THERMAL DYNAMICS®

51

CUTMASTER™

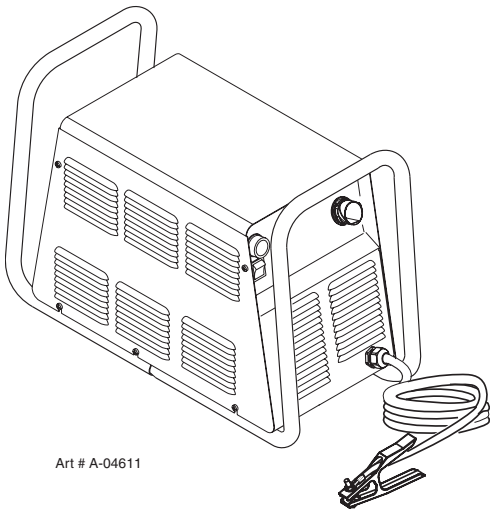
AUTOMATED

PLASMA CUTTING SYSTEM

SL100SV

PLASMA CUTTING

MACHINE TORCH



Art # A-04611

Operating Manual

Rev. AC.01 **Date:** April 2, 2007 **Manual #** 0-4640

Operating Features:

40 AMP	DC	1 PHASE	3 PHASE	208-230 V	400 V	400 V (CE)	460 V

WE APPRECIATE YOUR BUSINESS!

Congratulations on your new Thermal Dynamics product. We are proud to have you as our customer and will strive to provide you with the best service and reliability in the industry. This product is backed by our extensive warranty and world-wide service network. To locate your nearest distributor or service agency call 1-800-426-1888, or visit us on the web at **www.thermal-dynamics.com.**

This Operating Manual has been designed to instruct you on the correct use and operation of your Thermal Dynamics product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product.

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Thermal Dynamics is a Global Brand of manual and automation Plasma Cutting Products for Thermadyne Industries Inc.

We distinguish ourselves from our competition through market-leading, dependable products that have stood the test of time. We pride ourselves on technical innovation, competitive prices, excellent delivery, superior customer service and technical support, together with excellence in sales and marketing expertise.

Above all, we are committed to developing technologically advanced products to achieve a safer working environment within the welding industry.

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.

Automated Plasma Cutting System
Automated CutMaster™ 51 Power Supply
SL100SV Machine Torch
Operating Manual Number 0-4640

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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 workpiece.*

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 electronique. Ceux qui travail près d’une application à l’arc au jet de plasma devrait consulter leur membre professionel 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. Eliminez toute source de telle fumée.
- Ce produit, dans le procéder de soudage et de coupe, produit de la fumée ou des gaz pouvant contenir des éléments reconnu 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-violets 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 suggèrée dans le recommendation qui suivent ANSI/ASC Z49.1:

Courant Arc	Nuance Minimum Protective Numéro	Nuance Suggerée 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'experience a démontrer que les filtres moins foncés peuvent être utilisés quand l'arc est caché par moiceau 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 dú4ez 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.

The equipment described in this manual conforms to all applicable aspects and regulations of the "EMC Directive" (European Council Directive 89/336/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.

* CENELEC EN50199 EMC Product Standard for Arc Welding Equipment.

* ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) (EN50192) (EN50078) applicable to plasma cutting equipment and associated accessories.

* For environments with increased hazard of electrical shock, Power Supplies bearing the S mark conform to EN50192 when used in conjunction with hand torches with exposed cutting tips, if equipped with properly installed standoff guides.

* 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: Steve Ward
Operations Director
Thermadyne Europe
Europa Building
Chorley N Industrial Park
Chorley, Lancashire,
England PR6 7BX

CE

1.08 Statement of Warranty

LIMITED WARRANTY: Subject to the terms and conditions established below, Thermal Dynamics® Corporation warrants to the original retail purchaser that new Thermal Dynamics CUTMASTER™ 1Series plasma cutting systems sold after the effective date of this warranty are free of defects in material and workmanship. Should any failure to conform to this warranty appear within the applicable period stated below, Thermal Dynamics Corporation shall, upon notification thereof and substantiation that the product has been stored operated and maintained in accordance with Thermal Dynamics' specifications, instructions, recommendations and recognized industry practice, correct such defects by suitable repair or replacement.

T**his warranty is exclusive and in lieu of any warranty of merchantability or fitness for a particular purpose.**

Thermal Dynamics will repair or replace, at its discretion, any warranted parts or components that fail due to defects in material or workmanship within the time periods set out below. Thermal Dynamics Corporation must be notified within 30 days of any failure, at which time Thermal Dynamics Corporation will provide instructions on the warranty procedures to be implemented.

Thermal Dynamics Corporation will honor warranty claims submitted within the warranty periods listed below. All warranty periods begin on the date of sale of the product to the original retail customer or 1 year after sale to an authorized Thermal Dynamics Distributor.

LIMITED WARRANTY PERIOD

Product	Power Supply Components (Parts and Labor)	Torch and Leads (Parts and Labor)
CUTMASTER™ 51	3 Years	1 Year
CUTMASTER™ 81	3 Years	1 Year
CUTMASTER™ 101	3 Years	1 Year

This warranty does not apply to:

1. Consumable Parts, such as tips, electrodes, shield cups, o - rings, starter cartridges, gas distributors, fuses, filters.
2. Equipment that has been modified by an unauthorized party, improperly installed, improperly operated or misused based upon industry standards.

In the event of a claim under this warranty, the remedies shall be, at the discretion of Thermal Dynamics Corporation:

1. Repair of the defective product.
2. Replacement of the defective product.
3. Reimbursement of reasonable costs of repair when authorized in advance by Thermal Dynamics.
4. Payment of credit up to the purchase price less reasonable depreciation based on actual use.

These remedies may be authorized by Thermal Dynamics and are FOB West Lebanon, NH or an authorized Thermadyne service station. Product returned for service is at the owner's expense and no reimbursement of travel or transportation is authorized.

LIMITATION OF LIABILITY: Thermal Dynamics Corporation 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 customer of distributors (hereinafter "Purchaser") for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal Dynamics 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 the goods covered by or furnished by Thermal Dynamics 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 liability is based.

This warranty becomes invalid if replacement parts or accessories are used which may impair the safety or performance of any Thermal Dynamics product.

This warranty is invalid if the Thermal Dynamics product is sold by non - authorized persons.

Effective January 15, 2004

SECTION 2: SPECIFICATIONS

2.01 Scope of Manual

This manual contains descriptions, operating instructions and basic maintenance procedures for the Thermal Dynamics Automated CutMaster 51 Plasma Cutting System. Servicing of this equipment is restricted to properly 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 characteristics and capabilities of this equipment will assure the dependable operation for which it was designed.

2.02 Power Supply Specifications

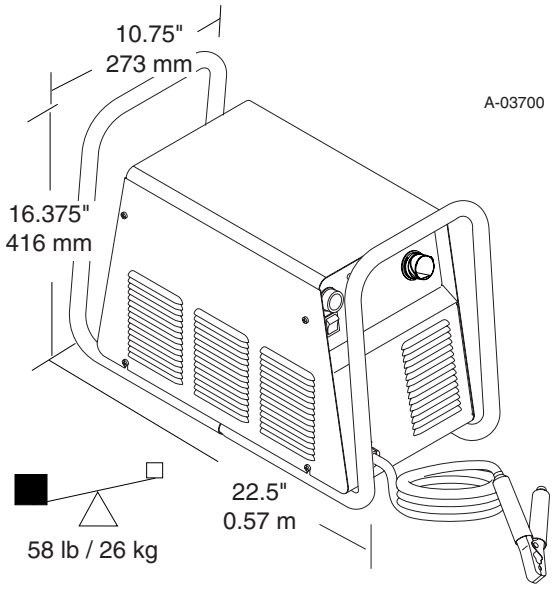
Automated CutMaster 51 Power Supply Specifications							
Input Power	208 / 230 VAC (187 - 253 VAC), Single Phase, 60 Hz						
	400 VAC (360 - 440 VAC), Three Phase, 50/60 Hz						
	400 VAC (360 - 440 VAC), Three Phase, 50/60 Hz, CE						
	460 VAC (414 - 506 VAC), Single Phase, 60 Hz						
	460 VAC (414 - 506 VAC), Three Phase, 60 Hz						
Input Power Cable	Power Supply includes input cable. Cable for 208/230V input power includes molded plug.						
Output Current	20 - 40 Amps, Continuously Adjustable						
Power Supply Gas Filtering Ability	Particulates to 20 Microns						
CutMaster 51 Power Supply Duty Cycle *							
Ambient Temperature	40° C (104° F)						
		IEC Rating	TDC Rating	IEC Rating	TDC Rating	IEC Rating	TDC Rating
All Units	Duty Cycle	**40%**		**60%**		**100%**	
	Current	40 Amps	n/a	25 Amps	n/a	n/a	n/a
	DC Voltage	96 vdc	n/a	90 vdc	n/a	n/a	n/a
* NOTE: The duty cycle will be reduced if the primary input power (AC) is low or the output voltage (DC) is higher than shown in this chart.							

NOTE:

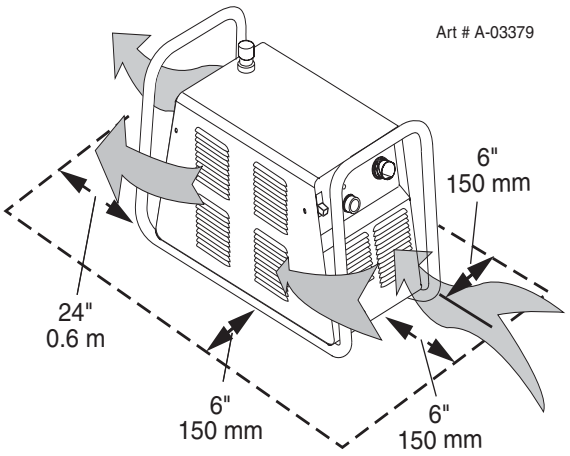
IEC Rating is determined as specified by the International Electro-Technical Commission. These specifications include calculating an output voltage based upon power supply rated current. To facilitate comparison between power supplies, all manufacturers use this output voltage to determine duty cycle.

TDC Rating is determined using an output voltage representative of actual output voltage during cutting with a TDC torch. This voltage may be more or less than IEC voltage, depending upon choice of torch, consumables, and actual cutting operation.

Power Supply Dimensions & Weight



Ventilation Clearance Requirements



2.03 Input Wiring Specifications

CutMaster 51 Power Supply Input Wiring Requirements											
Input		Power Input		Current Input		Suggested Sizes (See Notes)					
Voltage	Freq.	1-Ph	3-Ph	1-Ph	3-Ph	Fuse (Amps)		Wire (AWG)		Wire (Canada)	
(Volts)	(Hz.)	(kVA)	(kVA)	(Amps)	(Amps)	1-Ph	3-Ph	1-Ph	3-Ph	1-Ph	3-Ph
208	60	9		39		60		10		10	
230	60	9		37		60		10		10	
400	50		8		11		15		12		12
400	60		8.5		12		15		12		12
460	60	14		17.5		25		12		12	
460	60		8		10		15		12		12
Line Voltages with Suggested Circuit Protection and Wire Sizes Based on National Electric Code and Canadian Electric Code											

CE CutMaster 51 Input Wiring Specifications						
	Input		Power Input	Current Input	Suggested Sizes (See Notes)	
	Voltage	Frequency	3-Ph	3-Ph	Fuse (Amps)	Wire (mm^2)
	(Volts)	(Hz)	(kVA)	(Amps)	3-Ph	3-Ph
CE CutMaster 51	400	50	7.9	11.5	15	4
Line Voltages with Suggested Circuit Protection and Wire Sizes Based on National Electric Code and Canadian Electric Code						

NOTES

Refer to Local and National Codes or local authority having jurisdiction for proper wiring requirements.

Cable size is de-rated based on the Duty Cycle of the equipment.

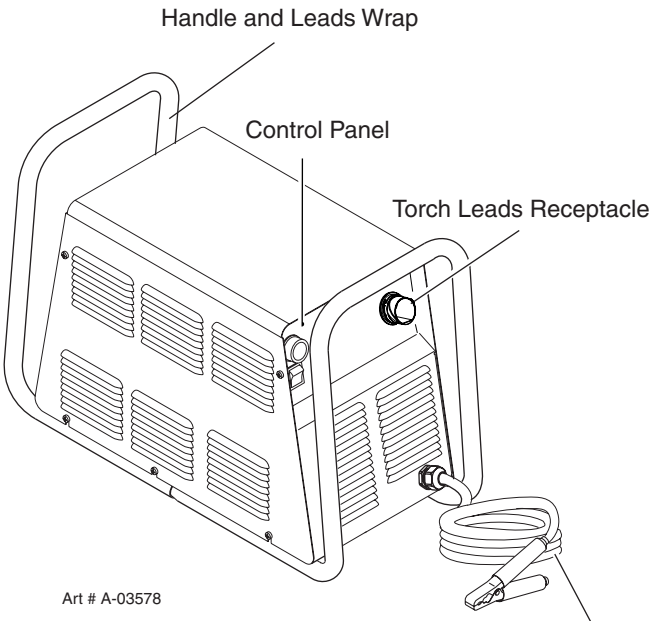
The suggested sizes are based on flexible power cable with power plug installations. For hard-wired installations refer to local or national codes.

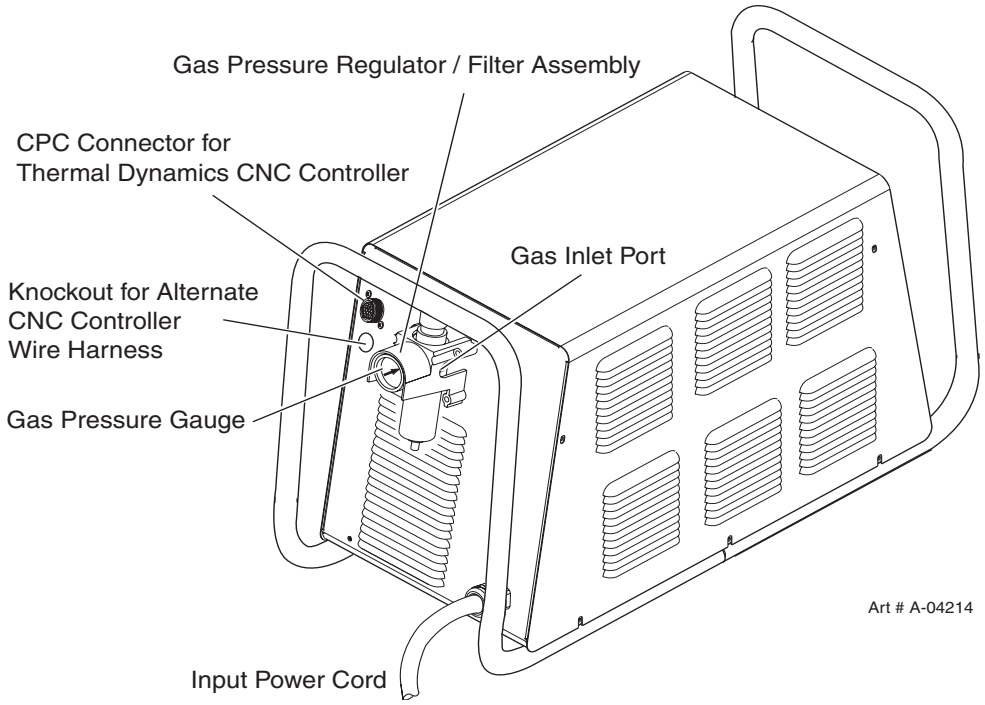
Cable conductor temperature used is 167° F (75° C).

An energy limiting fuse UL Class RK-1 (examples: BUSS LPS / LPN-RK or Gould-Shawmut AZK-A6K) should be used to minimize damage to Plasma Cutting, Welding or power distribution equipment.

***NEVER** use replaceable element fuses like UL Class H, or "one-time" fuses like UL Class K5.*

2.04 Power Supply Features





2.05 Power Supply Options and Accessories

Section 6, Parts Lists, provides catalog numbers and ordering information.

A. Single-Stage Air Filter Kit

For use with compressed air shop systems. Filters moisture and particulate matter from the air stream to at least 0.85 microns. This filter increases performance and improves consumables parts life.

B. Two Stage Air Filter Kit

For use on compressed air shop systems. Filters moisture and contaminants from the air stream to at least 5.0 microns. This filter is pre-assembled at the factory and needs only to be installed on the power supply.

C. High Pressure Regulators

High pressure regulators are available. The regulators are used to set the proper compressed air pressure.

NOTE

Regulators should not be installed with In-Line Air Filters.

D. Extended Work Cable with Clamp

As an alternative to the standard 20 ft / 6.1 m work cable & clamp on the power supply, a 50 ft / 15.2 m work cable with clamp is available.

E. Multi-Purpose Cart

Rugged steel cart on easy-rolling rear wheels and front-mounted swivel casters. Provides maximum mobility for the power supply and can also serve as a display cart. Top shelf is 12" / 305 mm x 20" / 508 mm. Steel handle is 30" / 762 mm high.

F. Wheel Kit

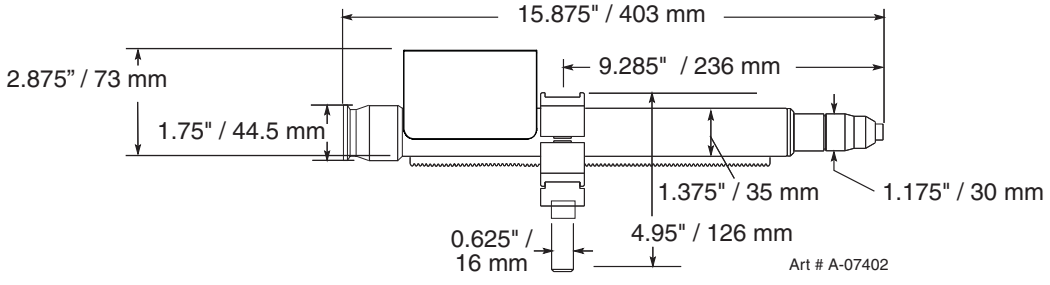
A kit with easy-rolling wheels, for maximum portability for the power supply.

2.06 Torch Specifications

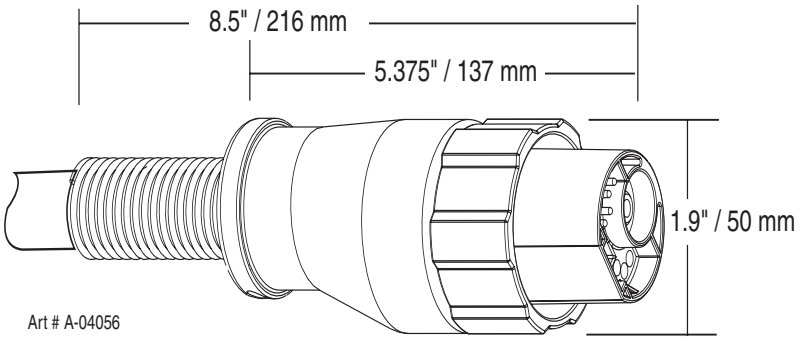
SL100SV Machine Torch Specifications	
Torch Ratings	
Ambient Temperature	104° F / 40° C
Duty Cycle *(Refer to NOTE)*	100% @ 100 Amps @ 400 scfh
Maximum Current	100 Amps
Voltage (V_{peak})	500V
Arc Striking Voltage	7kV
Type of Cooling	Combination of Ambient Air and Gas Flow Through Torch
Current Rating	Up to 100 Amps, DC, Straight Polarity
Gas Requirements	
Gas (Plasma and Secondary)	Compressed Air (**ONLY**)
Operating Pressure (Varies According to Power Supply and Torch Leads Length)	60 - 75 psi 4.1 - 5.2 bar
Maximum Input Pressure	125 psi / 8.6 bar
Gas Flow	300 - 500 scfh / 142 - 235 lpm
NOTE: Operating pressure varies with operating amperage and torch leads length.	
Torch Leads Lengths	
25' / 7.6 m, with ATC Connector	
35' / 10.6 m, with ATC Connector	
50' / 15.2 m, with ATC Connector	
Plasma Power Supply Used With:	
Thermal Dynamics CutMaster 51, CutMaster 81, CutMaster 101, CutMaster 151	
NOTE Torch duty cycle is greater than power supply duty cycle.	

A. Torch Configuration

The standard machine torch has a positioning tube with rack & pinch block assembly.



B. Torch Connector Dimensions



C. Torch Parts

Start Cartridge, Electrode, Tip, Shield Cup Body, Shield Cap

D. Parts - In - Place (PIP)

Torch Head has built - in switch

12 vdc circuit rating

E. Direct Contact Hazard

For exposed tip the recommended standoff is 3/16 inches / 4.7 mm.

2.07 Torch Options and Accessories

These items can adapt a standard system to a particular application or further enhance performance (refer to Section 6 for ordering information).

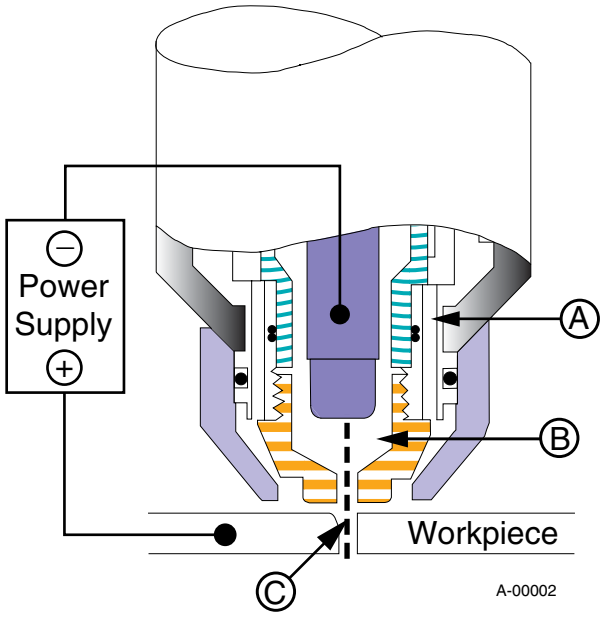
- Spare Parts Kits - Various kits containing replacement consumable torch parts.
- Pinion Assembly (for machine torches)
- Leather Leads Covers

2.08 Introduction to Plasma

A. Plasma Gas Flow

Plasma is a gas which has been heated to an extremely high temperature and ionized so that it becomes electrically conductive. The plasma arc cutting and gouging processes use this plasma to transfer an electrical arc to the workpiece. The metal to be cut or removed is melted by the heat of the arc and then blown away.

In a Plasma Cutting Torch a cool gas enters Zone B, where a pilot arc between the electrode and the torch tip heats and ionizes the gas. The main cutting arc then transfers to the workpiece through the column of plasma gas in Zone C.



Typical Torch Head Detail

By forcing the plasma gas and electric arc through a small orifice, the torch delivers a high concentration of heat to a small area. The stiff, constricted plasma arc is shown in Zone C. Direct current (DC) straight polarity is used for plasma cutting, as shown in the illustration.

Zone A channels a secondary gas that cools the torch. This gas also assists the high velocity plasma gas in blowing the molten metal out of the cut allowing for a fast, slag - free cut.

B. Gas Distribution

The single gas used is internally split into plasma and secondary gases.

The plasma gas flows into the torch through the negative lead, through the start cartridge, around the electrode, and out through the tip orifice.

The secondary gas flows down around the outside of the torch start cartridge, and out between the tip and shield cup around the plasma arc.

C. Pilot Arc

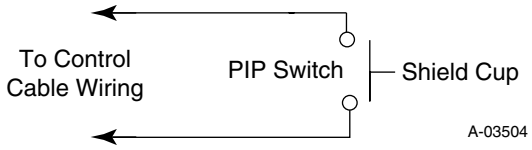
When the torch is started a pilot arc is established between the electrode and cutting tip. This pilot arc creates a path for the main arc to transfer to the work.

D. Main Cutting Arc

DC power is also used for the main cutting arc. The negative output is connected to the torch electrode through the torch lead. The positive output is connected to the workpiece via the work cable and to the torch through a pilot wire.

E. Parts - In - Place (PIP)

The torch leads include a 'Parts - In - Place' (PIP) circuit. When the torch shield cup is properly installed, it closes a switch. The torch will not operate if this switch is open.



Parts - In - Place Circuit Diagram

SECTION 3: INSTALLATION

3.01 Unpacking

1. Use the packing lists to identify and account for each item.
2. Inspect each item for possible shipping damage. If damage is evident, contact your distributor and / or shipping company before proceeding with the installation.
3. Record Power Supply and Torch model and serial numbers, purchase date and vendor name, in the information block at the front of this manual.

3.02 Lifting Options

The Power Supply includes a handle for **hand lifting only**. Be sure unit is lifted and transported safely and securely.

WARNINGS

Do not touch live electrical parts.

Disconnect input power cord before moving unit.

***FALLING EQUIPMENT** can cause serious personal injury and can damage equipment.*

***HANDLE** is not for mechanical lifting.*

- Only persons of adequate physical strength should lift the unit.
- Lift unit by the handle, using two hands. Do not use straps for lifting.
- Use optional wheel kit, cart or similar device of adequate capacity to move unit.
- Place unit on a proper skid and secure in place before transporting with a fork lift or other vehicle.

3.03 Primary Input Power Connections

CAUTION

Check your power source for correct voltage before plugging in or connecting the unit. The primary power source, fuse, and any extension cords used must conform to local electrical code and the recommended circuit protection and wiring requirements as specified in Section 2.03.

A. Connections to 208 / 230-Volt Power

The 208 / 230-Volt power supply includes a factory-installed input power cable and plug.

1. Check your power source for correct voltage before plugging in the unit.
2. Connect the input power cable (or close the main disconnect switch) to supply power to the system.

CAUTION

The primary power source and power cable must conform to local electrical code and the recommended circuit protection and wiring requirements (refer to table in Section 2.03).

B. Connections to 400-Volt, 460-Volt, or 600-Volt Three-Phase Power

3

These Power Supplies are equipped with a four-conductor input power cable for three-phase input power. The 460-Volt Power Supply will accept 460-VAC, Single-Phase input power with a change of input power cable.

1. Check your power source for correct voltage before plugging in the unit.
2. The input cable's outer covering is stripped back at the factory to expose the individual wires at the free end of the cable.
3. Connect the ends of the individual wires to a customer supplied plug or main disconnect as follows:

CAUTION

The primary power source and power cable must conform to local electrical code and the recommended circuit protection and wiring requirements (refer to table in Section 2). All the input cable wires must be connected for three-phase operation.

- Green / Yellow wire to Ground.
- Remaining wires to L1, L2, L3 input.

4. Connect the input power cable (or close the main disconnect switch) to supply power to the system.

C. Connections to 460-Volt Single- Phase Power

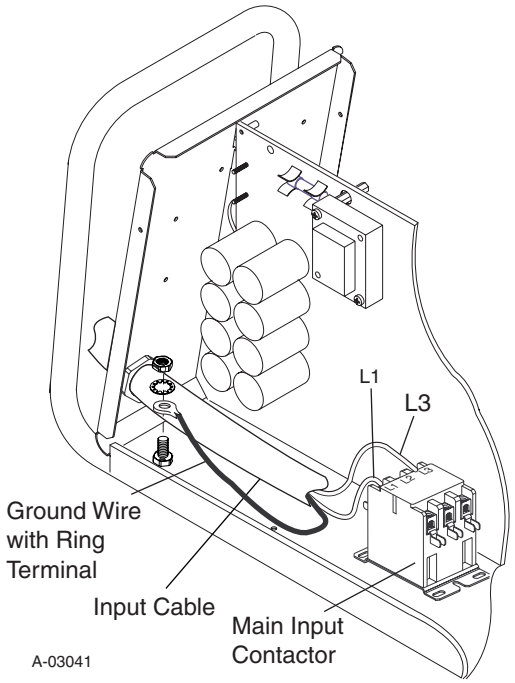
The 460-Volt Power Supply will accept 460-VAC, Single-Phase input power with a change of input power cable.

1. Remove the Power Supply cover per section 5.09-A.
2. Disconnect the original input power cable from the main input contactor and the chassis ground connection.
3. Loosen the through-hole protector on the back panel of the power supply. Pull the original power cable out of the power supply.
4. Pass a customer-supplied, three-conductor input power cable through the access opening in the back panel of the power supply. Refer to Section 2 for power cable specifications.

CAUTION

The primary power source and power cable must conform to local electrical code and the recommended circuit protection and wiring requirements (refer to table in Section 2.03).

5. Strip back the insulation on the individual wires.
6. Connect to main input contactor as follows:
   - Line 1 wire to terminal L1.
   - Line 3 wire to terminal L3.
7. Connect the ground wire to Ground (Earth). The Ground wire connection requires a ring terminal.
8. Tighten the through-hole protector to secure the power cable.



Input Power Connections, 460 VAC, Single-Phase

9. Replace the Power Supply cover.
10. Connect the input power cable (or close the main disconnect switch) to supply power to the system.

3.04 Gas Connections

A. Connecting Gas Supply to Unit

Use **only** compressed air with this power supply.

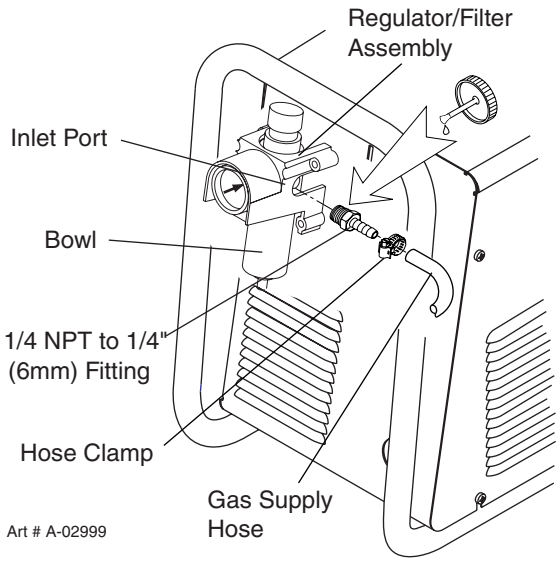
An in-line pneumatic dryer & evaporator type air filter, capable of filtering to at least 5 microns, is required when using air from a compressor. This type filter will insure that moisture, oil, dirt, chips, rust particles, and other contaminants from the supply hose do not enter the torch. For highly automated applications, a refrigerated drier may be used.

The connection is the same for compressed air from a compressor from high pressure cylinders. Refer to subsection 3.4-B or 3.4-C if an additional air line filter is to be installed.

1. Connect the air line to the inlet port. The illustration shows typical fittings as an example. Other fittings can be used.

NOTE

For a secure seal, apply thread sealant to the fitting threads, according to manufacturer's instructions. Do not use Teflon tape as a thread sealer, as small particles of the tape may break off and block the small air passages in the torch.



Air Connection to Inlet Port

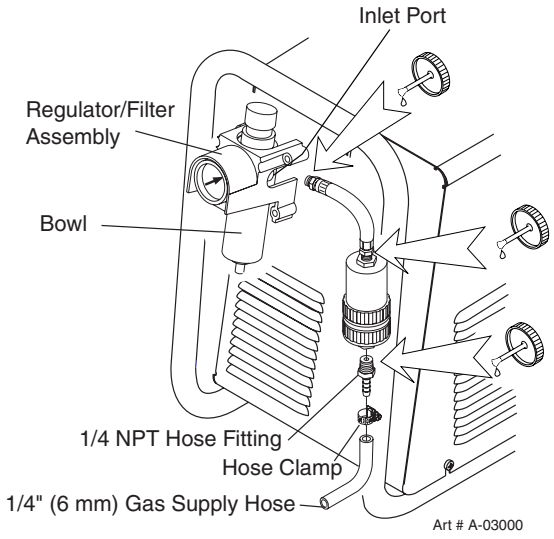
B. Installing Optional Single-Stage Air Filter

A Single-Stage filter kit is recommended for improved filtering, to keep moisture and debris out of the torch.

1. Attach the Single-Stage Filter Hose to the Inlet Port.
2. Attach the Filter Assembly to the filter hose.
3. Connect the air line to the Filter. Use only Synflex or equivalent grade hose. The illustration shows typical fittings as an example.

NOTE

For a secure seal, apply thread sealant to the fitting threads, according to the maker's instructions. Do Not use Teflon tape as a thread sealer, as small particles of the tape may break off and block the small air passages in the torch. Connect as follows:



Optional Single-Stage Filter Installation

C. Installing Optional Two-Stage Air Filter Kit

This optional two-stage air line filter is also for use on compressed air shop systems. Filter removes moisture and contaminants to at least 5 microns.

Connect the air supply as follows:

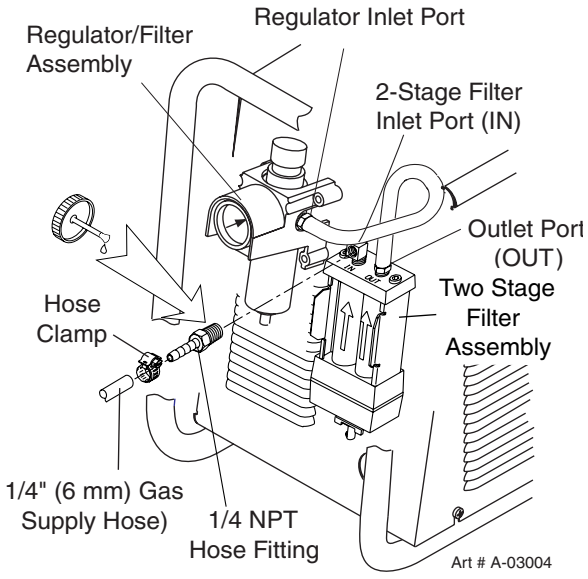
a. Attach the Two Stage Filter bracket to the back of the power supply per instructions supplied with the filter assembly.

NOTE

For a secure seal, apply thread sealant to the fitting threads according to manufacturer's instructions. Do Not use Teflon tape as a thread sealer as small particles of the tape may break off and block the small air passages in the torch.

b. Connect the two stage filter outlet hose to the inlet port of the Regulator / Filter Assembly.

c. Use only Synflex or equivalent grade hose. Use customer-supplied fittings to connect the air line to the Filter. A 1/4 NPT to 1/4" hose barbed fitting is shown as an example.



Optional Two-Stage Filter Installation

D. Using High Pressure Air Cylinders

When using high pressure air cylinders as the air supply:

1. Refer to the manufacturer's specifications for installation and maintenance procedures for high pressure regulators.
2. Examine the cylinder valves to be sure they are clean and free of oil, grease or any foreign material. Briefly open each cylinder valve to blow out any dust which may be present.
3. The cylinder must be equipped with an adjustable high-pressure regulator capable of outlet pressures up to 100 psi (6.9 bar) maximum and flows of at least 500 scfh (236 lpm).
4. Connect supply hose to the cylinder.

NOTE

Pressure should be set at 100 psi (6.9 bar) at the high pressure cylinder regulator.

Supply hose must be at least 1/4 inch (6 mm) I.D.

For a secure seal, apply thread sealant to the fitting threads, according to manufacturer's instructions. Do Not use Teflon tape as a thread sealer, as small particles of the tape may break off and block the small air passages in the torch.

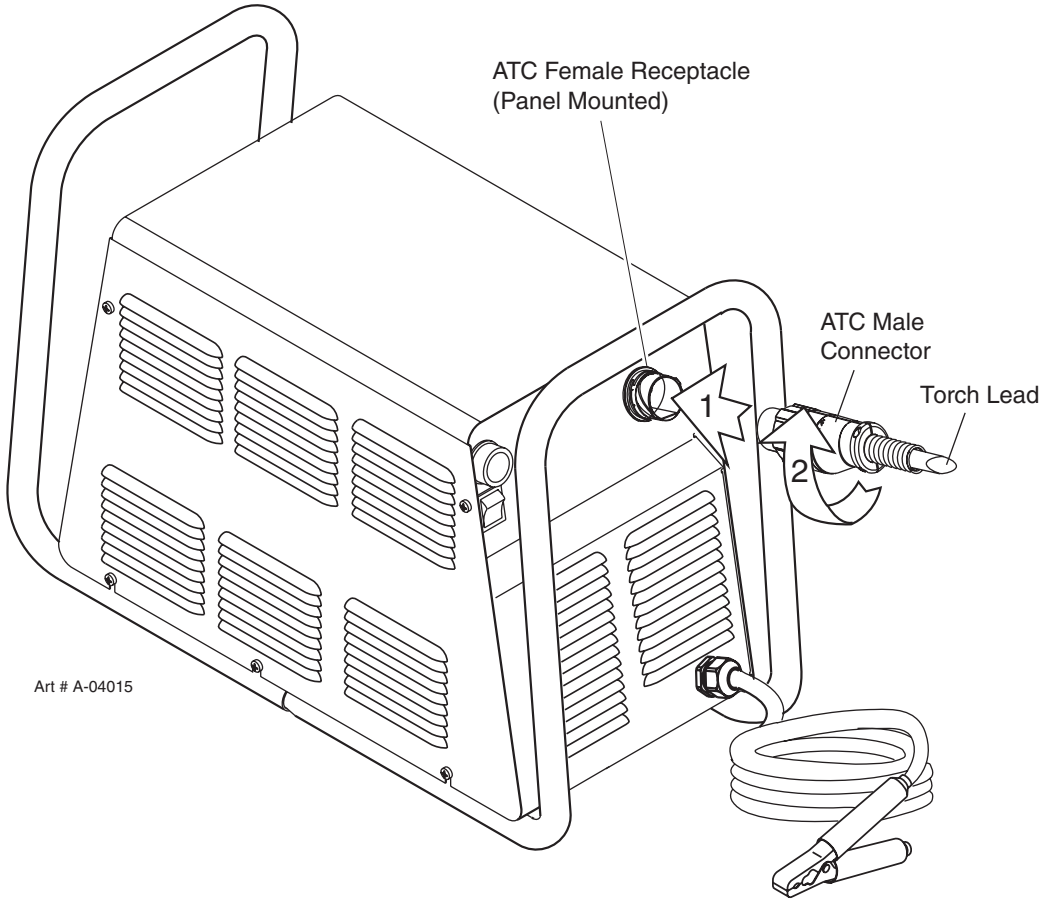
3.05 Torch Connections

If necessary, connect the torch to the Power Supply. Connect only the Thermal Dynamics model SL100 Torch (with ATC connector) to this power supply. Maximum torch leads length is 50 feet / 15.2 m.

WARNING

Disconnect primary power at the source before connecting the torch.

1. Align the ATC male connector (on the torch lead) with the female receptacle. Push the male connector into the female receptacle. The connectors should push together with a small amount of pressure.
2. Secure the connection by turning the locking nut clockwise until it clicks. DO NOT use the locking nut to pull the connection together. Do not use tools to secure the connection.
3. The system is ready for operation.

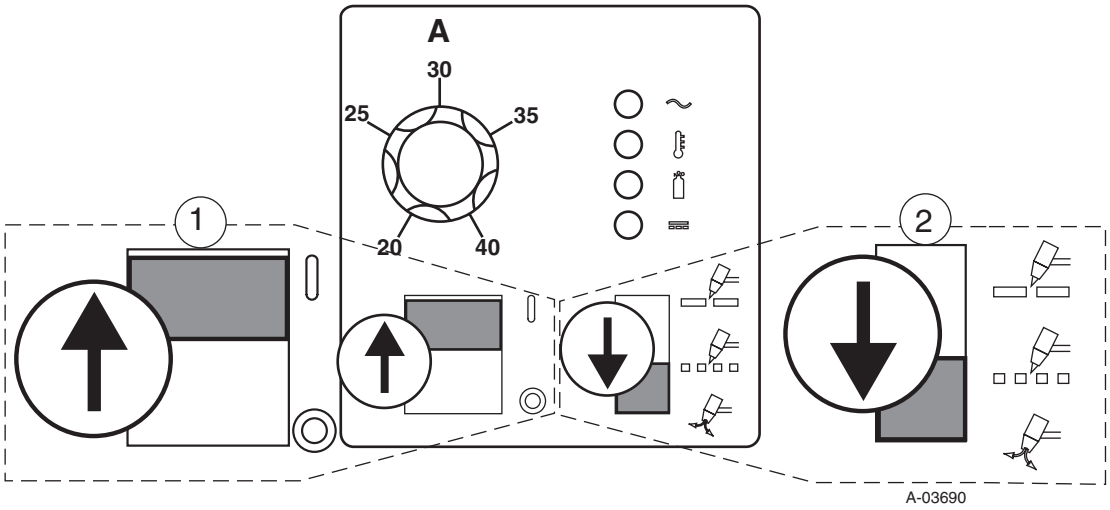


Connecting the Torch to the Power Supply

B. Check Air Quality

To test the quality of air:

1. Put the ON / OFF switch in the ON (up) position.
2. Put the RUN / RAPID AUTO RESTART / SET switch in the SET (down) position.
3. Place a welding filter lens in front of the torch and turn on the air. Any oil or moisture in the air will be visible on the lens. **Do not start an arc!**



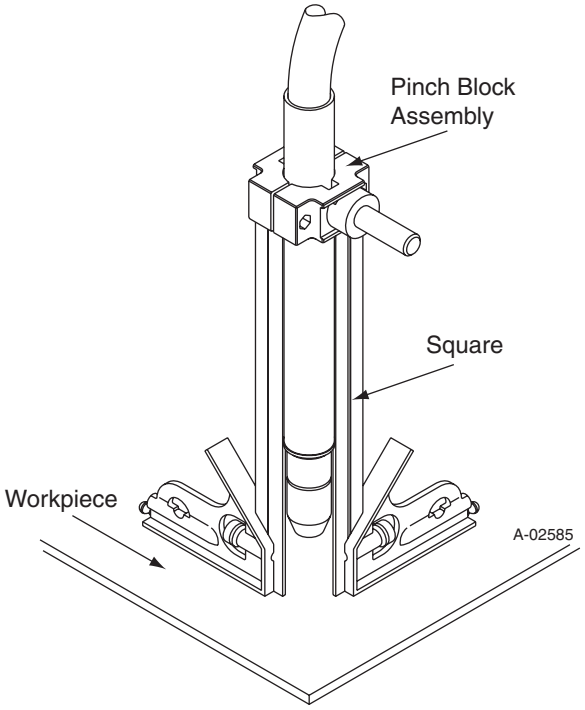
3.06 Torch Installation

WARNING

Disconnect primary power at the source before disassembling the torch or torch leads.

The machine torch includes a positioning tube with rack and pinch block assembly.

1. Mount the torch assembly on the cutting table.
2. To obtain a clean vertical cut, use a square to align the torch perpendicular to the surface of the workpiece.

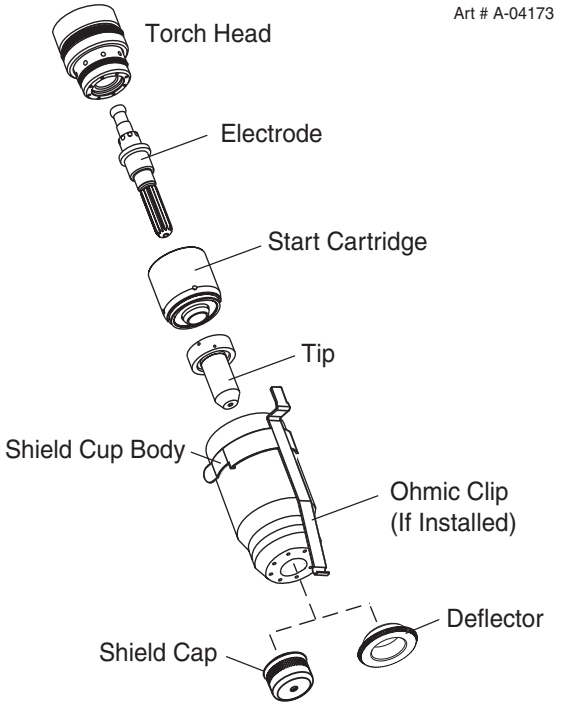


Machine Torch Set-Up

3. The proper torch parts (shield cup body, shield cap, tip, start cartridge, and electrode) must be installed for the type of operation. Refer to Section 3.07, Torch Parts Selection for details.

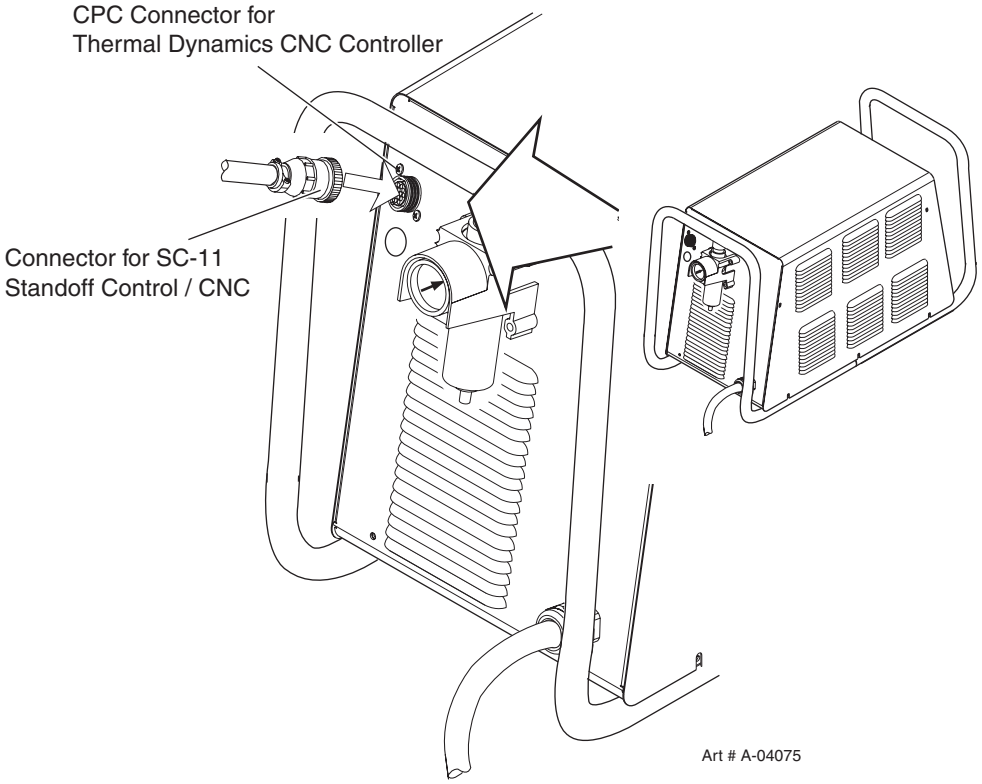
3.07 Torch Parts Selection

1. Check the torch for proper consumable parts. The parts supplied in the torch may not be correct for the operator's chosen amperage level. The torch parts must correspond with the type of operation.



3.08 Power Supply Connection to SC-11 Standoff Control

The power supply includes an Automation Interface PC Board connected to a CPC connector on the power supply rear panel. For connection to the Thermal Dynamics SC-11 Standoff Control, align and connect the cable from the Standoff Control to the CPC connector. Check for a secure connection.

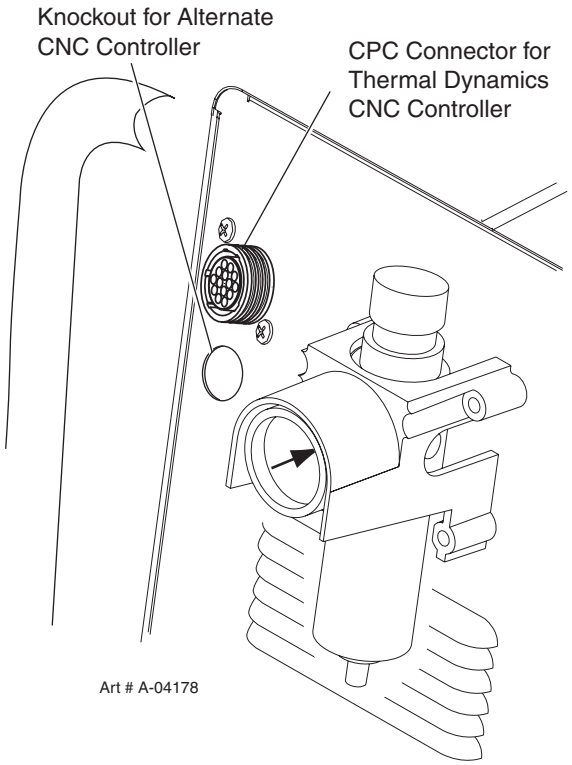


3.09 Power Supply Connection to Alternate Standoff Control

The Power Supply rear panel includes a knockout to accept wiring between the Automation Interface PC Board and alternate CNC controls. The Automation Interface PC board includes a terminal strip for connection to alternate CNC controls.

To connect an alternate CNC Control to the Power Supply:

1. Remove the Power Supply Cover.
2. Carefully open the lower knockout (below the factory-installed CNC connector) on the Power Supply rear panel.

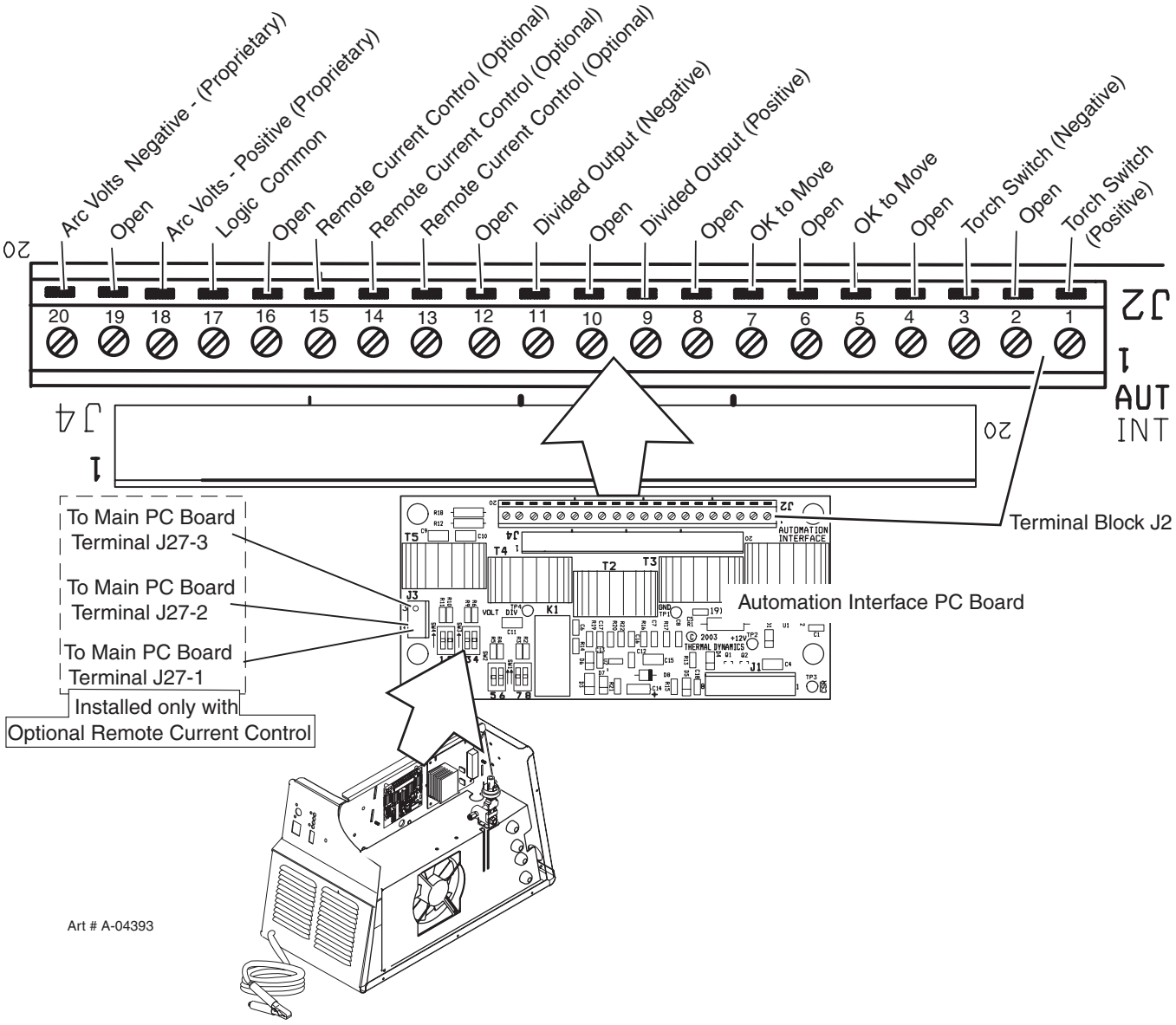


3. Install a through-hole protector ('Strain Relief') in the lower knockout hole.
4. Route the wire harness from the alternate CNC Control through the through-hole protector.

5. Connect the wire harness from the alternate CNC Control to the 20-position terminal strip (labeled 'J2') on the Automation Interface PC Board. Refer to the illustration.
   a. For divided voltage output, connect to terminals J2-11 (negative) and J2-9 (positive).
   b. For raw arc voltage, connect to Main Power PC Board terminals E24 (negative) and E27 (positive). Refer to the illustration on the next page.

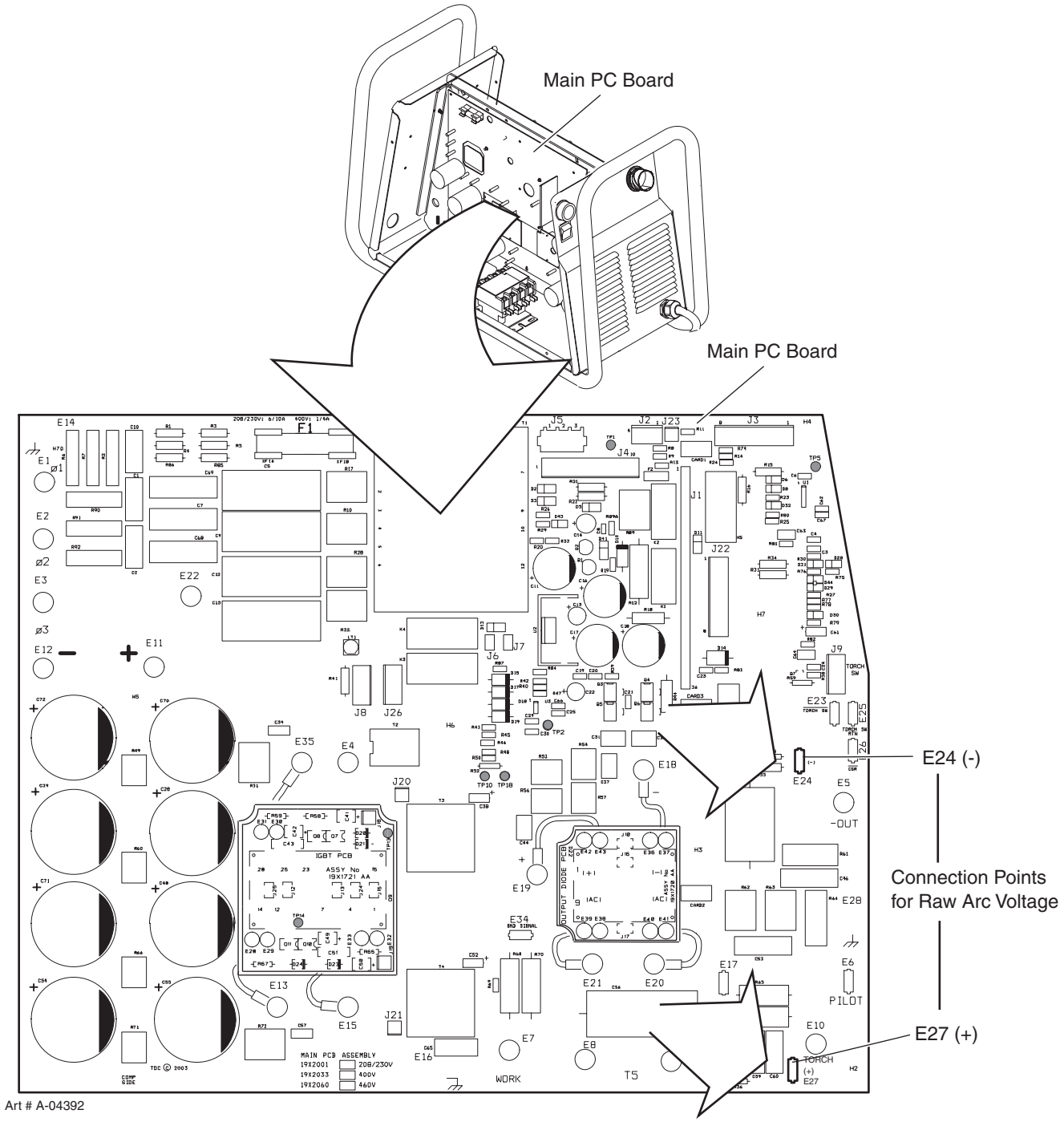
NOTE

There is no need to disconnect the factory-installed wire harness from the J4 terminal strip.



Alternate CNC Controller Connections to Automation Interface Board

6. Tighten the through-hole protector ('strain relief') to secure the CNC cable to the power supply. Leave the factory-installed harness connected to terminal block J4 in place.



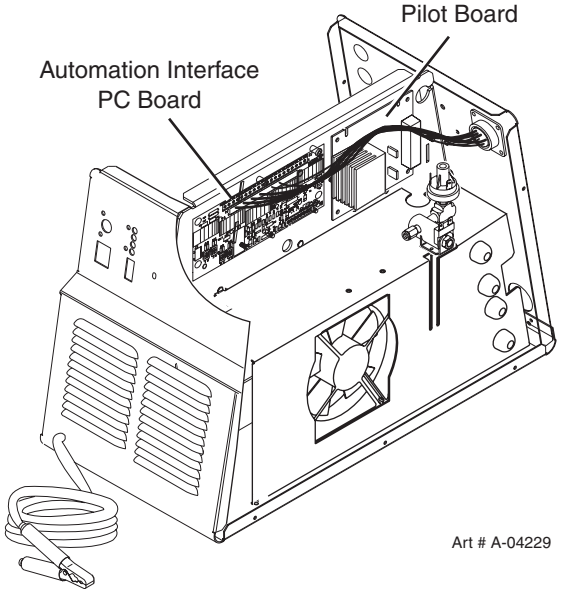
Raw Arc Voltage Connection Points

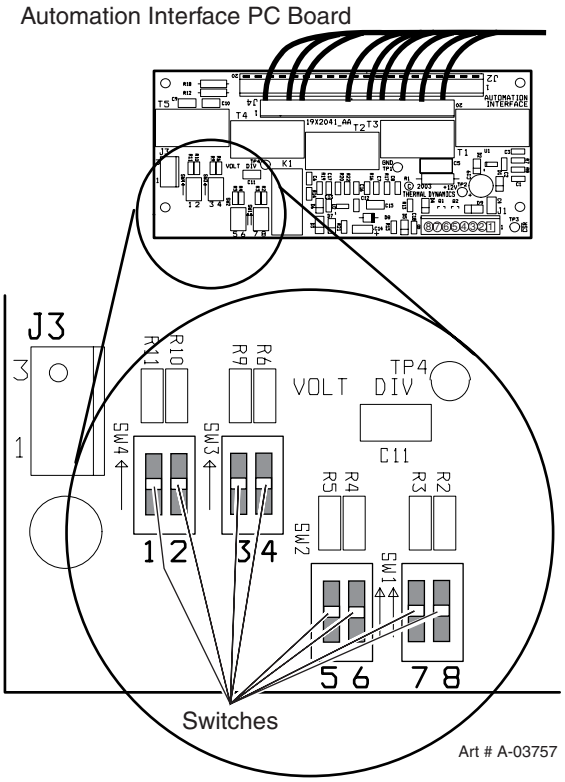
3.10 Automation Interface PC Board Set-up

The Automation Interface PC board includes switches that must be set to adapt the Interface Board to the automation system being used. The switches are factory-set for the Thermal Dynamics SC-11 Standoff Control and require no adjustment.

For operation with any other CNC equipment, refer to the CNC system documents to determine the division factor the CNC system requires. Proceed as follows:

1. Set the interface control board switches as indicated in the appropriate chart in the Appendix pages. The division factors are listed in the right-hand column of each chart.

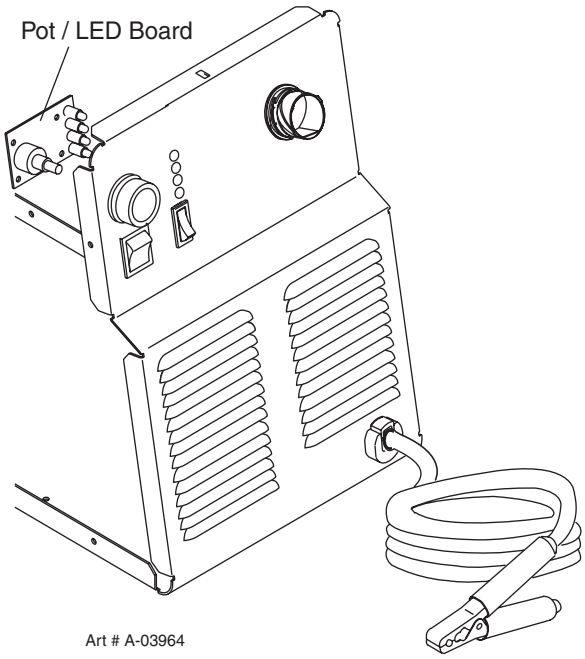




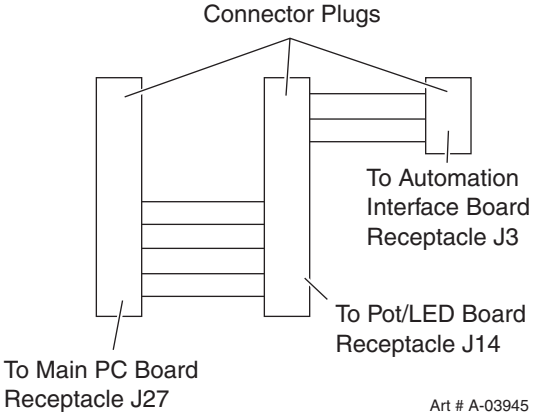
2. Re-install the Power Supply cover.

3.11 Optional Remote Current Control Harness Installation

1. Locate the power supply Pot/LED Board just inside the power supply front panel.



2. Disconnect and remove the wire harness between the Pot/LED Board and receptacle J22 on the Main PC Board. Keep the harness for possible future use.
3. The kit includes a wire harness with 3 connectors. Install the harness as follows:



4. Ensure that the wire harness will not interfere with the fit of the power supply cover against the top edge of the power supply center chassis. Use wire ties as needed to secure the wire harness.

NOTE

Installation of this harness disables the output current control **(A)** *on the front panel of the power supply. Use the CNC controller to control the output current of the power supply.*

5. Re-install the Power Supply cover.

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SECTION 4: OPERATION

4.01 Product Features

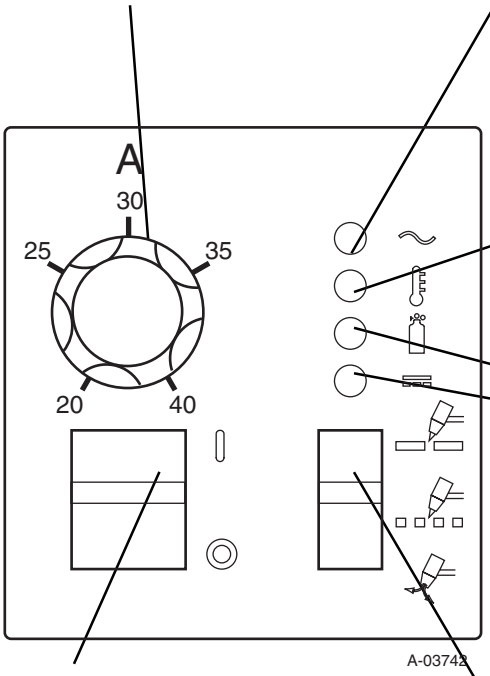
A. Power Supply Front Panel Controls and Indicators

AC Indicator

Steady light indicates power supply is ready for operation. Blinking light indicates unit is in protective interlock mode. Shut unit off, shut off or disconnect input power, correct the fault, and restart the unit. Refer to Section 5 for details.

(A) Output Current Control

Sets the desired output current.



TEMP Indicator

Indicator is normally OFF. Indicator is ON when internal temperature exceeds normal limits. Shut unit OFF; let the unit cool before continuing operation.

GAS Indicator

Indicator is ON when minimum input gas pressure for power supply operation is present. Minimum pressure for power supply operation is not sufficient for torch operation.

DC Indicator

Indicator is ON when DC output circuit is active.

ON / OFF Switch

Controls input power to the power supply.

is ON, is OFF.

RUN / RAPID AUTO RESTART / SET Switch

RUN (up) position is for general torch operation.

RAPID AUTO RESTART (middle) position is for an uninterrupted restart, when cutting expanded metal or in trimming operations.

SET (down) position is for setting gas pressure and purging lines.

4.02 Preparations For Operating

Perform the following steps at the start of each operating session:

WARNING

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

A. Torch Parts Selection

Check the torch for proper assembly and appropriate torch parts. The torch parts must correspond with the type of operation, and with the amperage output of this Power Supply (40 amps maximum).

B. Torch Connection

Check that the torch is properly connected. Only Thermal Dynamics model SL100 Torches may be connected to this Power Supply.

C. Check Primary Input Power Source

1. Check the power source for proper input voltage. Make sure the input power source meets the power requirements for the unit per Section 2, Specifications.
2. Connect the input power cable (or close the main disconnect switch) to supply power to the system.

D. Gas Selection

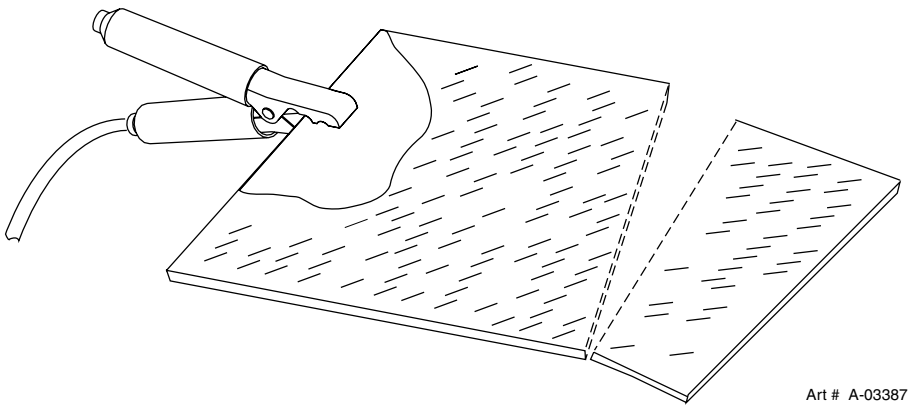
Ensure compressed air source meets requirements (refer to Section 3.4). Check connections and turn gas supply on.

4

Place the ON - OFF Switch on the Power Supply to the ON position. If the Run - Rapid Auto Restart - Set switch is in SET position, gas will flow. If the switch is in RUN or Rapid Auto Restart position there will be no gas flow.

E. Connect Work Cable

Clamp the work cable to the workpiece or cutting table. The area must be free from oil, paint and rust. Connect only to the main part of the workpiece; do not connect to the part to be cut off.



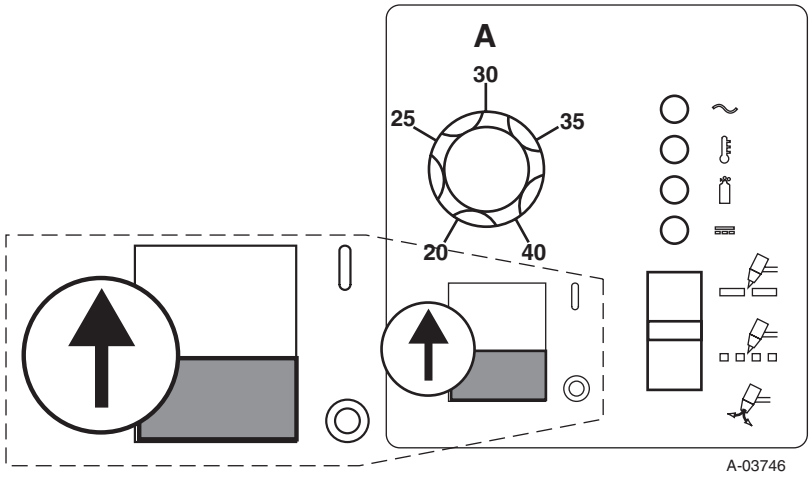
Art # A-03387

F. Power On

Place the Power Supply ON / OFF switch to the ON (up) position. AC indicator ~ turns on. Gas indicator turns on if there is sufficient gas pressure for power supply operation.

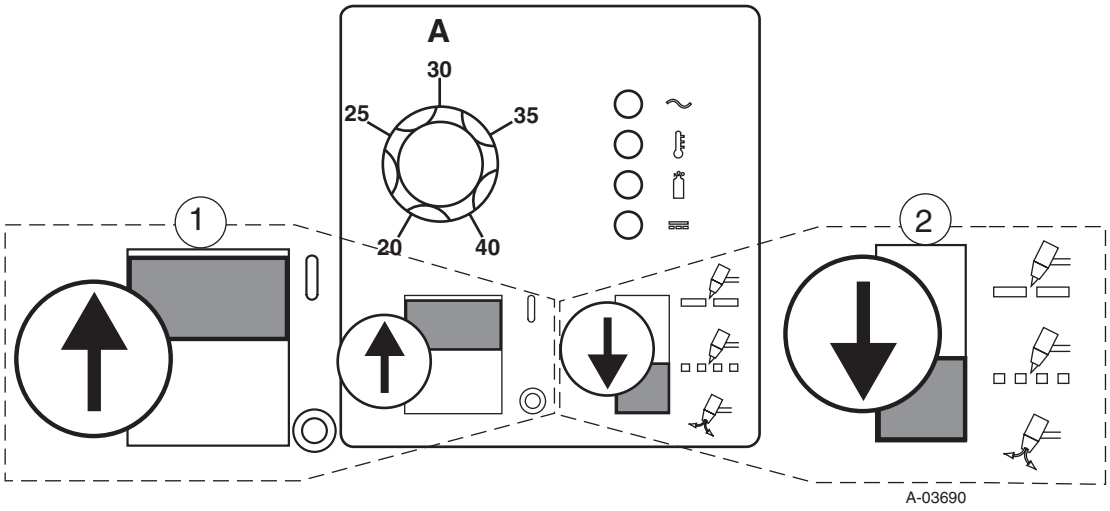
NOTE

Minimum pressure for power supply operation is lower than minimum for torch operation.



G. Set Operating Pressure

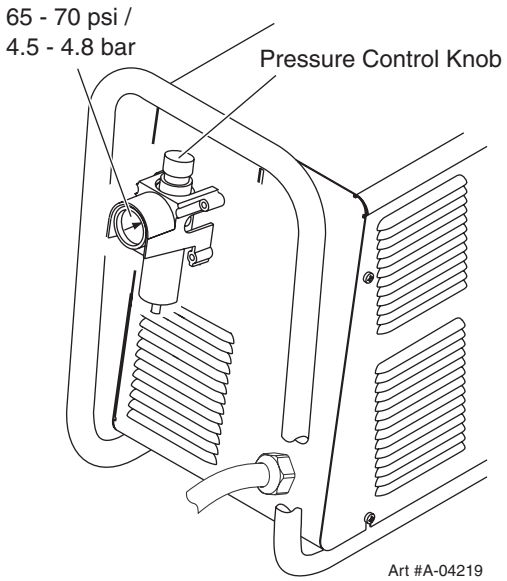
1. Place the Power Supply RUN / Rapid Auto Restart / SET switch to the SET (down) position. Gas will flow.



2. Adjust gas pressure per the settings chart.

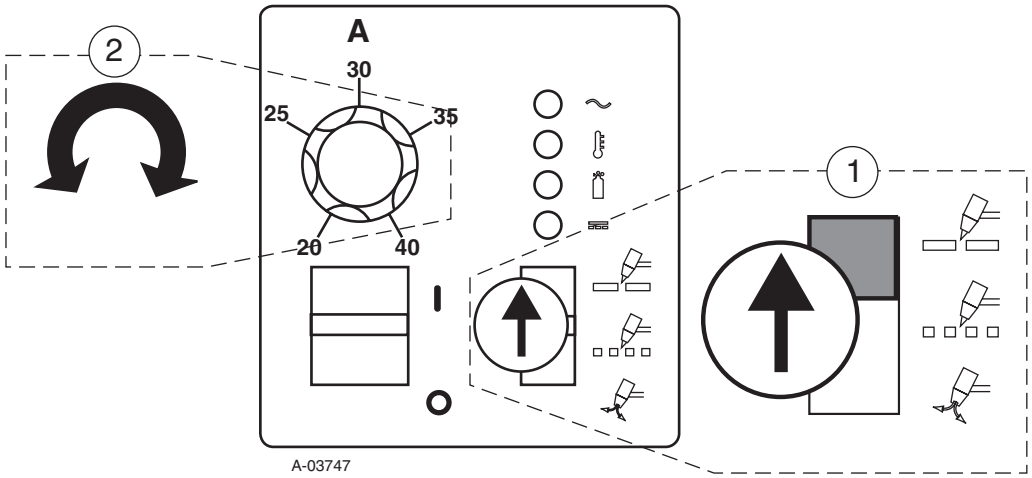
4

CutMaster 51 Gas Pressure Settings		
Leads Length	Up to 25' (7.6 m)	Over 25' (7.6 m)
40A Cutting	65 psi 4.5 bar	70 psi 4.8 bar



H. Select Current Output Level

1. Place RUN / Rapid Auto Restart / SET to RUN (up) or Rapid Auto Restart (center) position. Gas flow stops.
2. Set the current output level, up to 40 amps.



I. Cutting Operation

When the torch leaves the workpiece during cutting operations with the RUN / Rapid Auto Restart / SET switch in the RUN (up) position, there is a brief delay in restarting the pilot arc. With the switch in the 'Rapid Auto Restart' (middle) position, when the torch leaves the workpiece the pilot arc restarts instantly, and the cutting arc restarts instantly when the pilot arc contacts the workpiece. Use the 'Rapid Auto Restart' position when cutting expanded metal or gratings, or in trimming operations when an uninterrupted restart is desired.

J. Typical Cutting Speeds

Cutting speeds vary according to torch output amperage, the type of material being cut, and operator skill.

Output current setting or cutting speeds may be reduced to allow slower cutting while still producing cuts of excellent quality.

K. Postflow

De-activate the start signal (provided by the CNC Control) to stop the cutting arc. Gas continues to flow for approximately 6 seconds. During post - flow, if the user activates start signal, the pilot arc starts. The main arc transfers to the workpiece if the torch tip is within transfer distance to the workpiece.

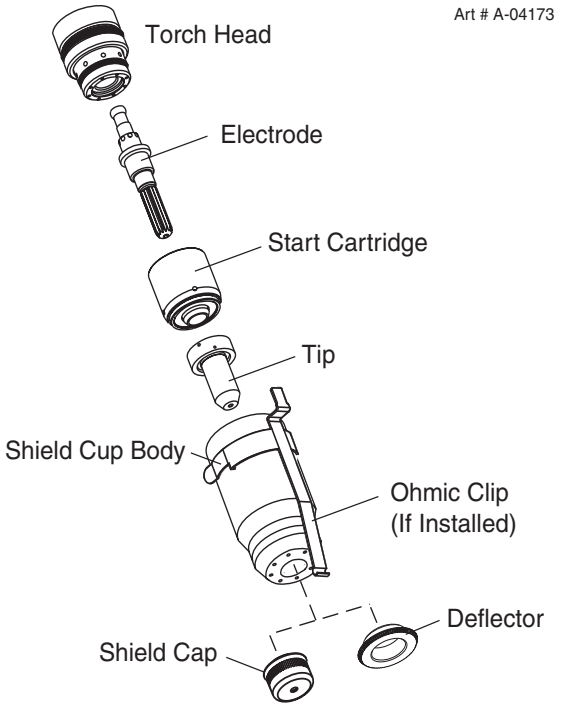
4.03 Selection, Inspection and Replacement of Consumable Torch Parts

The type of operation to be done determines the torch parts to be used. Change the torch parts for a different operation as follows:

WARNINGS

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

DO NOT touch any internal torch parts while the AC indicator light of the Power Supply is ON.



Consumable Parts

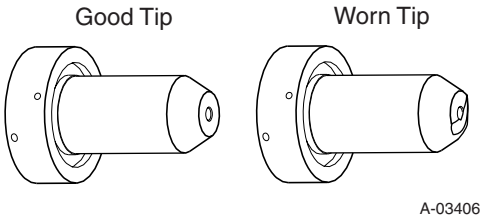
1. Unscrew and remove the shield cup assembly from the torch head. Inspect the cup for damage. Wipe it clean or replace if damaged.

NOTES

The shield cup holds the tip and start cartridge in place.

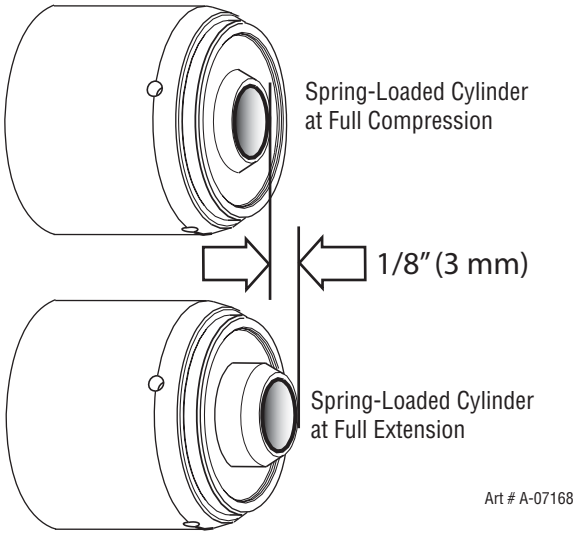
Slag built up on the shield cup that cannot be removed may affect the performance of the system.

2. Remove the tip. Check for excessive wear (indicated by an elongated or oversized orifice). Clean or replace the tip if necessary.

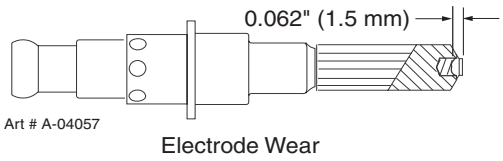


Tip Wear

3. Remove the start cartridge. Check for excessive wear, plugged gas holes, or discoloration. Check the lower end fitting for free motion. Replace if necessary.



4. Pull the Electrode straight out of the Torch Head. Check the end of the electrode for excessive wear. Replace the electrode if wear is greater than 0.062" / 1.5 mm or if the wear is excessively off-center. Refer to the following figure.



Electrode Wear

5. Reinstall the Electrode by pushing it straight into the torch head until it clicks.
6. Reinstall the start cartridge and tip into the torch head.
7. Hand tighten the shield cup until it is seated on the torch head. If resistance is felt when installing the cup, check the threads before proceeding.

NOTE

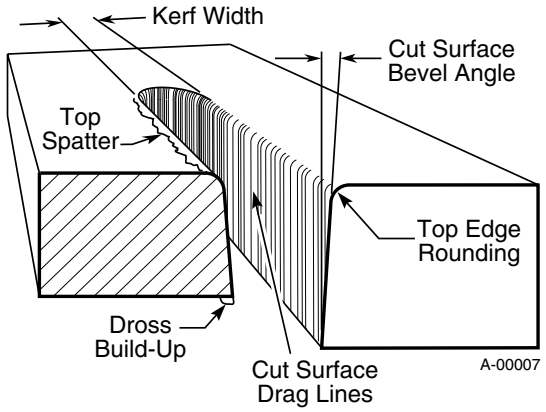
When the shield cup is properly installed, there is a slight gap between the shield cup and the torch head. Gas vents through this gap as part of normal operation. Do not attempt to force the shield cup to close this gap. Forcing the shield cup against the torch head can damage components.

4.04 Cut Quality

NOTES

Cut quality depends heavily on setup and parameters such as torch standoff, alignment with the workpiece, cutting speed, gas pressures, and operator ability.

Cut quality requirements differ depending on application. For instance, nitride build - up and bevel angle may be major factors when the surface will be welded after cutting. Dross - free cutting is important when finish cut quality is desired to avoid a secondary cleaning operation. The following cut quality characteristics are illustrated in the following figure:



Cut Quality Characteristics

A. Cut Surface

4

The desired or specified condition (smooth or rough) of the face of the cut.

B. Nitride Build - Up

Nitride deposits can be left on the surface of the cut when nitrogen is present in the plasma gas stream. These buildups may create difficulties if the material is to be welded after the cutting process.

C. Bevel Angle

The angle between the surface of the cut edge and a plane perpendicular to the surface of the plate. A perfectly perpendicular cut would result in a 0° bevel angle.

D. Top - Edge Rounding

Rounding on the top edge of a cut due to wearing from the initial contact of the plasma arc on the workpiece.

E. Bottom Dross Buildup

Molten material which is not blown out of the cut area and resolidifies on the plate. Excessive dross may require secondary cleanup operations after cutting.

F. Kerf Width

The width of the cut (or the width of material removed during the cut).

G. Top Spatter (Dross)

Top spatter or dross on the top of the cut caused by slow travel speed, excess cutting height, or cutting tip whose orifice has become elongated.

4.05 General Cutting Information

WARNINGS

Disconnect primary power at the source before disassembling the power supply, torch, or torch leads.

Frequently review the Important Safety Precautions at the front of this manual. Be sure the operator is equipped with proper gloves, clothing, eye and ear protection. Make sure no part of the operator's body comes into contact with the workpiece while the torch is activated.

CAUTION

Sparks from the cutting process can damage coated, painted, and other surfaces such as glass, plastic and metal.

NOTE

Handle torch leads with care and protect them from damage.

A. Piloting

Piloting is harder on parts life than actual cutting because the pilot arc is directed from the electrode to the tip rather than to a workpiece. Whenever possible, avoid excessive pilot arc time to improve parts life.

B. Torch Standoff

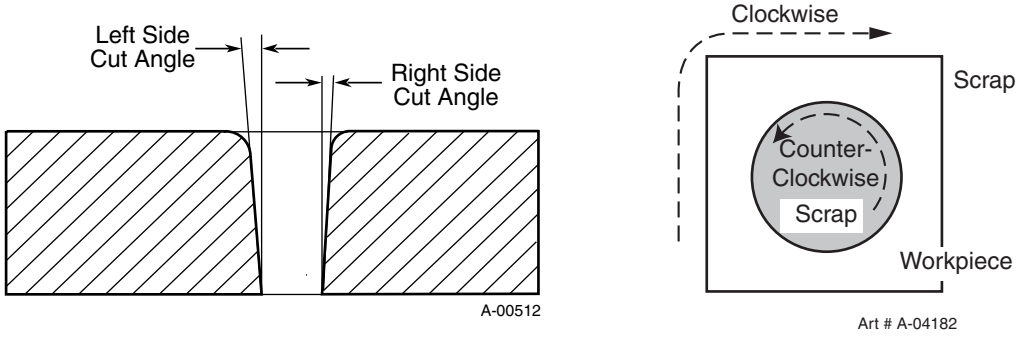
Improper standoff (the distance between the torch tip and workpiece) can adversely affect tip life as well as shield cup life. Standoff may also significantly affect the bevel angle. Reducing standoff will generally result in a more square cut.

C. Edge Starting

For edge starts, hold the torch perpendicular to the workpiece with the front of the tip near (not touching) the edge of the workpiece at the point where the cut is to start. When starting at the edge of the plate, do not pause at the edge and force the arc to "reach" for the edge of the metal. Establish the cutting arc as quickly as possible.

D. Direction of Cut

In the torches, the plasma gas stream swirls as it leaves the torch to maintain a smooth column of gas. This swirl effect results in one side of a cut being more square than the other. Viewed along the direction of travel, the right side of the cut is more square than the left.



Side Characteristics Of Cut

To make a square - edged cut along an inside diameter of a circle, the torch should move counterclockwise around the circle. To keep the square edge along an outside diameter cut, the torch should travel in a clockwise direction.

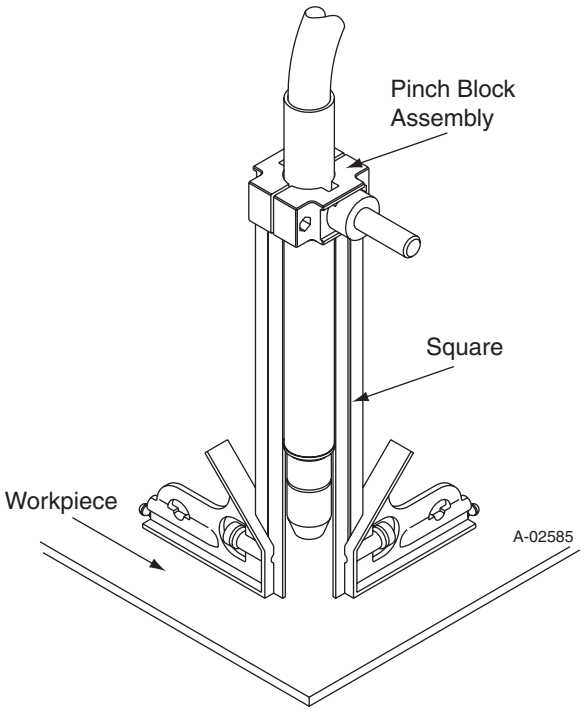
E. Dross

When dross is present on carbon steel, it is commonly referred to as either "high speed, slow speed, or top dross". Dross present on top of the plate is normally caused by too great a torch to plate distance. "Top dross" is normally very easy to remove and can often be wiped off with a welding glove. "Slow speed dross" is normally present on the bottom edge of the plate. It can vary from a light to heavy bead, but does not adhere tightly to the cut edge, and can be easily scraped off. "High speed dross" usually forms a narrow bead along the bottom of the cut edge and is very difficult to remove. When cutting a troublesome steel, it is sometimes useful to reduce the cutting speed to produce "slow speed dross". Any resultant cleanup can be accomplished by scraping, not grinding.

4.06 Torch Operation

A. Cutting

1. Use a square to check that the torch is perpendicular to the workpiece to obtain a clean, vertical cut.



Checking Alignment

2. To start a cut at the plate edge, position the center of the torch along the edge of the plate.

B. Travel Speed

Proper travel speed is indicated by the trail of the arc which is seen below the plate. The arc can be one of the following:

1. **Straight Arc**

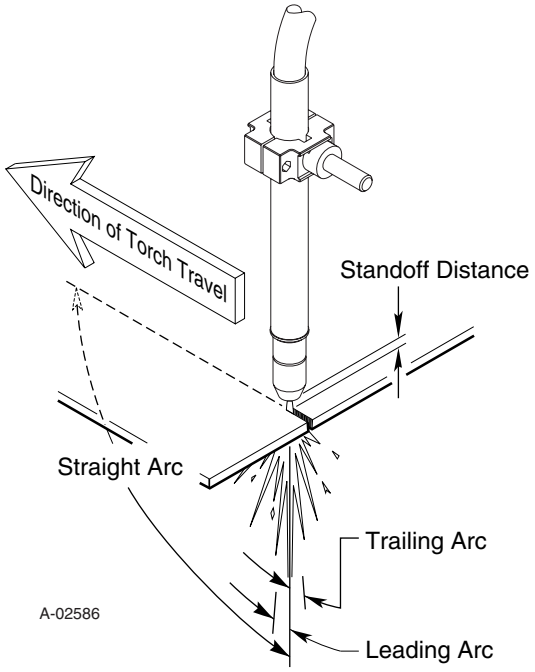
   A straight arc is perpendicular to the workpiece surface. This arc is generally recommended for the best cut using air plasma on stainless or aluminum.

2. **Leading Arc**

   The leading arc is directed in the same direction as torch travel. A five degree leading arc is generally recommended for air plasma on mild steel.

3. **Trailing Arc**

   The trailing arc is directed in the opposite direction as torch travel.



Machine Torch Operation

For optimum smooth surface quality, the travel speed should be adjusted so that only the leading edge of the arc column produces the cut. If the travel speed is too slow, a rough cut will be produced as the arc moves from side to side in search of metal for transfer.

Travel speed also affects the bevel angle of a cut. When cutting in a circle or around a corner, slowing down the travel speed will result in a squarer cut. The power source output should be reduced also. Refer to the appropriate Control Module Operating Manual for any Corner Slowdown adjustments that may be required.

C. Piercing With Machine Torch

To pierce with a machine torch, the arc should be started with the torch positioned as high as possible above the plate while allowing the arc to transfer and pierce. This standoff helps avoid having molten metal blow back onto the front end of the torch.

When operating with a cutting machine, a pierce or dwell time is required. Torch travel should not be enabled until the arc penetrates the bottom of the plate. As motion begins, torch standoff should be reduced to the recommended 1/8-1/4 inch (3-6 mm) distance for optimum speed and cut quality. Clean spatter and scale from the shield cup and the tip as soon as possible. Spraying or dipping the shield cup in anti-spatter compound will minimize the amount of scale which adheres to it.

4.07 Cutting Parameters

Cutting speed depends on material, thickness, and other factors. These may have an impact on system performance:

- Torch parts wear
- Air quality
- Line voltage fluctuations
- Torch standoff height
- Proper work cable connection

e torch switch is still activated, the main arc extinguishes and the pilot arc automatically restarts.

4.08 Cutting Specifications

Torch Specifications For CutMaster 51 Power Supplies	
Cutting Range	
Material	Mild Steel
Genuine Cut:	
Up to	1/2 inch - 12.7 mm
Speed	12-14 ipm / 0.3 - 0.36 mpm
Pierce Rating	
Material	Mild Steel
Thickness:	1/4 inch - 6.4 mm
Transfer Distance	3/8 inch - 9.5 mm
Gas Requirement	
Type Gas	Air
Operating Pressure	65 psi / 4.5 bar
Max Input Pressure	125 psi / 8.6 bar
Total Flow Rate:	
Cutting	350 scfh / 165 lpm
Gouging	230 scfh / 109 lpm

Cut Quality on Various Materials and Thicknesses

The following table defines the cut quality on various materials and thicknesses:

Cut Quality on Various Materials			
Material Thickness	**Type of Material**	**Type of Gas**	**Cut Characteristics**
Gage to 1/2 inch (12.7 mm)	Carbon Steel	Air	Good - Excellent
	Stainless	Air	Good
	Aluminum	Air	Good

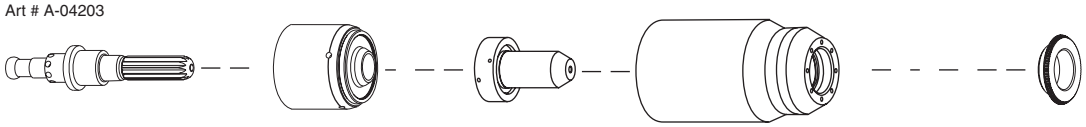
Description of Cut Characteristics:

Excellent - Minimum bevel (0 - 4°), minimum kerf (2 x tip orifice diameter), little or no dross, smooth cut surface.

Good - Slight bevel (0 - 10°), slightly wider kerf (2-1/2 x tip orifice diameter), some dross (easily removed), medium - smooth cut surface, slight top edge rounding.

4.09 Cutting Speed Chart: Mild Steel, SL100 Torch with Exposed Tip

Art # A-04203



Electrode 9-8215 | Start Cartridge 9-8213 | Tip | Shield Cup Body 9-8237 | Shield Cap, Deflector 9-8243

Material: Mild Steel

Torch: SL100 with Exposed Tip and Deflector **Table: Dry**
Power Supply: CutMaster 51 Automated **Gas: Compressed Air**

Material thickness			Tip	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel Speed	
In	GA	mm	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min
0.036	20	0.91	8-8208	40	65	0.188	4.8	0.00	96	0.19	4.80	341	8661.4
0.051		1.30	8-8208	40	65	0.188	4.8	0.00	97	0.19	4.80	300	7620
0.060	16	1.52	8-8208	40	65	0.188	4.8	0.10	98	0.19	4.80	265	6731
0.075	14	1.91	8-8208	40	65	0.188	4.8	0.30	100	0.19	4.80	190	4826
0.135	10	3.43	8-8208	40	65	0.188	4.8	0.40	101	0.19	4.80	120	3048
0.141		3.58	8-8208	40	65	0.188	4.8	0.50	102	0.19	4.80	112	2844.8
0.188		4.78	8-8208	40	65	0.188	4.8	0.60	107	0.19	4.80	60	1524
0.250		6.35	8-8208	40	65	0.188	4.8	1.00	111	0.19	4.80	40	1016
0.375		9.53	8-8208	40	65	NR	NR	NR	119	0.19	4.80	19.7	500.38
0.500		12.70	8-8208	40	65	NR	NR	NR	123	0.19	4.80	11.1	281.94
0.625		15.88	8-8208	40	65	NR	NR	NR	127	0.19	4.80	6	152.4

4

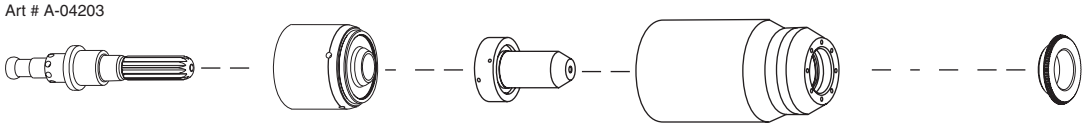
NOTES

** Gas pressure shown is for torches with leads up to 25' / 7.6 m long. For 50' / 15.2 m leads, increase pressure by 5 psi / 0.34 bar.*

This information represents realistic expectations using recommended practices and well - maintained systems. Actual speeds may vary up to 50% from those shown.

4.10 Cutting Speed Charts: Stainless Steel, SL100 Torch with Exposed Tip

Art # A-04203



Electrode 9-8215 | Start Cartridge 9-8213 | Tip | Shield Cup Body 9-8237 | Shield Cap, Deflector 9-8243

Material: Stainless Steel

Torch: SL100 with Exposed Tip and Deflector **Table: Dry**

Power Supply: CutMaster 51 Automated **Gas: Compressed Air**

Material thickness			Tip	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel Speed	
In	GA	mm	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min
0.038	20	0.95	8-8208	40	65	0.188	4.8	0.00	103	0.19	4.80	357	9067.8
0.050	18	1.27	8-8208	40	65	0.188	4.8	0.00	104	0.19	4.80	287	7289.8
0.063	16	1.60	8-8208	40	65	0.188	4.8	0.10	104	0.19	4.80	244	6197.6
0.078	14	1.98	8-8208	40	65	0.188	4.8	0.30	105	0.19	4.80	125	3175
0.135		3.43	8-8208	40	65	0.188	4.8	0.40	105	0.19	4.80	106	2692.4
0.141	10	3.58	8-8208	40	65	0.188	4.8	0.50	106	0.19	4.80	104	2641.6
0.188		4.78	8-8208	40	65	0.188	4.8	0.60	106	0.19	4.80	75	1905
0.250		6.35	8-8208	40	65	0.188	4.8	1.00	109	0.19	4.80	46.6	1183.64
0.375		9.53	8-8208	40	65	NR	NR	NR	109	0.19	4.80	31.5	800.1
0.500		12.70	8-8208	40	65	NR	NR	NR	112	0.19	4.80	17.4	441.96
0.625		15.88	8-8208	40	65	NR	NR	NR	114	0.19	4.80	10	254

4

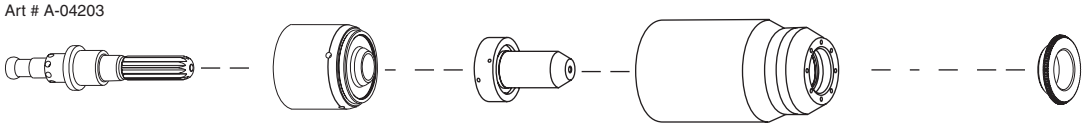
NOTES

* *Gas pressure shown is for torches with leads up to 25' / 7.6 m long. For 50' / 15.2 m leads, set gas pressure to 80 psi / 5.5 bar.*

This information represents realistic expectations using recommended practices and well - maintained systems. Actual speeds may vary up to 50% from those shown.

4.11 Cutting Speed Charts: Aluminum, SL100 Torch with Exposed Tip

Art # A-04203



Electrode 9-8215 | Start Cartridge 9-8213 | Tip | Shield Cup Body 9-8237 | Shield Cap, Deflector 9-8243

Material: Aluminum

Torch: SL100 with Exposed Tip **Table: Dry**

Power Supply: CutMaster 51 Automated **Gas: Compressed Air**

Material thickness			Tip	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel Speed	
In	GA	mm	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min
0.040	20	1.02	8-8208	40	65	0.188	4.8	0.00	94	0.19	4.80	440	11176
0.052	18	1.32	8-8208	40	65	0.188	4.8	0.00	96	0.19	4.80	440	11176
0.064	16	1.63	8-8208	40	65	0.188	4.8	0.10	98	0.19	4.80	440	11176
0.079	14	2.01	8-8208	40	65	0.188	4.8	0.30	102	0.19	4.80	297	7543.8
0.125		3.18	8-8208	40	65	0.188	4.8	0.35	106	0.19	4.80	145.6	3698.24
0.135		3.43	8-8208	40	65	0.188	4.8	0.40	108	0.19	4.80	135	3429
0.187		4.75	8-8208	40	65	0.188	4.8	0.60	112	0.19	4.80	98	2489.2
0.250		6.35	8-8208	40	65	0.188	4.8	1.00	115	0.19	4.80	50.4	1280.16
0.375		9.53	8-8208	40	65	NR	NR	NR	122	0.19	4.80	22	558.8
0.500		12.70	8-8208	40	65	NR	NR	NR	126	0.19	4.80	13.5	342.9
0.625		15.88	8-8208	40	65	NR	NR	NR	130	0.19	4.80	8	203.2

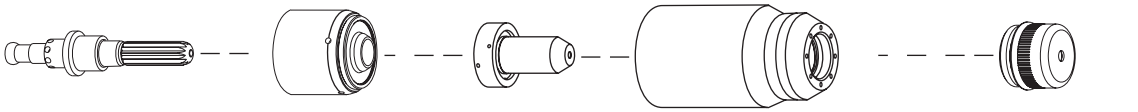
4

NOTES

** Gas pressure shown is for torches with leads up to 25' / 7.6 m long. For 50' / 15.2 m leads, increase pressure by 5 psi / 0.34 bar.*

This information represents realistic expectations using recommended practices and well - maintained systems. Actual speeds may vary up to 50% from those shown.

4.12 Cutting Speed Charts: Mild Steel, SL100 Torch with Shielded Tip



Electrode 9-8215 | Start Cartridge 9-8213 | Tip | Shield Cup Body 9-8237 | Shield Cap, Machine

Art # A-04204

Material: Mild Steel

Torch: SL100 with Shielded Tip **Table: Dry**

Power Supply: CutMaster 51 Automated **Gas: Compressed Air**

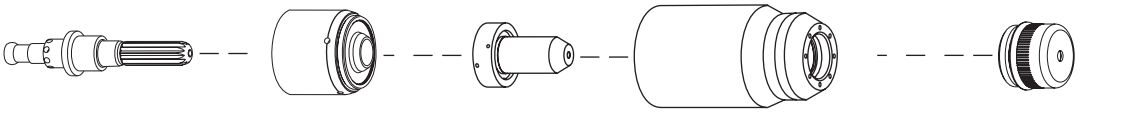
Material thickness			Torch Tip	Shield Cap	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel speed	
In	GA	mm	Cat. #	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min
0.036	20	0.9144	8-8208	9-8245	40	65	1.88	4.8	0.00	102	0.19	4.80	170	4318
0.051		1.30	8-8208	9-8245	40	65	1.88	4.8	0.00	103	0.19	4.80	148	3759.2
0.060	16	1.52	8-8208	9-8245	40	65	1.88	4.8	0.10	104	0.19	4.80	133	3378.2
0.075	14	1.91	8-8208	9-8245	40	65	1.88	4.8	0.30	106	0.19	4.80	95	2413
0.135	10	3.43	8-8208	9-8245	40	65	1.88	4.8	0.40	110	0.19	4.80	65	1651
0.188		4.78	8-8208	9-8245	40	65	1.88	4.8	0.60	113	0.19	4.80	30	762
0.250		6.35	8-8208	9-8245	40	65	1.88	4.8	1.00	117	0.19	4.80	23	584.2
0.375		9.53	8-8208	9-8245	40	65	NR	NR	NR	126	0.19	4.80	10	254
0.500		12.70	8-8208	9-8245	40	65	NR	NR	NR	122	0.19	4.80	7	177.8
0.625		15.88	8-8208	9-8245	40	65	NR	NR	NR	135	0.19	4.80	3	76.2

NOTES

** Gas pressure shown is for torches with leads up to 25' / 7.6 m long. For 50' / 15.2 m leads, increase pressure by 5 psi / 0.34 bar.*

This information represents realistic expectations using recommended practices and well - maintained systems. Actual speeds may vary up to 50% from those shown.

4.13 Cutting Speed Charts: Stainless Steel, SL100 Torch with Shielded Tip



Electrode 9-8215 | Start Cartridge 9-8213 | Tip | Shield Cup Body 9-8237 | Shield Cap, Machine

Art # A-04204

Material: Stainless Steel

Torch: SL100 with Shielded Tip **Table: Dry**

Power Supply: CutMaster 51 Automated **Gas: Compressed Air**

Material thickness			Torch Tip	Shield Cap	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel Speed	
In	GA	mm	Cat. #	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min
0.038	20		8-8208	9-8245	40	65	0.188	4.8	0.00	109	0.19	4.8	179	4546.6
0.050	18	1.27	8-8208	9-8245	40	65	0.188	4.8	0.00	109	0.19	4.8	150	3810
0.063	16	1.60	8-8208	9-8245	40	65	0.188	4.8	0.10	110	0.19	4.8	122	3098.8
0.078	14	1.98	8-8208	9-8245	40	65	0.188	4.8	0.30	111	0.19	4.8	66	1676.4
0.135		3.43	8-8208	9-8245	40	65	0.188	4.8	0.40	111	0.19	4.8	66	1676.4
0.141	10	3.58	8-8208	9-8245	40	65	0.188	4.8	0.50	112	0.19	4.8	65	1651
0.187		4.75	8-8208	9-8245	40	65	0.188	4.8	0.60	112	0.19	4.8	38	965.2
0.250		6.35	8-8208	9-8245	40	65	0.188	4.8	1.00	116	0.19	4.8	23	584.2
0.375		9.53	8-8208	9-8245	40	65	NR	NR	NR	116	0.19	4.8	16	406.4
0.500		12.70	8-8208	9-8245	40	65	NR	NR	NR	119	0.19	4.8	9	228.6
0.625		15.88	8-8208	9-8245	40	65	NR	NR	NR	121	0.19	4.8	5	127

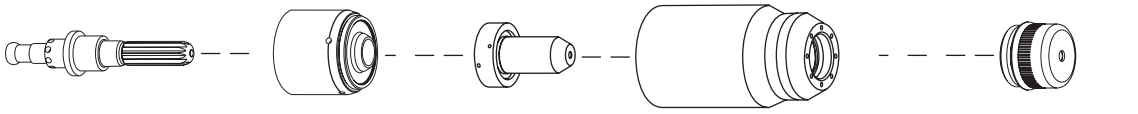
4

NOTES

** Gas pressure shown is for torches with leads up to 25' / 7.6 m long. For 50' / 15.2 m leads, increase pressure by 5 psi / 0.34 bar.*

This information represents realistic expectations using recommended practices and well - maintained systems. Actual speeds may vary up to 50% from those shown.

4.14 Cutting Speed Charts: Aluminum, SL100 Torch with Shielded Tip



Electrode 9-8215 | Start Cartridge 9-8213 | Tip | Shield Cup Body 9-8237 | Shield Cap, Machine

Art # A-04204

Material: Aluminum

Torch: SL100 with Shielded Tip **Table: Dry**

Power Supply: CutMaster 51 Automated **Gas: Compressed Air**

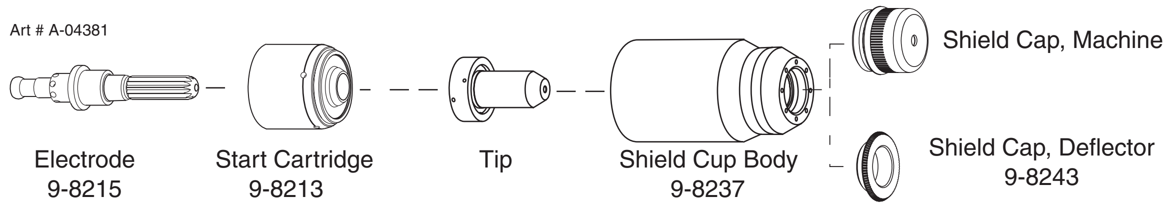
Material thickness			Torch Tip	Shield Cap	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel Speed	
In	GA	mm	Cat. #	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min
0.04	20	1.02	8-8208	9-8245	40	65	0.188	4.8	0.00	100	0.19	4.8	220	5588
0.051		1.30	8-8208	9-8245	40	65	0.188	4.8	0.00	102	0.19	4.8	220	5588
0.064	16	1.63	8-8208	9-8245	40	65	0.188	4.8	0.10	104	0.19	4.8	220	5588
0.079	14	2.01	8-8208	9-8245	40	65	0.188	4.8	0.30	108	0.19	4.8	149	3784.6
0.125		3.18	8-8208	9-8245	40	65	0.188	4.8	0.35	112	0.19	4.8	73	1854.2
0.135		3.43	8-8208	9-8245	40	65	0.188	4.8	0.40	115	0.19	4.8	69	1752.6
0.187		4.75	8-8208	9-8245	40	65	0.188	4.8	0.60	118	0.19	4.8	50	1270
0.250		6.35	8-8208	9-8245	40	65	0.188	4.8	1.00	122	0.19	4.8	25	635
0.375		9.53	8-8208	9-8245	40	65	NR	NR	NR	129	0.19	4.8	11	279.4
0.500		12.70	8-8208	9-8245	40	65	NR	NR	NR	134	0.19	4.8	7	177.8
0.625		15.88	8-8208	9-8245	40	65	NR	NR	NR	138	0.19	4.8	4	101.6

NOTES

** Gas pressure shown is for torches with leads up to 25' / 7.6 m long. For 50' / 15.2 m leads, increase pressure by 5 psi / 0.34 bar.*

This information represents realistic expectations using recommended practices and well - maintained systems. Actual speeds may vary up to 50% from those shown.

4.15 Operator's Custom Cutting Speed Charts



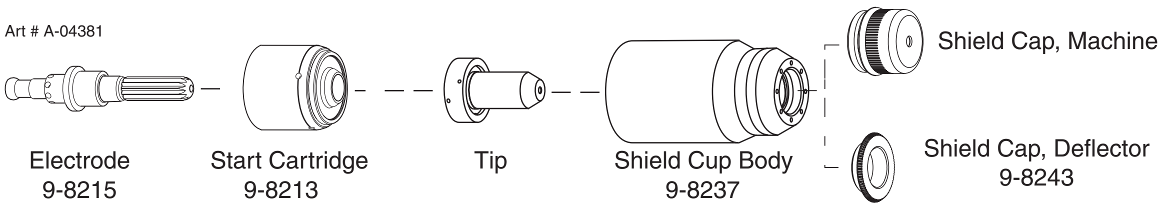
Material:

Torch: SL100 with Shielded Tip **Table: Dry**
Power Supply: CutMaster 51 Automated **Gas: Compressed Air**

Material thickness			Torch Tip	Shield Cap	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel Speed	
In	GA	mm	Cat. #	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min

4

Operator's Custom Cutting Speed Charts

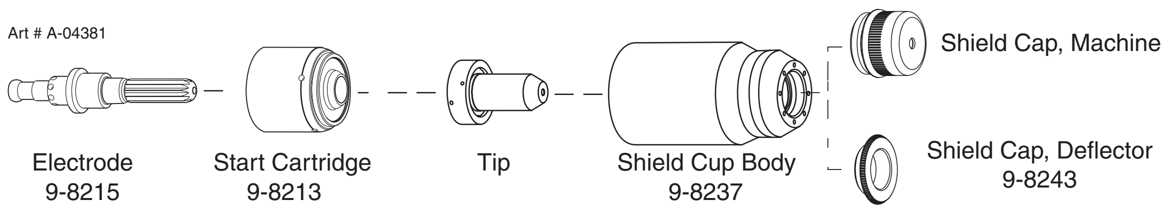


Material:

Torch: SL100 with Shielded Tip — **Table: Dry**
Power Supply: CutMaster 51 Automated — **Gas: Compressed Air**

Material thickness			Torch Tip	Shield Cap	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel Speed	
In	GA	mm	Cat. #	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min

Operator's Custom Cutting Speed Charts



Material:

Torch: SL100 with Shielded Tip **Table: Dry**

Power Supply: CutMaster 51 Automated **Gas: Compressed Air**

4

Material thickness			Torch Tip	Shield Cap	Current	Plasma Press.*	Pierce Height		Pierce Time	Arc voltage	Stand-off Height		Recommended Travel Speed	
In	GA	mm	Cat. #	Cat. #	Amps	PSI	In	mm	SEC	Volts	in	mm	IPM	mm/min

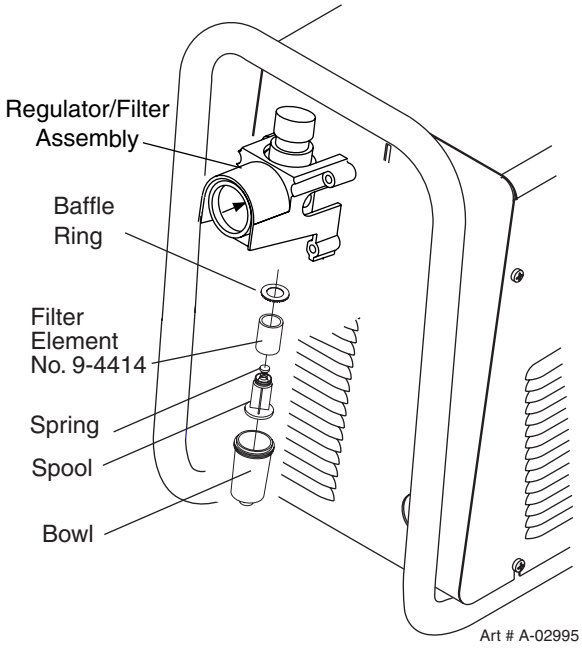
SECTION 5:
SERVICE

5.01 General Maintenance

A. Filter Element Replacement

The Regulator/Filter Assembly is on the rear panel. For better system performance, the Regulator/Filter Assembly filter element should be checked per the Maintenance Schedule in the Appendix section, and either cleaned or replaced.

1. Remove power from the power supply; turn off the gas supply and bleed down the system.
2. Unscrew the bowl on the bottom of the Regulator/Filter Assembly. The filter element will be visible and still attached to the main body of the Regulator/Filter.
3. Grasp the filter element and unscrew it from the Regulator/Filter body. The filter element will come off with a spool and some additional pieces.
4. Note the correct assembly of the filter/spool then remove the filter from the spool and either clean it or replace it.
5. The filter element and spool, with the baffle ring in place (teeth facing downward) can be screwed back into the Regulator body by compressing the spring on the spool. Tighten firmly by hand.



Regulator/Filter Element Replacement

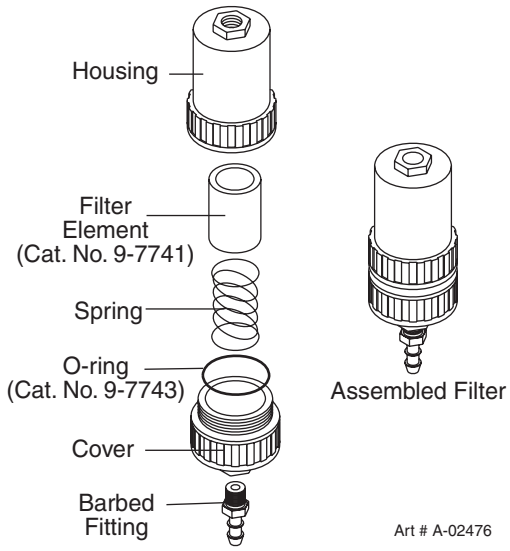
6. Reinstall the bowl.
7. Turn on the air supply.

B. Single-Stage Filter Element Replacement

These instructions apply to power supplies where the Single-Stage Filter has been installed.

The Power Supply shuts down automatically when the Filter Element becomes completely saturated. The Filter Element can be removed from its housing, dried, and reused. Allow 24 hours for Element to dry.

1. Remove power from power supply.
2. Shut off air supply and bleed down system before disassembling Filter to change Filter Element.
3. Disconnect gas supply hose.
4. Turn the Cover counter-clockwise and remove it from the Filter Housing. The Filter Element is located inside the Housing.



Single-Stage Filter Element Replacement

5. Remove the Filter Element from the Housing and set Element aside to dry.
6. Wipe inside of housing clean, then insert the replacement Filter Element open side first.
7. Replace Housing on Cover.
8. Reattach gas supply.

NOTE

If unit leaks between housing and cover, inspect the "O" Ring for cuts or other damage.

C. Optional Two-Stage Filter Element Replacement

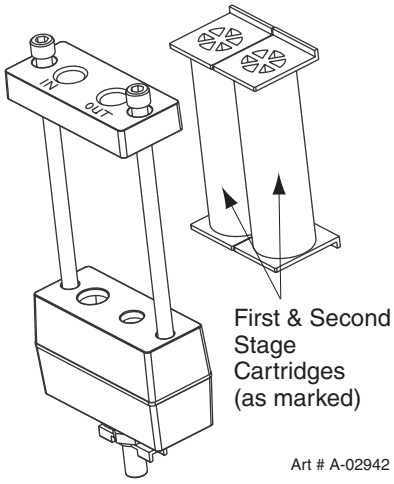
The Two-Stage Air Filter has two Filter Elements. When the Filter Elements become dirty the Power Supply will continue to operate but cut quality may become unacceptable. Refer to Section 6, Parts List, for replacement filter element catalog number.

1. Shut off primary input power.
2. Shut off air supply and bleed down system.

WARNING

Always turn off the air supply and bleed down the system before disassembling the Filter Assembly as injury could result.

3. Loosen the two bolts on the top of the Filter Assembly enough to allow the Filter Elements to move freely.
4. Note the location and orientation of the old Filter Elements.
5. Slide out the old Filter Elements.



Optional Two-Stage Filter Replacement

6. Slide the replacement Filter Elements into the Filter Assembly, with the same orientation as noted in Step 4 above.
7. Hand tighten the two bolts evenly, then torque each bolt to 20 - 30 in-lbs (2.3 - 3.4 Nm). Improper torque may damage the gasket.
8. Slowly apply air pressure to the assembly, checking for leaks.

NOTE

A small amount of air leakage from the bottom fitting is normal.

D. Cleaning Torch

Even if precautions are taken to use only clean air with a torch, eventually the inside of the torch becomes coated with residue. This buildup can affect the pilot arc initiation and the overall cut quality of the torch.

WARNINGS

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

DO NOT touch any internal torch parts while the AC indicator light of the Power Supply is ON.

The inside of the torch should be cleaned with electrical contact cleaner using a cotton swab or soft wet rag. In severe cases, the torch can be removed from the leads and cleaned more thoroughly by pouring electrical contact cleaner into the torch and blowing it through with compressed air.

CAUTION

Dry the torch thoroughly before reinstalling.

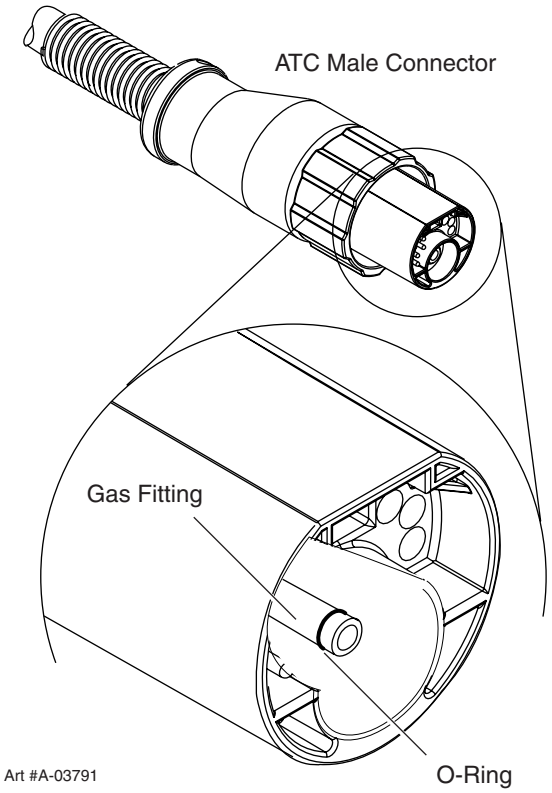
E. O-Ring Lubrication

An O-ring on the Torch ATC Male Connector requires lubrication on a regular basis, depending on how frequently the torch is disconnected and re-connected. This will allow the O-ring to remain pliable and provide a proper seal. The O-ring will dry out, becoming hard and cracked, if the O-ring lubricant is not used on a regular basis. This can lead to performance problems.

It is recommended to apply a very light film of O-ring lubricant (Catalog # 8-4025) to the O-ring on a weekly basis.

NOTE

DO NOT *use other lubricants or grease, they may not be designed to operate within high temperatures or may contain "unknown elements" that may react with the atmosphere. This reaction can leave contaminants inside the torch. Either of these conditions can lead to inconsistent performance or poor parts life.*



5.02 Common Faults

1. Insufficient Penetration

a. Cutting speed too fast

b. Torch tilted too much

c. Metal too thick

d. Worn torch parts

e. Cutting current too low

f. Non - Genuine Thermal Dynamics parts used

g. Incorrect gas pressure

2. Main Arc Extinguishes

a. Cutting speed too slow

b. Torch standoff too high from workpiece

c. Cutting current too high

d. Work cable disconnected

e. Worn torch parts

f. Non - Genuine Thermal Dynamics parts used

3. Excessive Dross Formation

a. Cutting speed too slow

b. Torch standoff too high from workpiece

c. Worn torch parts

d. Improper cutting current

e. Non - Genuine Thermal Dynamics parts used

f. Incorrect gas pressure

4. Short Torch Parts Life

a. Oil or moisture in air source

b. Exceeding system capability (material too thick)

c. Excessive pilot arc time

d. Gas pressure too low

e. Improperly assembled torch

f. Non - Genuine Thermal Dynamics parts used

5. Difficult Piloting

a. Worn torch parts

b. Non - Genuine Thermal Dynamics parts used

c. Incorrect gas pressure

5.03 Basic Troubleshooting

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

A. Basic Troubleshooting: Overview

This guide covers basic troubleshooting. It is helpful for solving many of the common problems that can arise with this system.

Follow all instructions as listed and complete each section in the order presented.

B. How to Use This Guide

The following information will help the Operator determine the most likely causes for various symptoms. Follow all instructions as listed and complete each section in the order presented.

This guide is set up in the following manner:

X. Symptom (Bold Type)

Any Special Instructions

1. *Cause*
   a. Check / Remedy

Locate your **symptom**, check the *causes* (easiest listed first), then remedies. Repair as needed being sure to verify that unit operates properly after any repairs.

C. Common Symptoms

A. AC indicator ~ OFF

1. *Switch at main power panel in OFF (open) position.*
   a. Close main power switch.
2. *Power Supply ON / OFF switch in OFF (down) position.*
   a. Turn switch to ON (up).
3. *Torch is not connected properly to Power Supply*
   a. Turn power supply ON / OFF switch to OFF (down). Check torch connection to Power Supply. Tighten or adjust as required. Do not use tools. Turn power supply ON / OFF switch to ON (up).
4. *Shield cup not fully tightened on torch head*
   a. Check shield cup for proper installation. Do not overtighten. Do not use tools to tighten.

CAUTION

When the shield cup is properly installed, there is a slight gap between the shield cup and the torch head. Gas vents through this gap as part of normal operation. Do not attempt to force the shield cup to close this gap. Forcing the shield cup against the torch head can damage components.

5. *Main power line fuse(s) or circuit breaker(s) blown*
   a. Check main power panel fuse(s). Replace as required.

6. *Unit internal fuse blown or loose*

   a. If blown, double-check input voltage and replace fuse.

7. *Actual input voltage does not correspond to voltage of unit*

   a. Verify that the input line voltage is correct. Refer to Section 2, Input Wiring Requirements.

B. Gas flows continuously when power is turned on, AC indicator ~ flashes

1. *Torch switch is activated (closed) before user turns power on.*

   a. Release torch switch.

2. *Faulty torch switch in CNC Control.*

   a. Check torch switch for continuity. Replace if necessary.

C. Gas flows continuously; Torch will not pilot when torch switch is activated; AC indicator ~ ON

1. *System is in SET mode*

   a. Change RUN / Rapid Auto Restart / SET switch to RUN (up).

D. No gas flow; RUN / Rapid Auto Restart / SET switch in SET position; Fan operates; AC indicator ~ ON; GAS indicator OFF

1. *Gas not connected*

   a. Check gas connections.

2. *Gas pressure too low for power supply operation*

   a. Adjust pressure to 65-70 psi / 4.5 - 4.8 bar.

E. Torch will not pilot; gas flows; AC indicator ~ ON, GAS, TEMP, and DC ⎓ indicators OFF

1. *Gas pressure is below power supply minimum requirement.*

   a. Adjust pressure to 65-70 psi / 4.5 - 4.8 bar.

NOTE

Minimum pressure for power supply operation is lower than minimum for torch operation.

F. Torch will not pilot; gas flows; AC ~ and Gas indicators ON; DC ⎓ and TEMP indicators OFF

1. *Gas pressure is below torch minimum requirement (Minimum pressure for power supply operation is lower than minimum required for torch operation.)*

   a. Adjust pressure to 65-70 psi / 4.5 - 4.8 bar.

2. *Positive and negative wire connections to automation interface PC Board terminals J2-1 and J2-3 are reversed.*

   a. Check wire connections, correct if necessary.

NOTE

This condition applies to CNC Controllers (other than the SC-11) with semiconductor switches.

G. Torch will not pilot; no gas flow; AC indicator ~ ON, GAS indicator ON, DC indicator ⎓ ON

1. *Start cartridge missing from torch*

   a. Shut off power supply. Remove shield cup, install start cartridge. Reinstall torch tip and shield cup. Turn power supply ON / OFF switch to ON (up).

2. *Shield cup is loose on torch*

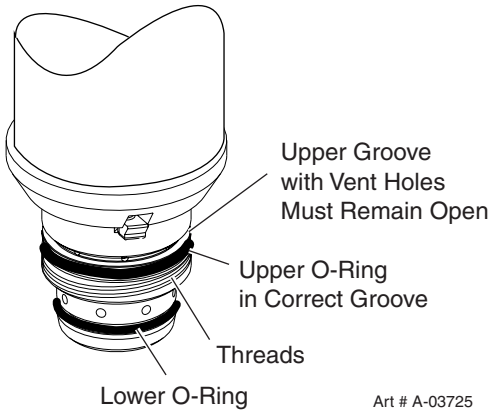
   a. Check shield cup; tighten if necessary.

NOTE

When operating the torch in a normal condition, a small amount of gas vents through the gap between the shield cup and torch head. Do not attempt to over tighten the shield cup as irreparable damage to internal components may result.

3. *Upper O-ring on torch head is in wrong position.*

   a. Remove shield cup from torch; check position of upper O-ring. Correct if necessary.



H. Torch will not pilot; AC ~, GAS, and TEMP indicators ON, DC ⎓ indicator OFF

1. *Air flow blocked*

   a. Check for blocked air flow around the unit and correct condition.

2. *Unit is overheated*

   a. Let unit cool down for at least 5 minutes. Make sure the unit has not been operated beyond Duty Cycle limit. Refer to duty cycle data in Section 2.

3. *Input line voltage is low*

   a. Check and connect to proper input power line.

I. Torch cannot be activated; AC indicator ~ flashing; Gas indicator ON; Temp indicator OFF; DC indicator ⎓ OFF

1. *System is in protective interlock mode. (Torch switch in CNC Controller in ON position while turning on power supply ON / OFF switch.)*
   a. Release torch switch.
2. *System is in protective interlock mode. (Torch parts are missing or loose.)*
   a. Release torch switch, and set power supply ON / OFF switch to OFF (down). Open main disconnect switch. Check torch parts. Replace parts as needed. Reinstall shield cup; hand - tighten it securely against the torch head. Do not overtighten. Do not use tools. Close main disconnect switch. Set ON / OFF switch to ON (up) position.

J. Gas cycles on and off without torch switch being activated; AC indicator ~ Flashing; Gas indicator ON; DC indicator ⎓ OFF

1. *Torch tip or electrode missing*
   a. Shut off power supply. Remove shield cup, install missing part(s). Turn power supply ON / OFF switch to ON (up).

K. No cutting output; Torch pilots; Gas flows; Fan operates; AC ~ , Gas , and DC ⎓ indicator ON; TEMP indicator OFF

1. *Work cable not connected to work piece, or connection is poor*
   a. Make sure that work cable has a proper connection to a clean, dry area of the workpiece or the cutting table.
2. *Faulty Torch*
   a. Return for repair or have qualified technician repair.

L. Torch cuts but not adequately

1. *Incorrect setting of output current* (**A**) *control*
   a. Check and adjust to proper setting.
2. *Torch consumables worn*
   a. Check torch consumables; replace as needed.
3. *Work cable connection is poor*
   a. Make sure that work cable has a proper connection to a clean, dry area of the workpiece or cutting table.
4. *Torch is being moved too fast across workpiece*
   a. Reduce cutting speed.
5. *Excessive oil or moisture in torch*
   a. Put RUN / RAPID AUTO RESTART / SET switch in SET (down) position. Position the torch 1/8 inch (3 mm) from a clean surface while purging and observe oil or moisture buildup (do not activate torch). If there are contaminants in the gas, additional filtering may be needed.
6. *Fluctuations in input power*
   a. Have electrician check input line voltage.

M Arc shuts off during operation; arc will not restart when torch switch is activated.

1. *Power Supply is overheated (TEMP indicator*  *ON)*

   a. Let unit cool down for at least 5 minutes. Make sure the unit has not been operated beyond Duty Cycle limit. Refer to Section 2 for duty cycle specifications.

2. *Fan blades blocked (TEMP indicator*  *ON)*

   a. Check and clear blades.

3. *Air flow obstructed (TEMP indicator*  *ON)*

   a. Check for obstructed air flow around the unit and correct condition.

4. *Gas pressure too low (GAS indicator*  *OFF when torch switch is activated)*

   a. Check source for at least 60 psi / 4.1 bar; adjust as needed. (Minimum pressure for power supply operation is lower than minimum required for torch operation.)

5. *Torch consumables worn*

   a. Check torch consumables; replace as needed.

N AC indicator ~ remains ON when shield cup is removed

1. *Faulty PIP switch in torch*

   a. Check PIP switch for continuity; replace if necessary

5

5.04 Advanced Troubleshooting Guide - General Information

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

A. General Information

This Section covers advanced troubleshooting, which requires power supply disassembly and live measurements. Advanced troubleshooting and repair of this unit is a process which should be undertaken only by those familiar with high voltage high power electronic equipment.

If major complex subassemblies are faulty, the faulty subassembly must be returned for repair. Refer to Repairs & Replacement Procedures, for parts replacement instructions. Replacement instructions for some parts are included in this manual. Replacement instructions for parts not covered in this manual are included with the replacement part.

Under no circumstances are field repairs to be attempted on Printed Circuit Boards or other subassemblies of this unit. Evidence of unauthorized repairs will void the factory warranty.

NOTE

Follow all instructions as listed and complete each in the order presented.

B. How to Use the Troubleshooting Guide

The following information is a guide to help the Service Technician determine the most likely causes for various symptoms. This guide is set up in the following manner:

1. Perform operational check(s) on the equipment to isolate problem to possible circuit(s) per Subsection 5.06, Circuit Fault Isolation.
2. Determine symptom and isolate to defective assembly using the following format:

   X. Symptom (Bold Type)

   Any Special Instructions (Text Type)

   1. Cause (Italic Type)

   a. Check/Remedy (Text Type)
3. Locate your **symptom** in the appropriate Subsection.
4. Check the *causes* (easiest listed first) for the **symptom**.
5. Check the remedies listed for each cause.
6. Repair as needed being sure to verify that unit is fully operational after any repairs.

NOTES

Many signals are transferred between Printed Circuit Board Assemblies on Cables. If these cables become faulty they can then cause various problems. ***Do not*** *forget about these cables when troubleshooting.*

While troubleshooting visually inspect the internal components for signs of overheating, fractures and damage.

C. Main Input and Internal Power Tests

1. Connect main AC power to the unit.
2. Set the Power Supply ON/OFF switch to ON (up) and note the following:
   - AC indicator ~ steady ON
   - Gas solenoid energizes (clicks)
   - Main PCB Relay energizes, pulling in main input contactor (W1)
   - TEMP Indicator  OFF
   - GAS Indicator  ON if input pressure is sufficient for power supply operation. Minimum pressure for power supply operation is lower than minimum for torch operation.
   - Gas flows
   - Fan operate
   - DC indicator ⎓ is OFF
3. Set the Power Supply RUN / RAPID AUTO RESTART / SET switch to the RUN (up) position and note the following:
   - Gas flow stops

This completes the Main Input and Internal Power Tests. If the above are all correct then proceed to paragraph 'D'. If not, note the symptom and proceed to Subsection 5.05, Main Input and Internal Power Problems.

D. Pilot Arc Test

1. Activate the torch to establish a pilot arc and note the following:
   - Gas flows
   - Preflow delay (two seconds) then DC indicator turns ON
   - Pilot arc is established

This completes the Pilot Arc Test. If the above are all correct then proceed to paragraph 'E'. If the unit does not function properly, then note the symptom and proceed to Subsection 5.06, Pilot Arc Problems.

E. Main Arc Test

Make sure the work cable is firmly connected to the workpiece. Activate the torch to establish a pilot arc.

5

Bring the torch to within 1/8"-3/8" (3-10 mm) of the workpiece to establish the main cutting arc, and note the following:

- Main cutting arc starts

This completes the Main Arc Test. If the above are all correct then the equipment should be operating properly. If problems still persist then contact Technical Services.

If the torch does not function as noted then note the symptom and proceed to Subsection 5.07, Main Arc Problems.

5.05 Main Input and Internal Power Problems

A. Opening Power Supply Enclosure

The cover of the Power Supply must be removed for access to input power connections and test points.

WARNING

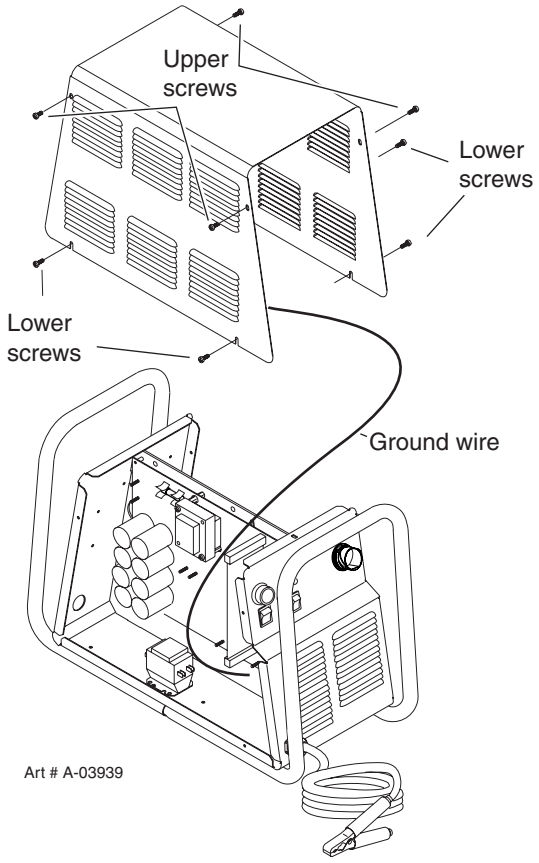
Disconnect primary power at the source before assembling or disassembling the Power Supply, torch parts, or torch and leads assemblies.

1. Remove the upper screws securing the cover to the main assembly.
2. Loosen, but do not remove, the lower screws.

NOTE

There is a ground wire attached from the cover to the main body of the unit.

3. Carefully lift the cover off the unit, and remove the nut securing the ground wire to the side panel.
4. Re-install the cover by reversing the above steps.



Cover Removal

Locate your symptom below:

A. Main power line fuses blow as soon as main disconnect is closed

1. Input power cable installed incorrectly or defective power cord.

a. Refer to Subsection 5.11-I and check that the input power cable is not defective or installed incorrectly.

2. Main input contactor (W1) stuck.

a. Check contactor. Replace if stuck.

B. Main power line fuses blow immediately after the ON/OFF Switch is turned on.

1. *Faulty Input Diode*

a. Test Input Diode per Subsection 5.08-C; repair as necessary.

C. Fan do not operate; AC indicator ~ OFF

1. Front Panel ON/OFF switch in OFF position

a. Place switch to ON (up) position.

2. Main power disconnect open

a. Close main power disconnect.

3. Torch is not properly connected to Power Supply.

a. Check torch connections to Power Supply. Tighten or adjust as needed.

4. Shield cup not fully tightened on torch head.

a. Check shield cup for proper installation. Do not overtighten.

5. Main power line fuses blown

a. Replace main power line fuses.

6. Improper input power cable connections inside Power Supply

a. Refer to System Schematic and correct if needed.

7. Defective input power cable

a. Replace input power cable. Refer to subsection 5.11-I.

8. Fuse blown inside Power Supply

a. Replace internal Fuse per Subsection 5.11-A.

9. Line voltage above 10% tolerance (over voltage protection)

a. Reduce line supply.

10. Faulty Auxiliary Transformer (refer to Appendix pages, 28 VAC Circuit Diagram)

Measure for 28 VAC on Main PC Board from J5-1 to J5-3.

a. If voltage is not present, replace the Main PC Board.

11. Faulty ON/OFF switch

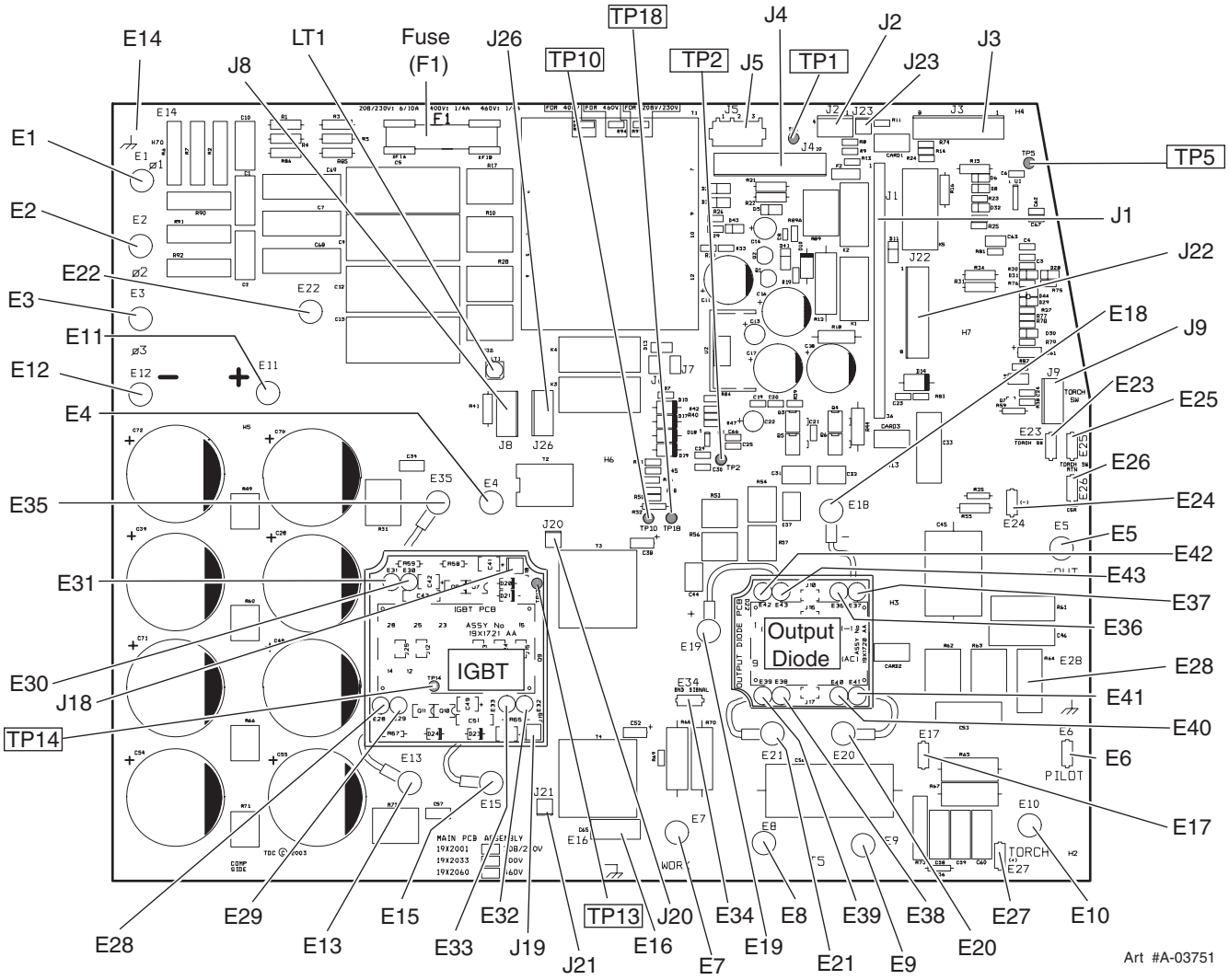
Measure for 28 VAC on the Main PC Board between J3-5 to J3-6.

a. If voltage is not present replace the ON/OFF Switch.

12. Faulty Main PC Board

Measure for 12 vdc on Main PC Board from TP5 to TP1.

a. If voltage is not present, replace the Main PC Board.



Main Printed Circuit Board Layout

D. AC ~ and TEMP indicators ON, fan does not run

1. *Air flow through unit is restricted*
   a. Provide adequate air flow
2. *Exceeded Duty Cycle of Power Supply*
   a. Deactivate torch and wait for fan to cool unit. Refer to Section 2 for proper duty Cycle for this unit.
3. *Faulty Fan*

   Measure for 230 VAC (±) on the Main PC Board from J26-1 to J26-4.

   - If voltage is correct, replace Fan (M1).

4. *Faulty Temperature Sensor / Switch*

   a. **Shut input power off.** Check IGBT Heatsink Temp Sensor (TS1). Disconnect wire connector P2 from terminal J2 on Main PC Board. Check connector pins 1 and 2 for 10K ohm (±25%) (at ambient temperature). If resistance is not 10K ohm (±25%), replace TS1.

   b. **Shut input power off.** Check Inductor Temp Switch (TS2). Disconnect wire connector P23 from terminal J23 on Main PC Board. Check connector pins 1 and 2 for resistance. If resistance is greater than 12K ohms, replace output inductor (L1). If temp switch is open, replace Main PC Board.

E. No gas flow; AC indicator ~ ON; TEMP, GAS and DC ⎓ indicators OFF

1. *RUN / RAPID AUTO RESTART / SET switch in RUN position*

   a. Change switch to SET position.

2. *Gas supply not connected to unit*

   a. Connect to gas supply.

3. *Gas supply not turned on*

   a. Turn gas supply on.

4. *Faulty RUN / RAPID AUTO RESTART / SET switch*

   a. Check continuity.

5. *Faulty Gas Solenoid circuit*

   a. Test Gas Solenoid circuit per Subsection 5.08-E; repair as necessary.

6. *Faulty Logic Board*

   a. Replace logic board

F. Gas flows; AC indicator ~ ON; GAS and DC ⎓ indicator OFF

1. *Gas pressure too low*

   a. Set operating pressure per pressure setting label on power supply.

NOTE

Minimum pressure for power supply operation is lower than minimum required for torch operation.

2. *Faulty Pressure Switch*

   Measure for 12 vdc from wire #10 to wire #11 at the Gas Pressure Switch, located on the right side of the unit. Refer to System Schematic in the Appendix pages.

   a. If 12 vdc is present and pressure is above 50 psi (3.4 bar), replace Gas Pressure Switch/Solenoid Assembly. Refer to Section 5.12-E.

   b. If pressure is above 50 psi (3.4 bar) and 12 vdc is not present, replace the Logic PC Board.

3. *Faulty Wiring or Faulty Logic PC Board*

   Check for 12 vdc at Main PC Board pin J24-3 to J24-4 from the Logic PC Board. Refer to Appendix Pages, Main PC Board Layout.

   - If less than a volt, replace Logic PC Board.

G Gas continues to flow with RUN / RAPID AUTO RESTART / SET switch in RUN position.

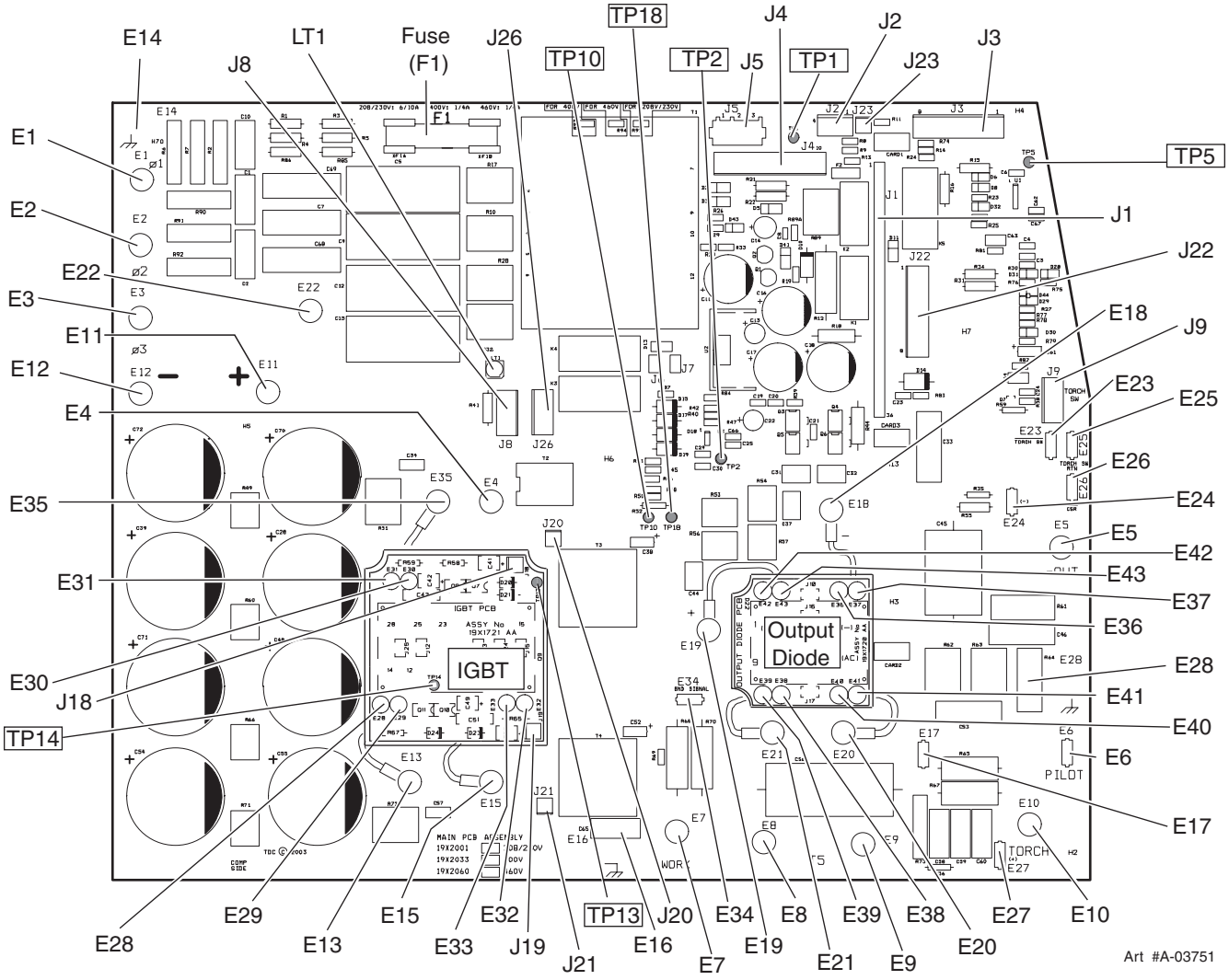
1. *Damaged gas solenoid.*

   a. Turn the front panel ON / OFF switch to OFF.

   • If gas continues to flow, debris from the air line is preventing the solenoid from closing. Clean or replace the solenoid.

2. *Faulty RUN / RAPID AUTO RESTART / SET switch.*

   a. Put switch in SET position. Disconnect wire harness connector from Main PC Board receptacle J18. Check continuity through wire harness sockets 7 and 8. If no continuity, replace switch.

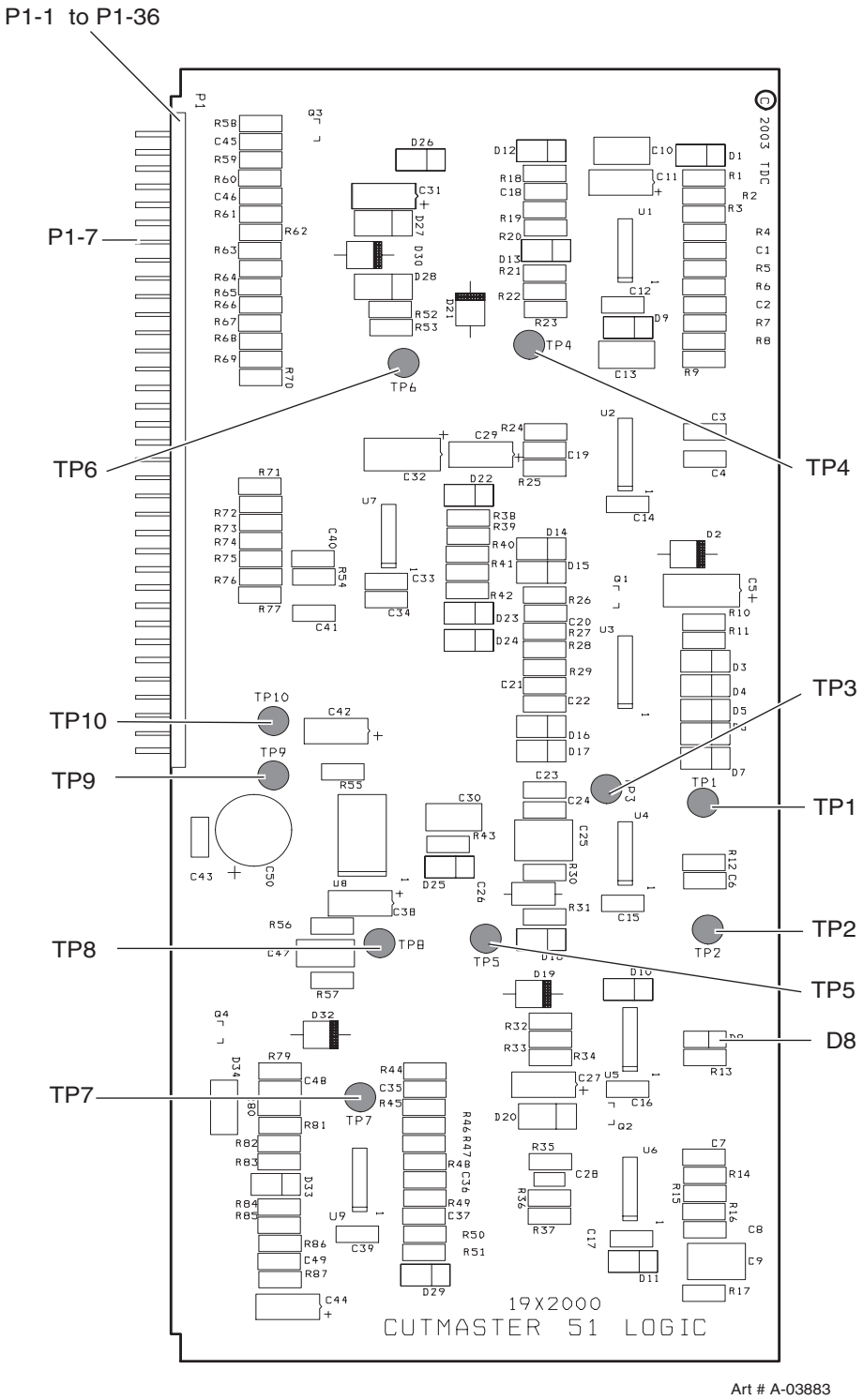


Main Printed Circuit Board Layout

3. *Faulty Logic PCB.*

   a. Measure for approximately 12 vdc between P1-7 and TP-1 on the Logic PCB.

   - If 0 vdc is present, replace Logic PCB.



Art # A-03883

Logic Board Layout

H. Gas flows continuously when power is turned on; AC indicator ~ flashes

1. *Torch switch is activated (closed) before user turns power on*

   a. Release torch switch.

2. *Faulty torch switch*

   a. Check torch switch for continuity.

I. Gas cycles on and off when power is turned on; AC indicator ~ flashes

1. *Shield cup is loose.*

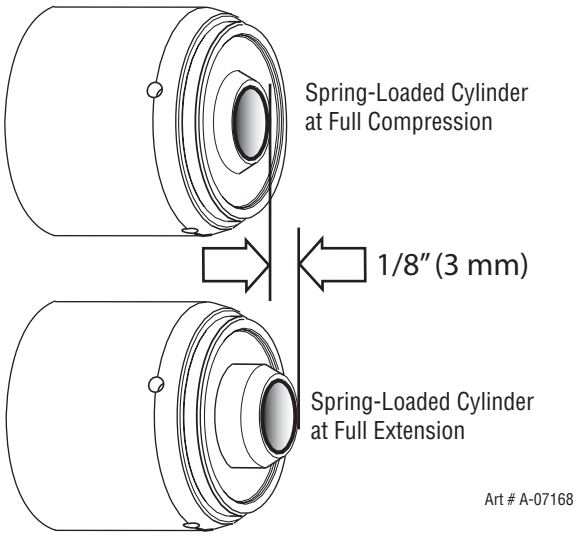
   a. Tighten shield cup by hand. Do not overtighten.

2. *Torch tip, electrode, or start cartridge missing*

   a. Turn off power supply. Remove shield cup, install missing parts.

3. *Start cartridge is stuck*

   a. Turn off power supply. Remove shield cup, tip, and start cartridge. Check lower end fitting on start cartridge for free movement. Replace cartridge if lower end fitting does not move freely.



5.06 Pilot Arc Problems

WARNING

The following tests must be performed with the power supply connected to primary input power. There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair without proper training in power electronics measurement and troubleshooting techniques.

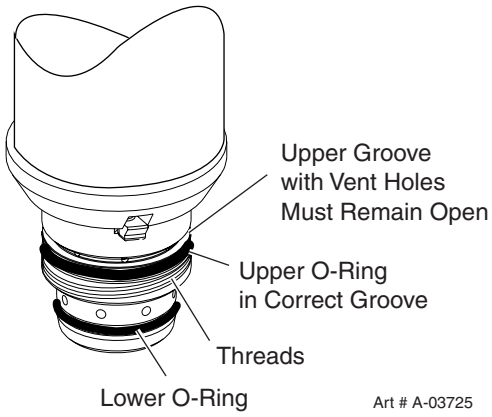
Locate your symptom below:

A. Torch will not pilot; gas flows; AC indicator ~ ON, GAS, TEMP, and DC ⎓ indicators OFF

1. *Gas pressure is below power supply minimum requirement. (Minimum pressure for power supply operation is lower than minimum required for torch operation.)*
   a. Adjust gas pressure per pressure setting label on power supply.

B. Torch will not pilot; gas flows; AC ~ and Gas indicators ON; TEMP and DC indicators ⎓ OFF

1. *Gas pressure is below torch minimum requirement (Minimum pressure for power supply operation is lower than minimum required for torch operation.)*
   a. Adjust gas pressure per pressure setting label on power supply.
2. *Power Supply RUN / SET switch in SET position*
   a. Place RUN / SET switch to RUN position.
3. *Upper O-ring on torch head is in wrong position.*
   a. Remove shield cup from torch; check position of upper O-ring. Correct if necessary.



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C. Torch will not pilot; AC ~, GAS, and TEMP indicators ON, DC ⎓ indicator OFF

1. *Air flow blocked*

   a. Check for blocked air flow around the unit and correct condition.

2. *Unit is overheated*

   a. Let unit cool down for at least 5 minutes. Make sure the unit has not been operated beyond Duty Cycle limit. Refer to duty cycle data in Specifications Section.

3. *Input line voltage is low*

   a. Check and connect to proper input power line.

4. *Faulty Temperature Sensor / Switch*

CAUTION

Turn off input power for the following tests.

   a. Check IGBT Heatsink Temp Sensor (TS1). Disconnect wire connector P2 from terminal J2 on Main PC Board. Check connector pins 1 and 2 for 10k ohm (± 25%) (at ambient temperature). If resistance is not 10K ohm (±25%), replace TS1.

   b. Check Inductor Temp Switch (TS2). Disconnect wire connector P23 from terminal J23 on Main PC Board. Check connector pins 1 and 2 for at least 12K ohms. If resistance is less than 12K ohms, replace output inductor (L1). If temp switch is open, replace Main PC Board.

5. *Faulty Logic PC Board*

   a. Check for (±) 12 vdc on Logic PC Board between J1-9 and TP1. If (±) 0 vdc is present, replace Logic PC Board.

6. *Faulty Main PC Board*

   a. Check for (±) 0 vdc on Main PC Board between J41-9 and TP1. If (±) 0 vdc is present, replace Main PC Board.

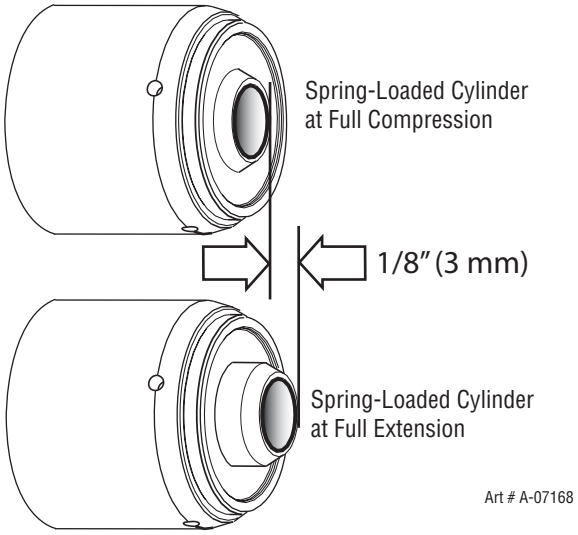
7. *Faulty Fan*

   a. Measure for (±) 230VAC on Main PC Board from J26-1 to J26-4.

      - If voltage is correct, replace fan (M1).

D. Torch will not pilot when torch switch is activated; AC ~ and GAS indicators ON; Temp and DC ⎓ indicators OFF

1. *Gas pressure too high or too low*
   a. Adjust gas pressure per pressure setting label on power supply.
2. *Torch tip, start cartridge, or electrode missing.*
   a. Turn off power supply. Remove shield cup, install missing parts.
3. *Start cartridge is stuck*
   a. Turn off power supply. Remove shield cup, tip, and start cartridge. Check lower end fitting on start cartridge for free movement. Replace cartridge if lower end fitting does not move freely.



4. *Worn or faulty torch parts*
   a. Inspect torch consumable parts. Replace if necessary.

5 E. Gas flows; AC indicator ~ and GAS indicators ON; TEMP indicator off; ON; DC ⎓ indicator off or blinks on/off once.

1. *Faulty IGBT or Output Diode Module Assembly*
   a. Check per Subsection 5.08-F; repair as needed.
2. *Faulty Main PCB*
   a. Test; repair as needed.

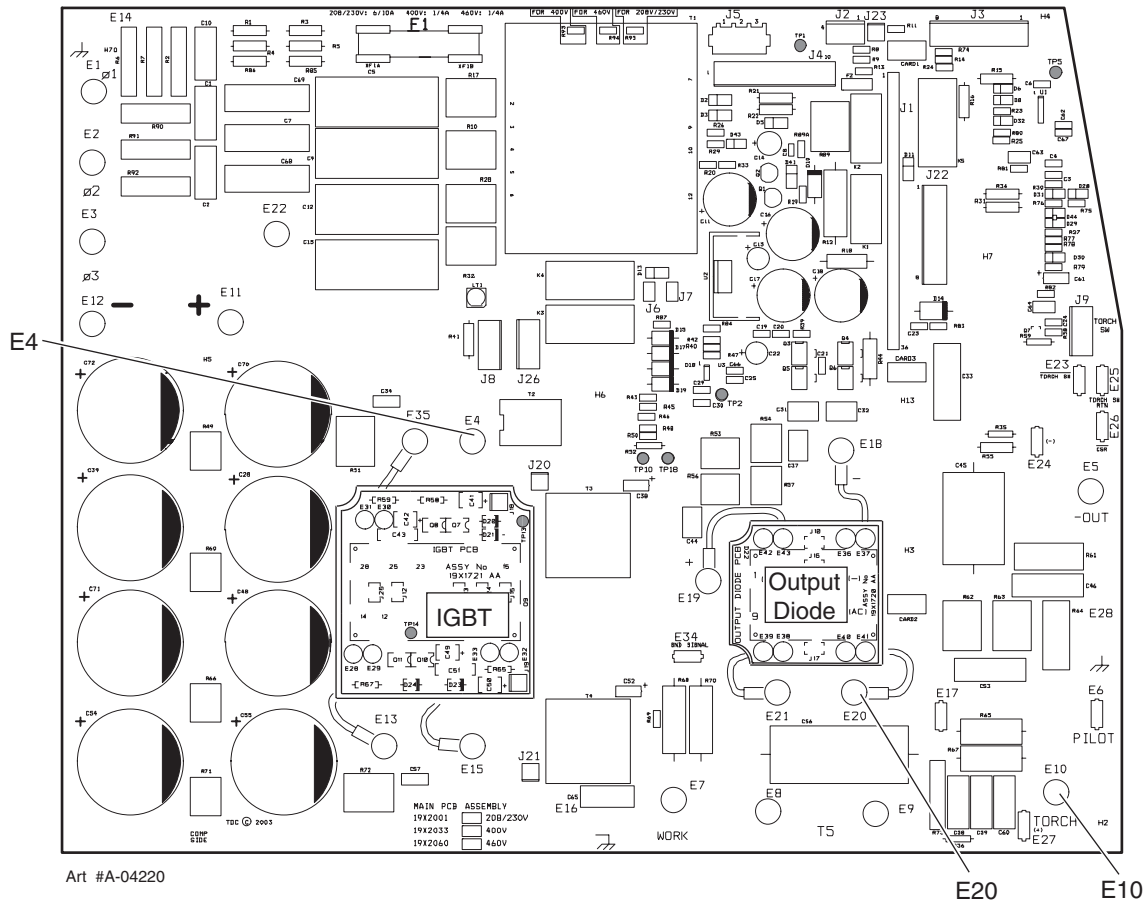
F. Gas flows; No arc in torch; AC ~, GAS, and DC ⎓ indicators ON; TEMP indicator off

1. Faulty IGBT

a. Measure between the following points on the Main PC Board:

- E4 to E10
- E10 to E20

Voltage should be approximately 20 vdc before the start signal is active. If voltage measures greater than 100 vdc when the start signal is active, replace the IGBT.



Main PC Board Layout (IGBT Test Points)

G. No arc or intermittent arc in torch; Gas flows; AC ~, GAS, and DC ⎓ indicators ON; TEMP indicator off

1. *Gas pressure set incorrectly (too high)*
   a. Reset gas pressure per pressure setting label on power supply.
2. *Oil/moisture in air lines*
   a. Put the ON / OFF switch in the ON (up) position. Put the RUN / RAPID AUTO RESTART / SET switch in the SET (down) position.
   b. Place a welding filter lens in front of the torch and turn on the air. Any oil or moisture in the air will be visible on the lens. **Do not start an arc!**
   c. Purge system. If problem corrected, add filters in line with air source.
3. *Incorrect torch parts*
   a. Inspect the torch parts; replace as needed.
4. *Faulty leads*
   a. Check torch leads continuity.
5. *Faulty torch*
   a. Check torch.
6. *Faulty connection of wire #58 or 62 to Pilot Board*
   a. Check wiring connection. Refer to the System Schematic in the Appendix. Connections should be:
      - Wire #58 to Pilot Board terminal E58
      - Wire #62 to Pilot Board terminal E62

      If wires 58 and 62 are not connected to the proper terminals, replace the Pilot Board.
7. *Faulty Main PC Board*
   a. Check for approximately 12 vdc at TP4 on Logic PC Board to TP1 on Main PC Board. If less than 2 vdc, replace the Main PC Board.
8. *Faulty Logic Board or Faulty Pilot Board*
   a. Install a jumper between wires 58 and 62 on Pilot Board and retry piloting. If torch pilots with jumper installed, replace Pilot Board. If torch does not pilot, replace Logic Board.

5

5.07 Main Arc Problems

Locate your symptom below:

A. Main cutting arc will not start

1. *Work cable not connected.*
   a. Connect work cable.

B. No cutting output

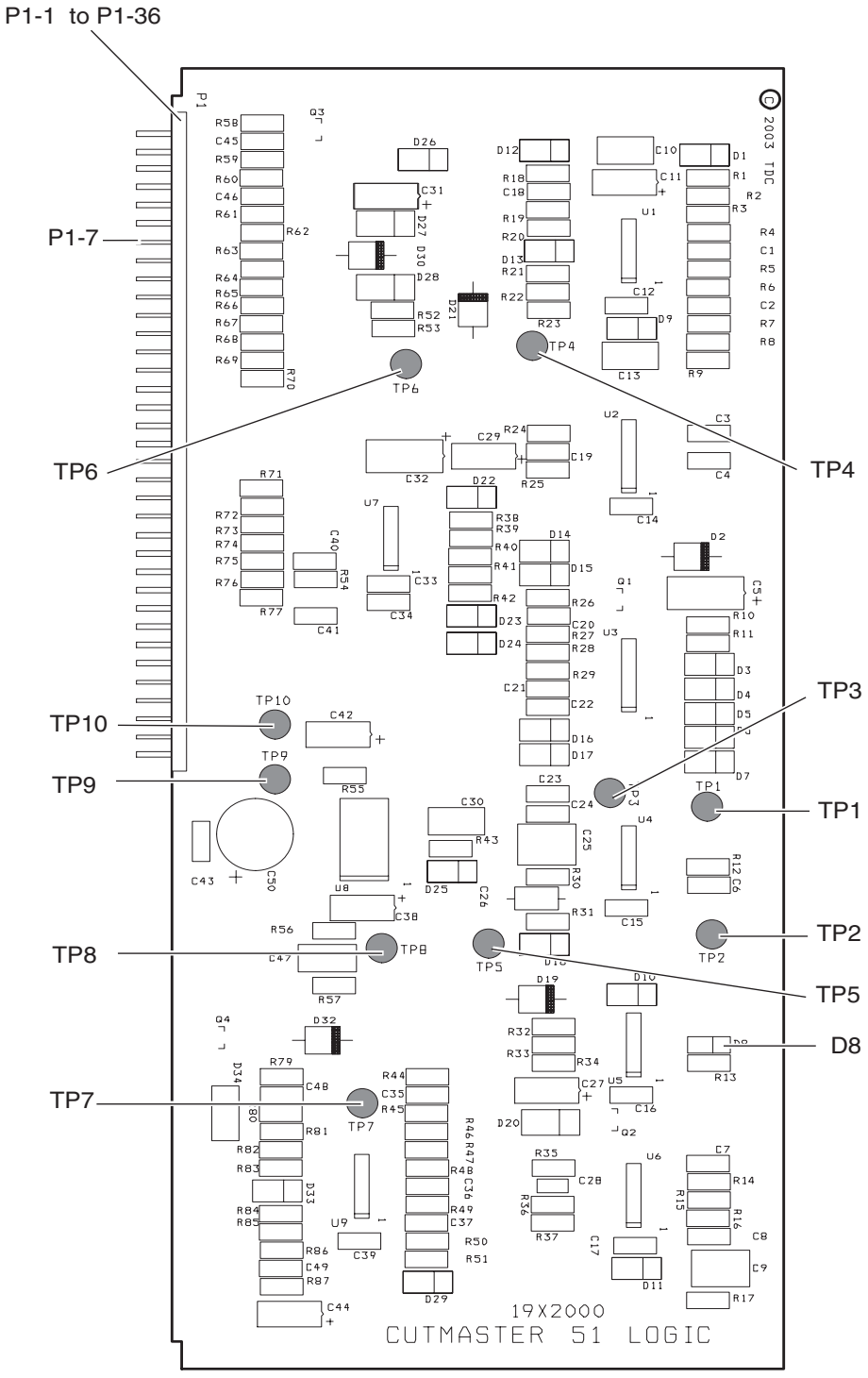
1. *Torch not properly connected to power supply*
   a. Check that torch leads are properly attached to power supply
2. *Shield cup not properly installed on torch*
   a. Check that shield cup is fully seated against torch head (do not overtighten)
3. *Parts - In - Place (PIP) not satisfied.*
   a. Check that shield cup is properly installed.
   b. Check switch in machine torch head for continuity.
4. *Faulty components in torch and leads assembly*
   a. Inspect torch assembly and replace if necessary.

C. Limited output with no control

1. *Poor input or output connections to power supply*
   a. Check all input and output connections.
2. *Faulty components in torch and leads assembly*
   a. Inspect torch assemblies and replace if necessary.

D. Erratic or improper cutting output

1. *Poor input or output connections to power supply*
   a. Check all input and output connections.
2. *Current set too low at power supply*
   a. Increase current setting.
3. *Torch is being moved too fast across workpiece*
   a. Reduce cutting speed.
4. *Holding too high of a standoff.*
   a. Refer to recommended standoff heights provided in speed charts in Section 3. Adjust as needed.
5. *Workpiece is painted or rusty.*
   a. Clean workpiece.
6. *Faulty Main PC Board or Logic Board.*
   a. Measure for ±0 vdc at TP2 to TP1 on the Logic Board when attempting to transfer. Refer to Logic Board Layout.
   - If TP2 goes to 0 vdc replace Output Board.
   - If not, replace Main PC Board.



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5

Logic Board Layout

7. Faulty Main Input Contactor.

a. Check per Subsection 5.08-D.

B. When operating the amperage drops off after the main cutting arc starts.

1. Faulty Pilot Board

a. With power off and wires E58 and E62 disconnected from the pilot board, measure for continuity between terminals #E58 and #E62. If continuity is found, replace Pilot Board.

5.08 Test Procedures

The test procedures in this subsection are referenced in the troubleshooting section.

A. Safety Precautions

1. Significant DC Voltage exists after removal of input power. Allow two minutes for discharge time. Voltage measured on input capacitors must be zero before performing service on the power supply.
2. Do Not touch electrical components with any part of the human body when power is applied.
3. Keep away from any moving parts.
4. Hot surfaces can cause severe burns. Allow equipment to cool before servicing.
5. Electrostatic discharge can damage printed circuit board assemblies. Transport printed circuit boards in proper antistatic shielded packages. Use proper grounding techniques with wrist strap before handling printed circuit boards.
6. Misaligned plugs can cause printed circuit board damage. Be sure plugs are properly aligned and completely seated.
7. Excessive pressure can damage printed circuit boards. Use only minimal pressure and gentle movement when disconnecting or connecting printed circuit board plugs.

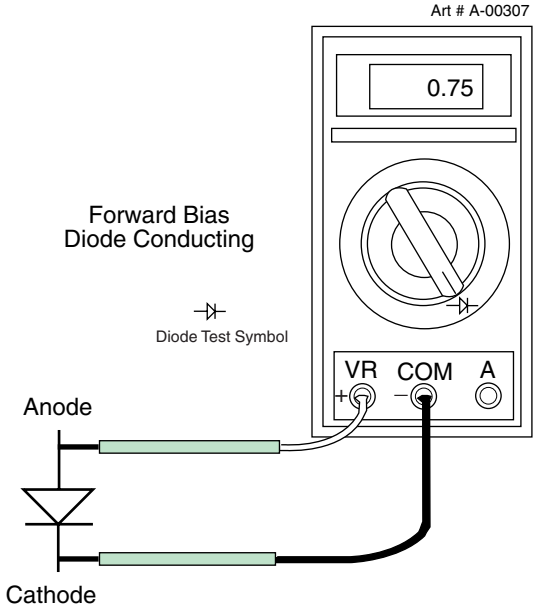
B. Diode Testing Basics

WARNING

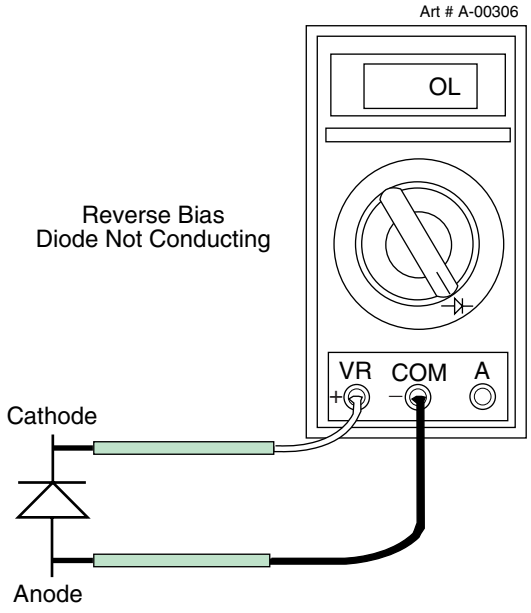
Disconnect primary power at the source before disassembling the power supply, torch, or torch leads.

Testing of diode modules requires a digital volt/ohmmeter that has a diode test scale. Remember that even if the diode module checks good, it may still be bad. If in doubt, replace the diode module.

1. Locate the diode module to be tested.
2. Remove cables from mounting studs on diodes to isolate the module.
3. Set digital volt/ohmmeter to diode test scale.
4. Using the Figures for each test, check each diode in the module. Each diode must be checked in forward bias (plus to negative) and reverse bias (negative to plus) direction.
5. Connect the volt/ohmmeter positive lead to the anode (+) of the diode and the negative lead to the cathode (-) of the diode for forward bias testing (refer to following figure). A properly functioning diode will conduct in the forward bias direction and indicate between 0.3 to 0.9 volts.



Testing Diode Forward Bias



Testing Diode Reverse Bias

6. Reverse the meter leads across the diode for reverse bias testing (refer to following figure). A properly functioning diode will block in the reverse bias direction and depending on the meter function will indicate an open or "OL".
7. If a diode checks bad, replace the diode module.
8. Reconnect all cables.

5

C. Diode Module Board Tests

WARNING

Disconnect primary power at the source before taking any resistance checks.

1. Input Diode Test

a. Disconnect input AC power.

b. Check Input Diode for shorted input diode. With an ohmmeter set on the diode range make the following checks from Main PC Board to Input Diode:

For 400-Volt and 460-Volt Power Supplies:

Meter (+)	Meter (-)	Indication
E1	E11	Diode Drop
E11	E1	Open
E2	E11	Diode Drop
E11	E2	Open
E3	E11	Diode Drop
E11	E3	Open
E12	E1	Diode Drop
E1	E12	Open
E12	E2	Diode Drop
E2	E12	Open
E12	E3	Diode Drop
E3	E12	Open

For 208/230-Volt Power Supplies:

Meter (+)	Meter (-)	Indication
E2	E11	Diode Drop
E11	E2	Open
E12	E2	Diode Drop
E2	E12	Open

c. The meter should indicate a diode drop in one direction and an open in the other direction for each check. Replace the Input Diode Module Board if the readings do not match the chart.

d. If Input Diode Module Board is shorted, make the following checks with an ohmmeter at the Main Contactor (W1):

	Meter (+)	Meter (-)	Indication
All Voltages	L1	T1	Open
	L2	T2	Open
400/460V Only	L2	T1	Open

If any test has resistance, then replace the Main Contactor.

2. Output Diode Module Board Circuit Test

a. Use an ohmmeter set on the diode function and make the following measurements on the Output Diode Module Boards to Power Output PC Board.

CutMaster 51 Output Diode Test Readings		
Meter (+)	**Meter (-)**	**Indication**
E18	E21	Diode Drop
E21	E18	Open
E18	E20	Diode Drop
E20	E18	Open
E20	E19	Diode Drop
E19	E20	Open
E21	E19	Diode Drop
E19	E21	Open
E18	E19	(2) Diode Drops
E19	E18	Open

b. The meter should indicate a diode drop in one direction and an open in the other direction for each check. Replace the Output Diode Module Board(s) if the readings do not match the chart.

3. IGBT Module Board Circuit Test

a. Use an ohmmeter set on the diode function and make the following measurements on the IGBT Module Board(s) to the Main PC Board.

CM51 IGBT Test Indications				
208/230V Power Supply		400V & 460V Power Supply		
Meter (+)	Meter (-)	Meter (+)	Meter (-)	Indication
E3	E13	E35	E13	Diode Drop
E13	E3	E13	E35	Open
E15	E3	E15	E35	Diode Drop
E3	E15	E35	E15	Open
E15	E13	E15	E13	(2) Diode Drops
E13	E15	E13	E15	Open

5

b. The meter should indicate a diode drop in one direction and an open in the other direction for each check. Replace IGBT Module Board(s) if readings are not the same as the chart.

D. Main Input Power Test

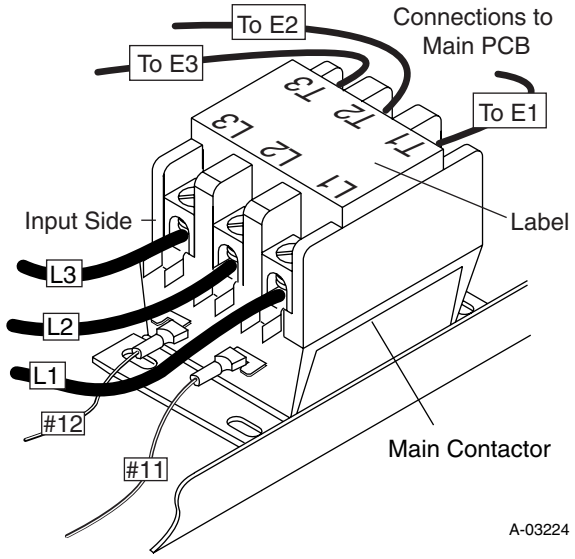
WARNING

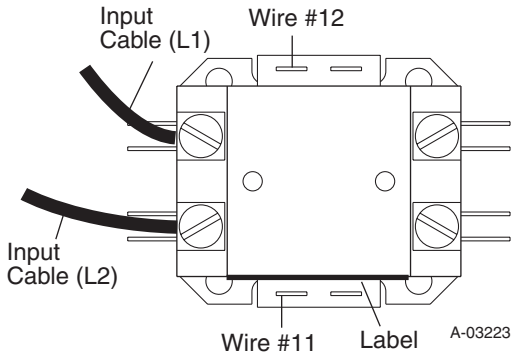
The following tests must be performed with the power supply connected to primary input power. There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair without proper training in power electronics measurement and troubleshooting techniques.

Reconnect power and observe proper start-up procedure. AC indicator on the Front Panel should be ON. If indicator is OFF there is no voltage to the Power Supply or an overvoltage condition exists.

1. If AC indicator on Front Panel is OFF, check for proper AC input voltage between input cables on the Main Contactor. Input voltage should be as shown in the following chart. If not, check for proper voltage at the main power source.

CutMaster 51 Input Contactor Voltage Ranges		
Input Power	Test Points	Voltage Range
208/230V	L1, L2	187-253VAC
400V	L1, L3	360-440VAC
460V	L1, L3	414-506VAC





Main Input Contactor (460-Volt Three-Phase Input Power Shown) 208/230-Volt Main Input Contactor

2. Check for approximately 28 VAC on coil of contactor between wires # 11 and #12.
   a. If voltage is correct, replace main contactor. If voltage is incorrect, replace Main PC Board.

E. Gas Solenoid Circuit Test

Make the following voltage checks and replace the faulty part as required.

1. Place the RUN / RAPID AUTO RESTART / SET Switch to the SET position.
2. Measure for 28 VAC across Solenoid wires #7 and #8. Refer to System Schematic in Appendix Section.
   - If 28 VAC is present, replace Solenoid / Pressure Switch Assembly.
   - If 28 VAC is not present, check for 65 psi (4.5 bar) at the pressure regulator.
3. Check for less than 2 vdc at P1-7 to TP1 on Logic Board.
   - If less than 2 vdc, replace Main PC Board.
   - If more than 2 vdc, replace Logic PC Board.

F. Output Power Tests

1. No DC Output

When the unit is at "idle" the AC indicator on the Front Panel should be ON. When the torch is activated, the gas begins to flow. When the preflow time is over, the INV ON indicator on the Logic PCB energizes, and the DC indicator on the Front Panel turns ON.

- If the INV ON indicator does not turn ON, then replace the Logic PCB.
- If the INV ON indicator turns ON then OFF immediately, the following test should be performed:

  a. Disconnect eight-pin wire harness connector from the Pilot PC Board.

WARNING

The connector on the Pilot PC Board must be disconnected to prevent electrical damage to measuring equipment when testing the open circuit voltage (OCV).

  b. Activate torch (Logic PC Board Inverter On Indicator, turns ON).

  c. Measure for more than 200 vdc between E7(+) and E10 (-) on the Main PC Board. If voltage is less than 10 vdc, each IGBT Module and Output Diode Module should be tested individually.

5

2. Output Diode Circuit Test

WARNING

Disconnect primary power at the source before taking any resistance checks.

a. Use an ohmmeter set to the diode function and make the following measurements on the Output Diode Board to Main Power PC Board.

CutMaster 51 Output Diode Test Readings		
Meter (+)	**Meter (-)**	**Indication**
E18	E21	Diode Drop
E21	E18	Open
E18	E20	Diode Drop
E20	E18	Open
E20	E19	Diode Drop
E19	E20	Open
E21	E19	Diode Drop
E19	E21	Open
E18	E19	(2) Diode Drops
E19	E18	Open

b. The meter should indicate a diode drop in one direction and an open in the other direction for each check. Replace Output Diode Board if readings are not the same as the chart.

3. IGBT Circuit Test

a. Use an ohmmeter set to the diode function and make the following measurements on the IGBT Board to the Main Power Board.

CM51 IGBT Test Indications				
208/230V Power Supply		400V & 460V Power Supply		
Meter (+)	Meter (-)	Meter (+)	Meter (-)	Indication
E3	E13	E35	E13	Diode Drop
E13	E3	E13	E35	Open
E15	E3	E15	E35	Diode Drop
E3	E15	E35	E15	Open
E15	E13	E15	E13	(2) Diode Drops
E13	E15	E13	E15	Open

b. The meter should indicate a diode drop in one direction and an open in the other direction for each check. Replace IGBT Board if readings are not the same as the chart.

c. Activate the torch.

- After two seconds INV ON indicator on the Logic PCB should turn ON. If indicator does not turn ON, replace Logic PCB.

d. Measure open circuit voltage between E7(+) to E10 (-) on the Main Power PC Board. Voltage should be greater than 200 vdc. If voltage is less than 10 vdc, refer to the output diode test measurements or IGBT module test measurements or shorted torch measurements.

4. Gate Drive & DC Sensing

a. After checking all previous steps in Subsection 4.09-G, jumper TP1 to TP3 on the Logic PCB.

b. Disconnect wires from the Main PC Board as shown in the chart. When the unit is turned on, the DC light should remain ON.

Main PC Board Wire Disconnection Points	
208/230V Units	E3, E13, E15
400, 460V Units	E13, E15, E35

c. Activate the torch (press torch switch on the handle, send START signal from CNC Control or press the torch switch on the Remote Pendant). After two seconds INV ON indicator on the Logic PCB should come on and remain on.

- If INV ON indicator does not remain on, replace Logic PCB.
- If INV ON indicator does remain on, then check for approximately 6 vdc between J1-29 and J1-28 and between J1-27 and J1-26.
  - If no voltage, replace Logic PC Board.
  - If voltage is correct, measure for approximately 6 vdc between E32 to TP-14 on the IGBT PCB and E31 to TP13 on IGBT PC Board.
    - If 0 vdc, replace Main PC Board.
    - If correct, reconnect wires to Main PC Board.

d. With jumper between TP1 to TP3 still in place, activate the torch and measure for 230 vdc to 300 vdc at Main PCB E18 to E19.

- If 0 vdc, replace IGBT PC Board.
- If correct, replace Logic PC Board.

5.09 Major External Parts Replacement

WARNING

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

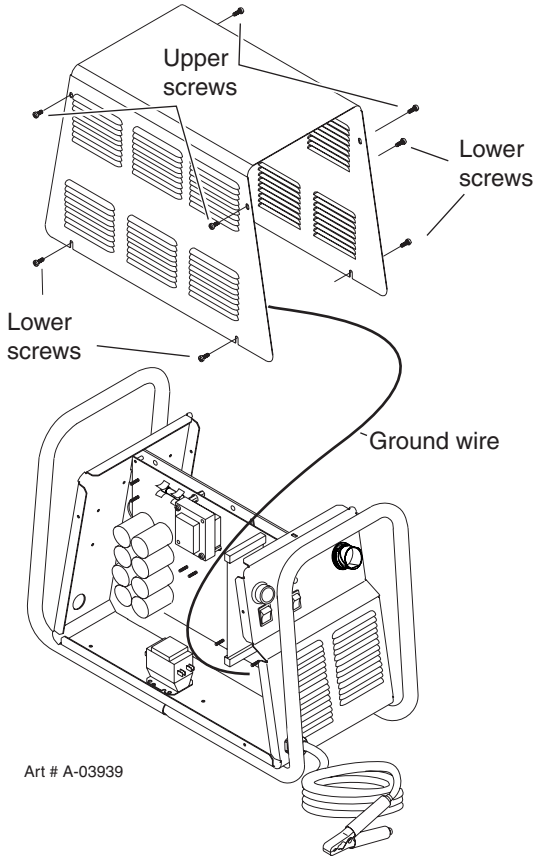
For replacement of parts not covered in this section, instructions are provided with the replacement part.

A. Cover Removal

1. Remove the upper screws which secure the cover to the main assembly.

NOTE

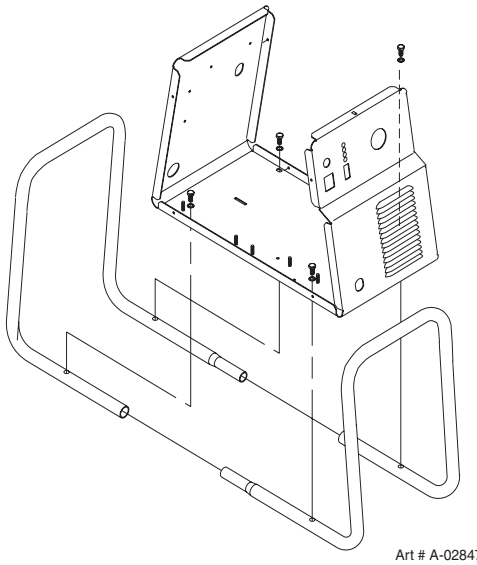
There is a ground wire connection to the inside of the unit. There is no need to disconnect the ground wire, unless there is a need for more room to work.



2. Loosen, but do not remove, the lower screws, then carefully pull the Cover up and away from the unit.

B. Tube Handle Replacement

1. Remove the power supply cover.
2. Remove the four bolts and star washers securing the tube handles to the base of the unit.
3. Move the input power cable, torch leads and work cable inside the handle, then lift the base of the unit away from the Tube Handle.
4. With a rubber mallet, separate the two handle ends as shown below.
5. Install the replacement Tube Handle by reversing the above steps.
6. Reinstall the power supply cover.



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C. Cover Installation

1. Reconnect the ground wire, if necessary.
2. Place the cover onto the power supply so that slots in the bottom edges of the cover engage the lower screws.
3. Tighten lower screws.
4. Reinstall and tighten the upper screws.

5

5.10 Front Panel Parts Replacement

WARNING

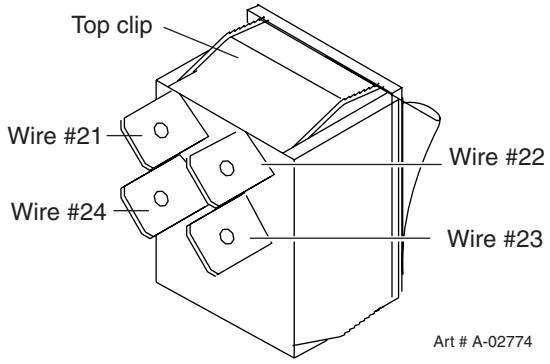
Disconnect input power at the source and bleed down the system before attempting these procedures.

A. Current (A) Control Knob Replacement

1. Turn the control knob fully clockwise and note the location of the pointer on the knob.
2. Loosen the screw securing the Knob to the potentiometer shaft and remove the Knob.
3. Place the replacement Knob on the potentiometer shaft with the location of the pointer the same as noted in step 1.
4. Tighten the screw to secure the knob to the potentiometer shaft.

B. ON/OFF Switch (SW1) Replacement

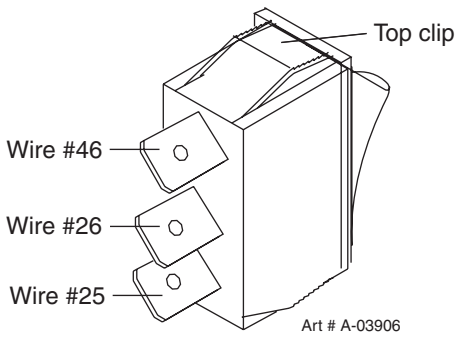
1. Remove the power supply cover.
2. Disconnect the wires on the rear of the ON/OFF Switch. Note the location of each wire, as shown below:



3. Squeeze together the clips on the top and bottom of the Switch. Remove the Switch through the Front Panel.
4. Install the replacement Switch by reversing the above steps.
5. Reinstall the power supply cover.

C. RUN / RAPID AUTO RESTART / SET Switch (SW2) Replacement

1. Remove the power supply cover,
2. Disconnect the wires on the rear of the Switch. Note the location of each wire, as shown:



3. Squeeze together the clips on the top and bottom of the Switch, then remove the switch through the Front Panel.
4. Install the replacement Switch by reversing the above steps.
5. Reinstall the power supply cover.

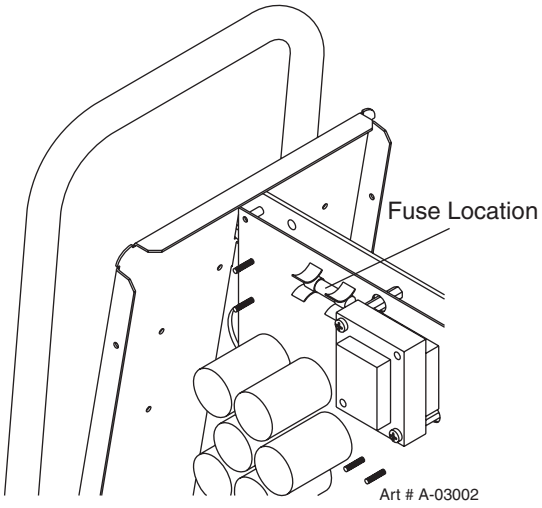
D. POT/LED PC Board Replacement

1. Remove the power supply cover,
2. Remove Current Knob .
3. Disconnect wire harness Connector from POT/LED PC Board.
4. Remove PC Board from standoffs.
5. Install the replacement POT/LED PC Board by reversing the above steps.
6. Reinstall the power supply cover.

5.11 Left Side Internal Parts Replacement

A. Fuse (F1) Replacement

1. Remove the power supply cover,
2. Locate the internal fuse on the left side of the center chassis.
3. Replace the fuse. A replacement fuse is located inside the power supply. Refer to Section 6, Parts Lists, for replacement fuse catalog number.
4. Reinstall the power supply cover by reversing the steps in paragraph "B" above.



Internal Fuse Location

B. Work Cable Replacement

1. Remove the power supply cover,
2. Disconnect the Work Cable from the WORK terminal on the Main Power PC Board, located on the left side of the unit.
3. Squeeze the top and bottom of the Work Cable Strain Relief and remove from the Front Panel.
4. Remove Work Cable from the unit.
5. Install the replacement Work Cable by reversing the above steps.

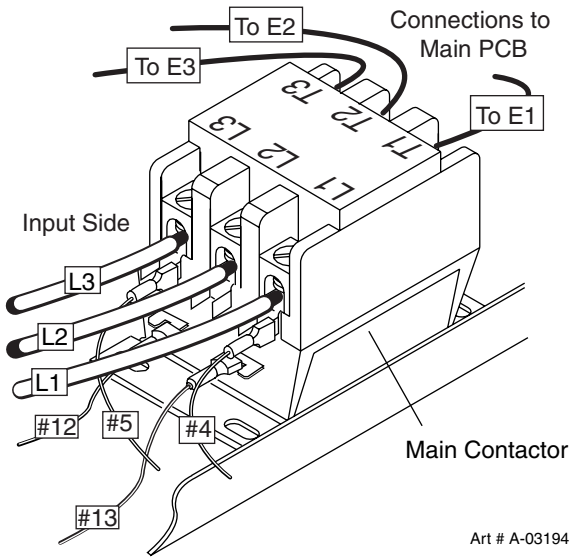
C. Main Input Contactor (W1) Replacement

1. Remove the power supply cover.
2. Label all wires connected to the Input Contactor.
3. Disconnect wires to the Input Contactor from the input cable.
4. Disconnect all other wires connected to the Input Contactor.
5. Remove the two nuts and washers securing the Input Contactor to the base of the power supply.
6. Position the replacement Input Contactor with the row of connectors labeled L toward the rear of the Power Supply. Fasten in place with the hardware removed previously.
7. Complete the wiring connections as shown.

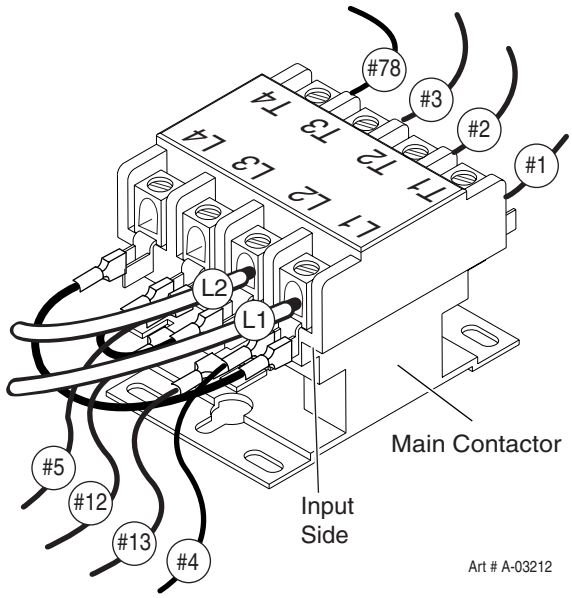
NOTE

It is important that wires are installed correctly, as shown, to prevent damage to the unit.

8. Reinstall the power supply cover.



400-Volt and 460-Volt Input Contactor
(3-phase input power connections shown)



208 / 230-Volt Input Contactor

5

D. Logic PC Board Replacement

Follow the antistatic procedures provided with the replacement part.

1. Remove the power supply cover.
2. Unlock the two tabs on the card guides protruding from the Main PC Board. Push in the silver part of the tab until the black part pops out on the other side.
3. Gently pull the Logic PC Board from the Main Power PC Board.
4. Install the replacement Logic PC Board by reversing the above steps. Note the following:
   a. The pins on the Logic Board must be fully seated in the J1 connector on the Main PC Board. Ensure that the tabs on the card guides close properly.
   b. The small pin inside the tab on the card guide must slide through the hole in the PC Board to ensure the PC Board is properly secured.
5. Reinstall the power supply cover.

E. IGBT Circuit Board or Output Diode Replacement

Follow the antistatic procedures provided with the replacement part.

WARNINGS

Follow the electrostatic discharge instructions included with the component to prevent damage to the component.

Thermal pads and the large flat surface on the back of diodes and IGBTs must be kept clean. Thermal pads must not be allowed to pick up any foreign material. A very clean installation between the module and heatsink is essential for proper operation.

1. Remove the power supply cover.
2. Turn the Power Supply onto its side.
3. For IGBTs, disconnect the small jumpers from their connections to the Main PC Board. Label and carefully remove all other wire connections from the Board being replaced.
4. Remove screw securing Board in place. Remove board and its screw from the power supply.
5. Use isopropyl alcohol and a clean rag to clean the heatsink. Remove all residue of the original thermal pad. Do not scratch or abrade the surface.
6. The thermal pad, provided with the replacement part, is a thin metal pad. Remove and discard any loose protective paper coverings from the pad.

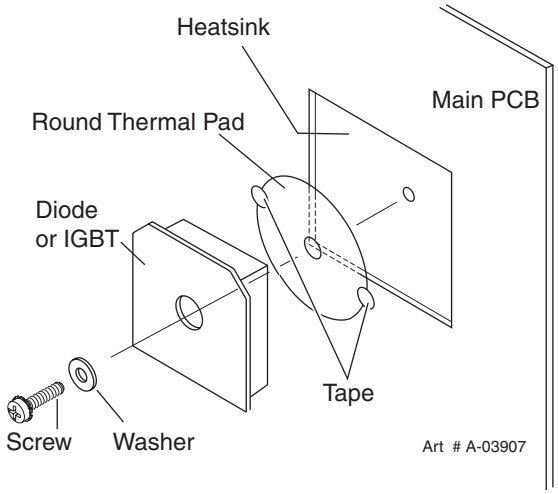
CAUTION

Protective coverings must be removed from the thermal pad. Installing a thermal pad with protective coverings in place will cause equipment damage or failure.

7. Apply the round thermal pad to the heatsink with a small piece of light-duty tape. Tape must cover no more than 1/8" (3 mm) of the edge of the thermal pad. Use the screw hole in the heatsink as a guide to position the pad.
8. For IGBTs, remove the small jumpers from the component being replaced. Transfer the jumpers to the replacement component.
9. Clean the large flat surface on the back of the replacement component with isopropyl alcohol.

10. Install modules as follows:

    a. Put the replacement module in position, and secure with the screw removed previously. Ensure that the washer is under the head of the screw.



    b. Torque the screw to 17 inch-pounds (1.9 Nm).

CAUTION

Failure to torque properly will cause component damage.

11. Reconnect the wiring per the applicable chart.

CutMaster 51 IGBT Wiring Connections	
From IGBT Terminals	To Main PCB Terminals
E28, E29	E13
E32, E33	E15
E30,E31	E35
J18	J20
J19	J21

Output Diode Wiring Connections	
From Output Diode	To Main PCB
E38, E39	E21
E42, E43	E19
E36, E37	E18
E40, E41	E20

11. Stand the Power Supply upright. Re-connect primary input power, and test the unit.

12. When all tests are completed, re-install the power supply cover.

F. Input Diode Replacement

WARNINGS

Follow the electrostatic discharge instructions included with the component to prevent damage to the component.

Thermal pads and the large flat surface on the back of diodes must be kept clean. Thermal pads must not be allowed to pick up any foreign material. A very clean installation between the module and mounting plate is essential for proper operation.

1. Remove the power supply cover.
2. Label and disconnect wires from the Input Diode.
3. Remove screws securing Board in place. Remove board and its screws from the power supply.
4. Use isopropyl alcohol and a clean rag to clean the mounting plate. Remove all residue of the original thermal pad. Do not scratch or abrade the surface.
5. Clean the large flat surface on the back of the replacement component with isopropyl alcohol.
6. The thermal pad, provided with the replacement part, is a thin metal pad. Remove and discard any loose protective paper coverings from the pad.

CAUTION

Protective coverings must be removed from the thermal pad. Installing a thermal pad with protective coverings in place will cause equipment damage or failure.

7. Apply the thermal pad to the diode. Use the screw hole and slot in the mounting plate as a guide to position the pad.

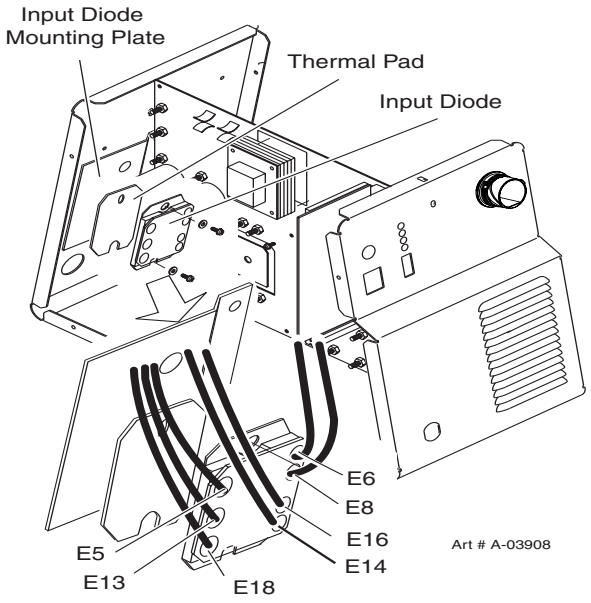
8. Install module as follows:

   a. Put the replacement module in position, and secure with the replacement screws. Ensure that the washers are under the heads of the screws.

   b. Torque the screws to 35 in-lb / 3.95 Nm.

CAUTION

Failure to torque properly will cause component damage.



9. Reconnect the wiring per the chart.

CutMaster 51 Input Diode Wiring Connections

208/230V Power Supplies		400V, 460V Power Supplies	
E5, E13, E18	E2	E5	E1
		E13	E2
		E18	E3
E6, E8	E11	E6, E8	E11
E14, E16	E12	E14, E16	E12

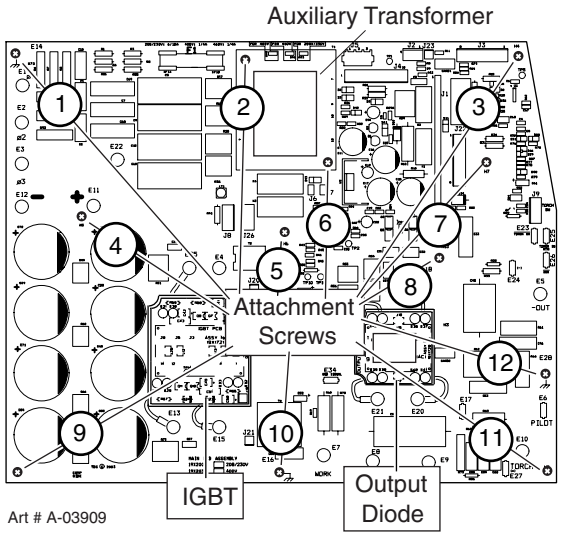
10. Re-connect primary input power, and test the unit for proper operation.

11. When all tests are completed, re-install the power supply cover.

G. Main PC Board Replacement

Follow the antistatic procedures provided with the replacement part.

1. Remove the power supply cover.
2. Remove the Logic PC Board.
3. Remove the POT/LED PC Board.
4. Disconnect all wire and cable connections to the Main PC Board, including the connections from the three smaller PC Boards. Refer to the Main PC Board Wiring Diagrams in the Appendix pages if necessary.
5. Remove the two long Transformer screws securing the Auxiliary Transformer to the Center Chassis.
6. Remove the other screws securing the PC Board to the Center Chassis.
7. Carefully remove the original PC Board.
8. Install the replacement PC Board by reversing steps above. It may be easier to install the PC Board if the Power Supply is turned on its right side first. Torque the screws to 17 inch-pounds (1.9 Nm).



9. Reconnect all wiring. Refer to the Appendix pages in this manual for wiring details.

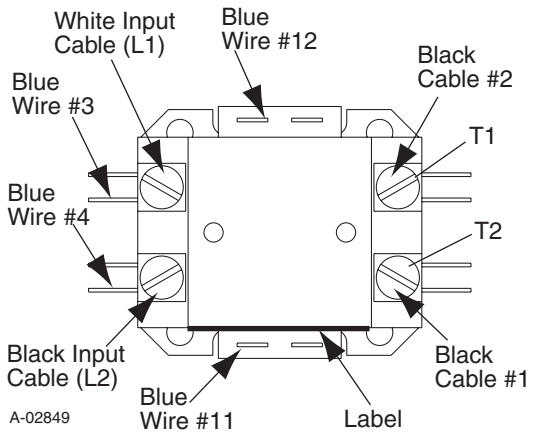
H. EMI Filter Replacement (CE Units Only)

1. Remove the power supply cover.
2. Label the input power cable connections and the cable connections to the main input contactor.
3. Disconnect all wire and cable connections to the EMI Filter.
4. Remove the hardware securing the EMI Filter. This hardware passes upward through the base of the power supply.
5. Put the replacement EMI Filter in position and secure it with the hardware removed in Step 4.
6. Connect the input power cables and the cable connections to the main input contactor.
7. Test the Power Supply for proper operation.

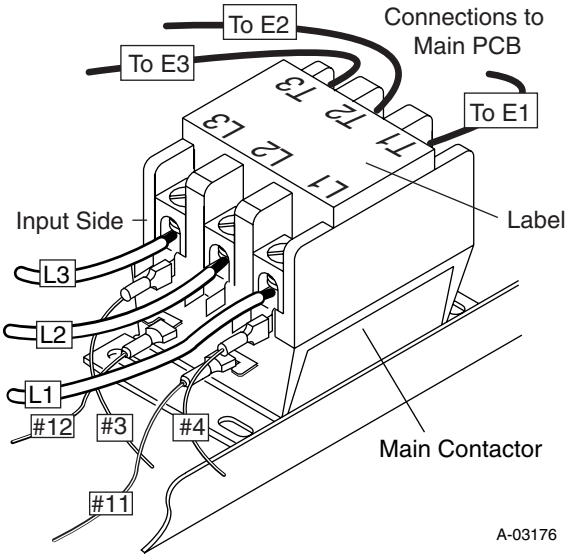
I. Input Power Cable Replacement

1. Remove the power supply cover.
2. Locate and label the input power cable connections and disconnect the cable.
3. Remove the hardware securing the input power ground wire to the ground stud on the base of the power supply.
4. Unthread the retaining nut on the Input Cable Strain Relief on the inside of the Rear Panel and remove the Input Power Cable from the unit.
5. Install the replacement Input Power Cable by reversing the above steps. The Input Power Cable ground wire requires a ring terminal. Refer to the illustrations for wire connection details.

For 208/230-Volt Power Supplies:



For 400-Volt and 460-Volt Power Supplies:



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5.12 Right Side Internal Parts Replacement

A. Fan (M1) Replacement

1. Remove the power supply cover.
2. Remove the two screws securing the Fan to the Fan Shroud and let the Fan drop down.
3. Turn the Fan slightly and slide the Fan out, left side first.
4. Carefully remove the two wiring connectors from the terminals on the Fan Assembly.
5. Install the replacement Fan Assembly as follows:
   a. Position Fan with the label facing inward and the Fan terminals facing bottom right.
   b. Connect the two wire connectors to the two Fan terminals.
   c. Slide the right end of the Fan in through the Shroud first, then the left.

NOTE

Only two screws are needed to attach the Fan to the Shroud and they can be installed in any two holes provided they are opposite each other. For grounding purposes, one of those screws must be installed with a star washer.

   d. Line up the Fan holes with the screw holes in the Fan Shroud then attach the Fan by installing two screws in opposite corners.

B. Pilot PC Board Replacement

The Pilot PC Board mounts to the Power Supply center chassis. Refer to Pilot Board Layout in the Appendix.

1. Remove the power supply cover.
2. Label and disconnect wires from Pilot PC Board terminals E58 and E62. Disconnect the wire harness from receptacle J28.
3. Remove the hardware securing the Pilot PC Board to the power supply center chassis. Remove the Pilot PC Board.
4. Position the replacement Pilot PC Board against the standoffs fastened to the center chassis. Note that the Pilot PC Board mounts with its printed text upside down. Fasten the Pilot Board to the standoffs with the hardware removed previously. Torque the hardware to 18 in-lbs (2.04 Nm).
5. Reconnect the wires to the Pilot PC Board. Wire #58 connects to terminal E58; wire #62 connects to terminal E62. Ensure that the wire harness connector is fully seated in receptacle J28.
6. Reinstall the power supply cover.

C. Main Transformer (T5) Replacement

The Main Transformer is located behind the Fan Shroud. For access to the Main Transformer, remove the Solenoid/Pressure Switch Assembly and the Fan and Fan Shroud.

1. Remove the power supply cover.
2. Release the tabs on the side and top of the Fan Shroud securing the Solenoid/Pressure Switch Assembly in position, enabling the Assembly to move freely.
3. Remove the gas hose from the Solenoid Fitting by pressing on the locking ring while pulling on the hose.
4. Remove Fan per Subsection 5.09-M. The Fan Shroud cannot be tilted up until the Fan wires are disconnected from the Fan. Removing the Fan also provides better access to the Main Transformer for reinstallation.
5. Remove the nuts securing the Fan Shroud to the Center Chassis.
6. Locate the two tabs below the Main PC Board securing the Fan Shroud to the Center Chassis. Use a screwdriver to push these tabs down to release the Shroud.
7. Label and disconnect cables at the following points on the Main Power PC Board. Refer to the Appendix pages for wiring details.
   - Primary to Main PCB Terminals E4 and E35
   - Secondary to Main PCB Terminals E8 and E9
8. Tilt the Fan Shroud up from the bottom to expose the Main Transformer and disconnect wire connector on the Coil Winding.
9. Remove the Transformer from the unit, carefully guiding all the connected cables and wires as you do so.
10. Turn unit onto its left side.
11. Position the replacement Transformer as follows:
    a. with the PC Board facing out from the unit;
    b. the cables oriented to the right side;
    c. the four Transformer Rubber Feet well seated in the four holes in the Center Chassis.
12. Feed the Transformer wires and cables as follows:
    a. White Transformer Cable - feed through bottom hole in Center Chassis.
    b. Black Transformer Cable - feed through hole in Top of Fan Shroud, then through hole in Center Chassis below Pilot PC Board.
    c. Blue Fan Wires - feed through same hole in Fan Shroud as Black Cable, then through hole at right side of Center Chassis.
13. Secure the Main Transformer in position by locking the two tabs on the bottom of the Shroud into the Center Chassis. Start with the left side first, lock it in position, then repeat with the right side.
14. Install the two nuts and washers securing the Shroud to the Center Chassis.
15. Connect wire connector to the Coil Winding on the Main Transformer.
16. Reinstall the Pressure Switch/Solenoid Assembly.
17. Reinstall the Fan and reconnect the wiring.
18. Reconnect cables to the following points on the Main Power PCB. Refer to the Appendix pages for wiring details.
    - Primary to Main PCB Terminals E4 and E35
    - Secondary to Main PCB Terminals E8 and E9
19. Reinstall the power supply cover.

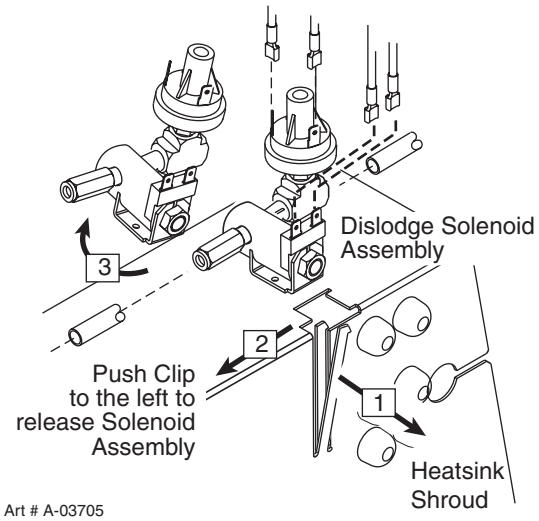
D. Output Inductor Assembly (L1) Replacement

1. Remove the power supply cover.
2. Disconnect the two wires connected to terminals E5 and E10 located on the right side of the Main Power PC Board. Pull through the bottom hole in the Center Chassis.
3. Disconnect the wires connected to J23 on the Main PC Board, removing tie wraps as necessary.
4. Remove the front mounting screw securing the Output Inductor Assembly to the unit base.
5. Remove grommet from Fan Shroud for better access to the Output Inductor Assembly rear mounting stud.
6. Pass a magnetic socket with a long extension through the hole in the Fan Shroud directly above the Output Inductor Assembly rear stud. Remove the nut. Use tape on the socket if the socket is not magnetic.
7. Install the replacement Output Inductor Assembly by reversing the above steps. The Output Inductor wires should be oriented towards the front of the unit.
8. Reinstall the power supply cover.

E. Pressure Switch/Solenoid Assembly (PS1/SOL1) Replacement

The Pressure Switch and Solenoid Valve are one Assembly.

1. Remove the power supply cover.
2. Disconnect:
   a. Wires #9 and #10 from the Pressure Switch Assembly.
   b. Wires #7 and #8 from the Solenoid Assembly.
3. Use a tool (screwdriver, etc.) to push the clip on the front of the Fan Shroud to the left. Release the Solenoid Assembly. Dislodge the Solenoid from underneath the clip on the top of the Fan Shroud.



4. Release the hose from the Adapter Fitting on the left side of the Solenoid Assembly. Hold a wrench or similar tool against the locking ring on the Fitting, then pull on the hose to release it.
5. Release the hose from the Adapter Fitting on the right side of the Pressure Switch.
6. Install the replacement Pressure Switch/Solenoid Assembly by reversing the above steps. Once installed, the Solenoid Assembly should fit securely under the Fan Shroud and should not be moveable.
7. Reinstall the power supply cover.

5.13 Rear Panel Parts Replacement

A. Filter/Regulator Assembly Replacement

WARNING

Disconnect the gas supply at the source and bleed down the system before performing this procedure.

1. Disconnect the gas input hose from the Filter/Regulator Assembly on the Rear Panel of the power supply.
2. Remove the four bolts securing the Regulator Mounting Bracket to the Rear Panel.
3. Disconnect the black gas tube from the Filter/Regulator Assembly Adapter Fitting. Hold a wrench or similar tool against the locking ring on the Fitting and pull on the tube to release it.
4. Remove the nut securing the Filter/Regulator Assembly to the Regulator Mounting Bracket. Remove the Filter-Regulator Assembly from the Mounting Bracket.
5. Install the replacement Filter/Regulator Assembly by reversing the steps above. When connecting the gas tube to the Adapter Fitting, simply insert the hose into the fitting until fully seated and it will automatically lock.

B. Filter/Regulator Bracket Replacement

1. Remove the four bolts securing the Regulator Bracket to the Rear Panel of the power supply.
2. Remove the nut securing the Filter/Regulator Assembly to the Regulator Bracket. Remove the Bracket from the Filter-Regulator Assembly.
3. Install the replacement Bracket by reversing the above steps.

This completes the replacement procedures.

SECTION 6:
PARTS LISTS

6.01 Introduction

A. Parts List Breakdown

The parts list provide a breakdown of all replaceable components. The parts lists are arranged as follows:

Section 6.03 Complete Power Supply Replacements
Section 6.04 Power Supply Options & Accessories
Section 6.05 Power Supply Major External Replacement Parts
Section 6.06 Power Supply Front Panel Replacement Parts
Section 6.07 Power Supply Left Side Internal Replacement Parts
Section 6.08 Power Supply Rear Panel Replacement Parts
Section 6.09 Power Supply Right Side Internal Replacement Parts
Section 6.10 : Torch Replacement Parts (SL100 Torch - no Solenoid on Mounting Tube)
Section 6.11: Torch Replacement Parts (SL100SV Torch - with Solenoid on Mounting Tube)
Section 6.12: Torch Consumable Parts
Section 6.13: Torch Spare Parts Kits
Section 6.14: Complete Torch Assembly Replacements
Section 6.15: Torch Options & Accessories

NOTE

Parts listed without item numbers are not shown, but may be ordered by the catalog number shown.

B. Returns

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

6.02 Ordering Information

Order replacement parts by catalog number and complete description of the part or assembly, as listed in the parts list for each type item. Also include the model and serial number of the power supply. Address all inquiries to your authorized distributor.

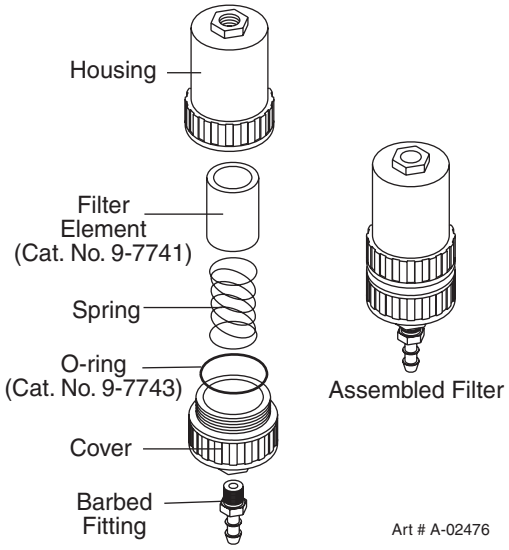
6.03 Complete Power Supply Replacement

The following items are included with the replacement power supply: work cable & clamp, input power cable, gas pressure regulator / filter, and operating manual.

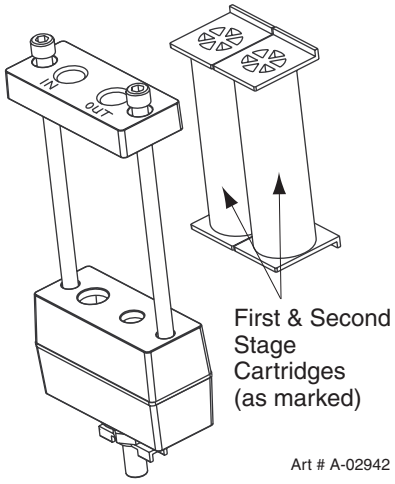
Qty	Description	Catalog #
	CutMaster 51 Automation Power Supply	
1	208 / 230VAC, Single-Phase, 50 / 60Hz, with input power cable and plug	3-5121-1
1	400VAC, Single - Phase, 50 /60Hz, with input power cable, non CE	3-5121-3
1	400VAC, Single - Phase, 50 /60Hz, with input power cable, CE	3-5121-4
1	460VAC, Three - Phase, 60 Hz, with input power cable	3-5121-2

6.04 Power Supply Options and Accessories

Qty	Description	Catalog #
1	Single-Stage Filter Kit (includes Filter & Hose)	7-7507
1	Replacement Filter Body	9-7740
1	Replacement Filter Hose (not shown)	9-7742
2	Replacement Filter Element	9-7741
1	Two-Stage Filter Kit (includes Hose & Mounting Screws)	7-7500
1	Bracket, Filter Mounting (not shown)	9-7535
1	Two-Stage Air Filter Assembly	9-7527
1	First Stage Cartridge	9-1021
1	Second Stage Cartridge	9-1022
1	Extended Work Cable (50 ft /15.2 m) with Clamp	9-8529
1	Multi-Purpose Cart	7-8888
1	25' / 7.6 m CNC Interface Cable	9-8312
1	50' / 15.2 m CNC Interface Cable	9-8313
1	75' / 22.8 m CNC Interface Cable	9-8315
1	100' / 30.4 m CNC Interface Cable	9-8316
1	125' / 38.0 m CNC Interface Cable	9-8317



Single-Stage Filter Kit

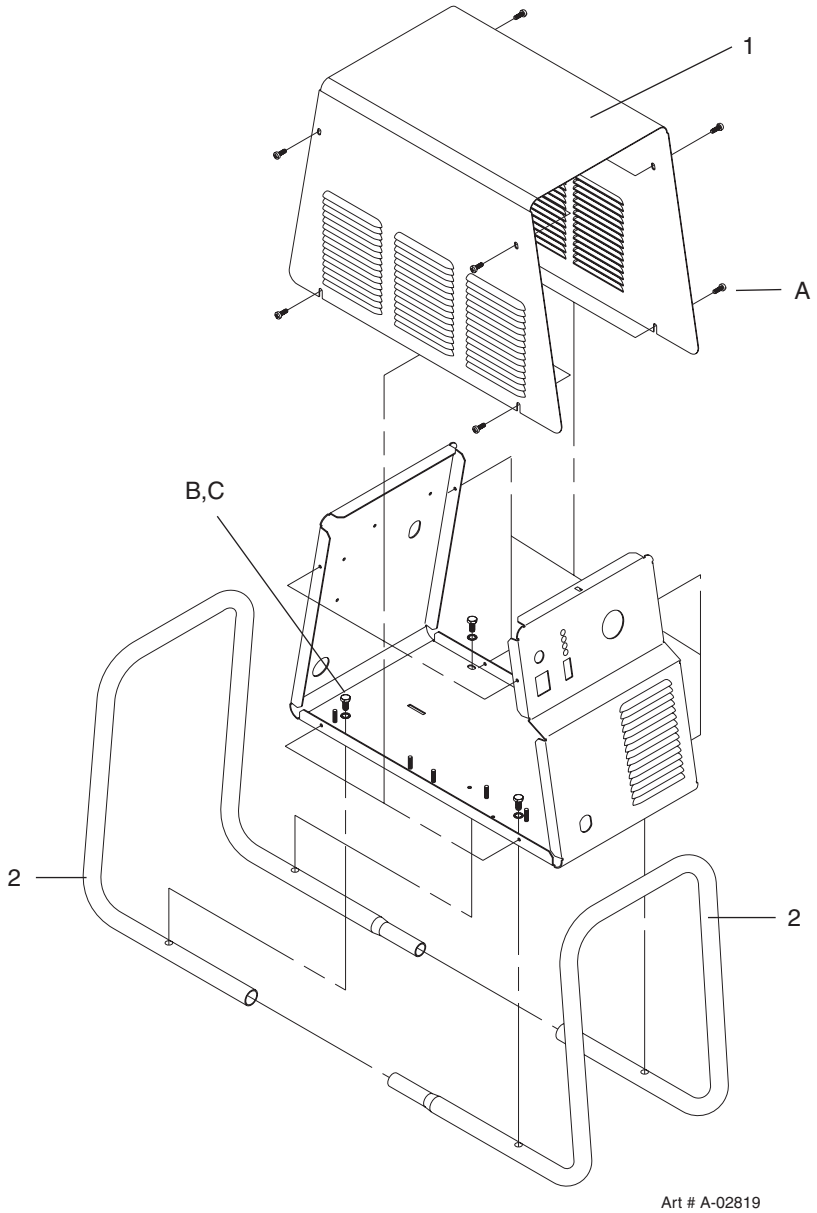


Optional Two-Stage Filter Kit

6

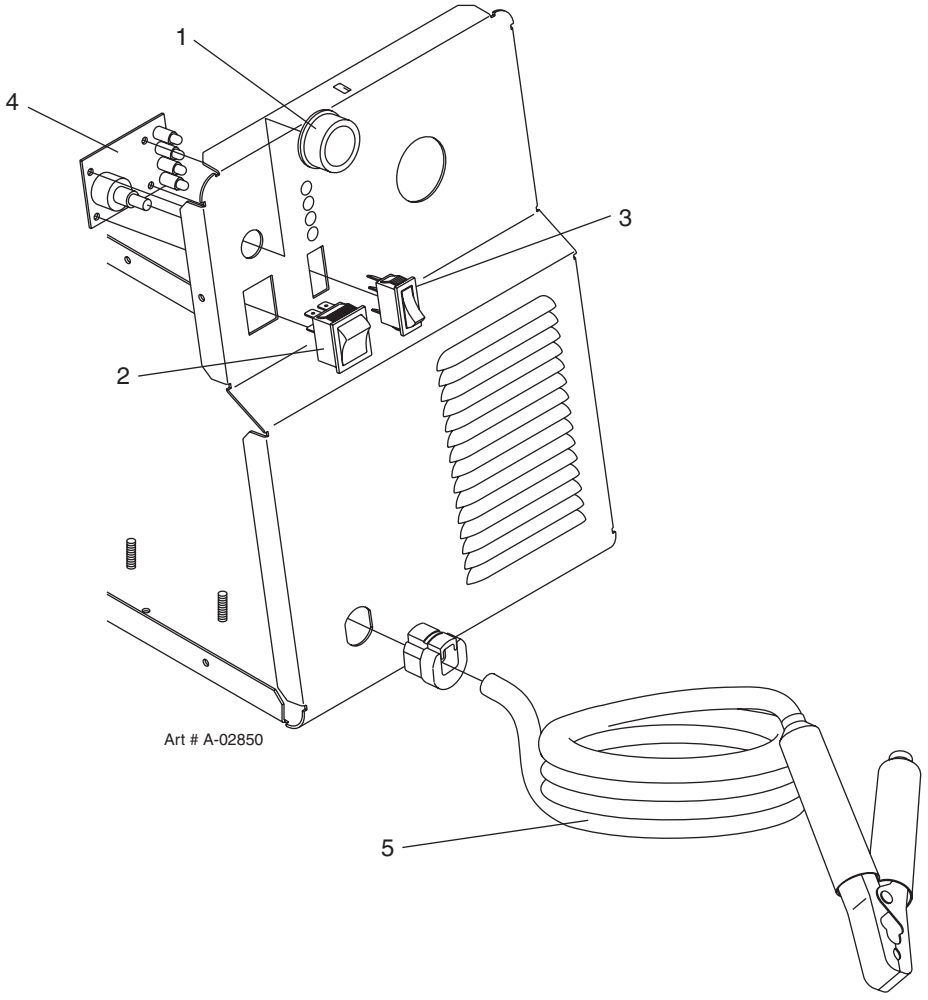
6.05 Power Supply Major External Replacement Parts

Item #	Qty	Description	Catalog #
1	1	Cover with labels	9-7999
2	1	Tube, roll handle	9-8320
Hardware:			
A	8	Screw, 10-32 x 1/2 PPH Swageform	See Note 1
B	4	Washer, 1/4 External Star	See Note 1
C	4	Screw, 1/4-20 x 3/4" Hex	See Note 1



6.06 Front Panel Replacement Parts

Item #	Qty	Description	Ref	Catalog #
1	1	Knob, Fluted, Skirted, 0.250 I.D.		9-8527
2	1	On/Off Rocker Switch	SW1	8-3258
3	1	Run/Rapid Auto Restart / Set Switch	SW2	8-3259
4	1	Assembly, Pot/LED PCB		9-8004
5	1	Cable, Work, #6 awg with Clamp, 20 Ft (6.1 m)		9-8528



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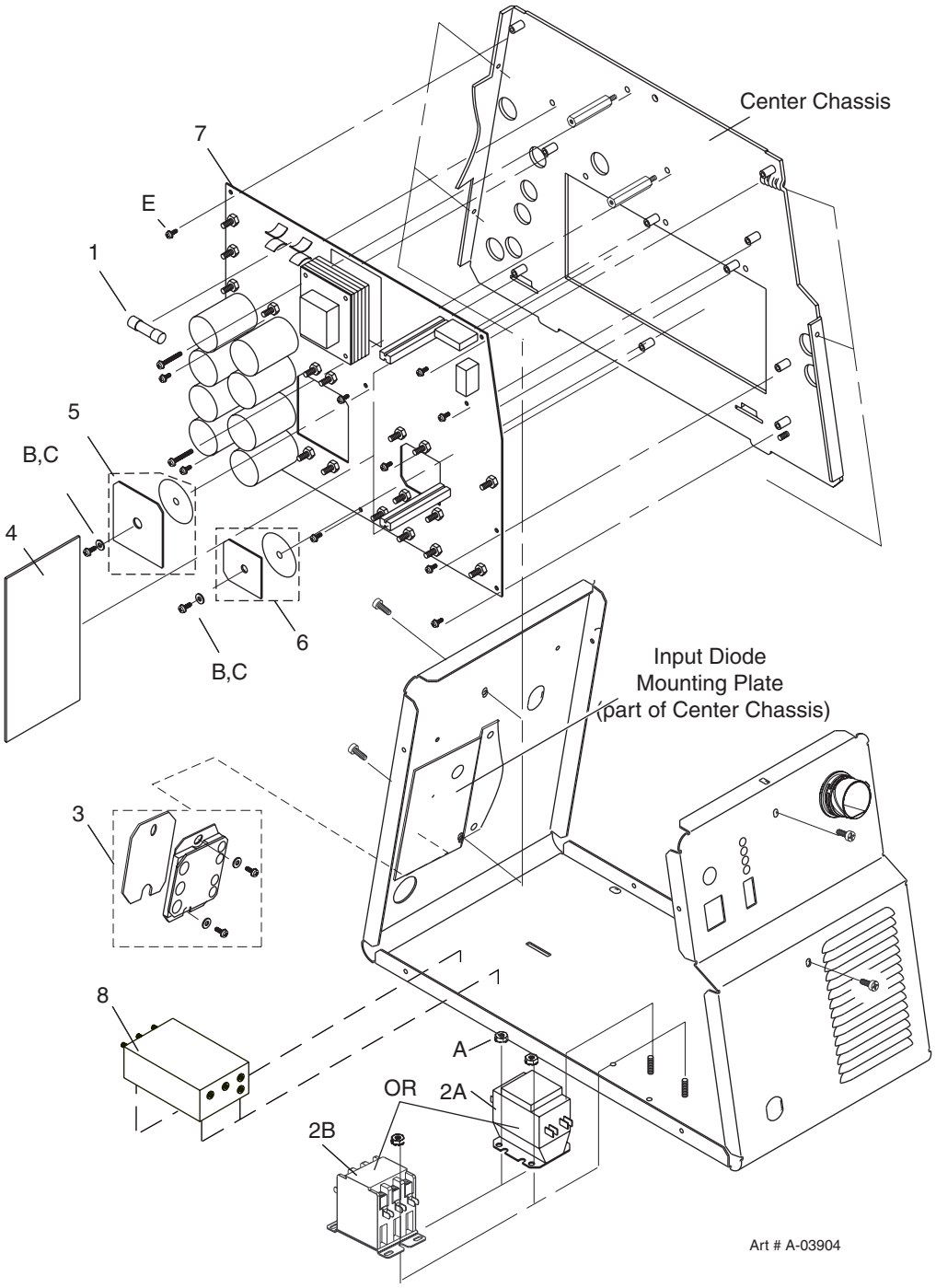
6.07 Left Side Internal Replacement Parts

Item #	Qty	Description	Ref	Catalog #
1		Fuse	F1	
	1	1/2A, 250V (For 208/230-Volt units)		9-8110
	1	1/2A, 600V (For 400-Volt and 460-Volt units)		9-8583
		Main Input Contactor	W1	
2A	1	For 208/230-Volt Units		9-8522
2B	1	For 400-Volt and 460-Volt Units		9-8554
3		PCB Kit, Input Diode		9-7088
	1	Input Diode		
	1	Thermal Pad		
	2	External star washer		
	2	Screw, 8-32 x 1/2", PPH		
4	1	PCB Assembly, Logic		9-7996
5	1	PCB Kit, IGBT Circuit		9-8540
	1	Round Thermal pad		
6	1	PCB Kit, Output Diode		9-8539
	1	Round Thermal pad		
7		PCB Kit, Main Power		
	1	For 208/230-Volt Units		9-7993
	1	For 400-Volt Units		9-7994
	1	For 460-Volt Units		9-7995
8	1	EMI Filter Assembly (CE Units only)		9-8561
Hardware:				
A	4	Hex nut		See Note
B	2	Screw, 8-32 x 3/4, PPH, with external star washer		See Note
C	3	Washer, 0.125 ID, zinc		See Note
D	1	Screw, 8-32 x 1", PPH, with external star washer		See Note
E	10	Screw, 6-32 x 3/8, PPH, with external star washer		See Note

NOTE

May be purchased locally.


Center Chassis
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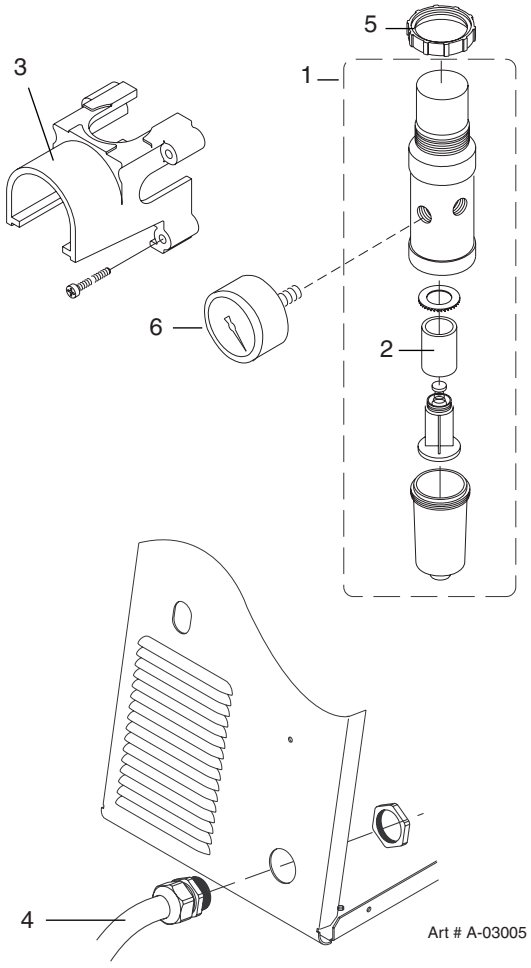
E
1
5
B,C
4
B,C
6
Input Diode
Mounting Plate
(part of Center Chassis)
3
1
1
8
A
OR
2A
2B
Art # A-03904

6.08 Rear Panel Replacement Parts

Item #	Qty	Description	Catalog #
1	1	Assembly, Filter / Regulator	9-7514
2	1	Regulator / Filter Replacement Element	9-4414
3	1	Regulator Mounting Bracket	9-7589
4	1	Input Power Cable	
		For 208 / 230-Volt Units	8-4384
		For 400-Volt Units (non-CE)	9-8562
		For 400-Volt CE Units	9-8553
		For 460-Volt Units	9-8593
5	1	Mounting Nut	9-5804
6	1	Pressure Gauge	9-1045
Hardware:			
A	2	10-32 x 1/2 PPH Screw	See Note 1
B	4	10-32 x 1-1/8" PPH Screw	See Note 1



NOTES

1. *May be purchased locally.*
2. *Illustration may vary slightly from unit.*

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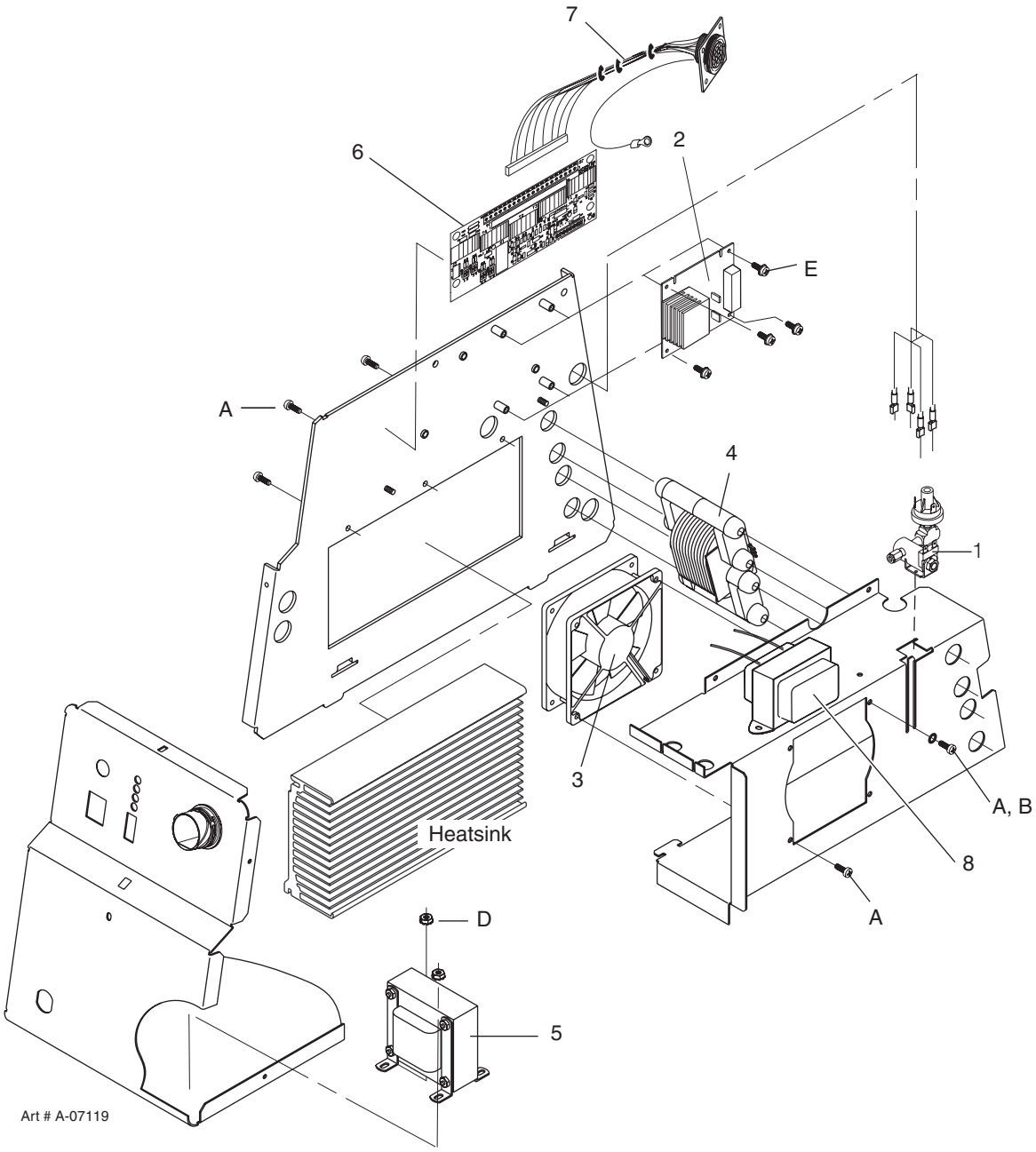
6.09 Right Side Internal Replacement Parts

Item #	Qty	Description	Ref	Catalog #
1	1	Assembly, Pressure Switch/Solenoid	SOL1, PS1	9-8329
2	1	Assembly, Pilot PCB		9-7985
3		Fan, 220V, 115 CFM	M1	9-7687
4	1	Assembly, Main Transformer	T5	9-8544
5	1	Assembly, Output Inductor	L1	9-8560
6	1	Automation Interface PC Board		9-4894
7	1	Automation Interface Wire Harness		9-4895
8	1	Transformer (only in power supplies connected to SL100SV Torch [with solenoid on mounting tube])		9-9449
Hardware:				
A	5	10-32 x 1/2 pph screw		See Note
B	1	#10 External star washer		See Note
C	1	1/4-20 nut, brass		See Note
D	3	10-32 Kepnut w/ star washer		See Note
E	4	6-32 x 3/8" pph screw		See Note
F	2	6-32 x 3-1/2" pph screw		See Note
G	1	1/4" External star washer		See Note
H	1	1/4-20 X 1" hex bolt, brass		See Note

NOTE

May be purchased locally.



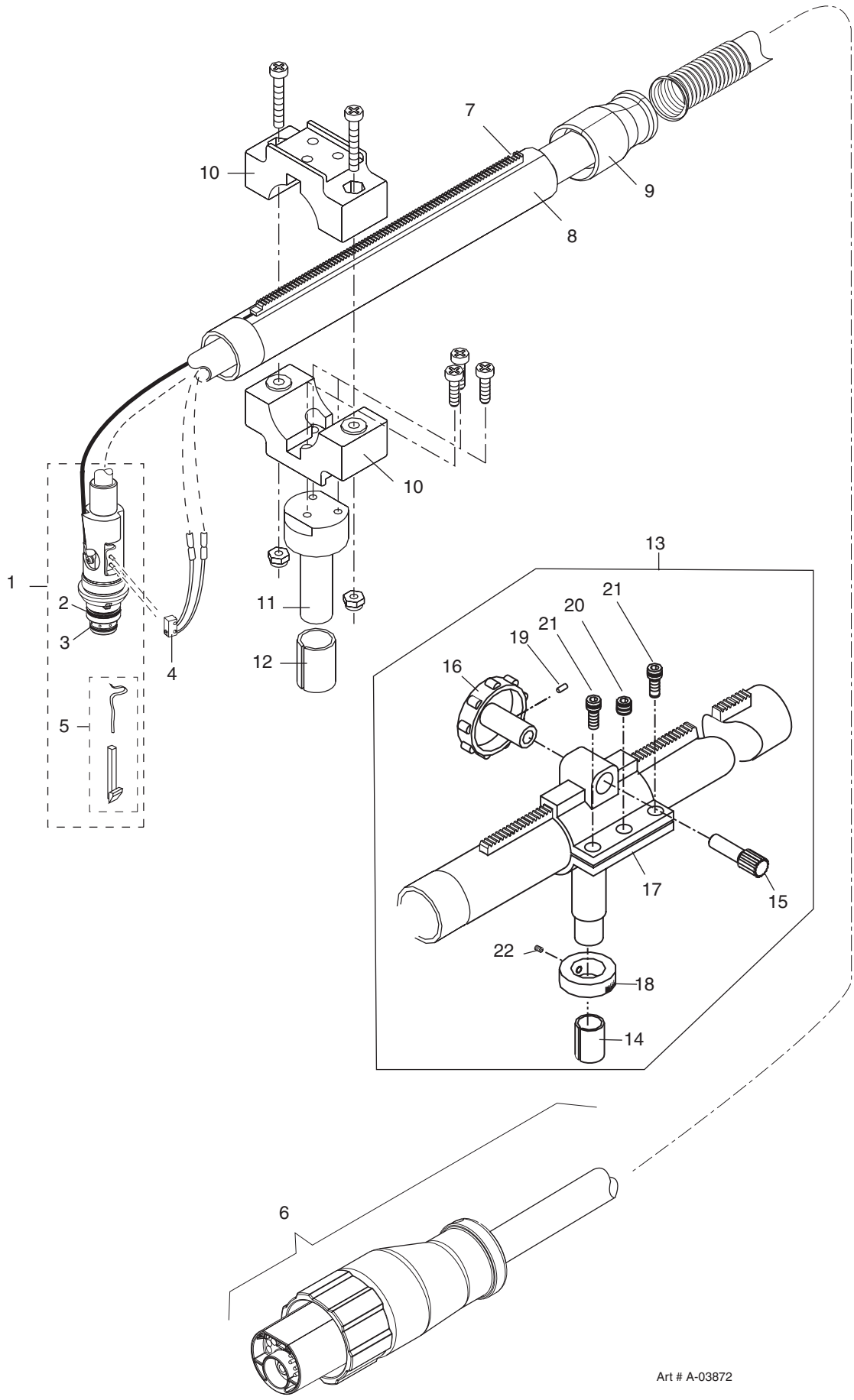
NOTE

Illustration may vary slightly from unit.

6.10 Torch Replacement Parts

SL100 Torch, without Solenoid Assembly

Item No.	Qty	Description	Catalog No.
1	1	Torch Head Assembly without leads (includes items 2, 3, and 14)	9-8220
2	1	Large O - Ring	8-3487
3	1	Small O - Ring	8-3486
4	1	PIP Switch Kit	9-7036
5	1	PIP Plunger and Return Spring Kit	9-7045
6		**Automated Leads Assemblies with ATC connectors**	
	1	5 - foot / 1.5 m Leads Assembly with ATC connector	4-7850
	1	10 - foot / 3.05 m Leads Assembly with ATC connector	4-7851
	1	25 - foot / 7.6 m Leads Assembly with ATC connector	4-7852
	1	50 - foot / 15.2 m Leads Assembly with ATC connector	4-7853
7	1	11" / 279 mm Rack	9-7041
8	1	11" / 279 mm Mounting Tube	9-7043
9	1	End Cap Assembly	9-7044
10	2	Body, Mounting, Pinch Block	9-4513
11	1	Pin, Mounting, Pinch Block	9-4521
12	1	Torch Holder Sleeve	7-2896
13	1	Pinion Assembly (does not include positioning tube)	7-2827
14	1	Torch Holder Sleeve	7-2896
15	1	Pinion Gear-Short	8-6074
16	1	Handwheel (Torch Holder)	9-4514
17	1	Low Profile Torch Holder (1 3/8 Dia) w/o Hardware	9-4515
18	1	Calibrated Torch Holder Bushing	9-4366
19	1	5/32 Dia x 5/8 Lg Slotted Spring Pin	See Note 1
20	1	3/8-24 x 3/8 Soc Hd Set Screw, Cup Point	See Note 1
21	2	1/4-20 x 5/8 Hex Socket Head Screw	See Note 1
22	1	#10-24 x 3/8 Hex Socket Set Screw, Cup Point	See Note 1
	1	5" / 126 mm Positioning Tube (Not shown)	9-7042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Art # A-03872

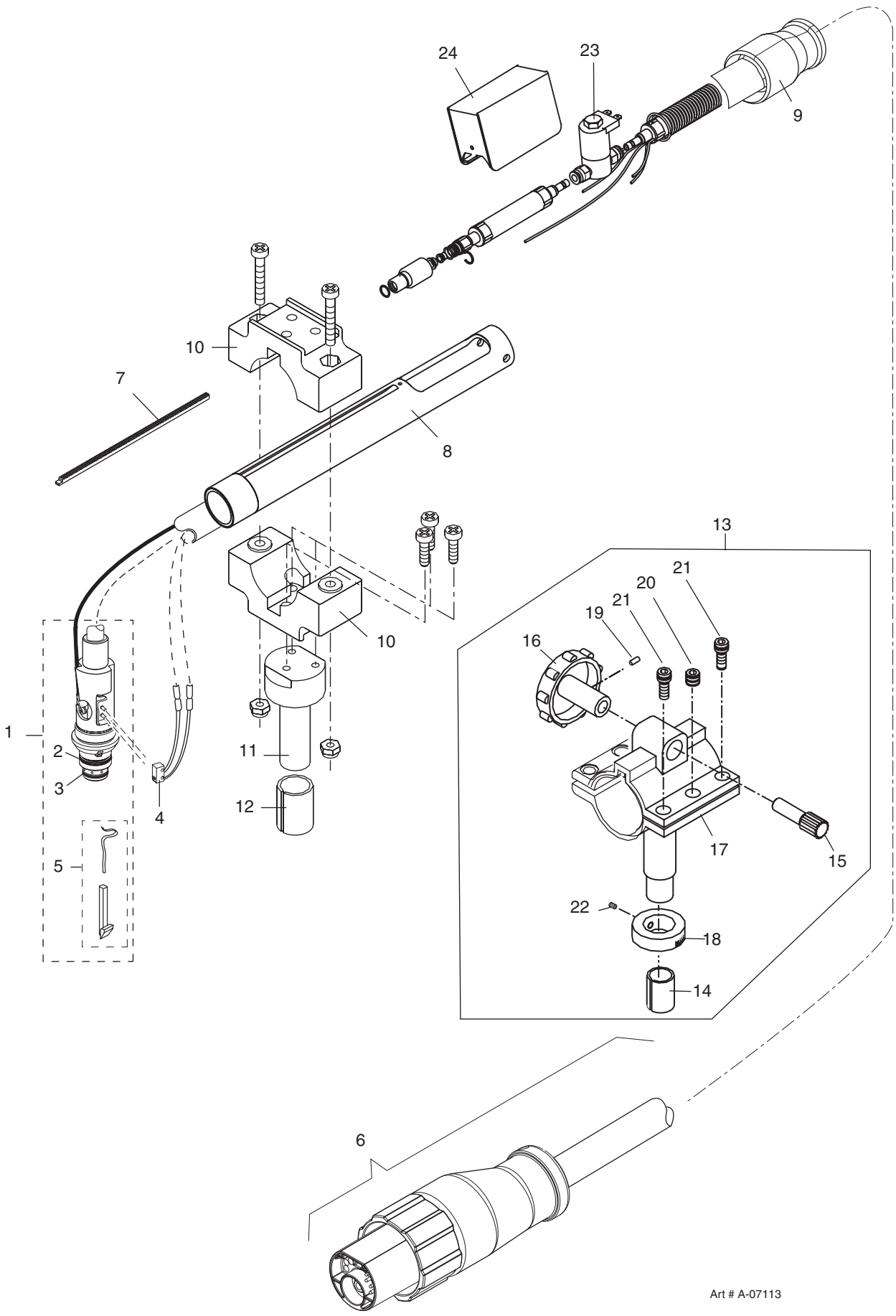
6.11 Torch Replacement Parts

SL100SV Torch, with Solenoid Assembly

Item No.	Qty	Description	Catalog No.
1	1	Torch Head Assembly without leads (includes items 2, 3, and 14)	9-8220
2	1	Large O - Ring	8-3487
3	1	Small O - Ring	8-3486
4	1	PIP Switch Kit	9-7036
5	1	PIP Plunger and Return Spring Kit	9-7045
6		**Automated Leads Assemblies with ATC connectors**	
	1	25 - foot / 7.6 m Leads Assembly with ATC connector	4-3058
	1	35 - foot / 10.6 m Leads Assembly with ATC connector	4-3059
	1	50 - foot / 15.2 m Leads Assembly with ATC connector	4-3060
7	1	Rack	9-9448
8	1	Mounting Tube	9-9445
9	1	End Cap Assembly	9-7044
10	2	Body, Mounting, Pinch Block	9-4513
11	1	Pin, Mounting, Pinch Block	9-4521
12	1	Torch Holder Sleeve	7-2896
13	1	Pinion Assembly (does not include positioning tube)	7-2827
14	1	Torch Holder Sleeve	7-2896
15	1	Pinion Gear-Short	8-6074
16	1	Handwheel (Torch Holder)	9-4514
17	1	Low Profile Torch Holder (1 3/8 Dia) w/o Hardware	9-4515
18	1	Calibrated Torch Holder Bushing	9-4366
19	1	5/32 Dia x 5/8 Lg Slotted Spring Pin	See Note 1
20	1	3/8-24 x 3/8 Soc Hd Set Screw, Cup Point	See Note 1
21	2	1/4-20 x 5/8 Hex Socket Head Screw	See Note 1
22	1	#10-24 x 3/8 Hex Socket Set Screw, Cup Point	See Note 1
23	1	Solenoid Assembly	9-9447
24	1	Solenoid Cover	9-9446

NOTE 1

Purchase these parts locally.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Art # A-07113

6.12 Torch Consumables

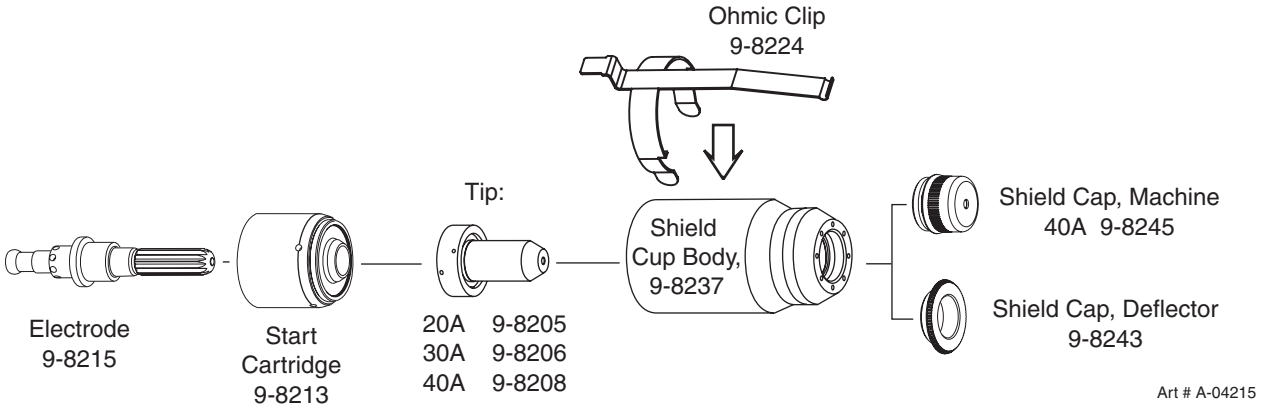
The illustration shows all consumable parts for the SL100 torch.

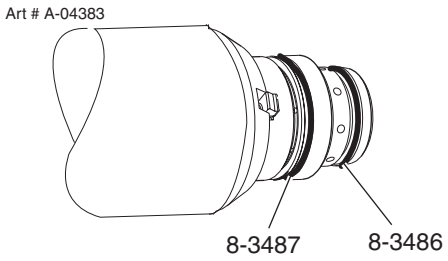
The Shield Cup Body with the Deflector Shield Cap provides extended parts life and improved resistance to reflected heat. The electrode and starter cartridge are the same for all operations.

6.13 Torch Spare Parts Kits

Qty	Description	Catalog #
	40-Amp Automated Machine Torch Spare Parts Kit, includes:	5-0054
3	Electrode	9-8215
5	30 Amp Tip	9-8206
5	40 Amp Standoff Tip	9-8208
1	Starter Cartridge	9-8213
1	Shield Cup Body	9-8237
1	Shield Cap, Machine, 40 Amp	9-8245
1	Shield Cap, Deflector	9-8243
1	Ohmic Clip Kit	9-8224
1	Large O - Ring	8-3487
1	Small O - Ring	8-3486

Torch Consumables Selection





6.14 Complete Torch Assembly Replacement

Qty	Description	Catalog #
	100 - Amp Machine Torch and Leads Assemblies, Unshielded Leads, without Solenoid:	
1	SL100 Machine Torch and 5 foot / 1.5 m Leads, with ATC Connector	7-5213
1	SL100 Machine Torch and 10 foot / 3.05 m Leads, with ATC Connector	7-5214
1	SL100 Machine Torch and 25 foot / 7.6 m Leads, with ATC Connector	7-5215
1	SL100 Machine Torch and 35 foot / 10.6 m Leads, with ATC Connector	7-5232
1	SL100 Machine Torch and 50 foot / 15.2 m Leads, with ATC Connector	7-5216
	100 - Amp Machine Torch and Leads Assemblies, Unshielded Leads, with Solenoid:	
1	SL100SV Machine Torch and 25 foot / 7.6 m Leads, with ATC Connector	7-4001
1	SL100SV Machine Torch and 35 foot / 10.6 m Leads, with ATC Connector	7-4002
1	SL100SV Machine Torch and 50 foot / 15.2 m Leads, with ATC Connector	7-4003

6.15 Torch Options & Accessories

Qty	Description	Catalog #
1	Computer Control (CNC) Cable	
	25 Foot / 7.6 m length	8-5557
	50 Foot / 15.2 m length	8-5558
1	Leather Leads Cover, 25 foot / 7.6 m	9-1270
1	Leather Leads Cover, 50 foot / 15.2 m	9-1280

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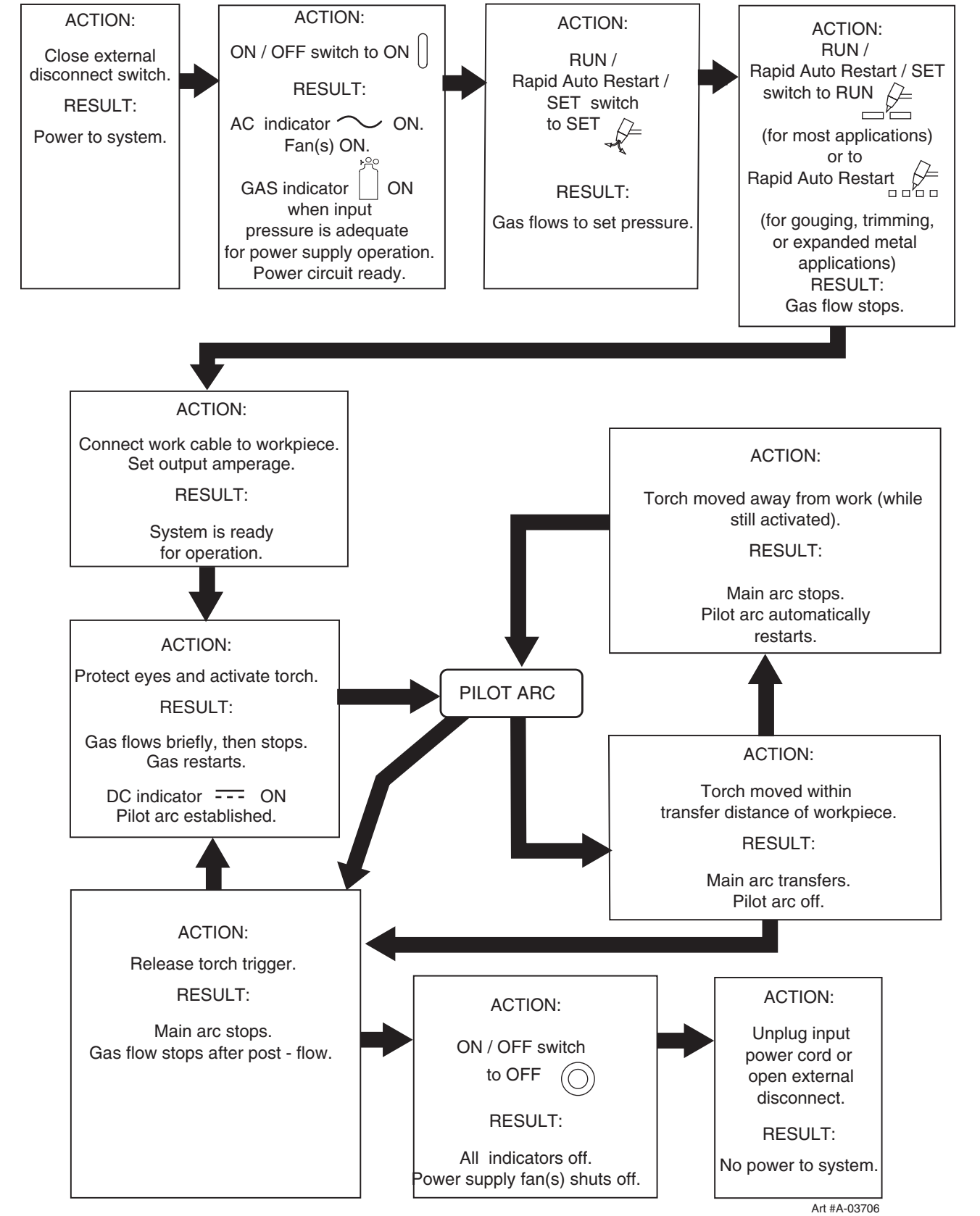
APPENDIX 1: SEQUENCE OF OPERATION (BLOCK DIAGRAM)



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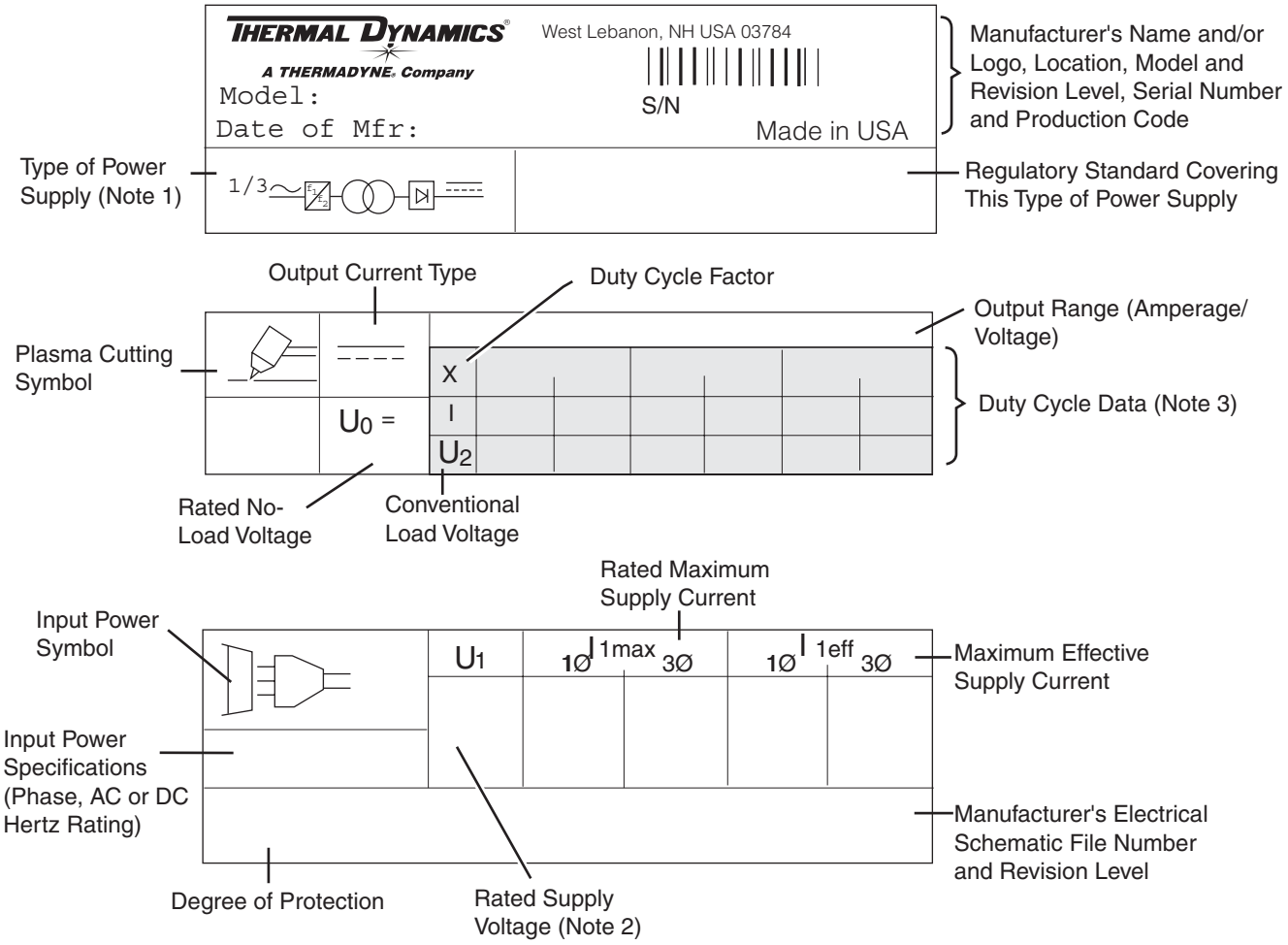
APPENDIX 2: DATA TAG INFORMATION



NOTES:

1. Symbol shown indicates single- or three-phase AC input, static frequency converter-transformer-rectifier, DC output.
2. Indicates input voltages for this power supply. Most power supplies carry a label at the input power cord showing input voltage requirements for the power supply as built.
3. Top row: Duty cycle values.
   IEC duty cycle value is calculated as specified by the International ElectroTechnical Commission.
   TDC duty cycle value is determined under the power supply manufacturer's test procedures.
   Second row: Rated cutting current values.
   Third row: Conventional load voltage values.
4. Sections of the Data Tag may be applied to separate areas of the power supply.

Standard Symbols

~	AC
⎓	DC
Ø	Phase

Art # A-03288

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APPENDIX 3: MAINTENANCE SCHEDULE

This schedule applies to all types of ***non-liquid cooled*** plasma cutting systems. Some systems will not have all the parts listed and those checks need not be performed.

NOTE

The actual frequency of maintenance may need to be adjusted according to the operating environment.

Daily Operational Checks or Every Six Cutting Hours:

1. Check torch consumable parts, replace if damaged or worn.
2. Inspect torch for any cracks or exposed wires, replace if necessary.
3. Check plasma and secondary supply and pressure/flow.
4. Purge plasma gas line to remove any moisture build-up.
5. Inspect input power cable for damage or exposed wires, replace if necessary.

Weekly or Every 30 Cutting Hours:

1. Check fan for proper operation and adequate air flow.
2. Blow or vacuum dust and dirt *out* of the entire machine.

CAUTION

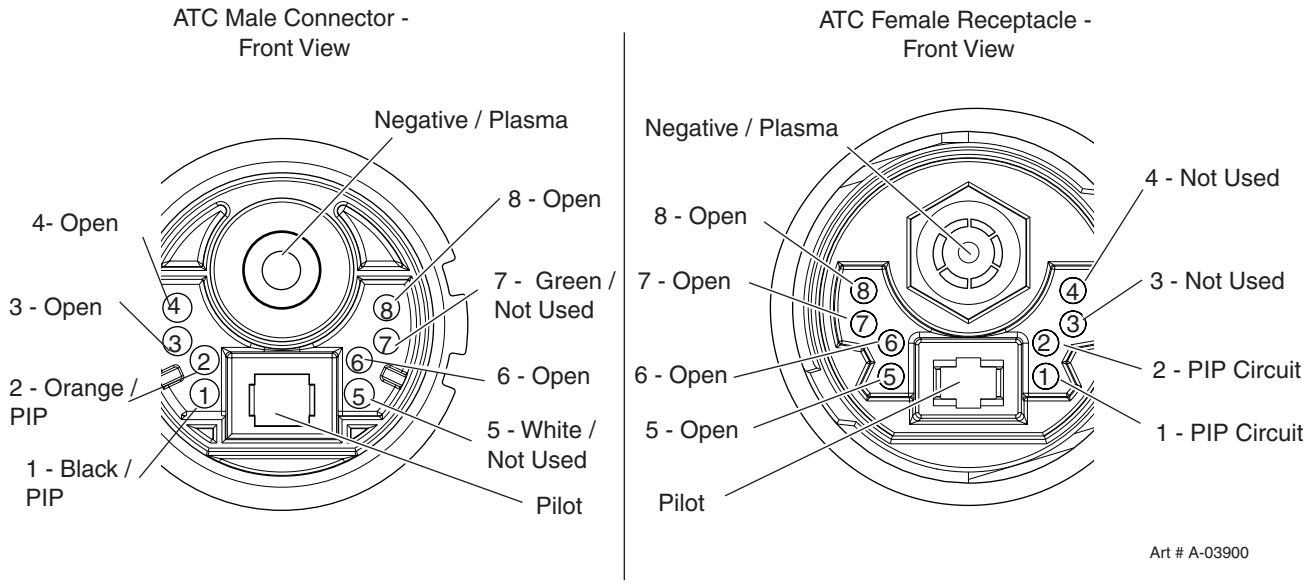
Do not blow air into the power supply during cleaning. Blowing air into the unit can cause metal particles to interfere with sensitive electrical components and cause damage to the unit.

Six Months or Every 720 Cutting Hours:

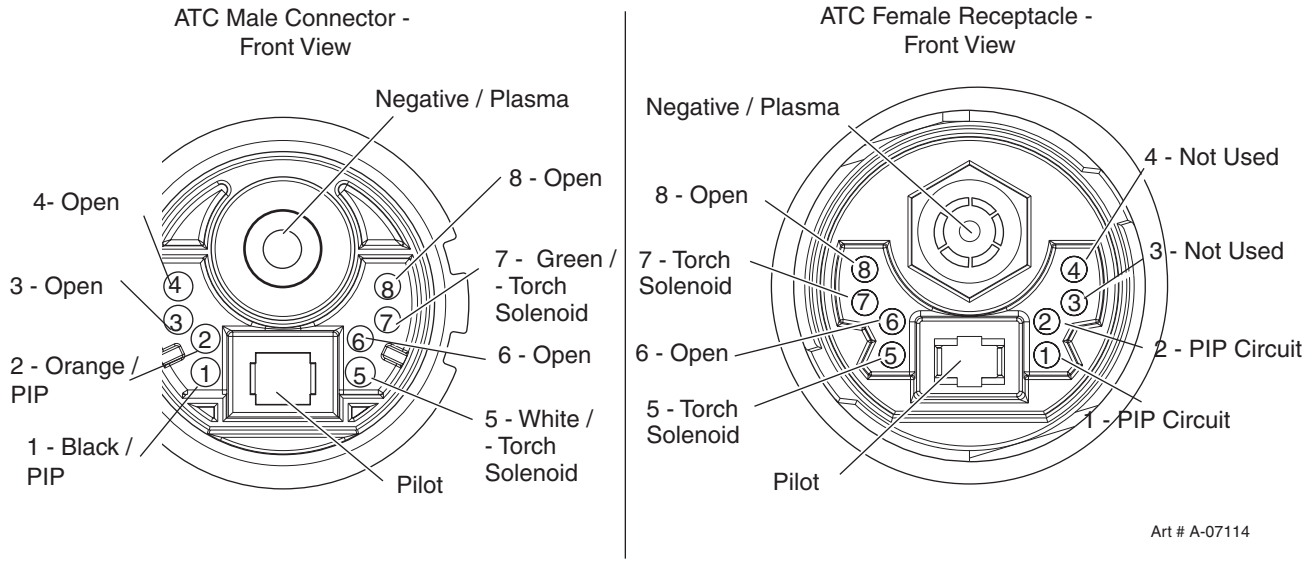
1. Check the in-line air filter(s), clean or replace as required
2. Check cables and hoses for leaks or cracks, replace if necessary.
3. Check all contactor points for severe arcing or pits, replace if necessary.

APPENDIX 4: TORCH PIN - OUT DIAGRAMS

A. Power Supply and SL100 Torch (without Solenoid)



B. Power Supply and SL100SV Torch (With Solenoid)



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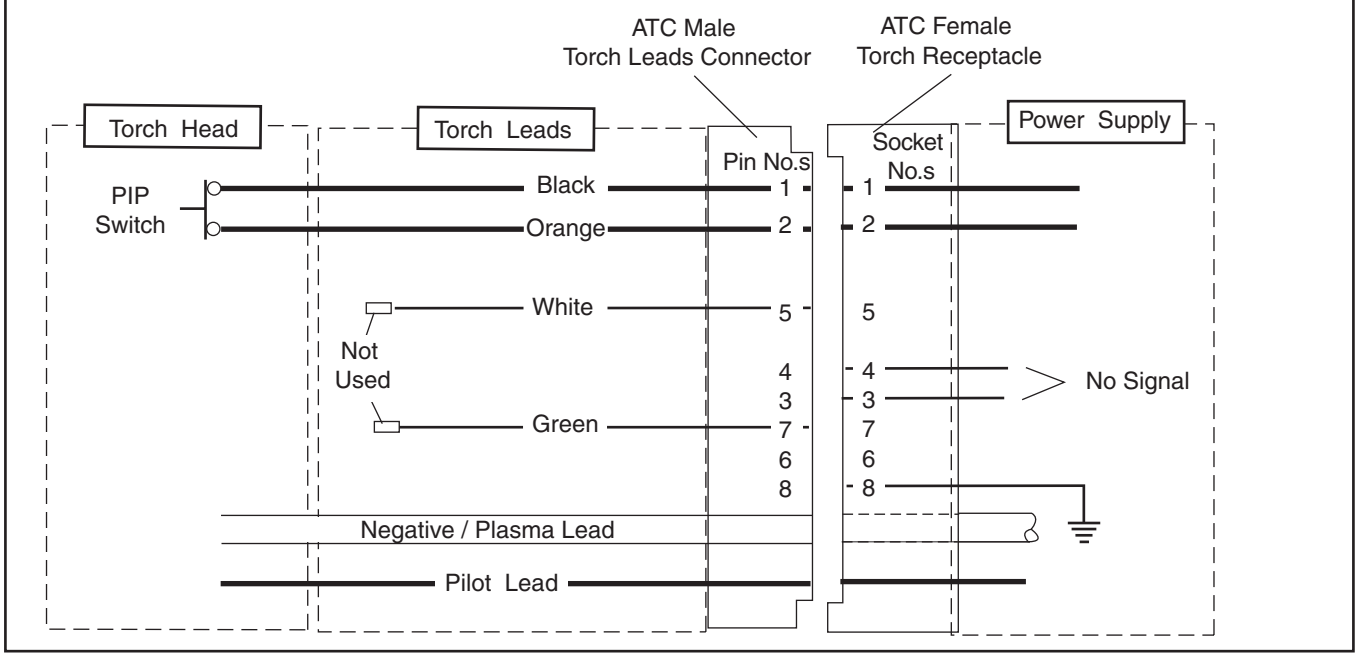
APPENDIX 5: TORCH CONNECTION DIAGRAMS

A. Power Supply and SL100 Torch (without Solenoid)

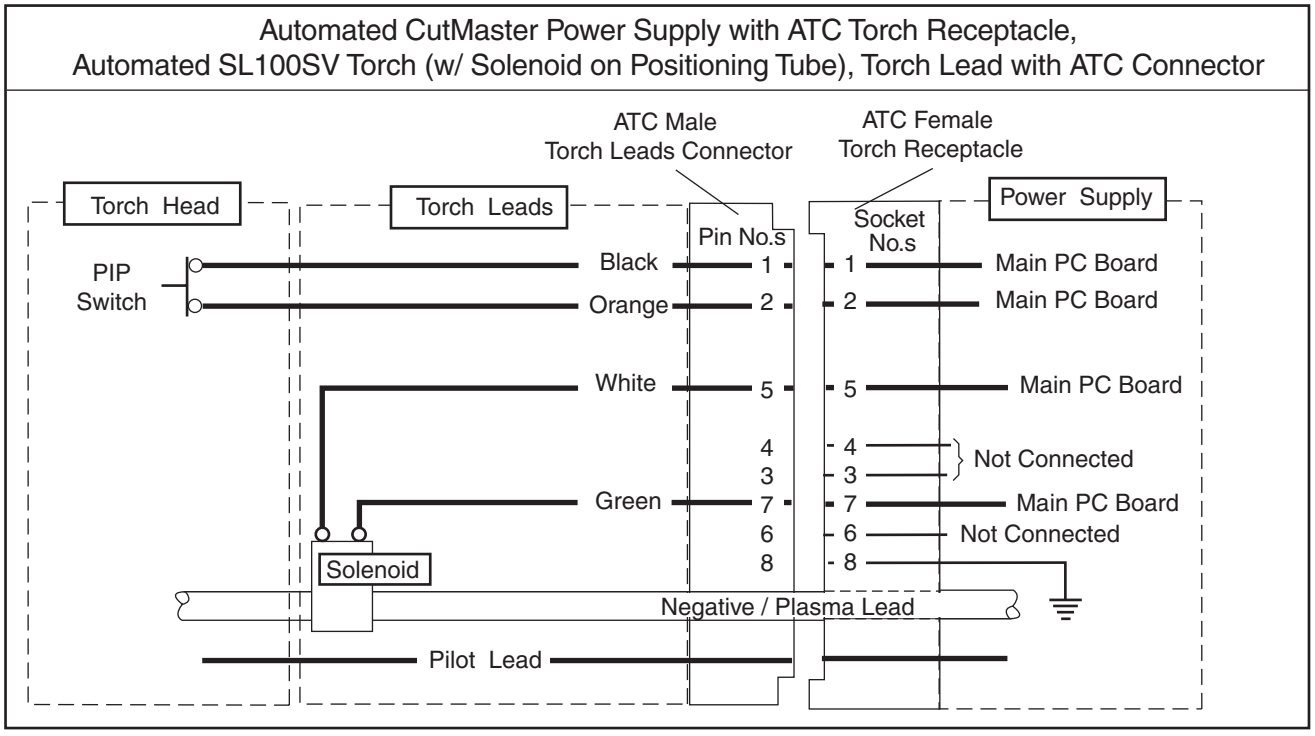
Automated CutMaster Power Supply with ATC Torch Receptacle,
Automated SL100 Torch with ATC Connector,



Art # A-03901

B. Power Supply and SL100SV Torch (With Solenoid)

Automated CutMaster Power Supply with ATC Torch Receptacle,
Automated SL100SV Torch (w/ Solenoid on Positioning Tube), Torch Lead with ATC Connector



Art # A-07115

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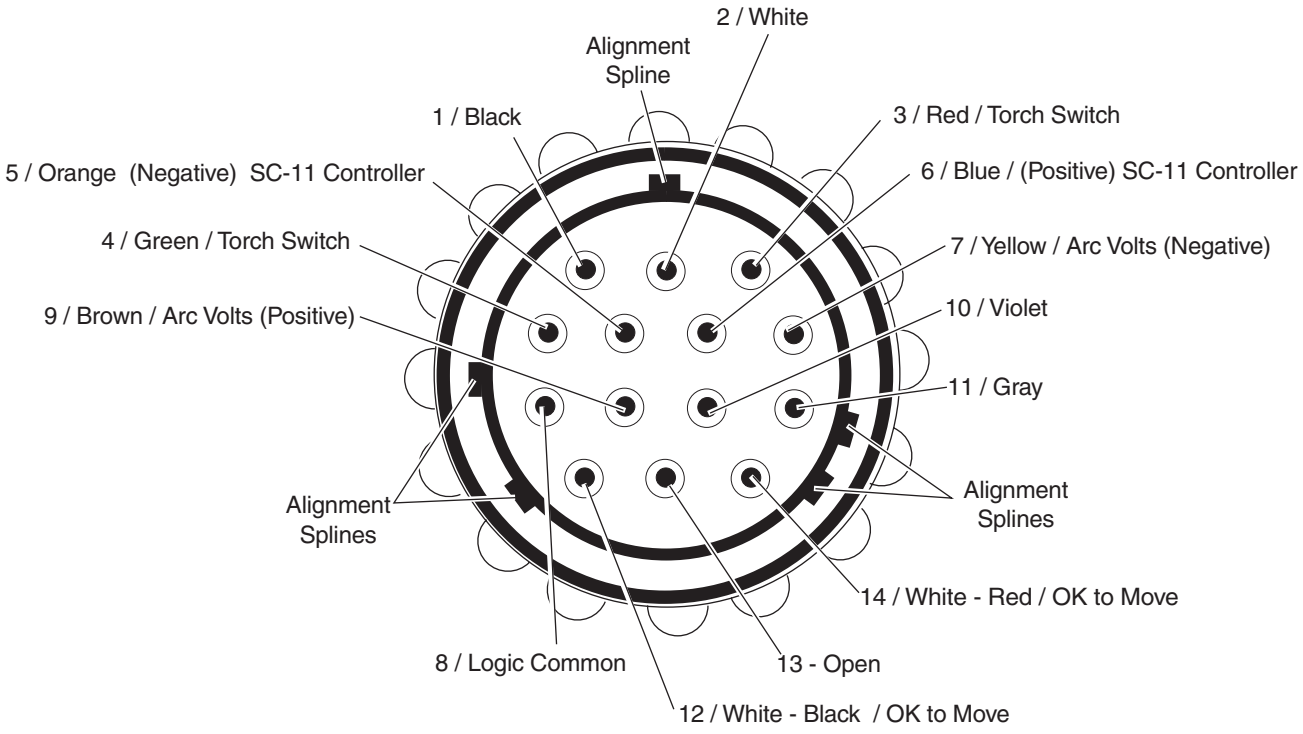
APPENDIX 6: CONTROL CABLE PIN - OUT DIAGRAM



Art # A-03993

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APPENDIX 7: INTERFACE PCB SWITCH SETTINGS (MOST COMMON SETTINGS)

Automation Interface Switch Setting Chart - *Common Voltage Divider Output Settings*										
SW 4		**SW3**		**SW2**		**SW1**		**Volts Out for 100vdc In**	**Volts Out for 200vdc In**	***Division Factor***
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**			
0 = DOWN = OFF, 1 = UP = ON										
Factory Default Settings Suitable for Thermal Dynamics SC-11 Standoff Control:										
0	0	0	0	0	0	0	0	6.00	12.00	16.3:1
Other Common Settings:										
0	0	0	1	0	1	1	0	5.00	10.00	20:1
0	1	0	1	0	0	0	1	3.3	6.6	30:1
1	1	0	0	0	0	0	0	2.5	5.0	40:1
1	1	1	1	1	1	1	1	2.0	4.0	50:1
0 = DOWN = OFF, 1 = UP = ON										

APPENDIX 8: INTERFACE PCB SWITCH SETTINGS (Division Factors 16-24)

Automation Interface Switch Setting Chart - *Division Factors 16 - 24*								
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Switch 6**	**Switch 7**	**Switch 8**	***Divide Factor***
0 = DOWN = OFF, 1 = UP = ON								
0	0	0	0	0	0	0	0	16.56
0	0	0	0	0	0	0	1	16.70
0	0	0	0	0	0	1	0	16.84
0	0	0	0	0	0	1	1	16.98
0	0	0	0	0	1	0	0	17.14
0	0	0	0	0	1	0	1	17.28
0	0	0	0	0	1	1	0	17.42
0	0	0	0	0	1	1	1	17.56
0	0	0	0	1	0	0	0	17.74
0	0	0	0	1	0	0	1	17.89
0	0	0	0	1	0	1	0	18.03
0	0	0	0	1	0	1	1	18.17
0	0	0	0	1	1	0	0	18.32
0	0	0	0	1	1	0	1	18.46
0	0	0	0	1	1	1	0	18.60
0	0	0	0	1	1	1	1	18.75
0	0	0	1	0	0	0	0	19.11
0	0	0	1	0	0	0	1	19.25
0	0	0	1	0	0	1	0	19.39
0	0	0	1	0	0	1	1	19.53
0	0	0	1	0	1	0	0	19.69
0	0	0	1	0	1	0	1	19.83
0	0	0	1	0	1	1	0	19.97
0	0	0	1	0	1	1	1	20.11
0	0	0	1	1	0	0	0	20.29
0	0	0	1	1	0	0	1	20.44
0	0	0	1	1	0	1	0	20.58
0	0	0	1	1	0	1	1	20.72
0	0	0	1	1	1	0	0	20.87
0	0	0	1	1	1	0	1	21.01
0	0	0	1	1	1	1	0	21.15
0	0	0	1	1	1	1	1	21.30
0	0	1	0	0	0	0	0	21.67
0	0	1	0	0	0	0	1	21.81
0	0	1	0	0	0	1	0	21.95
0	0	1	0	0	0	1	1	22.09
0	0	1	0	0	1	0	0	22.25
0	0	1	0	0	1	0	1	22.39
0	0	1	0	0	1	1	0	22.53
0	0	1	0	0	1	1	1	22.67
0	0	1	0	1	0	0	0	22.85
0	0	1	0	1	0	0	1	23.00
0	0	1	0	1	0	1	0	23.14
0	0	1	0	1	0	1	1	23.28
0	0	1	0	1	1	0	0	23.43
0	0	1	0	1	1	0	1	23.57
0	0	1	0	1	1	1	0	23.71
0	0	1	0	1	1	1	1	23.86
0 = DOWN = OFF, 1 = UP = ON								

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APPENDIX 9: INTERFACE PCB SWITCH SETTINGS (Division Factors 24-30)

Automation Interface Switch Setting Chart, *Division Factors 24-30*								
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Switch 6**	**Switch 7**	**Switch 8**	***Divide Factor***
0 = DOWN = OFF, 1 = UP = ON								
0	0	1	1	0	0	0	0	24.22
0	0	1	1	0	0	0	1	24.36
0	0	1	1	0	0	1	0	24.50
0	0	1	1	0	0	1	1	24.64
0	0	1	1	0	1	0	0	24.80
0	0	1	1	0	1	0	1	24.94
0	0	1	1	0	1	1	0	25.08
0	0	1	1	0	1	1	1	25.22
0	0	1	1	1	0	0	0	25.40
0	0	1	1	1	0	0	1	25.55
0	0	1	1	1	0	1	0	25.69
0	0	1	1	1	0	1	1	25.83
0	0	1	1	1	1	0	0	25.98
0	0	1	1	1	1	0	1	26.12
0	0	1	1	1	1	1	0	26.26
0	0	1	1	1	1	1	1	26.41
0	1	0	0	0	0	0	0	27.32
0	1	0	0	0	0	0	1	27.46
0	1	0	0	0	0	1	0	27.60
0	1	0	0	0	0	1	1	27.74
0	1	0	0	0	1	0	0	27.89
0	1	0	0	0	1	0	1	28.04
0	1	0	0	0	1	1	0	28.18
0	1	0	0	0	1	1	1	28.32
0	1	0	0	1	0	0	0	28.50
0	1	0	0	1	0	0	1	28.65
0	1	0	0	1	0	1	0	28.78
0	1	0	0	1	0	1	1	28.93
0	1	0	0	1	1	0	0	29.08
0	1	0	0	1	1	0	1	29.22
1	0	0	0	0	0	0	0	29.31
0	1	0	0	1	1	1	0	29.36
1	0	0	0	0	0	0	1	29.45
0	1	0	0	1	1	1	1	29.50
1	0	0	0	0	0	1	0	29.59
1	0	0	0	0	0	1	1	29.73
0	1	0	1	0	0	0	0	29.87
1	0	0	0	0	1	0	0	29.89
0 = DOWN = OFF, 1 = UP = ON								

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APPENDIX 10: INTERFACE PCB SWITCH SETTINGS (Division Factors 30-33)

Automation Interface Switch Setting Chart, *Division Factors 30-33*								
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Switch 6**	**Switch 7**	**Switch 8**	***Divide Factor***
0 = DOWN = OFF, 1 = UP = ON								
0	1	0	1	0	0	0	1	30.01
1	0	0	0	0	1	0	1	30.03
0	1	0	1	0	0	1	0	30.15
1	0	0	0	0	1	1	0	30.17
0	1	0	1	0	0	1	1	30.29
1	0	0	0	0	1	1	1	30.31
0	1	0	1	0	1	0	0	30.44
1	0	0	0	1	0	0	0	30.49
0	1	0	1	0	1	0	1	30.59
1	0	0	0	1	0	0	1	30.64
0	1	0	1	0	1	1	0	30.73
1	0	0	0	1	0	1	0	30.78
0	1	0	1	0	1	1	1	30.87
1	0	0	0	1	0	1	1	30.92
0	1	0	1	1	0	0	0	31.05
1	0	0	0	1	1	0	0	31.07
0	1	0	1	1	0	0	1	31.20
1	0	0	0	1	1	0	1	31.21
0	1	0	1	1	0	1	0	31.33
1	0	0	0	1	1	1	0	31.35
0	1	0	1	1	0	1	1	31.48
1	0	0	0	1	1	1	1	31.50
0	1	0	1	1	1	0	0	31.63
0	1	0	1	1	1	0	1	31.77
1	0	0	1	0	0	0	0	31.86
0	1	0	1	1	1	1	0	31.91
1	0	0	1	0	0	0	1	32.00
0	1	0	1	1	1	1	1	32.05
1	0	0	1	0	0	1	0	32.14
1	0	0	1	0	0	1	1	32.28
0	1	1	0	0	0	0	0	32.43
1	0	0	1	0	1	0	0	32.44
0	1	1	0	0	0	0	1	32.57
1	0	0	1	0	1	0	1	32.58
0	1	1	0	0	0	1	0	32.71
1	0	0	1	0	1	1	0	32.72
0	1	1	0	0	0	1	1	32.85
1	0	0	1	0	1	1	1	32.86
0 = DOWN = OFF, 1 = UP = ON								

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APPENDIX 11: INTERFACE PCB SWITCH SETTINGS (Division Factors 33-36)

Automation Interface Switch Setting Chart, *Division Factors 33 - 36*								
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Switch 6**	**Switch 7**	**Switch 8**	***Divide Factor***
0 = DOWN = OFF, 1 = UP = ON								
0	1	1	0	0	1	0	0	33.01
1	0	0	1	1	0	0	0	33.04
0	1	1	0	0	1	0	1	33.15
1	0	0	1	1	0	0	1	33.19
0	1	1	0	0	1	1	0	33.29
1	0	0	1	1	0	1	0	33.33
0	1	1	0	0	1	1	1	33.43
1	0	0	1	1	0	1	1	33.47
0	1	1	0	1	0	0	0	33.61
1	0	0	1	1	1	0	0	33.62
0	1	1	0	1	0	0	1	33.76
1	0	0	1	1	1	0	1	33.76
0	1	1	0	1	0	1	0	33.89
1	0	0	1	1	1	1	0	33.90
0	1	1	0	1	0	1	1	34.04
1	0	0	1	1	1	1	1	34.05
0	1	1	0	1	1	0	0	34.19
0	1	1	0	1	1	0	1	34.33
1	0	1	0	0	0	0	0	34.42
0	1	1	0	1	1	1	0	34.47
1	0	1	0	0	0	0	1	34.56
0	1	1	0	1	1	1	1	34.61
1	0	1	0	0	0	1	0	34.70
1	0	1	0	0	0	1	1	34.84
0	1	1	1	0	0	0	0	34.98
1	0	1	0	0	1	0	0	35.00
0	1	1	1	0	0	0	1	35.12
1	0	1	0	0	1	0	1	35.14
0	1	1	1	0	0	1	0	35.26
1	0	1	0	0	1	1	0	35.28
0	1	1	1	0	0	1	1	35.40
1	0	1	0	0	1	1	1	35.42
0	1	1	1	0	1	0	0	35.56
1	0	1	0	1	0	0	0	35.60
0	1	1	1	0	1	0	1	35.70
1	0	1	0	1	0	0	1	35.75
0	1	1	1	0	1	1	0	35.84
1	0	1	0	1	0	1	0	35.89
0	1	1	1	0	1	1	1	35.98
0 = DOWN = OFF, 1 = UP = ON								

APPENDIX 12: INTERFACE PCB SWITCH SETTINGS (Division Factors 36-43)

Automation Interface Switch Setting Chart, *Division Factors 36-43*								
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Switch 6**	**Switch 7**	**Switch 8**	***Divide Factor***
0 = DOWN = OFF, 1 = UP = ON								
1	0	1	0	1	0	1	1	36.03
0	1	1	1	1	0	0	0	36.16
1	0	1	0	1	1	0	0	36.18
0	1	1	1	1	0	0	1	36.31
1	0	1	0	1	1	0	1	36.32
0	1	1	1	1	0	1	0	36.44
1	0	1	0	1	1	1	0	36.46
0	1	1	1	1	0	1	1	36.59
1	0	1	0	1	1	1	1	36.61
0	1	1	1	1	1	0	0	36.74
0	1	1	1	1	1	0	1	36.88
1	0	1	1	0	0	0	0	36.97
0	1	1	1	1	1	1	0	37.02
1	0	1	1	0	0	0	1	37.11
0	1	1	1	1	1	1	1	37.16
1	0	1	1	0	0	1	0	37.25
1	0	1	1	0	0	1	1	37.39
1	0	1	1	0	1	0	0	37.55
1	0	1	1	0	1	0	1	37.69
1	0	1	1	0	1	1	0	37.83
1	0	1	1	0	1	1	1	37.97
1	0	1	1	1	0	0	0	38.15
1	0	1	1	1	0	0	1	38.30
1	0	1	1	1	0	1	0	38.44
1	0	1	1	1	0	1	1	38.58
1	0	1	1	1	1	0	0	38.73
1	0	1	1	1	1	0	1	38.87
1	0	1	1	1	1	1	0	39.01
1	0	1	1	1	1	1	1	39.16
1	1	0	0	0	0	0	0	40.07
1	1	0	0	0	0	0	1	40.21
1	1	0	0	0	0	1	0	40.35
1	1	0	0	0	0	1	1	40.49
1	1	0	0	0	1	0	0	40.64
1	1	0	0	0	1	0	1	40.79
1	1	0	0	0	1	1	0	40.93
1	1	0	0	0	1	1	1	41.07
1	1	0	0	1	0	0	0	41.25
1	1	0	0	1	0	0	1	41.40
1	1	0	0	1	0	1	0	41.53
1	1	0	0	1	0	1	1	41.68
1	1	0	0	1	1	0	0	41.83
1	1	0	0	1	1	0	1	41.97
1	1	0	0	1	1	1	0	42.11
1	1	0	0	1	1	1	1	42.25
1	1	0	1	0	0	0	0	42.62
1	1	0	1	0	0	0	1	42.76
1	1	0	1	0	0	1	0	42.90
0 = DOWN = OFF, 1 = UP = ON								

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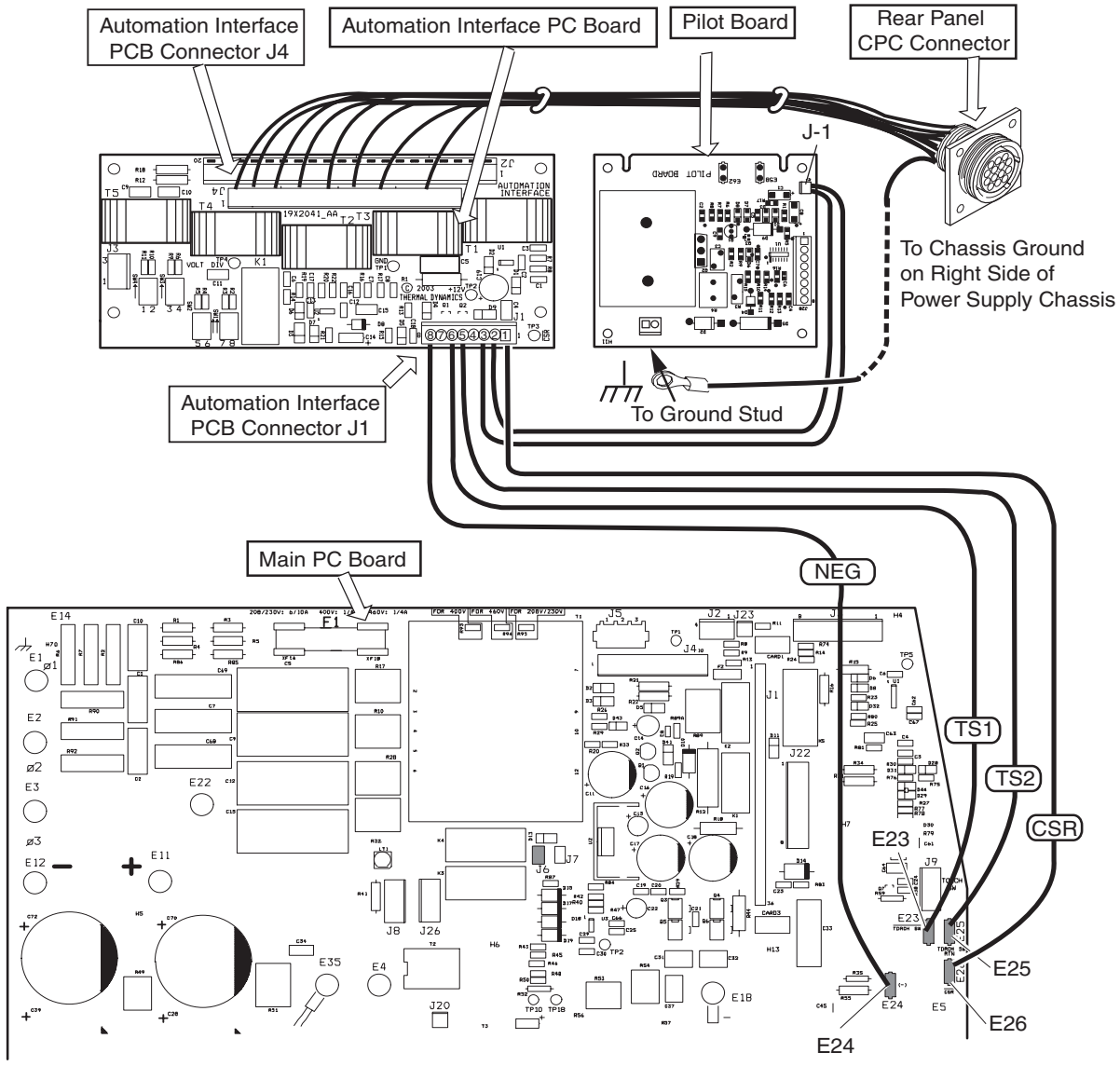
APPENDIX 13: INTERFACE PCB SWITCH SETTINGS (Division Factors 43-50)

Automation Interface Switch Setting Chart, *Division Factors 43 - 50*								
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Switch 6**	**Switch 7**	**Switch 8**	***Divide Factor***
0 = DOWN = OFF, 1 = UP = ON								
1	1	0	1	0	0	1	1	43.04
1	1	0	1	0	1	0	0	43.19
1	1	0	1	0	1	0	1	43.34
1	1	0	1	0	1	1	0	43.48
1	1	0	1	0	1	1	1	43.62
1	1	0	1	1	0	0	0	43.80
1	1	0	1	1	0	0	1	43.95
1	1	0	1	1	0	1	0	44.08
1	1	0	1	1	0	1	1	44.23
1	1	0	1	1	1	0	0	44.38
1	1	0	1	1	1	0	1	44.52
1	1	0	1	1	1	1	0	44.66
1	1	0	1	1	1	1	1	44.80
1	1	1	0	0	0	0	0	45.18
1	1	1	0	0	0	0	1	45.32
1	1	1	0	0	0	1	0	45.46
1	1	1	0	0	0	1	1	45.60
1	1	1	0	0	1	0	0	45.76
1	1	1	0	0	1	0	1	45.90
1	1	1	0	0	1	1	0	46.04
1	1	1	0	0	1	1	1	46.18
1	1	1	0	1	0	0	0	46.36
1	1	1	0	1	0	0	1	46.51
1	1	1	0	1	0	1	0	46.64
1	1	1	0	1	0	1	1	46.79
1	1	1	0	1	1	0	0	46.94
1	1	1	0	1	1	0	1	47.08
1	1	1	0	1	1	1	0	47.22
1	1	1	0	1	1	1	1	47.36
1	1	1	1	0	0	0	0	47.73
1	1	1	1	0	0	0	1	47.87
1	1	1	1	0	0	1	0	48.01
1	1	1	1	0	0	1	1	48.15
1	1	1	1	0	1	0	0	48.31
1	1	1	1	0	1	0	1	48.45
1	1	1	1	0	1	1	0	48.59
1	1	1	1	0	1	1	1	48.73
1	1	1	1	1	0	0	0	48.91
1	1	1	1	1	0	0	1	49.06
1	1	1	1	1	0	1	0	49.19
1	1	1	1	1	0	1	1	49.34
1	1	1	1	1	1	0	0	49.49
1	1	1	1	1	1	0	1	49.63
1	1	1	1	1	1	1	0	49.77
1	1	1	1	1	1	1	1	49.91
0 = DOWN = OFF, 1 = UP = ON								

APPENDIX 14: AUTOMATION INTERFACE PC BOARD WIRING LAYOUT



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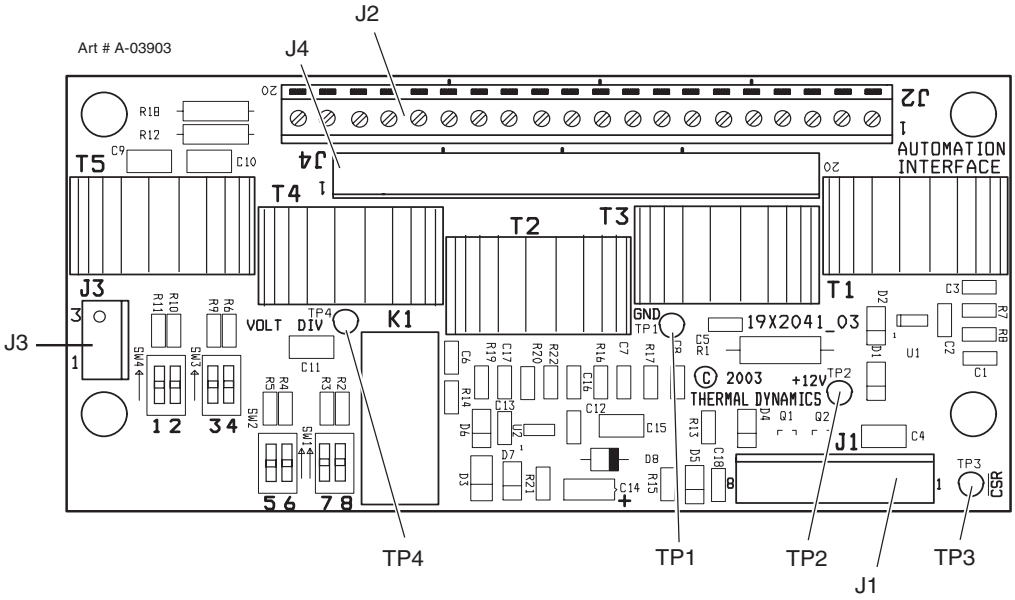
APPENDIX 15: AUTOMATION INTERFACE PC BOARD LAYOUT and TEST POINTS



Signals

Connector J2 *(To wiring harness for alternate CNC Controller)*

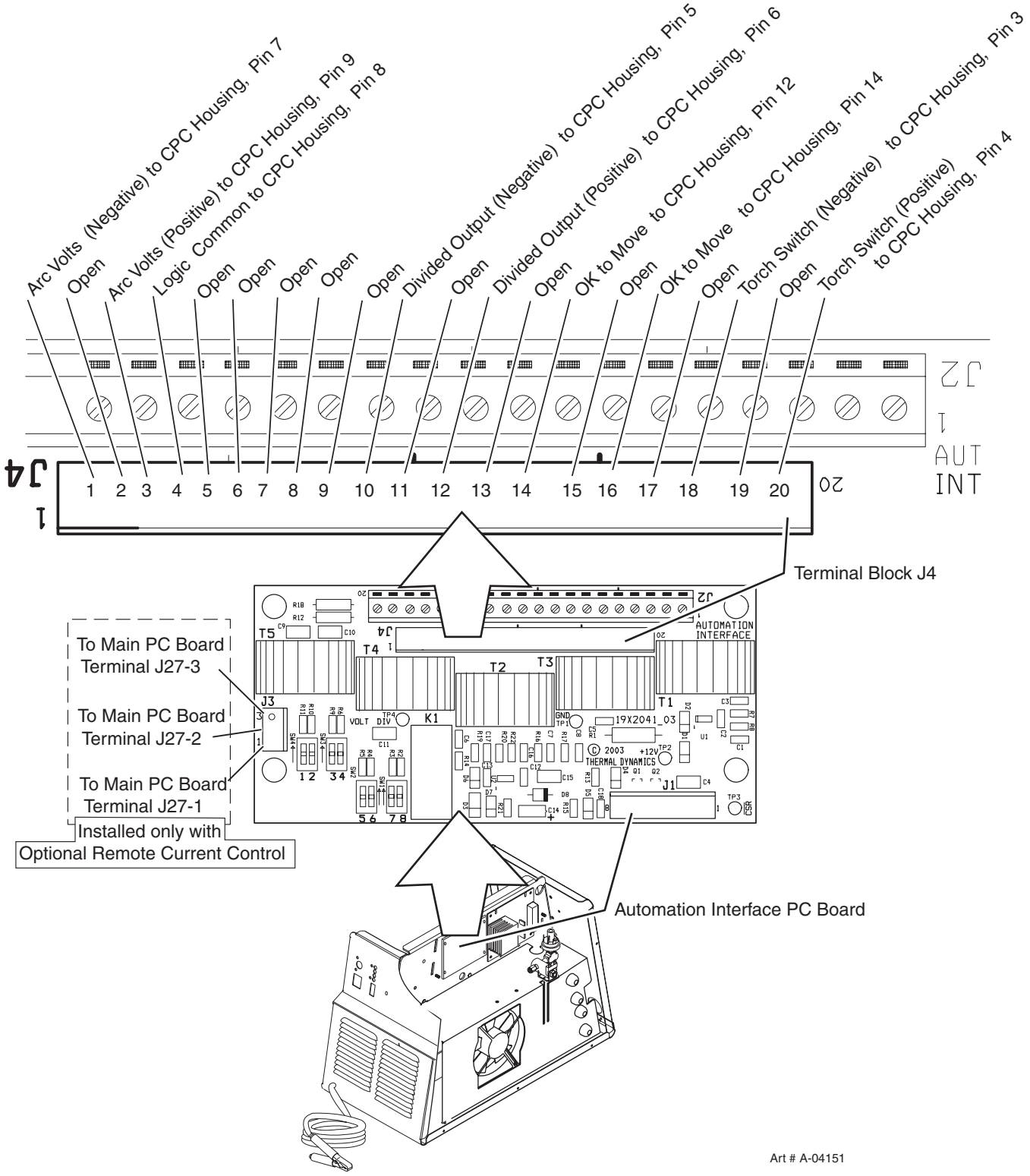
J2-1 Torch Switch (Positive)
J2-2 Open
J2-3 Torch Switch (Negative)
J2-4 Open
J2-5 OK to Move
J2-6 Open
J2-7 OK to Move
J2-8 Open
J2-9 Divided Output (Positive)
J2-10 Open
J2-11 Divided Output (Negative)
J2-12 Open
J2-13 Remote Current Control
J2-14 Remote Current Control
J2-15 Remote Current Control
J2-16 Open
J2-17 DC Common
J2-18 Arc Volts (+)
J2-19 Open
J2-20 Arc Volts (-)

Connector J4 *(to CPC Connector on Power Supply Rear Panel)*

J4-1 Arc Volts (-) (Through 100K ohm resistor)
J4-2 Open
J4-3 Arc Volts (+) (Through 100K ohm resistor)
J4-4 Logic Common
J4-5 Open
J4-6 Open
J4-7 Open
J4-8 Open
J4-9 Open
J4-10 SC-11 (-)
J4-11 Open
J4-12 SC-11 (+)
J4-13 Open
J4-14 OK to Move
J4-15 Open
J4-16 OK to Move
J4-17 Open
J4-18 Torch Switch (-)
J4-19 Open
J4-20 Torch Switch (+)

A

APPENDIX 16: AUTOMATION INTERFACE PC BOARD WIRING CONNECTIONS TO OEM CNC HARNESS



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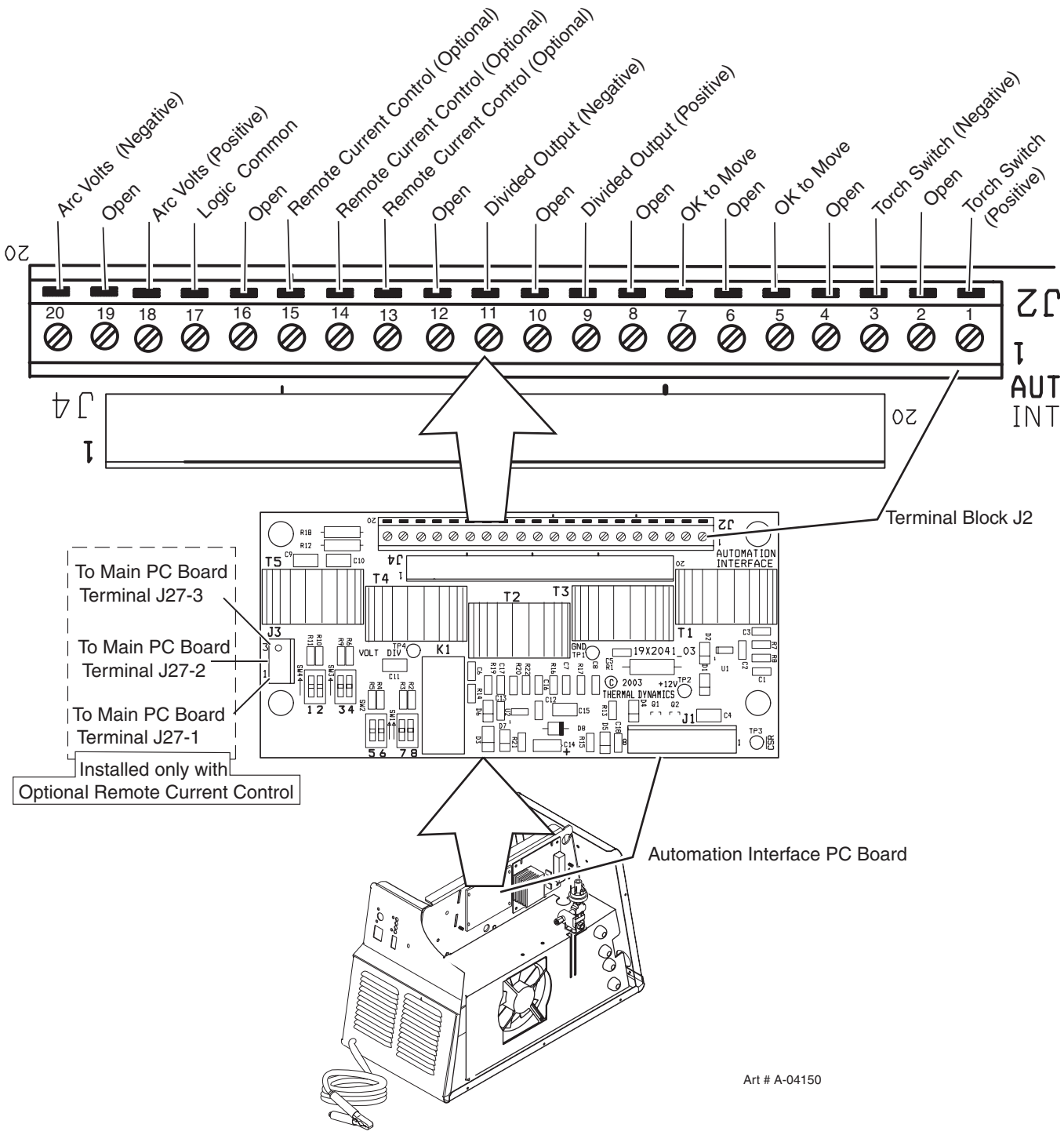
APPENDIX 17: AUTOMATION INTERFACE PC BOARD WIRING CONNECTIONS TO ALTERNATE CNC HARNESS



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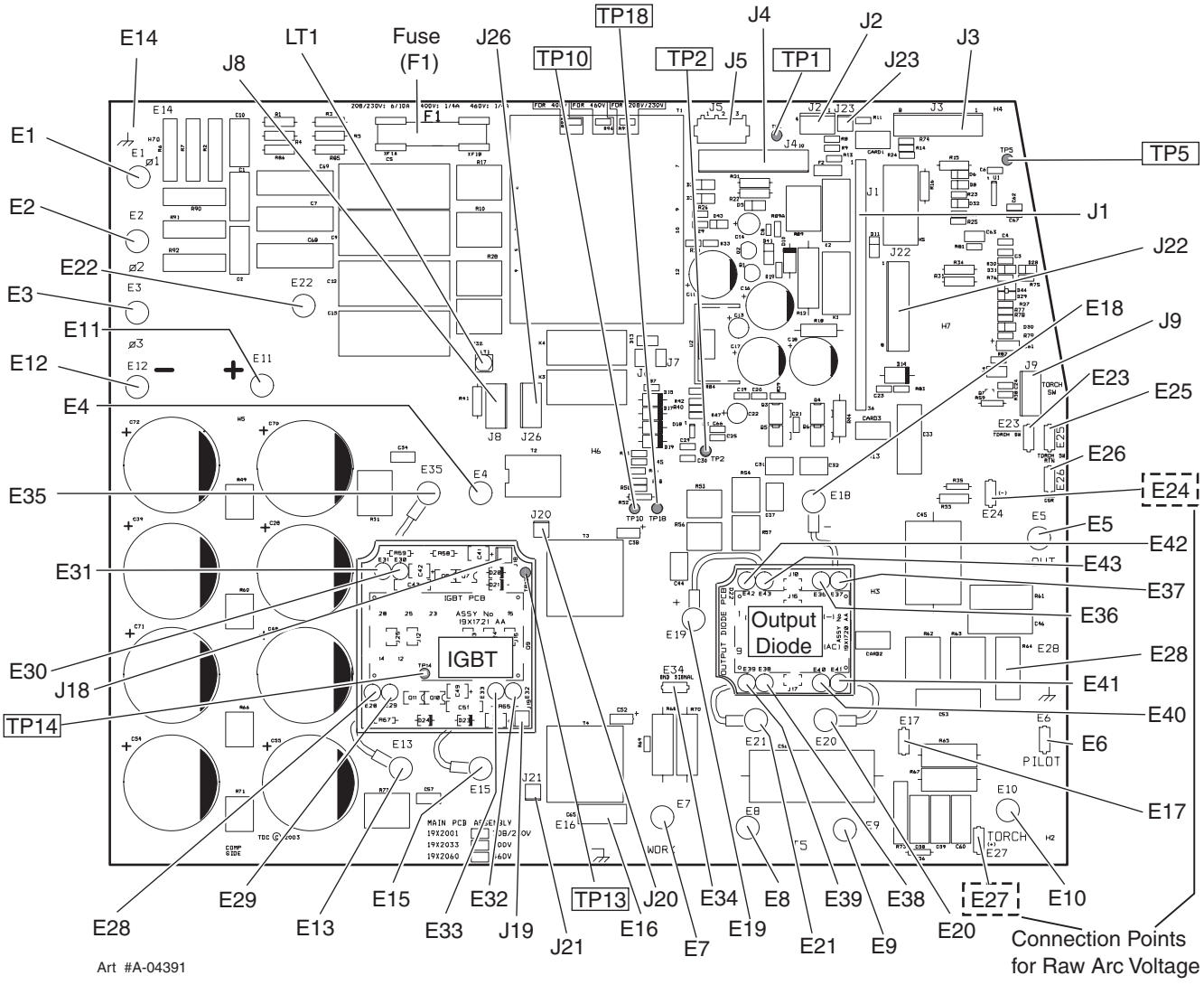
APPENDIX 18: MAIN PC BOARD LAYOUT



Main Power PC Board Signals

J1-1 +12vdc to Logic PCB
J1-2 +12vdc to Logic PCB
J1-3 Ground
J1-4 Ground
J1-5 Logic Low = - W1 on Signal
J1-6 Ground
J1-7 RUN / RAPID AUTO RESTART /SET
Signal Logic Low for SET
J1-8 Logic Low = PS1 Closed=Pressure OK
to Logic PCB
J1-9 Logic Low = TS1 (or TS2) Closed = Overtemp
J1-10 Ground
J1-11 Ground
J1-12 Ground
J1-13 28VAC A
J1-14 Logic Low = Gas on Signal from Logic PCB
J1-15 Logic Low = CSR Signal to Logic PCB
J1-16 Ground Signal
J1-17 Logic Low = DC OK Signal from Logic PCB
J1-18 Logic Low = OVERTEMP signal from Logic PCB
J1-19 Logic Low = AC OK signal from Logic PCB
J1-20 Return
J1-21 Logic Low = torch switch signal to Logic PCB
J1-22 +12 vdc to Logic PCB
J1-23 Pot High
J1-24 Pot Wiper
J1-25 Pot Low
J1-26 Gate Drive B Return from Logic PCB
J1-27 Gate Drive B from Logic PCB
J1-28 Gate Drive A Return from Logic PCB

A

J1-29 Gate Drive A from Logic PCB
J1-30 Negative out
J1-31 Current Sense
J1-32 Current Sense
J1-33 Current Sense Return
J1-34 Current Sense Return
J1-35 I Sense
J1-36 Tip (PIP?)

J2-1 Overtemp Signal from TS1 mounted on Heatsink
J2-2 Overtemp Return
J2-3 Jumpered to J2-4
J2-4 Jumpered to J2-3

J3-1 Not used.
J3-2 Not used.
J3-3 28VAC B from Auxiliary Transformer to On/OFF Switch
J3-4 28VAC A from Auxiliary Transformer to ON/OFF Switch
J3-5 28VAC A from ON/OFF Switch to Main PC Board
J3-6 28VAC B from ON/OFF Switch to Main PC Board
J3-7 RUN / RAPID AUTO RESTART / SET Signal
Logic Low Logic Low = SET Mode
J3-8 RUN / RAPID AUTO RESTART / SET Return

J4-1 28VAC A to Gas Solenoid
J4-2 28VAC B to Gas Solenoid
J4-3 Pressure Switch Signal Logic Low
J4-4 Pressure Switch Signal Return Low
J4-5 28VAC Main Contactor W1
J4-6 28VAC to Main Contactor W1
J4-7 +12V
J4-8 Ground from Pilot Board
J4-9 Current Sense to Pilot Board
J4-10 ISense to Pilot Board

J5-1 28VAC A - for test only
J5-2 Ground - for test only
J5-3 28VAC B - for test only

J8-1 230VAC from Primary of Aux Transformer Fan Power
J8-2 Not Used
J8-3 Not Used
J8-4 230VAC from Primary of Aux Transformer Fan Power

J9-1 PIP Return
J9-2 PIP
J9-3 Torch Switch
J9-4 Torch Switch Return

J20-1 Gate Drive B Return
J20-2 Gate Drive B

J21-1 Gate Drive A Return
J21-2 Gate Drive A

J22-1 Pot High
J22-2 Pot Wiper
J22-3 Pot Low
J22-4 +12V
J22-5 AC Indicator
J22-6 GAS Indicator 
J22-7 TEMP Indicator 
J22-8 DC Indicator

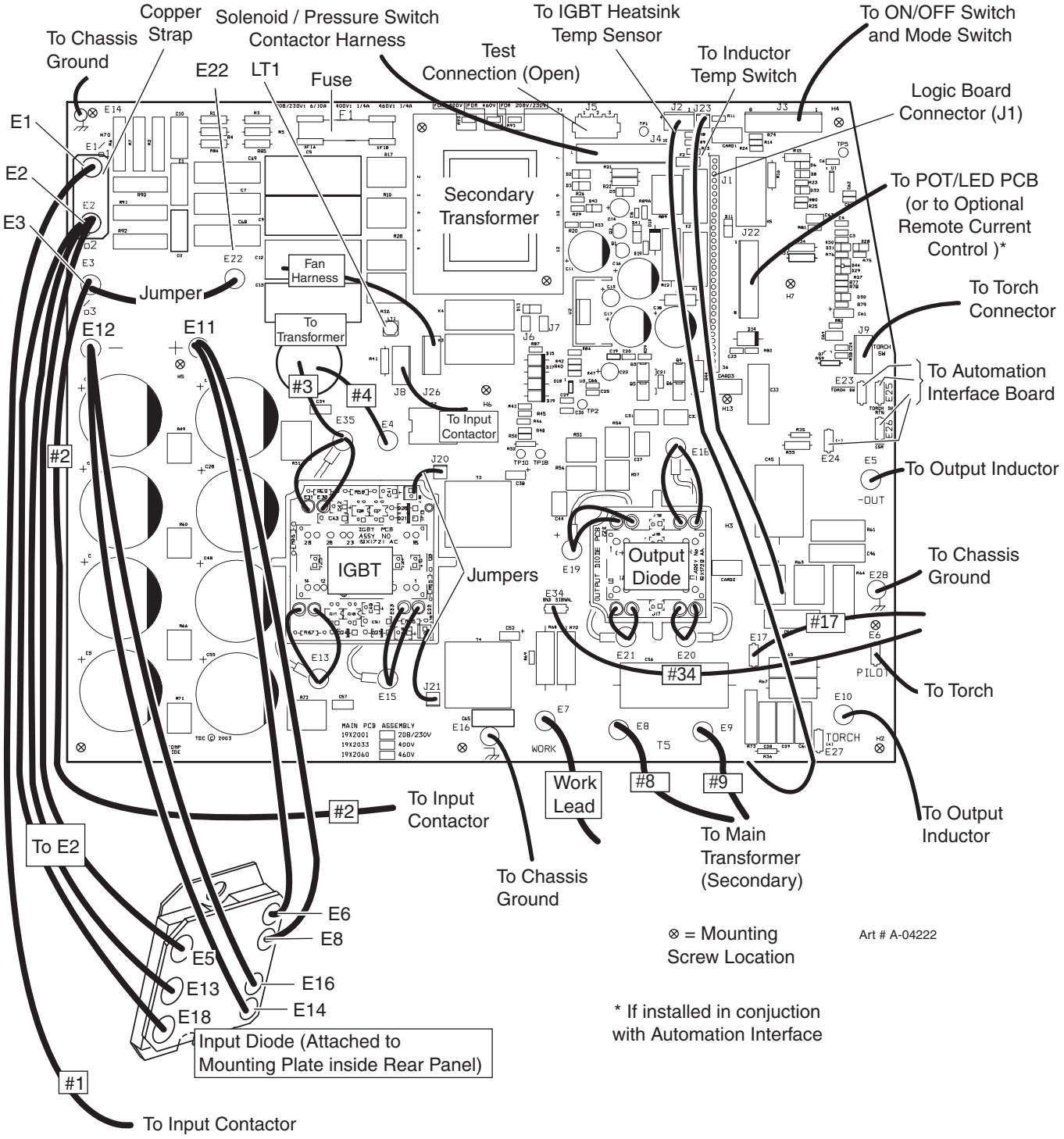
J23-1 Overtemp Signal from TS2 mounted
in Output Inductor
J23-2 Overtemp Return

J26-1 230V to Fan
J26-2 Not Used
J26-3 Not Used
J26-4 230V to Fan

TP1 Logic Ground
TP2 Not Used
TP5 +12vdc
TP10 Current Sense Signal Return
TP18 Current Sense Signal Return

LT1 Power ON Indicator (indicates power is present on the line side of the Input Contactor)

APPENDIX 19: MAIN PC BOARD WIRING LAYOUT (208 /230-Volt POWER SUPPLIES)



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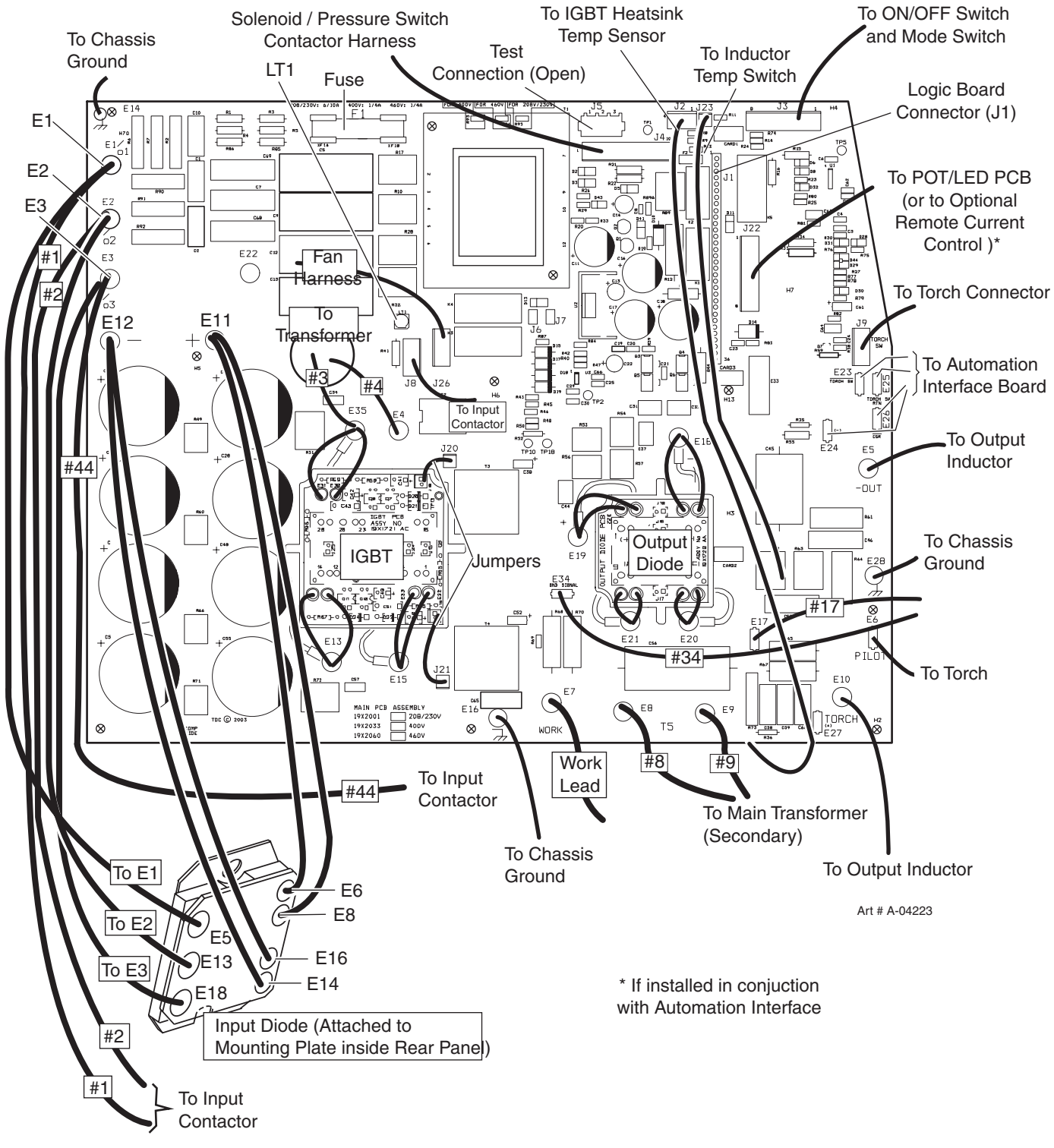
APPENDIX 20: MAIN PC BOARD WIRING LAYOUT (400-Volt and 460-Volt POWER SUPPLIES)



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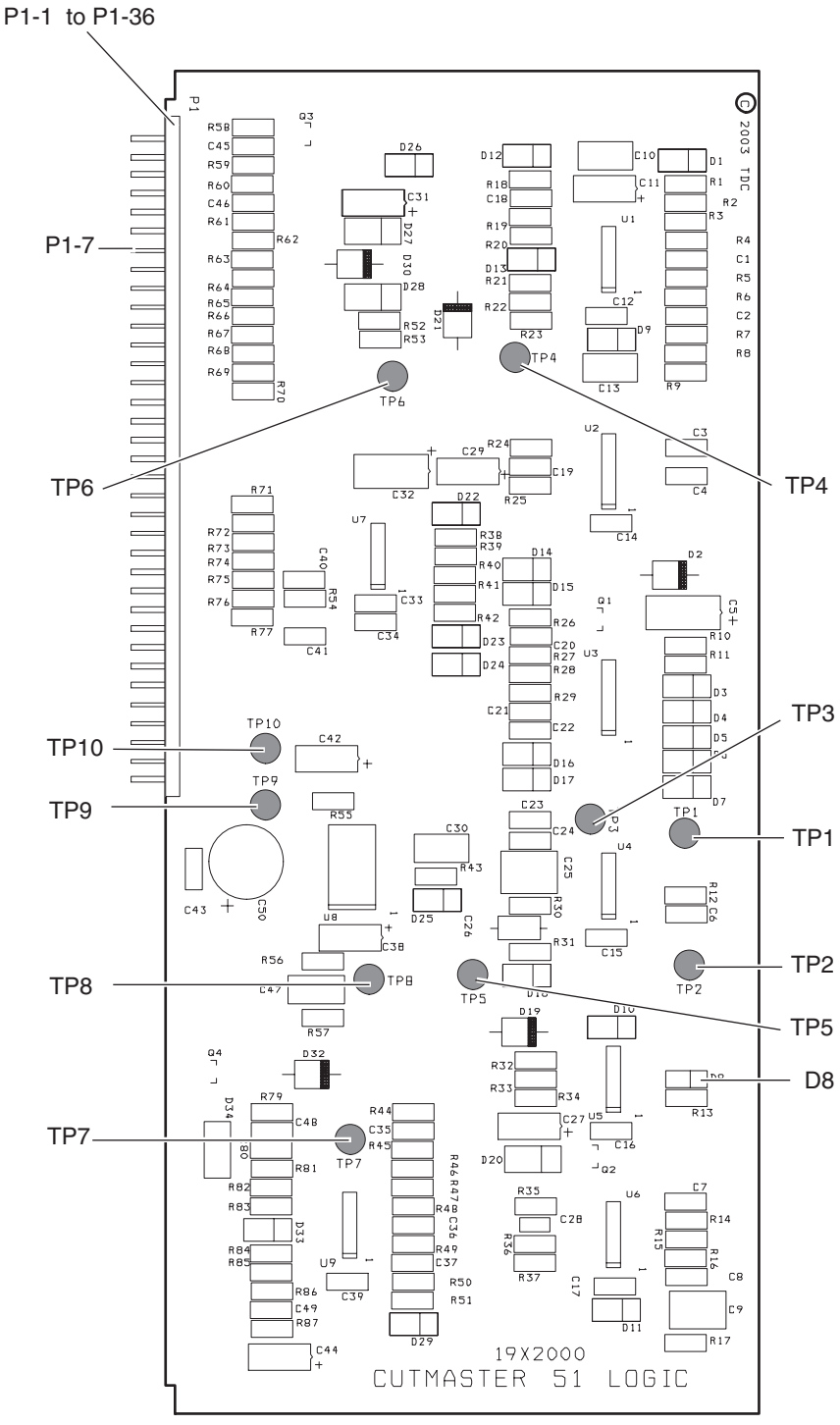
APPENDIX 21: LOGIC BOARD LAYOUT



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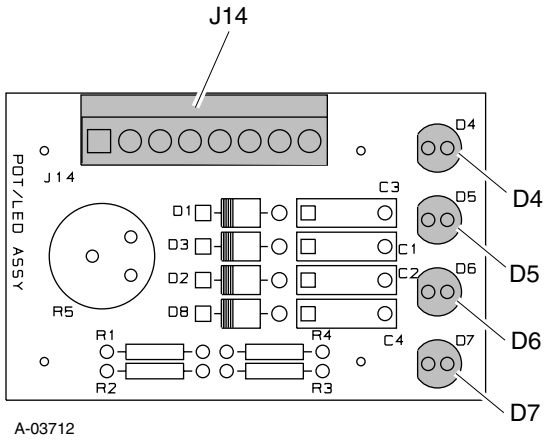
Logic Board Signals

P1-1 +12vdc from Main PCB
P1-2 +12vdc from Main PCB
P1-3 Ground
P1-4 Ground
P1-5 Logic Low - W1 on Signal
P1-6 Ground
P1-7 RUN / RAPID AUTO RESTART / SET Signal Logic Low for SET
P1-8 Logic Low = Pressure good signal
P1-9 Overtemp Signal (Logic Low)
P1-10 Ground
P1-11 Ground
P1-12 Ground
P1-13 28VAC
P1-14 Logic Low = Gas on Signal to Main PCB
P1-15 Logic Low = CSR Signal from Main PCB
P1-16 Ground
P1-17 Logic Low = DC OK Signal to Main PCB
P1-18 Logic Low = OVERTEMP Signal to Main PCB
P1-19 Logic Low = AC OK Signal to Main PCB
P1-20 Return for Torch Switch
P1-21 Logic Low = Torch Switch Signal
P1-22 +12 vdc
P1-23 To Current Control Pot
P1-24 Current Control
P1-25 Current Control Return
P1-26 Gate Drive B Return
P1-27 Gate Drive B Signal
P1-28 Gate Drive A Return
P1-29 Gate Drive A Signal
P1-30 (-) Output Signal
P1-31 Current Sense Signal
P1-32 Current Sense Signal
P1-33 Current Sense Return
P1-34 Current Sense Return
P1-35 ISense
P1-36 Tip

TP1 Logic Ground
TP2 DC OK Signal
TP3 CSR Signal
TP4 PWM Fault Shutdown
TP5 Demand Signal
TP6 Overtemp Fault
TP7 (-) Output Signal
TP8 Gate Drive A Signal
TP9 Gate Drive A Return
TP10 Gate Drive B Signal

INDICATOR LED:
D8 Inverter On

APPENDIX 22: POT / LED BOARD LAYOUT

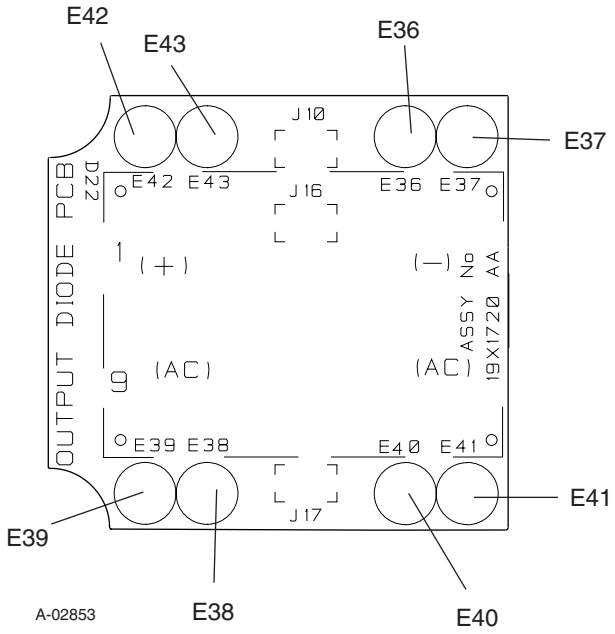


Pot/LED PC Board Signals

J14-1 from Main PC Board (J27-1) Pot High
J14-2 Main PC Board (J27-2) Pot Wiper
J14-3 from Main PC Board (J27-3) Pot Low
J14-4 12vdc (J27-4)
J14-5 Logic Low Signal for AC OK Indicator from Logic PC Board (J27-5)
J14-6 Logic Low Signal for GAS Indicator from Logic PC Board (J27-6)
J14-7 Logic Low Signal for TEMP Indicator from Logic PC Board (J27-7)
J14-8 Logic Low Signal for DC Indicator from Logic PC Board (J27-8)

D4 Front Panel AC Indicator
D5 Front Panel TEMP Indicator
D6 Front Panel GAS Indicator
D7 Front Panel DC Indicator

APPENDIX 23: OUTPUT DIODE BOARD LAYOUT



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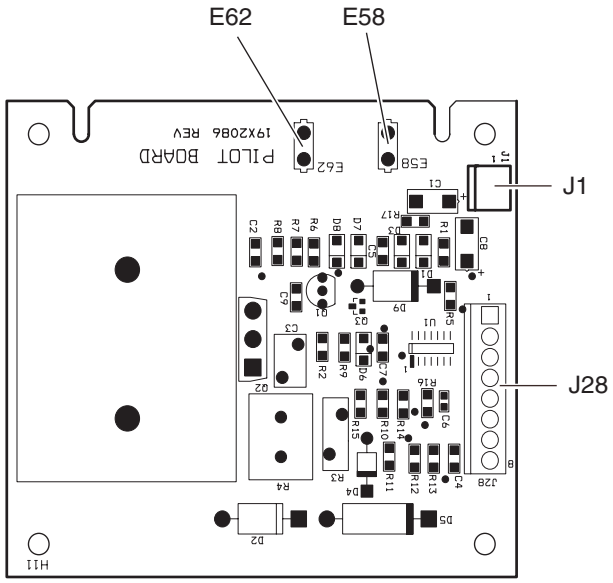
APPENDIX 24: PILOT BOARD LAYOUT



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Pilot Board Signals

J1-1 +12 vdc to Automation Interface PC Board J1-3
J1-2 DC Common to Automation Interface PC Board J1-2

J28-1 +12 vdc
J28-2 DC Com
J28-3 Not Used
J28-4 Not Used
J28-5 Logic Low CSR
J28-6 Not Used
J28-7 Not Used
J28-8 Not Used

E58 To Power Output PC Board Terminal E58
E62 To Power Output PC Board Terminal E62

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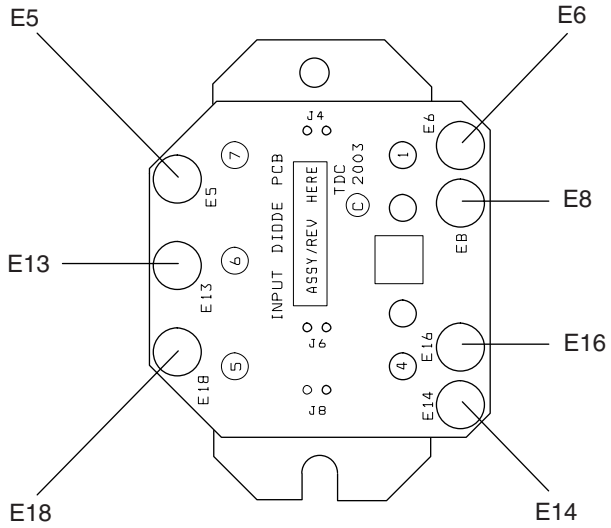
APPENDIX 25: INPUT DIODE LAYOUT



Art # A-03882

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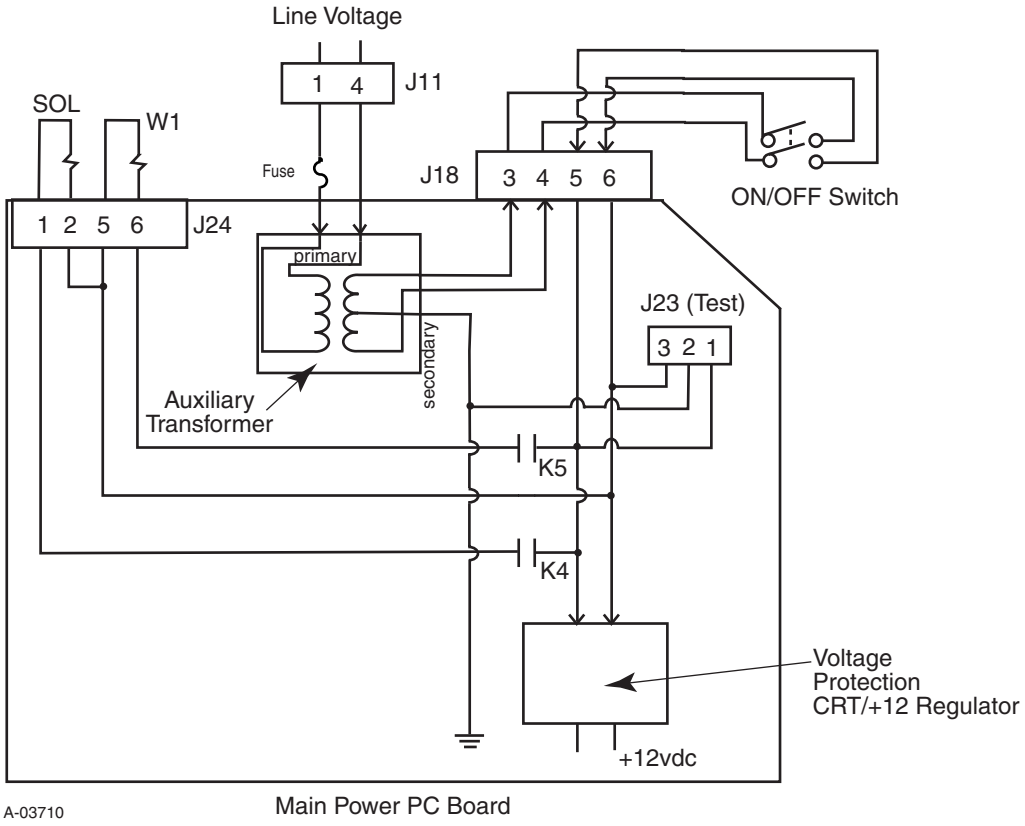
APPENDIX 26: 28VAC CIRCUIT DIAGRAM



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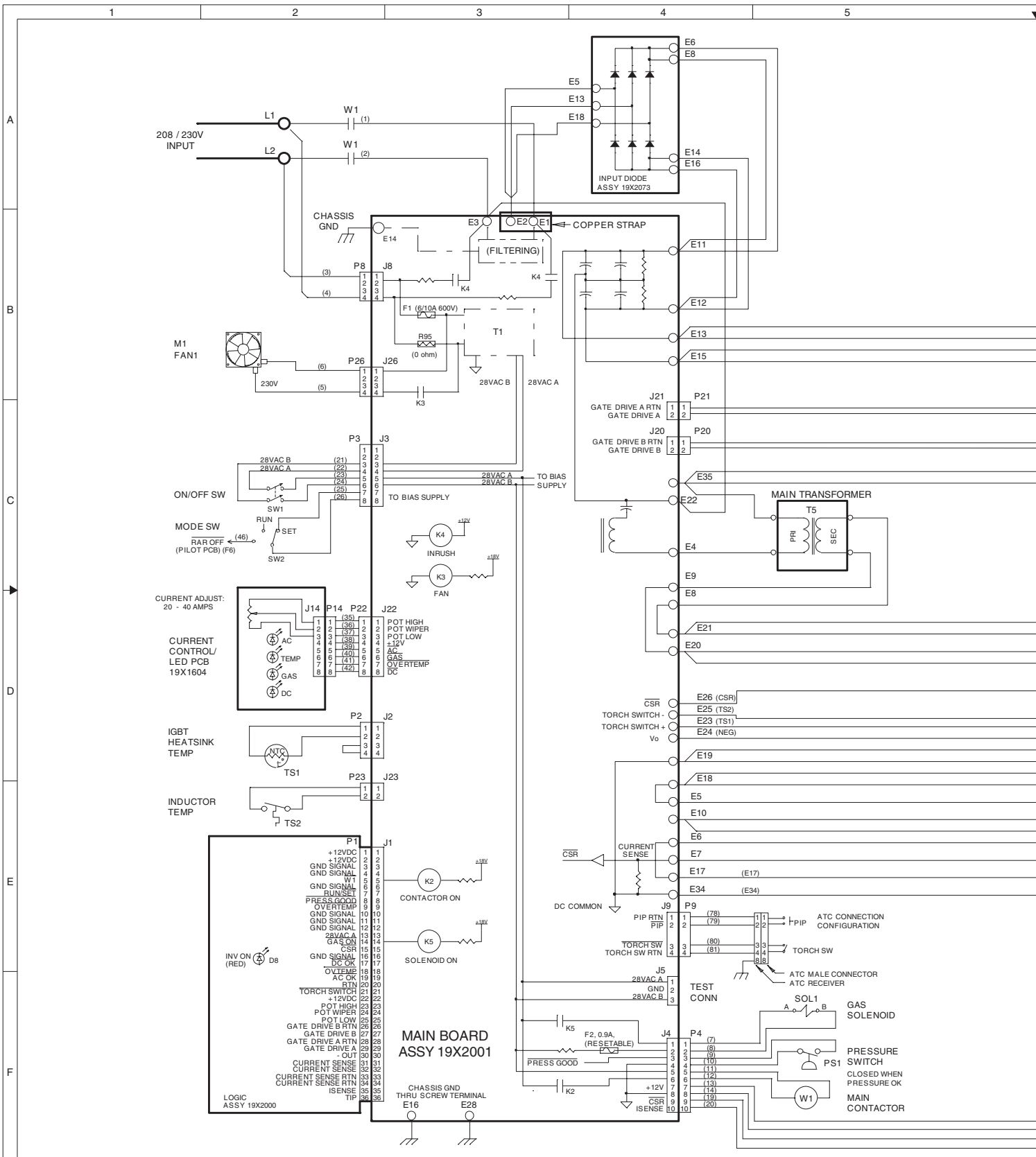
APPENDIX 27: 208/230V SYSTEM SCHEMATIC

Power Supply & SL100 Torch (without Solenoid)



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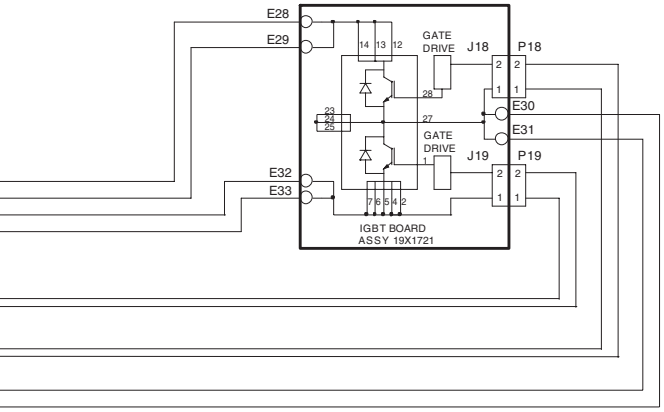
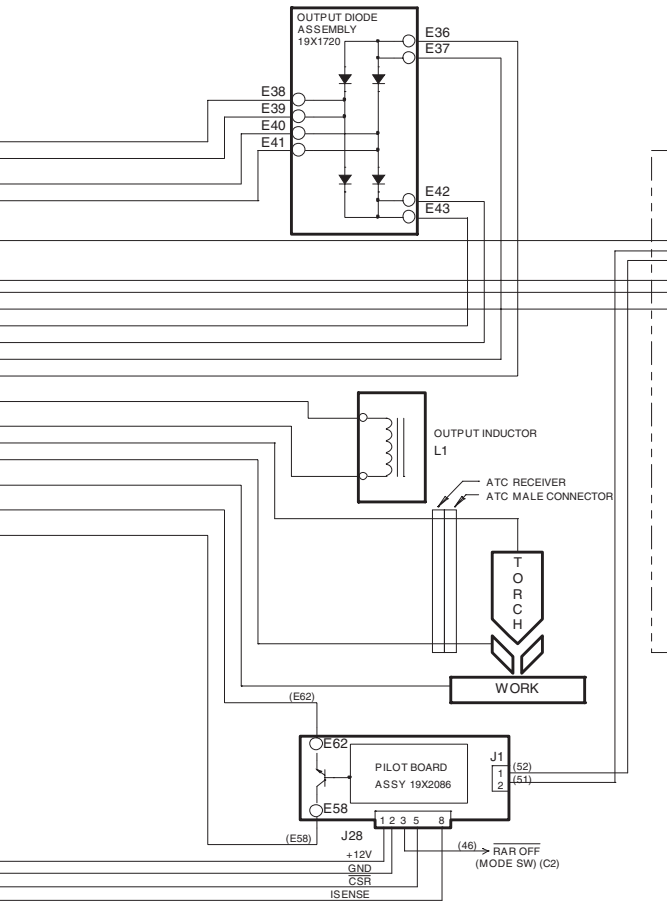
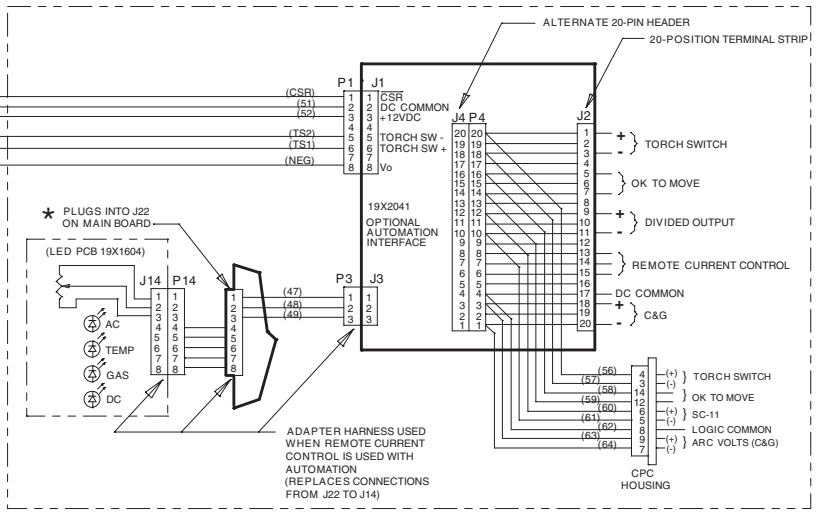
COMP	DESCRIPTION	LOCATION
F1	FUSE, 6/10A 600V KTK	B3
W1	MAIN CONTACTOR	F5
SW1	SWITCH, ON/OFF	C2
SW2	SWITCH, RUN/SET/RAR	C2
M1	FAN, 4.5" 220VAC	B2
SOL1	GAS SOLENOID	F5
PS1	PRESSURE SWITCH	F5
TS1	TEMP. SENSOR, IGBT HEATSINK	D2
TS2	TEMP. SENSOR, INDUCTOR	E2
T1	AUX TRANSFORMER	B3
T5	MAIN TRANSFORMER	C5
L1	OUTPUT INDUCTOR	E6

NOTES: UNLESS OTHERWISE SPECIFIED
1. DEPICTIONS OF CIRCUITRY INSIDE PCB BLOCKS IS FOR REFERENCE ONLY





OPTIONAL AUTOMATION INTERFACE CONNECTIONS



Rev	Revisions	By	Date
AA	ECO 101136 (REL)	DLL	05/27/03
AB	ECO 101314	HAS	02/11/04
AC	ECO 101429	HAS	06/09/04

Last Modified: Thursday, June 10, 2004 15:05:29

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NOTE: Unless Otherwise Specified, Resistors are in Ohms 1/4W 5%. Capacitors are in Microfarads (UF)

TITLE: SCHEMATIC, CM51 208/230V SYSTEM

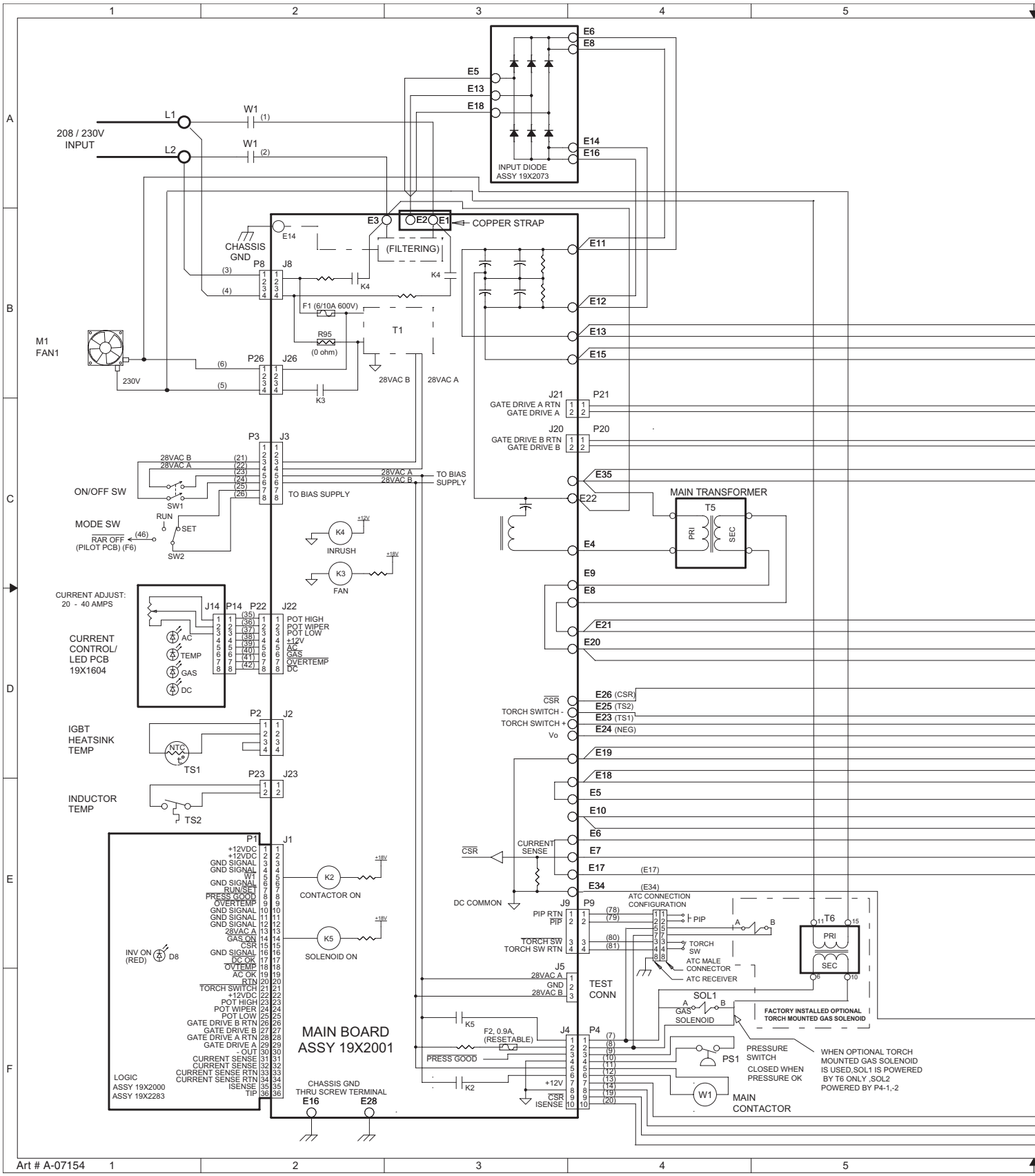
PCB No:
Assy No:
Scale
Supersedes
Date: 05/27/03
Drawn: D.Lilja
References
Chk:
App:
Sheet 1 of 1
Size D
DWG No: 42X1150

Art # A-03695

A

APPENDIX 28: 208/230V SYSTEM SCHEMATIC

Power Supply & SL100SV Torch (with Solenoid)



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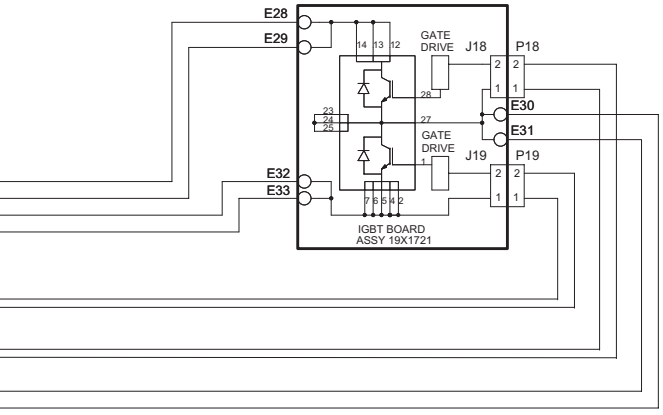
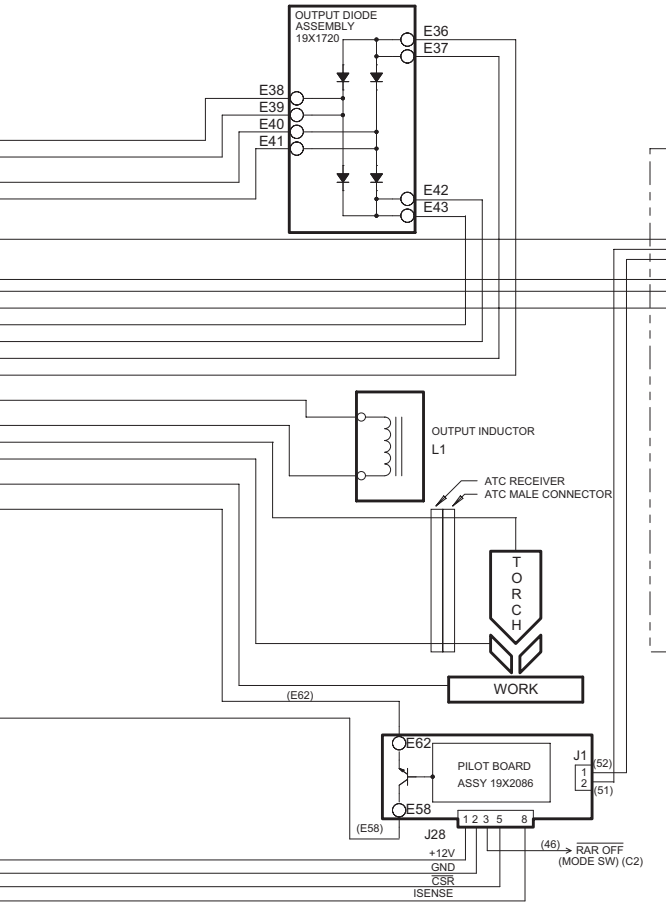
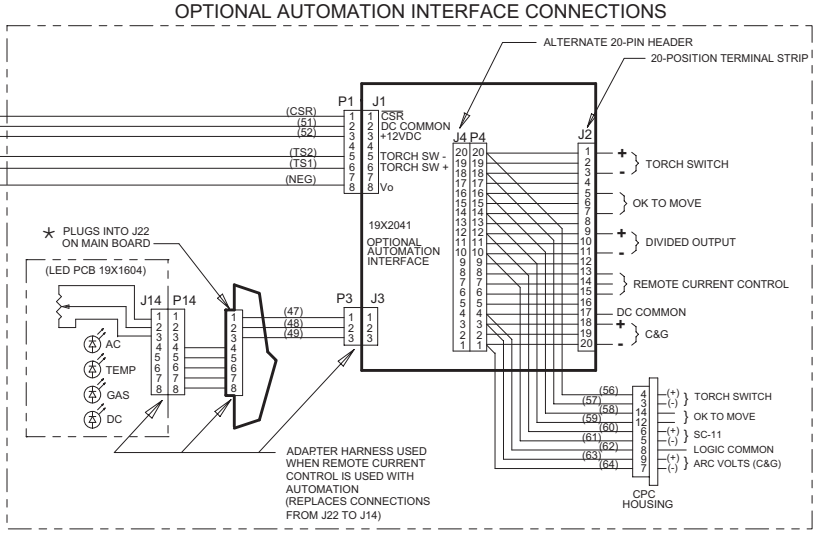
COMP	DESCRIPTION	LOCATION
F1	FUSE, 6/10A 600V KTK	B3
W1	MAIN CONTACTOR	F5
SW1	SWITCH, ON/OFF	C2
SW2	SWITCH, RUN/SET/RAR	C2
M1	FAN, 4.5" 220VAC	B2
SOL1	GAS SOLENOID	F5
PS1	PRESSURE SWITCH	F5
TS1	TEMP. SENSOR, IGBT HEATSINK	D2
TS2	TEMP. SENSOR, INDUCTOR	E2
T1	AUX TRANSFORMER	B3
T5	MAIN TRANSFORMER	C5
L1	OUTPUT INDUCTOR	E6

NOTES: UNLESS OTHERWISE SPECIFIED
1. DEPICTIONS OF CIRCUITRY INSIDE PCB BLOCKS IS FOR REFERENCE ONLY







Rev	Revisions		By	Date
AA	ECO 101136	(REL)	DLL	05/27/03
AB	ECO 101314		HAS	02/11/04
AC	ECO 101429		HAS	06/09/04
AD	ECO B028		RS	01/09/06
AE	ECO B016		RWH	01/27/06

Last Modified: Friday, January 27, 2006

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NOTE: Unless Otherwise Specified, Resistors are in Ohms 1/4W 5%. Capacitors are in Microfarads (UF)

TITLE: SCHEMATIC, CM51 208/230V SYSTEM

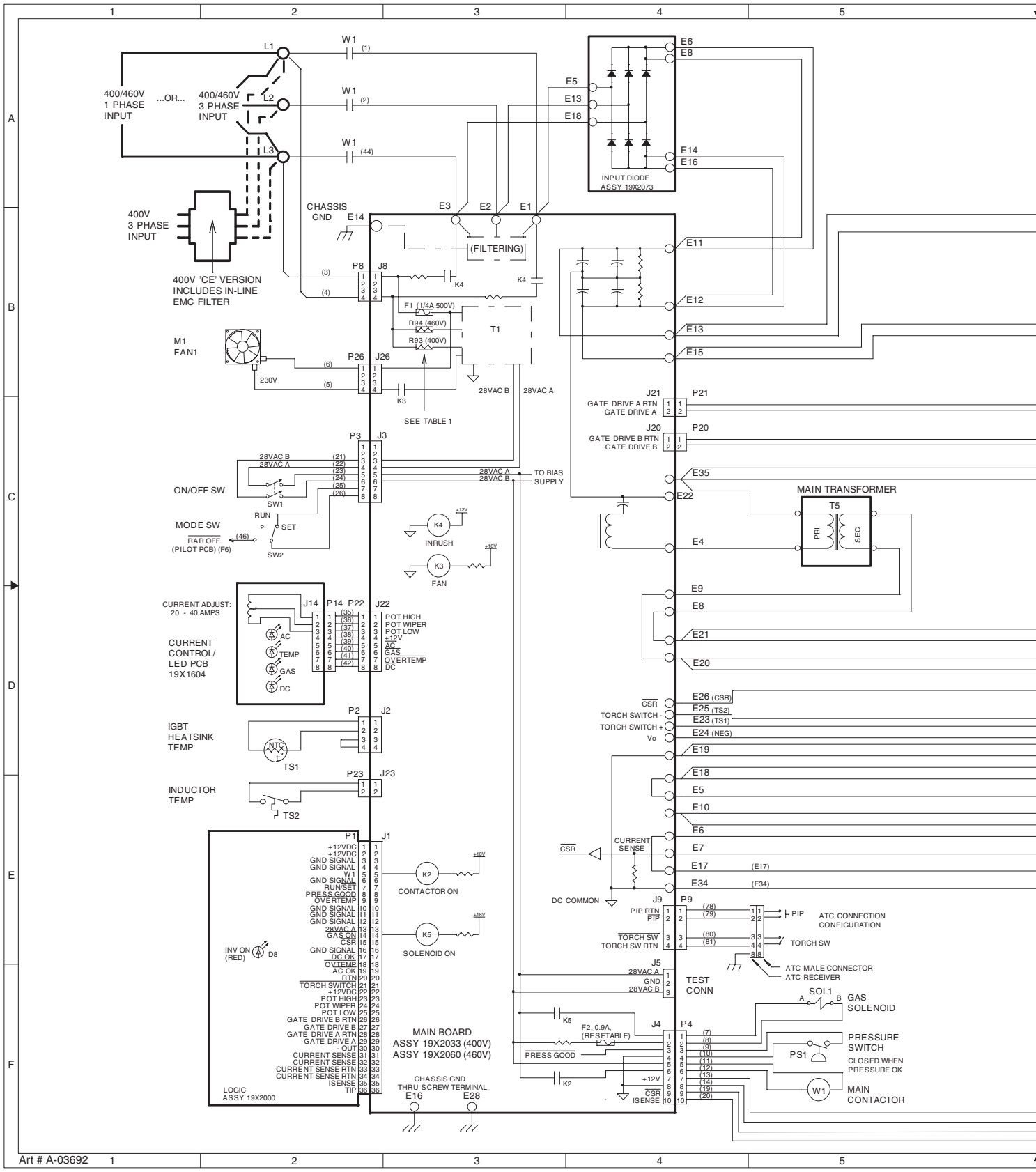
PCB No:
Assy No:
Scale: Supersedes
Date: 05/27/03
Drawn: D.Lija
References
Chk: App: Sheet 1 of 1
Size: D DWG No: 42X1150

Art # A-07154

A

APPENDIX 29: 400/460V SYSTEM SCHEMATIC

Power Supply & SL100 Torch (without Solenoid)



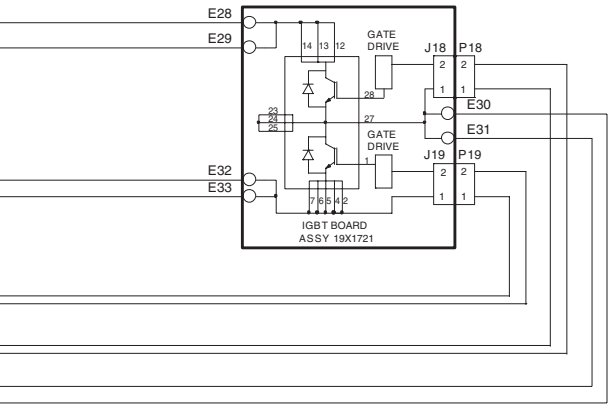
A

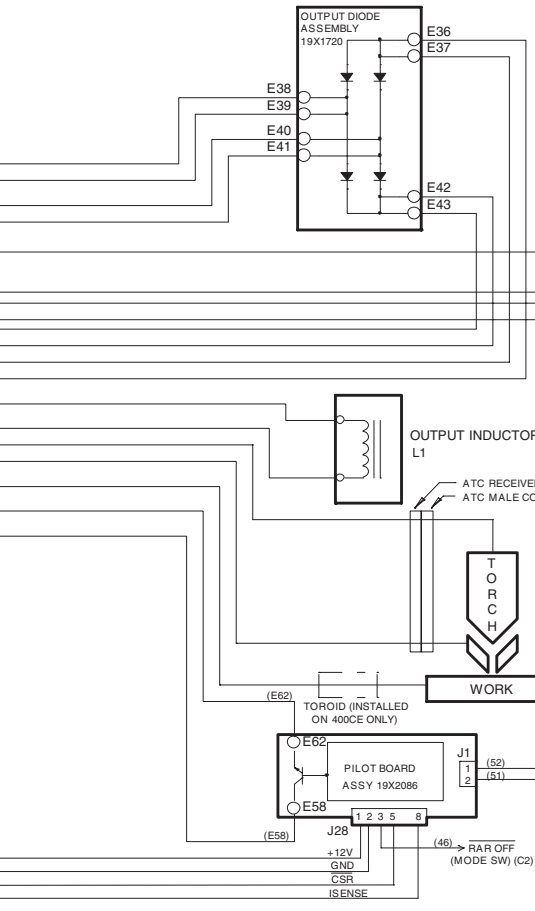
COMP	DESCRIPTION	LOCATION
F1	FUSE, 1/4A 500V FNQ	B3
W1	MAIN CONTACTOR	F5
SW1	SWITCH, ON/OFF	C2
SW2	SWITCH, RUN/SET/RAR	C2
M1	FAN, 4.5" 220VAC	B2
SOL1	GAS SOLENOID	F5
PS1	PRESSURE SWITCH	F5
TS1	TEMP. SENSOR, IGBT HEATSINK	D2
TS2	TEMP. SENSOR, INDUCTOR	E2
T1	AUX TRANSFORMER	B3
T5	MAIN TRANSFORMER	C5
L1	OUTPUT INDUCTOR	E6

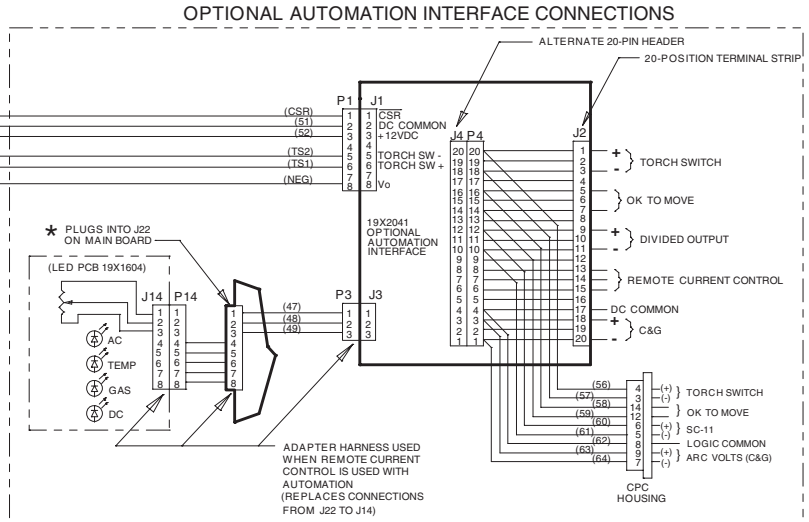
NOTES: UNLESS OTHERWISE SPECIFIED
1. DEPICTIONS OF CIRCUITRY INSIDE PCB BLOCKS IS FOR REFERENCE ONLY

TABLE 1

	ASSEMBLY	
COMP	19X2033 (400V)	19X2060 (460V)
R93	115X465-2 (0 ohm)	XXXXXXXX
R94	XXXXXXXX	115X465-2 (0 ohm)
F1	1/4A 500V	1/4A 500V







Rev	Revisions	By	Date
AA	ECO 101136 (REL)	DLL	05/27/03
AB	ECO 101314	HAS	02/11/04
AC	ECO 101429	HAS	06/09/04

Last Modified: Thursday, June 10, 2004 15:05:29

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TITLE: SCHEMATIC, CM51 400/460V SYSTEM 1Ø/3Ø

PCB No:
Assy No:
Scale: Supersedes
Date: 05/27/03
Drawn: D.Lilja
References
Chk: App: Sheet 1 of 1
Size: D DWG No: 42X1151

Art # A-03692

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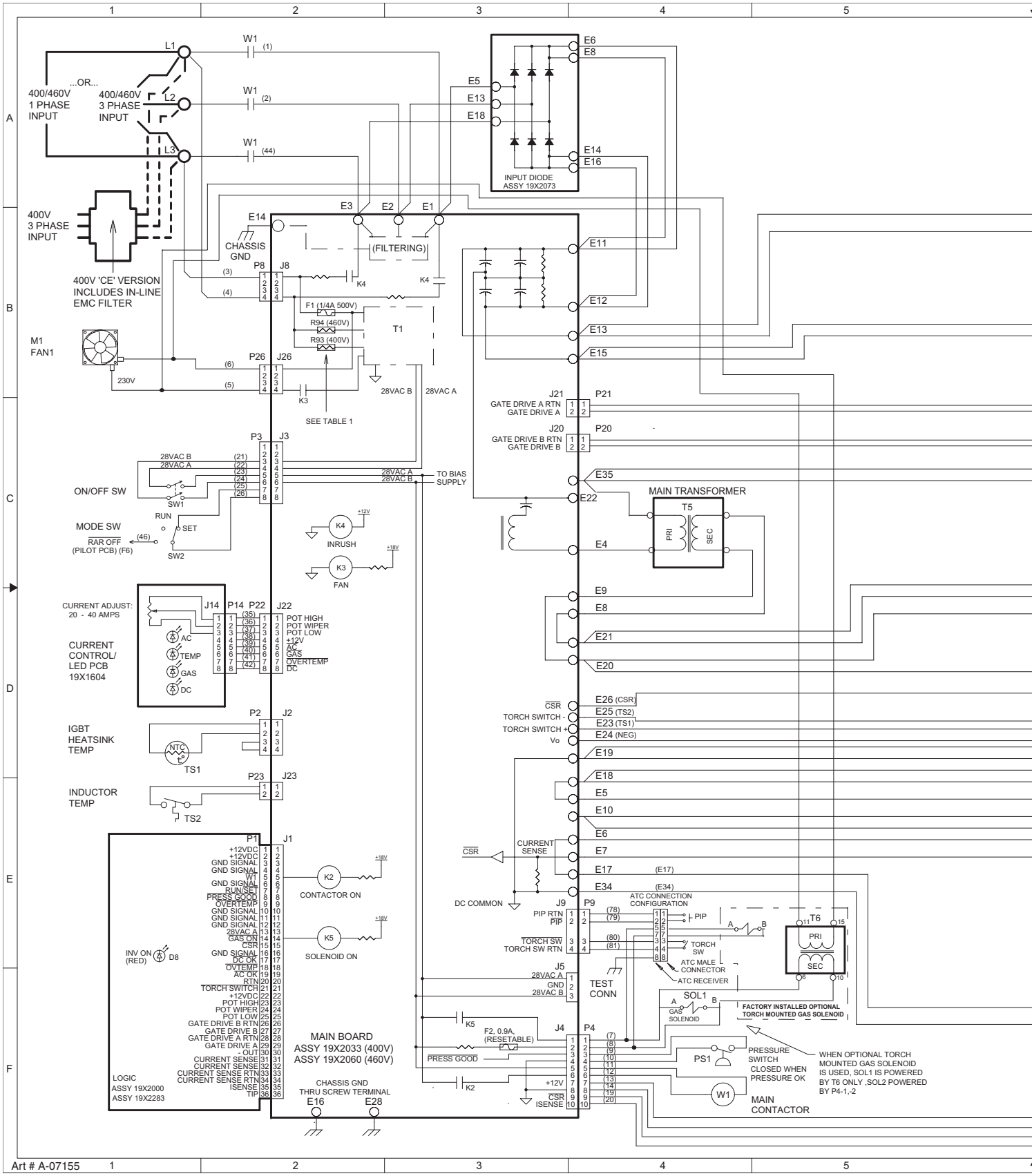
APPENDIX 30: 400/460V SYSTEM SCHEMATIC

Power Supply & SL100SV Torch (with Solenoid)



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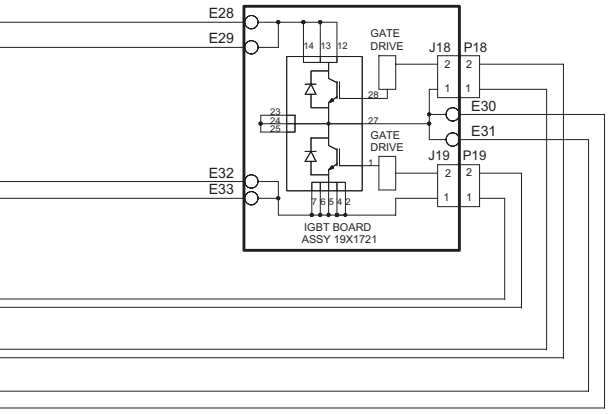
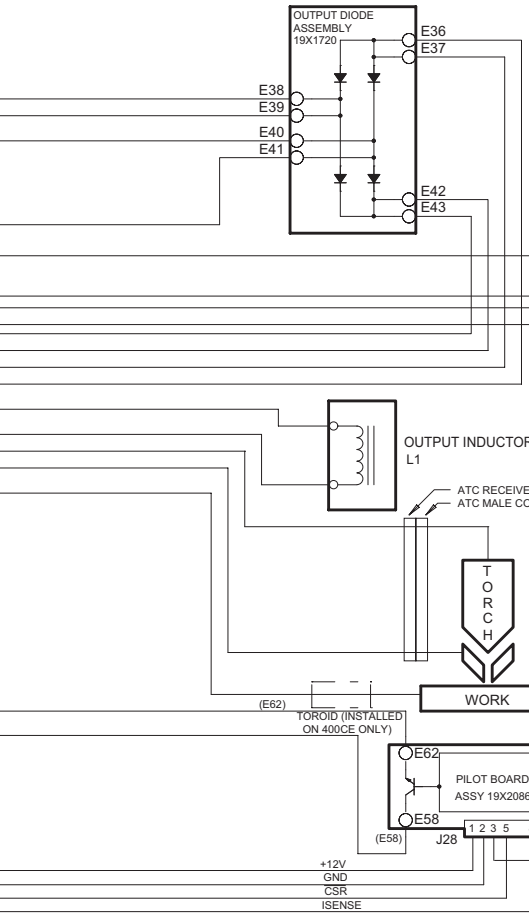
COMP	DESCRIPTION	LOCATION
F1	FUSE, 1/4A 500V FNQ	B3
W1	MAIN CONTACTOR	F5
SW1	SWITCH, ON/OFF	C2
SW2	SWITCH, RUN/SET/RAR	C2
M1	FAN, 4.5" 220VAC	B2
SOL1	GAS SOLENOID	F5
PS1	PRESSURE SWITCH	F5
TS1	TEMP. SENSOR, IGBT HEATSINK	D2
TS2	TEMP. SENSOR, INDUCTOR	E2
T1	AUX TRANSFORMER	B3
T5	MAIN TRANSFORMER	C5
L1	OUTPUT INDUCTOR	E6

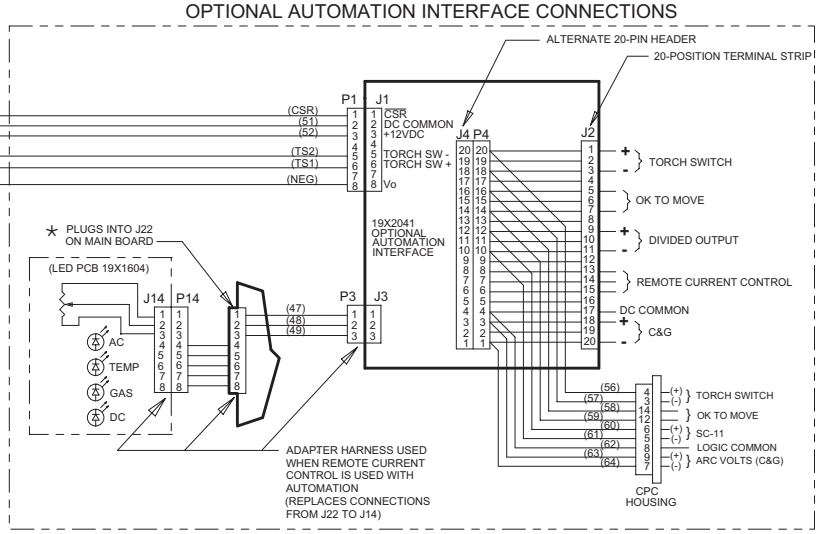
NOTES: UNLESS OTHERWISE SPECIFIED
1. DEPICTIONS OF CIRCUITRY INSIDE PCB BLOCKS IS FOR REFERENCE ONLY

TABLE 1

	ASSEMBLY	
COMP	19X2033 (400V)	19X2060 (460V)
R93	115X465-2 (0 ohm)	XXXXXXXX
R94	XXXXXXXX	115X465-2 (0 ohm)
F1	1/4A 500V	1/4A 500V







Rev	Revisions		By	Date
AA	ECO 101136	(REL)	DLL	05/27/03
AB	ECO 101314		HAS	02/11/04
AC	ECO 101429		HAS	06/09/04
AD	ECO B028		RS	01/09/06
AE	ECO B016		RWH	01/27/06

Last Modified: Friday, January 27, 2006

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NOTE: Unless Otherwise Specified, Resistors are in Ohms 1/4W 5%. Capacitors are in Microfarads (UF)

TITLE: SCHEMATIC, CM51 400/460V SYSTEM 1Ø/3Ø

PCB No:
Assy No:
Scale
Supersedes
Date: 05/27/03
Drawn: D.Lilja
References
Chk:
App:
Sheet 1 of 1
Size D
DWG No: 42X1151

Art # A-07155

APPENDIX 31: Publication History

Publication Date*	Rev.	Revisions
1/3/05		Released to production.
2/14/05		Updated per ECO 101610, adding parts to Spare Parts Kits.
Feb. 1, 2006		Updated per ECOs B016 (logic boards), B028 (SL100SV torch) and ECR A044 (power supply updates for SL100SV torch [with solenoid on mounting tube]). Added new replacement parts, new wiring diagram, new schematics. Added Publication History to manual.
Mar. 29, 2006	AA	Dropped references to leads extensions. Changed to new cover style.
April 17, 2006	AB	Changed input diode torque spec to 35 in-lb / 3.95 Nm.
Oct. 5, 2006	AB.01	Added patent information, and newer revision control to include two numbers.
April 2, 2007	AC.01	Revised Art - Appendix 4, Torch Pin - Out Diagrams: A. Power Supply and SL100SV (without Solenoid) Art A-03900 B. Power Supply and SL100SV Torch (with Solenoid) Art A-07114 added text to Callout #'s: 3 & 4: Not Used, updated inside & rear cover.

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