter.

e. Always use the Leather Shield to protect yourself from sparks and splatter.

f. Always remove all personal metal items (i.e., rings, watches, etc.) when working with the torch as they can trap sparks and slag causing a severe burn and damage to the item.

g. Always keep your head away from the fume plume.

h. Always use adequate ventilation and exhaust at the arc point to keep fumes and gases from your breathing zone as well as the general area. Special breathing apparatus must be used when welding or cutting galvanized, cadmium plated (or other heavy metal plated), or painted parts to avoid inhalation of toxic fumes and gases.

i. Always keep the ignited tip of the cutting rod away from the oxygen cylinder, battery, and oxygen hoses.

j. Always use extreme caution when operating the torch in windy or other adverse conditions.

k. Never allow falling sparks or molten metal to contact any part of the torch kit. Damage may result which could render the equipment unsafe to operate.

l. Always use caution when cutting overhead to avoid falling sparks, molten material, and falling objects.

m. Always keep oil and grease away from the torch, oxygen cylinders, valves, regulators, hoses, and fittings. Never use compressed air, oil, solvents, or other material to clean any part of the oxygen system. Oxygen reacts explosively when mixed with oil or grease.

n. Never clean any internal part of the oxygen system. Never use compressed air, oil, solvents, or any other material to clean the oxygen system. The oxygen system could become contaminated and cause internal burning in the torch or hose. All service on oxygen delivery parts must be performed by a qualified and knowledgeable technician.

o. Never use a high pressure gas cylinder that does not comply with current inspection and testing requirements. Always ensure the cylinder is marked with a sticker showing a valid inspection certification.

p. Never drop a high pressure gas cylinder. Never leave a high pressure gas cylinder in direct sunlight for prolonged periods. Never expose a high pressure gas cylinder to fire or extreme heat. High pressure gas cylinders can be dangerous. Use with caution.

q. Always ensure the correct over pressure safety relief device is installed in the high pressure cylinder valve. Never use a safety relief device whose burst pressure is higher than that recommended by the cylinder manufacturer.

r. Never leave the torch unattended while the oxygen cylinder valve is open and/or there is pressure in the hose.

s. Always use a 12-volt DC ignition system. Never use this equipment in conjunction with a welding machine or with any power source other than a 12-VDC. Although a 12-volt power source is desirable, a 24-VDC ignition system may also be used.

t. Never touch live electrical parts. Always wear welder's gloves when inserting or removing the rod into/from the torch and/or extender. Never let the rod touch any unprotected part of the body.

u. Always know the composition of the target material.

v. Always know what is behind the target material.

w. Always ensure that all parts of the torch system are in good working order prior to use to avoid potential malfunction.

See: American National Standard Z49.1-88 Safety in Welding and Cutting published by the American Welding Society, 550 N.W. LeJeune Road; Miami, FL 33126.

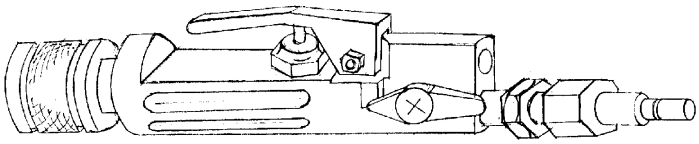
OSHA Safety and Health Standards 29 CFR 1910 available from the U.S. Department of Labor; Washington, D.C. 20210.

Section II. EQUIPMENT DESCRIPTION

1-5. PC/TAC TACTICAL CUTTING TORCH SYSTEM.

A combination of light weight and great cutting capability make this back-packed torch system ideal for confined space and remote operations. Hand-tight fittings and quick connects facilitate assembly and disassembly without the use of tools. Everything required for field deployment or stationary cutting training is included.

a. **Torch Assembly.** The torch assembly consists of several parts. The torch body is a combination of handle, oxygen plug valve, and rod holder. The oxygen control lever allows the operator to throttle the oxygen flow through the cutting rod. It also includes quick connect fittings, a collet, a collet washer, and a collet nut. The integral plug valve allows the oxygen cylinder to be opened without the oxygen flow entering the torch handle and facilitates the use of the RapidFire cutting rod igniters. The torch comes with one 1/4" and one 3/8" collet.

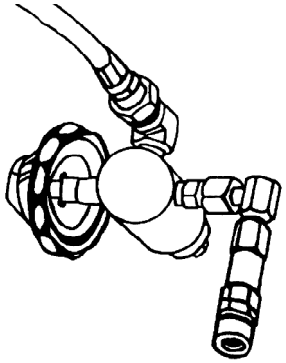


b. **Cutting Rod.** The kit is designed to use either 1/4" or 3/8" cutting rods. (3/16" and 1/2" diameter cutting rods are also available from Broco but are not appropriate for this kit.) Standard rod length is 18 inches. The 3/8" rod is also available in a 36" length.

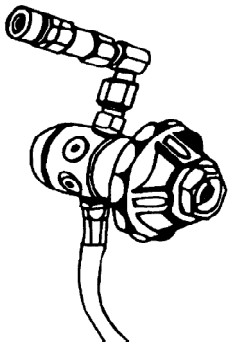
c. **Leather Shield.** The flexible Leather Shield acts as a hand guard and a splatter shield. It attaches to the torch directly behind the collet nut and is a six inch by six inch square.

d. **Oxygen Supply System.** The Oxygen (02) Supply System consists of the following component parts:

1) **Oxygen Regulator.** There are two versions of regulator sold with the PC/TAC . Both have a hand-tighten cylinder connection (CGA 540) and a quick connect coupler outlet fitting. The first version, an industrial, pre-set regulator is for most applications. The second, based on a modified SCUBA first stage, will maintain output pressure when submerged in water. Cylinder volume constraints limit the practical working depth to 60 feet. Both versions of regulator are factory set to provide for a working pressure of 60 to 65 pounds per square inch (psi), which is the optimum for breaching operations.

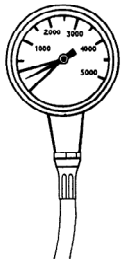


INDUSTRIAL REGULATOR



SUBMERSIBLE REGULATOR

2) **Pressure Gauge.** This submersible high pressure gauge is connected to the regulator by an 18 inch length of high pressure hose. It measures the pressure of the compressed oxygen in the cylinder from zero to 5000 psi and is designed for use with oxygen only.



PC/TAC-G PRESSURE GAUGE

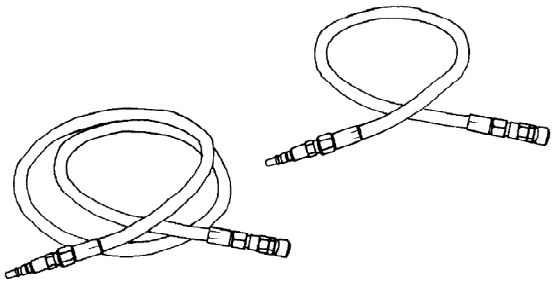
WARNING

Never use a standard SCUBA pressure gauge as they contain oil.

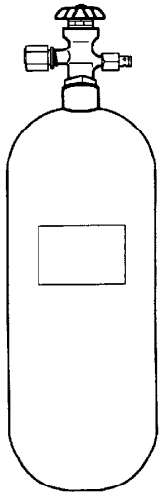
Do not use compressed air to test the pressure gauge, hose or any other component of the oxygen supply system as oil contamination may result.

3) **Oxygen Hose.** The PC/TAC contains a five foot hose and ten foot hose. Both are fitted with brass quick-connect ends. The five foot hose enables the operator to freely use the torch system in the backpack configuration. The additional hose may be combined if the system is to be used from a stationary oxygen source at a distance from the operator.

4) **Oxygen Cylinder.** The hoop wrapped composite oxygen cylinder is a seamless aluminum compressed gas cylinder with a 45 cubic foot (cu ft) capacity at 2200 psi. The aluminum shell is wrapped in a fiber-glass laminate. The cylinder is manufactured in compliance with U.S. Department of Transportation (DOT) specifications. It has a standard oxygen valve (CGA 540) for ease of filling and attachment to a regulator.



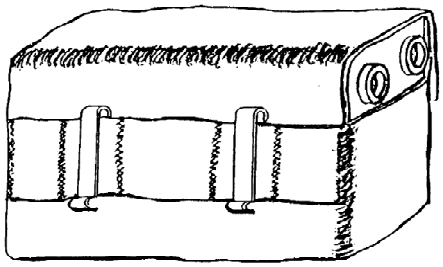
OXYGEN HOSES, 5' LONG & 10' LONG



OXYGEN CYLINDER

e. **Battery Ignition Components.** The battery ignition components are used to ignite the cutting rod by means of an electric arc.

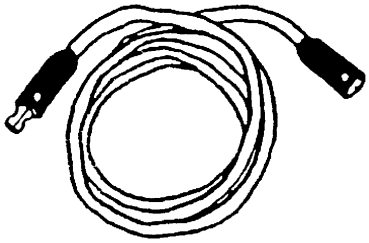
1) **Lightweight Battery.** The Lightweight Battery (PC/BISLW) contains a rechargeable 12-volt, sealed, lead acid (gel-type) battery. The battery provides DC power (through AWG #6 welding cables) to both the torch and the striker plate assembly. A dead short spark is all that is necessary for igniting the cutting rod.



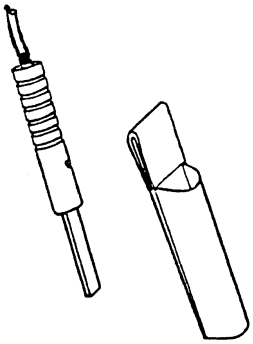
PC/BISLW LIGHTWEIGHT BATTERY

2) **Striker Plate Assembly.** The Striker Plate Assembly, shown with leather sheath, consists of a replaceable insulated copper grounding plate with battery cable. The 15' long cable is fitted with a set of electrical quick-connects allowing it to be shortened to 5' long for use in a back-packed mode.

3) **Torch Power Cable.** The Torch Power cable has electrical quick-connects fitted at both ends for attachment to the torch assembly and the lightweight battery. The 15' long cable is fitted with a set of electrical quick-connects allowing it to be shortened to 5' long for use in a back-packed mode.



TORCH POWER CABLE



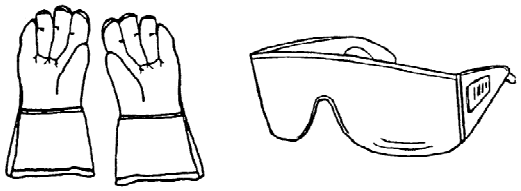
STRIKER PLATE AND LEATHER STRIKER HOLDER

f. **Harness Assembly.** The back harness assembly is a high strength, lightweight plastic (SCUBA-type) frame with padded adjustable shoulder straps. Shoulder straps and chest strap have quick release buckles. The frame also has nylon cylinder retaining straps. It allows the oxygen cylinder to be carried in an up-right position on the operator's back.

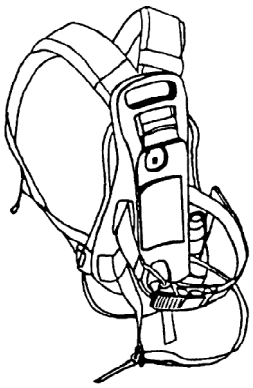
g. **Extender.** The extender included in the PC/TAC extends the reach of the rod 14 inches and is used to enable the operator to employ the torch in otherwise inaccessible places and or make best use of available cover. A 36” long extender is available from Broco as an optional accessory.

h. **Quiver.** The quiver is a nylon pouch designed to hold the cutting rods. It is adjustable to accommodate either 18 inch or 36 inch rods. It has two Velcro fastened belt loops to adjust carrying height.

i. **Safety Equipment.** The safety equipment included with each kit consists of welder's gloves and two pairs of safety glasses with number 5 lenses.



WELDER'S GLOVES & SAFETY GLASSES



PC/LWB LIGHTWEIGHT BACKPACK

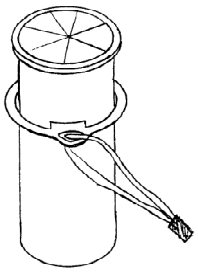
WARNING

Never operate this equipment without proper face and eye protection. Always use a number 5 or 6 shade filter lens.

h. **Component Case.** A plastic Pelican™ case, foam lined with internal nylon straps to secure the hardware and absorb shock. There is a manual pressure relief valve on the front under the handle.

Available Separately:

i. **Rod Igniter.** The RapidFire™ cutting rod ignition cartridges are an alternative means of lighting the torch, eliminating the weight and bulk of the battery, striker plate and related cables.

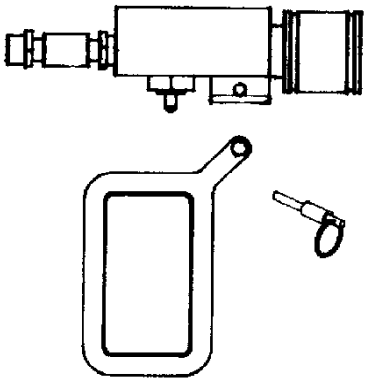


PC/RFC CUTTING ROD IGNITION CARTRIDGE

1-6. PC/MINI-TAC COMPACT CUTTING TORCH SYSTEM.

The smallest exothermic torch system is well suited to limited cutting operations where portability, speed and cutting capability are paramount. The PC/MINI-TAC can be used in either a handheld configuration or belt mounted in a traditional exothermic torch configuration. Hand-tight fittings and quick-connects facilitate assembly and disassembly without the use of tools.

a. **Torch Assembly.** The torch assembly consists of several parts. The torch body is a combination of handle and rod holder. The reversible oxygen control lever (retained by a quick release pin) allows the operator to throttle the oxygen flow through the cutting rod. A quick-connect fitting at the back of the torch body is for rapid attachment to either the oxygen regulator or the auxiliary hose assembly. The torch also includes a collet, a collet washer, and a collet nut. The torch comes with one 1/4", one 3/16" and one 3/8" collet.



PC/MT-T1A MINI-TAC TORCH ASSEMBLY WITH REVERSIBLE LEVER

b. **Cutting Rod.** The kit is designed to use either 3/16", 1/4" or 3/8" cutting rods. (1/2" diameter cutting rods are also available from Broco but are not appropriate for this kit.) Standard rod length is 18 inches. The 3/8" rod is also available in a 36" length.

c. **Oxygen Supply System.** The Oxygen (02) Supply System consists of the following component parts:

1) **Oxygen Regulator.** The PC/MINI-TAC has a piston type oxygen regulator. It has a hand-tighten cylinder connection (CGA 540) and a quick-connect coupler outlet fitting. Output pressure is preset to accommodate 1/4" and 3/16" cutting rods. A heavier spring (included) must be installed for use with the 3/8" cutting rods. A 3,000 psi pressure gauge is included.

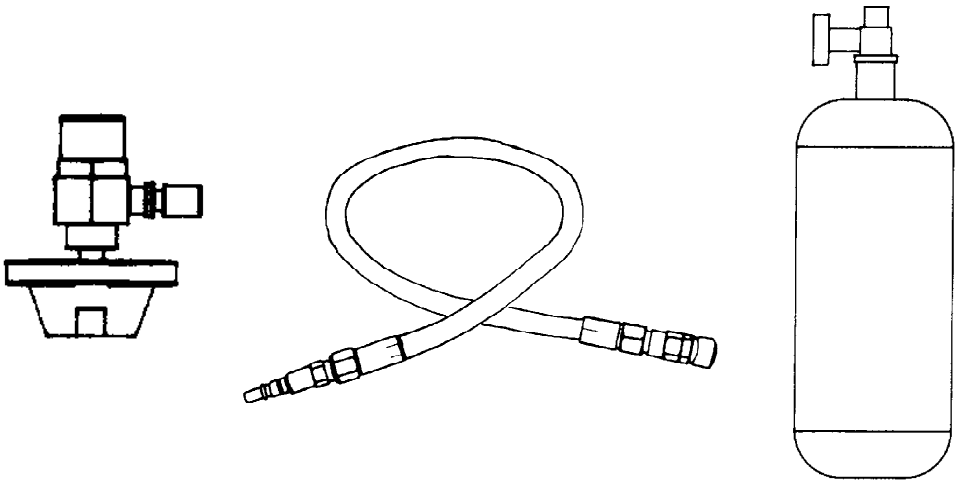
WARNING

Do not use compressed air to test the pressure gauge, hose or any other component of the oxygen supply system as oil contamination may result.

2) **Oxygen Hose.** The PC/MINI-TAC contains a four foot hose fitted with brass quick-connect ends. A plug valve is installed on the end of the hose assembly that connects to the torch.

3) **Oxygen Cylinders.** Two fully wrapped composite oxygen cylinders are included with the PC/MINI-TAC. Each is a seamless aluminum compressed gas cylinder with 15 cubic foot (cu ft) capacity at 3000 psi. The aluminum shell is wrapped in a fiber-glass laminate. Each cylinder is manufactured in compliance with U.S. Department of Transportation (DOT) specifications.

They have a standard oxygen valve (CGA 540) for ease of filling and attachment to a regulator.

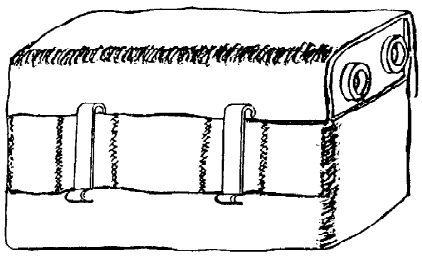


MINI-TAC REGULATOR, HOSE AND CYLINDER

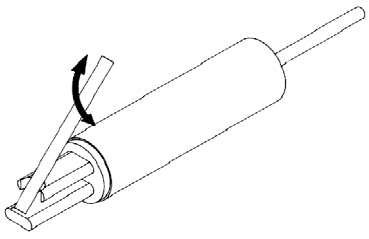
d. **Battery Ignition Components.** The battery ignition components are used to ignite the cutting rod by means of an electric arc.

1) **Lightweight Battery.** The Lightweight Battery (PC/BISLW) contains a rechargeable 12-volt, sealed, lead acid (gel-type) battery. The battery provides DC power (through AWG #6 welding cables) to the dual pole striker plate assembly. A dead short spark is all that is necessary for igniting the cutting rod.

2) **Dual Pole Striker Plate Assembly.** The Dual Pole Striker Plate Assembly consists of a handle, two copper grounding plates (poles) and battery cables with electrical quick-connects. The striker plate functions by the grounding of a cutting rod tip between the two poles, creating a preheat spark, igniting the cutting rod.



PC/BISLW LIGHTWEIGHT BATTERY

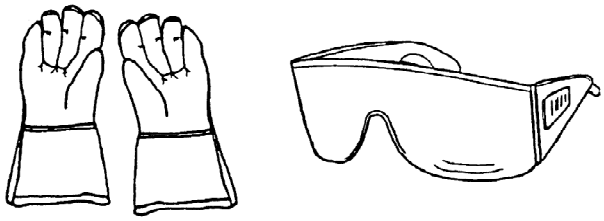


PC/SPD-5 DUAL POLE STRIKER PLATE

e. **Leather Shield.** The flexible Leather Shield acts as a hand guard and a splatter shield. It attaches to the torch directly behind the collet nut and is a six inch by six inch square.

f. **Fanny Pack.** The Fanny Pack is a nylon pouch designed to hold an oxygen cylinder with regulator attached, packet of cutting rods (18" long), torch and hose. Mounting straps and Alice Clips allow the fanny pack to be carried horizontally or vertically, attached to belt, tactical vest, or load bearing harness.

g. **Safety Equipment.** The safety equipment included with each kit consists of welder's gloves, and one pair of safety glasses with number 5 lenses.



WELDER'S GLOVES & TINTED SAFETY GLASSES

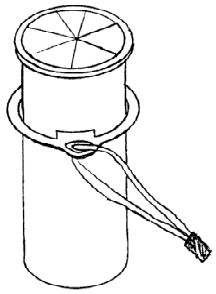
WARNING

Never operate this equipment without proper face and eye protection. Always use a number 5 or 6 shade filter lens.

h. **Component Case.** A plastic Pelican™ case, foam lined to secure the hardware and absorb shock. There is a manual pressure relief valve on the front under the handle.

Available Separately:

i. **Rod Igniter.** The RapidFire™ cutting rod ignition cartridges are an alternative means of lighting the torch, eliminating the weight and bulk of the battery, striker plate and related cables.



PC/RFC CUTTING ROD
IGNITION CARTRIDGE

CHAPTER 2

PREPARATION

Section I. SETUP PROCEDURES

2-1. PREPARING THE WORK AREA.

WARNING

Never operate the torch in explosive or flammable environments.

Never cut into unknown material.

Never operate the torch with other personnel or bystanders in front of the torch or in the immediate work area.

Some plastics, paints, and plated parts give off toxic fumes. Organic materials may be combustible. Exotic metals may ignite. Glass and thin porcelain may shatter. Rock and minerals may spall.

a. Clear the work area of bystanders/non-essential personnel.

b. Place the oxygen supply and battery in a location away from the immediate work area.

c. Know the composition of the target material. Some metals burn violently. Concrete will spall.

d. Know what is beyond the target material. Never cut near power cables, pipes, or flammable objects.

e. When the target material is a container or pipe, know the material previously contained therein. Always thoroughly purge pipelines and containers with an inert gas (such as nitrogen or argon) prior to cutting.

f. Ensure that falling material (molten metal, sparks, or severed pieces of target material) will not cause injury to operator or bystanders or cause damage to property.

2-2. PRE-ASSEMBLY INSPECTION.

WARNING

Never use any equipment which is unsafe or appears to be unsafe. Always replace damaged or worn components to reduce the risk of injury. Never operate the torch without the flash arrestor and flash arrestor screen in place.

a. Always inspect the oxygen hose(s), power cables, oxygen quick-connects and electrical connectors for damage or wear prior to and immediately following each use of the cutting torch.

b. Always inspect the torch assembly, the flash arrestor, and flash arrestor screen for damage or wear prior to and immediately following each use.

c. Check the battery for leaks. Never use a leaking battery as gases may be toxic and/or combustible. Seepage may be caustic, harming skin and eyes.

Section II. PC/TAC ASSEMBLY PROCEDURES

2-3. OXYGEN SYSTEM. (PC/TAC)

WARNING

To reduce the risk of injury in the event of regulator failure, never stand directly in front of or directly behind the oxygen regulator while opening the oxygen cylinder valve.

Always keep oil and grease away from the torch, oxygen cylinders, valves, regulators, hoses, and fittings. Never use compressed air, oil, solvents, or other material to clean any part of the oxygen system. Oxygen reacts explosively when mixed with oil or grease.

Always make sure the oxygen cylinder is a safe distance from the immediate work area. Never let sparks or molten material come into contact with the oxygen cylinder.

PC/TAC utilizes a fiber wound composite oxygen cylinder. Never use a cylinder with damaged windings. Always have a licensed test facility inspect questionable cylinders.

Do not use a torch if there is an oxygen leak.

a. General. The oxygen cylinders included with the Prime-Cut Tactical cutting torch kits are manufactured in compliance with all applicable US Department of Transportation requirements for high pressure compressed gas cylinders. The cylinder valve outlet fitting is to the Compressed Gas Association (CGA) specification 540, the common US industrial oxygen outlet.

   High pressure gas cylinders are required to comply with current inspection and testing requirements. Cylinders must undergo internal visual inspection annually and pass hydrostatic testing every three years. Always ensure the cylinder to be used is marked with a sticker showing a valid inspection certification.

b. Export kits. The US standard outlet fitting (CGA 540) is used in many parts of the world. Where it is not accepted, the British standard for oxygen fittings is usually the local standard (e.g. most of Asia). Adapters to convert from US to British standard are available from Broco.

   1) BR-540 adapter allows the US standard regulators supplied in the tactical torch kits to be used with British standard oxygen cylinders. This facilitates the use of larger, locally obtained oxygen cylinders when practicing cutting technique (as opposed to Method Of Entry training).

      a) Thread the BR-540 adapter onto the British standard oxygen valve outlet fitting. Tighten with a wrench.

      b) Attach the regulator to the other side of the BR-540 adapter.

   2) BR-541 adapter enables the filling of the oxygen cylinders included in the tactical torch kits by gas suppliers with British standard fill hose end connections. BR-541 adapter can also be used to fit a British standard oxygen regulator to a US standard oxygen cylinder.

      a) Thread the BR-541 onto the US CGA 540 standard oxygen cylinder valve outlet connection. Tighten with a wrench.

      b) Attach the fill hose (or British standard regulator) to the other side of the BR-541 adapter.

   3) BR-540 adapter can also be used with a US standard transfill hose assembly to transfer oxygen between a US standard cylinder and a British standard cylinder.

a) Thread the BR-540 onto the British standard oxygen cylinder valve outlet connection. Tighten with a wrench.

b) Thread one end of the transfill hose assembly onto the other end of the BR-540.

c) Attach the other end of the transfill hose assembly to the US standard oxygen cylinder valve outlet connection.

d) Follow transfill instructions detailed elsewhere in this manual.

c. Inspect and wipe clean with a clean dry cloth all fittings, hoses, and cables. Ensure there is no grease, oil, or other contaminant on these items.

d. Ensuring that the oxygen is turned off, place the oxygen cylinder into the back harness assembly:

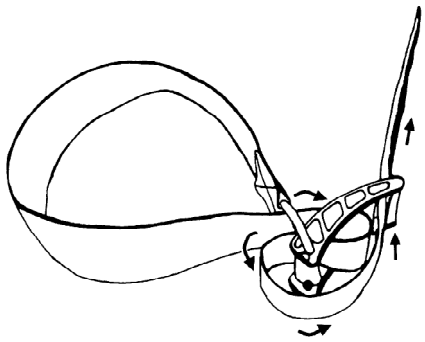
1) The oxygen cylinder will be in an up-right position.

2) The oxygen outlet shall be positioned toward the user's left shoulder (when wearing the rig).

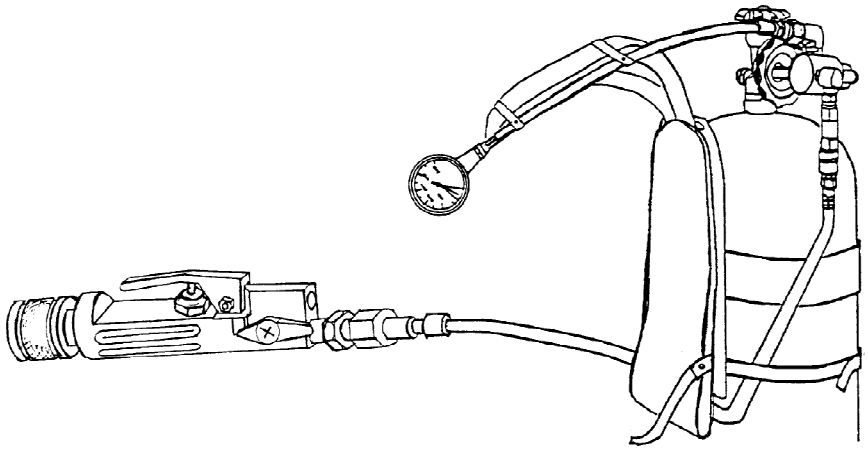
3) The oxygen cylinder will be located on the back harness assembly so that the cylinder strap is approximately center on the oxygen cylinder.

4) Tighten the cylinder strap using the tensioner. The cylinder strap must be routed through the tensioner as shown to remain securely attached to the back harness assembly.

5) Tighten the keeper strap.



ROUTING THE MAIN CYLINDER STRAP



PC/TAC SETUP- OXYGEN SYSTEM

CAUTION

Do not use a wrench to tighten the regulator inlet nipple as damage to the nipple may occur.

e. Connect the oxygen regulator to the oxygen cylinder ensuring that the regulator quick connect fitting for the oxygen hose is pointed straight down and is parallel to the oxygen cylinder. Note that the regulator inlet is fitted with a hand-tight nut and Teflon tipped inlet nipple. A complete seal can be achieved by hand tightening.

f. Attach the pressure gauge hose to the left side shoulder strap of the back harness assembly using the snap tabs.

g. Connect the five foot oxygen hose to the oxygen regulator by pushing the plug end oxygen quick connect on the hose into the oxygen quick connect coupler on the regulator. Route the oxygen hose down along the oxygen cylinder and between the keeper strap and the oxygen cylinder.

h. Attach the torch assembly to the oxygen hose by pushing the plug end oxygen quick connect on the torch into the oxygen quick connect coupler on the hose. Turn the plug valve to the open position.

WARNING

Regulators may fail when pressurized. Never stand directly in front of the regulator while opening the oxygen cylinder valve. Always stand to the side of a regulator when opening the oxygen cylinder valve.

Always open the oxygen cylinder valve slowly. Do not allow rapid pressurization of the regulator. Regulator failure may occur, injuring the operator or bystanders.

i. Standing on the opposite side of the oxygen cylinder from the oxygen regulator, slowly open the oxygen cylinder valve to start the flow of oxygen. Open the valve all the way, then back off 1/4 of a turn. Check the pressure gauge on the oxygen regulator to ensure that the oxygen cylinder is full.

j. Check all connections for oxygen leaks by listening for escaping gas. Depress the oxygen control lever on the torch assembly to verify proper functioning (i.e. not sticking, no obstructions, etc.). Close the plug valve.

2-4. IGNITION SYSTEM. (PC/TAC)

WARNING

Always use a 12-volt DC ignition system.

Lead-acid batteries generate explosive gases during normal battery operation. Never smoke or allow spark or flame in the near vicinity of the battery. Always make sure the battery is safely positioned away from the immediate work area and adequately ventilated. Never let sparks or molten material come into contact with the battery.

Always wear eye protection and protective clothing. If battery acid makes contact with skin/clothing, promptly wash with soap and water. If acid makes contact with eyes, flood immediately with running cold water for at least ten minutes and seek immediate medical attention.

Remove all personal metal items (i.e., rings, watches, etc.) when working with lead-acid batteries as they can produce a short-circuit current high enough to weld a ring or other like item to metal causing a severe burn.

Never use the battery while the battery charger is plugged into an AC outlet. Always unplug the battery charger before attaching the ignition power cables to the battery .

Never let the striker plate accidentally contact the torch, rods, or work area. Electrical shock and sparks may result.

Do not submerge the battery in water.

CAUTION

The battery can discharge if the striker plate continuously contacts the work area. Exercise caution to prevent complete discharge of the battery.

The battery should never be left in a total discharged state for an extended period of time. Damage could be permanent with poor performance as a result. When not in use, recharge at least every three months.

2-4-1. Lightweight Battery. The Lightweight Battery (PC/BISLW) contains a rechargeable 12-volt, sealed, lead acid (gel-type) battery. It can be stored in any position. The battery provides DC power (through AWG #6 welding cables) to the torch and striker plate. A dead short spark is all that is necessary for igniting the cutting rod.

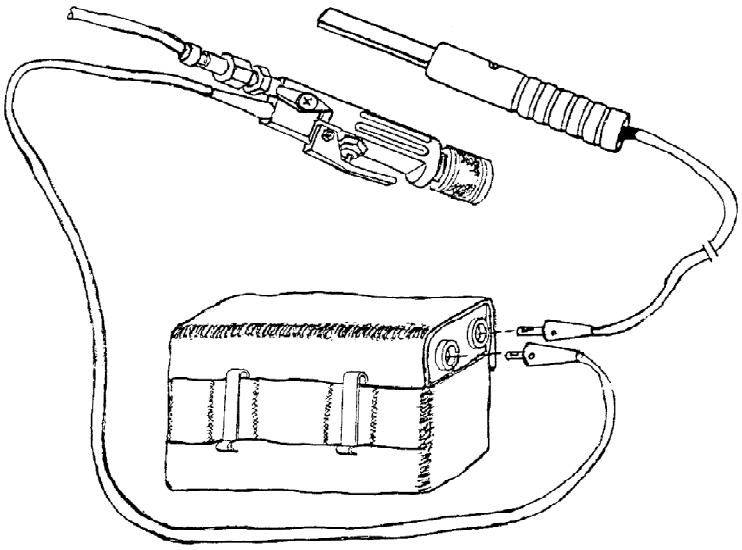
a. Attach the Lightweight Battery to the Back Harness Assembly waist strap using the metal clips on the lightweight battery's nylon cover.

b. Unsnap and lift the front tab of the battery cover, exposing the two electrical quick connect receptacles.

c. Separate the torch power cable into two segments. Connect the 5 foot power cable to the torch by firmly seating the black plug in the hole in the back of the torch assembly then twisting 1/4 turn to lock in place.

d. Connect the other end of the 5 foot power cable to the battery. Firmly seat the black plug into the black receptacle then twist 1/4 turn to lock in place.

e. Separate the striker plate cable into two segments. Connect the striker plate cable to the battery by firmly seating the red plug into the red receptacle then twisting 1/4 turn to lock it in place.

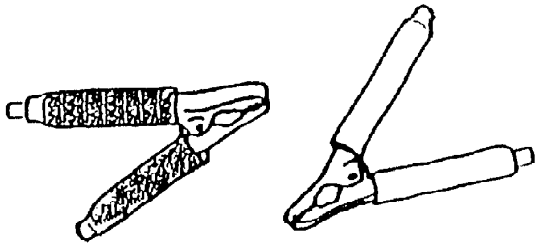


PC/TAC SETUP- IGNITION SYSTEM

NOTE

There may be times when the backpack need not be used (e.g. training). At these times it may also be advantageous to use oxygen from a larger cylinder (more cutting duration). In these instances leave the torch power cable and striker plate cable at 15 feet. Also join the 10 foot long oxygen hose to the 5 foot hose for a total of 15 feet.

2-4-2. Battery Adapter Clamps. The battery adapter clamps are employed when using any 12- or 24-volt (DC) power source other than the Lightweight Battery.



PC/BAK BATTERY CLAMPS ADAPT TORCH AND STRIKER POWER CABLES TO 12 AND 24 VOLT BATTERIES.

WARNING

Never use a battery for ignition that is connected to a battery charger.

Always unplug the battery charger before attaching the ignition power cables to the battery.

Never let the striker plate accidentally contact the torch, rods, or work area. Electrical shock and sparks may result.

CAUTION

The battery can discharge if the striker plate continuously contacts the work area. Exercise caution to prevent complete discharge of the battery.

NOTE

Polarity does not matter for ignition since only a direct short is required to ignite the rod.

a. Connect the 15 foot power cable to the torch by firmly seating the black plug in the hole in the back of the torch assembly then twisting 1/4 turn to lock in place.

b. Connect the other end of the 15 foot power cable to the black battery adapter clamp. Firmly seat the black plug into the receptacle then twist 1/4 turn to lock in place.

c. Connect the 15 foot striker plate cable to the red battery clamp by firmly seating the red plug into the receptacle then twisting 1/4 turn to lock it in place.

d. Connect the battery adapter clamps and to the terminals on the 12- or 24-volt DC power source.

Section III. PC/MINI-TAC ASSEMBLY PROCEDURES

2-5. OXYGEN SYSTEM. (PC/Mini-Tac)

WARNING

To reduce the risk of injury in the event of regulator failure, never stand directly in front of or directly behind the oxygen regulator while opening the oxygen cylinder valve.

Always keep oil and grease away from the torch, oxygen cylinders, valves, regulators, hoses, and fittings. Never use compressed air, oil, solvents, or other material to clean any part of the oxygen system. Oxygen reacts explosively when mixed with oil or grease.

Never let sparks or molten material come into contact with the oxygen cylinder.

PC/Mini-Tac utilizes a fiber wound composite oxygen cylinder. Never use a cylinder with damaged windings. Always have a licensed test facility inspect questionable cylinders.

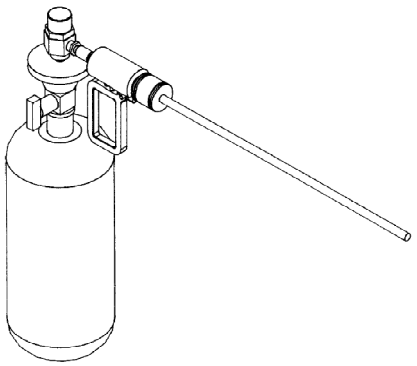
Do not use a torch if there is an oxygen leak.

a. General. The oxygen cylinders included with the Prime-Cut Tactical cutting torch kits are manufactured in compliance with all applicable US Department of Transportation requirements for high pressure compressed gas cylinders. The cylinder valve outlet fitting is to the Compressed Gas Association (CGA) specification 540, the common US industrial oxygen outlet.

   High pressure gas cylinders are required to comply with current inspection and testing requirements. Cylinders must undergo internal visual inspection annually and pass hydrostatic testing every three years. Always ensure the cylinder to be used is marked with a sticker showing a valid inspection certification.

2-5-1. HANDHELD MODE. (PC/Mini-Tac)

Setup the PC/Mini-Tac in the handheld mode by adhering to the following:



a. Inspect and wipe clean with a clean dry cloth all fittings, hoses, and cables. Ensure there is no grease, oil, or other contaminant on these items.

b. Ensure the proper regulator spring is in the regulator. The PC/Mini-Tac is shipped from the factory with a regulator spring that delivers oxygen at a pressure suitable for use with the 3/16” and 1/4” cutting rods. If 3/8” cutting rods are to be used, the standard spring should be removed and the heavier spring (included in kit) installed in its place. To change the spring:

   1) Grip the regulator body in a vise or other fixture. Make sure it is secure, and positioned so as not to damage any component. Use a cloth to protect the surface.

   2) Use an adjustable wrench, pipe wrench, channel-lock pliers or other suitable tool to grip the cap on the top of the regulator. Turn counter-clockwise to loosen and remove.

   3) Remove the regulator spring.

   4) Install the replacement regulator spring. Place cap back into position and thread clockwise until hand tight. Snug with a tool. Be careful not to over tighten.

c. Ensure that the oxygen is turned off.

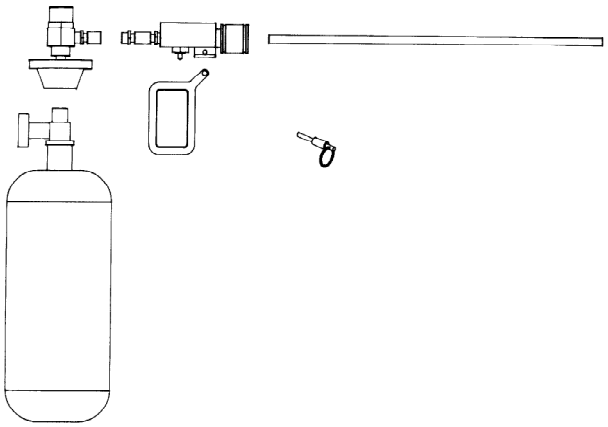
d. Hold the oxygen cylinder in an up-right position.

CAUTION

Do not use a wrench to tighten the regulator inlet nipple as damage to the nipple may occur.

e. Connect the oxygen regulator to the oxygen cylinder. To ensure a proper grip, position the regulator quick connect fitting so it points away from the operator while the oxygen cylinder valve points away from the operator's palm (e.g. right handed operator- valve is directed left; left handed operator- valve points right. Note that the regulator inlet is fitted with a hand-tight nut and Teflon tipped inlet nipple. A complete seal can be achieved by hand tightening.

f. Attach the Mini-Tac torch assembly to the oxygen regulator by pushing the plug end oxygen quick connect on the torch into the oxygen quick connect coupler on the regulator.



PC/MTMOD1 MINI-TAC HANDHELD MODE COMPONENTS

g. Ensure the torch oxygen control lever is positioned correctly (i.e. short side contacting valve stem, long side parallel to cylinder). To change: remove the quick release pin, turn the lever around, replace the pin.

WARNING

Regulators may fail when pressurized. Never stand directly in front of the regulator while opening the oxygen cylinder valve. Always point the PC/Mini-Tac regulator away from the operator and other bystanders when opening the oxygen cylinder valve.

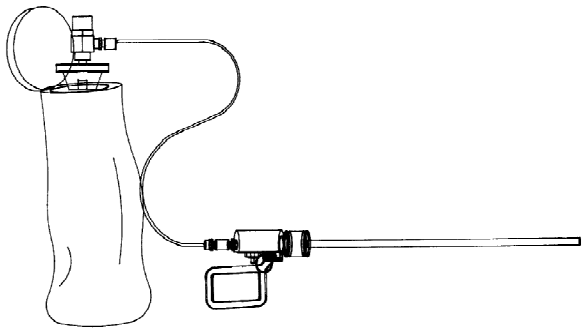
Always open the oxygen cylinder valve slowly. Do not allow rapid pressurization of the regulator. Regulator failure may occur, injuring the operator or bystanders.

h. While pointing the top of the regulator away from the operator and any bystanders, slowly open the oxygen cylinder valve to start the flow of oxygen. Open the valve all the way, then back off 1/4 of a turn. Check the pressure gauge on the oxygen regulator to ensure that the oxygen cylinder is full.

i. Check all connections for oxygen leaks by listening for escaping gas. Depress the oxygen control lever on the torch assembly to verify proper functioning (i.e. not sticking, no obstructions, etc.).

j. Close the oxygen cylinder valve.

2-5-2. CONVENTIONAL MODE.



(PC/Mini-Tac) The PC/Mini-Tac can be setup to emulate a conventional exothermic torch kit where the oxygen source and the torch are separated by a 4 foot long length of hose.

a. Ensure the proper regulator spring is in the regulator. The PC/Mini-Tac is shipped from the factory with a regulator spring that delivers oxygen at a pressure suitable for use with the 3/16" and 1/4" cutting rods. If 3/8" cutting rods are to be used, the standard spring should be removed and the heavier spring (included in kit) installed in its place. To change the spring:

   1) Grip the regulator body in a vise or other fixture. Make sure it is secure, and positioned so as not to damage any component. Use a cloth to protect the surface.

   2) Use an adjustable wrench, pipe wrench, channel-lock pliers or other suitable tool to grip the cap on the top of the regulator. Turn counter-clockwise to loosen and remove.

   3) Remove the regulator spring.

   4) Install the replacement regulator spring. Place cap back into position and thread clockwise until hand tight. Snug with a tool. Be careful not to over tighten.

b. Ensure that the oxygen is turned off.

c. Hold the oxygen cylinder in an up-right position.

CAUTION

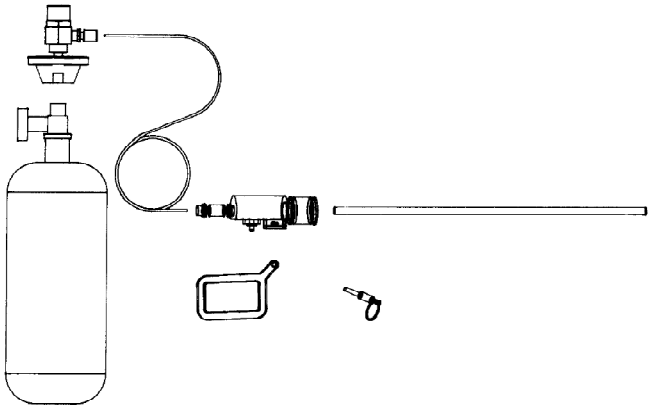
Do not use a wrench to tighten the regulator inlet nipple as damage to the nipple may occur.

d. Connect the oxygen regulator to the oxygen cylinder. Note that the regulator inlet is fitted with a hand-tight nut and Teflon tipped inlet nipple. A complete seal can be achieved by hand tightening.

e. Attach the Mini-Tac hose assembly to the oxygen regulator by pushing the plug end oxygen quick connect on the hose into the oxygen quick connect coupler on the regulator.

f. Attach the torch assembly to the oxygen hose by pushing the plug end oxygen quick connect on the torch into the oxygen quick connect coupler on the hose. Turn the plug valve (located on the hose) to the open position.

g. Ensure the torch oxygen control lever is positioned correctly (i.e. long side contacting valve stem, parallel to torch). To change: remove the quick release pin, turn the lever around, replace the pin.



PC/MTMOD1 MINI-TAC CONVENTIONAL MODE COMPONENTS

WARNING

Regulators may fail when pressurized. Never stand directly in front of the regulator while opening the oxygen cylinder valve. Always point the PC/Mini-Tac regulator away from the operator and other bystanders when opening the oxygen cylinder valve.

Always open the oxygen cylinder valve slowly. Do not allow rapid pressurization of the regulator. Regulator failure may occur, injuring the operator or bystanders.

h. While pointing the top of the regulator away from the operator and any bystanders, slowly open the oxygen cylinder valve to start the flow of oxygen. Open the valve all the way, then back off 1/4 of a turn. Check the pressure gauge on the oxygen regulator to ensure that the oxygen cylinder is full.

i. Check all connections for oxygen leaks by listening for escaping gas. Depress the oxygen control lever on the torch assembly to verify proper functioning (i.e. not sticking, no obstructions, etc.).

j. Close the oxygen cylinder valve.

2-6. IGNITION SYSTEM. (PC/Mini-Tac)

WARNING

Always use a 12-volt DC ignition system.

Lead-acid batteries generate explosive gases during normal battery operation. Never smoke or allow spark or flame in the near vicinity of the battery. Always make sure the battery is safely positioned away from the immediate work area and adequately ventilated. Never let sparks or molten material come into contact with the battery.

Always wear eye protection and protective clothing. If battery acid makes contact with skin/clothing, promptly wash with soap and water. If acid makes contact with eyes, flood immediately with running cold water for at least ten minutes and seek immediate medical attention.

Remove all personal metal items (i.e., rings, watches, etc.) when working with lead-acid batteries as they can produce a short-circuit current high enough to weld a ring or other like item to metal causing a severe burn.

Never use the battery while the battery charger is plugged into an AC outlet. Always unplug the battery charger before attaching the ignition power cables to the battery .

Never let the striker plate accidentally contact the torch, rods, or work area. Electrical shock and sparks may result.

Do not submerge the battery in water.

CAUTION

The battery can discharge if the striker plate continuously contacts the work area. Exercise caution to prevent complete discharge of the battery.

The battery should never be left in a total discharged state for an extended period of time. Damage could be permanent with poor performance as a result. When not in use, recharge at least every three months.

a. **Lightweight Battery.** The Lightweight Battery (PC/BISLW) contains a rechargeable 12-volt, sealed, lead acid (gel-type) battery. It can be stored in any position.

b. **Dual Pole Striker Plate.** The battery provides DC power (through AWG #6 welding cables) to the dual pole striker plate. A dead short spark is all that is necessary for igniting the cutting rod.

1) Attach the Lightweight Battery to a belt, load bearing harness or other carrying point using the metal clips on the lightweight battery's nylon cover.

2) Unsnap and lift the front tab of the battery cover, exposing the two electrical quick connect receptacles.

3) Connect the dual pole striker plate power cables to the battery by firmly seating the black plug into the black receptacle then twisting 1/4 turn to lock in place, and firmly seating the red plug into the red receptacle then twisting 1/4 turn to lock it in place.

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Section IV. ACCESSORY EQUIPMENT

2-7. LEATHER SHIELD. The leather shield is intended to reduce the sparks and spatter coming back at the operator's hand. Always use the leather shield when piercing.

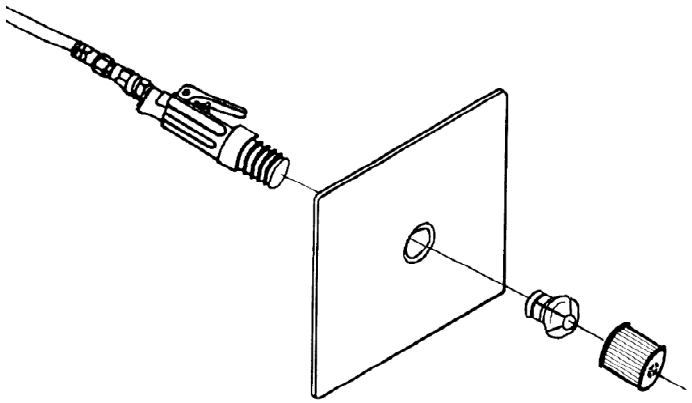
WARNING

Always use the leather shield designed for the Prime-Cut torch (in conjunction with protective outer wear and gloves) to protect yourself from spark and splatter burns.

a. Remove the collet nut and collet from the torch assembly.

b. With the smooth finished side of the leather shield facing away from the torch assembly, work the leather shield over the threads and onto the torch.

c. Re-insert the collet and screw the collet nut back onto the torch assembly.



INSTALLING THE LEATHER SHIELD

2-8. FANNY PACK. (PC/Mini-Tac) The Fanny pack is used for carrying the PC/Mini-Tac in either handheld or conventional mode. It is sized to accommodate the oxygen cylinder with the regulator attached. A packet of 18" long cutting rods also fits in the main compartment. A front pocket holds the torch assembly and hose assembly.

a. Determine whether the fanny pack is to be carried vertically or horizontally and whether oriented left or right opening.

b. Attach the metal clips to the appropriate mounting points on the back of the fanny pack.

c. Secure the fanny pack to a belt, load bearing harness or other carrying point using the metal clips.

2-9. ROD EXTENDER. (PC/TAC) The rod extender is used to enable the operator to reach otherwise inaccessible places; make better use of existing cover; or create a stand-off between the torch and the burning rod to avoid excessive splatter when cutting aluminum or piercing.

a. Ensure the 3/8" collet is in the torch assembly.

b. Loosen the collet nut one-half turn.

c. Insert the end of the rod extender into the collet until it is firmly seated against the collet washer.

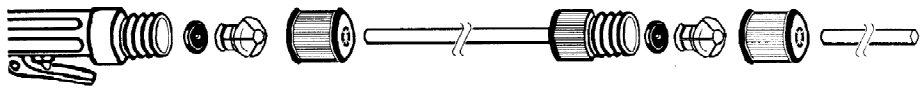
d. Tighten the collet nut to lock the rod extender in place.

e. Check for oxygen leaks at the collet nut. If a leak exists:

   1) Make sure rod extender is firmly seated on the collet washer.

   2) Inspect the rod extender for damage.

   3) Inspect the collet washer for damage and replace if necessary.



ROD EXTENDER INSTALLATION

f. Insert the rod into the rod extender as follows:

   1) Check to see that the collet in the rod extender is the appropriate size to properly fit the rod being used. To replace the collet, remove the collet nut and collet from the rod extender. Make sure the appropriate size collet washer is in place. Insert the desired collet and replace the collet nut.

   2) Loosen the collet nut one-half turn.

   3) Insert the end of the rod that has the recessed internal rods into the collet until it is firmly seated against the collet washer.

   4) Tighten the collet nut to lock the rod in place.

   5) Check for oxygen leaks at the collet nut. If a leak exists:

      (a) Make sure the rod is firmly seated on the collet washer.

      (b) Ensure the collet nut assembly is tightened.

      (c) Inspect the rod for damage.

      (d) Inspect the collet washer for damage and replace if needed.

      (e) If the collet nut still leaks, remove the rod extender from service and turn in for repair.

2-10. RAPIDFIRE™ CUTTING ROD IGNITERS.

RapidFire™ cutting rod ignition cartridges are used to light the cutting rods without the need for a battery, striker plate, and related cables. RapidFire™ cutting rod ignition cartridges contain a material which when exposed to pure oxygen near instantaneously heats to incandescence, in turn causing the cutting rod tip to quickly ignite.

WARNING

The rod igniters utilized with the PC/TAC contain activated iron alloy strips, a pyrophoric / combustible in air. Combustion is achieved through oxidation. Exposure to high concentrations of oxygen will cause ignition. Hazard Class: 4.2/ID #UN1383/DOT Label: Spontaneously Combustible.

a. **General.** The rod igniter, utilized with the PRIME-CUT TACTICAL torch kits, contains an activated iron alloy strip that is enclosed in a small, airtight, hermetically sealed glass vial which is housed within a steel cylinder. Activated iron alloy is pyrophoric/combustible in air. Combustion is achieved through oxidation. Exposure to high concentrations of oxygen will cause ignition. Should the activated material be exposed to air, the strips can be inerted by the application of water, carbon dioxide (CO2), or foam. Material will self-inert in air over a time of approximately 30-45 minutes.

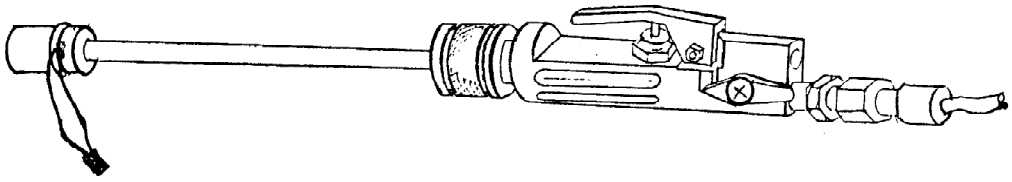
b. **Packaging.** RapidFire™ cutting rod igniters are sold in units of ten pieces. Five igniters are sealed in an airtight, aluminized pouch. Two pouches are then packed in a cardboard box. The cardboard boxes, each containing ten (10) rod igniters, are securely packed and shipped in a standard 515 ammunition can.

c. **Transportation.** Current regulations prohibit the shipping of the cutting rod igniters by commercial air carriers. They must be transported by truck or vessel. Likewise the cutting rod igniters can not be shipped via post, Federal Express, DHL or UPS.

d. **Storage.** Cutting rod igniters should be stored in the ammunition can they are shipped in until they are needed for use. Do not store the cutting rod igniters next to flammable liquid.

e. **Disposal.** The activated iron alloy should be exposed to the air prior to disposal. The material will oxidize and become deactivated. The remaining residue is not hazardous and may be discarded.

f. **Shelf Life.** The current shelf life is estimated at three years inside the sealed foil pouch.



PC/RFC IGNITER SHOWN IN PLACE ON CUTTING ROD

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. INTRODUCTION

WARNING

Never operate the torch without protective safety gear nor without the leather shield in place. Always protect yourself from spark and splatter burns.

Prime-Cut Tactical Torch Kits operate at a temperature of approximately 10,000 degrees Fahrenheit, enabling them to cut or melt almost any known material. Sparks, splatter, and molten material generated by this process can cause fire, severe property damage, bodily injury, or death.

3-1. TORCH OPERATION. The torch operates on the following principle. A regulated oxygen flow is fed through a consumable cutting rod consisting of a tube and alloy fuel wires. The cutting rod is ignited by arcing the end of that rod on a battery powered striker plate or by rapidly heating the rod with the near-instantaneous reactive igniter. The resulting flame is fed by the oxygen and consumes the alloy rod for fuel. When the tip of the burning rod is held on or in close proximity to the target material and the appropriate technique is applied, a cut or pierce will result.

Section II. OPERATING PROCEDURES

WARNING

Never operate the Prime-Cut Tactical Torch Kit without proper eye protection. Either a helmet with #5 face shield or #5 safety glasses shall be worn when using the tactical torch kits. Ultraviolet rays can cause burns, potentially damaging the eyes.

Remove all personal jewelry (i.e., rings, watches, etc.) before operating the torch. Slag and splatter can become trapped between the worn item and the skin causing severe burns and damage to the item.

Always wear welding gloves when inserting cutting rods into and/or removing cutting rods from the torch.

Always insert the correct end of the cutting rod into the torch.

Never use a damaged cutting rod.

CAUTION

Always use Prime-Cut ultrathermic cutting rods with Prime-Cut Tactical torch kits. Prime-Cut rods are specially designed to fit with the collets used in Prime-Cut torches. Never use any other rods as hazardous backflashes or internal burning may result.

NOTE

Refer to the table to determine the correct cutting rod size for the target material and type of work being performed.

3-2. ROD INSERTION.

a. Check to see that the collet in the torch assembly is the appropriate size to properly fit the rod being used. To replace the collet, remove the collet nut and collet from the torch assembly. Make sure the neoprene collet washer is in place and sized appropriately for the collet. Insert the desired collet and replace the collet nut.

   1) 3/16” collet is used with red washer.

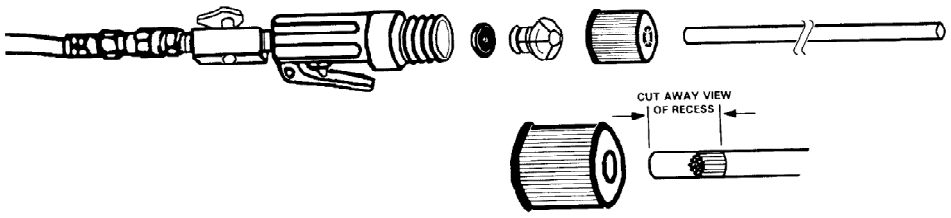
   2) 1/4” and 3/8” collets are used with black washer.

   3) 1/2” collet is used with either white washer or black washer.

b. Ensure the plug valve is closed. Loosen the collet nut one-half turn. Do not remove the collet nut.

c. Insert the end of the cutting rod that has the recessed internal wires into the collet until it is firmly seated against the collet washer.

d. While maintaining slight pressure, tighten the collet nut to lock the rod in place.



CUTTING ROD INSERTION

e. Open the plug valve fully.

f. Depress the oxygen control lever to start the flow of oxygen. Check for leaks at the collet nut by listening for escaping oxygen. If any leaks are encountered:

   1) Make sure the cutting rod is firmly seated on the collet washer.

   2) Re-tighten the collet nut assembly.

   3) Inspect the cutting rod for damage.

   4) Make sure correct size collet washer is being used. Inspect for damage and replace if necessary.

5) If none of the preceding remedy the leak, remove the torch from service and contact Broco customer service or another qualified person for inspection and repair.

g. Fully close the plug valve until ready to use the torch.

Table 3.1. Cutting rod size selection chart.

ROD SIZE					APPLICATION
3/16”	**1/4”**	**3/8”x 18”**	**3/8”x 36”**	**1/2”**	
					CUTTING
X					Lock hasps and shanks
		X			Reinforcement bar in concrete (re-bar)
	X				All steel plate (mild and high strength) to 1/2” thick
		X	X		All steel plate (mild and high strength) over 1/2” thick, to 2” thick
			X	X	All steel plate (mild and high strength) over 2” thick
			X	X	Aluminum, titanium, magnesium alloys and other volatile alloys*
					PIERCING
X					Broken bolts to 3/4” diameter
	X				Pins and broken bolts 3/4” diameter to 1 1/4” diameter
		X			Steel plate less than 6” thick
			X	X	Steel plate greater than 6” deep*
			X		Concrete to 4” thick*
				X	Concrete over 4” thick*
					GOUGING
			X	X	Gouge cutting steel composite barriers to 2” thick
				X	Gouge cutting steel composite barriers over 2” thick
					* Use the accessory cutting rod extender

3-3. IGNITING THE CUTTING ROD. (PC/TAC)

WARNING

3-3-1. Ignition using the striker plate.

Always hold the striker plate by the plastic handle to avoid electric shock.
Never touch the copper plate.

Avoid prolonged contact between the cutting rod and the striker plate. Damage to the battery may result.

NOTE

Only a light flow of oxygen is required for rod ignition. Too much oxygen will make the rod more difficult to ignite and create excessive sparks.

a. With the plug valve closed, fully depress the oxygen control lever on the torch assembly. Slowly open the plug valve until a light flow of oxygen is heard. Release the oxygen control lever.

b. Point the rod away from your body. Never point the rod at bystanders.

c. Start the flow of oxygen by lightly squeezing the oxygen control lever on the torch assembly.

d. Bring the striker plate (2) into contact with the end of the rod (3).

e. While holding the rod at a 45 to 90 degree angle to the striker plate, slowly and lightly pull the rod across the striker plate surface (using a slight back and-forth motion). The resulting arc will ignite the tip of the rod.

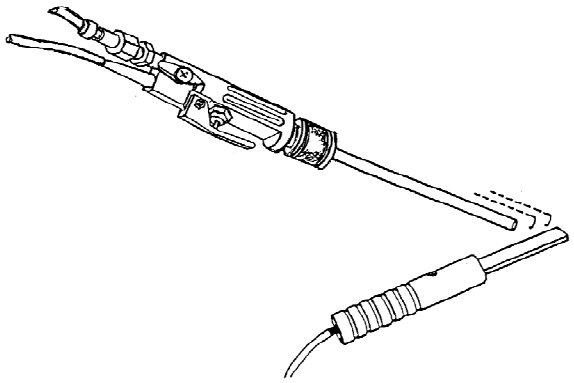
f. Rod sparkling indicates ignition. Approximately 2- 4 seconds of contact is required for ignition.

g. Maintain slight pressure on the oxygen control lever to ensure complete ignition.

h. Once ignited, immediately remove the rod from the striker plate and bring it to the target material.

i. Place the striker plate in a safe location away from the work area.

j. Keeping the oxygen control lever depressed, fully open the plug valve. Commence cutting, piercing, or gouging according to the directions outlined in “Operating Techniques” of this Manual.



ROD IGNITION USING THE STRIKER PLATE. SLOWLY PULL AND ROCK ACROSS SURFACE TO ARC.

3-3-2. Ignition using RapidFire™ cutting rod igniter - Land Environment.

WARNING

Do not depress the oxygen control lever until the internal igniter seal has been penetrated by the rod (when on dry land).

Do not apply too much oxygen or excessive sparks and/or spray may result.

Do not remove the safety clip from the rod igniter until the igniter has been placed on the rod tip and the operator is ready to initiate cutting.

Always wear eye protection, gloves and appropriate safety clothing. Keep face well back from line of spray to reduce risk of injury.

NOTE

Although a self-heating material, the ingredients within the rod igniter are not violently reactive with air. A strong oxidizer is required to achieve good combustion. Water will render the material inert.

It is important to not have oxygen flowing when the igniter seal is first broken. Too rapid a reaction will result.

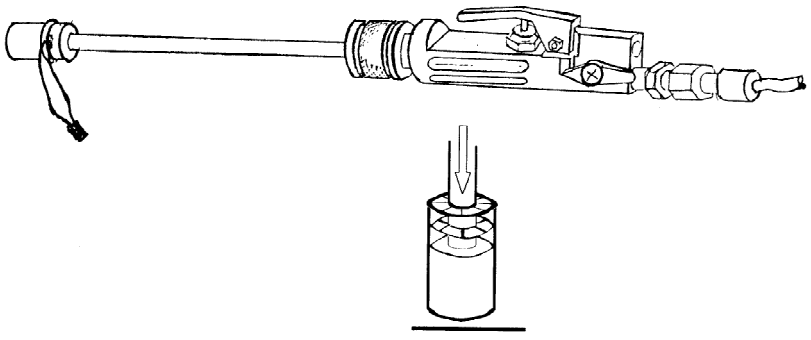
Do not raise the rod from the ignition point until complete ignition has been achieved. Ignition is more efficient if a molten puddle is allowed to form around the tip of the rod.

a. With the plug valve closed, fully depress the oxygen control lever on the torch assembly. Slowly open the plug valve until a light flow of oxygen is heard. Release the oxygen control lever.

b. Place the cutting rod igniter on the cutting rod and press gently until the rod is seated within both igniter alignment bushings and is against the safety clip.

c. Remove the safety clip by pulling on the attached cord.

d. With the operator's hand away from the oxygen control lever, tap the bottom of the rod igniter against the ground (or other hard surface) to break the internal container. Press down on the torch assembly to bury the rod tip in the reactive material.



CUTTING ROD IGNITION USING RAPIDFIRE IGNITER .

e. Depress the oxygen control lever to introduce the light flow of oxygen into the rod igniter.

f. Hold the rod tip in the molten puddle which forms (approximately 4-5 seconds). Sparkling indicates rod ignition.

g. Keeping the oxygen control lever depressed, raise the rod to the work piece/target material and fully open the plug valve to commence cutting.

3-3-3. Ignition using RapidFire™ cutting rod igniter - Underwater.

General. The PC/TAC can be used to conduct underwater cutting at depths to 60 fsw (with the submersible regulator). As the lightweight battery cannot be submersed, and cutting frequently must be performed where surface support (oxygen source and a power supply) is not practical, RapidFire cutting rod ignition cartridges are used to ignite cutting rods underwater.

WARNING

Do not remove the safety clip from the rod igniter until the igniter has been placed on the rod tip and the operator is ready to initiate cutting.

NOTE

Although a self-heating material, the ingredients within the rod igniter are not violently reactive with air. A strong oxidizer is required to achieve good combustion. Prolonged contact with water will cause the material within the igniter to become inert.

Do not raise the rod from the ignition point until ignition has been achieved. Ignition is more efficient if a molten puddle is allowed to form around the tip of the rod.

When using a RapidFire™ cutting rod ignition cartridge to ignite a cutting rod underwater, the oxygen must be flowing before the internal seal is broken, unlike the preceding land environment procedure which requires the seal to be broken prior to oxygen being introduced.

a. With the plug valve closed, fully depress the oxygen control lever on the torch assembly. Slowly open the plug valve until a moderate flow of oxygen is detected (1”-3” jet observed issuing from the cutting rod tip). Release the oxygen control lever.

b. Place the cutting rod igniter on the cutting rod and press gently until the rod is seated within both igniter alignment bushings and is against the safety clip.

c. Remove the safety clip by pulling on the attached cord.

d. Pace the bottom of the igniter against a hard surface.

e. Depress the oxygen control lever allowing the moderate oxygen flow into the cutting rod igniter.

NOTE

By introducing the oxygen into the rod igniter PRIOR to breaking the internal seal, the water is displaced to allow for proper oxidation and combustion.

f. Tap the bottom of the rod igniter against the hard surface to break the internal seal. Press down on the torch assembly to bury the rod tip in the reactive material.

g. Hold the rod tip in the molten puddle which forms (approximately 4- 5 seconds). Sparkling indicates rod ignition.

h. Keeping the oxygen control lever depressed, fully open the plug valve. Raise the cutting rod to the work piece/target material and commence cutting.

3-4. IGNITING THE CUTTING ROD. (PC/Mini-Tac)

3-4-1. Ignition using the dual pole striker plate.

WARNING

Always hold the dual pole striker plate by the handle to avoid electric shock.
Never touch the copper plates.

Avoid prolonged contact between the cutting rod and the copper plates. Damage to the battery may result.

NOTE

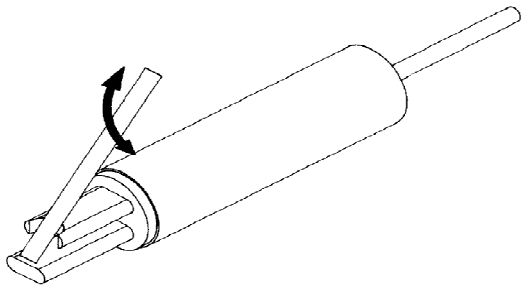
Only a light flow of oxygen is required for rod ignition. Too much oxygen will make the rod more difficult to ignite and create excessive sparks.

a. Point the rod away from your body. Never point the rod at bystanders.

b. Start a slight flow of oxygen by lightly squeezing the oxygen control lever on the torch assembly.

c. Bring both poles of the striker plate into contact with the end of the rod. Keep the upper pole in contact with the side of the rod and the lower plate in contact with the tip of the cutting rod.

d. Hold the rod at a 60 to 90 degree angle to the bottom plate and slowly rotate the rod against the plate surface (using a slight back and-forth motion). The resulting arc will ignite the torch.



IGNITING CUTTING RODS WITH THE DUAL POLE STRIKER PLATE.

e. Rod sparkling indicates ignition. Approximately 2 - 4 seconds of contact is required for ignition.

f. Maintain slight pressure on the oxygen control lever to ensure complete ignition.

g. Once ignited, immediately remove the rod from the dual pole striker plate and bring it to the target material.

h. Place the striker plate in a safe location away from the work area.

i. Commence cutting, piercing, or gouging according to the directions outlined in “Operating Techniques” of this Manual.

3-4-2. Ignition using RapidFire™ cutting rod igniter – Handheld configuration.

WARNING

Do not depress the oxygen control lever until the internal igniter seal has been penetrated by the rod (when on dry land).

Do not apply too much oxygen or excessive sparks and/or spray may result.

Do not remove the safety clip from the rod igniter until the igniter has been placed on the rod tip and the operator is ready to initiate cutting.

Always wear eye protection, gloves and appropriate safety clothing. Keep face well back from line of spray to reduce risk of injury.

NOTE

Although a self-heating material, the ingredients within the rod igniter are not violently reactive with air. A strong oxidizer is required to achieve good combustion. Water will render the material inert.

It is important to not have oxygen flowing when the igniter seal is first broken. Too rapid a reaction will result.

Do not raise the rod from the ignition point until complete ignition has been achieved. Ignition is more efficient if a molten puddle is allowed to form around the tip of the rod.

a. Place the cutting rod igniter on the cutting rod and press gently until the rod is seated within both igniter alignment bushings and is against the safety clip.

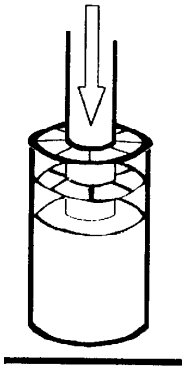
b. Remove the safety clip by pulling on the attached cord.

c. With the operator's hand away from the oxygen control lever, tap the bottom of the rod igniter against the ground (or other hard surface) to break the internal seal. Press down on the torch assembly to bury the rod tip in the reactive material.

d. Slightly depress the oxygen control lever to introduce a light flow of oxygen into the rod igniter.

e. Hold the rod tip in the molten puddle which forms (approximately 4-5 seconds). Sparkling indicates rod ignition.

f. Increase pressure on the oxygen control lever, raise the rod to the work piece/target material and commence cutting.



PRESS TO BREAK SEAL BEFORE INTRODUCING LIGHT OXYGEN FLOW.

3-4-3. Ignition using RapidFire™ cutting rod igniter – Conventional configuration.

WARNING

Do not depress the oxygen control lever until the internal igniter seal has been penetrated by the rod (when on dry land).

Do not apply too much oxygen or excessive sparks and/or spray may result.

Do not remove the safety clip from the rod igniter until the igniter has been placed on the rod tip and the operator is ready to initiate cutting.

Always wear eye protection, gloves and appropriate safety clothing. Keep face well back from line of spray to reduce risk of injury.

NOTE

Although a self-heating material, the ingredients within the rod igniter are not violently reactive with air. A strong oxidizer is required to achieve good combustion. Water will render the material inert.

It is important to not have oxygen flowing when the igniter seal is first broken. Too rapid a reaction will result.

Do not raise the rod from the ignition point until complete ignition has been achieved. Ignition is more efficient if a molten puddle is allowed to form around the tip of the rod.

a. With the plug valve closed, fully depress the oxygen control lever on the torch assembly. Slowly open the plug valve until a light flow of oxygen is heard. Release the oxygen control lever.

b. Place the cutting rod igniter on the cutting rod and press gently until the rod is seated within both igniter alignment bushings and is against the safety clip.

c. Remove the safety clip by pulling on the attached cord.

d. With the operator's hand away from the oxygen control lever, tap the bottom of the rod igniter against the ground (or other hard surface) to break the internal seal. Press down on the torch assembly to bury the rod tip in the reactive material.

e. Depress the oxygen control lever to introduce the light flow of oxygen into the rod igniter.

f. Hold the rod tip in the molten puddle which forms (approximately 4-5 seconds). Sparkling indicates rod ignition.

g. Keeping the oxygen control lever depressed, raise the rod to the work piece/target material and fully open the plug valve to commence cutting.

3-4-4. Ignition using RapidFire™ cutting rod igniter - Underwater.

General. Due to the limited quantity of oxygen, the PC/Mini-Tac can be used to conduct underwater cutting only at very shallow depths (to 15 fsw). As the lightweight battery cannot be submersed, and cutting frequently must be performed where surface support (oxygen source and a power supply) is not practical, RapidFire™ cutting rod ignition cartridges are used to ignite cutting rods underwater.

WARNING

Do not remove the safety clip from the rod igniter until the igniter has been placed on the rod tip and the operator is ready to initiate cutting.

NOTE

Although a self-heating material, the ingredients within the rod igniter are not violently reactive with air. A strong oxidizer is required to achieve good combustion. Prolonged contact with water will cause the material within the igniter to become inert.

Do not raise the rod from the ignition point until ignition has been achieved. Ignition is more efficient if a molten puddle is allowed to form around the tip of the rod.

When using a RapidFire™ cutting rod ignition cartridge to ignite a cutting rod underwater, the oxygen must be flowing before the internal seal is broken, unlike the preceding land environment procedure which requires the seal to be broken prior to oxygen being introduced.

a. Place the cutting rod igniter on the cutting rod and press gently until the rod is seated within both igniter alignment bushings and is against the safety clip.

b. Remove the safety clip by pulling on the attached cord.

c. Pace the bottom of the igniter against a hard surface.

d. Depress the oxygen control lever until a moderate flow of oxygen is going into the cutting rod igniter.

NOTE

By introducing the oxygen into the rod igniter PRIOR to breaking the internal seal, the water is displaced to allow for proper oxidation and combustion.

e. Tap the bottom of the rod igniter against the hard surface to break the internal seal. Press down on the torch assembly to bury the rod tip in the reactive material.

f. Hold the rod tip in the molten puddle which forms (approximately 4- 5 seconds). Sparkling indicates rod ignition.

g. Increase pressure on the oxygen control lever until it is fully open. Raise the cutting rod to the work piece/target material and commence cutting.

3-5. OPERATING TECHNIQUES.

WARNING

Never let the cutting rod burn down into the torch.

Always release the torch oxygen control lever to extinguish the torch while there is at least two inches of rod remaining.

3-5-1. Piercing. A pierce is accomplished by holding the torch with the rod at a 90 degree angle (perpendicular) to the pierce point. The burning rod is slowly pushed into the point and a swirling motion is applied to widen the hole. The pushing and swirling motions are continued until the proper depth or burn-through is achieved. Comply with the following steps.

WARNING

Always wear adequate protective clothing and full face shield. Always use the leather shield during piercing operations. Blowback is greater when piercing. Exercise extreme caution.

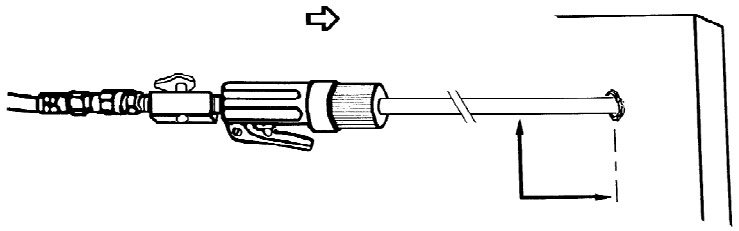
Never touch a used rod, the target material, or the work surface with a bare hand until it has cooled. Always wear welding gloves.

a. With the oxygen control lever slightly depressed (light flow of oxygen), press the burning tip of the rod against the target material at a 90 degree angle, allowing it to melt a 1/4 inch deep hole.

b. Insert the rod tip into the depression.

c. Keeping the tip of the rod in the hole, increase the oxygen flow to increase penetration by slowly depressing the oxygen control lever.

d. As the target material melts and flows back out of the hole, move the rod in and out and around to enlarge the hole and to allow the oxygen pressure to wash away molten material. Continue to push the rod into the hole, applying low to moderate force for about two seconds, then pull back. Repeat this process until target material is pierced.



PRESS TO PIERCE.

CAUTION

Remove the rod from the pierced hole before releasing the oxygen control lever. Oxygen must not be shut off while cutting rod is inside a pierced hole or else the rod may seal itself shut or weld itself to the target material.

e. When piercing is completed, first, remove the rod from the pierced hole. Secondly, release the oxygen control lever to extinguish the torch assembly. The rod will continue to burn only as long as oxygen is supplied.

HELPFUL HINTS:

- Disrupting the oxygen flow may cause the rod to become lodged in the hole. If the cutting rod goes out while piercing, the rod should be extracted immediately, if possible. The still hot rod can be re-ignited. If the rod becomes lodged in the hole, release the torch oxygen control lever and remove the torch from the cutting rod. The stuck rod can then be extracted by a gloved hand or pliers, or cut free with a new rod inserted in the torch.

- To avoid excessive blowback when starting a pierce, use the oxygen control lever to limit the oxygen pressure to a moderate flow. When the penetration is approximately 1.5 to 2 inches deep, depress the oxygen control lever fully to increase the oxygen pressure to maximum flow.

- When piercing a hole deeper than 5 inches, it is best to use a 3/8 inch diameter rod.

3-5-2. Cutting. Normal cutting is done by using a drag or pull technique. Following the ignition of a cutting rod, it is brought to the work surface that is to be cut. The rod is dragged or pulled along the surface in the direction of the desired cut. The operator should strive for a proper balance between the speed of the cut and rod consumption. When the operator cannot see through the kerf (groove or notch made by a cutting tool), the speed of the cut is too fast. (A sawing motion is used on materials thicker than 1-1/2 to 2 inches to ensure a complete melt through.) When there are no other items to be cut, the oxygen control lever is released to extinguish the rod. Comply with the following steps.

WARNING

Always wear adequate protective clothing and eye and face protection. Exercise extreme caution.

NOTE

Keep the burning tip of the rod in direct contact with target material.

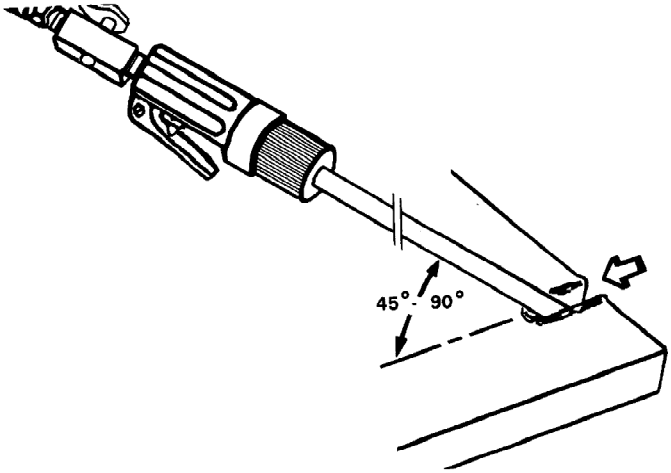
a. Place the burning tip of the rod against the target material at a 45 to 90 degree angle. (A position just off of perpendicular is preferred as the cross-sectional thickness is minimized.)

b. Increase oxygen flow by slowly depressing the oxygen control lever.

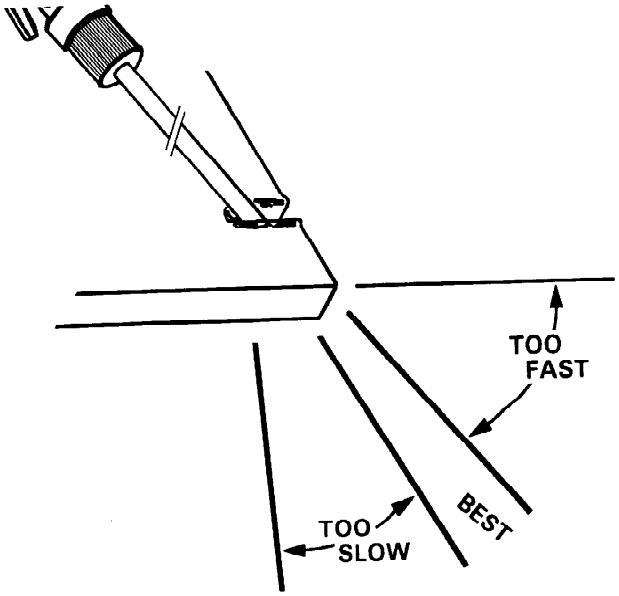
c. Keep the rod in the cut.

d. Pull the rod in the direction of the intended cut. Be sure that the molten material is blown forward through the cut and does not splash backwards. The operator should look through the cut in order to observe the spray. If the spray deflects substantially, the operator is moving too quickly.

e. After completing the cut, release the oxygen control lever to extinguish the torch assembly. The rod will continue to burn only as long as oxygen is supplied.



PULL TO CUT. MAINTAIN CONTACT BETWEEN ROD AND TARGET (DRAG).

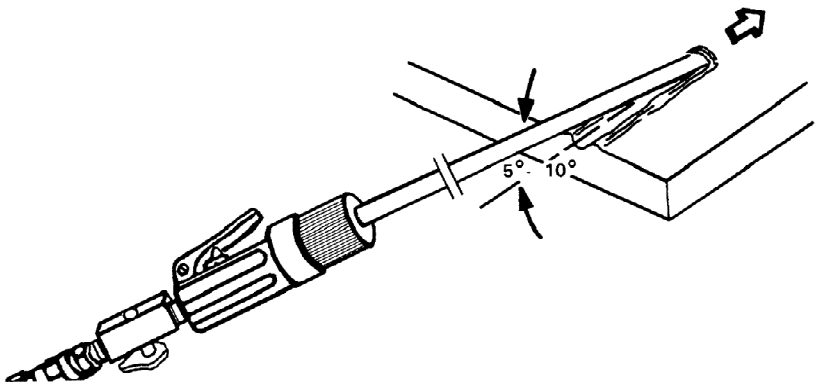


SLAG SPRAY ANGLE DURING CUTTING.

3-5-3. Gouging. Gouging is conducted by holding the rod at a slight angle to the target material and pushing into the direction of the desired gouge. Comply with the following steps.

WARNING

Always wear adequate protective clothing and eye and face protection. Exercise extreme caution.



PUSH TO GOUGE. CUTTING ROD IS NEARLY FLAT AGAINST TARGET.

a. With the oxygen control lever slightly depressed (light flow of oxygen), lay the rod flat on the work piece with the burning tip of the rod against the target material.

b. Increase the oxygen flow by slowly depressing the oxygen control lever.

c. The target material will puddle in approximately 1 to 2 seconds. Keep the rod at a very slight angle to the work piece and the tip of the rod in the puddle.

d. With the oxygen control lever fully depressed, push the rod in the direction of the desired gouge. Ensure the tip of the rod does not hang up and burrow into the target material as blowback of sparks/splatter will occur.

e. When the gouge is complete, lift the rod tip from the target material.

f. Release the oxygen control lever to extinguish the torch assembly. The rod will continue to burn only as long as oxygen is supplied.

HELPFUL HINTS:

Gouging is a good technique to use when steel is backed some other material which is either not readily burnable (ex. dirt) or exhibits a volatile reaction when burned or exposed to prolonged high heat (e.g. concrete, high percentage of aluminum or magnesium alloys). Quickly gouge a trough in the steel in the shape of the cut leaving between 1/8" and 1/4" thickness. Then cut or gouge away remaining material in one final quick pass.

3-6. RESTART PROCEDURES.

a. If at any time the cutting rod goes out while in use, move the torch away from the cutting surface. Check the oxygen flow and pressure and then re-ignite the rod as previously explained. If re-ignition fails or the rod continues to go out, insert a new rod and ignite the rod as previously explained.

CAUTION

Cutting rod is considered consumed when less than two inches long. Never allow a cutting rod to burn into the torch. Never use a damaged cutting rod.

b. Cutting rods may also seal shut during use, especially if the oxygen flow is stopped before removing the rod from the work piece. To clear a sealed rod when using a striker plate and battery, touch the rod tip to the striker plate and depress the oxygen control lever when the arcing begins. This procedure may have to be repeated to completely clear the rod.

c. If a rod becomes sealed when using the RapidFire™ cutting rod igniters, a new rod must be inserted and ignited with the rod igniter as previously explained.

3-7. SHUTDOWN PROCEDURES. (PC/TAC)

a. Release the oxygen control lever to stop the rod from burning.

b. Loosen the collet nut and remove the rod from the torch assembly then close the oxygen cylinder valve.

c. Depress the oxygen control lever to relieve any pressure from the oxygen hose and the pressure gauge/hose.

CAUTION

Always place a protective cap or piece of tape over the open end of the oxygen hose to prevent dirt or foreign objects from entering during storage.

d. Disconnect and remove the oxygen hose from the torch assembly at the quick disconnect fitting. Place a piece of tape over all openings to prevent dirt or foreign objects from entering the oxygen system.

e. Disconnect and remove the oxygen hose from the regulator at the quick disconnect fitting.

f. Unsnap the snap tabs on the back harness assembly and remove the regulator and pressure gauge/hose from the oxygen cylinder. Inspect the Teflon inlet nipple on the regulator (not shown) for damage and/or wear.

g. Disconnect and remove the black power cable electrical connector from the torch assembly .

h. Disconnect and remove the black power cable electrical connector from the lightweight battery.

i. Disconnect and remove the red striker plate electrical connector from the lightweight battery.

j. Wipe down the torch assembly and striker plate assembly with a clean, oil-free cloth.

k. Remove the collet nut, collet, collet washer, flash arrestor, and flash arrestor screen from the torch. Inspect for damage and/or wear. Clean and reassemble.

NOTE

Always replace any damaged or worn parts with factory replacement parts.

l. Always inspect the cables and hoses for cuts, burns, or any other signs of damage or wear.

m. Charge the lightweight battery.

n. Store the cutting torch kit in a clean, dry place.

3-8. SHUTDOWN PROCEDURES. (PC/Mini-Tac)

a. Release the oxygen control lever to stop the rod from burning.

b. Loosen the collet nut and remove the rod from the torch assembly then close the oxygen cylinder valve.

c. Depress the oxygen control lever to relieve any pressure from the oxygen hose and the regulator.

CAUTION

Always place a protective cap or piece of tape over the open end of the oxygen hose to prevent dirt or foreign objects from entering during storage.

d. **Conventional mode.** Disconnect and remove the oxygen hose from the torch assembly at the quick disconnect fitting. Disconnect and remove the oxygen hose from the regulator at the quick disconnect fitting.

e. **Handheld mode.** Disconnect and remove the torch assembly from the regulator at the quick disconnect fitting.

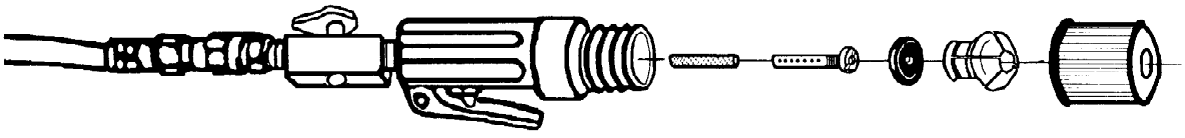
f. Remove the regulator from the oxygen cylinder. Inspect the Teflon inlet nipple on the regulator (not shown) for damage and/or wear.

g. Disconnect and remove the black striker plate electrical connector from the lightweight battery.

h. Disconnect and remove the red striker plate electrical connector from the lightweight battery.

i. Wipe down the torch assembly and dual pole striker plate assembly with a clean, oil-free cloth.

j. Remove the collet nut, collet, collet washer, flash arrestor, and flash arrestor screen from the torch. Inspect for damage and/or wear. Clean and reassemble.



INSPECT FLASH ARRESTOR AND SCREEN.

NOTE

Always replace any damaged or worn parts with factory replacement parts.

k. Always inspect the cables and hoses for cuts, burns, or any other signs of damage or wear.

l. Charge the lightweight battery.

m. Store the cutting torch kit in a clean, dry place.

3-9. BATTERY CHARGING INSTRUCTIONS.

3-9-1. Charging the Lightweight Battery.

CAUTION

Always disconnect power cables prior to charging the Lightweight Battery.

Working in vicinity of a lead-acid battery is dangerous. Batteries generate explosive gases during normal battery operation and there is a risk of these gases exploding. Never smoke or allow a spark or flame in the immediate vicinity of the battery to reduce the risk of battery explosion.

The Lightweight Battery should never be left in a total discharged state for an extended period of time. Damage could be permanent with poor performance as a result. When not in use, recharge at least every three months.

Do not leave the Lightweight Battery on charge for more than 72 hours. Damage to the battery may result.

NOTE

Battery chargers supplied with Broco Prime-Cut Tactical cutting torch kits may be either 110 volt or 220 volt input. Ensure the proper charger is being used to suit local standards.

Pin adapters are available to configure the 220 volt battery charger to local requirements.

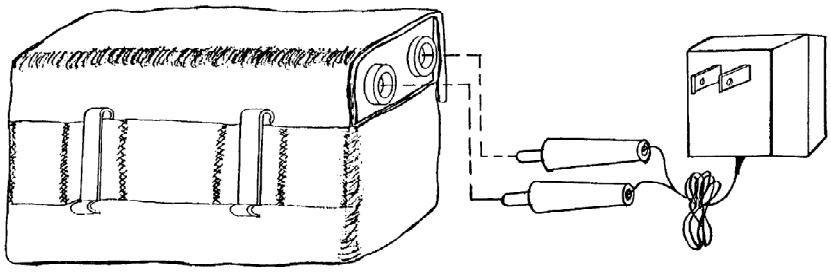
a. Plug the black and red electrical connectors from the charger cord into the black and red electrical receptacles on the Lightweight Battery.

b. Plug the battery charger into a standard household current wall receptacle.

c. The indicator light on the back of the battery charger should go on when the charger is first plugged in and remain on while the battery is charging. The light will blink when the battery is charged.

d. Unplug the battery charger from the wall receptacle. Unplug the battery charger's black and red electrical connectors from the battery's receptacles.

e. Replace the Lightweight Battery in the cutting kit..



CHARGING THE PC/BISLW.

3-9-2. Charging the 12-Volt/24-Volt Vehicle Battery.

WARNING

Always disconnect torch and striker plate power cables prior to charging the battery.

Working in vicinity of a lead-acid battery is dangerous. Batteries generate explosive gases during normal battery operation and there is a risk of these gases exploding. Never smoke or allow a spark or flame in the immediate vicinity of the battery to reduce the risk of battery explosion.

a. Read and carefully follow the manufacturer's instructions for charging the vehicle battery(ies) being used.

3-10. TRANSFILLING OXYGEN CYLINDERS.

a. General. Only personnel with the proper training and knowledge of safe oxygen handling should attempt to fill a high pressure oxygen cylinder. Do not attempt to fill or transfill an oxygen cylinder unless trained in cylinder handling, cylinder filling and oxygen safety procedures.

WARNING

Never let sparks or molten material come into contact with the oxygen cylinder.

Always keep oil and grease away from the torch, oxygen cylinders, valves, regulators, hoses, and fittings. Oxygen reacts explosively when mixed with oil or grease.

Never clean any internal part of the oxygen system. Never use compressed air, oil, solvents, or any other material to clean the oxygen system. The oxygen system could become contaminated and cause internal burning in the torch or hose. All service on oxygen delivery parts must be performed by a qualified and knowledgeable technician.

Always ensure the cylinder to be used is marked with a sticker showing a valid inspection certification. High pressure gas cylinders are required to comply with current inspection and testing requirements. Cylinders must undergo internal visual inspection annually and pass hydrostatic testing every three years.

Prime-Cut Tactical torch kits utilize a fiber wound composite oxygen cylinder. Never use a cylinder with damaged windings. Always have a licensed test facility inspect questionable cylinders.

Always open the oxygen cylinder valve slowly. Do not allow rapid pressurization of regulators, hoses or cylinders. Failure may occur, injuring the operator or bystanders.

Always check the manufacturer's working pressure of the cylinder to be filled, and the stamped safety device on the cylinder valve to ensure the cylinder will not be overfilled.

NOTE

When transfilling cylinders the resulting pressure in both cylinders can be determined by …

b. **Transfill procedures**:

1) Ensure that the transfill hose, adapters, cylinder valves, tools and any other items to be used are clean and free from oil, grease or other contaminants.

2) Lay both cylinders on the ground (so they can't fall) and position them so as to allow the transfill hose to reach between them without putting a strain on the hose or any connections. If one cylinder must be upright (e.g. filling from a six-pack) support the other cylinder in such a manner that it can not fall and does not strain the transfill hose or any connections.

3) Connect the transfill hose to the source cylinder by threading one end of the hose on to the oxygen valve outlet fitting. Note that the transfill hose inlet is fitted with a hand-tight nut and Teflon tipped inlet nipple. A complete seal can be achieved by hand tightening.

4) Attach the cylinder to be filled (target cylinder) to the other side of the transfill hose.

5) Slowly open the valve on the target cylinder by turning the valve handle counter-clockwise, allowing the transfill hose to pressurize. Listen for oxygen leaks. Pause for 10 seconds then continue slowly opening the valve all the way until it stops. Turn the valve handle 1/4 turn clockwise.

6) Slowly open the valve on the source cylinder by turning the valve handle counter-clockwise until oxygen can be heard (and felt) to be leaving the cylinder. Immediately stop turning the cylinder valve handle.

7) Walk away for a few minutes to allow transference to take place.

8) When the sound of oxygen leaving the source cylinder can no longer be heard (or felt), slowly open the cylinder valve a little more until oxygen is heard to move again.

9) Walk away for a few minutes to allow transference to take place.

10) Repeat steps "8)" and "9)" as necessary until the oxygen pressure has equalized between the cylinders (when opening the valve further will not result in gas transferring).

11) Close the valve on the target cylinder by turning the handle clockwise until it stops.

12) Close the valve on the source cylinder by turning it clockwise until it stops.

13) Loosen the connection between the transfill hose and the target cylinder, allowing the hose to lose pressure. Remove the transfill hose from the target cylinder.

14) Remove the transfill hose from the source cylinder.

15) Check the pressure in each cylinder using the gauge attached to the regulator. Mark cylinder "E" (empty), "1/4", "1/2", or "3/4" with chalk, a sticker or a tag before storing cylinder.

CHAPTER 4

SCHEDULED MAINTENANCE

Section I. INTRODUCTION

4-1. PREVENTIVE MAINTENANCE. Preventive maintenance is the responsibility of the equipment operator.

Preventive maintenance should be conducted in accordance with this Manual and consist of inspecting, servicing, and cleaning. Inspections will also reveal the need for repairs. Periodic Limited Technical Inspections (LTI) will be required to ensure the torch kit is safe and serviceable. Regulator repairs should only be performed by qualified technicians. Oxygen cylinder inspection and testing must only be conducted by certified technicians.

WARNING

Prior to conducting any maintenance, ensure proper shut down procedures are followed. Ensure oxygen cylinder is shut off and all oxygen hoses are disconnected.

Always disconnect the torch and striker plate power cables from the battery when the torch is not in use.

Always use a clean, dry, oil-free cloth to wipe any part of the torch kit. Mild soap and water may be used to wash components.

Never use compressed air to purge any part of the oxygen system as oil contamination may result. Always use oxygen.

CAUTION

Always replace any worn or damaged parts with authorized replacement parts.

Always use Viton o-rings only.

a. After each use, wipe the torch assembly, striker plate assembly, battery, oxygen cylinder, and regulator with a clean, dry, oil-free cloth.

b. Remove the collet nut, collet, collet washer, flash arrestor, and flash arrestor screen. Inspect for damage and wear. Clean, replace as necessary, and reassemble.

c. Before and after each use, conduct a close inspection of the cables and hoses. Check for cuts, burns, or any other sign of damage or wear. After every use, wipe down all cables and hoses with a clean, oil-free cloth.

d. If the torch assembly has been used and/or transported underwater, dip the torch in fresh water while depressing the valve lever to clean the exterior and flush the interior.

e. If any rods have been taken into salt water, rinse with fresh water and let dry before returning to storage.

f. If any rod igniters have been in salt water, rinse them with fresh water and dry before returning to storage.

g. Any torch, rod or igniter which has become wet must be completely dry before being placed into long term storage. Flush the interior with oxygen, argon, or nitrogen gas to displace residual moisture.

h. Preventive maintenance for the striker plate will include the following:

WARNING

Disconnect the striker plate power cable from the battery prior to cleaning the striker plate surface. Failure to do so could result in electric shock.

1) Repeated ignition will cause a build-up of slag deposits on the surface of the striker plate. This build-up is easily removed by scraping the striker plate across a rough surface or hard edge.

2) After each use, wipe the striker plate cable assembly with a clean, dry, oil-free cloth. Inspect for damaged parts and replace or repair as necessary.

i. Recharge the battery as needed.

j. Oxygen cylinder maintenance:

1) Inspect and clean the oxygen cylinder. Look for damage to cylinder windings. Damaged windings can weaken the cylinder. Should damage be visible, take the cylinder to a certified technician for testing.

2) Attach the regulator and check the cylinder pressure. If pressure is below minimum required for anticipated use, have the oxygen cylinder filled before returning it to the kit.

3) Interior of cylinder must be visually inspected by qualified technician annually.

4) Cylinder must be hydrostatically tested and recertified by an approved test facility every three years. Check most recent test sticker or manufacturer's label for date of last test.

Section II. SCHEDULED MAINTENANCE

4-2. PREVENTIVE MAINTENANCE PROCEDURES. As soon as possible after each use, the torch kit should be cleaned and inspected as described in paragraph 4-1 of this Manual. In addition, preventive maintenance checks should be performed every 120 days (quarterly) to keep the kit ready for use. Table 4-1 outlines the procedures for the quarterly PMCS.

Table 4-1. Quarterly Preventive Maintenance Checks and Services

ITEM INSPECTED	PROCEDURE / ACTIONS
Oxygen Cylinder, Composite:	Wipe down with a clean, dry, oil-flee cloth.
Cylinder	Check for any type of damage, i.e. burns, cracks, or chips in the fiber wrap.
Oxygen Valve	Check for leaks. Ensure handle turns freely.
Teflon O-Ring	Ensure it is in place and is not damaged. Replace if required.
Regulator:	Wipe all surfaces with oil-free cloth. Brush can be used on metal surfaces.
Regulator - Body / Adapters	Check for nicks, dents or other damage.
Soft Tip Nipple	Check for nicks, gouges, excessive wear, or other damage that may cause leaks.
Valve Nut	Ensure proper functioning. Hand tight only. Inspect for cracks, damaged threads, etc.
Female Quick Disconnect	Check for dents or other damage. Inspect for obstructions. Ensure hose will seat and lock in place.
High Pressure Gauge Hose	Inspect the high pressure hose for burns, cuts, or other damage. Pressurize and check for leaks.
High Pressure Gauge	Check gauge for visible damage. Pressurize and check movement.
Hose Assemblies, Oxygen:	Wipe all hose surfaces with an oil-free cloth. An oil-free brush can be used on metal surfaces/fittings.
Low Pressure Hose	Check for burns, cuts, abrasions, excess wear, other damage.
Hose Fittings / Connectors	Inspect for dents, bends, or other damage. Ensure proper seating/locking in regulator/torch.
Torch Assembly:	Wipe all surfaces with a clean, oil-free cloth. An oil-free brush can be used on metal surfaces.
Torch Body	Check for dents or other damage. Inspect serviceability of the threading.

Collet Nut	Check for dents or other damage. Inspect the serviceability of the threading.
Collet (3/16”, 1/2”, 3/8" and 1/4")	Ensure proper functioning. Test with rod to ensure proper fit. Inspect for cracks, bends, other damage. Replace as necessary.
Collet Washer	Inspect for cuts, excessive wear, or any other damage. Replace as required. Ensure correct size washer is being used to fit collet.
Flash Arrestor	Unscrew the flash arrestor from the torch body. Check for damage, wear, and/or clogging. Clean and/or replace as needed.
Flash Arrestor Screen	Remove from inside the flash arrestor by sliding it out the back. Inspect for damage, wear, corrosion, and/or clogging. If dirty, clean with warm soapy water, rinse with clean fresh water, and air dry. If damaged or corroded, replace with a new screen.
Oxygen Control Valve and Lever	Inspect the lever and valve stem for wear, damage, and leaks. Inspect the mating surface of the valve nut and valve body recess for damage or wear. Replace valve stem o-ring or neoprene seat if leaking or worn. Use caution when replacing valve nut so as not to damage threads. Do not over torque. Damage to valve nut o-ring may result.
Plug Valve	Check for proper functioning. Inspect for any type of damage. Replace o-rings or plug insert as necessary.
Male Quick Connect	Inspect for dents, bends, or other damage. Check for correct seating and locking with the oxygen hose assemblies.
Cable, Power, 15 feet, w/ Connectors:	Wipe all surfaces with an oil-flee cloth. An oil-free brush can be used on metal surfaces.
CAMLOKs, Black	Check for broken insulator, nicks, dents, bends, excessive wear, or other damage. Ensure proper seating and locking with the receptacles on the torch, battery and battery adapter clamp.
Striker Plate Assembly:	Wipe all surfaces with an oil-free cloth. An oil-free brush can be used on metal surfaces/fittings. Replace damaged/unserviceable items as necessary.
Striker Plate Handle	Check for burns, cracks, wear, or other damage.
Copper Plate	Inspect for signs of damage. Remove any slag build-up.
Wooden Insulator	Check for cracks, breaks, or other damage.
Wire Terminal Lug	Ensure proper connection. Inspect for any damage.
Cable	Check for burns, abrasions, excess wear, or other damage.
CAMLOKs, Red	Check for broken insulator, nicks, dents, bends, excessive wear, or other damage. Ensure proper seating and locking with the receptacles on the battery and battery adapter clamp.
Lightweight Battery:	Clean with oil-free cloth and brushes. Inspect for cracks in the case, burns in the pouch and other damage. Ensure all connectors function properly. Check the charge, recharge as needed.
Battery Charger	Inspect for wear / damage.

Back Harness Assembly:	Clean with oil-free cloth/rags and oil-free brushes. If extremely dirty, clean with warm soapy water, rinse with clean fresh water, and air dry. Confirm the serviceability of the straps, buckles, and fasteners.
SCUBA Backpack	Check for wear and other damage. Inspect serviceability.
Backpack Pad	Inspect the serviceability / check for damage.
Backpack Harness	Ensure proper functioning of adjusters and snaps. Inspect for wear and/or other damage.
Tank Strap / Keeper Strap	Inspect for cuts, excessive wear, or any other damage. Ensure the serviceability of the buckle / tensioner.
Rod Extender, 14"	Ensure proper functioning. Inspect for bends, wear, and/or other damage. Check the serviceability of the collet, collet nut, and threading.
Case	Inspect for dents, cracks, holes, or other damage. Make sure all securing hasps/hardware functions properly.
Rod Quiver	Ensure functionality of all snaps, buckles, fasteners, and clips. Inspect the stitching, as well as for holes and other damage.
Leather Striker Holder	Check for wear and damage. Ensure the item is serviceable.
Leather Shield	Check for burns, holes, damage, and/or wear. Ensure the shield functions properly on torch. Replace as required.
Leather Gloves	Check for burns, tears, holes, and any other damage. Examine the stitching and inspect the overall serviceability.
Safety Glasses, #5 Lens	Inspect for cracks, scratches, or other damage. Check for overall serviceability.

CHAPTER 5

TROUBLESHOOTING

NOTE

This guide is intended to assist in determining the probable causes of torch malfunctions and their associated repairs. For each potential problem identified a probable cause and recommended repair procedure is listed.

Section I. OXYGEN SYSTEM MALFUNCTIONS

5-1. OXYGEN LEAKS.

Table 5-1. Troubleshooting Oxygen Leaks

TYPE OF PROBLEM / MALFUNCTION	PROBABLE CAUSE	RECOMMENDED REPAIR PROCEDURES
1. OXYGEN LEAKS AT THE COLLET NUT.	a. The cutting rod not seated against the neoprene washer. OR b. The collet washer may be dirty, worn, damaged, or missing.	Loosen the collet nut 1/2 turn CCW. Firmly seat the rod and tighten the collet nut. If the leak persists, remove the collet nut, collet, and collet washer. Clean or replace the collet washer. If the collet washer is worn and a new one is not available, and only as a temporary/expedient remedy, turn the washer over and replace with the unworn face exposed.
2. OXYGEN LEAKS AT THE CONTROL VALVE NUT.	a. The control valve nut is loose. b. The valve nut o-ring gasket is pinched or damaged. c. The control valve nut or valve body threads are damaged.	a. Partially unscrew the control valve nut, then re-tighten as described in the control valve re-assembly procedures. b. Remove the valve nut. Remove the o-ring gasket from the valve nut, inspect and replace if necessary. c. Remove the control valve nut and inspect the threads. Inspect the control valve body threads. Replace parts as necessary.
3. THE OXYGEN VALVE DOES NOT SHUT OFF ALL THE WAY.	a. The rubber gasket is dirty or worn. b. The valve stem o-ring is dirty or worn. c. The valve stem washer is dirty or worn. d. The valve stem is worn.	a. Remove and clean or replace as needed. b. Follow control valve disassembly procedures to remove the valve stem. Clean or replace the o-ring as needed. c. Follow control valve disassembly procedures to remove the valve stem washer. Clean or replace as needed. d. Replace the valve stem and install a new o-ring.

	e. The valve stem washer mating surface of the valve nut is dirty, worn or damaged.	e. Remove the valve nut. Inspect and clean or replace as needed.

5-2. UNEVEN OXYGEN FLOW.

Table 5-2. Troubleshooting Uneven Oxygen Flow

TYPE OF PROBLEM / MALFUNCTION	PROBABLE CAUSE	RECOMMENDED REPAIR PROCEDURES
1. UNEVEN OXYGEN FLOW	a. The flash arrestor is dirty or worn.	a. Follow the flash arrestor inspection / replacement procedures to remove the flash arrestor. Clean or replace as needed.
	b. The flash arrestor screen is dirty or worn.	b. Remove the flash arrestor screen as described in the repair procedure. Clean or replace with a new screen as needed.
	c. The torch is dirty.	c. Remove the flash arrestor and flash arrestor screen as described in the inspection / replacement procedure. With the torch connected to an oxygen source, depress and release the oxygen control valve lever three or four times to clear the oxygen path. Reinstall the flash arrestor and flash arrestor screen.

Section II. VALVE STEM MALFUNCTIONS

5-3. STICKING CONTROL VALVE.

Table 5-3. Troubleshooting Valve Stem Malfunctions

TYPE OF PROBLEM / MALFUNCTION	PROBABLE CAUSE	RECOMMENDED REPAIR PROCEDURES
1. THE VALVE STEM WILL NOT MOVE FREELY WHILE DEPRESSING AND RELEASING THE OXYGEN CONTROL LEVER	a. The valve stem is bent.	a. Follow the oxygen control valve disassembly / reassembly procedures to remove and replace the valve stem. NOTE Always replace the valve stem O-Ring when the valve stem is replaced.
	b. The valve stem spring is worn.	b. Follow the oxygen control valve disassembly / reassembly procedures to remove and replace the valve stem spring.
	c. The valve stem o-ring is worn.	c. Follow the oxygen control valve disassembly / reassembly procedures to remove and replace the valve stem o-ring.

Section III. CUTTING ROD MALFUNCTIONS

5-4. COLLET PROBLEMS.

Table 5-4. Troubleshooting Collet / Cutting Rod Malfunctions

TYPE OF PROBLEM / MALFUNCTION	PROBABLE CAUSE	RECOMMENDED REPAIR PROCEDURES
1. THE CUTTING ROD WILL NOT FIT INTO THE COLLET IN THE TORCH	a. The wrong size collet is in the torch.	a. Inspect the collet in the torch to determine if it is the correct size for the cutting rod to be used. If incorrect, remove the collet and replace with the correct collet.
	b. The collet in the torch is damaged.	b. Remove the collet from the torch and inspect for burrs or slag buildup. If found, remove, clean and reinstall the collet. OR c. Remove the collet from the torch. Use a standard slotted screwdriver to apply pressure in the collet slots to open up the collet. Replace the collet in the torch.

CHAPTER 6

CORRECTIVE MAINTENANCE

Section I. INTRODUCTION

6-1. GENERAL. This chapter contains inspection, disassembly, and reassembly procedures required for corrective maintenance on the Broco Prime-Cut Tactical torch kits.

Section II. ADJUSTMENTS, ALIGNMENTS, AND REPAIRS

If you have any questions about the maintenance or repair of Broco Prime Cut Tactical torch systems CONTACT BROCO, INC. AT (800) 845-7259, (909) 483 3222 OR BY FAX (909) 483 3233 BEFORE PROCEEDING.

WARNING

Regulator repairs shall be conducted only by qualified personnel trained and authorized to perform work on high pressure oxygen regulators.

Inspections and repairs of oxygen cylinders and oxygen cylinder valves shall only be conducted by qualified personnel trained and authorized to perform work on high pressure oxygen cylinders and oxygen cylinder valves.

The composite cylinders included with these kits must be inspected and hydrostatic tested every three years. The maximum service life for these cylinders, allowed by the U.S. Department of Transportation, is 15 years.

Always use a clean, dry, oil-free cloth to wipe any part of the torch kit. Mild soap and water may be used to wash components.

Never use compressed air to purge any part of the oxygen system as oil contamination may result. Always use oxygen.

CAUTION

Always replace any worn or damaged parts with authorized replacement parts.

Always use Viton o-rings only.

6-2. FLASH ARRESTOR AND SCREEN.

WARNING

Do not operate the torch without a flash arrestor or screen. The flash arrestor and flash arrestor screen perform an important safety function by suppressing flashbacks that could otherwise cause serious injury to the operator or damage the equipment.

CAUTION

Always remove, clean, and/or replace the flash arrestor and flash arrestor screen after the torch has been submerged in water.

The flash arrestor and flash arrestor screen must be removed and inspected before and after each use to insure an unrestricted oxygen path.

a. Disassembly.

1) With the hands, unscrew the collet nut and remove the collet from the torch assembly .

2) Using a small tip screwdriver, lift and remove the collet washer from the torch assembly.

3) Using a flat tip screwdriver, engage the slot in the flash arrestor and turn counterclockwise. Remove the flash arrestor.

4) Pull out the flash arrestor screen from inside the back of the flash arrestor.

b. Inspection.

1) Inspect the collet nut, collet, torch assembly, and collet washer for damage and/or wear. Repair or replace as required.

2) Inspect the flash arrestor for damage, wear, and clogging of the ports. Clean (or replace) as required.

3) Inspect the flash arrestor screen for damage, wear, corrosion, and/or clogging. If dirty, clean the screen with warm soapy water, rinse with fresh water, and dry. If damaged or corroded, replace with a new screen.

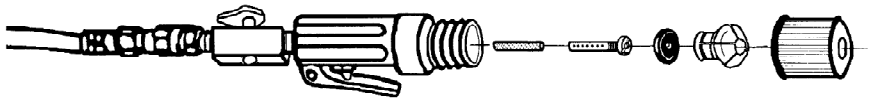
c. Reassembly.

1) Place the flash arrestor screen inside the flash arrestor.

2) Place the flash arrestor into the torch assembly. Using a flat tip screwdriver to engage the slot in the flash arrestor, turn clockwise. Do not over tighten.

3) Place the collet washer into the torch assembly.

4) Place the appropriately sized collet into the torch assembly and screw the collet nut on to the torch hand-tight.



COLLET, WASHER, FLASH ARRESTOR & SCREEN

6-3. OXYGEN CONTROL VALVE

CAUTION

The oxygen control valve is disassembled as part of a major overhaul of the torch kit system, when damaged, when obstructed, or when an oxygen leak is detected. During the normal course of operations it should not be necessary to disassemble the oxygen control valve.

The repair procedure calls for securing brass/aluminum components in a vise. Brass/aluminum is a soft metal that bends or distorts easily. Damage to torch parts can affect fit-up and cause oxygen leakage, making the torch unsafe to operate.

a. **Disassembly.**

1) Using a 3/8" open end wrench to hold the brass lock nut and a flat tip screwdriver, unscrew the oxygen control lever screw from the brass lock nut and remove the oxygen control lever from the torch body.

2) Secure the torch body with the control valve nut facing up.

CAUTION

The valve spring is under tension and may cause an uncontrolled separation of the control valve nut from the torch body.

Use caution to avoid damaging the valve nut gasket.

3) Using a 13/16" box end or socket wrench, unscrew and remove the control valve nut from the torch body.

4) Separate the valve stem spring from the valve stem.

5) Separate the valve stem from the control valve nut.

6) Separate the valve stem washer from the valve stem.

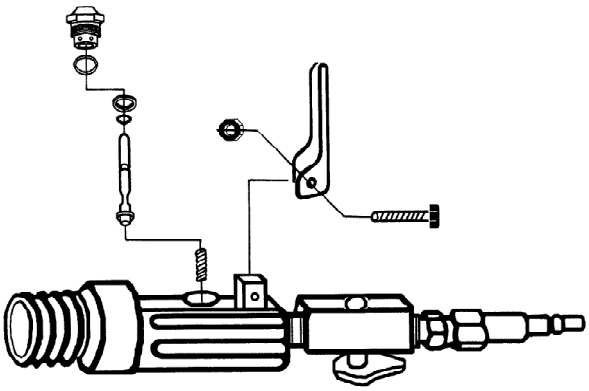
7) Do not remove the valve stem o-ring unless it has first been determined the o-ring will be replaced.

8) Do not remove the valve nut gasket unless it has first been determined the gasket will be replaced.

b. **Inspection.**

1) Inspect the brass lock nut, oxygen control lever screw, the oxygen control lever, the control valve nut, the valve stem spring and the valve stem for damage or wear. Replace as required.

2) Inspect the valve stem washer, valve stem o-ring, and the valve nut gasket for cuts or deformation. Replace as required.



OXYGEN CONTROL VALVE COMPONENTS.

c. **Reassembly.**

1) If the valve stem o-ring is to be replaced, secure the valve stem with the rounded end exposed. Cut the old o-ring off the valve stem. Apply a light coating of silicone lubricant to the rounded end of the valve stem. Slide the new o-ring on to the valve stem until it seats in the groove. Remove the valve stem from the securing fixture.

2) Slide the valve stem washer over the rounded end of the valve stem until it seats against the back of the valve stem.

3) Press the valve stem assembly into the rear of the control valve nut with a rotating motion.

4) Attach the valve stem spring to the rear of the valve stem.

5) If the valve nut gasket is to be replaced, cut the old gasket off the control valve nut. Slide a new valve nut gasket on to the control valve nut.

CAUTION

Brass threads are easily stripped. Use caution not to cross-thread or over-tighten.

6) Screw the control valve nut assembly into the torch body. Hand tighten until it stops. Torque an additional 1/8 to 1/4 turn.

7) Reattach the oxygen control lever to the torch body using the oxygen control lever screw and the brass lock nut.

8) Attach to an oxygen source and check for leaks.

6-4. OXYGEN CONTROL VALVE ASSEMBLY LEAK TESTING PROCEDURE.

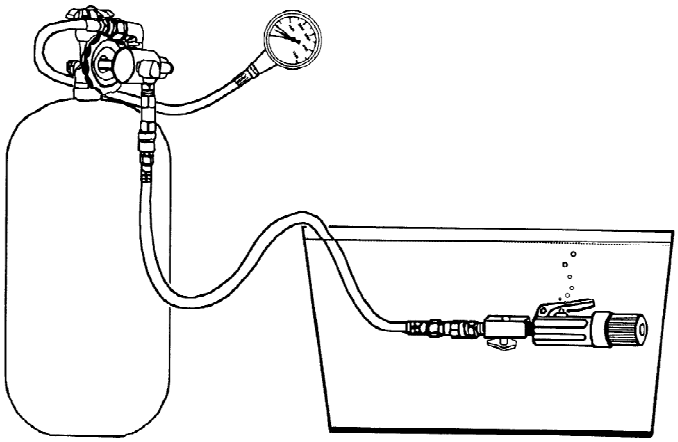
a. Connect one end of the oxygen to the torch assembly and connect the other end of the oxygen hose to a regulated oxygen source. Set the oxygen delivery pressure to 100 psi.

b. Fill a tank or tub with enough fresh water to submerge the torch assembly.

c. Open the oxygen cylinder valve. If using the PC/TAC torch, open the plug valve.

d. Depress and release the oxygen control lever three or four times. Ensure the torch appears to be working correctly.

e. Completely submerge the torch assembly in the water. Inspect around the valve stem and the valve nut for bubbles which indicate an oxygen leak.



OXYGEN CONTROL VALVE LEAK TEST.

f. If a leak is found, disconnect the torch from the oxygen regulator. Disassemble and reassemble the oxygen control valve assembly by following the procedures outlined in this Manual and perform a retest.

g. If no leak is present, return the torch assembly to operational ready status.

6-5. STRIKER PLATE ASSEMBLY.

a. **General.** Repeated ignition will cause a build-up of slag deposits on the surface of the striker plate. This build-up is easily removed by scraping the striker plate across a rough surface or hard edge. After each use, wipe the striker plate assembly and cable with a clean, dry, oil-free cloth.

WARNING

Always disconnect the striker plate power cable from the battery prior to disassembly or cleaning the striker plate surface. Failure to do so could result in electric shock.

b. Disassembly.

1) Ensure the striker plate power cable is not connected to the battery.

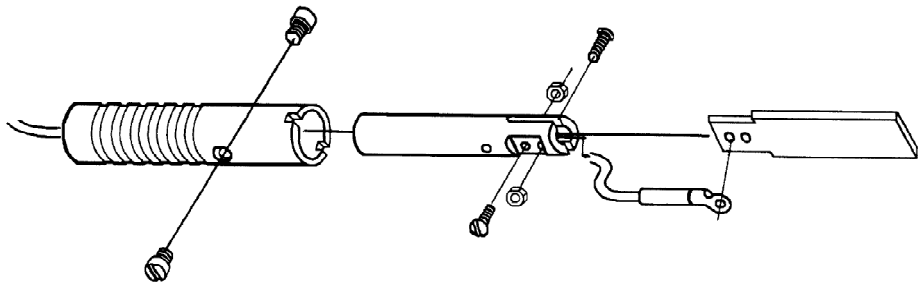
2) Using a flat tip screwdriver, remove the two nylon screws from the striker plate handle.

3) Grasp the copper striker plate and slide the striker plate handle back over the striker plate power cable, exposing the wooden insulator.

4) Using a flat tip screwdriver and a 3/8" socket wrench, secure the exposed brass nuts with the socket wrench and unscrew both brass screws. Remove the brass nuts and the brass screws.

5) Slide the copper striker plate from between the flanges of the wooden insulator.

6) Pull the striker plate power cable from the base of the wooden insulator to exposing the wire terminal lug.



STRIKER PLATE ASSEMBLY.

c. Inspection.

1) Ensure the striker plate power cable and the wire terminal lug is free of cuts and is not frayed. Repair or replace as required.

2) Ensure the two nylon screws, two brass nuts and two brass screws are present and properly tighten. Replace as required.

3) Inspect the striker plate handle, the copper striker plate, and the wooden insulator for gouges, deep scars, and deformation. Repair or replace as required.

d. Reassembly.

1) Push the striker plate power cable up through the base of the wooden insulator until the wire terminal lug slides into the groove in the wooden insulator.

2) Insert the copper striker plate into the groove in the wooden insulator taking care to overlap the wire terminal lug with the copper striker plate. Align these parts so that the bottom-most hole in the wooden insulator is in line with the hole in the wire terminal lug and the rearmost hole in the copper striker plate.

3) Insert the first brass screw through the wooden insulator and attach a brass nut. Insert the second brass screw through the wooden insulator and attach a brass nut. Tighten with a flat tip screwdriver and a 3/8" socket wrench.

4) Slide the striker plate handle over the exposed wooden insulator.

5) Insert the two nylon screws into the striker plate handle and tighten with a flat tip screwdriver.