



***Plasma Welding  
Power Supply***

***Ultima 150***

**Operating Manual**

October 4, 2002

Manual No. 0-2472



## WARNINGS

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

*While the information contained in this operators manual represents our best judgement, Thermal Dynamics Corporation assumes no liability for its use.*

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ULTIMA-150 Plasma Welding Operating Manual  
Number 0-2472

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**Record the following information for Warranty purposes:**

Where Purchased: \_\_\_\_\_

Purchase Date: \_\_\_\_\_

Power Supply Serial #: \_\_\_\_\_

Torch Serial #: \_\_\_\_\_

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# SECTION 1: 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).

	<b>Parts</b>			
	<b><u>XL Plus &amp; CutMaster Series</u></b>	<b><u>Parts Cougar/ Drag-Gun</u></b>	<b><u>Parts All Others</u></b>	<b><u>Labor</u></b>
<b><u>PAK Units, Power Supplies</u></b>				
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
<b><u>Consoles, Control Equipment, Heat Exchanges, And Accessory Equipment</u></b>	1 Year		1 Year	1 Year
<b><u>Torch And Leads</u></b>				
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
<b><u>Repair/Replacement Parts</u></b>	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

# SECTION 2: GENERAL INFORMATION

## 2.01 Scope of this Manual

This manual provides operating instructions and basic maintenance procedures for the Thermal Arc ULTIMA-150® Plasma Welding Power Supply. Service of this equipment is restricted to Thermal Dynamics trained personnel; unqualified personnel are strictly cautioned against attempting repairs or adjustments not covered in this manual, at the risk of voiding the warranty.

Read this manual thoroughly. A complete understanding of the capabilities and functions of the equipment will assure the dependable operation for which it was designed.

## 2.02 ULTIMA-150 Power Supply Description

The ULTIMA-150 Plasma Welding Power Supply is one integrated unit providing power, pilot control inverter, and coolant recirculator. With output ranges from 0.5-15 amps and 5-150 amps, the power supply is ideally suited for all low current gas tungsten arc welding (GTAW) and automated welding applications. Suitable for use with all designated Thermal Dynamics plasma welding torches.

## 2.03 ULTIMA-150 Power Supply Specifications

### A. Input Power

200 VAC ±10%	50/60hz, 1 or 3 phase
208 VAC ±10%	50/60hz, 1 or 3 phase
230 VAC ±10%	50/60hz, 1 or 3 phase
380 VAC ±10%	50/60hz, 1 or 3 phase
415 VAC ±10%	50/60hz, 1 or 3 phase
460 VAC ±10%	50/60hz, 1 or 3 phase
575 VAC ±10%	50/60hz 3 phase (available with optional Transformer Module only)

### B. Output Power

#### 1. Output Amps

Range I - 0.5 to 15 amps DC Straight Polarity  
Range II - 5 to 150 amps DC Straight Polarity

#### 2. Duty Cycle

60% Duty Cycle @ 40°C, 150 amp output  
100% Duty Cycle @ 40°C, 100 amp output

#### 3. Pilot Arc Output

2-15 amp Variable, Continuous Pilot Arc  
Pilot Arc Output 100% Duty Cycle @ 40° C

### C. Fuse

3A, 500V (1FU) Fuse

### D. Protection Features

A number of interlocks have been provided to assure proper handling of fault conditions at all times.

- Coolant flow and level - Monitored and shut down the recirculator pump when below minimum levels.
- Pump operation - System shuts down due to air in torch leads or in the system.
- Coolant and power supply - Over temperature of the power supply or coolant will immediately disable the power supply output. The recirculator pump remains running for system and coolant cool down.
- Plasma gas and shield gas - Both have minimum pressure switches that disable pilot arc operation.
- Pilot arc - Always latched off in event of power supply interlock trip. The pilot must be disabled and then re-energized to initiate the pilot arc after a fault shutdown.

### E. Gas Supply

Plasma Gas - 0.5-3.0 scfh

Shield Gas - 5.0-30 scfh

### F. Coolant Reservoir Capacity

2 gallon Coolant Reservoir; Thermal Arc® Coolant only

### G. Weight

130 lbs (59 kg) - ULTIMA-150 Power Supply only

150 lbs (68kg) - shipping weight (including coolant and torch)

### H. Dimensions

18" high (457 mm) x 15" wide (381 mm) x 28.5" deep (724 mm)

## 2.04 The ULTIMA-150 System

The ULTIMA-150 Plasma Welding System includes the following components:

- ULTIMA-150 Power Supply with 10 ft Gas Supply Hoses (2)
- Quick Disconnect Torch with leads (torch type and lead length as ordered)
- Torch Spare Parts Kit
- Thermal Arc Coolant - 2 gallons
- 10 ft Work Cable with Cable Lug connector.



Figure 2-1 The ULTIMA-150 System

## 2.05 Requirements to Complete System

To complete the system, the user needs the following:

- Remote signal to operate Arc ON/OFF via TB-1 interface or J-20 receptacle using accessory remote device
- Gas Pressure Regulators. Both Argon Gas Regulator and Argon/Hydrogen Gas Regulators are available through Thermal Dynamics
- Power Input Cable

## 2.06 Options, Accessories, and Replacement Parts

Options and accessories are available for the ULTIMA-150 Plasma Welding Power Supply to customize it for a particular application or to further enhance performance. For more information, refer to Section 6, Parts Replacement.

- Quick Disconnect Adapter Kit - For use with older model Thermal Arc torches. The Adapter Kit retrofits the torch for direct connection to the quick disconnect receptacle on the Power Supply.
- Torch Spare Parts Kit - Kit contains replacement front end torch parts.
- 575-Volt Transformer Module - A step-down transformer which converts 575V primary power to 460V for use with the ULTIMA-150 Plasma Welding Power Supply.
- Remote Current Control Device - Required for operation of the ULTIMA-150 Plasma Welding System.
- Weld Sequencer - An add-on accessory for controlling weld timing, pulsing, current slope, and gas slope.
- Coolant Pressure Gauge Assembly Kit - This kit allows for easy monitoring and adjusting of coolant pressure.

## 2.07 Introduction to Plasma Arc Welding

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 gas to transfer an electric arc to the work piece. The metal to be welded is melted by the heat of this arc.

In a Thermal Arc Plasma Welding Torch, a cool gas such as argon enters Zone A (Figure 2-2). 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 work piece through the column of gas in Zone C.

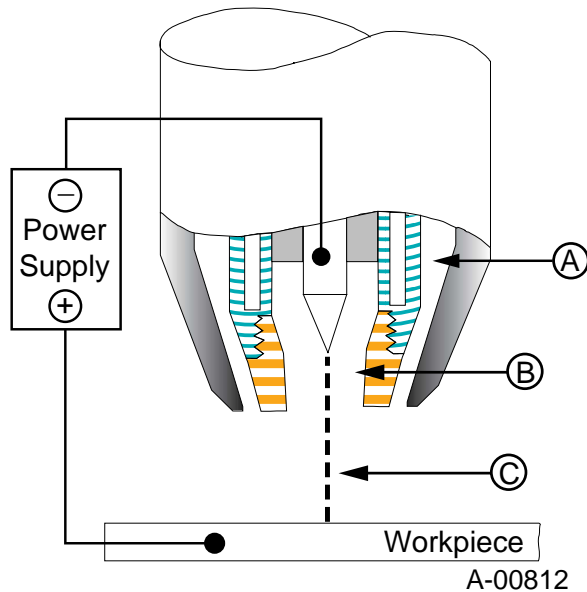


Figure 2-2 Thermal Arc Plasma Welding

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 (DCSP) is used for plasma welding, as shown in the illustration.

The exclusive 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, shielding the welding puddle.

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 (lower plasma gas flow). Full penetration or 'keyhole' welding requires a stiff arc (high plasma gas flow).

Individual welding torch instruction manuals contain detailed information on these parameters.

## 2.08 Theory of Operation

### A. Plasma and Shield Gases

Plasma and shield gases flow through the ULTIMA-150 at rates set at the console flow meter controls. The flow rate of each gas is indicated on the front panel flow meters. Solenoid valves inside the unit turn the gases on and off. The gas pressure interlock shuts the system down if plasma gas pressure falls below 25 psi.

The plasma gas flows through the positive (black) torch lead, around the electrode and gas distributor, and out through the tip orifice. The shield gas flows through the negative (yellow) torch lead, around the torch front end and out through the shield cup.

Two pressure switches act as an interlock for the gas supply. If supply pressure falls below minimum requirements the pressure switches will open, shutting off the power to the contactor, and the GAS indicator, will go out. When adequate gas supply pressure is available the pressure switches close, allowing power to be resumed for welding.

### B. Pilot Arc

When the torch is started a pilot arc is established between the electrode and cutting tip. This pilot arc creates a path for the main arc to transfer to the work. Direct current (DC) alone is not enough to start the main welding arc. High frequency is used momentarily. The high frequency jumps between the tip and electrode with the DC following, then the high frequency turns off. The Pilot Indicator will be lighted when the pilot arc is enabled.

### C. Current Control

The welding current is controlled by remote or at the power supply. The weld arc ON/OFF is controlled remotely by the user - by remote pendant, foot control, or remote signal.

### D. Coolant Flow

Coolant flows from the coolant recirculator, through the negative torch lead to the torch head and returns through the positive torch lead. The coolant pressure interlock shuts the system down if the coolant pressure falls below 35 psi.

### E. Welding Current

The power supply provides the welding current. The negative (green) output is connected to the torch electrode through the liquid cooled lead. The positive output is connected to the workpiece through the work cable.





# SECTION 3: INSTALLATION

## 3.01 Introduction

This section describes installation procedures for the ULTIMA-150 Power Supply. These instructions apply to the power supply only; installation procedures for options and accessories can be found in manuals provided for those components.

## 3.02 Site Location

Select a clean, dry location with good ventilation and adequate working space around all components. The power supply is cooled by air flow through the front and rear. Air flow must not be obstructed. At least 2 feet (0.61 m) of clearance should be provided at the front and rear with at least 6 inches (0.15 m) of clearance on each side.

### CAUTION

*Operation without proper air flow will inhibit proper cooling and reduce duty cycle.*

### NOTE

*Review the safety precautions in the front of this manual to be sure that the location meets all safety requirements.*

## 3.03 Unpacking

The ULTIMA-150 is carefully packed to protect it from damage during shipping. Components may be packed in one carton or separately in several cartons, depending on the system configuration and accessories ordered.

1. Unpack each item and remove all packing material.
2. Locate the packing list(s) and use the list to identify and account for each item.
3. Inspect each item for possible shipping damage. If damage is evident, contact your distributor before proceeding with installation.

## 3.04 Primary Input Power Connections

The ULTIMA-150 Plasma Welding Power Supply accepts input voltages from 200V to 460V. Input can be 50 or 60 Hz, single-phase or three-phase.

The primary power source, power cable, and plug (supplied by user) must conform to the local electric code and the recommended circuit protection and wiring requirements. (See Appendix I for requirements.)

### NOTE

*Every system is factory-wired for 460V three-phase input. For any other input voltage, the power supply must be reset by the user. Refer to Section 3.05, Voltage Changeover, for instructions on how to change the voltage setting.*

For 575 Volt operation, an optional Transformer Module is available. It is factory set to step down to 460V three-phase input.

### NOTE

*Input power connections can be made directly to a properly fused disconnect or by using a plug which conforms to the recommended ratings.*



### WARNING

*Disconnect primary power at the source before assembling the power supply, torch parts or torch and leads assemblies.*

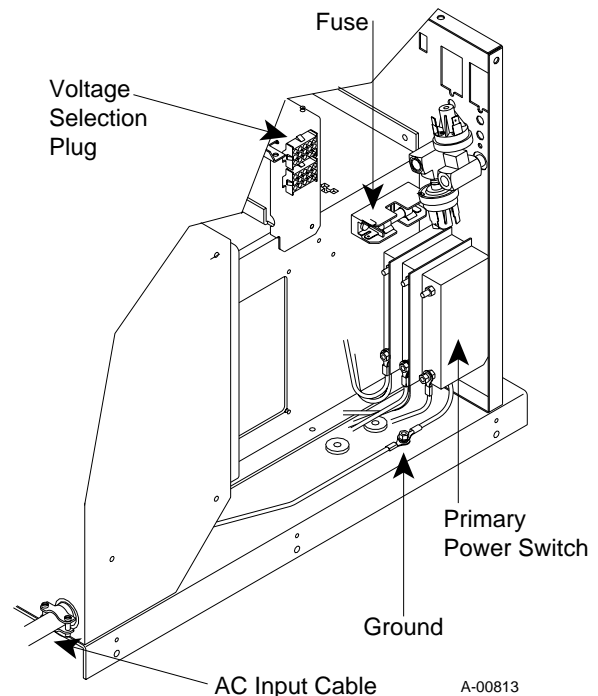


Figure 3-1 Internal View Power Input Connections

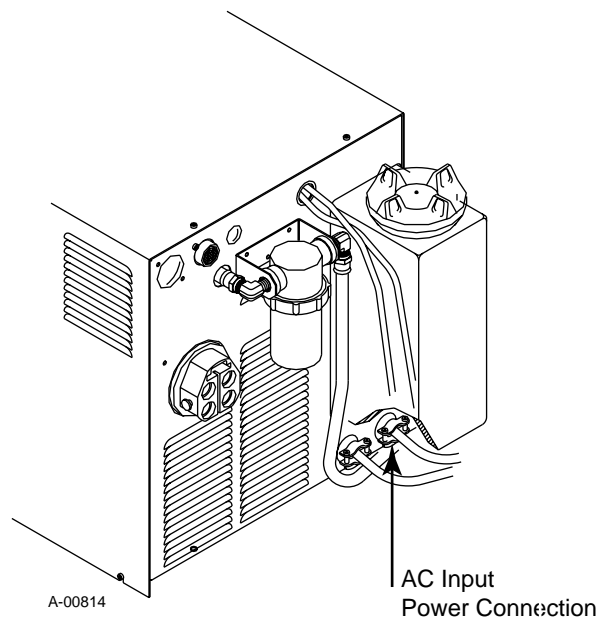


Figure 3-2 Rear Panel Input Power Connection

### A. Connections for Single-Phase

Single-phase operation requires a 2-conductor cable with ground.

1. Remove the Enclosure Cover from the unit to set up the correct electrical service.
2. Feed AC input cable through the strain relief on rear panel of unit and tighten the strain relief screws.
3. Insert the ground wire into the terminal marked GND (ground) and tighten the set screw.
4. Connect the other two wires to terminals L1 and L2 located on the top end of the Main Circuit Breaker (MCB). L1 is the left terminal and L2 is the center terminal when viewing the MCB from the rear.

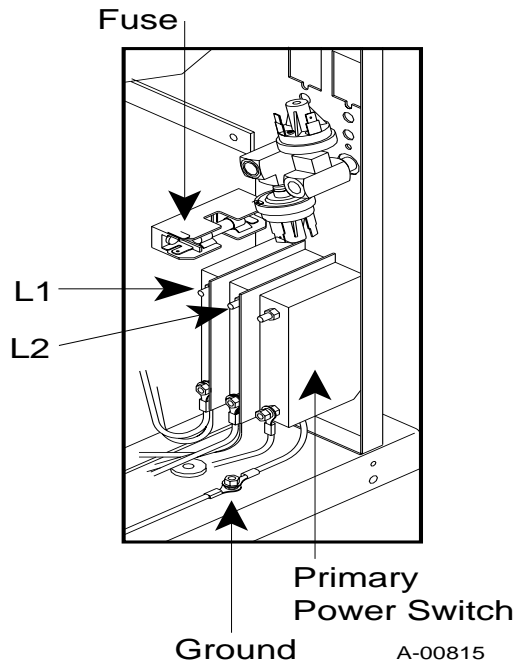


Figure 3-3 Single-Phase Input Connections



Make sure the ground wire is designated GND on the other end of the cable. Electric shock and damage to the unit could occur if power is applied to the GND terminal.

## B. Connections for Three-Phase

Three-phase operation requires a 3-conductor cable with ground.

1. Remove the Enclosure Cover from the unit to set up the correct electrical service.
2. Feed AC input cable through the strain relief on rear panel of unit and tighten the strain relief screws.
3. Insert the ground wire into the terminal marked GND (ground) and tighten the set screw.
4. Connect the other three wires to terminals L1, L2, and L3 located on the top end of the Main Circuit Breaker (MCB). L1 is the left terminal, L2 is the center terminal, and L3 is the right terminal, when viewing the MCB from the rear of the unit. Tighten set screws.

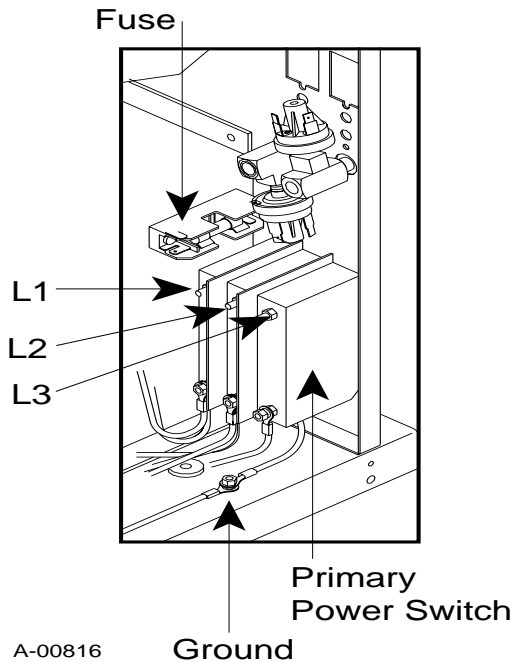


Figure 3-4 Three-Phase Input Connections

## C. 575 Volt Operation

575V input is handled by an optional step-down Transformer Module (Catalog No. 7-3315). When used, input power is connected directly to the Transformer Module. Refer to Manual No. 0-2498 for detailed installation instructions.

## 3.05 Voltage Changeover

The ULTIMA-150 Plasma Welding Power Supply is factory-wired for high voltage operation, greater than 380VAC. Voltage changeover is required for low voltage operation (200-230VAC).

### NOTE

*If the voltage selection plug is improperly set, the 3 amp fuse (1FU) located near the Main Circuit Board (MCB) will blow to protect the power supply.*

1. Locate the High-Low Voltage Selection Receptacle.
2. Move the Voltage Selection Plug into the appropriate receptacle: the bottom receptacle is for 208-230VAC, the top receptacle is for 380-460 VAC.

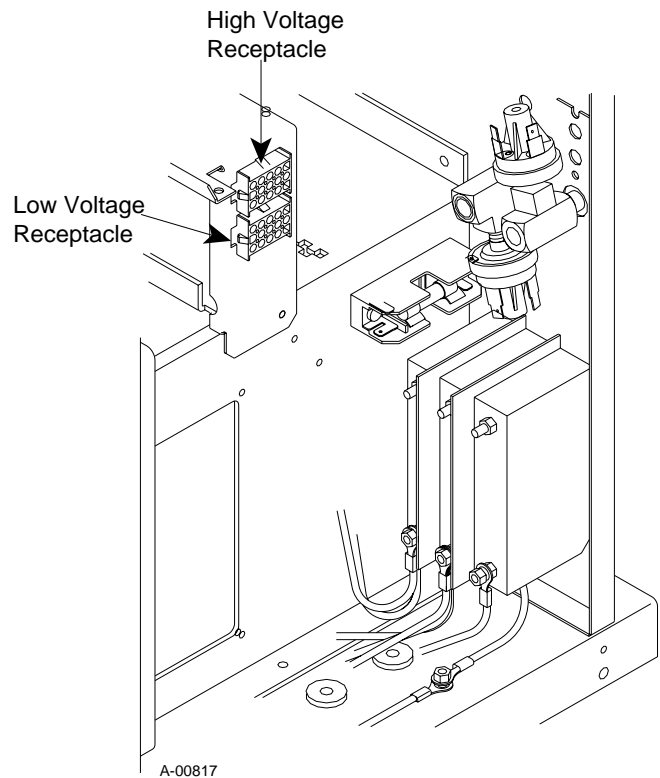


Figure 3-5 High-Low Voltage Selection Detail

### 3.06 Work Cable Connection

High frequency pilot arc initiation generates a certain amount of electromagnetic interference (EMI), commonly called RF noise. This RF may interfere with other electronic equipment such as CNC controllers, etc. The system is designed with shielded torch leads to help prevent this problem. To further minimize RF interference, make sure the work cable is properly connected when installing mechanized systems.

1. Make sure the work cable is securely fastened to the WORK connection on the rear panel of unit.
2. Make a solid connection between the work cable and the work piece or welding machine.

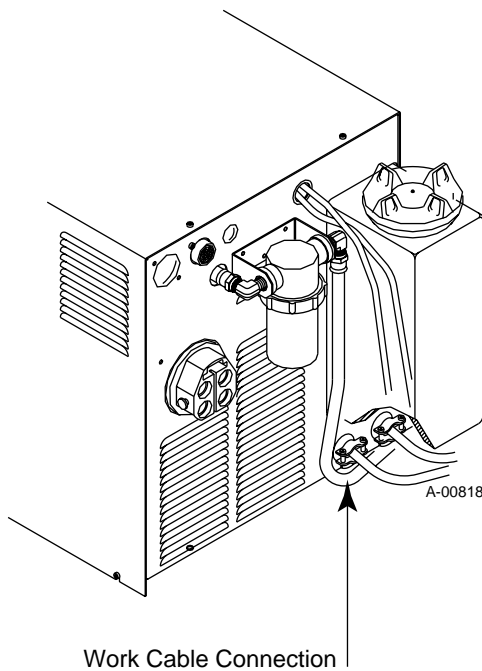


Figure 3-6 Rear Panel Work Cable Connection



#### **WARNING**

*Make sure the ground wire is designated GND on the other end of the cable. Electric shock and damage to the unit could occur if power is applied to the GND terminal.*

### 3.07 Plasma and Shield Gas Connections

The ULTIMA-150 power supply comes with two 10' gas supply hoses. Plasma and shield gases are connected at the rear of the ULTIMA-150 power supply unit.

#### **NOTE**

*It is not recommended to supply both plasma and shield gas from one (1) regulator via "Y" connections. It is an additional source for leaks and flow rates of the gases can be impacted when one is changed.*

1. Connect the Plasma (black or no tape) and Shield (yellow tape) gas supply hoses from the rear of the unit to the gas supply regulators.
2. Set pressure regulators on gas cylinders at 35 psi.

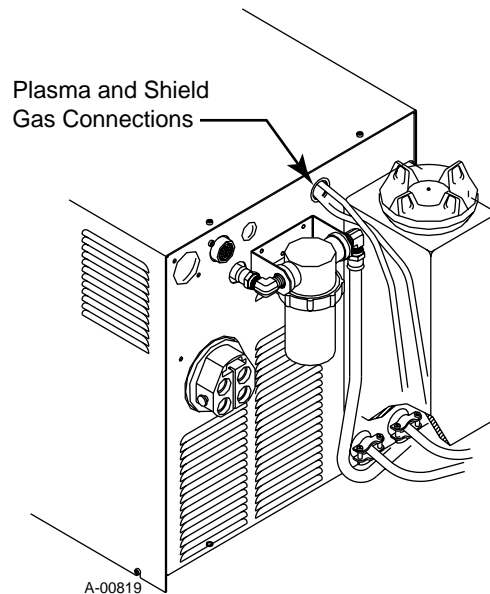


Figure 3-7 Gas Connections

3. Plasma gas flows when the main power circuit breaker is turned on. Gas flow rates are controlled by the Plasma and Shield gas flow meters located on the front panel. Gas flow rates typical for most applications are:

Plasma Gas: 1 - 1.5 scfh

Shield Gas: 15-20 scfh

4. Shield gas can be selected to operate ON or OFF when the pilot arc is off. For Shield gas ON, jumper across TB1 pins 17 to 18.

### 3.08 Torch Connection

The PWH/M Quick Disconnect Torch connects directly to the quick disconnect fitting labelled TORCH on the rear panel of the ULTIMA-150 power supply.

Older model Thermal Arc torches can also be used with the ULTIMA-150 but require the optional Quick Disconnect Adapter Kit to do so. See Section 6, Parts Replacement for more information.

Note: Make sure ALL pins are clean and dry before making connection.

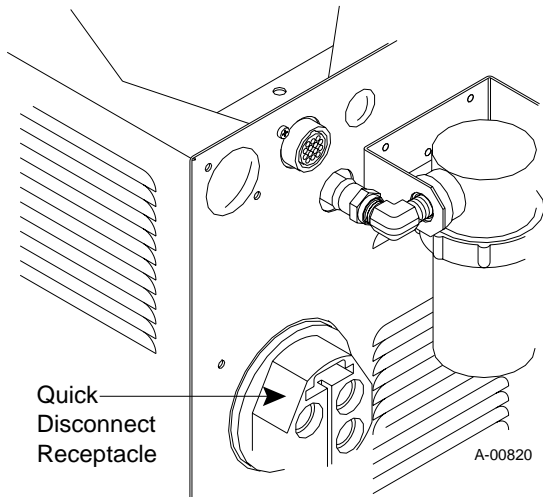


Figure 3-8 Detail of Torch Quick Disconnect



#### WARNING

Make sure there is no moisture or coolant on the Torch Quick Disconnect. Use compressed air to dry the power pins and receptacles before making connections.

#### NOTE

For information on installing and operating plasma welding torches, see the appropriate manual.

### 3.09 Remote Connections

#### A. Using the STANDARD (J20) Connector

The J20 connector on the rear panel of the ULTIMA-150 is factory-wired for convenience. The remote wiring is connected to the TB1 terminal strip on the Logic Display Board inside the unit, as follows:

TB1 Connection	Description
3 & 4	Weld Arc On
12 & 13	Pilot Arc On
19, 20 & 21	Remote Weld Current

1. Connect the remote cable connector to the J20 connector on the rear of the unit labelled STANDARD.
2. If modifications need to be made, see Appendix III, for Remote Function and Control Signal Assignments.
3. Reinstall Enclosure Cover, if necessary.

#### B. Using the TB1 Terminal Strip on Logic Display Board

1. Locate the TB1 terminal strip on the Logic Display Board inside the unit.
2. Feed the remote cable through the small strain relief on the rear of the unit (beside the STANDARD connector bucket).
3. Connect the remote cable to the terminal strip per Appendix III, Remote Function and Signal Assignments.

#### NOTE

The user cannot weld without closing TB1-3 to TB1-4.

4. Secure the remote cable on the outside of rear panel.
5. Reinstall Enclosure Cover.

### 3.10 Filling Coolant Reservoir

The Coolant Reservoir supplies the system with coolant to cool the torch and torch parts during operation. The torch is cooled by circulating the coolant from the built-in recirculator through the torch leads to the torch and back to the recirculator. The coolant is filtered and cooled before being returned to the Coolant Reservoir. Coolant level can be maintained without removing the recirculator from the ULTIMA-150 Plasma Welding Power Supply. The maximum capacity of the reservoir is two gallons of coolant.

The Thermal Arc® Coolant supplied with the ULTIMA-150 can be used in ambient temperatures down to 10° F (-12° C). If the ambient temperature will be below 10° F (-12° C) then Thermal Arc® Super Coolant should be used. This coolant can be used in areas where the ambient temperature drops to -34° F (-36° C).



#### **WARNING**

---

*Never use tap water in place of Thermal Arc® Torch Coolant or electrolytic corrosion will occur.*

---

1. Remove the Coolant Filler Cap from the reservoir at the rear of the ULTIMA-150 Power Supply.
2. Carefully pour enough of the supplied Thermal Arc® Torch Coolant into the reservoir to fill it to within one inch of the top.

#### **NOTE**

---

*After operating the system more coolant may need to be added to fill the torch leads.*

3. Add Deionizer Bag to the stainless steel basket located inside the Coolant Reservoir.
4. Reinstall the Coolant Reservoir Filler Cap.



#### **WARNING**

---

*After operating the ULTIMA-150 Plasma Welding Power Supply, more coolant may need to be added to fill the torch leads.*

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# SECTION 4: OPERATION

## 4.01 Introduction

This section provides a description of the Power Supply operating controls and operating procedures.

## 4.02 Operating Controls and Indicators

### A. Front Panel

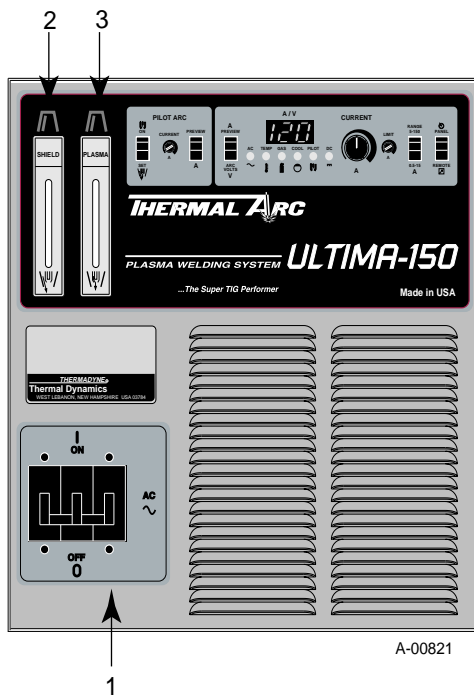


Figure 4-1 Front Panel View

#### 1. Primary Power Switch (Main Disconnect Switch)

ON position supplies AC power to activate all system control circuits. OFF position deactivates control circuits.

#### 2. SHIELD Gas Flow Control

Range: 5.0 - 30 scfh.

#### 3. PLASMA Gas Flow Control

Range: 0.5 - 3.0 scfh.

### B. Control Panel Detail

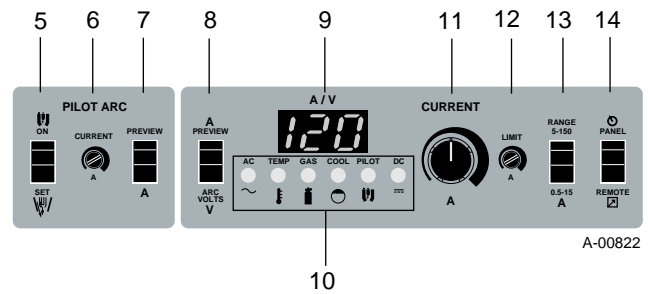


Figure 4-2 Front Panel Detail

#### 5. Pilot Arc ON/SET Switch

ON/SET is a two-position switch. The ON position is for normal system operation; the SET position allows verification of the following settings:

- Pilot Arc Current Preview
- Set Current Limiter
- Weld Current Preview
- Gas Flow Rate Selection

#### 6. Pilot Arc CURRENT Adjust

This potentiometer is accessible through the front panel and can be adjusted with a screwdriver, 2-15 amps, single turn.

#### 7. Pilot Arc Current PREVIEW

This momentary rocker switch displays the pilot arc current set point in SET position. Actual pilot arc current displayed in ON position.

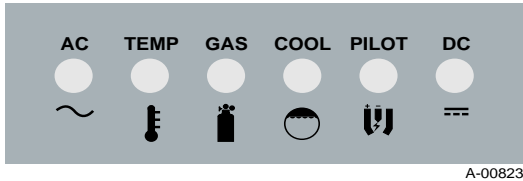
#### 8. Weld Current/Arc Voltage Preview

This is a three-position momentary rocker switch. Amp position displays the main weld current set point (PREVIEW). Volt position displays the actual arc voltage during welding operation; normal position displays actual weld current.

#### 9. LED Amp/Volt Display

During welding operation, the LED displays weld current. Also displays Pilot Arc Current, Arc Volts, and Pilot Current, when queued.

## 10. Status Indicator Lights Detail



### a. AC Power Indicator

GREEN light indicates when AC power is applied and okay. No light indicates no AC power.

### b. TEMP Indicator

GREEN light indicates all temperatures are okay. RED light indicates the coolant temperature or power supply temperature is too high. (The fan/motor/recirculator pump remains on for system and coolant cool down. Pilot Arc is disabled.

### c. GAS Indicator

GREEN light indicates when plasma and shield gas pressures are okay. No light indicates there is insufficient gas pressure or gas connection.

### d. COOL Indicator

GREEN light indicates the conductivity of the coolant is okay. RED light indicates the conductivity level in the coolant is too high and requires changing.

RED-GREEN blinking light indicates the coolant recirculator pump has shut down due to inadequate flow or low coolant levels.

### NOTE

*By interfacing the power supply into TB1, the power supply can be deactivated when the coolant conductivity level is too high. (see Appendix III, Remote Wiring)*

### e. PILOT Arc Indicator

GREEN light indicates the pilot arc is enabled.

### f. DC Indicator

GREEN light indicates the weld signal is enabled.

## 11. Weld CURRENT Adjust

This control adjusts between either 0.5 to 15 amps or 5 to 150 amps depending on setting of the RANGE Switch. This control is functional only when the REMOTE/PANEL switch is set to the PANEL position.

## 12. Current LIMIT

Allows setting the maximum current output of each range for torch protection or improved current resolution control. Single turn, accessible through a hole in the front panel. The Current LIMIT pot is nonfunctional when using remote analog voltage input control/signal.

## 13. RANGE Switch

This switch sets main weld current range to 5-150 amps (High), or 0.5-15 amps (Low).

## 14. PANEL/REMOTE Switch

This is a two-position switch. In the PANEL position, weld current is adjusted by the front panel pot. Preview with Weld Current PREVIEW switch.

In the REMOTE position, the front panel pot is non-functional and the current must be controlled from an external control device via J20 or interface to TB1. The remote device must be compatible with Ultima-150 current control circuit. Current PREVIEW is operational.

## C. Rear Panel

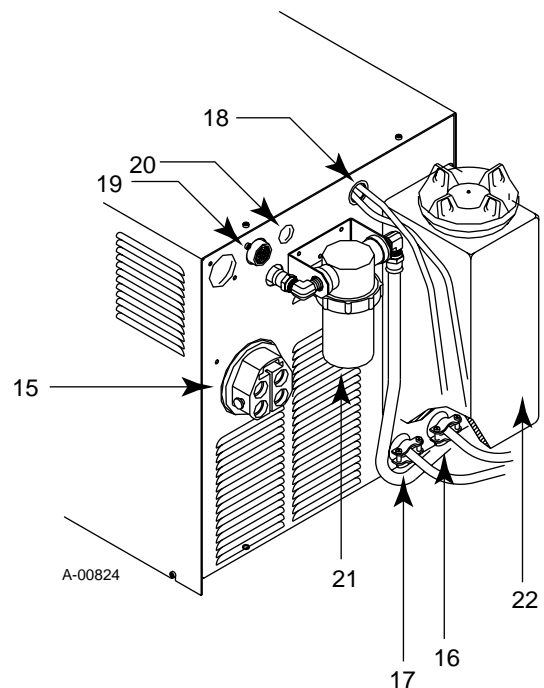


Figure 4-3 Rear Panel



### 15. Quick Disconnect Torch Connector

Connects a PWH/M quick disconnect torch to the power supply (or an older model torch that has been retrofitted with the Adapter Kit).

### 16. Power Input Connector

Fitting on the rear panel through which the Primary AC Input power cable is fed and wired to the main circuit breaker and ground.

### 17. Work Cable Connector

Fitting on the rear panel which connects to the inside of the unit. The work Cable Lug on the other end should be securely attached to the work piece or machine.

### 18. Gas Connectors

Plasma (black) and shield (yellow) gas hoses connect from the gas solenoids inside the unit on the front panel through the back panel of the unit to the gas regulators on the gas cylinders.

### 19. Standard Remote Interface Connector (J20)

Connects any remote device with 14 pin amp plug for remote interface to the unit. Factory-wired to connect to the TB1 terminal strip on the Logic Board inside the unit, for Arc on and remote weld current.

### 20. Interface Knock-Out

Connects user's own remote interface to the unit. User must make own connections to TB1. (See Appendix III, Remote Wiring, for Control Signal Assignments.)

### 21. Coolant Filter

Coolant Filter connects to rear of unit by a bracket.

### 22. Coolant Reservoir

Coolant Reservoir is accessible from rear of unit. The user can fill the Coolant Reservoir, check coolant conductivity, and replace Deionizer Bag without removing Enclosure cover.

## 4.03 Basic Operation

### **NOTE**

*Frequently review the safety precautions at the front of this manual.*

### 1. Setup

Make sure the system is set up properly before operating. Check the following:

#### a. Input Voltage Connection

Check the power source for proper input voltage. The voltage must be compatible with the High-Low Voltage selection within the ULTIMA-150 Power Supply.

### **NOTE**

*This step is particularly important if the input power cable is not hard-wired to the power source, and the system is moved frequently between locations.*

#### b. Gas Connections

Make sure gas pressure regulators are connected properly to the plasma welding system.

#### c. Work Cable Connection

Check for a solid and clean work cable connection to the work piece. The area must be free from paint and rust.

#### d. Torch Assembly and Connection

Check the torch for proper assembly and torch parts for the application and appropriate front end torch parts.

### 2. Turn on Gases

Turn gases on. Check that gases pressure is set to 35 psi.

### 3. Turn on System

Switch the Main Disconnect Switch (#1) to the ON position.

#### 4. Confirm LED indicators

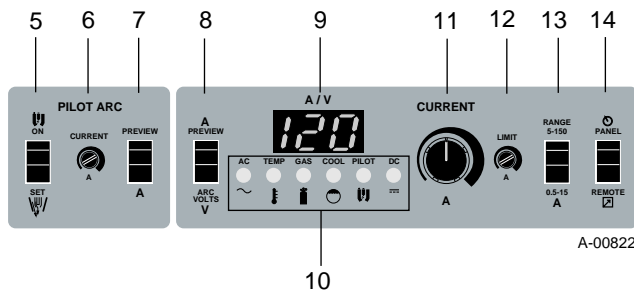


Figure 4-4 Front Panel Detail

For normal operation, the following lights should be GREEN when you turn on the power:

- AC light
- TEMP light
- GAS light
- COOL light

#### 5. Select Current Range:

Select the current range desired (#13):

**High**      5-150 amps

**Low**        0.5-15 amps

#### 6. Select Remote/Panel Mode:

PANEL (#14) -Current control is adjusted by the front panel pot. Preview with Weld Current Preview switch.

REMOTE (#14) -Current control is adjusted by external remote device (compatible with Ultima-150 current control circuit). The front panel pot is nonfunctional in the remote mode. Current preview is operational.

#### 7. Adjust Current Limiter:

The Current Limiter Control (#12) limits the maximum output current of the power source. The current limiter prevents damage to the welding torch or consumables and can also provide more precise current control.

For example, in range 5-150 (#13) with the maximum current limiter (#12) set to 150 amps, the maximum setting (fully clockwise) on the front panel current control (#11) would represent 150 amps, and the minimum setting (fully counter clockwise) would represent approximately 5 amps.

If the current is controlled with either a remote device or the front panel pot, the current will be 0-100% of the range established by the current limiter (#12). If

the current is controlled with an external remote device, and the remote control is set at 50%, then approximately 75 amps weld current will be provided. (Note that the current limiter pot is nonfunctional when using remote analog voltage input signal.)

To set the Current Limiter, turn the current adjust control (#11) fully clockwise, make sure the PANEL/REMOTE switch is in PANEL mode (#14), depress the current PREVIEW switch (#8), and adjust the Current Limiter (#12) with small screwdriver to desired maximum current output.

#### 8. Preview Pilot Current:

Depress Pilot Arc Preview switch (#7). Set current (#6), if applicable by using a small screwdriver. Normal range for pilot current is 5-8 amps.

#### 9. Preview Weld Current:

Depress Current Preview switch (#8). If in PANEL mode (#14), turn front panel control (#11). If in REMOTE mode, adjust REMOTE Amp control pot to desired level.

#### 10. Pilot On:

Set the ON/SET Switch to ON (#5). Pilot arc will start and Pilot Arc indicator light will be GREEN to indicate pilot arc enabled.

#### 11. Torch

Position torch over weld segment approximately 0.060" -0.125" (1.2mm - 3mm).

#### 12. Enable arc

Start the welding arc. (The method for enabling the arc - foot control, user supplied switch, etc. depends on user setup). When enabled, the DC indicator light is GREEN. Welding Arc will transfer. Set proper weld time, travel speed, and adjust current to obtain the weld performance desired.

### 4.04 Torch Operation

#### A. Torch Parts Selection

The torch parts selected (shield cup, tip and electrode) must correspond to the type of operation. See torch manual for torch setup.

# SECTION 5: GENERAL MAINTENANCE

---

## 5.01 Introduction

This section covers the following topics:

1. General Maintenance
2. Basic Troubleshooting
3. Basic Parts Replacement

General Maintenance includes procedures which can be performed by the user. Only those procedures that require limited disassembly or taking of measurements are described here. No other adjustments or repairs are to be attempted except by Thermal Dynamics trained personnel. Basic Troubleshooting describes some of the more common problems users encounter. Basic Parts Replacement describes replacing some of the more basic parts, for example, filters and fuses.

---

### NOTES

*Under no circumstances are field repairs to be attempted on Printed Circuit Board (PCB) or other subassemblies of this unit. Evidence of unauthorized repairs may void the factory warranty.*

*If major complex assemblies are faulty, the unit must be returned to an authorized service center for repair.*



### WARNING

---

*Disconnect primary power to the system before disassembling the torch, leads, or power supply.*

---

## 5.02 General Maintenance

### A. Power Supply Maintenance

The only routine maintenance required for the power supply is a thorough cleaning and inspection, with the frequency depending on the usage and the operating environment.

---

### CAUTION

*Do not blow air into the power supply or through the radiator during cleaning. Blowing air into the unit can cause metal particles to interfere with sensitive electrical components and cause damage to the unit.*

1. To clean the unit, open the enclosure and use a vacuum cleaner to remove any accumulated dirt and dust.
2. The unit should also be wiped clean. If necessary, solvents that are recommended for cleaning electrical apparatus may be used.

---

### CAUTION

*When cleaning care must be taken not to move or damage the electronic components.*

## B. Coolant Filter Maintenance

The Ultima-150 has three filters in the cooling system: the Coolant Filter Assembly, the In-line Filter Assembly, and the Reservoir Filter (Coolant Reservoir Deionizer Basket & Bag). As part of general maintenance, or if the system performance is diminished, check or clean these filters as needed.

### 1. Coolant Filter Assembly

The Coolant Filter Assembly should be cleaned periodically. Remove the filter screen by unscrewing the filter retainer from the Coolant Filter Assembly. Clean the filter screen by rinsing with hot soapy water. Remove the soap residue by rinsing with hot clean water. Be sure that all the soap is removed and the screen is dry of water before reinstalling the Coolant Filter Assembly.

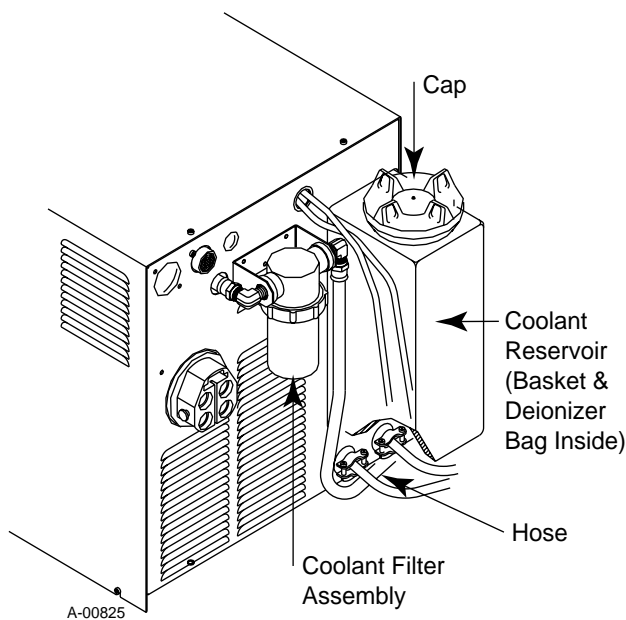


Figure 5-1 Coolant Filter Assembly (Rear View)

### 2. In-line Filter Assembly

The In-line Filter Assembly should be cleaned periodically. To gain access, remove Enclosure Cover. Place a dry rag under the In-line Filter assembly and remove the filter retainer from the filter housing assembly. If the In-line Filter is suspect, clean the filter screen by rinsing with hot soapy water. Remove the soap residue by rinsing with hot clean water. Be sure that all the soap is removed and the screen is dry of water before reinstalling the filter assembly.

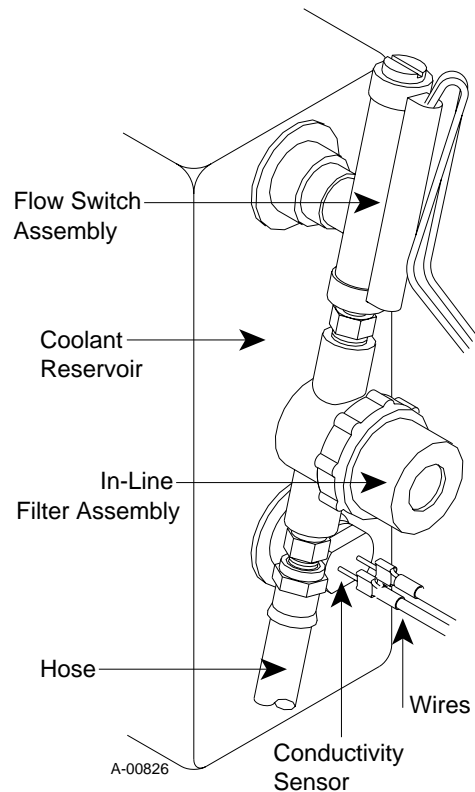


Figure 5-2 In-line Filter Assembly (Side View)

#### NOTE

*Protect the power supply from coolant spill. Place a rag under filter housing when cleaning filter screen.*

### 3. Reservoir Filter Assembly

Make sure there is always a Deionizer bag in the Reservoir Basket. Check the condition of the Deionizer Bag - if the complete bag is yellowish brown then replace the bag.

## C. Cooling System Maintenance

### 1. Coolant Level

The coolant level should be checked every day. If the coolant in the Reservoir is more than 2 inches (50 mm) from the top of the reservoir, then add Thermal Arc® Torch Coolant.

#### CAUTION

*Do Not introduce tap water into the coolant system or electrolytic corrosion will occur. Use only Thermal Arc® Torch Coolant.*

## 2. Flushing the System

As part of general maintenance, periodically the cooling system should be flushed. To flush the system, remove the hose fitting at the filter end of the Coolant Filter Assembly and drain into an appropriate container. Do not turn on the pump. Gravity flow will drain the Reservoir.

## 3. Coolant Conductivity

The coolant conductivity LED on the front panel must be green for normal operation. If the LED is red then flush the old coolant from the system.

To flush the cooling system, remove the hose fitting at the filter end of the Coolant Filter Assembly and drain into an appropriate container. Do not turn on the pump. Gravity flow will drain the Reservoir. Refill cooling system with Thermal Arc® Torch Coolant.

### CAUTIONS

*Handle and dispose of the used coolant per recommended procedures.*

*Do Not turn on the pump. Running the cooling pump dry will cause premature failure of the pump. Pump pressure is preset at the factory and should not require attention.*

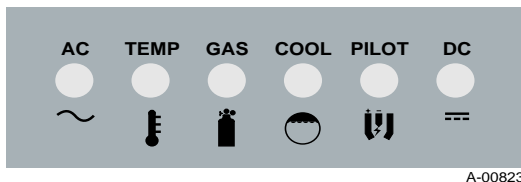
## 5.03 Basic Troubleshooting

This manual covers basic troubleshooting that requires limited disassembly and measurements. Most common problems can be resolved with the information provided in this section.

### NOTE

*If major complex assemblies are faulty, the unit must be returned to an authorized service center for repair.*

The ULTIMA-150 Power Supply provides Status Indicator Lights to indicate potential source of most problems. Check here to identify the nature of a problem.



A-00823

Figure 5-3 Front Panel Status Indicator Lights

## A. AC Power Problems

### 1. AC light indicator not on; fan does not operate

- Switch at customer's main power panel in OFF position*
  - Close main power panel switch
- Input power fuse (F1) blown or loose*
  - If blown, double-check input voltage against voltage selection inside unit. Replace input power fuse (Refer to Section 5.04, Basic Parts Replacement)
- Incorrect voltage selection*
  - Check High-Low Voltage Selection (refer to Section 3.05, Voltage Changeover)
- Customer's main power fuse(s) blown or loose*
  - Check main power fuse(s) and replace as required
- Input power not properly connected to customer's main power panel*
  - Check that input power is present and unit is properly connected (refer to Section 3.04, Primary Input Power Connections for 1-phase, 3-phase, input)
- Defective input power cable*
  - Check cable and replace if faulty

### 2. AC light is on; fan operates slowly

- Incorrect voltage selection*
  - Check High-Low Voltage Selection. Refer to Section 3.05, Voltage Changeover

## B. Temperature Problems

### 1. Temp light is RED

Overtemperature of the power supply or coolant will immediately disable the power supply output. The recirculator pump remains running to cool down the system and coolant

- Obstructed air flow outside power supply*
  - Check to insure there is adequate space around power supply. See Section 3.02, Site Location, for more information
- Exceeded duty cycle*
  - Exceeded duty cycle causing power supply or coolant to overheat. Refer to Section 2.03, Specifications, for correct Amps and Duty Cycle

## C. Plasma/Shield Gas Problems

### 1. Gas light not on

- a. *Gas tank(s) empty; not connected properly; not turned on*
  - Check gas tanks, connect gas supply or turn on gas supply flow, as necessary
- b. *Gas pressure switches not satisfied*
  - Set Plasma and Shield Gas inlet pressure to 35 psi
- c. *Gas leak present*
  - Check system for gas leaks. One way to verify gas leaks is to turn off the system and gas supply at source and watch pressure gauges on regulators. With no gas flow, the pressure at the regulators should remain constant. If pressure decreases, a leak is present in the system
  - If gases are supplied to system via a pipeline, check that all excess station drops are closed and there are no leaks in the pipeline

---

**CAUTION**

---

*The pipeline should always be pressurized. Otherwise the collection of moisture can result, causing severe torch parts damage*



**WARNING**

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*Never use a rubber hose to supply gas to system.*

---

## D. Cooling System Problems

### 1. Coolant light blinks RED/GREEN (pump does not operate)

- a. *Coolant flow is inadequate*
  - Clean In-line Filter, Coolant Filter, and replace Reservoir Deionizer Bag, as necessary
- b. *Coolant levels are inadequate*
  - Add coolant to reservoir. Cycle the main switch disconnect, then cycle the ON/SET switch
- c. *Air in cooling system*
  - Toggle the main switch disconnect off then force a 3 second pump operation cycle. Repeat if necessary for continuous pump operation

### 2. Coolant light is RED

- a. *Coolant Conductivity level is high*
  - Replace reservoir coolant per Section 3.11, Filling Coolant Reservoir

## E. Pilot Arc Problems

### 1. No pilot arc (no pilot light)

- a. *Gas pressures not satisfied (gas light off)*
  - Check Plasma and Shield gas pressures. Gases should be 35 psi.
  - Check system for gas leaks. One way to verify gas leaks is to turn off the system and gas supply at source and watch pressure gauges on regulators. With no gas flow, the pressure at the regulators should remain constant. If the pressure decreases, there is a leak in the system
- b. *Pilot ON/SET switch not reset*
  - Reset ON/SET Switch on front panel
- c. *Improper installation of torch parts*
  - Check installation procedure for torch parts (see appropriate torch manual)
- d. *Tip shorted to electrode*
  - Replace parts and check electrode setback
- e. *Shorted torch*
  - Check torch, replace if necessary

---

**NOTE**

---

*The pilot arc is always latched off in the event of power supply interlock trip. The pilot must be disabled and then re-energized to initiate the pilot arc after a fault shutdown.*

- f. *Remote pilot switch not enabled (if applicable)*
  - Enable signal; remote pilot arc option TB1-12 & 13 positions. ON/SET switch on front panel must be in ON position
- g. *Coolant Conductivity high (if applicable)*
  - Check remote wiring on Logic Board TD1 (if remote wiring has been interfaced to indicate high coolant conductivity levels)

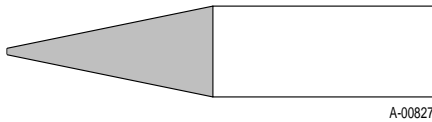
## 2. No pilot arc /weak pilot arc

### a. Pilot current too low

- Increase current by adjusting the Pilot Arc CURRENT Adjust potentiometer on front panel of the power supply.

### b. Plasma Gas flow too low

- Increase flow rate



- Remove sharp point (.015-.025) flat
- Sharpen to 20 degree included angle
- Surface finish minimum 32 microinch

Figure 5-4 Preparation Specifications

### c. Electrode setting at maximum electrode setback

- Adjust electrode setting

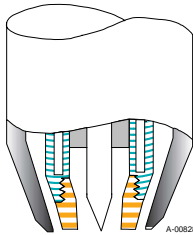


Figure 5-5 Minimum Electrode Setback

### d. Improper electrode preparation

- Adjust electrode setting according to specifications

## 4. Coolant light is RED

### a. Coolant Conductivity level is high

- Replace Coolant in per Section 3.11, Filling Coolant Reservoir

## 5. Tungsten electrode in torch is discolored (bluing)

### a. Gas leak is present

- Check system for gas leaks. One way to verify gas leaks is to turn off the system and gas supply at source and watch pressure gauges on regulators. With no gas flow, the pressure at the regulators should remain constant. If the pressure decreases, there is a leak in the system
- If gases are supplied to system via a pipeline, the pipeline must be leakproof and excess station drops must be closed

### CAUTION

The pipeline should always be pressurized. Otherwise the collection of moisture can result, causing sever torch parts damage.

### b. Contamination is present

- Check operational procedures. Improper start-up/shut down procedures can contaminate the electrode.



### WARNING

Never use a rubber hose to supply gas to system; moisture can impregnate rubber and damage the torch parts and torch head.

## F. DC Problems

### 1. No welding current/Pilot Arc On (no DC light)

#### a. Remote switch for Weld Arc ON not enabled

- Check remote switch to make sure it is on
- Check control signal assignments (J20 pins 3 to 4). Refer to Appendix III, Remote Wiring
- Check connections from J20 to TB1 on Logic Board (LBD). Refer to Appendix III, Remote Wiring

#### b. Work cable not attached or incorrectly attached to work piece

- Attach work cable to piece per instructions in Section 3.06, Work Cable Connection

## G. Welding Problems

See the appropriate torch manual for torch troubleshooting.

## 5.04 Basic Parts Replacement

The parts replacement procedures described in this manual are for basic replacement of parts that require limited or no disassembly of the unit. This section describes parts replacement for the following:

1. Fuse Replacement
2. Coolant Filter Assembly Replacement
3. In-line Filter Replacement
4. Hose Assembly Replacement

Before disassembling any part of the ULTIMA-150 Plasma Welding Power Supply, first read the procedure for the part to be replaced, then proceed with the disassembly.



**WARNING**

*Disconnect primary power from the source before disassembling or replacing parts on the ULTIMA-150 Plasma Welding Power Supply.*

### A. Opening the ULTIMA-150 Power Supply

1. Remove the four Phillips head screws on the top of the Enclosure Cover.
2. Loosen the six Phillips head screws, three on each side, at the bottom edge of the Enclosure Cover.
3. Carefully pull the Enclosure Cover up from the rest of the unit.

### B. Fuse Replacement

1. Remove the Enclosure Cover per Section 5.04.
2. Locate the Fuse on the side of the chassis above the Front Panel Breaker Assembly.
3. Remove the Fuse.

4. Install replacement Fuse by reversing the above

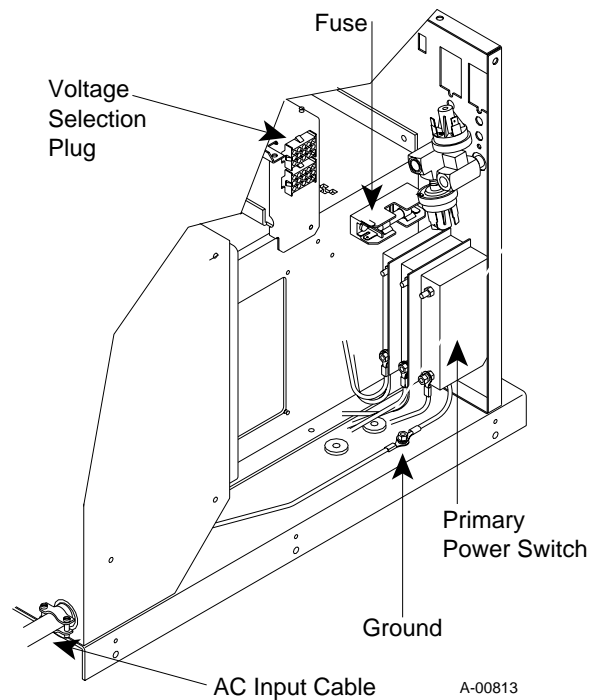


Figure 5-6 Fuse Location

### C. Coolant Filter Assembly Replacement

The Coolant Filter Assembly is located on a bracket on the rear panel of the unit.

1. Remove the two coolant hose connections to the Filter Assembly.
2. Remove the two elbow fitting on each side of the Coolant Filter Assembly and remove the damaged Coolant Filter Assembly from the bracket.
3. Clean the old thread sealer from the threads of the elbow fittings.
4. Apply a thin coating of liquid Teflon thread sealer to the threads of the elbow fittings.
5. Place the replacement Coolant Filter Assembly in the bracket with the arrow pointing to the left and reinstall the two elbow fittings.



- Reconnect the two coolant hoses to the Coolant Filter Assembly making sure that the hose to the Pump Assembly is on the output of the Coolant Filter Assembly (Left side as viewed from the back.)

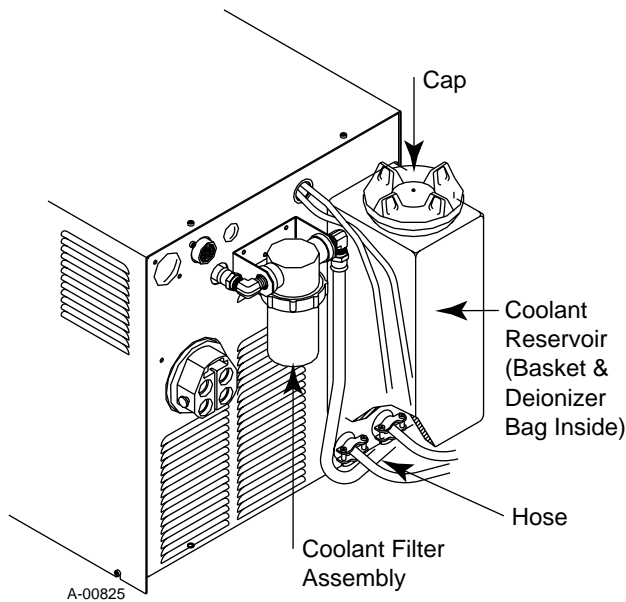


Figure 5-7 Coolant Filter Assembly

#### D. In-line Filter Assembly Replacement

- Remove the Enclosure Cover per Section 5.04.

**CAUTION**

*Handle and dispose of the used coolant per recommended procedures.*

- Drain the coolant from the Coolant Reservoir per the following procedure:
  - Disconnect the Input Hose at the Rear Panel Filter Assembly. The hose goes from the bottom of the reservoir to the Filter Assembly.
  - Place the end of the hose into a container to catch the coolant as it flows from the reservoir. Only enough needs to be removed so that the level is below the In-Line Filter/Flow Switch Assembly hole located on the end of the reservoir.

**NOTE**

*Do Not run the pump as the coolant will gravity feed from the reservoir.*

- Remove the hose connected to the bottom of the In-Line Filter Assembly.
- Remove the In-Line Filter Assembly from the Flow Switch Assembly.
- Install the replacement In-Line Filter Assembly by reversing the above steps.
- Refill the Coolant Reservoir with the coolant removed or add fresh Thermal Arc® Torch Coolant.

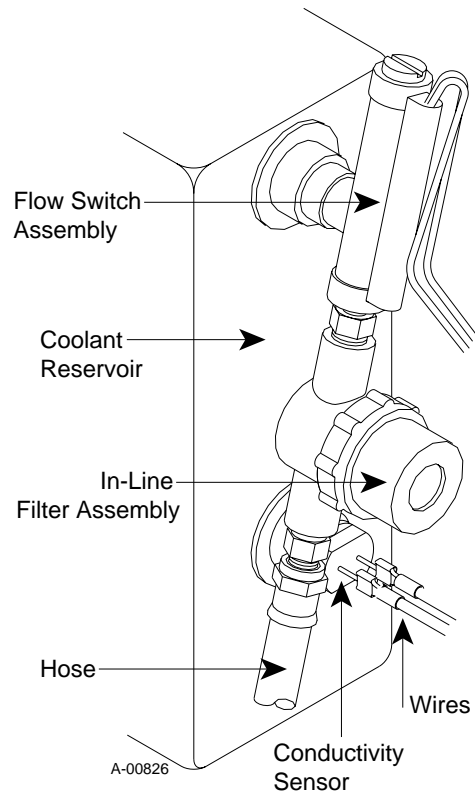


Figure 5-8 In-Line Filter Assembly

## E. Hose Assembly Replacement

This subsection describes the replacement of the various Hose Assemblies used in the ULTIMA-150 Plasma Welding Power Supply. There are five hose assemblies:

- Coolant Supply Hose (Reservoir to Coolant Filter) Assembly
  - Coolant Supply Hose (Coolant Filter to Pump) Assembly
  - The Coolant Return Hose (TORCH Connector to Radiator) Assembly
  - Coolant Supply Hose (Pressure Gauge to TORCH Connector) Assembly
  - Coolant Return Hose (Radiator to In-Line Filter) Assembly
1. To replace the hose assemblies inside the ULTIMA-150 Plasma Welding Power Supply, remove the Enclosure Cover per Section 5.04, paragraph A.
  2. Inspect and replace the damaged hose(s) as required.
  3. Replace the Enclosure Cover.

# SECTION 6: PARTS REPLACEMENT

## 6.01 Introduction

This section provides a breakdown of all ULTIMA-150 parts that the user can easily replace as well as a list of accessories.

For more information on torches, see the appropriate torch manual.



### **WARNING**

*Evidence of unauthorized repairs may void the factory warranty.*

## 6.02 Returns

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

## 6.03 Ordering Information

Order replacement parts by catalog number and complete description of the part or assembly, as listed in the description column of the Parts List. Also include the model and serial number of the machine as shown on the plate attached to the front panel of the unit. Address all inquiries to your authorized Thermal Dynamics distributor.

## 6.04 Complete Systems

Complete system packages include the ULTIMA-150 Power Supply with two 10 ft Gas Supply Hoses, Quick Disconnect Torch with leads, Torch Spare Parts Kit, Thermal Arc Coolant (2 gallons), and a 10ft Work Cable with Cable Lug. Complete systems are ordered by torch rating/lead length.



Figure 6-1 Complete ULTIMA-150 System

### **A. ULTIMA-150 with 2A Torch**

#### **Description**

PWH-2A 70° with 12.5 ft. leads  
PWH-2A 70° with 25 ft. leads

PWH-2A 90° with 12.5 ft. leads  
PWH-2A 90° with 25 ft. leads

PWH-2A 180° with 12.5 ft. leads  
PWH-2A 180° with 25 ft. leads

PWM-2A 180° with 12.5 ft. leads  
PWM-2A 180° with 25 ft. leads

### **B. ULTIMA-150 with 3A Torch**

#### **Description**

PWH-3A 70° with 12.5 ft. leads  
PWH-3A 70° with 25 ft. leads

PWH-3A 90° with 12.5 ft. leads  
PWH-3A 90° with 25 ft. leads

PWH-3A 180° with 12.5 ft. leads  
PWH-3A 180° with 25 ft. leads

PWM-3A 180° with 12.5 ft. leads  
PWM-3A 180° with 25 ft. leads

## C. ULTIMA 150 with 4A Torch

### Description

PWH-4A 70° with 12.5 ft. leads  
PWH-4A 70° with 25 ft. leads

PWH-4A 90° with 12.5 ft. leads  
PWH-4A 90° with 25 ft. leads

PWH-4A 180° with 12.5 ft. leads  
PWH-4A 180° with 25 ft. leads

PWM-4A1 180° with 12.5 ft. leads  
PWM-4A1 180° with 25 ft. leads

PWH-4A 180° with 12.5 ft. leads  
PWH-4A 180° with 25 ft. leads

PWM-4A1 180° with 12.5 ft. leads  
PWM-4A1 180° with 25 ft. leads

## 6.05 Power Supply Only

### 3-2770 ULTIMA-150 Power Supply Unit Only

Includes ULTIMA-150 Power Supply Unit with built-in Quick Disconnect connection.

## 6.06 Replacement Torches

Two types of torches can be used with the ULTIMA-150 Plasma Welding Power Supply: the Quick Disconnect torch with the built-in quick disconnect connection, or the old style torch which requires the Quick Disconnect Adapter Kit.

### **NOTE**

*H (Hand) designates torch with molded handle*

*M (Machine) designates torch with rack/pinion assembly*

### A. Torches with Quick Disconnect

#### 1. 2A Torches

##### Catalog # Description

2-2100 PWH-2A 70° with 12.5 ft. leads  
2-2104 PWH-2A 70° with 25 ft. leads

2-2101 PWH-2A 90° with 12.5 ft. leads  
2-2105 PWH-2A 90° with 25 ft. leads

2-2102 PWH-2A 180° with 12.5 ft. leads  
2-2106 PWH-2A 180° with 25 ft. leads

2-2103 PWM-2A 180° with 12.5 ft. leads  
2-2107 PWM-2A 180° with 25 ft. leads

#### 2. 3A Torches

##### Catalog # Description

2-2110 PWH-3A 70° with 12.5 ft. leads  
2-2114 PWH-3A 70° with 25 ft. leads

2-2111 PWH-3A 90° with 12.5 ft. leads  
2-2115 PWH-3A 90° with 25 ft. leads

2-2112 PWH-3A 180° with 12.5 ft. leads  
2-2116 PWH-3A 180° with 25 ft. leads

2-2113 PWM-3A 180° with 12.5 ft. leads  
2-2117 PWM-3A 180° with 25 ft. leads

#### 3. 4A Torches

##### Catalog # Description

2-2120 PWH-4A 70° with 12.5 ft. leads  
2-2125 PWH-4A 70° with 25 ft. leads

2-2119 PWH-4A 90° with 12.5 ft. leads  
2-2126 PWH-4A 90° with 25 ft. leads

2-2121 PWH-4A 180° with 12.5 ft. leads  
2-2127 PWH-4A 180° with 25 ft. leads

2-2122 PWM-4A 180° with 12.5 ft. leads  
2-2128 PWM-4A 180° with 25 ft. leads

2-2123 PWH-4A 180° with 12.5 ft. leads  
2-2129 PWH-4A 180° with 25 ft. leads

2-2124 PWM-4A 180° with 12.5 ft. leads  
2-2130 PWM-4A 180° with 25 ft. leads

### B. Torches without Quick Disconnect (old style)

#### 1. 2A Torches

##### Catalog # Description

2-2443 PWH-2A 70° with 12.5 ft. leads  
2-2504 PWH-2A 70° with 25 ft. leads

2-2444 PWH-2A 90° with 12.5 ft. leads  
2-2506 PWH-2A 90° with 25 ft. leads

2-3002 PWH-2A 180° with 12.5 ft. leads  
2-2108 PWH-2A 180° with 25 ft. leads

2-2480 PWM-2A 180° with 12.5 ft. leads  
2-2594 PWM-2A 180° with 25 ft. leads

**2. 3A Torches**

**Catalog # Description**

2-2527	PWH-3A 70° with 12.5 ft. leads
2-2599	PWH-3A 70° with 25 ft. leads
2-2529	PWH-3A 90° with 12.5 ft. leads
2-2623	PWH-3A 90° with 25 ft. leads
2-2616	PWH-3A 180° with 12.5 ft. leads
2-2621	PWH-3A 180° with 25 ft. leads
2-2531	PWM-3A 180° with 12.5 ft. leads
2-2624	PWM-3A 180° with 25 ft. leads

**3. 4A Torches**

**Catalog # Description**

2-2821	PWH-4A 70° with 12.5 ft. leads
2-2820	PWH-4A 70° with 25 ft. leads
2-2819	PWH-4A 90° with 12.5 ft. leads
2-2818	PWH-4A 90° with 25 ft. leads
2-2828	PWH-4A 180° with 12.5 ft. leads
2-2829	PWH-4A 180° with 25 ft. leads
2-2482	PWM-4A 180° with 12.5 ft. leads
2-2592	PWM-4A 180° with 25 ft. leads
2-2850	PWH-4A 180° with 12.5 ft. leads
2-2851	PWH-4A 180° with 25 ft. leads
2-2803	PWM-4A 180° with 12.5 ft. leads
2-2804	PWM-4A 180° with 25 ft. leads

**6.07 Options and Accessories**

**A. Quick Disconnect Torch Adapter Kit**

**Catalog # Description**

5-2990	Quick Disconnect Adapter Kit
--------	------------------------------

**B. Torch Spare Parts Kits**

**1. 2A Torch Spare Parts Kit**

Catalog#	Qty	Description
<b>5-2984</b>		<b>2A Spare Parts Kit includes:</b>
8-3226	2	Shield Cup
8-2080	5	.046 Long Tip
8-2083	5	.081 Long Tip
8-2033	2	Electrode
8-2040	1	Gas Distributor
8-2021	1	Gauge/Wrench Assembly
8-4025	1	Lubricant
8-3141	1	Tool Box

**2. 3A Torch Spare Parts Kit**

Catalog#	Qty	Description
<b>5-2985</b>		<b>3A Spare Parts Kit includes:</b>
8-3040	1	Shield Cup
9-1789	5	.046 Long Tip
9-1791	5	.081 Long Tip
9-1811	5	.093 Long Tip
8-2007	2	Electrode
9-1780	1	Collet
9-2240	1	Gas Distributor
9-1810	1	Gauge/Wrench Assembly
8-4025	1	Lubricant
8-3141	1	Tool Box

**3. 4A Torch Spare Parts Kit**

Catalog#	Qty	Description
<b>5-2986</b>		<b>4A Spare Parts Kit includes:</b>
8-4088	1	Shield Cup
9-1890	5	.062 Long Tip
9-1891	5	.093 Long Tip
9-1892	5	.125 Long Tip
9-1827	2	Electrode
8-4011	2	Liner
9-2204	1	Gas Distributor
9-1873	1	Gauge/Wrench Assembly
8-4025	1	Lubricant
8-3141	1	Tool Box

**C. Coolant System**

**Catalog # Description**

7-2850	Thermal Arc® Torch Standard Coolant
7-2959	Thermal Arc® Torch Super Coolant
8-4410	Coolant Deionizer Basket
8-3312	Deionizer Bag
8-3460	In-line Filter
8-4276	Coolant Filter

**D. Remote Controls**

**Catalog# Description**

7-3080	Foot Control
7-3106	RP-1 Remote Pendant
9-4130	Remote Control Cable (20 ft.)
9-4063	Remote Interface Cable (10 ft.)

## E. Weld Sequencer Packages

### Catalog# Description

- 7-3105 Weld Sequencer Package,  
includes:
  - 7-3100 WT-1 Weld Timer
  - 5-2908 Timer Enclosure
- 3-2677 Weld Sequencer Package,  
includes:
  - 7-3100 WT-1 Weld Timer
  - 7-3102 CS-1 Current Slope
  - 7-3103 CP-1 Pulser
  - 7-3104 WSE Enclosure
  - 7-3106 RP-1 Remote Pendant
- 3-2676 Weld Sequencer Package,  
includes:
  - 7-3100 WT-1 Weld Timer
  - 7-3102 CS-1 Current Slope
  - 7-3101 Gas Slope
  - 7-3103 CP-1 Pulser
  - 7-3104 WSE Enclosure
  - 7-3106 RP-1 Remote Pendant

## F. Gas Pressure Regulators

### Catalog # Description

- 9-2722 Argon
- 9-3053 Argon/Hydrogen

## G. 575 Volt Transformer Module

- 7-3315 575V Transformer Module

## H. Coolant Pressure Gauge Assembly Kit

- 7-7779 Coolant Pressure Gauge Assembly Kit,  
includes:
  - 9-6296 Pressure Gauge
  - 9-3456 Adapter Fitting
  - 0-2588 Instruction Sheet

## I. Other

- 8-1153 3 Amp, 500V Dual Element Fuse (1FU)
- 9-2628 Work Clamp

# APPENDIX I: CIRCUIT PROTECTION & WIRING

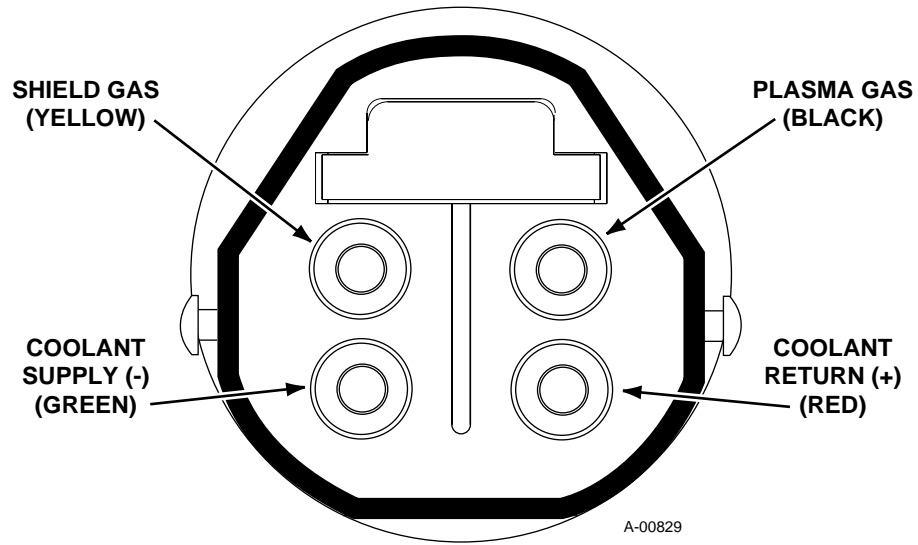
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Input Voltage (Volts)	Power		Input Current		Freq. (Hz)	Recommended Sizes					
	1-Ph (kVA)	3-Ph (kVA)	1-Ph (Amps)	3-Ph (Amps)		Fuse (Amps)		Wire (AWG)		Wire (Canada)	
						1-Ph	3-Ph	1-Ph	3-Ph	1-Ph	3-Ph
200	8	6	39	21	50/60	45	25	10	14	8	10
208	8	6	37	20	50/60	40	25	10	14	8	10
230	8	6	34	19	50/60	35	20	10	12	8	12
380	8	6	24	12	50/60	25	15	14	18	10	12
415	8	6	22	12	50/60	25	15	14	18	10	12
460	8	6	20	11	50/60	25	15	14	18	10	12

Recommended Circuit Protection and Wire Sizes

# APPENDIX II: QUICK DISCONNECT LEADS ASSIGNMENT

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Rear Panel Mounted Quick Disconnect Leads Assignment  
Viewed Looking at Rear Panel



# APPENDIX III: REMOTE WIRING

## Notes:

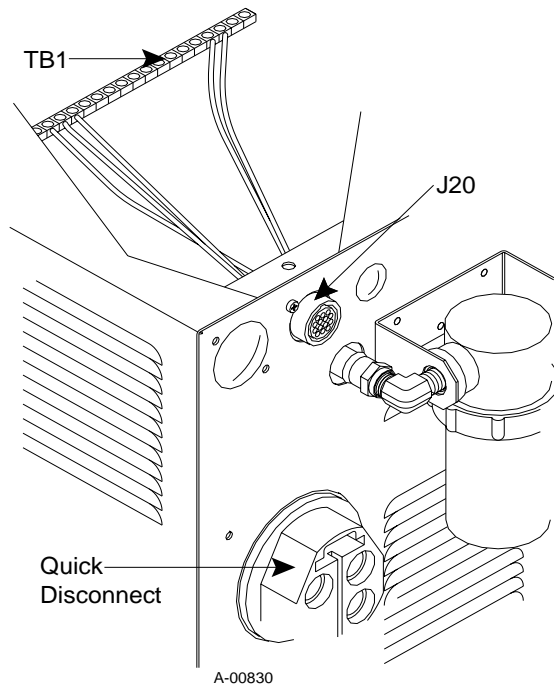
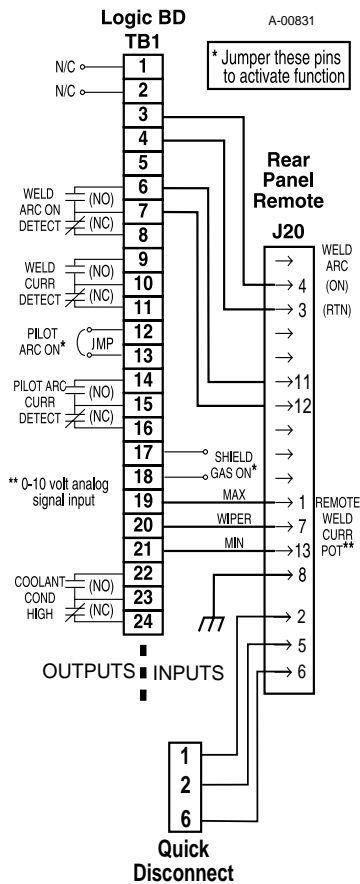
1. Welding Arc/ON disabled without closing TB1-3 to TB1-4. This must be done by direct interface to TB1-3 & TB1-4 or via remote connection J20 Pin 3 to 4.
2. To disable the pilot arc when coolant conductivity level is high, connect pin 12 to pin 24 and pin 13 to pin 23.
3. Weld Arc On Detect (for use with Synerweld 2100) is enabled with the following wiring connections\*:

- TB1-6 to J20 pin 11
- TB1-7 to J20 pin 12

(If not using J20, wire directly from input/output interface signals to TB1.)

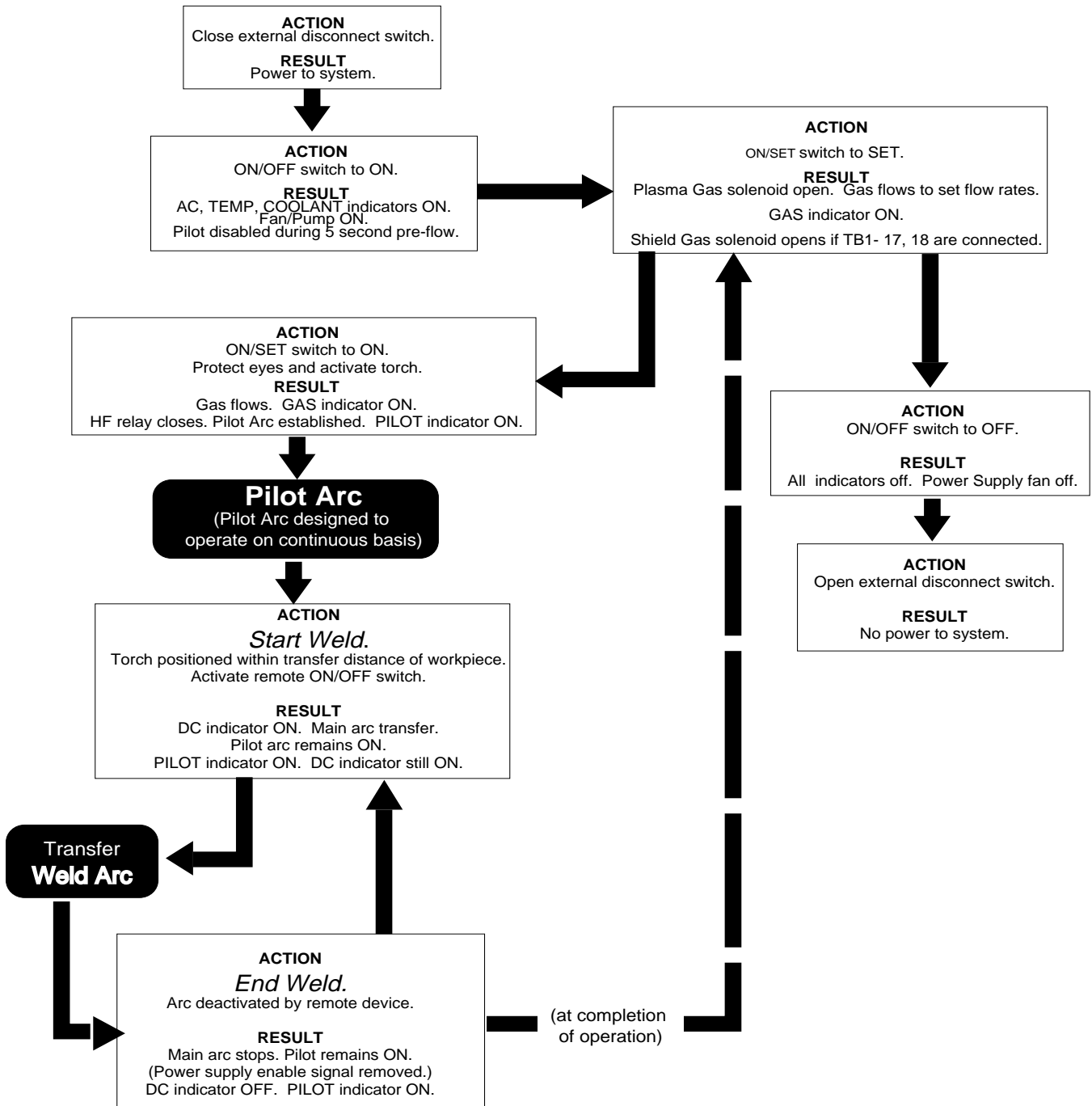
\* Ultima units manufactured after Nov. 1997 are factory-wired; all other units must be wired by user.

4. Wiring Connections for the 3A Torch with Auto Wire Feed are through J20 to Quick Disconnect.



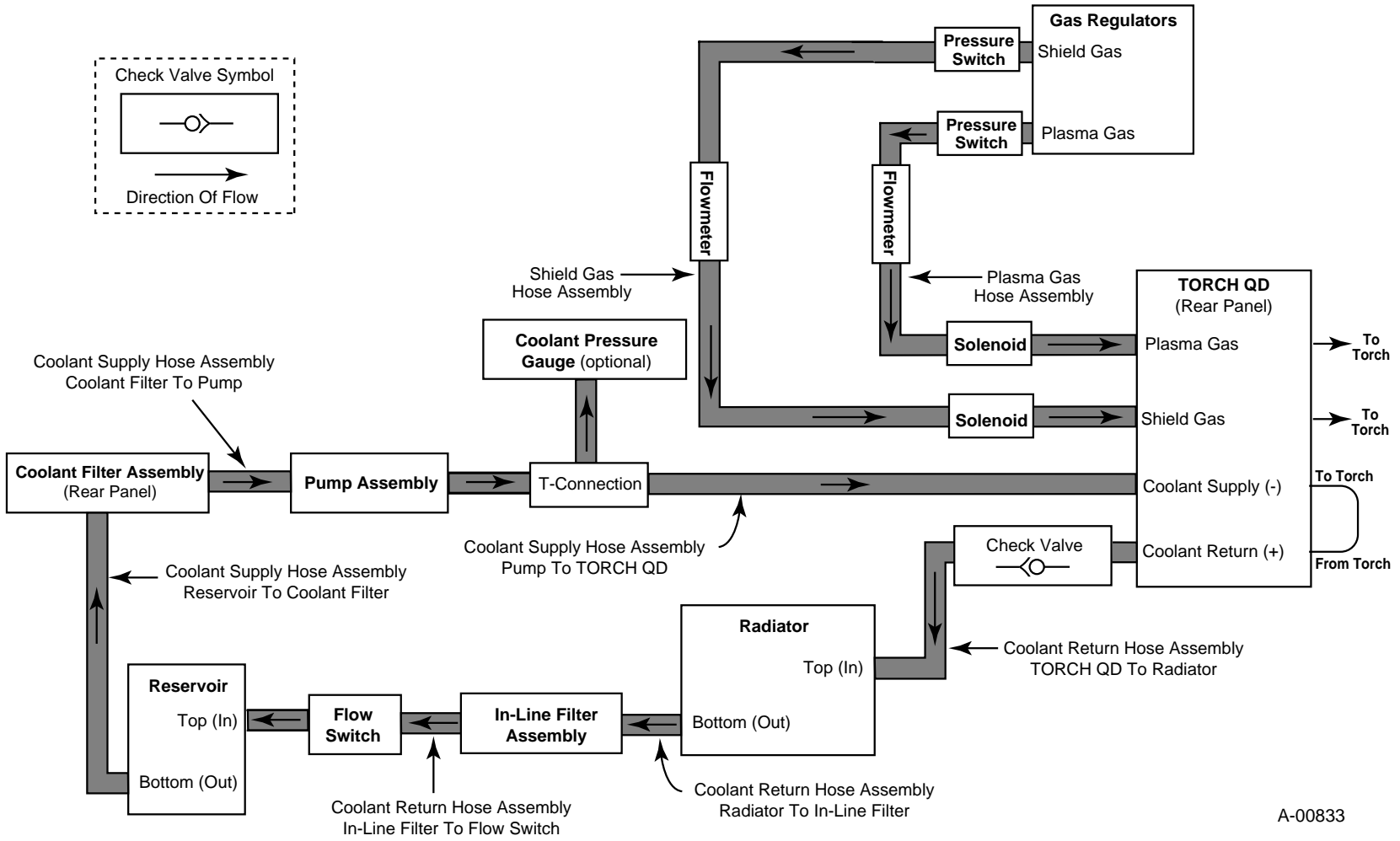
Rear Panel View

# APPENDIX IV: OPERATIONAL FLOWCHART



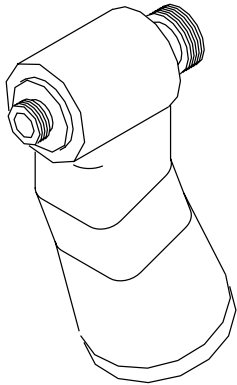
A-00832

APPENDIX V: HOSE DIAGRAM

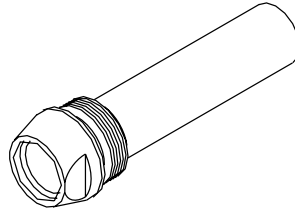


# APPENDIX VI: TORCH PARTS

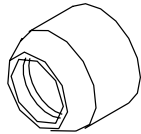
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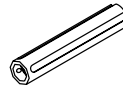
1. Torch Head Assembly



5. Liner



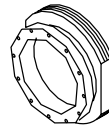
2. Shield Cup



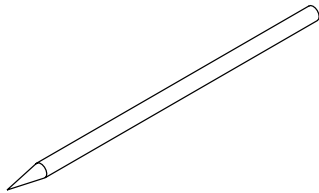
6. Gas Distributor



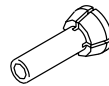
3. Tip



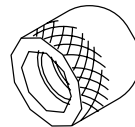
7. Gas Diffuser



4. Electrode



8. Collett Assembly



9. Back Cap

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## APPENDIX VII: TORCH PARTS TABLE

ITEM NUMBER	PART DESCRIPTION	TORCH TYPE		
		PWH-2A Torch	PWH-3A Torch	PWH-4A Torch
1	Torch Head Assembly	8-2027 (70 deg) 8-2028 (90 deg) 8-2097 (180 deg-offset)	8-3030 (70 deg) 8-3031 (90 deg) 8-3032 (180 deg-offset)	8-4014 (70 deg) 8-4015 (90 deg) 8-4016 (180 deg-offset) 8-4054 (180 deg-inline)
2	Shield Cup	8-3236 (use w/ext. tip) 8-2071 (use w/std. tip)	8-3040	8-4088
3	Tip	8-2023 (.046) 35A-std 8-2024 (.062) 55A-std 8-2025 (.081) 75A-std 8-2079 (.031) 15A-lg 8-2080 (.046) 25A-lg 8-2082 (.062) 35A-lg 8-2083 (.081) 50A-lg	9-1788 (.031) 35A-lg 9-1789 (.046) 50A-lg 9-1790 (.062) 75A-lg 9-1791 (.081) 100A-lg 9-1811 (.093) 130A-lg	9-1890 (.062) 100A-lg 9-1891 (.093) 125A-lg 9-1892 (.125) 150A-lg
4	Electrode	8-2033 (.093) std. 8-2006 (.093) ext. 8-2044 (.040) std 8-2046 (.040) ext.	8-2007 (.093) std. 9-1775 (.093) ext.	9-1827 (.187) std. 9-1834 (.187) ext.
5	Liner	N/A	N/A	8-4011
6	Gas Distributor (insulating sleeve)	8-2040 (.093-electrode) 8-2042 (.040-electrode)	9-2240	9-2204
7	Gas Diffuser	N/A	8-3059	8-4087
8	Collet Assembly	8-2039 (.093-electrode) 8-2041 (.040-electrode)	9-1780	9-1876
9	Back Cap	8-2032 (std-electrode) 8-2030 (ext-electrode)	9-1779 (std-electrode) 9-1803 (ext-electrode)	8-4158 (std-electrode) 9-1877 (ext-electrode)
N/S	Collar	N/A	N/A	8-4024
N/S	O-ring (liner)	N/A	N/A	8-0560
N/S	O-ring (internal)	N/A	N/A	8-0528
N/S	O-ring (back cap)	8-2035	8-0527	8-0530
N/S	Gasket (shield cup)	8-2036	8-3057	8-4069
N/S	Gauge/Wrench Assy.	8-2021	9-1810	9-1873
NOTE: The use of an extended electrode requires an extended back cap.				

# APPENDIX VIII: SCHEMATIC DIAGRAM

