Tote-Weld® II Outfit

Stock Numbers

840/1840

2475

2476

4475

4476

INSTALLATION AND OPERATION INSTRUCTIONS

Before Installing or Operating, Read and Comply with These Instructions

Controls Corporation of America
1501 Harpers Road   Virginia Beach, VA 23454
To Order Call 1-800-225-0473 or 757-422-8330 • Fax 757-422-3125
www.concoa.com

December 2005
Supersedes February 1998
USER RESPONSIBILITY

This equipment will perform in conformity with the description thereof contained in this manual and accompanying labels and/or inserts when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Defective equipment should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated, should be replaced immediately. Should such repair or replacement become necessary, CONTROLS CORPORATION OF AMERICA (“CONCOA”) recommends that a telephonic or written request for service advice be made to the CONCOA Warranty Administrator in Virginia Beach, Virginia.

This equipment, or any of its parts, should not be altered without the prior written approval of CONCOA. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than CONCOA or a service facility designated by CONCOA.

CUSTOMER ASSISTANCE

In the event of equipment failure, call the CONCOA Customer Assistance Line: 1-800-225-0473. Please be prepared to provide the model number and serial number of the equipment involved, in addition to some details regarding its application.
SAFETY

FOLLOW MANUAL INSTRUCTIONS

The TOTE-WELD II Outfit mixes flammable fuel gas and oxygen under pressure to support a flame. When the OUTFIT IS USED AS INSTRUCTED, IT CAN SAFELY WELD, BRAZE, HEAT AND CUT METALS. But failure to follow safe practices can cause fire and explosions that may result in severe burns and serious injury.

Sparks, flying slag, fumes, hot metal, as well as heat are normally associated with oxy-fuel processes. To avoid hazards which they may present, certain precautions must be taken.

Therefore, as a wise operator, avoid unnecessary risks. Make safety a habit. Read and comply with the following precautions and install, operate, and maintain the outfit as instructed in this manual:

A. EQUIPMENT

1. Keep the outfit, particularly oxygen parts, clean and free from oil, grease and other combustibles (including greasy gloves).
2. Keep outfit gas tight. Examine regularly for leaks, worn parts, and loose connections. If leak is suspected, test as described in SERVICE Section. Fuel gas leaks can usually be smelled but don’t rely on your nose.
3. No repair should ever be undertaken by anyone not having qualifications described in SERVICE Section.
4. Do not modify any part of the outfit. It is recommended that only replacement components listed in PARTS Section be used.
5. Avoid damage to equipment. Do NOT tamper with cylinder valves. Handle gas cylinders and valves with care to prevent damage. Do NOT drop cylinders. Keep cylinders in the outfit case. Do NOT use them or their contents for other than their intended use.
6. Do NOT attempt to refill any cylinders yourself. Return oxygen and acetylene cylinders to your distributor for refill.
7. Do not expose cylinders to sparks, slag, or temperatures exceeding 130°F (54°C).
8. Do NOT use a hammer or wrench (except special key for acetylene) to open a cylinder valve that cannot be opened by hand. Notify your supplier.
9. Do not completely empty a cylinder. Leave a little gas (about 25 psig) when returning it for refilling, and be sure cylinder valve is tightly closed.
10. Always identify gas content by the written word on the cylinder label or decal. Do not use a cylinder whose contents are not so identified. Do not rely on the color of the cylinder for identification.
11. Avoid cylinder contact with electrical circuits. Resulting short circuit arcs may weaken cylinder walls and lead to a subsequent serious accident.

B. PROTECTIVE EQUIPMENT

1. Wear welding goggles with filter lenses Shade No. 3 to protect your eyes from damage by radiation from the flame and the molten puddle, and by sparks.
2. Keep fire extinguishing materials within reach when using the outfit and use it to put out fire or smoldering materials.
3. Wear welder’s protective gloves when using outfit or when handling hot metal.
4. Protect yourself against hot sparks and flying slag: Button your collar, cuffs, and pockets or shirt. Avoid cuffed trousers. Overlap high shoes with trouser legs, or wear loose-fitting low shoes that can be quickly removed if sparks enter.

C. VENTILATION

1. Operate, transport, and store the outfit in a well-ventilated area.
2. Some metals and fluxes, when heated, emit irritating or toxic fumes that may accumulate in the breathing air. Provide ventilation adequate to prevent harmful accumulation of such fumes.
3. Do NOT store or transport compressed gas cylinder in unventilated enclosures or vehicles. Gas leakage can accumulate in unventilated spaces to create a fire or explosion hazard.

D. KEEP HEAT FROM COMBUSTIBLES AND PEOPLE

1. Protect the surrounding area against hot sparks and flying slag.
2. Do NOT use the torch near combustibles or containers holding flammable gases or liquids.
3. Do NOT smoke in the work area or where compressed gases are stored.
4. Do NOT point a lit torch at people or at gas cylinders.
5. Do NOT point a stream of fuel gas at any person or source of ignition.
E. KEEP COMBUSTIBLES FROM WELDING AREA
1. Clear the working area of combustibles before starting to work. Use firebrick on a metal bench as the working surface.
2. Do NOT use flammable hair preparations; they may cause hair to ignite while welding or cutting.
3. When finished working, SHUT OFF gases at the torch valves and cylinders as described in SHUTDOWN, and check that the area is free of smoldering material or flames.

F. COMPRESSED GASES
1. Oxygen is NOT compressed air; DO NOT refer to it or use it as compressed air. Oxygen is not flammable but materials that burn slowly in air will ignite easily and burn violently in oxygen. DO NOT use it to ventilate a confined space or to blow surfaces or clothing clean. A spark can ignite clothing full of oxygen causing it to burn vigorously.
2. Use the words acetylene or fuel gas not just GAS when referring to the fuel gas. Fuel gases are flammable. They should not be confused with other gases and should be used only as prescribed in this manual.
3. To prevent explosive gas mixtures in torch or hoses, purge each gas line individually before lighting torch.

G. BACKFIRES
1. Avoid backfires; they can overheat the torch and lead to a flashback which can cause an explosion or fire.
2. Definition: A backfire is a loud noise produced by the explosion of gases at the cutting or welding tip usually following a minor flashback, extinguishment, and re-ignition at the tip. Repeated backfire can cause tip to overheat and eventually cause a sustained flashback. Causes are: the following
   a. Bringing tip too close to work or touching it.
   b. Foreign particles entering tip and impeding gas flow.
   c. Overheated tip, such as caused by working in corners.
   d. Trying to operate with too low a gas flow.
3. Remedy: If torch does not stay lit, close fuel gas and oxygen valves in that order. Relight fuel gas with sparklighter only, NOT MATCHES, and NOT over hot work. If stable flame is not obtained by adding oxygen, close torch valves, check tip cleanliness and regulator settings, purge, and relight.

H. FLASHBACKS
1. Definition: A flashback is a burning back of the flame from the tip into or through the torch. It is also called a sustained burning inside the tip or torch.
2. A flashback can be caused by equipment that is faulty or misused. If it does not cause fire or rupture of hose, then it may produce hissing or squealing due to burning inside torch or tip. Examples of faulty or misused equipment are: the following
   a. Failure to purge (as prescribed in paragraph F.3)
   b. When squealing sound is heard: The internal combustion must be extinguished immediately by shutting off torch fuel gas and oxygen valves in that order. Wait a MOMENT, OR UNTIL NO SQUEALING is heard on re-opening fuel gas valve, then relight.
   c. When squealing is not heard (and flashback is indicated by flow of hot gases from tip): Flame is inside the torch. Immediately shut off cylinder valves and wait.
      After five (5) minutes, if torch, regulator, and cylinder are cool, disconnect equipment, inspect torch and regulator for inner damage.
4. Normally, the regulator check valves help to prevent backflow of wrong gases into hoses. Therefore, check that they are in working condition as indicated in SERVICE Section.

I. REFERENCE BOOKLETS
2. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING AND CUTTING, obtainable same as item 1.
3. American Welding Society publication C4.78, OPERATOR’S MANUAL FOR OXY-FUEL GAS CUTTING, obtainable from AWS, Box 351040, Miami, FL 33135
4. CONCOA publication ADE 872, latest revision, SAFE PRACTICES IN WELDING AND CUTTING.
J. SAFETY EQUIPMENT

Helmets, shields, goggles, gloves, aprons, sleeves, leggings, hard hats and caps are available from your local supplier.

INTRODUCTION

You have purchased the finest-designed, compact, self-contained welding and cutting outfit available for light industry - the TOTE-WELD II Outfit.

To get the best results, use the outfit as instructed in this manual. It provides installation, operation, servicing, and parts information for the outfit.

DESCRIPTION

The outfit is available as acetylene or MAPP gas outfits.

The TOTE-WELD II outfit components shown in Figures 1 and 2 are:

1. Case - Provides a portable storage container for all components of the outfit.
2. Torch - Transmits and controls flow of oxygen and fuel gases. It consists of a handle with two valves to control the gas flow for the flame and a cutting oxygen pushbutton valve for the cutting oxygen jet.
3. Two Regulators - Reduce high gas pressure available from cylinder to an adjustable, uniform working pressure needed at the torch: one regulator for oxygen, one for fuel gas. Both have check valves to prevent reverse flow of gases to the regulators.
4. Cutting Attachment - Attaches to torch via nut, and has tip nut (removable) to secure tip. Mixes oxygen and fuel gas and transmits mixture to tip for preheating of metal before cutting. Has a separate channel for oxygen required in cutting.
5. Acetylene Cutting Tip - Has four (4) flame holes (orifices) where the mixed (preheat) gases burn for preheating of metal, and center hole for the cutting oxygen stream.
5. **MAPP Cutting Tip** - Two-piece tip with thin rectangular spline for uniform preheats and maximum heat transfer.

AND

6. **Welding Tip Assembly** - Replaces cutting attachment and tip for welding, brazing, etc. Has two parts: mixer assembly and a welding tip that screws into mixer.

**NOTE**

Other welding tips and cutting tips of various sizes are available as accessories. See Table II in INITIAL OPERATION Section.

7. **Oxygen Cylinder** - Returnable for refilling, green, in color, with hand valve, contains 20 cu. ft.
8. **MAPP Gas Cylinder** - One lb. cylinder, (8.85 cu. ft.) disposable and NOT refillable.
9. **Wrench [key]** - For acetylene cylinder. Leave on acetylene cylinder valve when valve is open, to permit fast emergency closing.
10. **Hose** - 1½ ft. of twin hose with "A" fittings.

Optional Accessories - Other size welding tips, and cutting tips are available for different metal thicknesses, through your local supplier. (See Table II).

11. **Sparklighter** - Used to ignite mixed gases at tip. Worn flints can be unscrewed and replaced.
12. **Welding Goggles** - Must be worn at all times to protect eyes from flying sparks, slag and molten metal, and from radiant energy of flame and cutting stream.
13. **Sample Supplies of Flux and Rods** - Flux keeps metal clean and prevents contamination by air. Rods are used to add metal to welds or brazes. Different fluxes and rods are used for different metals and processes. (See HOW TO USE OUTFIT Section.)

**USE**

The TOTE-WELD II outfit can be used for heating, soft soldering, silver brazing, brazed welding, welding, metal surfacing, shaping and cutting. See Table I. Thicknesses up to 3/32-inch can be welded, and up to 1/2-inch can be cut.

<table>
<thead>
<tr>
<th>TABLE I. Metals Processed by Outfit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>Mild Steel</td>
</tr>
<tr>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Gal. Steel*</td>
</tr>
<tr>
<td>Copper</td>
</tr>
<tr>
<td>Brass</td>
</tr>
<tr>
<td>Bronze</td>
</tr>
</tbody>
</table>

*If galvanized coating is removed from joint area.

**INSTALLATION**

**CAUTION**

Make all connections gas tight.

**ATTACH OXYGEN REGULATOR**

1. Check that connecting surfaces of oxygen regulator and cylinder valve are free of foreign matter and undamaged. Remove any foreign matter that may be present by wiping surfaces clean with a clean lint-free cloth.
2. Screw regulator inlet nut on cylinder valve outlet clockwise (be sure threads catch and turn easily). Tighten securely with a 1-1/8-inch wrench. Do not overtighten.
3. Back out T-handle pressure-adjusting screw of regulator counterclockwise until no contact is felt with internal spring beneath screw. (Remove screw on first installation and immediately replace to get the feel of such contact.)
4. With regulator T-handle backed out loose, slowly open cylinder valve counterclockwise. NO GAS SHOULD FLOW from regulator. If gas does flow, immediately unscrew regulator from cylinder and return it for repair.

**ATTACH MAPP GAS REGULATOR**

(For outfits containing MAPP Gas)

1. Check connecting surfaces of MAPP Gas regulator and cylinder as done for oxygen, Step 1, above.
2. Back out knurled-knob pressure-adjusting screw counterclockwise all the way.
3. Fit bottom of regulator over cylinder outlet threads and screw on clockwise by hand until it bottoms and stops.
4. With regulator knob backed out loose, NO gas should flow from regulator. If it does, immediately unscrew regulator from cylinder and return it for repair. Cylinder valve closes itself.
ATTACH ACETYLENE REGULATOR
(For outfits containing Acetylene)

To connect the acetylene regulator, use the same steps 1 through 4 as you did for the oxygen regulator. Use a \(1\frac{3}{16}\)-inch wrench to tighten inlet nut. Use the key wrench provided to open the cylinder valve \(\frac{1}{4}-\frac{1}{2}\) turn, and leave it on the valve for quick closing in emergency when valve is open.

ATTACH TORCH

Connect red torch hose to fuel regulator outlet counterclockwise (left-hand thread). Connect green torch hose to oxygen regulator outlet clockwise. Tighten hose connections snugly with a \(\frac{7}{16}\)-inch wrench; do not overtighten. Repeat the operation at the torch inlet connection. The red hose goes to inlet marked "F" and the green hose at inlet marked "O". Close torch valves clockwise (CW).

PRESSURIZE FUEL

With both torch valves closed and cylinder valves open, turn in T-handle of acetylene regulator pressure-adjusting screw or MAPP gas regulator knob clockwise until it stops. NO GAS SHOULD BE ESCAPING from system. Test hose, torch (both ends of handle, and valves) and cylinder connections for leaks. To locate leak, brush on an oxygen approved leak detection solution. If bubbles indicate a leak, immediately close cylinder valve. To stop leaks, disconnect, clean mating surfaces of the faulty connections, retighten, and retest. If the leak persists, the threads or seating surfaces are faulty. DO NOT USE a faulty torch, hose, regulator, or cylinder. It must be repaired and tested.

PRESSURIZE OXYGEN

To pressurize and test oxygen system, use same procedure as for fuel above. Always open slowly oxygen cylinder valve fully to seat against upper seal and prevent leakage of oxygen through stem.

DEPRESSURIZE

Back out both regulator adjusting screws counterclockwise to unload regulators. Open torch fuel valve (same side as red hose) counterclockwise to depressurize hose, then close it. Open and close torch oxygen valve to depressurize hose.

VENT gases in a safe area. Point tip away from yourself and other people and from any source of ignition.

INITIAL OPERATION

ATTACH TIP

Select a welding tip according to recommended use from Table II. As packed, the tip/mixer assembly is not attached to the torch. To install the welding tip:

1. Be sure the three O-ring seals on torch end of welding tip/mixer are clean, properly set in their grooves, and undamaged.
2. Connect tip/mixer to torch. Tighten nut clockwise with \(\frac{11}{16}\)-inch wrench, with tip pointed in desired direction. DO NOT overtighten: the neoprene O-rings provide a soft-compression seal, a metal-to-metal seal is not needed.

For Cutting

1. Connect cutting attachment to torch as in steps 1 and 2 above.
2. Slide tip nut over tip and tighten to attachment with \(\frac{3}{8}\)-inch wrench.

TABLE II. Welding and cutting Tip Guide

<table>
<thead>
<tr>
<th>STYLE 474</th>
<th>ACETYLENE PRESSURE</th>
<th>ACETYLENE FLOW</th>
<th>MAPP GAS PRESSURE</th>
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<td>000</td>
<td>2 to 8</td>
<td>1.2 to 2.8</td>
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<td>810 4720</td>
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<td>1.3 to 3.7</td>
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<td>10.0 to 26.0</td>
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<td>2 to 11</td>
<td>17.0 to 37.0</td>
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Separate tips, Style 91, can be ordered as replacements

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<td>8+</td>
<td>810 0968</td>
<td>Light Range Heating &amp; Brazing</td>
</tr>
</tbody>
</table>

+ Use with 810 9201 mixer only

Cutting Tip Guide - Acetylene - Style 112

Stinger - Style 233 MAPP

Heating Tip Guide - Style 754

+ Use with 810 9201 mixer only
To change welding tip for an accessory welding tip, unscrew it from mixer and screw in accessory tip until it bottoms. To change cutting tip for accessory tip No. 1 if desired (see Table II) use ⅝-inch wrench to remove tip nut and make exchange. Wrench-tighten nut clockwise.

ADJUST REGULATORS AND FLAME

For Welding, Brazing and Heating

To adjust flame:

1. Check that both regulator adjusting screws are backed out counterclockwise (no contact with internal springs and both torch valves are shut (clockwise).
2. Open fuel valve on red hose side of torch one turn.
3. Turn in fuel regulator adjusting screw knob (or T-handle) clockwise until fuel gas starts to flow from tip. (Point tip away from yourself and other people, and from any source of ignition).
4. Allow fuel gas to flow about five (5) seconds, then close torch fuel valve. This is called purging.

CAUTION

Be sure that fuel valve on torch is tightly closed before opening oxygen valve.

5. Turn in fuel regulator knob (or T-handle) one more turn to pressurize fuel line.
6. Open torch oxygen valve one turn.
7. Turn in oxygen regulator adjusting screw T-handle (clockwise) until oxygen flows from tip.
8. Allow oxygen to flow about five (5) seconds and close torch oxygen valve. This purges oxygen line. DO NOT purge towards clothing.
9. Check for leaks at tip and torch connections as follows:
   a. Block off tip outlet with finger and immerse tip and torch in water.
   b. Open torch oxygen valve and look for bubbles which indicate leakage.
   c. If no bubbles appear, close oxygen valve.
   d. If bubbles appear, tighten connections and repeat test. If leakage persists, leaky parts must be replaced or repaired and tested.
10. Open torch fuel valve slightly and without delay, light tip with sparklighter. If valve is opened too far, flame will blow away.
11. Carefully open torch oxygen valve counterclockwise until flame appears neutral. If valve is opened too far, flame will go out with a pop.
12. Open fuel valve further counterclockwise until flame is carburizing, then open oxygen valve further until flame is again neutral.
13. Repeat above step until flame is as large as needed for the work. Turn torch valves off.
14. Once pressure regulators are set, turn off and relight flame or adjust it by using the torch valves only.

For Cutting

To adjust flame:

1. Follow steps 1 through 8 in preceding Subsection covering welding tip flame.
2. Turn in oxygen regulator T-handle all the way (less for thin steel requiring lower pressure).
3. Light and adjust flame as in preceding Subsection, but substitute CUTTING flames when lighting off with fuel gas, until flame is carborizing. Open oxygen valve until flame is neutral.
4. Open fuel and oxygen valves on torch further, in alternate steps, until the inner cone of the flame is about ¼-inch long (more or less, depending on metal thickness). This neutral flame is used to preheat the metal for the cut. These valves are called preheat fuel and oxygen valves when cutting. Press cutting oxygen valve button on torch. The oxygen stream does the cutting.

If a repeated popping is heard, it may indicate a leak in the metal-to-metal seal between tip and attachment, or through O-rings between attachment and torch. Shut torch valves an tighten tip nut further. If popping continues, check sealing surfaces and O-rings for dirt or damage.

SHUTDOWN

1. Close torch valves and close both cylinder valves (clockwise).
2. Open torch oxygen valve counterclockwise to bleed (depressurize) the system, then close valve.
3. Back out oxygen regulator adjusting T-handle counterclockwise to unload regulator.
4. Follow same steps as 2 and 3 for fuel system. DO NOT bleed towards people, flame or source of ignition.

SERVICE

SERVICE PROCEDURE

A unit which is not functioning properly should not be used until all required repairs have been completed and the unit has been tested to ascertain that it is in proper operating condition.
Inspection, troubleshooting, and repair of this equipment as indicated in this manual, may ordinarily be undertaken by a competent individual having at least general experience in the maintenance and repair of equipment of this nature.

CAUTION

No such maintenance or repair should ever be undertaken or attempted by anyone not having such qualifications.

It is recommended that defective parts be replaced with a part manufactured or sold by the manufacturer.

Except for inspection, troubleshooting, and repairs indicated in this manual, it is recommended that all other servicing be done by an authorized served facility. Contact the distributor from whom purchased, for assistance.

If so advised, the unit should be sent to a service facility authorized by the manufacturer, adequately packaged, in the original shipping container, if possible, and shipped prepaid, with a statement of the observed deficiency. In all cases other than where warranty is applicable, repairs will be made at current list price for the replacement part(s) plus a reasonable labor charge.

TESTING

To prevent use under unsafe operating conditions, check the outfit for leaks after each reconnection, and regularly test the outfit as follows at least every six (6) months, at most after each week of use, or any time equipment is mishandled. If any leak is found, have faulty component repaired.

CAUTION

DO NOT USE THE OUTFIT IF ANY PART LEAKS OR IS SUSPECTED OF A LEAK. Replace leaking hose or any part - torch, regulator, tip, mixer or cutting attachment - that has a leaking connection or valve.

External Leaks
1. With outfit still pressurized up to torch, brush soap solution on ALL joints of the regulator, ALL over the hoses, and on the torch handle ends. (Torch valves should be closed, regulators fully engaged clockwise). Bubbles indicate leaks.
2. Test torch valves and tip connections for leaks either with an oxygen approved leak detection solution on ALL surfaces or by immersing entire torch and tip in water. Block tip outlet with finger and open oxygen valve. Bubbles in either case indicate leaks. Close valve.
3. Press cutting oxygen valve button and check for valve leaks.
4. Release button and go on to next test.

Leaks Through Torch Valves
1. Install cutting attachment and tip on pressurized torch and apply soap solution to tip or immerse tip in water.
2. If no bubbles appear, go on to next test. Bubbles at the tip indicate a torch valve seat leak. Torch must be repaired or replaced.

Regulator Seat Leaks
1. With system still pressurized, release fuel gas regulator adjusting screw (counterclockwise) and open torch fuel valve to depressurize system. DO NOT discharge towards people or source of ignition.
2. After fuel gas stops flowing, open valve and immerse tip in water as in torch valve test. If bubbles continue to appear, the internal regulator seat is leaking and the regulator must be repaired or replaced.
3. If there are no leaks, close fuel gas valve and repeat test for oxygen regulator. Then go on to next test.

Regulator Check Valve Leaks
1. With torch valves closed, pressurize torch and hoses.
2. With both regulator adjusting screws turned in, turn off both cylinder valves and remove regulators (still connected to torch) from cylinders.
3. After a minute to allow for seepage through leaky check valve, immerse tip in water and open torch oxygen valve. If bubbles appear, oxygen regulator check valve is working. If no bubbles appear, it is leaking and the regulator must be repaired or replaced.
4. Close oxygen valve, and open torch fuel valve to test acetylene regulator check valve in same way.

REPLACEMENT PARTS

ORDERING
1. Give the stock number, description, and quantity of each part required.
2. Give stock number and description of equipment on which the parts are to be used.
3. Indicate any special shipping instructions.
For parts information, MAPP Gas cylinders, oxygen and acetylene cylinder refills, call your local distributor listed in the Yellow Pages or your telephone directory under "Welding Equipment & Supplies".

Figure 3 - Replacement Parts
<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>STOCK NO.</th>
<th>DESCRIPTION (Figure 3)</th>
<th>CODE</th>
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<td></td>
<td>TOTE-WELD II OUTFIT (Acetylene)</td>
<td>A</td>
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<tr>
<td>*2476</td>
<td></td>
<td>TOTE-WELD II OUTFIT (Acetylene w/o Cylinder)</td>
<td>B</td>
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<tr>
<td>*4475</td>
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<td>TOTE-WELD II OUTFIT (MAPP)</td>
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<td>TOTE-WELD II OUTFIT (MAPP w/o Cylinder)</td>
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<td>WELDING TIP ASSEMBLY No. 2 (Includes Items 2-8)</td>
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*840 or 1840 prefix
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Numbers in ( ) indicate quantity if more than one.

*818 or 1818 prefix
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*806 or 1806 prefix
ITEM NO. | STOCK NO. | DESCRIPTION (Figure 6)
--- | --- | ---
*7014 | | MAPP GAS REGULATOR (Figure 3, Item 14)
1 | 925 0070 | PLUG, Hole Stimpson #D4919
2 | 830 4274 | SCREW, Adjusting
| | | SCREW, Pan Head, 6-32 x ¼ long (Phillips Recess)
3 | 830 2548 | SPRING
4 | 830 4273 | WASHER, Thrust
5 | 830 3237 | CASE, Spring
6 | 830 4275 | PLUNGER & DIAPHRAGM ASSEMBLY
7 | 830 3295 | CHECK VALVE
8 | 830 3231 | CONNECTION, Inlet
9 | 830 4270 | PIN
10 | 830 3239 | O-RING
11 | 830 3232 | BODY

*806 or 1806 prefix
HOW TO USE OUTFIT

THE OXYFUEL PROCESS

The oxyfuel processes involve the application of a flame for welding, brazing, cutting, and heating. This flame is produced by burning fuel gas with oxygen.

Oxygen is compressed into cylinders for use with oxyfuel equipment. The gases, oxygen combined with MAPP gas or acetylene, are combined in the torch and, when burned at the tip of the torch, produce a gas flame of intense heat. The temperature of this flame - 5300°F (2900°C) - is high enough to melt most metals, making the welding of these metals possible. In cutting, a jet of oxygen is supplied in addition to the flame.

Basically, oxyfuel welding consists of joining metal together by the heat of the flame. The edges of the metal to be joined are first prepared as will be explained later, then heated to the melting point, with the torch. After reaching the melting point, a puddle of molten weld metal is formed. The molten metal flows together and, when cooled, forms a solid, seamless joint. In effect, the edges to be joined have been melted and completely fused together so the original edges no longer exist and the two pieces of metal become one; a jointless joint.

TIP SELECTION (Table II)

Choose a welding tip that will provide you with the easiest control of the weld metal puddle. This will depend on the character (thickness, heat conductivity, melting point) of the material being welded, the type of joint, and the position in which the weld is being made. The resulting flame should be adequate yet soft enough to avoid blowing away the molten metal.

BASE METAL PREPARATION

In preparing the base metal for welding, clean the edges and remove all traces of dirt, oil, grease, and other foreign matter. Also clean the surface of the metal around the edges to be joined.

Figure 7 shows some of the more common methods of preparing joints for welding. View (A) shows a square-edge butt joint. This type of joint is used where the thickness of the metal does not exceed ⅛-inch.

View (B) shows a flanged-edge joint used where the metal is not over ⅛-inch thick. The upturned edges of the joint prevent warping caused by the heat of the flame, and become filler metal in the joint. The use of welding rod as filler metal is explained later.

TACK WELDING

Where long pieces of metal plate have to be joined together as in Figures 8, it is best to tack weld the plates together at two or more places. Tack welding consists of fusing a small weld deposit between the two edges of the joint to make sure they stay in alignment during the welding operation. Figure 8 also shows the proper method of supporting the plates.

WELDING STEEL

Most types of steel and steel alloys can be welded by the oxyfuel method. Different welding rods are available as filler metal for the various types of steel welds desired. Use #1 alloy steel rods or #7 mild steel rods (if sample provided) for welding of steel.

One of the most important facts about steel welding is that molten steel solidifies almost as soon as the flame is removed. Because of this, steel can be welded in vertical and overhead positions as well as in the flat position.

Effect of Oxyfuel Flame

When the neutral or slightly carburizing flame is directed against a steel surface, the molten puddle of metal remains initially clean and calm. There is no foaming, boiling, or appreciable sparking. This flame protects the molten steel from oxidation and gives the toughest, most effective welds.
A strong carburizing flame usually adds carbon to the molten steel and may cause brittleness. An oxidizing flame makes the molten steel puddle foam and spark, indicating that the excess oxygen is forming iron oxide, which will cause a porous weld.

**Welding Techniques**

There are several different methods of oxyfuel steel welding which produce good results. These methods also apply generally to welding of other metals. The most suitable method to use depends largely on the type of work. The various methods or techniques, however, are all based on the same general principles. The most important welding principles are:

1. Maintain a calm puddle of molten metal. Move this puddle evenly along the joint as the weld is made.
2. Melt the end of the welding rod (if used) by holding it in the puddle. Do no hold the rod in the flame above the puddle where it may melt and drip into the puddle.
3. Avoid contact of the inner flame cone with the molten base metal, welding rod, or the molten metal of the puddle.
4. The flame should bring the edges of the joint to the fusion point ahead of the puddle as it is advanced along the seam.
5. The penetration (fusion to the base metal) of the molten metal should be all the way down to the bottom surface of the joint, but molten metal should not be allowed to drip in beads from the bottom of the weld.
6. Always make allowances for expansion of the metal when it is heated and for contraction when it is cooled.

**Forehand Welding**

In the forehand method of welding (Figure 9), the welding rod is moved ahead of the torch tip in the direction in which the weld is being made. The flame is also pointed in this direction and is directed downward at an angle to it will preheat the edges of the joint as it is moved along. The torch tip and the welding rod are manipulated to give opposite back-and-forth movements in semicircular paths. This motion provides uniform distribution of both the heat of the flame and the molten metal along the path of the weld.

The forehand method is the best for light welding.

**BRAZE WELDING**

Braze welding is a gas welding technique in which groove or fillet welds are deposited with a non-ferrous filler metal that melts below the melting point of the base metals but above 800°F. This is sometimes incorrectly called brazing. The joint types and methods of distributing filler metal in the joints differ significantly in the two processes. Brazing (capillary brazing) is discussed in the next section.

A flux designed for use in braze welding is essential to success in this operation. A sample may be provided with your outfit.

In preparing parts for braze welding it is necessary to clean thoroughly, removing all grease, paint, oxide scale, and other foreign material.

Flux powder is sprinkled over the slightly preheated joint area. The brass rod is similarly preheated and dipped into the flux to pick up additional flux. As braze welding progresses, the hot rod end is dipped into the flux to maintain continuous flux coverage. Paint flux paste on the joint surfaces, including the bottom side of the joint root. Dip the braze welding rod in the flux. The welding flame heat will dry out the moisture from the paste, leaving a continuous coating of flux.

Braze welding rods are composed essentially of 60% cooper and 40% zinc and are generally referred to as bronze rods.

When performing the braze welding operation, it is possible to heat the molten metal excessively, oxidizing some of the zinc in these rods. Such a condition is immediately visible in the form of dense, white fumes.

Take the following corrective measures immediately to eliminate fuming.

1. Avoid overheating, particularly the base metal.
2. Make sure that the flame is neutral, or only slightly oxidizing.

Avoid breathing these zinc fumes. They are recognizable by a "sweetish" taste in the mouth. Work out-of-doors if possible. See SAFETY section in front of book for proper ventilation precautions.

CAUTION

Exposure to zinc-oxide fumes results in a condition which welders call "galvo" since it can also come from welding on galvanized steel. Actually, it is a metal fume fever. If the fumes are breathed for a long period, a feeling of nausea will be experienced. Accompanying this will be profuse perspiring and weakness. If one has been exposed to a large amount of zinc fumes, it is best to consult a doctor and follow his advice. Be sure to explain the conditions under which the exposure occurred. Generally, under medical care, zinc fume fever clears up with about a day of rest and does not cause permanent injury.

Adjustment of the oxyfuel flame for braze welding is somewhat different than for other welding processes. A neutral flame may be used provided there is adequate flux coverage. However, a slightly oxidizing flame which may lessen flux requirements is recommended. When an oxidizing flame is used, a thin film of oxide will form over the molten pool and protect the molten metal from further oxidation.

As in any braze welding, it is necessary only to heat the local joint area above the melting point of the filler metal.

CAPILLARY BRAZING

Brazing encompasses a group of welding processes taking place above 800°F, in which a non-ferrous filler metal, with a melting point below that of the base metal as in braze welding, is used to join two pieces.

However, the similarity ends there. In brazing, the members of the joint are closely fitted together within thousandths of an inch, and the molten filler metal is distributed in the joint by capillary attraction. It is also called silver brazing.

Most metals may be brazed using suitable filler metals and fluxes. In addition, many combinations of dissimilar metals may be readily joined by brazing. In general, the more commonly available brazing filler metals are silver base alloys.

From the above definition it will be noted that the joints are closely fitted. For most brazing applications, other than aluminum, this joint clearance should be in the range of 0.002 to 0.006 inch. Generally, the lap joint will produce the most reliable results and can be proportioned to give joint strengths equaling the strength of the base metal. For optimum joint strength, a good general rule is to make the length of lap three times the thickness of the thinner member joined. Figure 10 illustrates the basic joint types used in brazing. Figure 11 provides a summary of good and poor brazed joint designs.

![Figure 10 - Basic Types of Brazed Joints](image-url)
Silver brazing fluxes contain fluorides. These chemical compounds are necessary to produce a low melting flux with the necessary cleaning action at brazing temperature. The flux labels carry the following caution notice:

**CAUTION**

Contains Fluorides

This flux, when heated, gives off fumes which may irritate eyes, nose and throat.

1. Avoid fumes - use only in well ventilated spaces.
2. Avoid contact of flux with eyes or skin.
3. Do not take internally.

Silver brazing filler metals may contain cadmium. The packages containing these alloys, as well as a tag affixed to the coils of alloys, carry the following warning notice:

**CAUTION**

Contains Cadmium

Poisonous Fumes May be Formed on Heating

Do not breathe fumes. Use only with adequate ventilation such as fume collectors, exhaust ventilators, or air-supplied respirators. See ANSI Standard Z49.1 (obtainable from the American Welding Society, Box 351040, Miami, FL 33135).

If chest pain, cough, or fever develops after use, call physician immediately.

Keep children away when using.

In following instructions for brazing, it is emphasized that the heat of the work, not a direct flame, should be used for melting the filler metals. This method greatly reduces the possible generation of cadmium-oxide fumes.

Cadmium-oxide fumes will most likely occur if the flame is used to melt the filler metal, or if the joint is not precleaned. This leads to overheating of the base metal in an effort to get the brazing alloy to flow through the joint.

In heating assemblies for brazing, adjust the flame to a slightly excess fuel or neutral condition. Avoid an oxidizing flame. Heat the parts uniformly and gradually. Thicker parts of the joint, such as flanges require more heating than pipes, for example. Continue heating until the flux liquefies. With initial heating, the flux will dry out as water is evaporated leaving a dry flux crust. With further heating, this dry flux crust will melt and liquefy, becoming "water clean". When this stage is reached, the eat in the parts should be sufficient to melt the filler metal. Use the heat of the parts, not the torch flame, to melt the filler.

Remove all dirt, grease, and oxide before brazing. Solvents and chemical cleaners are useful for the removal of oil and grease. Mechanically abrading the joint areas with steel wool or emery cloth is also effective.

Silver brazing flux comes in paste form and should be painted on the joint areas and the filler metal. Mix ONLY enough to handle the job since the paste loses activity if permitted to stand for a day or more.

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Figure 11 - Joint Designs for Brazing
metal which will then flow throughout the joint almost instantaneously. When the filler metal has visibly flowed to the extremities of the joint, discontinue heating. Do not overheat the joint.

After brazing is completed, remove all flux residue from the completed assembly by scrubbing with hot water. Flux residues can pick up moisture from the air and cause serious corrosion of the assembly. If the flux has had to handle gross contamination on the parts, the residue may be a glass-like compound. If this occurs, hand-chipping or chemical cleaning may be required.

If it is necessary to braze plated metals, determine the nature of the plating. Cadmium plating is widely used on steel. Heating such plating for brazing will almost surely produce cadmium-oxide fumes. (See previous CAUTION about cadmium.)

SURFACING
Surfacing by oxy-fuel welding is a procedure by which weld metal is deposited on a metal surface to produce certain desired properties or to restore dimensions.

Oxyfuel welding is well suited to surfacing operations. It permits smooth, precise, and very high quality deposits of surfacing metals. Small areas, grooves, and recesses may be accurately filled. Very thin layers of filler metal may be applied smoothly. The inherent heat of the oxyfuel flame provides preheating and develops slow cooling, thereby minimizing cracking. By seating with a slightly carburizing flame, there is a minimum dilution of the weld deposits with the base metals, thus preserving the properties of the surfacing deposit.

Grease and dirt should be removed with suitable cleaners before welding. Oxide and scale may require grinding. Contamination will impede the flow of molten filler metal over the area to be surfaced.

For surfacing operations, use a slightly-carburizing flame. For ordinary carbon steel welding, excess fuel is measured by the feather of unburned fuel visible at the end of the inner cone; this should be 1½ times the length of the inner cone. With a flame adjusted in this manner, it is possible to carburize or inject carbon into the surface condition and the metal appears to sweat, hence the description of sweating on. While the base metal is being prepared, hold the surfacing filler metal in the outer envelope of the flame; this serves to preheat the end of the rod. When the required area of the base metal is in the sweating condition, introduce the preheated welding rod end into the hottest part of the area. A small portion will be melted onto the base metal. It should wet the base metal and spread smoothly over the heated area. The typical weaving motion of oxyfuel welding is used to control the heating of the base and filler metals and distribute the molten filler metal.

CUTTING
Cutting Principles
When iron or steel is heated to a temperature of 1600°F, it will burn if brought into contact with oxygen. If the oxygen comes only from the surrounding air, combustion occurs only on the surface of the metal. However, if a jet of pure oxygen is directed at the hot metal, the metal will burn through in a narrow zone, called a kerf.

In oxyfuel cutting, the metal is first preheated with the oxyfuel flame to the ignition temperature. When the required temperature is reached, the cutting oxygen is turned on, and the stream of pure oxygen is directed against the heated metal. This ignites the iron or steel and starts the cut.

By moving the flame and oxygen jet (torch tip) progressively forward, fresh metal and oxygen are brought together forming iron oxide or slag in molten form and expelling it from the bottom of the kerf. A balance must be achieved among speed of movement, oxygen jet size, and intensity of flame to achieve a continuous operation.

The preheat oxygen and fuel are first mixed, and the mixture ignites as it issues from the outer ring of orifices as preheating flames. The flow of fuel gas is controlled by the torch fuel valve and the flow of preheat oxygen is governed by the valve on the right side of the torch. The cutting-oxygen jet is controlled by pressure on the cutting oxygen valve button between the two valves. Oxygen to both the preheat oxygen valve and the cutting-oxygen valve is supplied through the oxygen regulator, which is fully open during cutting operations.

Tip Selection
Interchangeable cutting tips, available with the torch, are selected according to material thickness (See Table II). Gas pressures vary accordingly.

Cutting Steel
In cutting steel, a neutral oxyfuel flame is used for preheating. When possible the cut is started at the edge of the workpiece (Figure 12). Hold the cutting torch lightly but steadily so that the ends of the preheating flame cones are about ¼-inch above the surface of the metal.
When a spot of metal at the top of the edge has been heated to a cherry red, press down the cutting-oxygen lever and begin cutting.

With welding goggles, look down into the cut as the cutting progresses and make sure that the flow of slag is clear and not blocked. Move the torch in a straight line to keep a straight cut, and move the torch at a uniform speed at which the flame is cutting through the metal.

Chalk line guides may be drawn on the cutting surface to mark the cut. For greater accuracy, use straight-edges, shaped guide bars, or templates to steady the hand and guide the cut. The torch may also be clamped to circle guides or wheeled carriages.

**Piercing Steel**
When starting a cut in steel away from the edge, pierce a hole through the metal to start the cut (Figure 13). To do this, heat a spot to cherry red, raise the torch ½-inch or more above the normal position for cutting to prevent slag from being blow against and fouling the tip, and slowly press the cutting-oxygen button.

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**CAUTION**

To prevent the blowing of molten slag back into the operator’s face, take the following precautions: Start the cut with low cutting-oxygen flow. As in Figure 13, View 3, either tilt the tip at a slight angle, or move the tip sideways and rotate around the edge of the cut, blowing the slag away from the face. Use full head and shoulder protection until experienced in hole piercing.

As soon as the hole is burned all the way through the metal, lower the torch to the normal height above the work and proceed with the cut.

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**Figure 12 - Starting a Cut at Edge**

**Figure 13 - Piercing to Start Cut Away from Edge**
Warranty Information

This equipment is sold by CONTROLS CORPORATION OF AMERICA under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this equipment directly from CONTROLS CORPORATION OF AMERICA or its Authorized Distributors as new merchandise and are extended to the first Buyer thereof other than for the purpose of resale.

For a period of one (1) year from the date of original delivery (90 days in corrosive service) to Buyer or to Buyer’s order, this equipment is warranted to be free from functional defects in materials and workmanship and to conform to the description of this equipment contained in this manual and any accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use and that regular periodic maintenance and service is performed or replacements made in accordance with the instructions provided. The foregoing warranties shall not apply if the equipment has been repaired: other than by CONTROLS CORPORATION OF AMERICA or a designated service facility or in accordance with written instructions provided by CONTROLS CORPORATION OF AMERICA, or altered by anyone other than CONTROLS CORPORATION OF AMERICA, or if the equipment has been subject to abuse, misuse, negligence or accident.

CONTROLS CORPORATION OF AMERICA’s sole and exclusive obligation and Buyer’s sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at CONTROLS CORPORATION OF AMERICA’s option, the equipment or part, which is reported to its Authorized Distributor from whom purchased, and which if so advised, is returned with a statement of the observed deficiency, and proof of purchase of equipment or part not later than seven (7) days after the expiration date of the applicable warranty, to the nearest designated service facility during normal business hours, transportation charges prepaid, and which upon examination, is found not to comply with the above warranties. Return trip transportation charges for the equipment or part shall be paid by Buyer.

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