

THERMAL DYNAMICS[®]



A THERMADYNE[®] Company

Plasma Welding Torch

Model PWH/M-2A

Instruction Manual

April 19, 2002

Manual No. 0-2005



WARNINGS

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment.

While the information contained in this Manual represents the Manufacturer's best judgement, the Manufacturer assumes no liability for its use.

Plasma Welding Torch
PWH/M-2A
Instruction Manual Number 0-2005

Published by:
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Record the following information for Warranty purposes:

Where Purchased: _____

Purchase Date: _____

Power Supply Serial #: _____

Torch Serial #: _____

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GENERAL INFORMATION

1.01 Notes, Cautions and Warnings

Throughout this manual, notes, cautions, and warnings are used to highlight important information. These highlights are categorized as follows:

NOTE

An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION

A procedure which, if not properly followed, may cause damage to the equipment.



WARNING

A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

1.02 Important Safety Precautions



WARNINGS

OPERATION AND MAINTENANCE OF PLASMA ARC EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.

Plasma arc cutting produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near plasma arc cutting applications should consult their medical health professional and the manufacturer of the health equipment to determine whether a hazard exists.

To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call 1-603-298-5711 or your local distributor if you have any questions.



GASES AND FUMES

Gases and fumes produced during the plasma cutting process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the welding fume plume.
- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the plasma arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or welding any metals which may contain one or more of the following:

Antimony	Chromium	Mercury
Arsenic	Cobalt	Nickel
Barium	Copper	Selenium
Beryllium	Lead	Silver
Cadmium	Manganese	Vanadium

- Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using. These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
- For information on how to test for fumes and gases in your workplace, refer to item 1 in Subsection 1.03, Publications in this manual.
- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.
- This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Sec. 25249.5 et seq.)



ELECTRIC SHOCK

Electric Shock can injure or kill. The plasma arc process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically “live” or “hot.”
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.

- Extra care must be taken when the workplace is moist or damp.
- Install and maintain equipment according to NEC code, refer to item 9 in Subsection 1.03, Publications.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.



FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks, or the plasma arc.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapors from the workplace.
- Do not cut or weld on containers that may have held combustibles.
- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminum workpieces when they are cut underwater or while using a water table. **DO NOT** cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.



NOISE

Noise can cause permanent hearing loss. Plasma arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
- For information on how to test for noise, see item 1 in Subsection 1.03, Publications, in this manual.



PLASMA ARC RAYS

Plasma Arc Rays can injure your eyes and burn your skin. The plasma arc process produces very bright ultra violet and infra red light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a welding helmet or shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear welding gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep helmet and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens or shields.
- Use the shade of lens as suggested in the following per ANSI/ASC Z49.1:

Arc Current	Minimum Protective Shade No.	Suggested Shade No.
Less Than 300*	8	9
300 - 400*	9	12
400 - 800*	10	14

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the work-piece.*

1.03 Publications

Refer to the following standards or their latest revisions for more information:

1. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
3. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

1.04 Note, Attention et Avertissement

Dans ce manuel, les mots “note,” “attention,” et “avertissement” sont utilisés pour mettre en relief des informations à caractère important. Ces mises en relief sont classifiées comme suit :

NOTE

Toute opération, procédure ou renseignement général sur lequel il importe d'insister davantage ou qui contribue à l'efficacité de fonctionnement du système.

ATTENTION

Toute procédure pouvant résulter l'endommagement du matériel en cas de non-respect de la procédure en question.



AVERTISSEMENT

Toute procédure pouvant provoquer des blessures de l'opérateur ou des autres personnes se trouvant dans la zone de travail en cas de non-respect de la procédure en question.

1.05 Precautions De Securite Importantes



AVERTISSEMENTS

L'OPÉRATION ET LA MAINTENANCE DU MATÉRIEL DE SOUDAGE À L'ARC AU JET DE PLASMA PEUVENT PRÉSENTER DES RISQUES ET DES DANGERS DE SANTÉ.

Coupant à l'arc au jet de plasma produit de l'énergie électrique haute tension et des émissions magnétique qui peuvent interférer la fonction propre d'un “pacemaker” cardiaque, les appareils auditif, ou autre matériel de santé électronique. Ceux qui travail près d'une application à l'arc au jet de plasma devrait consulter leur membre professionnel de médication et le manufacturier de matériel de santé pour déterminer s'il existe des risques de santé.

Il faut communiquer aux opérateurs et au personnel TOUS les dangers possibles. Afin d'éviter les blessures possibles, lisez, comprenez et suivez tous les avertissements, toutes les précautions de sécurité et toutes les consignes avant d'utiliser le matériel. Composez le + 603-298-5711 ou votre distributeur local si vous avez des questions.



FUMÉE et GAZ

La fumée et les gaz produits par le procédé de jet de plasma peuvent présenter des risques et des dangers de santé.

- Eloignez toute fumée et gaz de votre zone de respiration. Gardez votre tête hors de la plume de fumée provenant du chalumeau.
- Utilisez un appareil respiratoire à alimentation en air si l'aération fournie ne permet pas d'éliminer la fumée et les gaz.
- Les sortes de gaz et de fumée provenant de l'arc de plasma dépendent du genre de métal utilisé, des revêtements se trouvant sur le métal et des différents procédés. Vous devez prendre soin lorsque vous coupez ou soudez tout métal pouvant contenir un ou plusieurs des éléments suivants:

antimoine	cadmium	mercure
argent	chrome	nickel
arsenic	cobalt	plomb
baryum	cuivre	sélénium
béryllium	manganèse	vanadium

- Lisez toujours les fiches de données sur la sécurité des matières (sigle américain "MSDS"); celles-ci devraient être fournies avec le matériel que vous utilisez. Les MSDS contiennent des renseignements quant à la quantité et la nature de la fumée et des gaz pouvant poser des dangers de santé.
- Pour des informations sur la manière de tester la fumée et les gaz de votre lieu de travail, consultez l'article 1 et les documents cités à la page 5.
- Utilisez un équipement spécial tel que des tables de coupe à débit d'eau ou à courant descendant pour capter la fumée et les gaz.
- N'utilisez pas le chalumeau au jet de plasma dans une zone où se trouvent des matières ou des gaz combustibles ou explosifs.
- Le phosgène, un gaz toxique, est généré par la fumée provenant des solvants et des produits de nettoyage chlorés. Éliminez toute source de telle fumée.
- Ce produit, dans le procédé de soudage et de coupe, produit de la fumée ou des gaz pouvant contenir des éléments reconnus dans L'état de la Californie, qui peuvent causer des défauts de naissance et le cancer. (La sécurité de santé en Californie et la code sécurité Sec. 25249.5 et seq.)



CHOC ELECTRIQUE

Les chocs électriques peuvent blesser ou même tuer. Le procédé au jet de plasma requiert et produit de l'énergie électrique haute tension. Cette énergie électrique peut produire des chocs graves, voire mortels, pour l'opérateur et les autres personnes sur le lieu de travail.

- Ne touchez jamais une pièce "sous tension" ou "vive"; portez des gants et des vêtements secs. Isolez-vous de la pièce de travail ou des autres parties du circuit de soudage.
- Réparez ou remplacez toute pièce usée ou endommagée.
- Prenez des soins particuliers lorsque la zone de travail est humide ou moite.
- Montez et maintenez le matériel conformément au Code électrique national des Etats-Unis. (Voir la page 5, article 9.)
- Débranchez l'alimentation électrique avant tout travail d'entretien ou de réparation.
- Lisez et respectez toutes les consignes du Manuel de consignes.



INCENDIE ET EXPLOSION

Les incendies et les explosions peuvent résulter des scories chaudes, des étincelles ou de l'arc de plasma. Le procédé à l'arc de plasma produit du métal, des étincelles, des scories chaudes pouvant mettre le feu aux matières combustibles ou provoquer l'explosion de fumées inflammables.

- Soyez certain qu'aucune matière combustible ou inflammable ne se trouve sur le lieu de travail. Protégez toute telle matière qu'il est impossible de retirer de la zone de travail.
- Procurez une bonne aération de toutes les fumées inflammables ou explosives.
- Ne coupez pas et ne soudez pas les conteneurs ayant pu renfermer des matières combustibles.
- Prévoyez une veille d'incendie lors de tout travail dans une zone présentant des dangers d'incendie.
- Le gas hydrogène peut se former ou s'accumuler sous les pièces de travail en aluminium lorsqu'elles sont coupées sous l'eau ou sur une table d'eau. NE PAS couper les alliages en aluminium sous l'eau ou sur une table d'eau à moins que le gas hydrogène peut s'échapper ou se dissiper. Le gas hydrogène accumulé explosera si enflammé.



RAYONS D'ARC DE PLASMA

Les rayons provenant de l'arc de plasma peuvent blesser vos yeux et brûler votre peau. Le procédé à l'arc de plasma produit une lumière infra-rouge et des rayons

ultra-violet très forts. Ces rayons d'arc nuiront à vos yeux et brûleront votre peau si vous ne vous protégez pas correctement.

- Pour protéger vos yeux, portez toujours un casque ou un écran de soudeur. Portez toujours des lunettes de sécurité munies de parois latérales ou des lunettes de protection ou une autre sorte de protection oculaire.
- Portez des gants de soudeur et un vêtement protecteur approprié pour protéger votre peau contre les étincelles et les rayons de l'arc.
- Maintenez votre casque et vos lunettes de protection en bon état. Remplacez toute lentille sale ou comportant fissure ou rognure.
- Protégez les autres personnes se trouvant sur la zone de travail contre les rayons de l'arc en fournissant des cabines ou des écrans de protection.
- Utilisez la nuance de lentille qui est suggérée dans la recommandation qui suivent ANSI/ASC Z49.1:

Courant Arc	Nuance Minimum Protective Numéro	Nuance Suggestée Numéro
Moins de 300*	8	9
300 - 400*	9	12
400 - 800*	10	14

** Ces valeurs s'appliquent ou l'arc actuel est observé clairement. L'expérience a démontré que les filtres moins foncés peuvent être utilisés quand l'arc est caché par moicseau de travail.*



BRUIT

Le bruit peut provoquer une perte permanente de l'ouïe. Les procédés de soudage à l'arc de plasma peuvent provoquer des niveaux sonores supérieurs aux limites normalement acceptables. Vous devez vous protéger les oreilles contre les bruits forts afin d'éviter une perte permanente de l'ouïe.

- Pour protéger votre ouïe contre les bruits forts, portez des tampons protecteurs et/ou des protections auriculaires. Protégez également les autres personnes se trouvant sur le lieu de travail.
- Il faut mesurer les niveaux sonores afin d'assurer que les décibels (le bruit) ne dépassent pas les niveaux sûrs.
- Pour des renseignements sur la manière de tester le bruit, consultez l'article 1, page 5.

1.06 Documents De Reference

Consultez les normes suivantes ou les révisions les plus récentes ayant été faites à celles-ci pour de plus amples renseignements :

1. OSHA, NORMES DE SÉCURITÉ DU TRAVAIL ET DE PROTECTION DE LA SANTÉ, 29CFR 1910, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. Norme ANSI Z49.1, LA SÉCURITÉ DES OPÉRATIONS DE COUPE ET DE SOUDAGE, disponible auprès de la Société Américaine de Soudage (American Welding Society), 550 N.W. LeJeune Rd., Miami, FL 33126
3. NIOSH, LA SÉCURITÉ ET LA SANTÉ LORS DES OPÉRATIONS DE COUPE ET DE SOUDAGE À L'ARC ET AU GAZ, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. Norme ANSI Z87.1, PRATIQUES SURES POUR LA PROTECTION DES YEUX ET DU VISAGE AU TRAVAIL ET DANS LES ECOLES, disponible de l'Institut Américain des Normes Nationales (American National Standards Institute), 1430 Broadway, New York, NY 10018
5. Norme ANSI Z41.1, NORMES POUR LES CHAUSSURES PROTECTRICES, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
6. Norme ANSI Z49.2, PRÉVENTION DES INCENDIES LORS DE L'EMPLOI DE PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
7. Norme A6.0 de l'Association Américaine du Soudage (AWS), LE SOUDAGE ET LA COUPE DE CONTENEURS AYANT RENFERMÉ DES PRODUITS COMBUSTIBLES, disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126
8. Norme 51 de l'Association Américaine pour la Protection contre les Incendies (NFPA), LES SYSTEMES À GAZ AVEC ALIMENTATION EN OXYGENE POUR LE SOUDAGE, LA COUPE ET LES PROCÉDÉS ASSOCIÉS, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

9. Norme 70 de la NFPA, CODE ELECTRIQUE NATIONAL, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. Norme 51B de la NFPA, LES PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. Brochure GCA P-1, LA MANIPULATION SANS RISQUE DES GAZ COMPRIMÉS EN CYLINDRES, disponible auprès de l'Association des Gaz Comprimés (Compressed Gas Association), 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. Norme CSA W117.2, CODE DE SÉCURITÉ POUR LE SOUDAGE ET LA COUPE, disponible auprès de l'Association des Normes Canadiennes, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada, M9W 1R3
13. Livret NWSA, BIBLIOGRAPHIE SUR LA SÉCURITÉ DU SOUDAGE, disponible auprès de l'Association Nationale de Fournitures de Soudage (National Welding Supply Association), 1900 Arch Street, Philadelphia, PA 19103
14. Norme AWSF4.1 de l'Association Américaine de Soudage, RECOMMANDATIONS DE PRATIQUES SURES POUR LA PRÉPARATION À LA COUPE ET AU SOUDAGE DE CONTENEURS ET TUYAUX AYANT RENFERMÉ DES PRODUITS DANGEREUX, disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126
15. Norme ANSI Z88.2, PRATIQUES DE PROTECTION RESPIRATOIRE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018

1.07 Declaration of Conformity

Manufacturer: Thermal Dynamics Corporation
Address: 82 Benning Street
West Lebanon, New Hampshire 03784
USA

The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 73/23/EEC as amended by Council Directive 93/68/EEC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- * CSA (Canadian Standards Association) standard C22.2 number 60 for Arc welding equipment.
- * UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.
- * ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) (EN50192) (EN50078) applicable to plasma cutting equipment and associated accessories.
- * Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermal Dynamics has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative: Giorgio Bassi
Managing Director
Thermal Dynamics Europe
Via rio Fabbiani 8A
40067 Rastignano (BO)
Italy

1.08 Statement of Warranty

LIMITED WARRANTY: Thermal Dynamics® Corporation (hereinafter “Thermal”) warrants that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the time period applicable to the Thermal products as stated below, Thermal shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal’s specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Thermal’s sole option, of any components or parts of the product determined by Thermal to be defective.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: Thermal shall not under any circumstances be liable for special or consequential damages, such as, but not limited to, damage or loss of purchased or replacement goods, or claims of customers of distributor (hereinafter “Purchaser”) for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Thermal whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based.

THIS WARRANTY BECOMES INVALID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMAL PRODUCT.

THIS WARRANTY IS INVALID IF THE PRODUCT IS SOLD BY NON-AUTHORIZED PERSONS.

The limited warranty periods for Thermal products shall be as follows (with the exception of XL Plus Series, CutMaster Series , Cougar and DRAG-GUN): A maximum of three (3) years from date of sale to an authorized distributor and a maximum of two (2) years from date of sale by such distributor to the Purchaser, and with the further limitations on such two (2) year period (see chart below).

The limited warranty period for XL Plus Series and CutMaster Series shall be as follows: A maximum of four (4) years from date of sale to an authorized distributor and a maximum of three (3) years from date of sale by such distributor to the Purchaser, and with the further limitations on such three (3) year period (see chart below).

The limited warranty period for Cougar and DRAG-GUN shall be as follows: A maximum of two (2) years from date of sale to an authorized distributor and a maximum of one (1) year from date of sale by such distributor to the Purchaser, and with the further limitations on such two (2) year period (see chart below).

	Parts				
	<u>XL Plus & CutMaster Series</u>	<u>Parts Cougar/Drag-Gun</u>	<u>Parts All Others</u>	<u>Labor</u>	
<u>PAK Units, Power Supplies</u>					
Main Power Magnetics	3 Years	1 Year	2 Years	1 Year	
Original Main Power Rectifier	3 Years	1 Year	2 Years	1 Year	
Control PC Board	3 Years	1 Year	2 Years	1 Year	
All Other Circuits And Components Including, But Not Limited To, Starting Circuit, Contactors, Relays, Solenoids, Pumps, Power Switching Semi-Conductors	1 Year	1 Year	1 Year	1 Year	
<u>Consoles, Control Equipment, Heat Exchanges, And Accessory Equipment</u>	1 Year		1 Year	1 Year	
<u>Torch And Leads</u>					
Maximizer 300 Torch			1 Year	1 Year	
SureLok Torches	1 Year		1 Year	1 Year	
All Other Torches	180 Days	180 Days	180 Days	180 Days	
<u>Repair/Replacement Parts</u>	90 Days	90 Days	90 Days	None	

Warranty repairs or replacement claims under this limited warranty must be submitted by an authorized Thermal Dynamics® repair facility within thirty (30) days of the repair. No transportation costs of any kind will be paid under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the customer. All returned goods shall be at the customer’s risk and expense. This warranty supersedes all previous Thermal warranties.

Effective: November 15, 2001

SPECIFICATIONS

1.1. DESCRIPTION OF EQUIPMENT

The Thermal Arc 2A Plasma Welding Torch is designed for direct current plasma arc welding of ferrous and non-ferrous metals, including aluminum, using the transferred arc plasma process. It is used as part of a welding system that includes a control console, a direct current power source, a coolant supply and a gas supply (Figure 1-A).

1.2. SPECIFICATIONS

- Straight Polarity Current Rating: 75 amperes DC maximum.
- Plasma Gas: Argon (Consumption: 0.5-2.5 SCFH (0.24-1.18 lpm)).
- Shield Gas Straight Polarity: Argon or Argon/Hydrogen (Consumption: 8-15 SCFH (3.8-7.1 lpm)).
- Shipping Weight: Hand torch: PWH-2A- 1 lbs. (0.45 kg); machine mounted torch PWM-2A – 2 lbs. (0.9 kg).
- Cooling Requirements: 2,000 BTU/hr; 114 gpm of TDC Torch Coolant @ 50 psi.

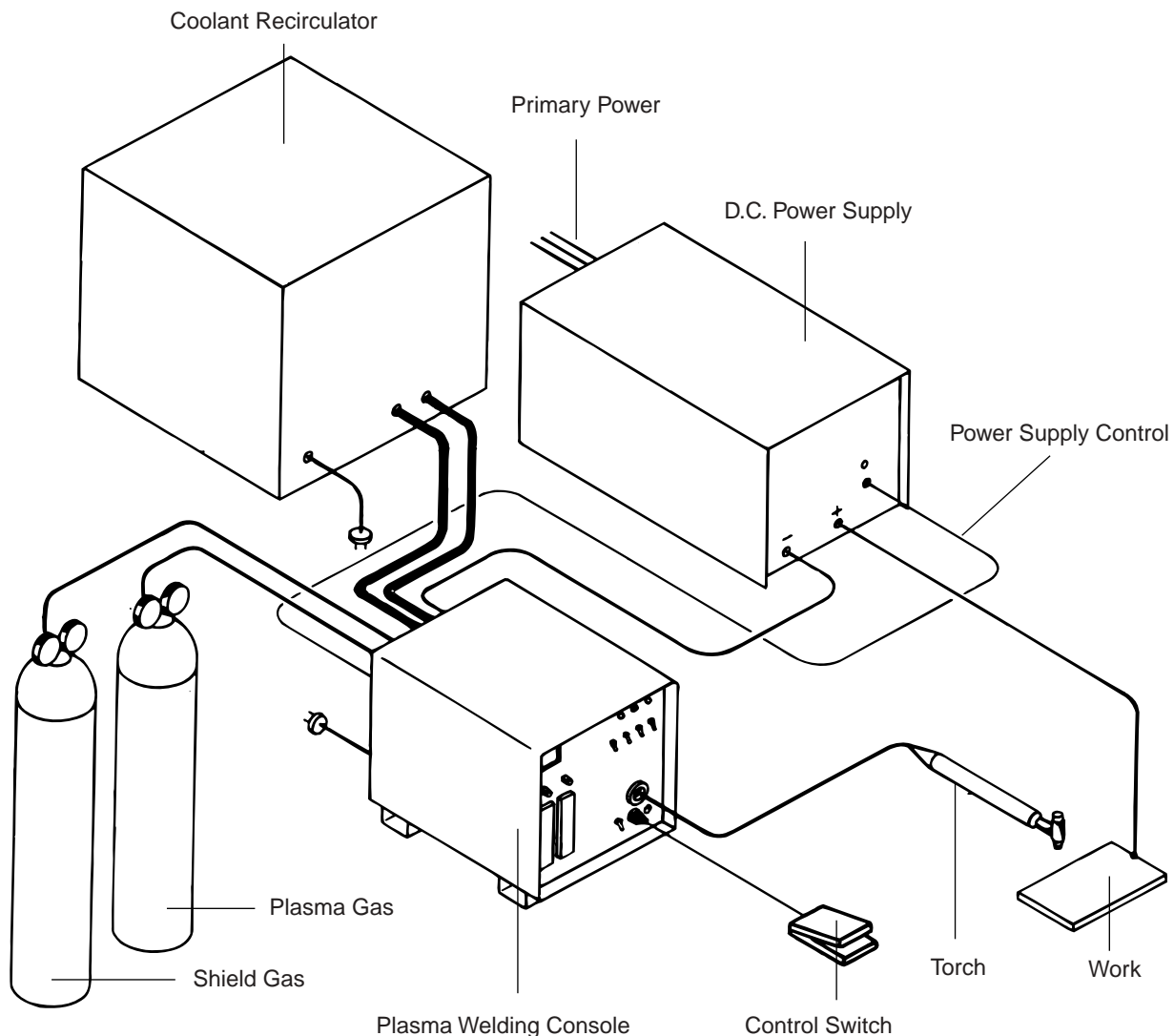
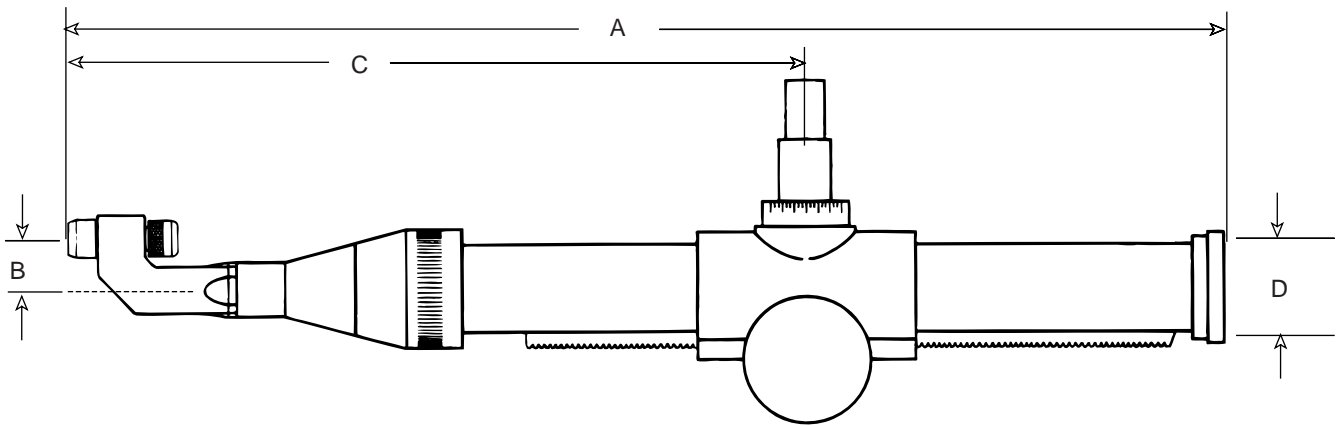
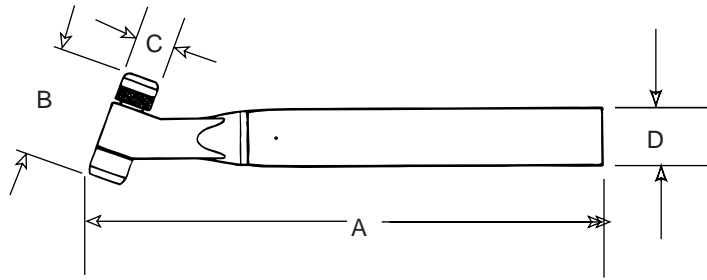


Figure 1-A Plasma Welding System



	A		B		C		D	
	Inches	cm	Inches	cm	Inches	cm	Inches	cm
PWH-2A (70°)	8.00	20.32	1.62	4.11	0.62	1.57	0.88	2.24
PWH-2A (90°)	7.75	19.68	1.62	4.11	0.62	1.57	0.88	2.24
PWM-2A	18.00	45.72	0.81	2.06	7.12	18.08	1.38	3.50
					15.00	38.10		

PWH/M-2A Torch Dimensions

1.3. THERMAL ARC PLASMA

Plasma is a gas which has been heated to an extremely high temperature and ionized so that the gas becomes electrically conductive. The welding process uses this plasma to transfer an electric arc to the workpiece. The metal to be welded is melted by the heat of the arc.

In a plasma torch, a cool gas such as Argon enters in Zone A, Figure 1-C. In Zone B a pilot arc between the electrode and the front of the torch heats and ionizes the gas. An arc transfers to the workpiece through a column of plasma gas in Zone C.

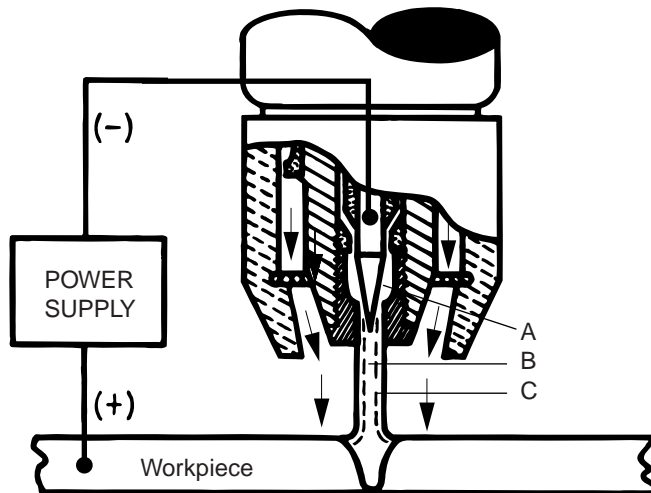


Figure 1-C Thermal Arc Plasma

By forcing the plasma gas and electric arc through a small orifice, Thermal Arc torches deliver a high concentration of heat to a very small area. The stiff, constricted plasma arc is shown in Zone C. Direct current straight polarity is used for most plasma welding, as shown in the illustration.

The Dual-Flow design of Thermal Arc welding torches uses a shield gas, shown by the small arrows. The shield gas surrounds the plasma arc and channels it to the workpiece, thus improving weld characteristics and shielding the weld puddle from atmospheric contamination.

Coolant from the coolant recirculator flows through the liquid-cooled power leads to the torch head and back.

The plasma arc is infinitely variable from soft to stiff. Most applications can best be accomplished with a softer arc, i.e. lower plasma gas flow. Full penetration or Key-hole welds require a stiff arc, i.e. high plasma gas flow.

1.4. THEORY OF OPERATION

TORCH CONNECTIONS

The plasma gas flows to the torch through the black lead, around the electrode and gas distributor and out through the tip orifice.

The shield gas flows through the yellow torch lead, around the torch front end and out through the shield cup.

The torch coolant and negative (-) power flow to the front end of the torch through the green (color coded) lead.

The coolant return and positive (+) power for the pilot arc flow through the red (color coded) lead.

PILOT ARC

When the torch is started, an arc is established between the electrode and welding tip. This pilot arc appears as a small "flame" at the front of the torch. This serves to illuminate the workpiece and assists in starting the main (welding) arc. It can also be left on while welding at low current levels to stabilize the welding arc.

HIGH FREQUENCY

A high voltage, high frequency current is superimposed on the direct current to establish the pilot arc.

WELDING ARC

The power supply provides the direct current (DC) for welding. The negative output is connected to the torch electrode through the negative liquid cooled lead. The positive output is connected to the workpiece through the work cable. The electrically charged plasma gas serves to close this electrical circuit and thus becomes the welding arc.

INSTALLATION

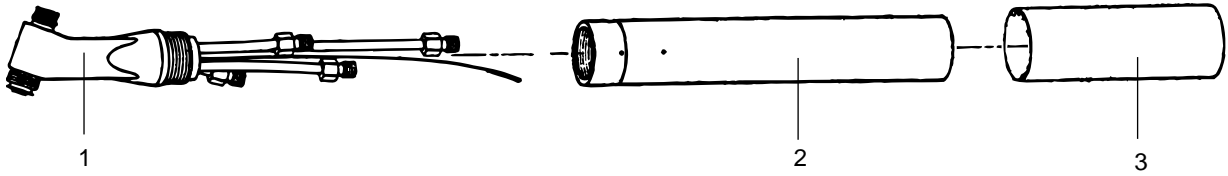


Figure 2-A

2.1. UNPACKING NEW EQUIPMENT

Unpack the equipment, check for possible damage during shipment. Check to be sure all items on the packing list are identified and accounted for.



WARNING

Check to be sure the main disconnect switch supplying power to the welding system is open.

2.2. HAND TORCH INSTALLATION (Figure 2-A)

If the torch is not already attached to the leads, assemble as follows:

- 1) Remove the handle (Item 2) from the head assembly (Item 1).
- 2) Feed the end of the leads with the torch fittings through the shrink tubing (Item 3) and then the handle (Item 2) and connect to the torch (Item 1), matching the color coded lead to the color coded torch fitting. Do not overtighten.

- 3) Screw the handle onto the torch.
- 4) Slide the shrink tubing over the handle until about 1/2 on. With a heat gun shrink the tubing until it is snug on the handle and the leads (Fig. 2-B).
- 5) Connect the other end of the leads to the appropriate fittings on the plasma welding console.

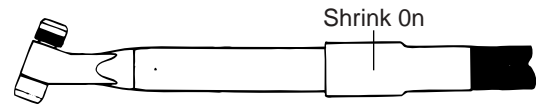


Figure 2-B

2.3. MACHINE TORCH INSTALLATION (Figure 2-C)

If the torch is not already attached to the leads, assemble as follows:

- 1) Loosen the nut (Item 2) and remove the positioning tube assembly (Item 4).
- 2) Unscrew the sleeve adaptor (Item 3).

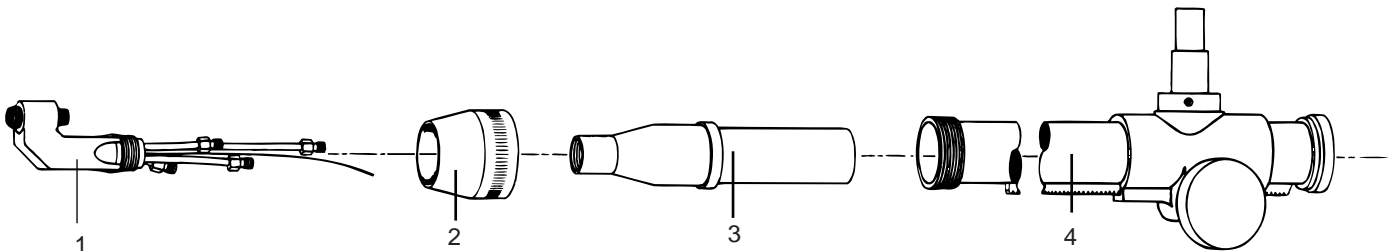


Figure 2-C

- 3) Feed the end of the leads with the torch fittings through Items 4, 3 and 2 connect to the torch, matching the color coded lead to the color coded torch fitting. Do not overtighten.
- 4) Pass the sleeve adaptor through the nut and screw onto the torch.
- 5) Slide the positioning tube onto the sleeve adaptor and secure with the nut (Item 2).
- 6) Connect the other end of the leads to the appropriate fittings on the plasma welding console.

Check the instructions for the other components of the welding system to insure they are installed properly.

OPERATION

3.1. PRE-OPERATION SET-UP

The selection of specific parameters for a given welding application depend on the type of material, configuration of the joint and type of weld desired. Proper settings for a given joint have to be developed on the job.

Table 3-A gives the maximum operating range of the various tips. These values are for a stiff collimated arc with the electrode setback at its maximum. A softer, less constricted arc can be obtained by decreasing the electrode setback (see Fig. 3-A). The minimum setback is with the electrode point flush with the face of the tip (see Fig. 3-B). By decreasing the electrode setback the plasma gas flow can be decreased while maintaining the higher current ratings of the tip. This gives a wider weld bead and in most cases allows for faster travel speeds.

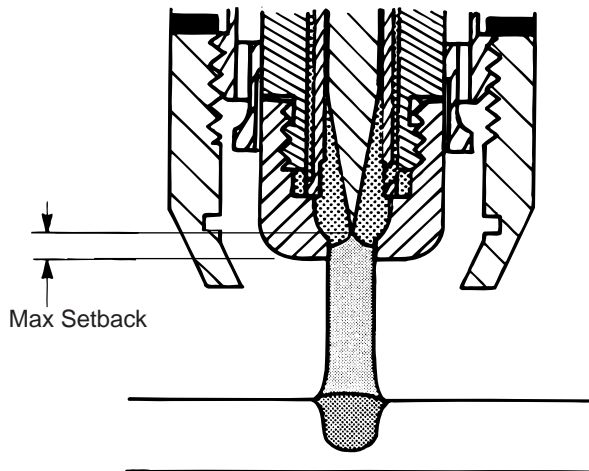


Figure 3-A

The electrode gauge values given in Table 3-A will result in maximum electrode setback for the given tip. This setback, when used with the given values for current and plasma gas flow will produce a stiff collimated arc that results in a narrower weld bead.

CAUTION

Decreasing the electrode standoff can only be done with tip orifice diameters of 0.046 or larger.

This procedure should be followed at the beginning of each shift:



WARNING

Check to be sure the main disconnect switch is open.

- 1) Check the torch to be sure that it has the proper components (see Section 4.1) and is adjusted properly (see Table 3-A).
- 2) Close the main disconnect switch supplying power to the welding system.

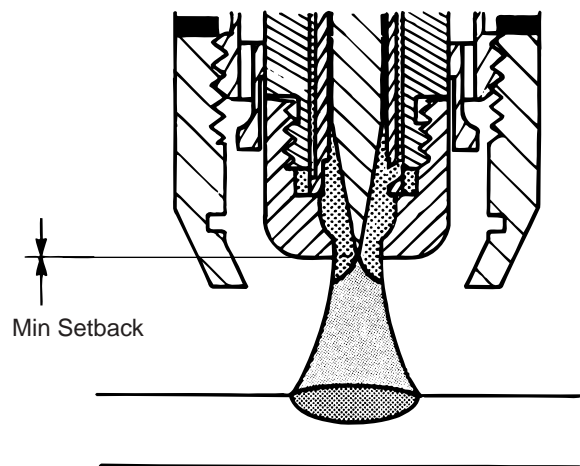


Figure 3-B

When the electrode is at minimum setback (flush with tip face) the plasma gas flow rate can be reduced below the levels given in Table 3-A while maintaining the given current levels. This produces a softer arc that results in less depth of penetration, giving a wider weld bead, and allowing faster travel speeds.

Table 3-A Suggested Starting Parameters for Manual Fusion Welding - Thermal Arc 2A Torch

Material/Thickness		Tip		Electrode			Current Range (Amps)	Plasma Gas (Argon) Flow		Shield Gas 8-15 SCFH (3.8-7.1 lpm)
Inch	mm	Cat. No.	Orifice Dia. (inch)	Std.	Ext.	Gauge*		SCFH	lpm	
Stainless Steel										
0.005	0.13	8-2077	0.014	8-2044	8-2046	4	3-5	0.25-0.5	0.12-0.24	Ar(95%)/H ₂ (5%) or Argon
		8-2078	0.022	8-2044	8-2046	4	3-5	0.25-0.5	0.12-0.24	
		8-2079	0.031	8-2044	8-2046	4	3-5	0.25-0.5	0.12-0.24	
0.010	0.25	8-2080	0.046	8-2044	8-2046	4	4-10	0.25-0.5	0.12-0.24	
0.020	0.051	8-2082	0.062	8-2044	8-2046	4	10-15	0.25-0.5	0.12-0.24	
		8-2024	0.062	8-2033		0	10-15	0.25-0.5	0.12-0.24	
1/32	0.80	8-2083	0.081	8-2044	8-2046	4	20-25	0.4-0.5	0.19-0.24	
				8-2033		4			0.19-0.24	
		8-2023	0.046	8-2033		0	20-30	0.4-0.6	0.19-0.28	
1/16	1.6	8-2023	0.046	8-2033		0	30-35	0.6-0.7	0.28-0.33	
		8-2024	0.062	8-2033		0	30-45	0.6-0.9	0.28-0.42	
3/32	2.4	8-2024	0.062	8-2033		0	45-55	0.9-1.1	0.42-0.52	
		8-2025	0.081	8-2033		0	45-60	0.9-1.2	0.47-0.57	
1/8	3.2	8-2025	0.081	8-2033		0	60-75	1.2-1.5	0.57-0.71	
Carbon Steel										
0.050	1.3	8-2023	0.046	8-2033		0	25-35	0.5-0.7	0.24-0.33	Ar(95%)/H ₂ (5%) or Argon
		8-2024	0.062	8-2033		0	25-40	0.5-0.8	0.24-0.38	
1/16	1.6	8-2024	0.062	8-2033		0	30-50	0.6-1.0	0.28-0.47	
3/32	2.4	8-2025	0.081	8-2033		0	60-75	0.9-1.4	0.42-0.66	
Titanium										
0.010	0.25	8-2080	0.046	8-2044	8-2046	4	4-8	0.25-0.5	0.12-0.24	Argon
0.020	0.51	8-2082	0.062	8-2044	8-2046	4	10-15	0.25-0.5	0.12-0.24	
		8-2024	0.062	8-2033		0	10-15	0.25-0.5	0.12-0.24	
		8-2023	0.081	8-2044	8-2046	4	10-15	0.25-0.5	0.12-0.24	

* Gauge settings are identified by the number of rings on the gauge and are for maximum electrode setback. See Torch Assembly, step 4 for proper adjustment procedure.

NOTE: This information represents our best judgement but Thermal Dynamics Corporation assumes no liability for its use. The parameters listed above may be varied to optimize performance.

- 3) Turn the system on.
- 4) Set the gas supply pressure regulator at 30 psig. Adjust the gas flow rates as required (see Table 3-A).
- 5) Purge for approximately 3 minutes by letting the plasma gas run. This will remove any condensation of moisture that may have accumulated in the torch while it was shut down.

NOTE

Only the plasma gas line needs to be purged.

- 6) Select the welding mode.
- 7) Set the current to the selected amperage level.

The torch is now ready for operation.



WARNING

Read and understand the precautions listed in the front of this manual. Be sure the operator is equipped with proper gloves, clothing and eye protection and that proper ventilation is provided.

3.2. HAND TORCH OPERATION

- 1) Pick up the torch and set the welding system to the operating mode.

CAUTION

The pilot arc is established at this time. Be careful of the direction the torch tip is pointed in so as not to get burned.

- 2.) Lower the welding helmet and position the torch at the beginning of the weld zone. The light from the pilot arc will help to find this position. Hold the torch approximately 3/16 inch from the workpiece and activate the control switch. When the welding arc transfers, adjust the torch standoff and amperage until the desired penetration is achieved. Move the torch along the line of weld at a speed to coincide with the weld puddle to achieve the desired weld quality.
- 3) Deactivate the control switch.
- 4) Switch the welding system to the standby mode (post purge).
- 5) Wait 5 minutes before shutting the system down to allow the torch to cool.

3.3. MACHINE TORCH OPERATION

- 1) Locate the torch at the required starting position for the weld. Adjust the height as required.
- 2) Activate control switch.
- 3) Rate of travel of the torch will depend on the material and type of weld. This will have to be determined by the operator.
- 4) After the weld is completed, deactivate the control switch.
- 5) Put the welding system in the standby mode (post purge).
- 6) Wait 5 minutes before shutting the system down to allow the torch to cool.

SERVICE

The Service Section is divided into two parts:

- 4.1. Torch Maintenance
- 4.2. Torch Leads

4.1. TORCH MAINTENANCE



WARNING

Check to be sure the main disconnect to the welding system is open before disassembling the torch.

Torch Disassembly and Inspection

CAUTION

The electrode cap has an O-ring seal to prevent gas leakage. It is important to observe the following precautions for the O-ring:

- A) Make sure that the groove and the surface that the O-ring will seal against are clean and free of nicks and scratches.
- B) Check to see that the O-ring is not cut or cracked.

- C) Lubricate O-ring with a light coating of Cat. No. 8-4025 O-ring lubricant. This should be used sparingly, just enough to make the O-ring slippery, but not enough to accumulate in the torch.

Disassemble the torch as follows:

- 1) Unscrew the ceramic shield cup (1).

CAUTION

Hold the torch with the tip end up to prevent the gas distributor from falling out and breaking.

- 2) Using the wrench (10), unscrew the tip (2).
- 3) Unscrew the electrode cap (9) while still holding torch tip end up. Slowly lower the cap until the collet (7), and the electrode (8) can be grasped with fingers. The gas distributor (3) will come out with the electrode and collet.

Torch Assembly



WARNING

Primary power to the welding system must be disconnected before assembling the torch.

- 1) Insert the electrode (8) in the collet (7) and then this assembly into the rear of the torch head (5). Hold in place with finger.

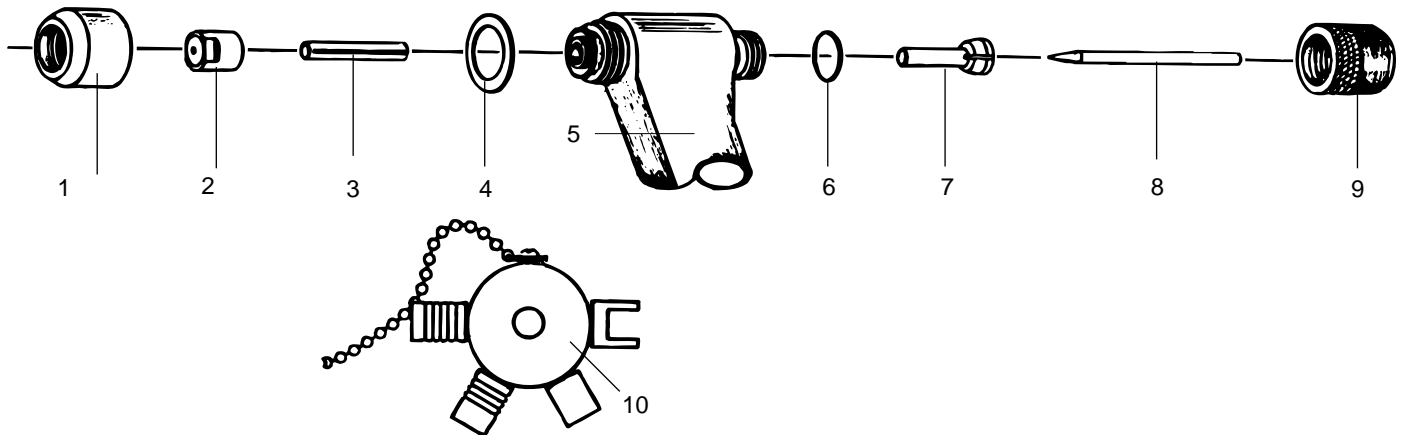


Figure 4-A Torch Parts Explosion

- | | |
|------------------------|----------------------------|
| 1. Shield Cup | 6. O-ring |
| 2. Tip | 7. Collet |
| 3. Gas Distributor | 8. Electrode |
| 4. Gasket | 9. Electrode Cap |
| 5. Basic Head Assembly | 10. Wrench & Gage Assembly |

- 2) Turn the torch upside down and slide the gas distributor (3), (end with holes in last), into the torch.

CAUTION

Care must be taken to insure that the gas distributor (3) is installed in the correct direction.

- 3) Screw the electrode cap (9) on firmly then back off a couple of turns so that the electrode (8) can be adjusted.
- 4) Select the proper gauge on the gauge and wrench (10) assembly. The electrode (8) must contact the gauge to be properly adjusted (Fig. 4-B). Insert the gauge into the front of the torch and press until the shoulder of the gauge contacts the torch anode (Step 2, Fig. 4-B). Tighten the electrode cap (9) securely while holding pressure against the gauge.
- 5) Install the welding tip (2) and tighten gently with the tip wrench (10).
- 6) Stretch the gasket (4) over the front end of the torch and position against the torch body.
- 7) Screw on shield cup (1).

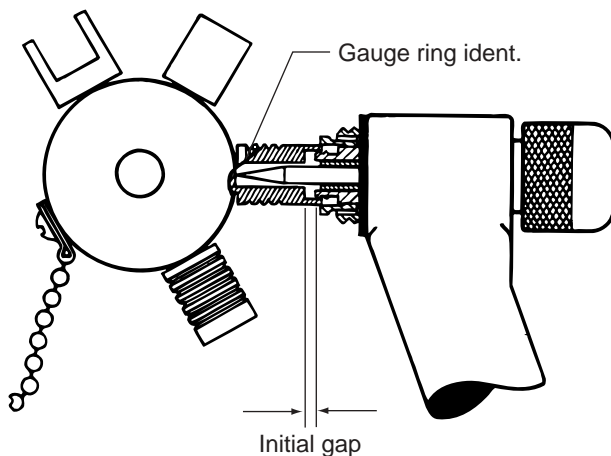
The torch is now assembled and ready to be checked for possible leakage before operating. Turn on the torch coolant recirculator and observe the tip and orifice of the torch for possible sign of moisture.

Turn on the plasma gas and watch the gas stream for possible signs of moisture in the stream before operating. Do not attempt to operate the torch until the source of the moisture has been identified and corrected.

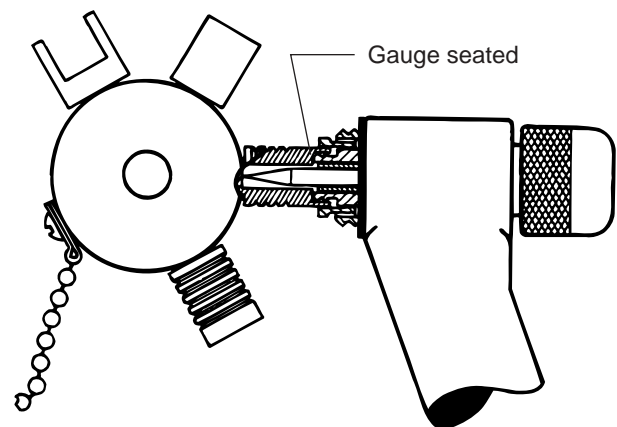
4.2. TORCH LEADS REPLACEMENT

Hand Torch

- 1) Cut off the shrink-on tubing that is at the end of the handle and leads sleeving.
- 2) Unscrew the handle from the torch.
- 3) Disconnect the four hoses from the torch.
- 4) Remove the handle from the old leads and insert on new leads.
- 5) Connect the new leads to the torch making sure the color coded leads mate with their color coded torch fittings. Do not over-tighten.
- 6) Screw the handle back onto the torch.
- 7) Slide the new shrink-on tubing over the handle until 1/2 of it is on the handle. Shrink the tubing with heat (not flame) until it is firm around the handle and sleeving.



Step 1



Step 2

Figure 4-B Gaging Electrode

Machine Mounted Torch

- 1) Unscrew the nut holding the positioning tube to the torch assembly. Slide the positioning tube back away from the torch.
- 2) Unscrew the sleeve adaptor from the torch. Slide up the leads until the torch fittings are accessible.
- 3) Disconnect the four hoses from the torch.
- 4) Remove the nut, sleeve adaptor and positioning tube from the old leads and install on the new leads at the torch end in the same order as they were on the old leads.
- 5) Connect the new leads to the torch making sure the color-coded leads mate with the color-coded torch fittings. Do not overtighten.
- 6) Screw the sleeve adaptor back onto the torch.
- 7) Slide the positioning tube over the sleeve adaptor and secure with the nut.

4.3 TORCH LEADS REPAIR



WARNING

Power to the system must be turned off.

If repair is needed to the console end of the leads, then disconnect at the console. To repair the leads at the torch end, disconnect as in the preceding steps according to the type of torch being used, then proceed as follows:

Positive and Negative Leads (Torch End)

- 1) To replace the fittings at the torch end, cut the hose (only) just behind the ferrule. Grip the fitting and slide the hose back 4 to 6 inches. Clamp the wire lead at the end of the hose to prevent the hose from sliding back down over the fitting. Cut the old fitting off where the wire lead goes in.
- 2) Slide the new ferrule onto the wire lead.
- 3) Insert the wire lead into the small end of the new fitting up to but not beyond the stop.
- 4) Crimp the wire lead into place with a 16-14 AWG crimping tool. It is important to crimp the whole length of the solid diameter from the slot to the end.

- 5) Use the same crimping tool to crimp the wire stop in the slot out of the way. This is necessary to insure proper coolant flow.
- 6) Remove the clamp from the wire lead and push the hose over the glands onto the fitting.
- 7) Slide the ferrule onto the hose and fitting until it rests over the glands. Crimp using a 5/16 diameter crimping die, Scovill No. 46 or equivalent.

Positive and Negative Leads (Console End)

- 1) To replace the fittings on the console end, cut the hose (only) just behind the ferrule. Grip the fitting and slide the hose back 4 to 6 inches. Clamp the wire lead at the end of the hose to prevent the hose from sliding back down over the fitting. Cut the old fitting off where the wire lead goes in.
- 2) Slide the new ferrule onto the wire lead and then the nut (in the right direction).
- 3) Insert the wire lead into the small end of the new fitting up to but not beyond the stop.
- 4) Crimp the wire lead into place with a 16-14 AWG crimping tool. It is important to crimp the whole length of the solid diameter from the slot to the end.
- 5) Use the same crimping tool to crimp the wire stop in the slot out of the way. This is necessary to insure proper coolant flow.
- 6) Slide the nut onto the fitting.
- 7) Remove the clamp from the wire lead and push the hose over the glands, onto the fitting.
- 8) Slide the ferrule onto the hose and fitting until it rests over the glands. Crimp using a 7/16 diameter crimping die, Scovill No. 46 or equivalent.

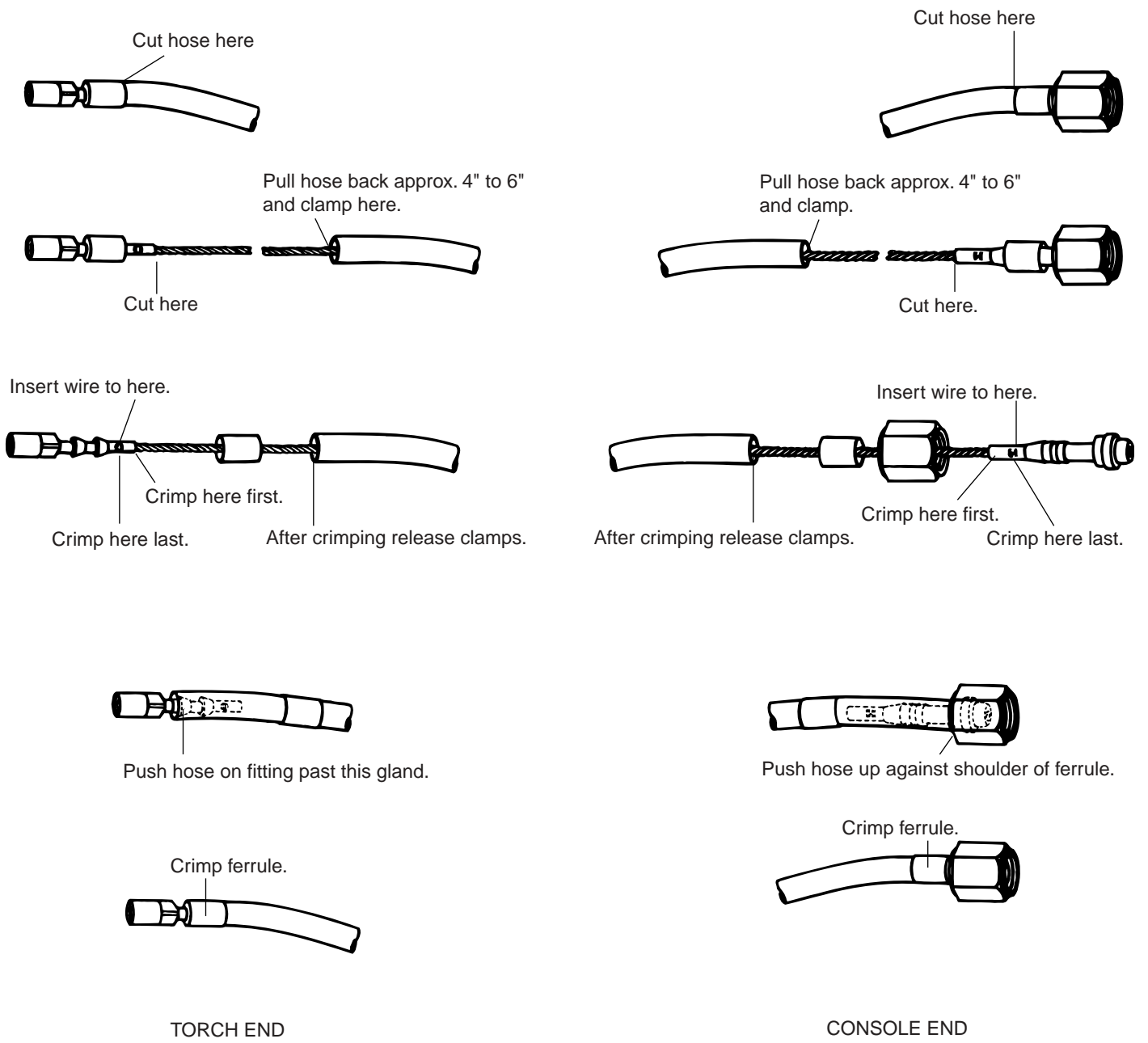


Figure 4-C Leads Fitting Replacement

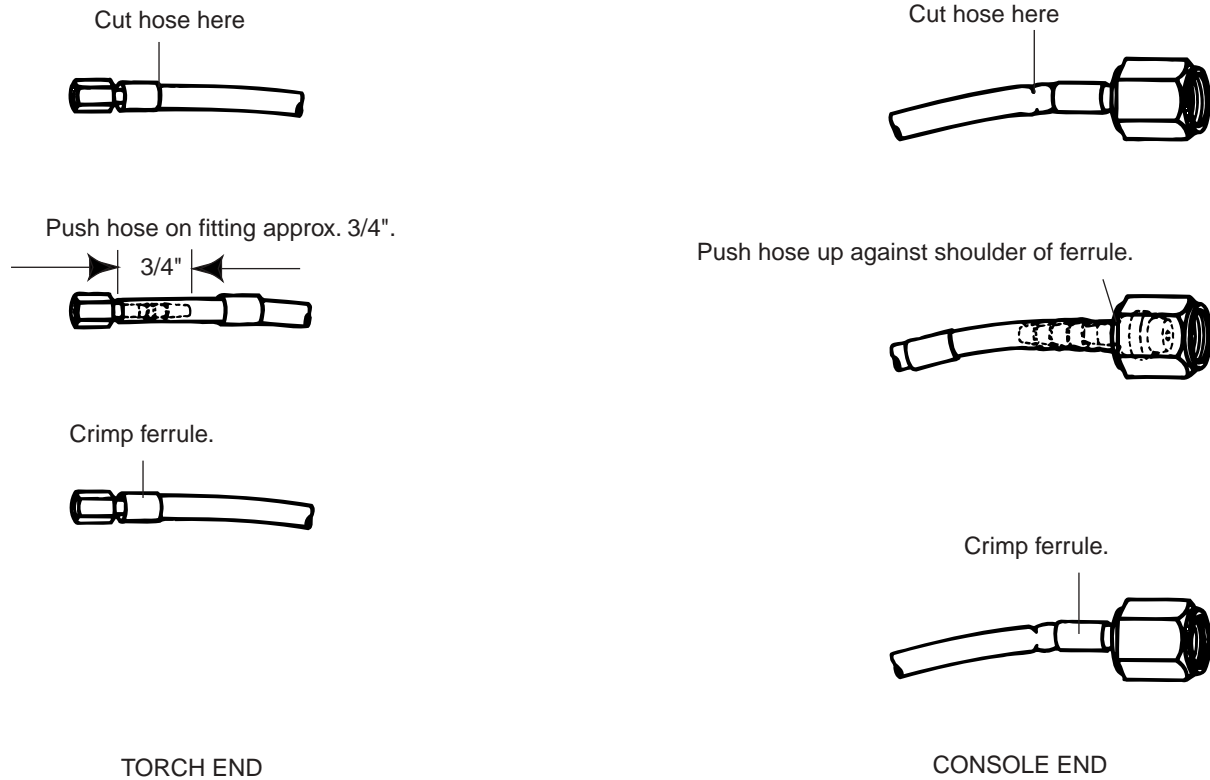


Figure 4-D Gas Fitting Replacement

Gas Hoses (Torch End)

- 1) Cut the gas hose just behind the ferrule.
- 2) Assemble the nut (threaded end first) over the fitting.
- 3) Slide the new ferrule over the hose and then slide the hose onto the fitting until it is approximately 1/4" past the last gland on the fitting.
- 4) Slide the ferrule over the hose and fitting until it rests over the glands. Crimp in place using a 1/4" diameter crimping die, Scovill No. 47 or equivalent.

Gas Hoses (Console End)

Follow Steps 1 through 3 for the torch end.

- 4) Slide the ferrule over the hose and fitting until it rests over the glands. Crimp in place using a 5/16" diameter crimping die, Scovill No. 46 or equivalent.

PARTS LIST

5.1. GENERAL ARRANGEMENT

Assembly Parts List

The Assembly Parts List consists of illustrated parts lists of the following:

Figure 5-1. 2A Series Welding Torch

Figure 5-2. 2A Torch Assembly

Figure 5-3. 2A Torch Leads Assembly

An item number in parentheses indicates the item is located behind the item pointed to. An asterisk beside the item number indicates the part is a main assembly, not a component. Parts listed without item numbers are not illustrated, but may be ordered by the catalog number shown.

ORDERING INFORMATION

When ordering replacement parts, order by catalog number and complete description of the part or assembly, as given in the description column of the Assembly Parts List. Address all inquiries to your authorized Thermal Dynamics distributor.

RETURNS

If a Thermal Dynamics' product must be returned for service, contact your Thermal Arc distributor. Material returned to Thermal Dynamics without proper authorization will not be accepted.

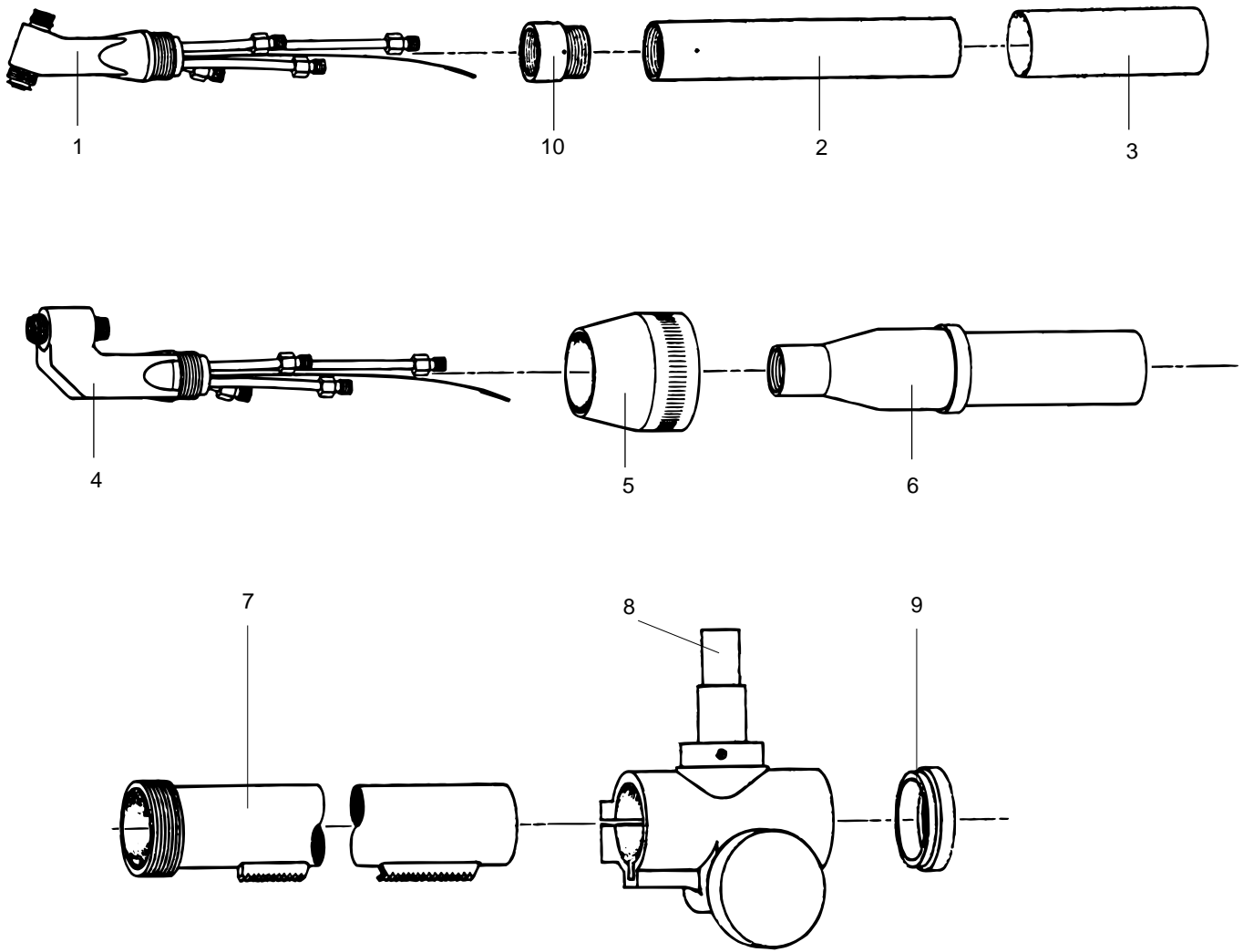


Figure 5-1 2A Welding Torch

Fig.	Item No.	Qty.	Catalog Number	Description
5-1	1	1	8-2027	700 Torch Head Assembly
5-1	1	1	8-2028	900 Torch Head Assembly
5-1		1	9-5558	Handle Assembly (includes 2 & 10)
5-1	2	1	9-1757	Handle
5-1	3	1	8-1204	Shrink-on Tubing
5-1	4	1	8-2097	Machine Mounted Torch Head Assembly
5-1	5	1	8-4018	Nut
5-1	6	1	8-2063	Sleeve Adaptor
5-1	7	1	8-5005	Positioning Tube
5-1	8	1	7-2827	Pinion Assembly
5-1	9	1	8-4204	Bushing
5-1	10	1	9-5557	Handle Adapter

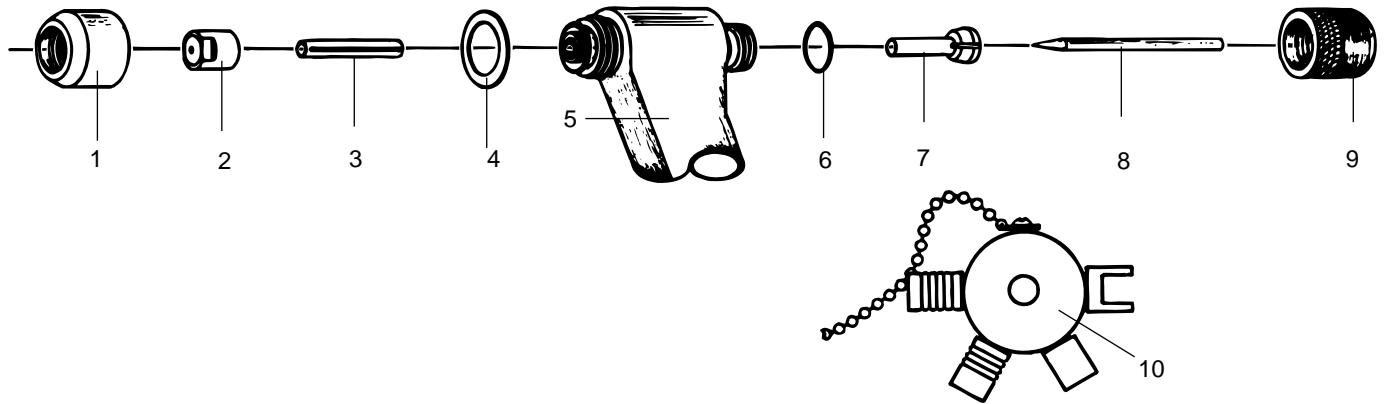


Figure 5-2 2A Torch Explosion

Fig.	Item No.	Qty.	Catalog Number	Description
5-2	1	1	8-2071	Shield Cup-Standard Weight
5-2	2	1		Tip (Packaged in Lots of 10)
	Standard:		8-2023	Tip - .046, 35 amp
			8-2024	Tip - .062, 55 amp
			8-2025	Tip - .081, 75 amp
5-2	3	1	8-2040	Gas Distributor-Straight Polarity
5-2	4	1	8-2036	Gasket-Shield Cup
5-2	5			Basic Head Assembly
5-2	6	1	8-2035	O-Ring
5-2	7	1	8-2039	Collet-Straight Polarity
5-2	8	1	8-2033	Electrode-Straight Polarity
5-2	9	1	8-2032	Electrode Cap-Standard
5-2	10	1	8-2021	Gauge and Wrench Assembly
	"MAX SHIELD" Parts:			
5-2	1	1	8-2076	Shield Cup- w/Gas Lens
5-2	2	1		Tip (Packaged in Lots of 10)
	Long:		8-2077	Tip - .014, 5 amp
			8-2078	Tip - .022, 5 amp
			8-2079	Tip - .031, 5 amp
			8-2080	Tip - .046, 10 amp
			8-2082	Tip - .062, 15 amp
			8-2083	Tip - .081, 25 amp
5-2	3	1	8-2042	Gas Distributor (.040)
5-2	7	1	8-2041	Collet (.040)
5-2	8	1	8-2044	Electrode- Long Tip (.040)
5-2		1	8-2046	Extended Electrode- Long Tip (.040)
5-2	9	1	8-2030	Electrode Cap-Extended

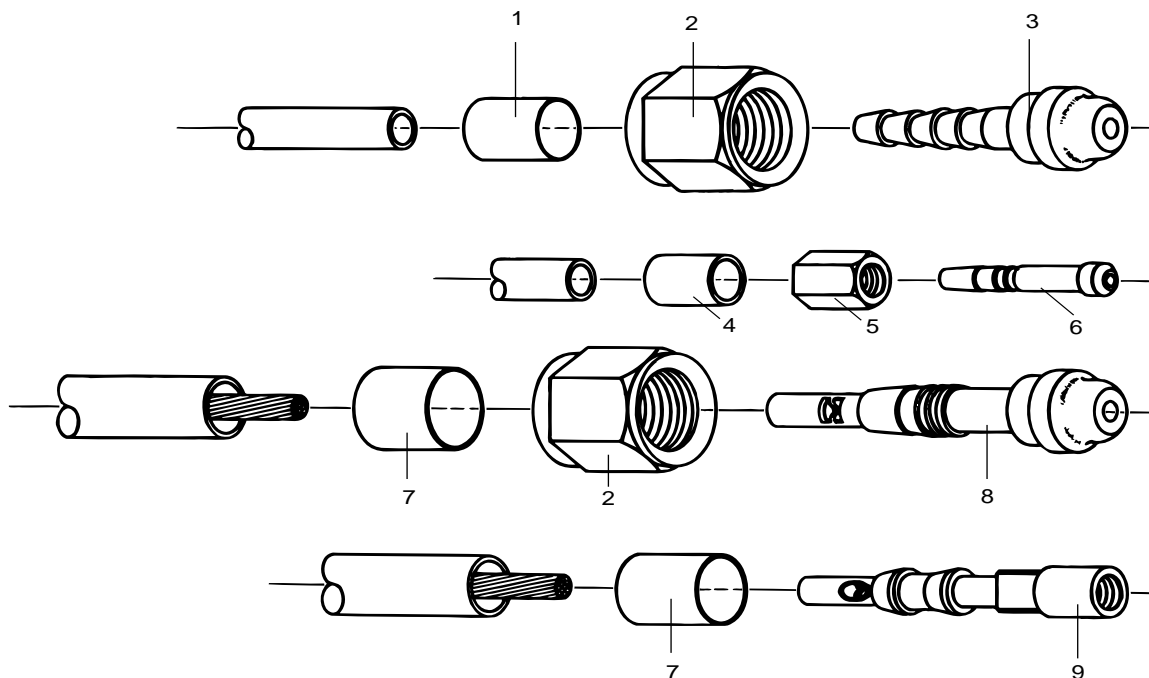


Figure 5-3 2A Torch Leads and Hose Fittings

Fig.	Item No.	Qty.	Catalog Number	Description
5-3		1	4-2539	2A Torch Leads - 12.5 ft.
5-3		1	4-2585	2A Torch Leads - 25 ft.
5-3		1	9-2105	Negative Torch Lead - 12.5 ft.
5-3		1	8-1494	Negative Torch Lead - 25 ft.
5-3		1	9-2107	Positive Torch Lead - 12.5 ft.
5-3		1	8-1495	Positive Torch Lead - 25 ft.
5-3		1	8-1074	Plasma Gas Hose - 12.5 ft.
5-3		1	8-1496	Plasma Gas Hose - 25 ft.
5-3		1	8-1075	Shield Gas Hose - 12.5 ft.
5-3		1	8-1497	Shield Gas Hose - 25 ft.
5-3		1	8-3138	Torch Leads Sleeving - 12.5 ft.
5-3		1	8-3139	Torch Leads Sleeving - 25 ft.
5-3		1	8-1204	Shrink-on Tubing
5-3	1	1	8-5012	Ferrule - Console End
5-3	2	1	8-5015	Nut - Console End (+ & -)
5-3	3	1	8-0328	Fitting, Console End
5-3	4	1	8-2064	Ferrule, Torch End
5-3	5	1	8-2061	Nut, Torch End
5-3	6	1	8-0335	Fitting, Torch End
5-3	7	1	8-3013	Ferrule - Both Ends
5-3	8	1	8-3034	Fitting - Console End (+ & -)
5-3	9	1	8-2069	Fitting - Torch End (+ & -)