THERMAL DYNAMICS®

400

ULTRA-CUT™

PLASMA CUTTING SYSTEM

Art# A-09430

Operating Manual

Rev. AI **Date:** September 20, 2012 **Manual #** 0-5164

Operating Features:

400 AMP	DC	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.

YOU ARE IN GOOD COMPANY!

The Brand of Choice for Contractors and Fabricators Worldwide.

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.

Plasma Cutting Power Supply, Ultra-Cut® 400
Operating Manual No. 0-5164

Published by:
Thermadyne Corporation
82 Benning Street
West Lebanon, New Hampshire, USA 03784
(603) 298-5711

www.thermal-dynamics.com

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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.*

LEAD WARNING

This product contains chemicals, including lead, or otherwise produces chemicals known to the State of California to cause cancer, birth defects and other reproductive harm. **Wash hands after handling**. (California Health & Safety Code § 25249.5 et seq.)

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.

PLOMB AVERTISSEMENT

Ce produit contient des produits chimiques, comme le plomb, ou engendre des produits chimiques, reconnus par l'état de Californie comme pouvant être à l'origine de cancer, de malformations fœtales ou d'autres problèmes de reproduction. **Il faut se laver les mains après toute manipulation.** (Code de Californie de la sécurité et santé, paragraphe 25249.5 et suivants)

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' (2006/95 EC) 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: Thermal Dynamics® Corporation (hereinafter "Thermal") warrants that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the time period applicable to the Thermal products as stated below, Thermal shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal's specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Thermal's sole option, of any components or parts of the product determined by Thermal to be defective.

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

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

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

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

The limited warranty periods for this product shall be: A maximum of three (3) years from date of sale to an authorized distributor and a maximum of two (2) years from date of sale by such distributor to the Purchaser, and with further limitations on such two (2) year period (see chart below).

	Parts	**Labor**
AutoCut© and UltraCut© Power Supplies and Components	2 Years	1 Year
Torch And Leads		
XT /XT™-300/ XT™-301 Torch (Excluding Consumable Parts)	1 Year	1 Year
Repair/Replacement Parts	90 Days	90 Days

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

Effective June 15, 2010

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SECTION 2: SPECIFICATIONS

2.01 General Description Of The System

A typical Ultra-Cut® 400 system configuration includes:

- One Power Supply
- Remote Arc Starter
- Gas Control Module
- Torch Valve Assembly
- Precision Plasma Cutting Torch
- Set Of Connecting Leads
- Torch Spare Parts Kit

The components are connected at installation.

2.02 Plasma Power Supply

The power supply provides the necessary current for cutting operations. The power supply also monitors system performance, and cools and circulates the liquid coolant for the torch and leads.

2.03 Remote Arc Starter

This unit produces a temporary HF pulse to start the pilot arc. The pilot arc creates a path for the main arc to transfer to the work. When the main arc is established, the pilot arc shuts off.

2.04 Gas Control Module

This module allows remote setting of gas selection, pressures, and flows together with setting of cutting current.

2.05 Precision Plasma Cutting Torch

The torch delivers the controlled current to the work through the main arc, causing the metal to be cut.

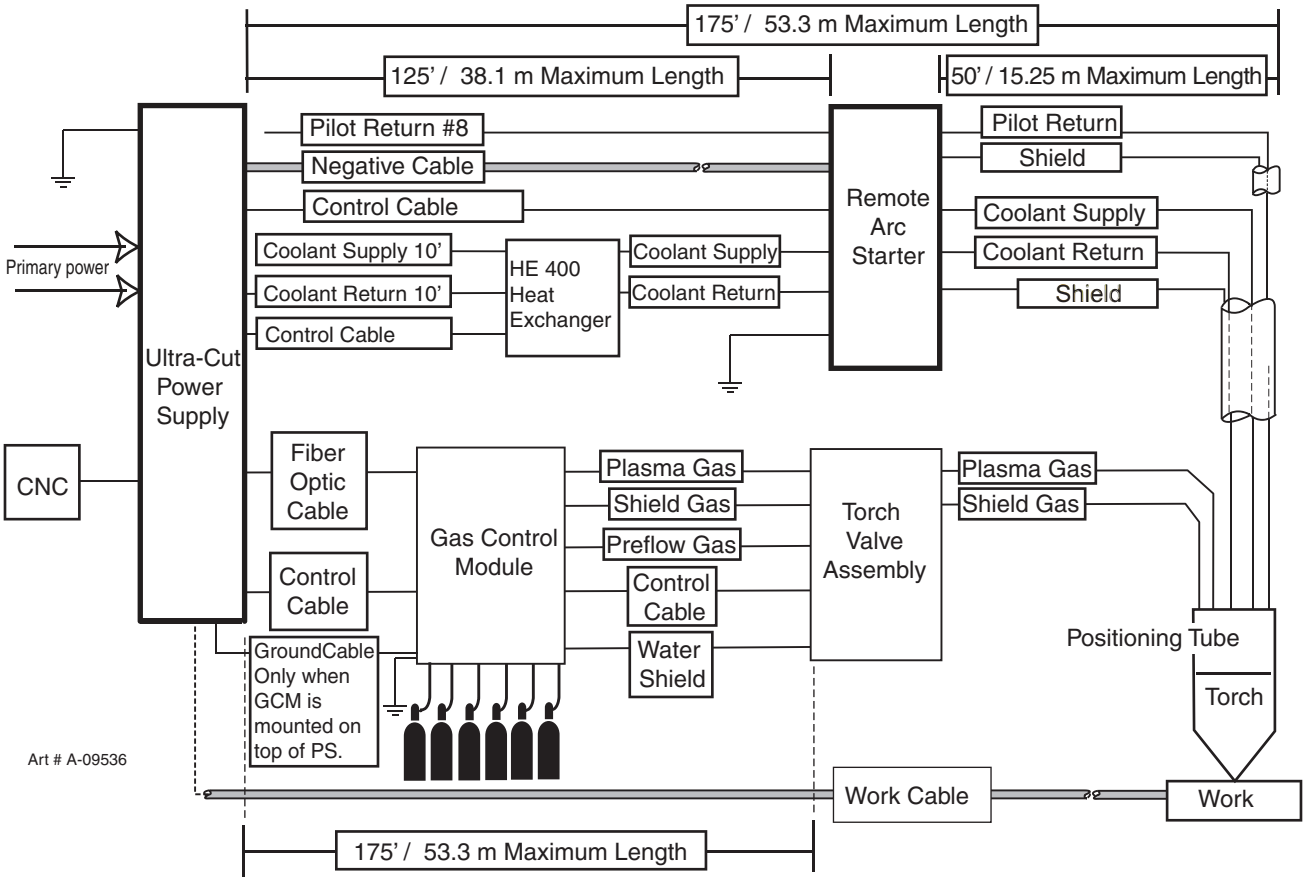
2.06 Specifications & Electrical Requirements

Ultra-Cut 400 Specifications & Design Features	
Max OCV (U0)	380 vdc
Minimum Output Current	10 Amps
Max Output Current	400 Amps
Output Voltage	60 - 230 vdc
Duty Cycle Rating	100% @ 400A, 200V, (80kW),
Ambient Temperature for Duty Cycle Rating	104F° (40°C)
Operating range	14°F to 122°F (-10°C to + 50°C)
Power Factor	0.73 @ 400 A DC Output
Cooling	Forced Air (Class F)

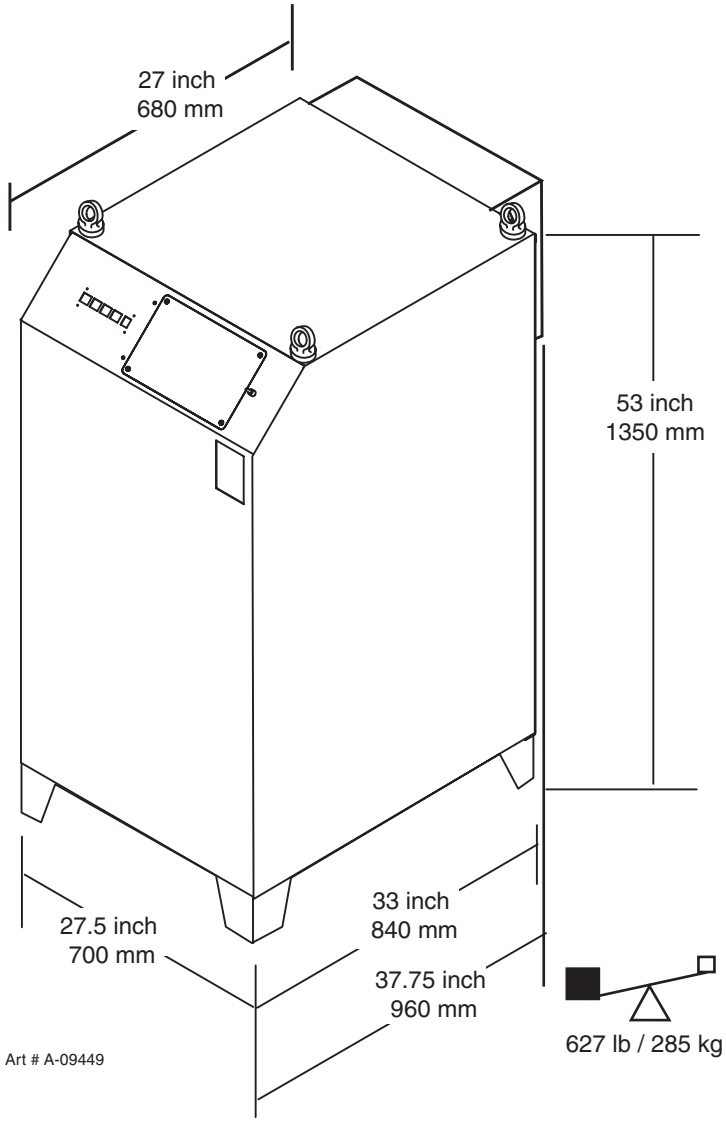
2.07 System Component Layout

Ultra-Cut 400 Power Supply						
Input		Power Input	Current	Suggested Sizes (See Note)		
Voltage	Freq.	3-Ph	3-Ph	Fuse (Amps)	Wire (AWG)	Wire (mm^2)
(Volts)	(Hz)	(kVA)	(Amps)	3-Ph	3-Ph	3-Ph
208	50/60	119	336	350	300MCM	150
230	50/60	119	304	350	250MCM	150
460	50/60	116	148	175	#1	50
380	50/60	120	183	225	1/0	70
400	50/60	120	174	225	1/0	70

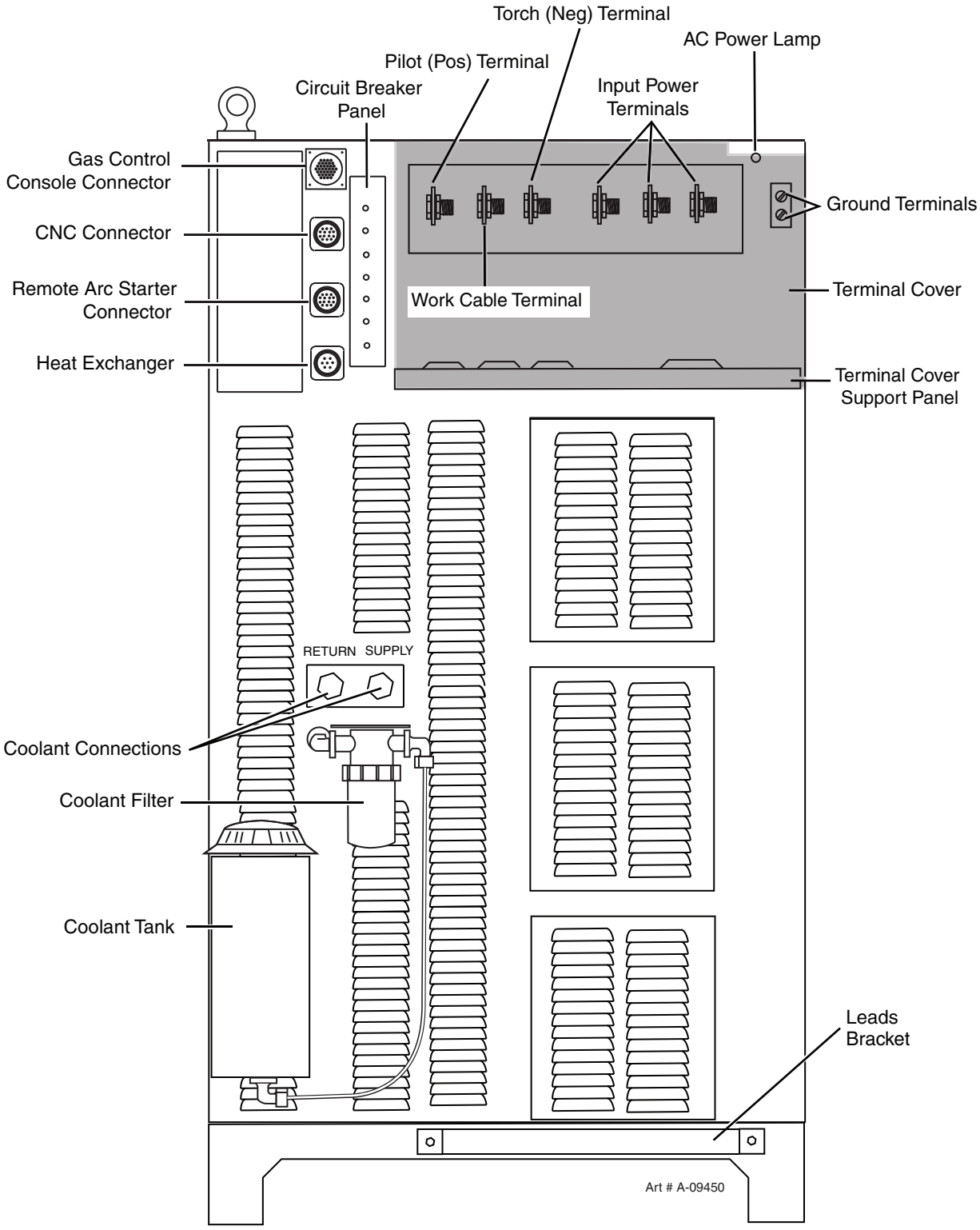
* Suggested wire size based on United States NFPA 70 National Electrical Code 2005 edition published by the National Fire Prevention Association.
Listings are from table 400.5(B) for flexible cord of certain types rated for 75 deg C in ambient temperatures up to 30 deg C. Using wires of lower temperature rating or different insulation type may require larger wire size. Derate for higher ambient.
These are suggestions only. Always refer to your local and national codes that apply to your region for final determination of correct wire type and size.



2.08 Power Supply Dimensions



2.09 Power Supply Rear Panel Features



2.10 Gas Requirements

The customer will provide all gases and pressure regulators. Gases must be of high quality. Pressure regulators shall be double stage and installed within 3 meters from the Gas Console.

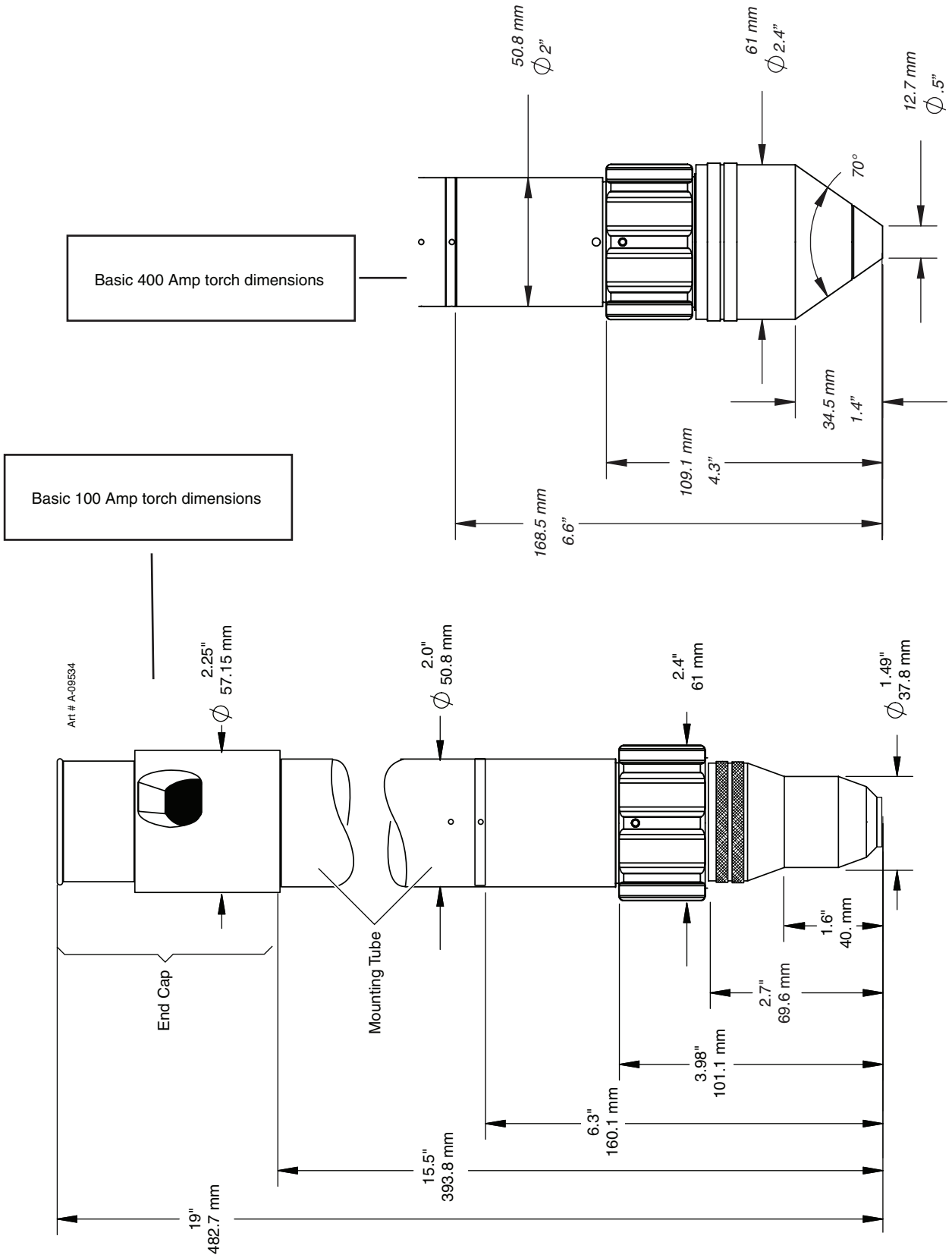
Ultra-Cut 400 Power Supply: Gas Pressures, Flows, and Quality Requirements			
Gas	Quality	Minimum Pressure	Flow
O2 (Oxygen)	99.5% Purity (Liquid recommended)	120 psi 8.3 bar / 827 kPa	200 scfh (5700 l/h)
N2 (Nitrogen)	99.5% Purity (Liquid recommended) <1000 ppm O2, <32 ppm H2O)	120 psi 8.3 bar / 827 kPa	500 scfh (14200 l/h)
Compressed or Bottled Air	Clean, Dry, Free of Oil (see Note 1)	120 psi 8.3 bar / 827 kPa	500 scfh (14200 l/h)
H35 (Argon-Hydrogen) H35 = 35% Hydrogen, 65% Argon	99.995% Purity (gas recommended)	120 psi 8.3 bar / 827 kPa	200 scfh (5700 l/h)
H17 17.5% Hydrogen 32.5% Argon 50% Nitrogen	99.995% Purity (gas recommended)	120 psi 8.3 bar / 827 kPa	200 scfh (5700 l/h)
Ar (Argon)	99.995% Purity (gas recommended)	120 psi 8.3 bar / 827 kPa	150 scfh (4200 l/h)
H2O (Water)	See Note 2	50 psi (3.5 bar)	10 gph (38 lph)
Note 1: The air source must be adequately filtered to remove all oil or grease. Oil or grease contamination from compressed or bottled air can cause fires in conjunction with oxygen.			
For filtering, a coalescing filter able to filter to 0.01 microns should be placed as close as possible to the gas inlets on the Gas Control Module.			
Note 2: The tap water source does not need to be deionized, but in water systems with extremely high mineral content a water softener is recommended. Tap water with high levels of particulate matter must be filtered.			
Note 3: Water Pressure Regulator No. 8-6118 is recommended to ensure proper water pressure.			

2.11 Gas Applications

MATERIAL	MILD STEEL			STAINLESS STEEL			ALUMINUM		
	GAS TYPE			GAS TYPE			GAS TYPE		
OPERATION	PREFLOW	PLASMA	SHIELD	PREFLOW	PLASMA	SHIELD	PREFLOW	PLASMA	SHIELD
30A Cut	Air	O2	O2	Air	Air	Air	Air	Air	Air
				N2	N2	H20	N2	N2	H20
50A Cut	Air	O2	Air	Air	Air	Air	Air	Air	Air
				N2	N2	H20	N2	N2	H20
70A Cut	Air	O2	Air	Air	Air	Air	Air	Air	Air
				N2	N2	H20	N2	N2	H20
100A Cut	Air	O2	Air	N2	H35	N2	N2	H35	N2
				N2	N2	H20	N2	N2	H20
150A Cut				N2	H35	N2	N2	H35	N2
				N2	N2	H20	N2	N2	H20
200A Cut	Air	O2	Air	N2	H35	N2	N2	H35	N2
				N2	N2	H20	N2	N2	H20
250A Cut	Air	O2	Air						
300A Cut	Air	O2	Air	N2	H35	N2	N2	H35	N2
				N2	N2	H20	N2	N2	H20
400A Cut				N2	H35	N2	N2	H35	N2
				N2	H17	N2	N2	H17	N2

2.12 XT Torch Specifications

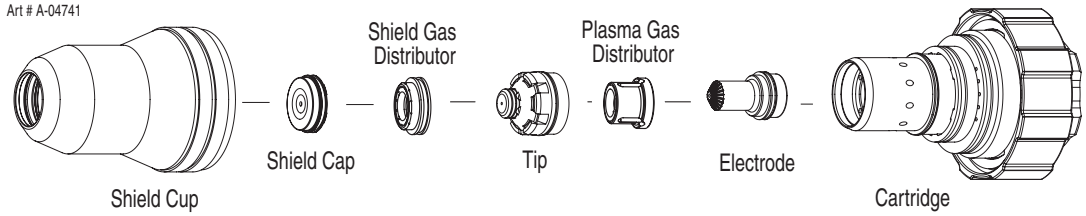
A. Torch Dimensions



B. Torch Leads Lengths

Torch Lead Assemblies	
Length	
Feet	Meters
10	3.05
15	4.6
25	7.6
50	15.2

C. Torch Parts (Generic Parts Shown)



D. Parts - In - Place (PIP)

The torch is designed for use with a power supply which senses coolant return flow to confirm that torch parts are in place. If coolant return flow to the power supply is absent or insufficient the power supply will not provide power to the torch. Coolant leakage from the torch also indicates that torch parts are absent or installed improperly.

E. Type of Cooling

Combination of gas stream through torch and liquid cooling.

F. XT Torch Data (with Ultra-Cut® 400 Power Supply)

XT Torch Ratings for use with Ultra-Cut 400 Power Supply	
Ambient Temperature	104° F 40° C
Duty Cycle	100% @ 400 Amps
Maximum Current	400 Amps
Voltage (Vpeak)	500V
Arc Striking Voltage	10kV
Current	Up to 400 Amps, DC, Straight Polarity
XT Torch Gas Specifications	
Plasma Gases:	Compressed Air, Oxygen, Nitrogen, H35, H17
Shield Gases:	Compressed Air, Oxygen, Nitrogen, Water
Operating Pressure	125 psi ± 10 psi 8.6 bar ± 0.7 bar
Maximum Input Pressure	135 psi / 9.3 bar
Gas flow	10 - 300 scfh

G. Plasma Power Supply Used With:

- Thermal Dynamics Ultra-Cut® 400

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SECTION 3: INSTALLATION

3.01 Installation Requirements

Electric Supply

The electrical supply network, the gas and water supply system must meet local safety standards. This conformity shall be checked by qualified personnel.

Ultra-Cut 400 Power Supply						
Input		Power Input	Current	Suggested Sizes (See Note)		
Voltage	Freq.	3-Ph	3-Ph	Fuse (Amps)	Wire (AWG)	Wire (mm^2)
(Volts)	(Hz)	(kVA)	(Amps)	3-Ph	3-Ph	3-Ph
208	50/60	119	336	350	300MCM	150
230	50/60	119	304	350	250MCM	150
460	50/60	116	148	175	#1	50
380	50/60	120	183	225	1/0	70
400	50/60	120	174	225	1/0	70

* Suggested wire size based on United States NFPA 70 National Electrical Code 2005 edition published by the National Fire Prevention Association.
Listings are from table 400.5(B) for flexible cord of certain types rated for 75 deg C in ambient temperatures up to 30 deg C. Using wires of lower temperature rating or different insulation type may require larger wire size. Derate for higher ambient.
These are suggestions only. Always refer to your local and national codes that apply to your region for final determination of correct wire type and size.

CAUTION

Fuse and wire sizes are for reference only. The installation must conform to national and local codes for the type and method of wire being used.

Gas Supply

The customer must supply all gases and pressure regulators. Gases must be of high quality. Pressure regulators must be double-stage and installed as close as possible to the gas console. Contaminated gas can cause one or more of the following problems:

- Reduced cutting speed
- Poor cut quality
- Poor cutting precision
- Reduced consumables life.
- Oil or grease contamination from compressed or bottled air can cause fires in conjunction with oxygen.

Cooling System Requirements

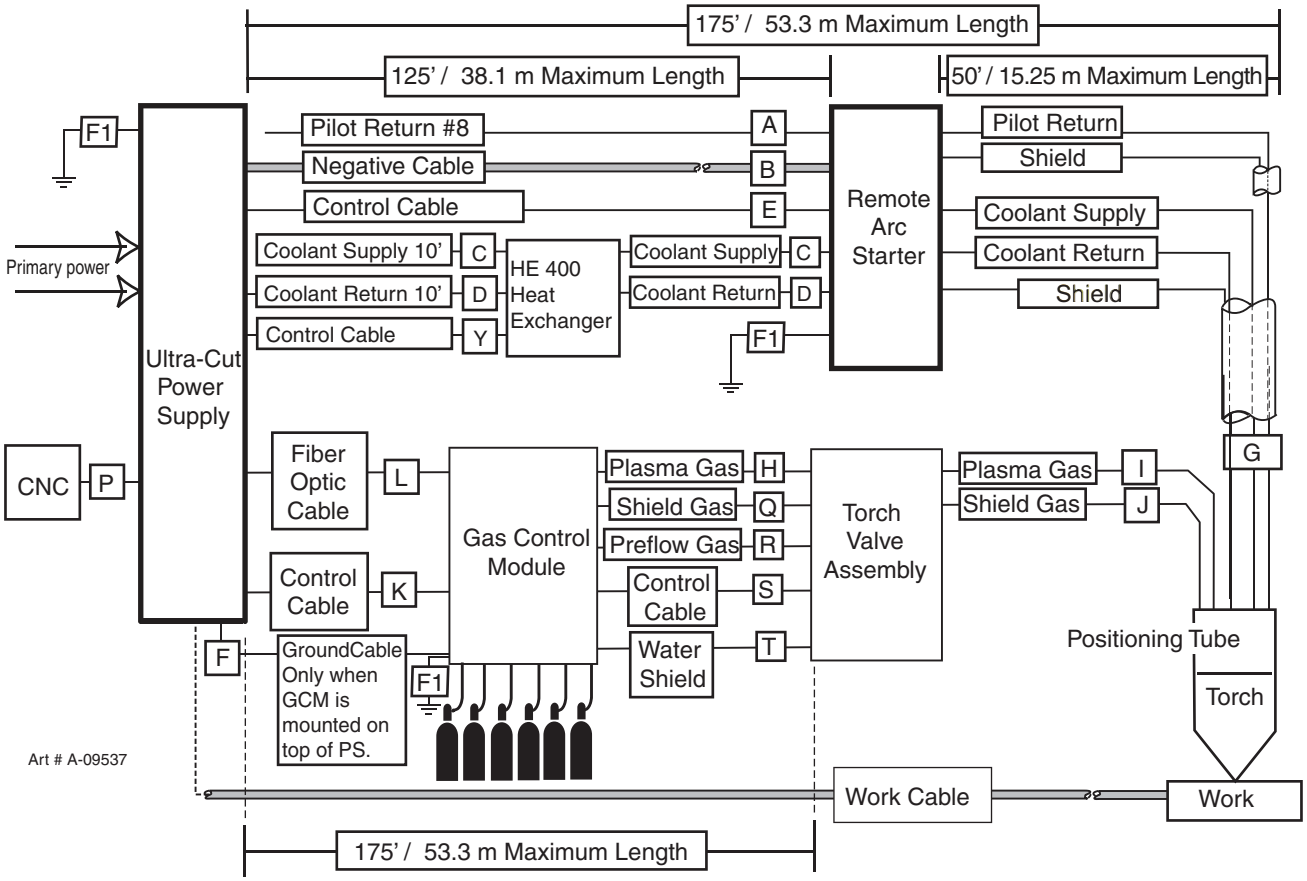
Coolant must be added to the system on installation. The amount required varies with torch leads length.

Thermal Dynamics recommends the use of its coolants 7-3580 and 7-3581 (for low temperatures).

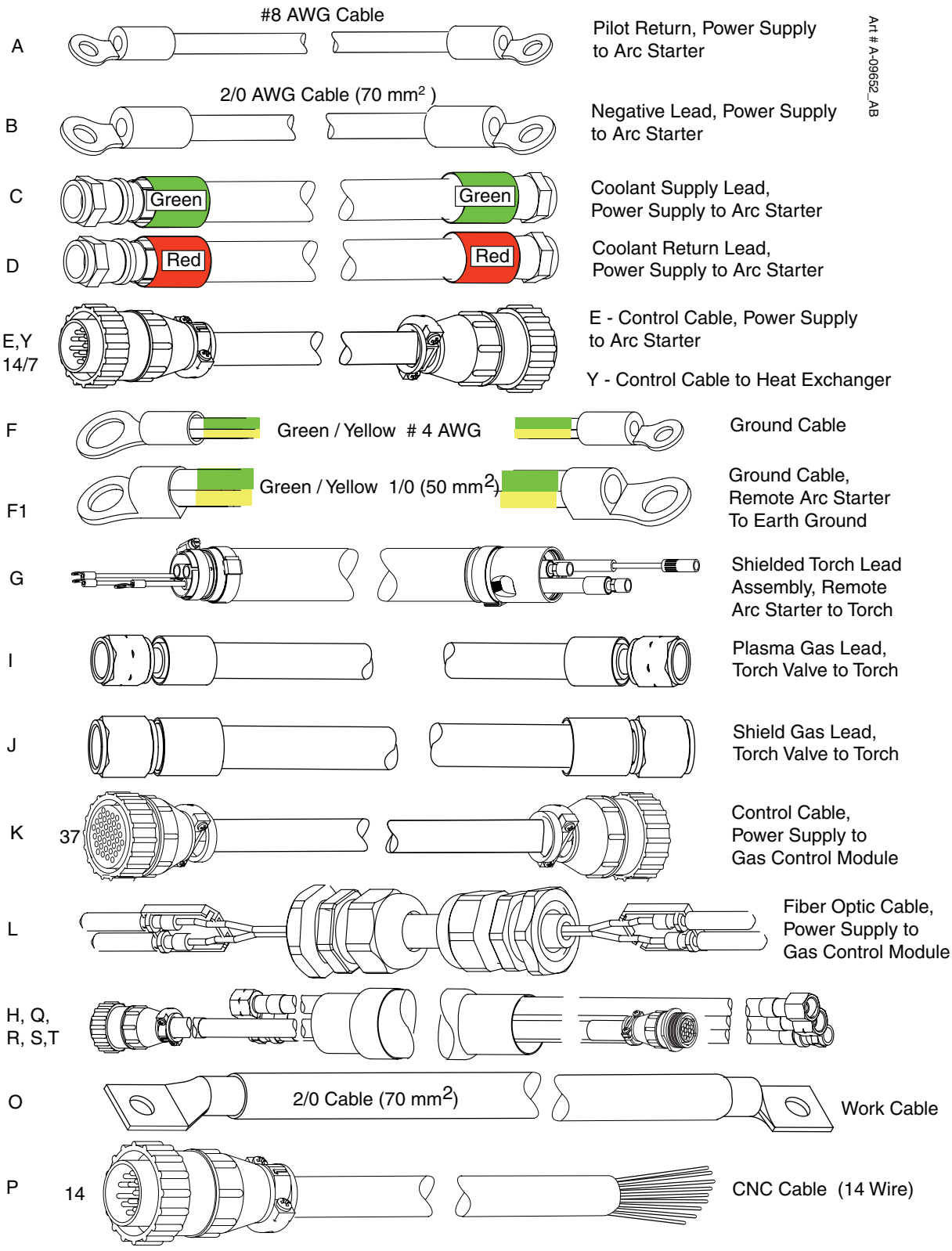
Coolant Capabilities		
Cat. Number and Mixture	Mixture	Protects To
7-3580 'Extra-Cool™'	25 / 75	10° F / -12° C
7-3581 'Ultra-Cool™'	50 / 50	-27° F / -33° C
7-3582 'Extreme Cool™'	Concentrate*	-76° F / -60° C
* For mixing with D-I Cool™ 7-3583		

3.02 System Layout

Refer to section 3.05 for ground connections and ground cables.



3.03 Cables & Leads Identification



3.04 Lift the Power Supply

WARNINGS

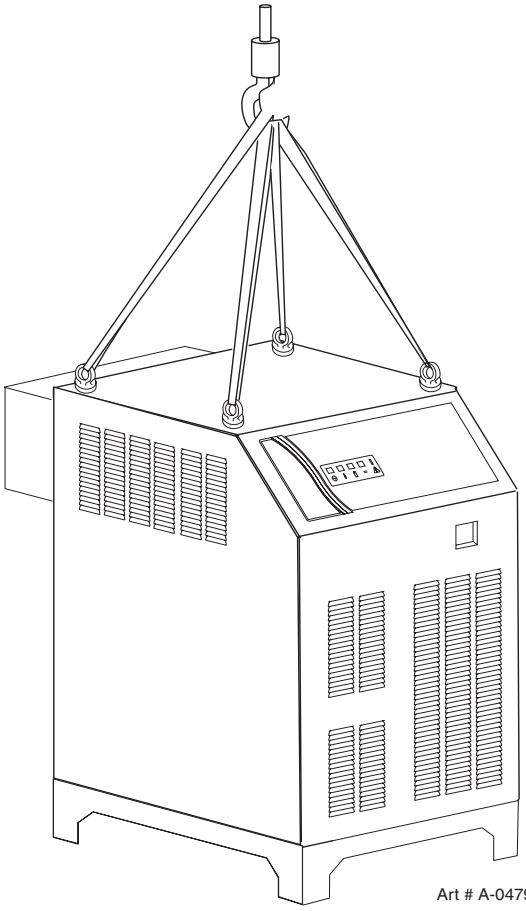
Do not touch live electrical parts.

Disconnect input power conductors from de-energized supply line before moving unit.

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

Use all four lifting eyes when using lifting straps to lift the power supply.

Use a forklift, crane, or hoist to lift the unit off the shipping pallet as shown. Keep the power supply steady and vertical. Do not lift it any further than necessary to clear the shipping pallet. Ensure all panels and screws are secure prior to lifting.



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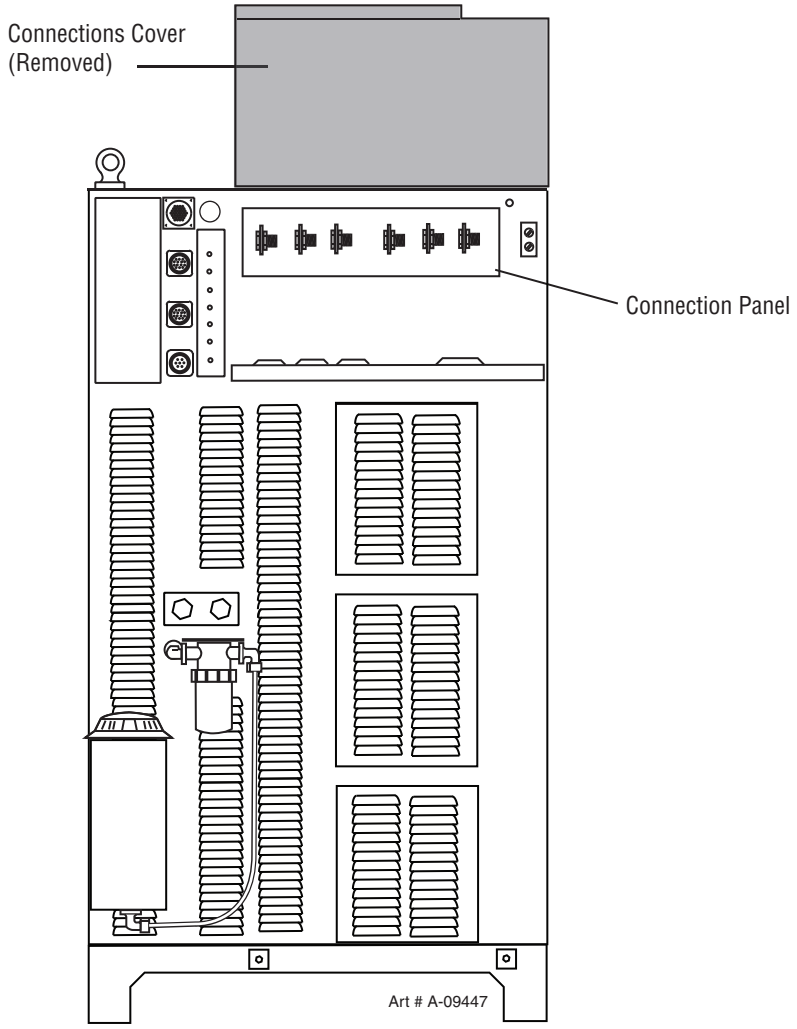
Set the power supply on a solid, level surface. The installer may fasten the power supply to the floor or a supporting fixture with hardware passing through the horizontal parts of the power supply feet.

3.05 Remove the Connections Cover

The primary power cable must be supplied by the end user and connected to the power supply.

Remove the connections cover on the rear of the Power Supply. Use caution when removing the panel; there is a ground wire connected to the inside of the panel. Do not disconnect this wire.

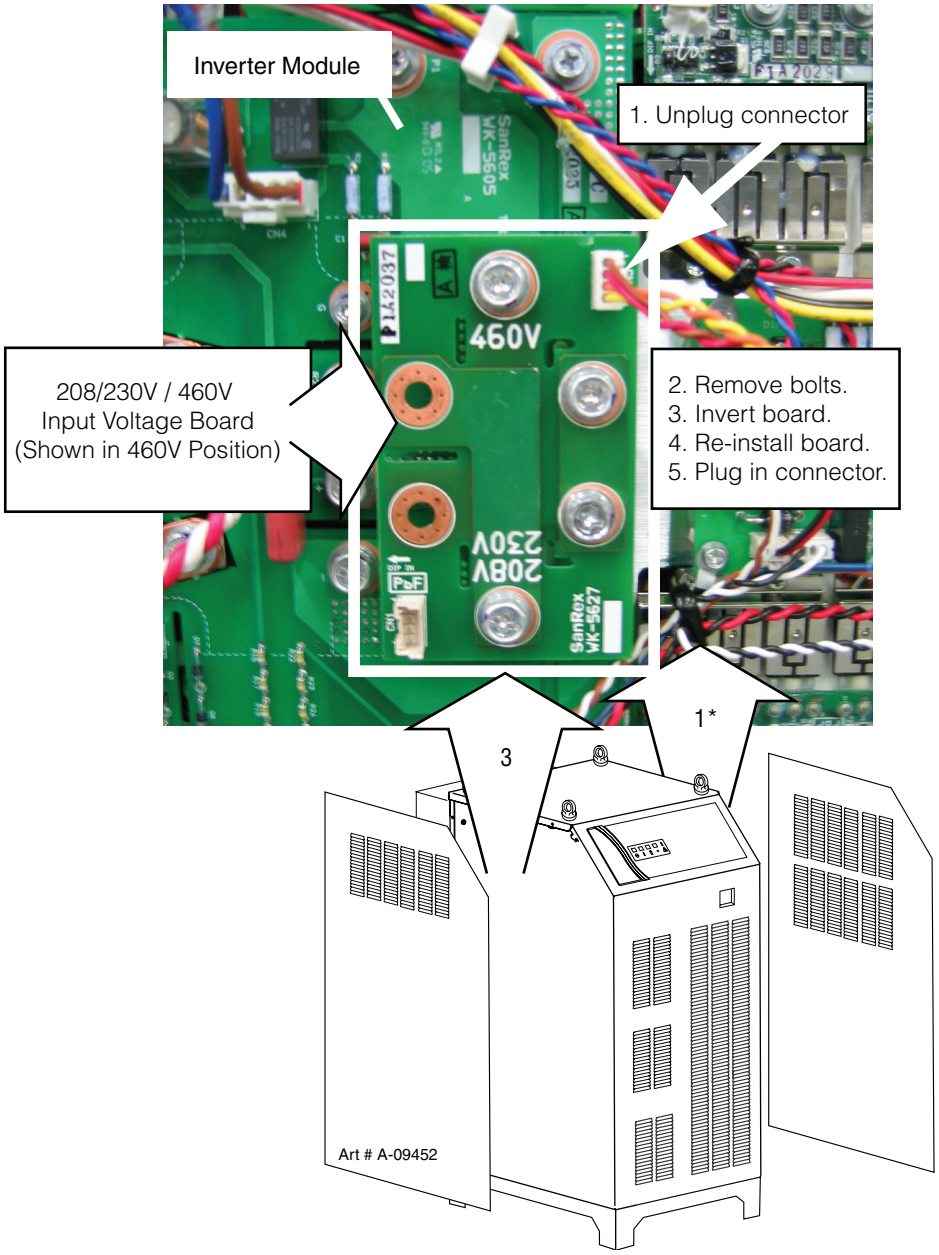


Check / Adjust Input Voltage Configuration for 208/230 and 460V Systems

1. The 208/230 and 460 V power supply includes a voltage configuration board which must be positioned to match the primary input voltage. Remove the power supply left and right side panel and locate the voltage configuration board. The input voltage configuration is shown at the top of the board for three on the left side and on the bottom for the single one on the right side. See NOTE.
2. If necessary, disconnect the jumper at the top right corner of the board, remove the board and reinstall it with the correct input voltage shown at the top of the board.
3. Reconnect the jumper. Reinstall the power supply side panel.

NOTE:

There are 4 inverters in the power supply. 3 on one side and 1 on the other. The single inverter will be installed upside down (opposite) of the other 3 so the 460V will be on the bottom when the other 3 will be on top as shown below.*



Connect Input Power and System Ground Cables

1. Carefully cut back the outer sheath on the primary input power cable to expose the individual wires. Cut back the insulation on the individual wires. Route the cable upward through leads bracket at the bottom of the rear panel, then through the connections cover support panel on the rear panel of the power supply.

NOTE

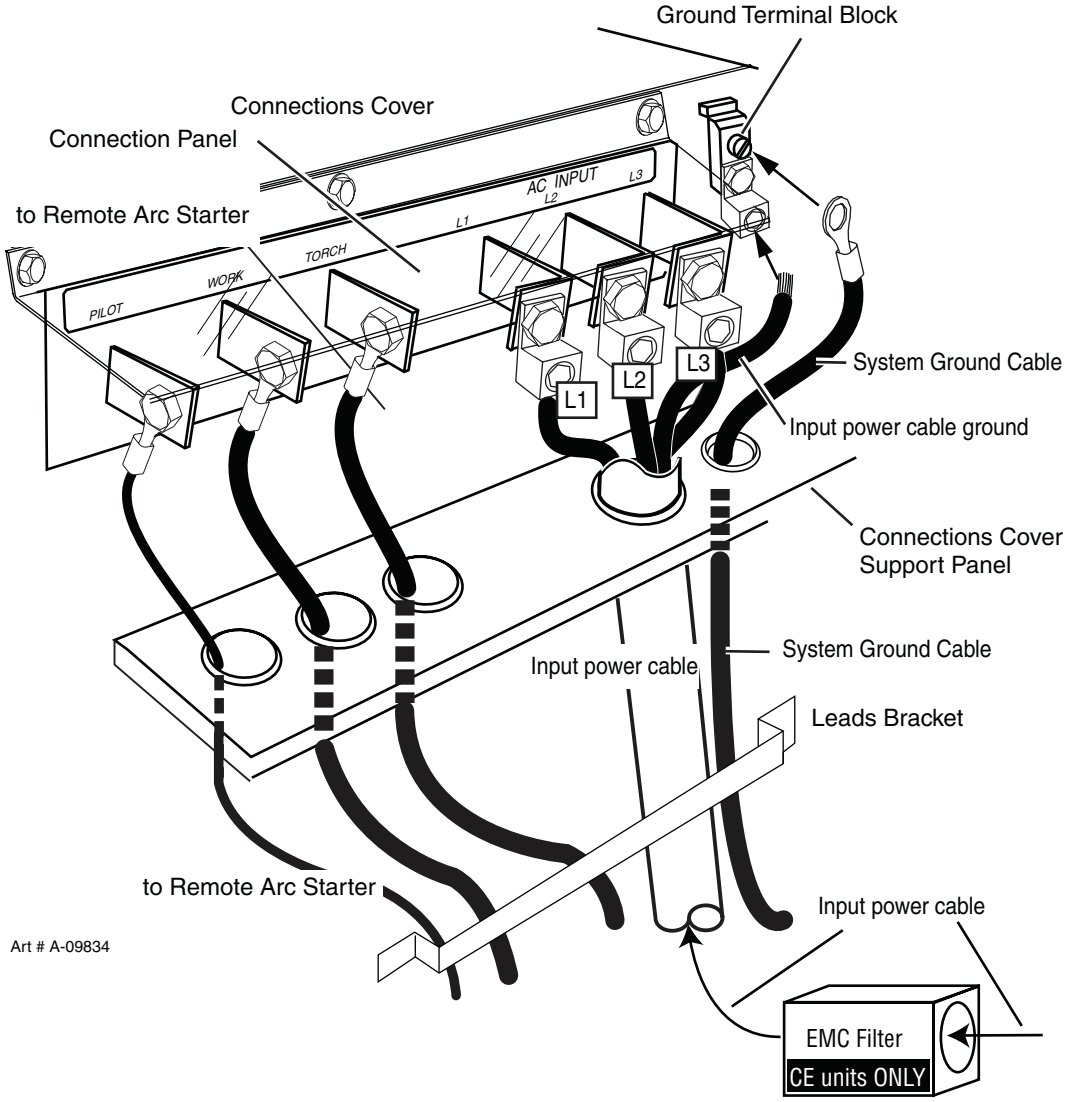
For CE versions the cable will need to be routed through the EMC filter box first. See following illustration.

2. Install stripped end of 3 phase wires into the terminal block L1, L2 and L3.
3. Connect the individual cables as shown. Connect the power cable ground cord to the ground terminal block.

CAUTION

The clear connections cover must remain in place.

4. If required pass a system ground cable (F1) through the last opening in the connections cover support panel next to the input power cable. Connect the cable to the ground terminal block on the power supply rear panel. Refer to the Ground Connections Section for full details and procedures on proper system grounding.

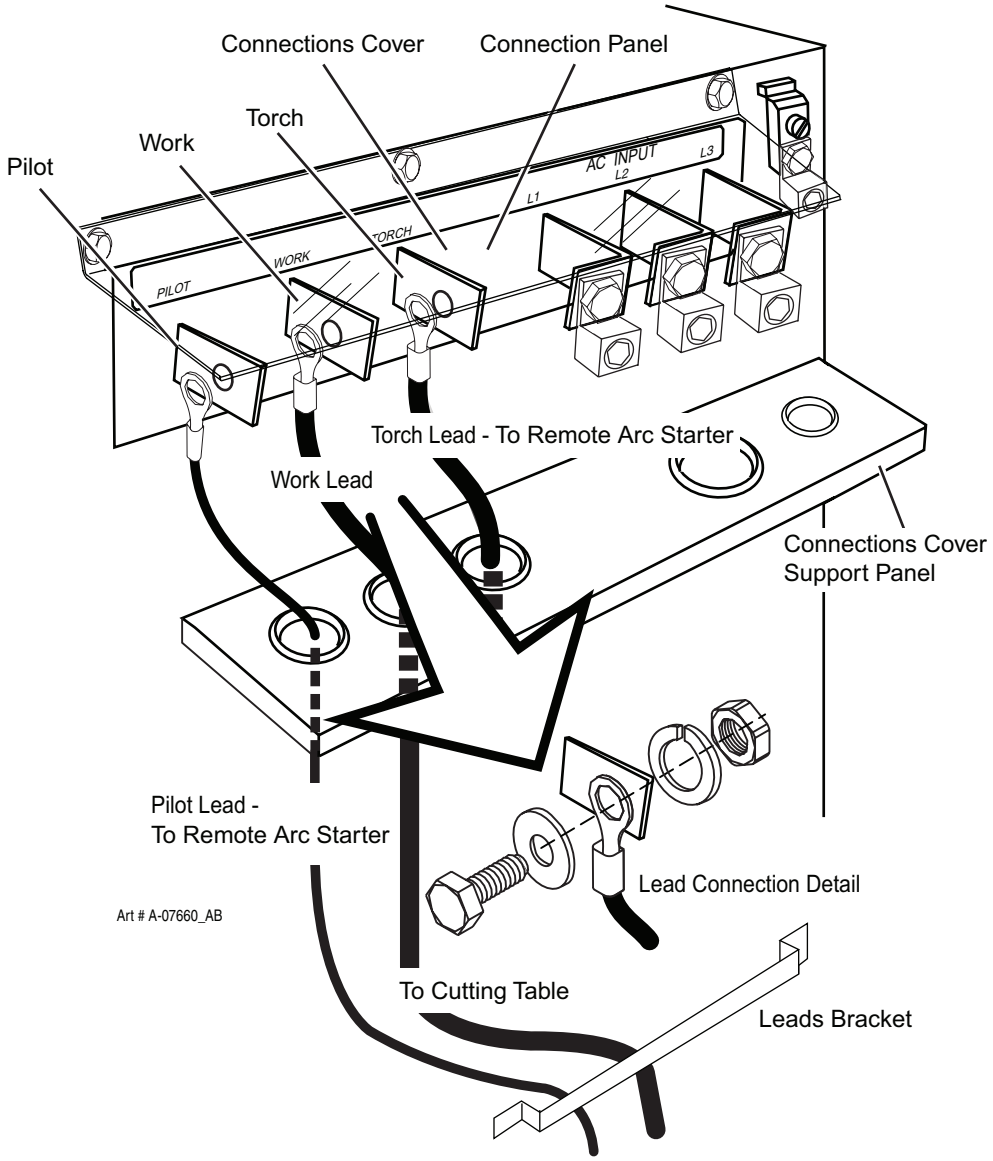


3.06 Connect Work Cable and Pilot and Negative Leads

1. Pass the ends of the work cable and pilot and negative leads upward through the leads bracket at the bottom edge of the rear panel, then through the openings in the connections cover support panel.
2. Refer to the illustration. Connect the leads as shown. Tighten securely. Do not overtighten.

CAUTION

The clear connections cover must remain in place.

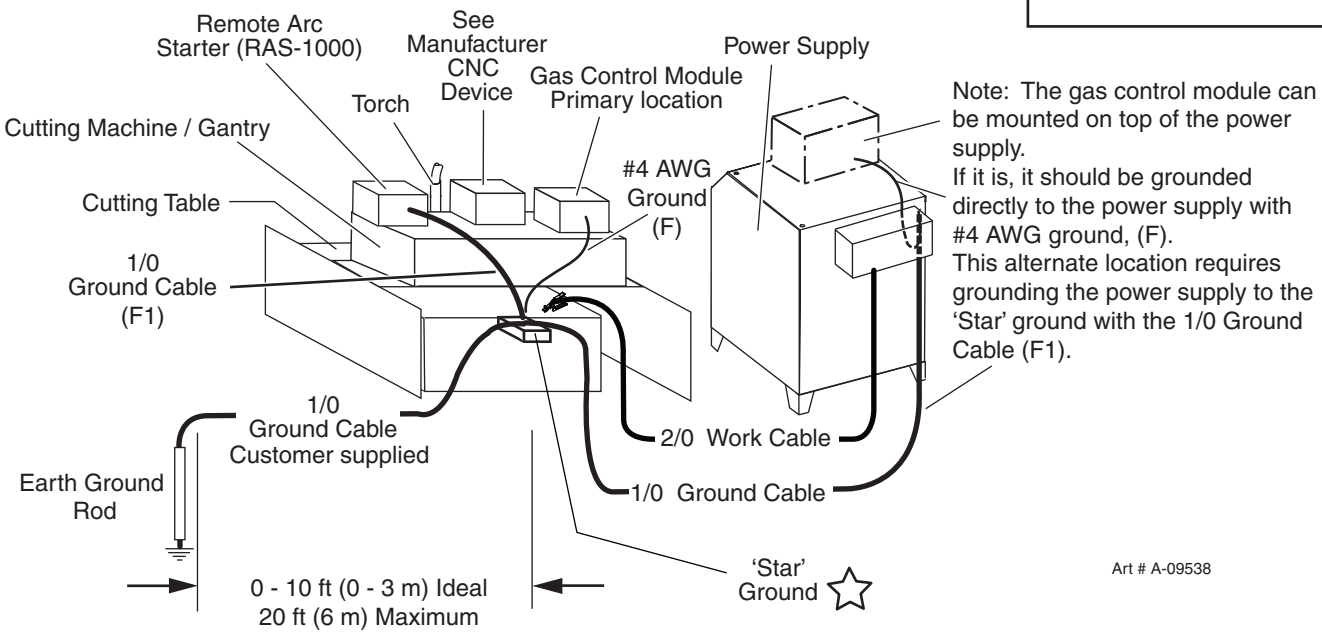


3. Reinstall the connections cover on the power supply. Snug the hardware securely by hand. Do not overtighten.

3.07 Ground Connections

300Amp or more Ultra-Cut or Auto-Cut O2

Star Ground on Cutting Table



A. Electromagnetic Interference (EMI)

Pilot arc starting generates a certain amount of electromagnetic interference (EMI), commonly called RF noise. This RF noise may interfere with other electronic equipment such as CNC controllers, remote controls, height controllers, etc. To minimize RF interference, follow these grounding procedures when installing mechanized systems:

B. Grounding

1. The preferred grounding arrangement is a single point or "Star" ground. The single point, usually on the cutting table, is connected with 1/0 AWG (European 50 mm^2) or larger wire to a good earth ground (measuring less than 3 ohms; an ideal ground measures 1 ohm or less. Refer to paragraph 'C', Creating An Earth Ground. The ground rod must be placed as close as possible to the cutting table, ideally less than 10 ft (3.0 m), but no more than 20 ft (6.1 m) from the cutting table.

NOTE

All ground wires should be as short as possible. Long wires will have increased resistance to RF frequencies. Smaller diameter wire has increased resistance to RF frequencies, so using a larger diameter wire is better.

2. Grounding for components mounted on the cutting table (CNC controllers, height controllers, plasma remote controls, etc.) should follow the manufacturer's recommendations for wire size, type, and connection point locations.

   For Thermal Dynamics components (except Remote Arc Starter and Gas Control Module) it is recommended to use a minimum of 10 AWG (European 6 mm^2) wire or flat copper braid with cross section equal to or greater than 10 AWG connected to the cutting table frame. The Remote Arc Starter uses 1/0 earth ground wire and the Gas Control Module should use minimum # 4 AWG wire. The connection point must be to clean bare metal; rust and paint make poor connections. For all components, wires larger than the recommended minimum can be used and may improve noise protection.

3. The cutting machine frame is then connected to the “Star” point using 1/0 AWG (European 50 mm^2) or larger wire.

4. The plasma power supply work cable (see NOTE) is connected to the cutting table at the single point “Star” ground.

NOTE

Do Not connect the work cable directly to the ground rod. Do not coil up excess ground or power cables. Cut to proper length and reterminate as needed.

5. Make sure work cable and ground cables are properly connected. The work cable must have a solid connection to the cutting table. The work and ground connections must be free from rust, dirt, grease, oil and paint. If necessary grind or sand down to bare metal. Use lock washers to keep the connections tight. Using electrical joint compound to prevent corrosion is also recommended.

6. The plasma power supply chassis is connected to the power distribution system ground as required by electrical codes. If the plasma supply is close to the cutting table (see NOTE) a second ground rod is not usually needed, in fact it could be detrimental as it can set up ground loop currents that cause interference.

   When the plasma power supply is far away from the ground rod and interference is experienced, it may help to install a second earth ground rod next to the plasma power supply. The plasma power supply chassis would then be connected to this ground rod.

NOTE

It is recommended that the Plasma Power Supply be within 20 - 30 ft (6.1 – 9.1 m) of the cutting table, if possible.

7. The plasma control cable should be shielded with the shield connected only at the cutting machine end. Connecting the shield at both ends will allow ground loop currents which may cause more interference than with no shield at all.

Creating An Earth Ground

1. To create a solid, low resistance, earth ground, drive a 1/2 in (12 mm) or greater diameter copper clad ground rod at least 6 - 8 ft (1.8 - 2.4 m) into the earth so that the rod contacts moist soil over most of its length. Depending on location, a greater depth may be required to obtain a low resistance ground (see NOTE). Ground rods, typically 10 ft (3.0 m) long, may be welded end to end for greater lengths. Locate the rod as close as possible to the work table. Install a ground wire, 1/0 AWG (European 50 mm2) or greater, between the ground rod and the star ground point on the cutting table.

NOTE

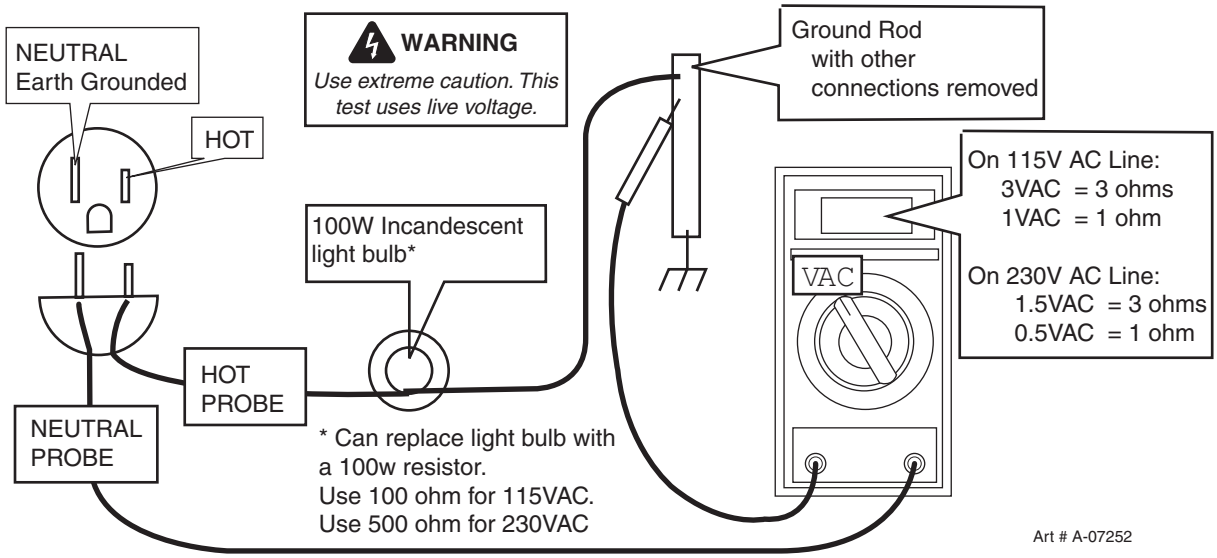
Ideally, a properly installed ground rod will have a resistance of three ohms or less.

To test for a proper earth ground, refer to the following diagram. Ideally, the reading on the multimeter should be as shown.

CAUTION

No other connections should be made at the ground rod being tested.

This test assumes the 115 or 230 VAC source neutral is connected to the utility earth ground.



Ground Testing

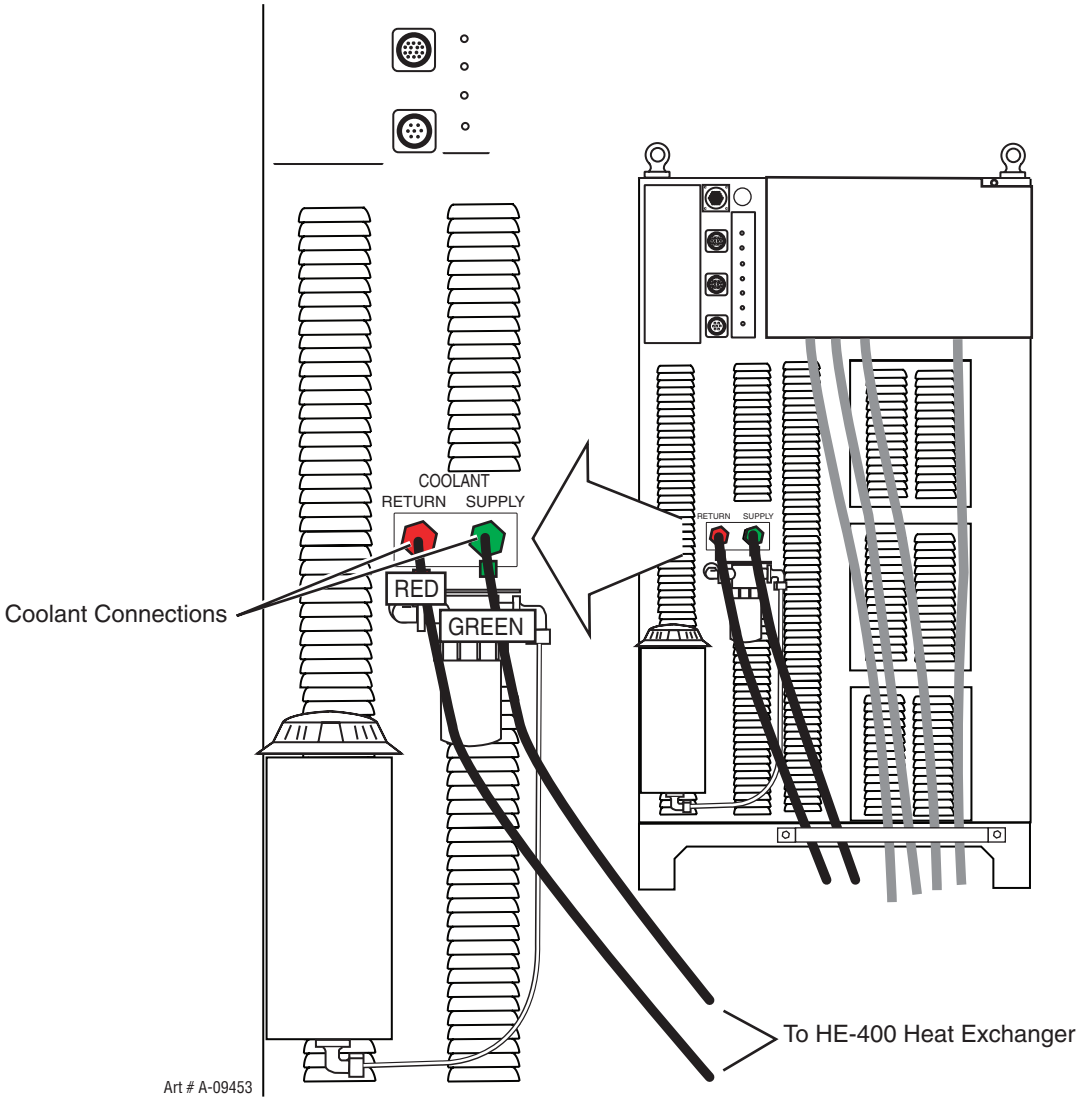
2. Increasing the ground rod length beyond 20 - 30 ft (6.1 – 9.1 m) does not generally increase the effectiveness of the ground rod. A larger diameter rod which has more surface area may help. Sometimes keeping the soil around the ground rod moist by continuously running a small amount of water into it will work. Adding salt to the soil by soaking it in salt water may also reduce its resistance. You may also try a chemical ground rod devise. When these methods are used, periodic checking of the ground resistance is required to make sure the ground is still good.

D. Routing Of Torch Leads

1. To minimize RF interference, position torch leads as far as possible from any CNC components, drive motors, control cables, or primary power lines. If cables have to pass over torch leads, do so at an angle. Do not run the plasma control or other control cables in parallel with the torch leads in power tracts.
2. Keep torch leads clean. Dirt and metal particles bleed off energy, which causes difficult starting and increased chance of RF interference.

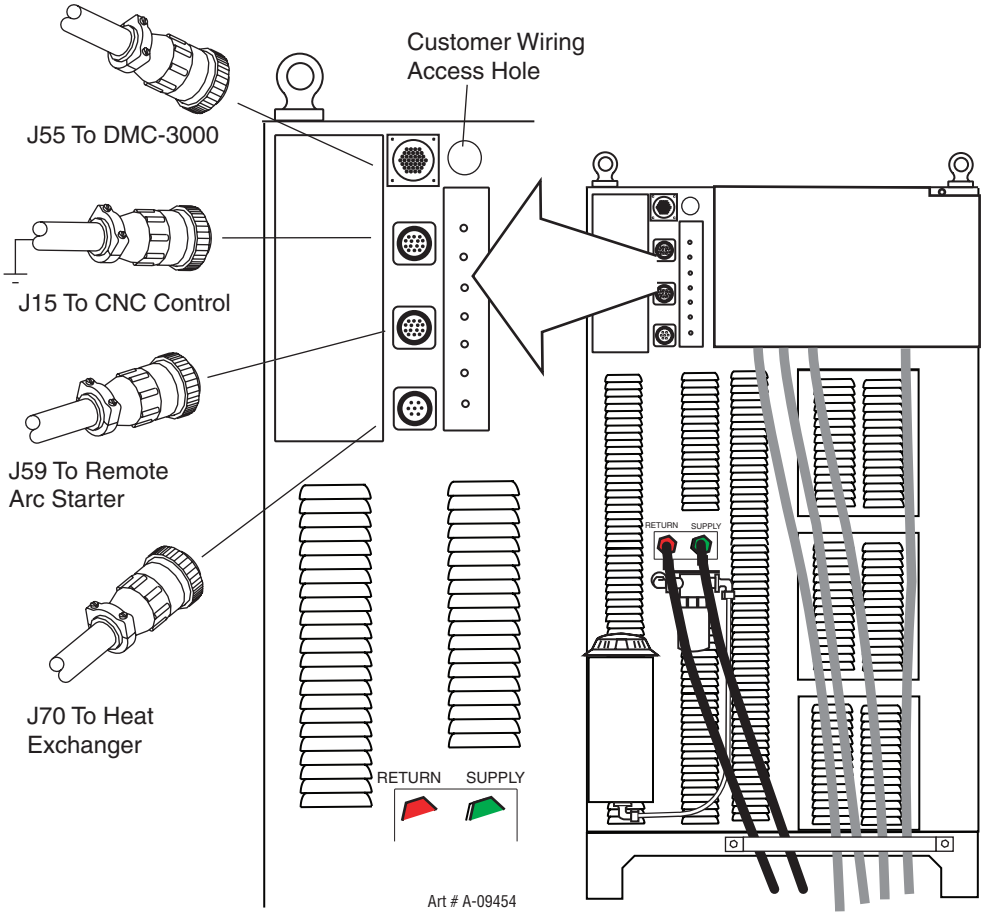
3.08 Connect Coolant Leads

1. Connect the color-coded coolant hoses to the coolant connections on the power supply rear panel. The supply line (out) is flagged green, the return line (in) is flagged red.



3.09 Connect Cables for CNC, Remote Arc Starter, DMC-3000 and HE 400

1. Connect one end of each cable to the power supply.
2. Connect the other end of the CNC cable to the CNC device.
3. The CNC cable shield must be attached to ground.

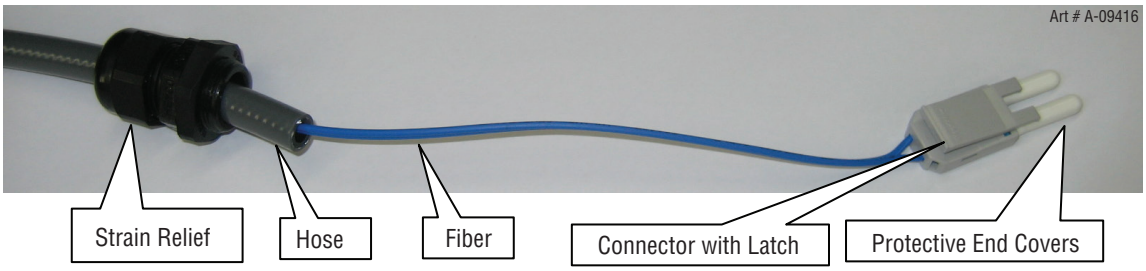


3.10 Handling and Installation of Fiber Optics

General Information

This kit is for proper handling and installation of Fiber Optic Cables used in Thermal Dynamics Ultra-Cut® and Auto-Cut O2® automated gas boxes and Gas Control Modules.

Fiber Optic cable is used in place of wire because it offers far superior immunity to electrical noise but it is more delicate and requires careful handling. With fiber optics, electrical signals are converted to light with a transmitter LED. The light passes down the fiber where it is converted back to an electrical signal at the receiver end. Any damage to the fiber from sharp bends or pulling that stretches the fiber can reduce it's ability to transmit light. We run the fiber inside a hose for most of its length to protect it from abrasion, burning from hot metal or sharp bends but the ends are exposed and must be handled with care.



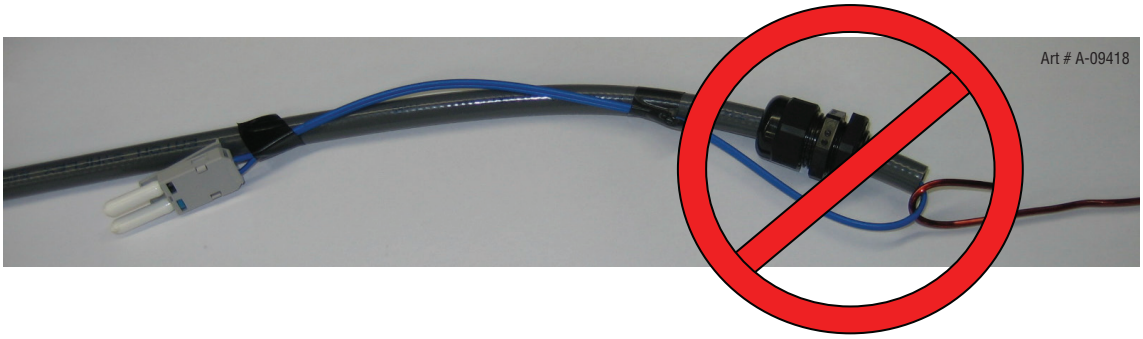
WARNINGS

Disconnect primary power at the source.

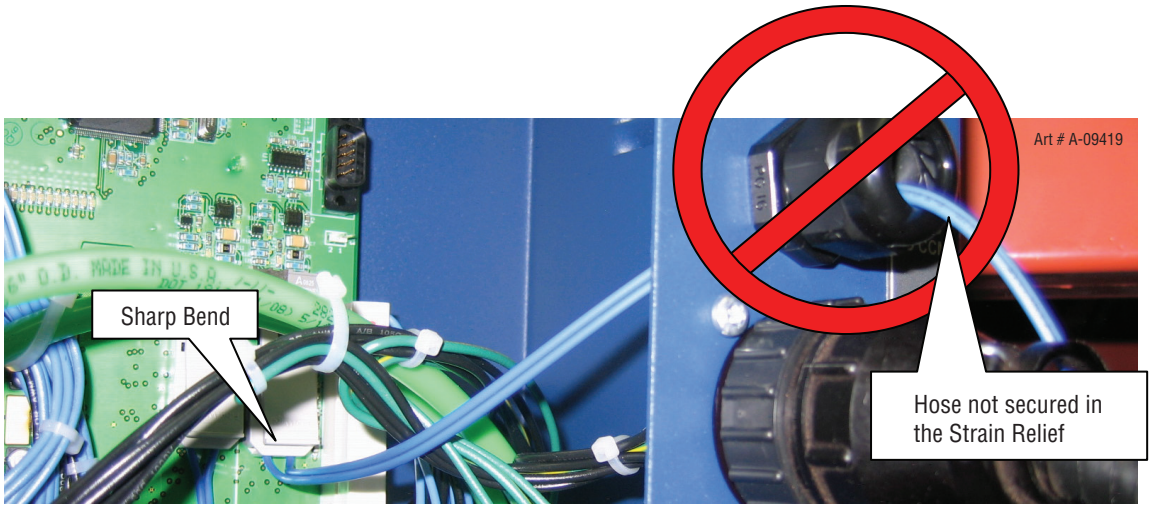
Avoid the following:

1. If you need to pull the cable through a power track do not fold the fiber back on itself making a sharp bend where it exits the hose.

2. Don't hook onto the fiber to pull on the cable.

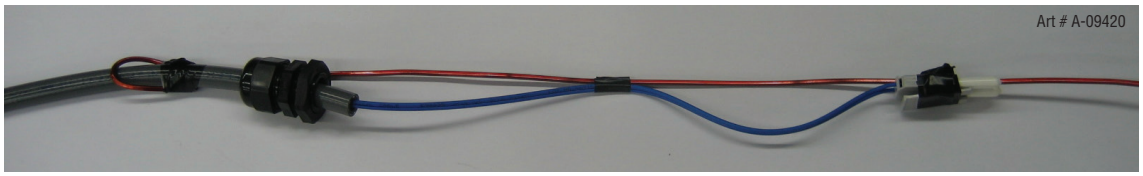


3. Once the fiber cable is installed in the CCM or gas control make sure the strain relief nut is securely tightened onto the hose so the hose can't pull out of it like this:

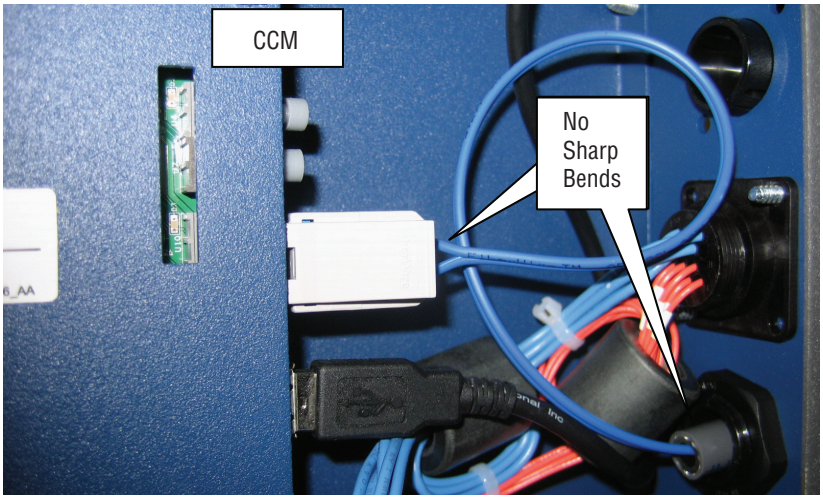


Correct installation:

Correct way to pull the cable is to use a snake or a wire or another cable and attach it securely to the hose behind the strain relief. Then secure the fiber connector to the pulling device leaving some slack in the fiber. Keep the protective end covers on the fiber until you are ready to connect it to the PCB in the CCM or gas control.



Correct installation in CCM or Gas Control leaves a loop of fiber so there is no stress on the fiber where it exits the connector or the hose.



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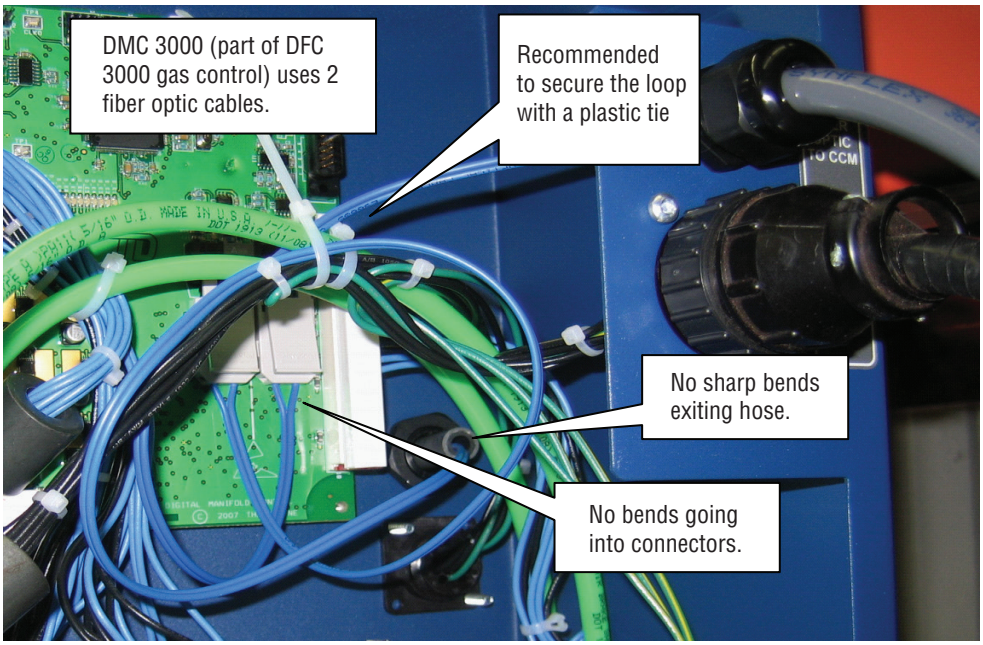

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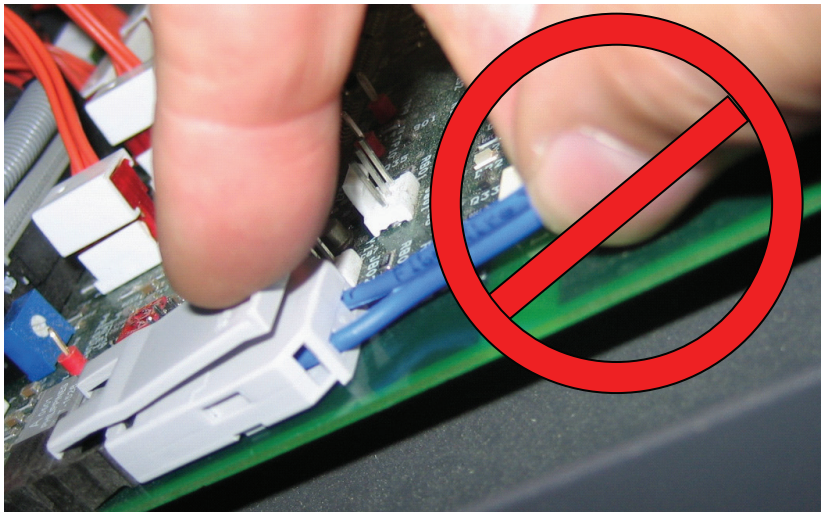
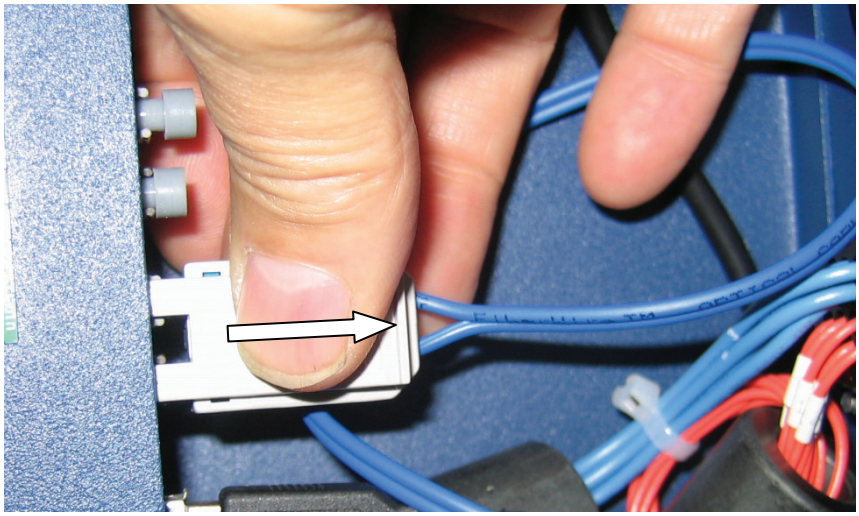
Unplugging the fiber optic connector.

Do not pull on the fiber!



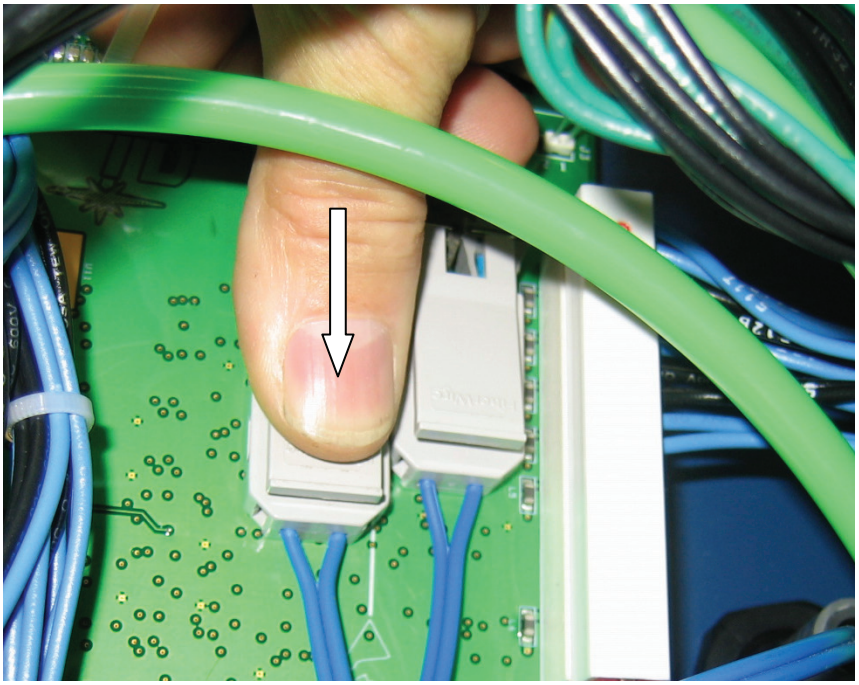
Art # A-09423

For the CCM grip the fiber connector front and back squeezing the latch lever and remove from the socket.



Art # A-09424

For the Gas controls where you can't grip the back of the connector, press in on the latch lever and push away from the sockets. Or grip the sides of the connector with thumb and finger while using index finger to press on the latch.



Art # A-09425

3.11 Connect Fiber Optic Cable (Type 3 internal control module)

CAUTION

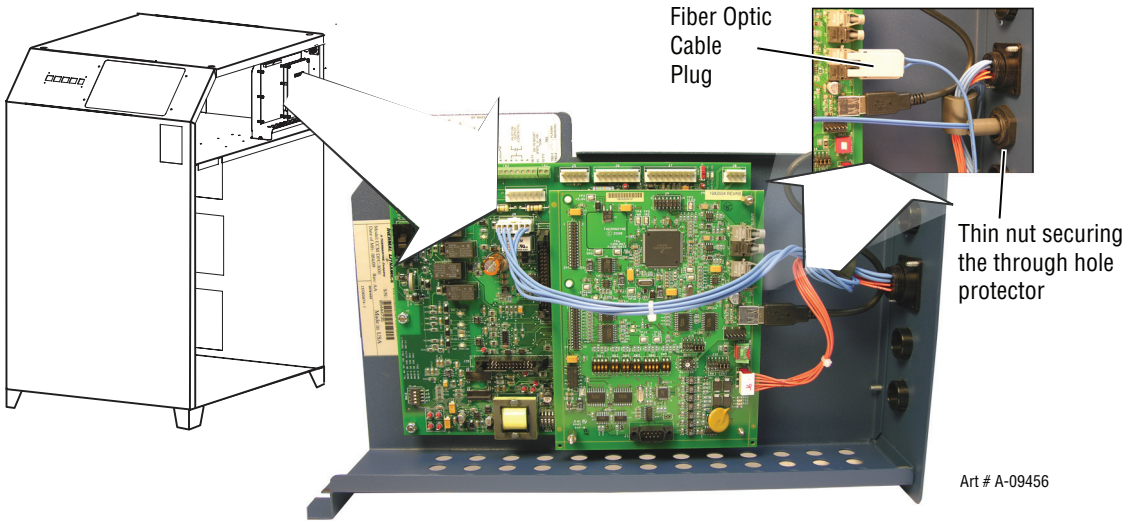
Check the type of internal control module.

1. Connect one end of each cable to the power supply as shown.

   a. Remove the strain relief securing nut from the strain relief on the fiber optic cable(s). Loosen the strain relief dome nut from the strain relief.

   b. Pass the cable connector through the appropriate opening. Slide the strain relief securing nut onto the cable. Make a loop of the cable; carefully press the cable connector into the appropriate receptacle on the internal control module.

   c. Tighten the strain relief onto the cable(s). Do not overtighten.



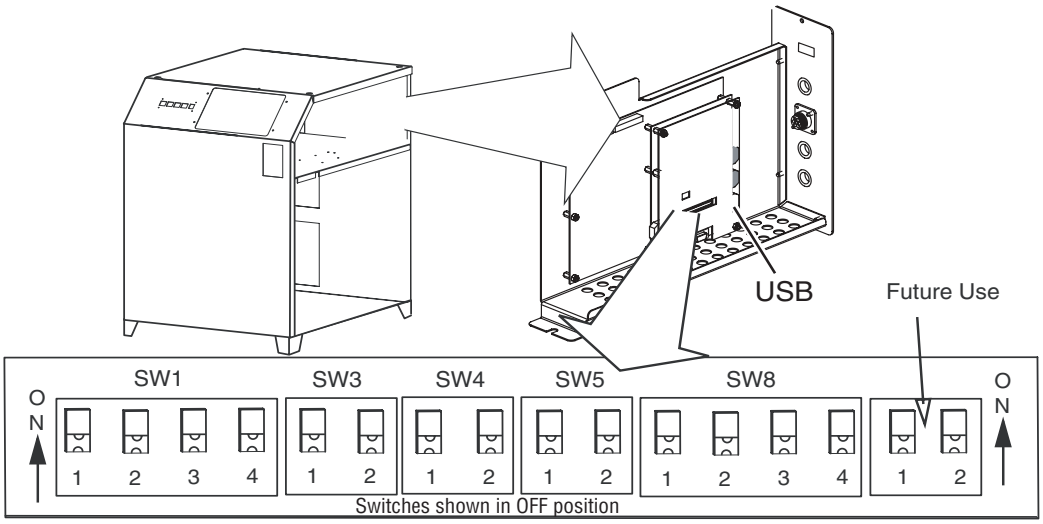
3.12 Set Switches on the Command - Control Module (Type 3 Module)

Compare the command - control module to the illustration. Follow instructions in this section for a module without an external connection cover.

Remove the power supply right side. Set switches on the CCM (Command-Control Module) per the illustrations. Switch settings and connection details are provided in the Appendix. Any changes made require a restart of the power supply.

CAUTION

Printed circuit boards in the Command - Control Module are static - sensitive. Discharge any built-up static charges in your body or surroundings before touching the printed circuit boards.

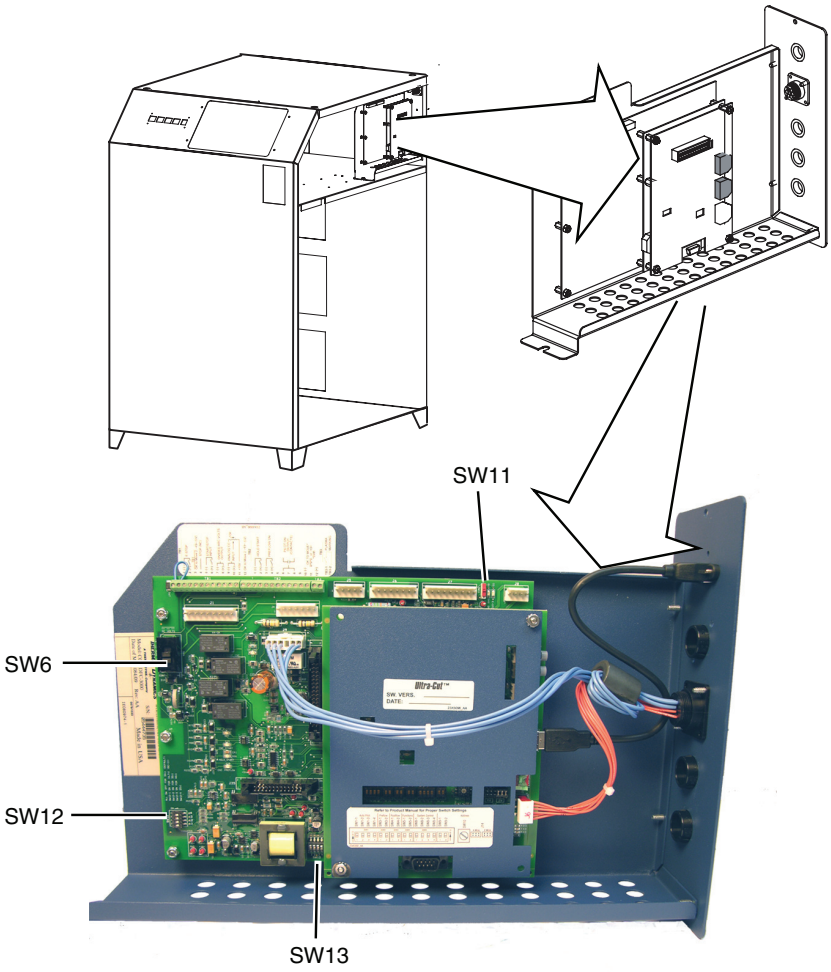


SW-1-1: Auto Pilot Restart.	1 = ON = Auto Pilot Function enabled. 1 = OFF = Auto Pilot Function disabled (Factory default setting).	
SW-1-2: Pilot Delay	2 = OFF, 3 = OFF, 4 = OFF: 0 Seconds (Factory default setting).	Active only when SW-1-1 is set to ON.
SW-1-3: Pilot Delay	2 = ON, 3 = OFF, 4 = OFF: 0.1 Seconds	
SW-1-4: Pilot Delay	2 = OFF, 3 = ON, 4 = OFF: 0.2 Seconds	
	2 = ON, 3 = ON, 4 = OFF: 0.4 Seconds	
	2 = OFF, 3 = OFF, 4 = ON: 0.8 Seconds	
	2 = ON, 3 = OFF, 4 = ON: 1.0 Seconds	
	2 = OFF, 3 = ON, 4 = ON: 1.5 Seconds	
	2 = ON, 3 = ON, 4 = ON: 2.0 Seconds	
SW-3: Gas Preflow Time	1 = Off, 2 = OFF: 2 seconds	
	1 = ON, 2 = OFF: 4 seconds	
	1 = OFF, 2 = ON: 6 seconds	
	1 = ON, 2 = ON: 8 seconds	
SW-4: Postflow Time	1 = OFF, 2 = OFF: 10 Seconds (Factory default setting).	
	1 = ON, 2 = OFF: 20 Seconds	
	1 = OFF, 2 = ON: 5 Seconds	
	1 = ON, 2 = ON: 0 Seconds	
SW-5-1: Tip Saver	Reserved for Factory use.	
SW-5-2: Off Plate	Reserved for Factory use.	
SW 8-1: Pilot Time	1 = OFF = Short (85 ms.) (Factory default setting). 1 = ON = Long (3 s.)	
SW 8-2: Remote Current	1 = OFF = Disabled (Factory default setting). 1 = ON = (Remote Analog Current Control)	* SW 8-3 is reserved for Factory use prior to Firmware V3.5
*SW 8-3: Auto Transfer Retry	1 = OFF = Enabled Up to 3 tries (Factory default setting). 1 = ON = Disabled	
SW 8-4:	OFF = Disabled (Factory default setting). ON = Remote Marking SW Enabled at TB3-1&2	

Art # A-06791_AC

CAUTION

Printed circuit boards in the Command - Control Module are static - sensitive. Discharge any built-up static charges in your body or surroundings before touching the printed circuit boards.



SW-6: OK-to-Move: Contact closure, 120VAC @ 1A (Factory default setting) or
DC Volts (16-18vdc@ up to 100 ma.)

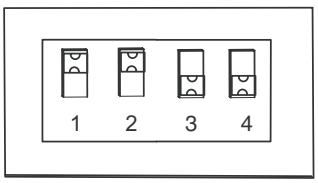
SW-11: Analog Current Control. B = from Gas Control (Factory default setting) or A = Remote Analog Source.
Position A requires that SW-8-2 be ON.

SW-12-1/2/3/4: Divided Arc signal All = OFF = 50:1 (Factory default setting)

1 = ON = 16.6:1
2 = ON = 30:1
3 = ON = 40:1
4 = ON = 25:1
} Only 1 on at a time.

Art # A-09458

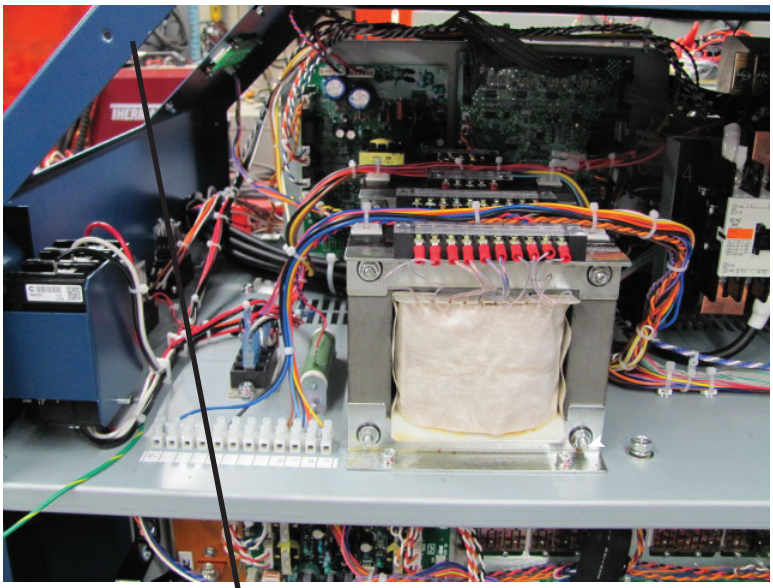
SW13: Ultra-Cut Switch positions



SW13 (Note positions 3-4 are not yet used)

3.13 Height Control Connections

The terminal strip has Arc Volts (-) connection to power supply negative output TORCH terminal, Arc Volts (+) connection to power supply positive output WORK terminal. These are for a height control that requires connection to the full non-divided arc voltage. Also available on the terminal strip are 120VAC (120,0) and 24 VAC (24, 0). Note that the two 0's are not common. The allowable current draw is 100ma @ 120VAC and 1Amp @ 24 VAC.



Art # A-09622

NOTE

There is also a hole added in the rear panel above the J55-GCM receptacle for customer wiring. This, rather than the one in the CCM will be the preferred place for customer added wiring (and strain relief) for connections to height controls, etc..

3.14 Gas Control Module Installation

The Gas Control Module must be installed in a suitable location where it is easily accessible to the system operator. The unit must be mounted to a flat horizontal surface. If the Module is mounted to a gantry or to any other support subject to vibration or motion, the installer must fasten the module to the support securely.

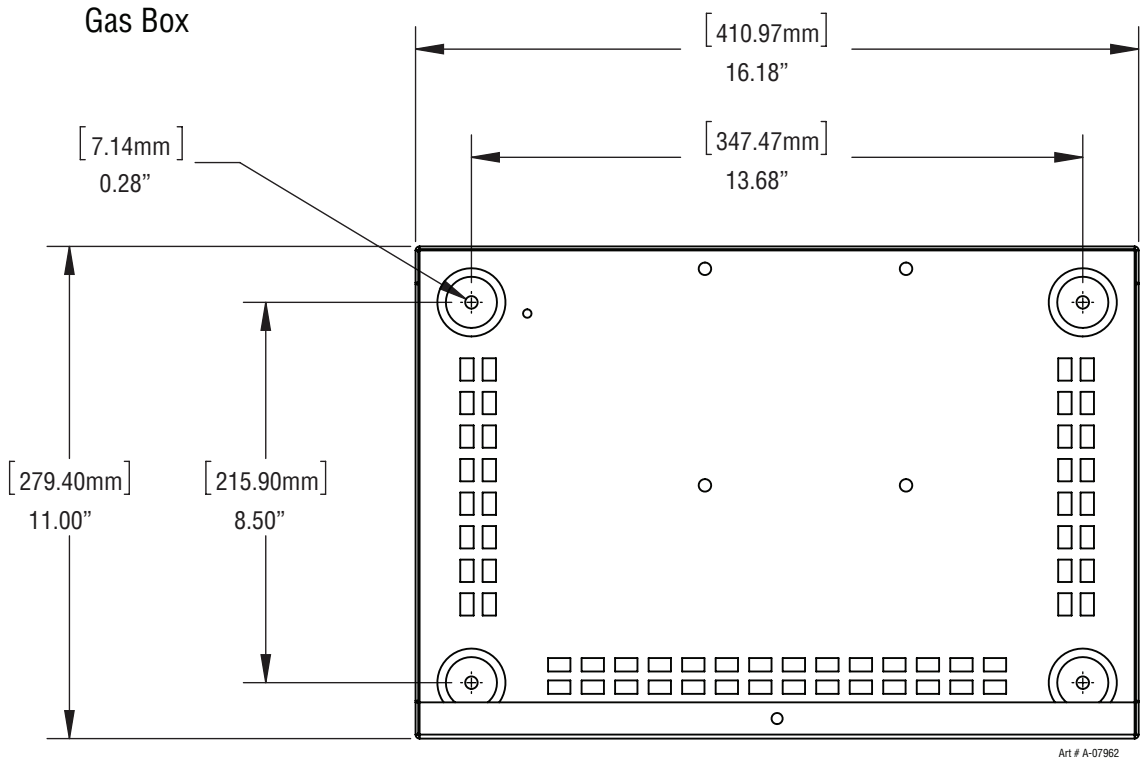
The Module should be located as far away as possible from the Arc Starter due to electromagnetic interference. It is acceptable to locate the control cable in the same track as the cables from the Arc Starter.

The Module includes feet which lift the bottom panel off the mounting surface. There are ventilation holes on the bottom panel; the space between the bottom panel and the mounting surface must remain open for ventilating air to enter the module. Louvers on the back panel of the module must also remain unblocked, for the free passage of ventilating air.

Mounting Dimensions

NOTE

Height not shown is 14.125" (359 mm)

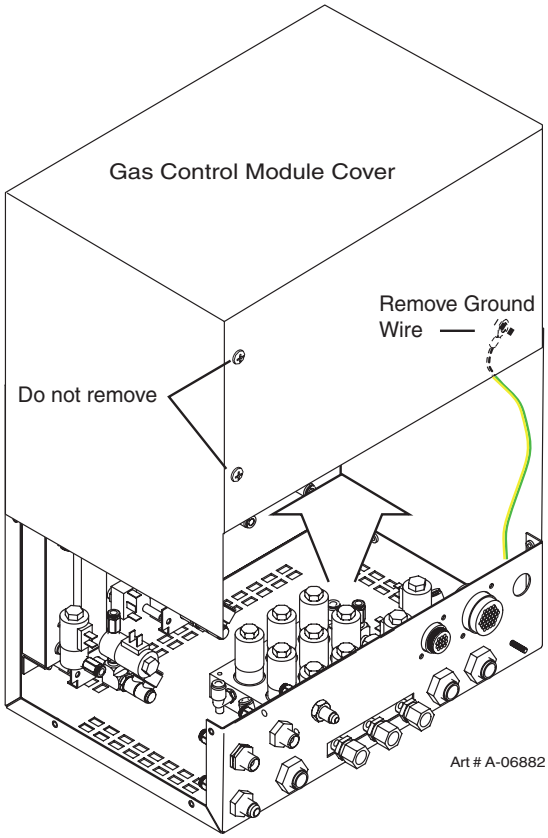


NOTE

The unit must be mounted so that the Flowmeters are plumb. If the Flowmeters are not plumb, incorrect flow indications may occur.

Preparation

1. Remove the screws securing the Cover Panel to the Module.
2. Carefully remove the cover from the module noting the attached ground wire. Remove the ground wire if needed.



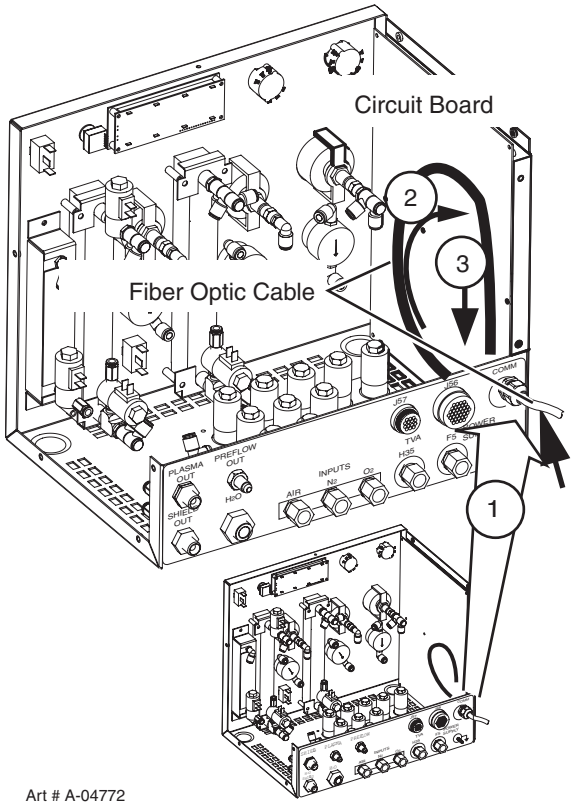
Cover Removal

3.15 Fiber Optic Cable Installation

1. Install the through-hole protector for the fiber-optic cable in the hole in connection panel on the back of the Module.
2. Pass the fiber-optic cable connector through the hole in connection panel on the back of the Module. Pass enough of the cable into the Module to allow the cable to loop upward as shown.

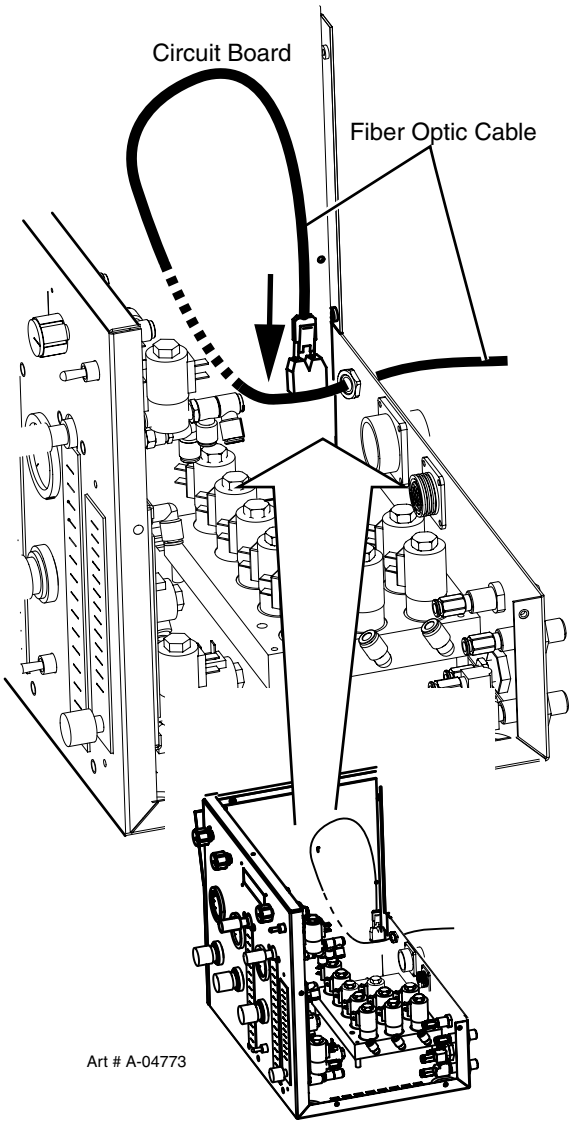
CAUTION

Avoid kinking, twisting, or bunching the fiber optic cable. The cable can be damaged by being forced into tight-radius turns.



Art # A-04772

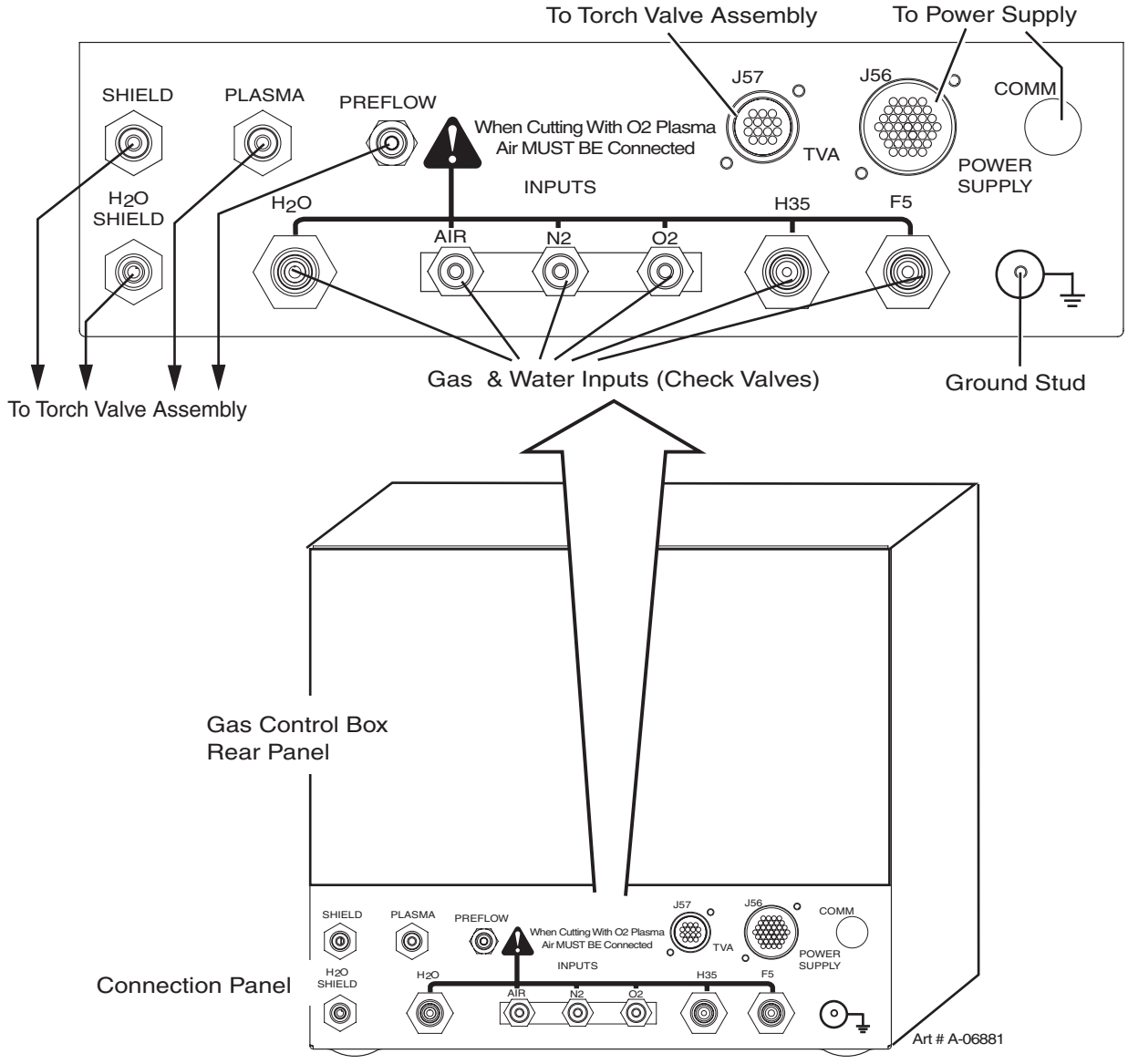
3. Insert the fiber-optic cable connector into the receptacle on the vertically-mounted circuit board as shown. Cable must snap into place.



4. Tighten the through-hole protector for the fiber-optic cable using hand tools.
5. Reinstall the Cover Panel making sure the ground wire is attached.

3.16 Gas Control Module: Control, Input, and Output Connections

1. Make all other connections to the rear of the Module. The connections are labeled. The Module must be grounded; the grounding terminal is marked ⏚ Use #10 AWG (European 6 mm²) (or thicker) wire for grounding. Keep the ground wire as short as possible.
2. Position the Module on a flat, horizontal, mounting surface.
3. Ensure that the Flowmeters are plumb.
4. Secure the Module to the mounting surface.
5. Connect all gas / water inputs to the rear panel of the module.
6. Connect the appropriate control cables to terminals marked 'TVA' (torch valve assembly) and 'power supply'.



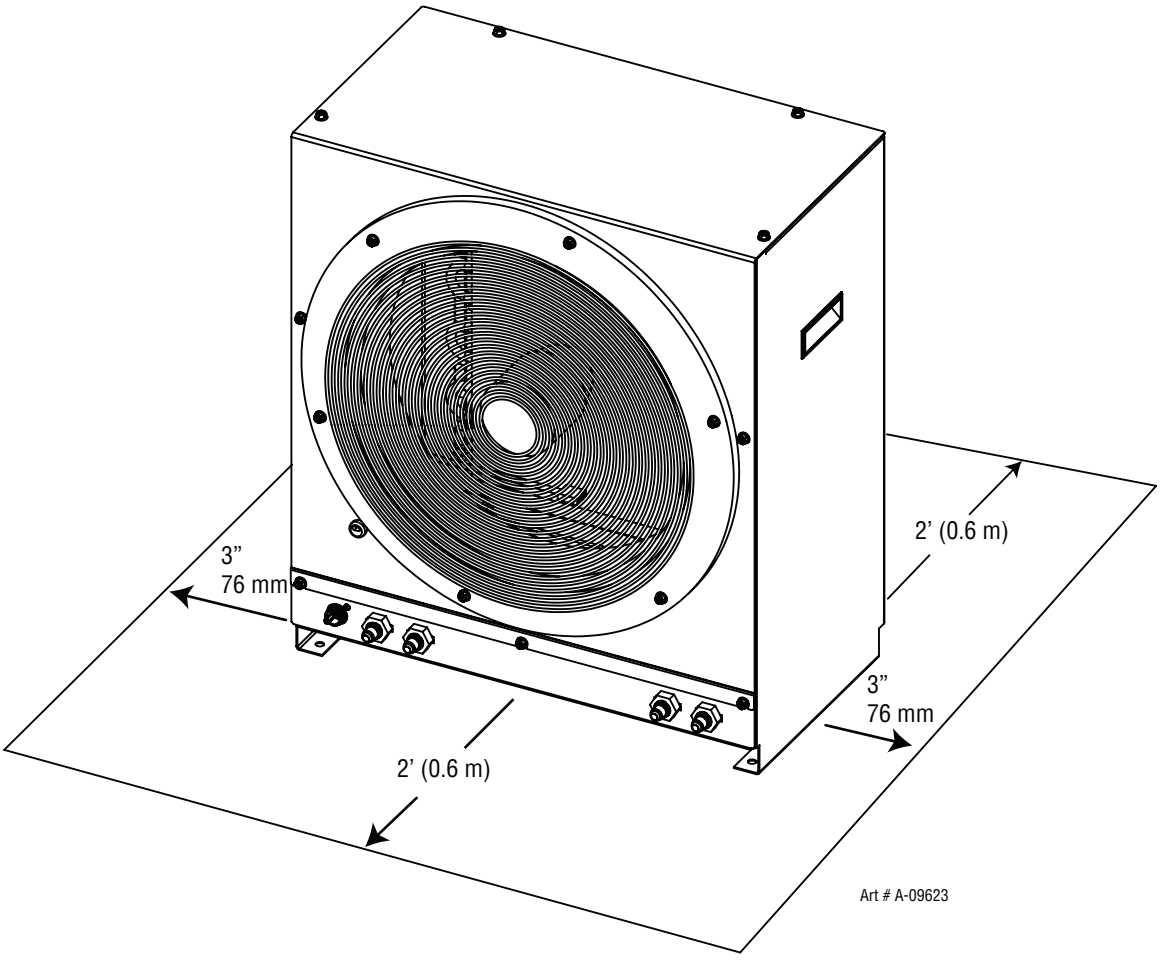
3.17 HE400 COOLER

Used in series with the existing cooling system of the UltraCut series power supplies, the HE400 Cooler provides necessary additional water cooling for the torch head when cutting at over 300amps. The HE400 operates independently of the UltraCut pump and fans therefore it can start at any time.

WARNING

Do not disassemble the Cooler with the power applied or the coolant flowing. Dangerous 220 AC voltages and high pressure liquid are present.

Locate the Cooler so that there is adequate ventilation in front of and behind the unit and do not place or stack anything on top of the unit.



NOTE

Ensure the four coolant lines described below are connected and leak free before connecting power to J71.

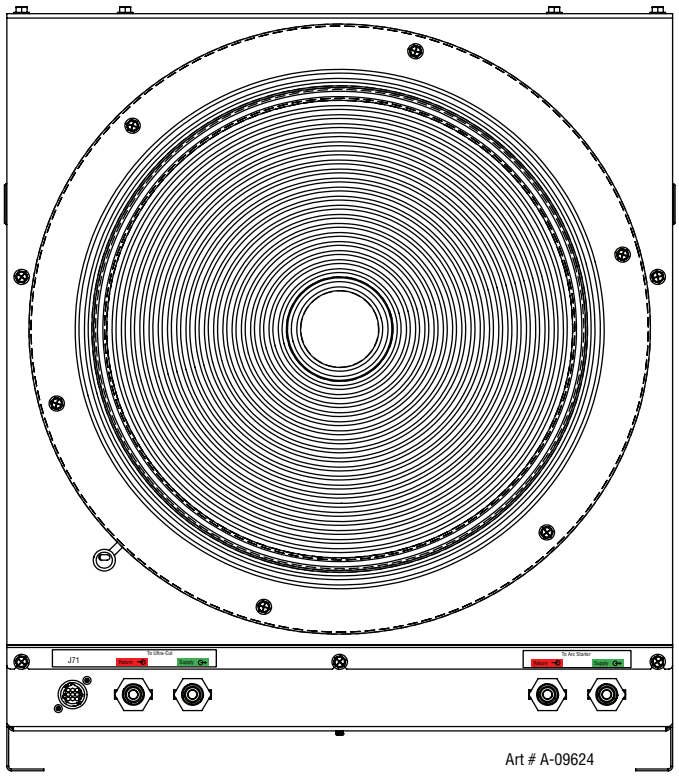
Match the colors of the hoses to the front panel label. Supply lines are green and return lines are red. Facing the unit as shown below, the left connections go to the UltraCut power supply, the right connections go to the RAS1000 arc starter.

CAUTION

Do NOT cross the coolant lines as this will not provide cooling for the XT plasma torch as designed and void the warranty.

Attach and tighten all #6 JIC fittings with 11/16" (18mm) wrench. Do not overtighten as it will strip the fitting threads and will cause a leak. Do not start the Ultracut without coolant in the reservoir. An additional gallon (3.78l) of coolant is required to compensate for the HE400 being attached to the system. Monitor the fluid level while filling the UltraCut. Do not allow the coolant reservoir level to drop below minimum.

Attach the J71 cable after the Cooler and coolant lines have been determined to be leak free.



Under low power plasma cutting the HE400 may not come on. This is normal operation.

Periodically check obstructions in the radiator and remove them by vacuuming the fins. Do not use cleaners or fluids to remove debris, they may affect the radiator integrity.

3.18 Install Remote Arc Starter

Site Location

Select a clean, dry location with good ventilation and adequate working space around all components.

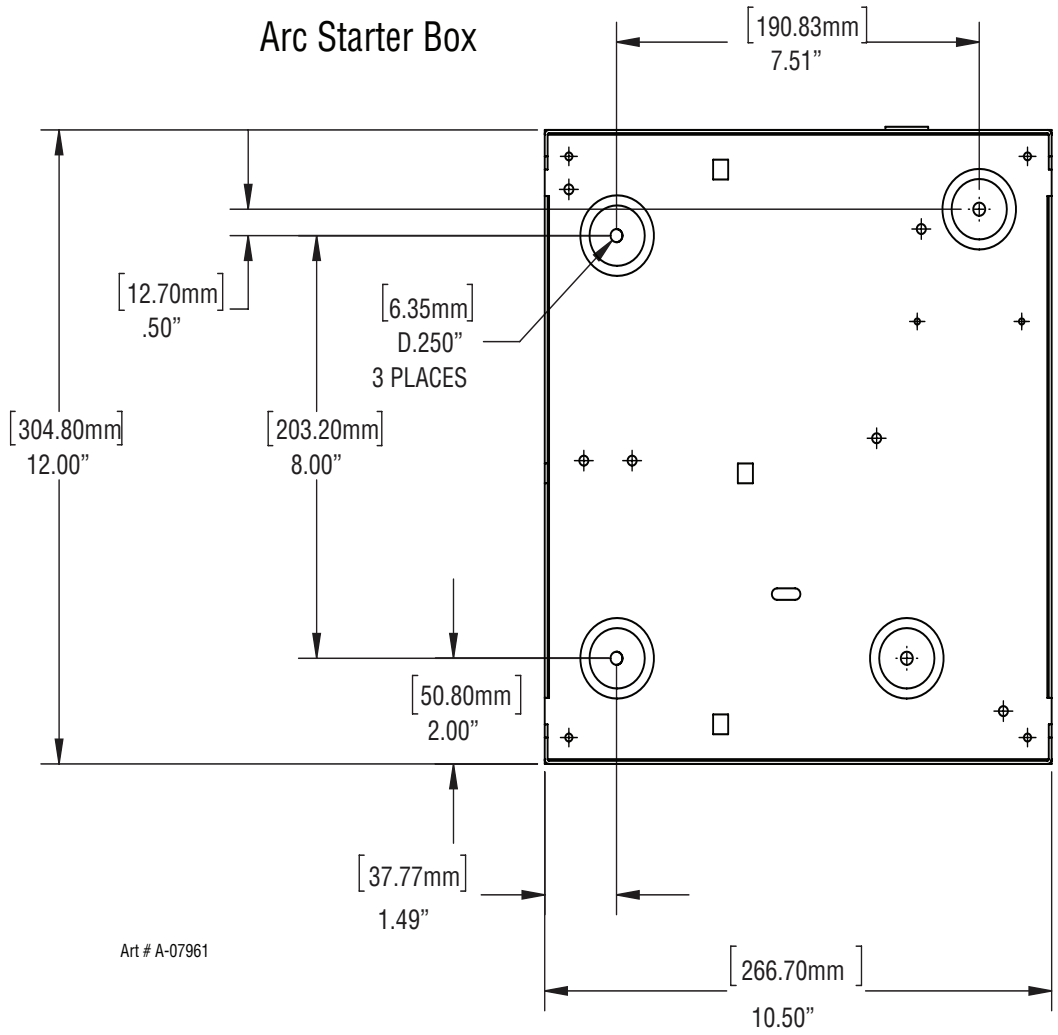
Review the safety precautions in the front of this manual to be sure that the location meets all safety requirements.

Interconnecting cables and hoses attach to the Arc Starter. There must be adequate space around the Arc Starter for these connections without excessive kinking or bending.

Mounting Dimensions

NOTE

Height not shown is 7.375" (187mm)



Installation

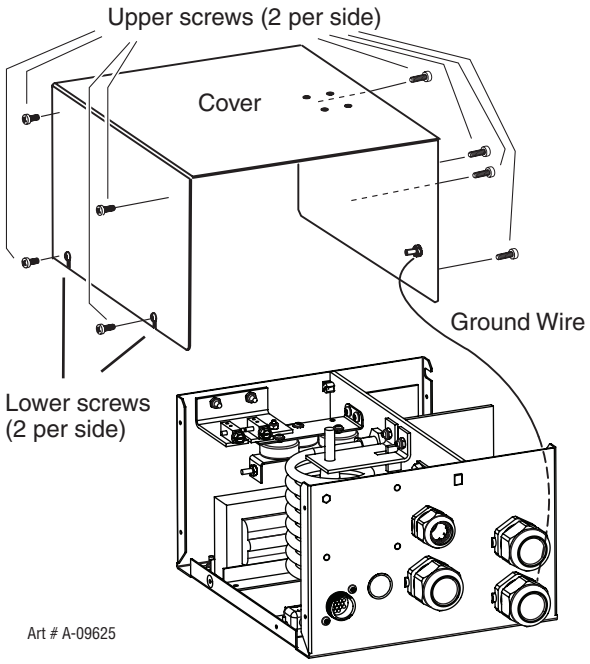
The Remote Arc Starter must be installed in a suitable location near the torch head. If the Arc Starter is mounted to a gantry or to any other support subject to motion or vibration, fasten the Arc Starter to the support securely.

1. Loosen, but do not remove, the lower screws securing the cover to the Arc Starter. Remove the upper screws securing the Cover Panel to the Arc Starter.

NOTE

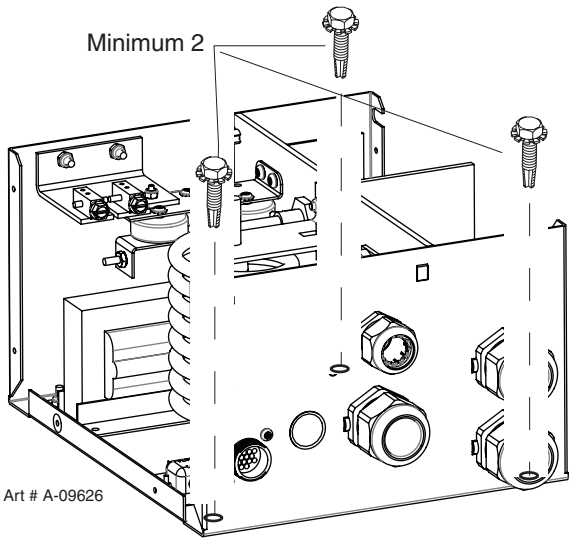
A ground wire connects the cover to the Arc Starter base. This wire must remain in place.

2. Remove the Cover Panel from the Arc Starter.



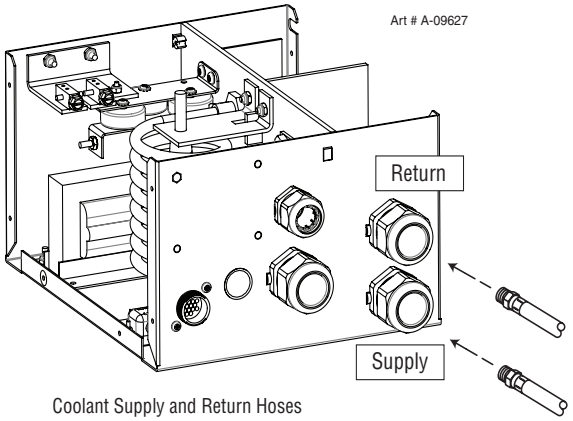
Cover Removal

3. Position the Arc Starter on a flat, horizontal mounting surface.
4. Use pre-drilled holes in at least two of the feet on the bottom of the Arc Starter to secure the Arc Starter to the mounting surface.

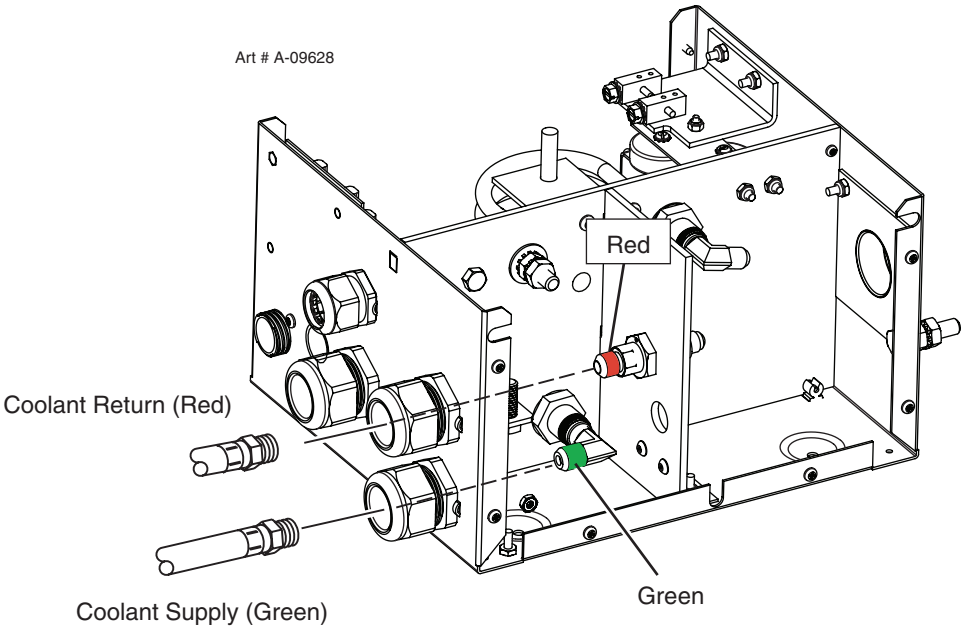


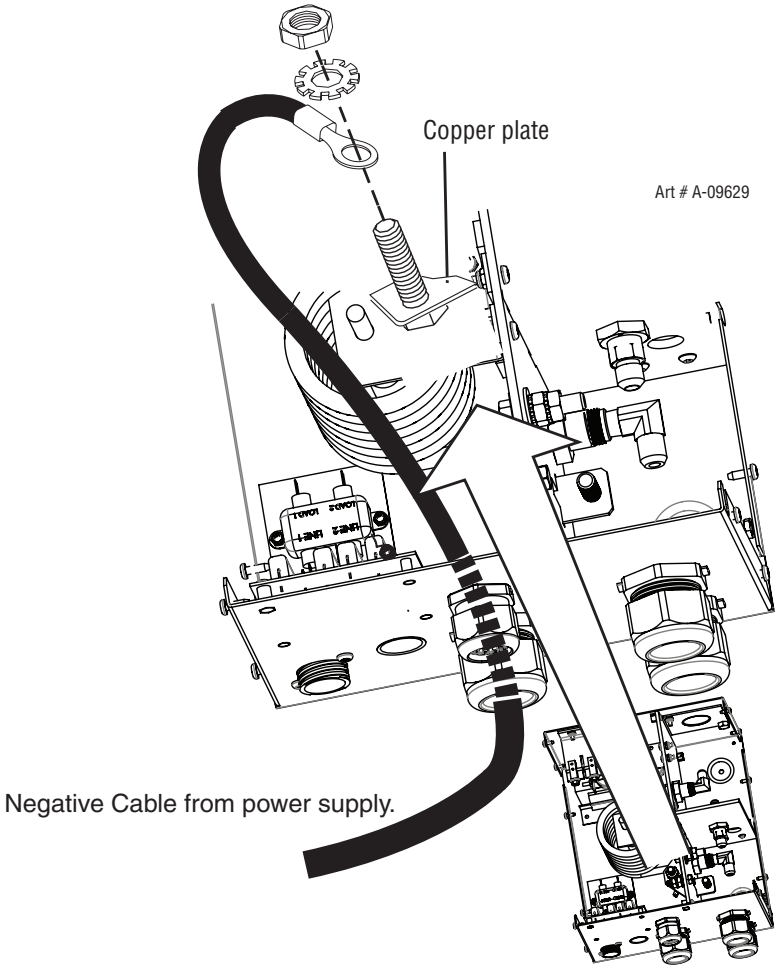
Input Connections

1. Refer to the illustrations. Make the following input connections to the Arc Starter.
   - Coolant Supply and Return Hoses (from HE-400 Heat Exchanger). Hoses and connectors are color-coded; Red for Return, Green for Supply.

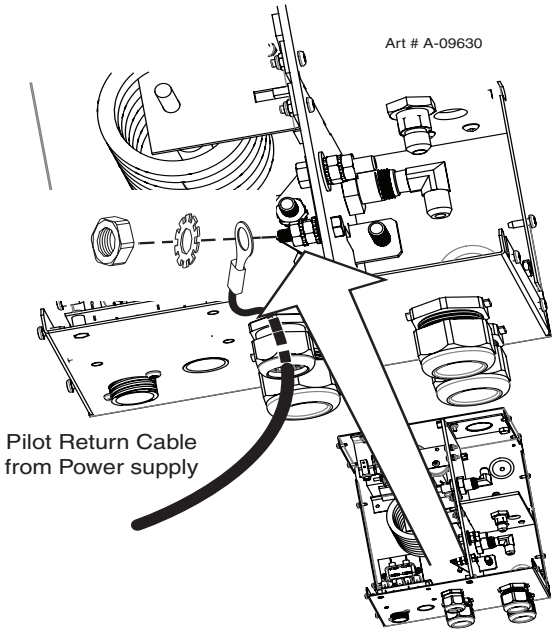


Coolant Supply and Return Hoses
(from power supply)

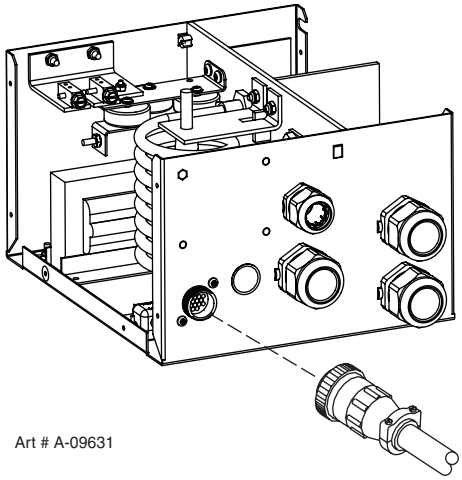




Negative Cables (from Power Supply rear panel)



PILOT Return Cable (from Power Supply rear panel)



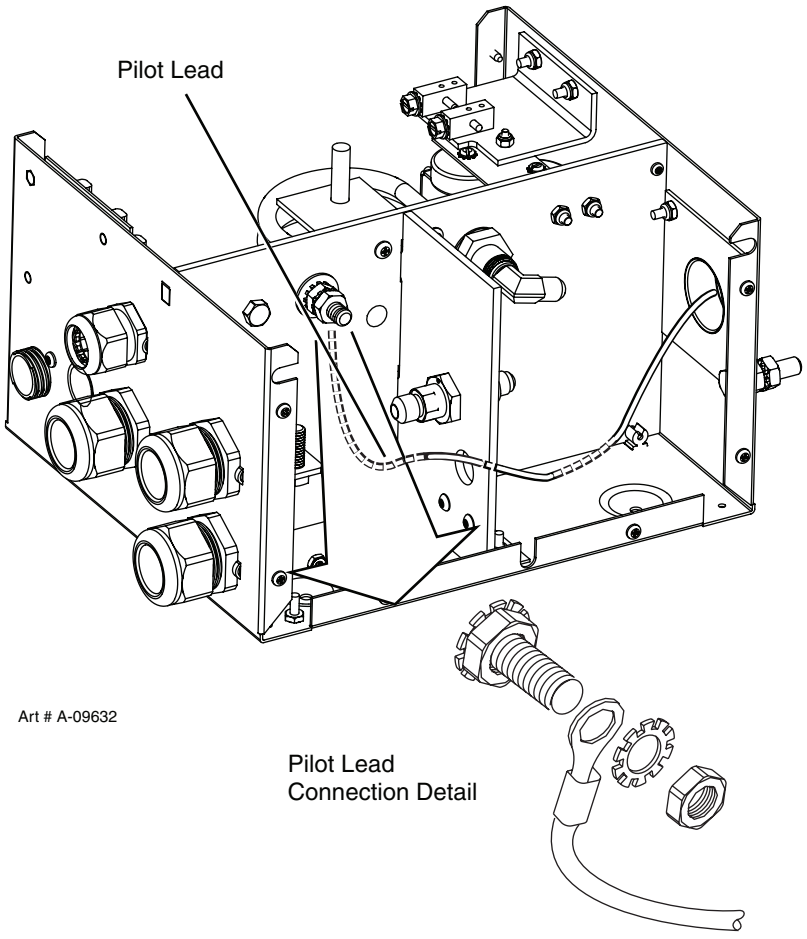
Control Cable from Power Supply rear panel

Output Connections

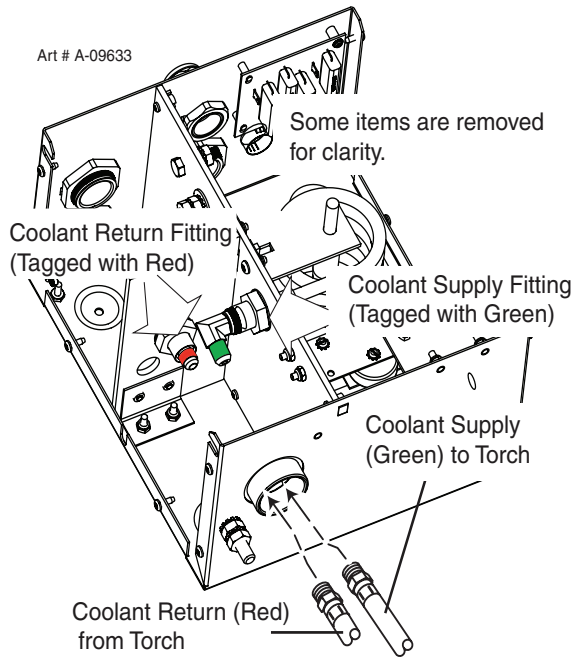
1. Refer to the illustrations. Make the following output connections to the Arc Starter.

NOTE

For newer leads with only one black wire, it must be connected to the pilot return. There are no inner shield wires.

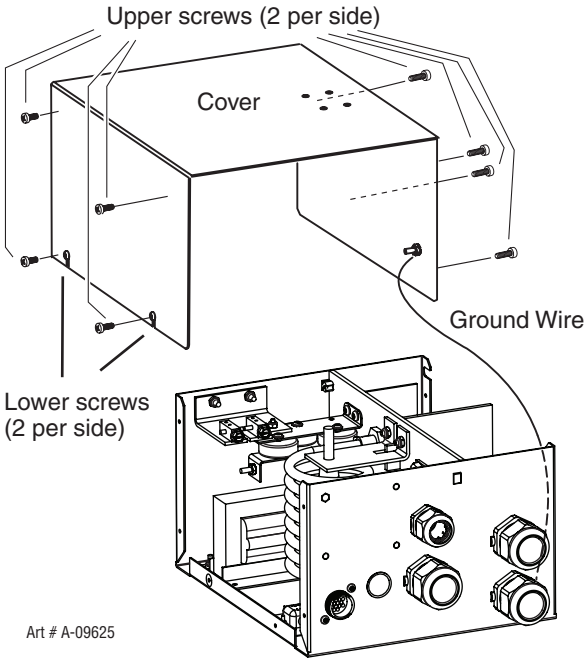


Pilot Return Cable and Inner Shield Lead (from Torch Leads)

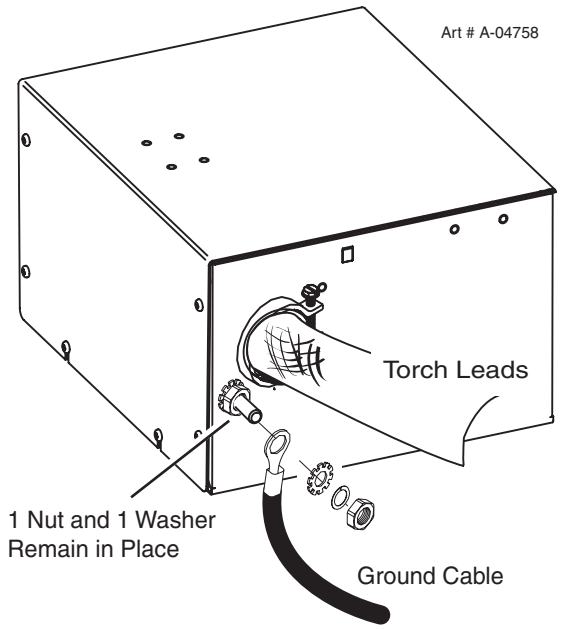


Coolant Supply and Return Hoses (from Torch)

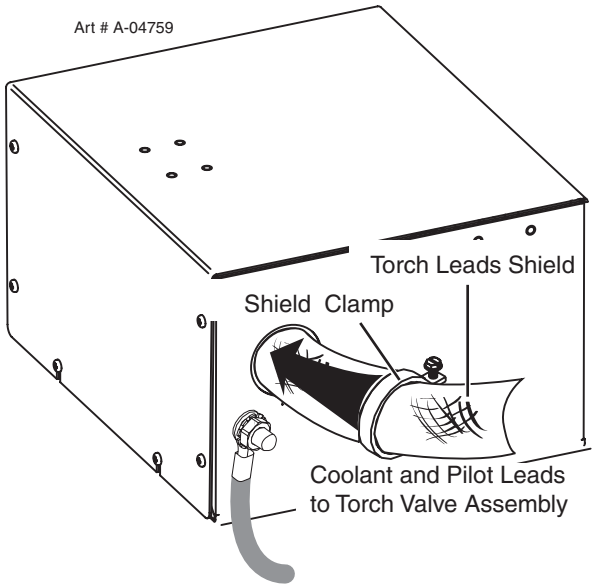
Reinstall the Arc Starter Cover. Ensure that the ground wire is not crimped between the cover and the base.



The Arc Starter must be grounded; the grounding terminal is marked ⏚. Refer to the previous section for grounding details.

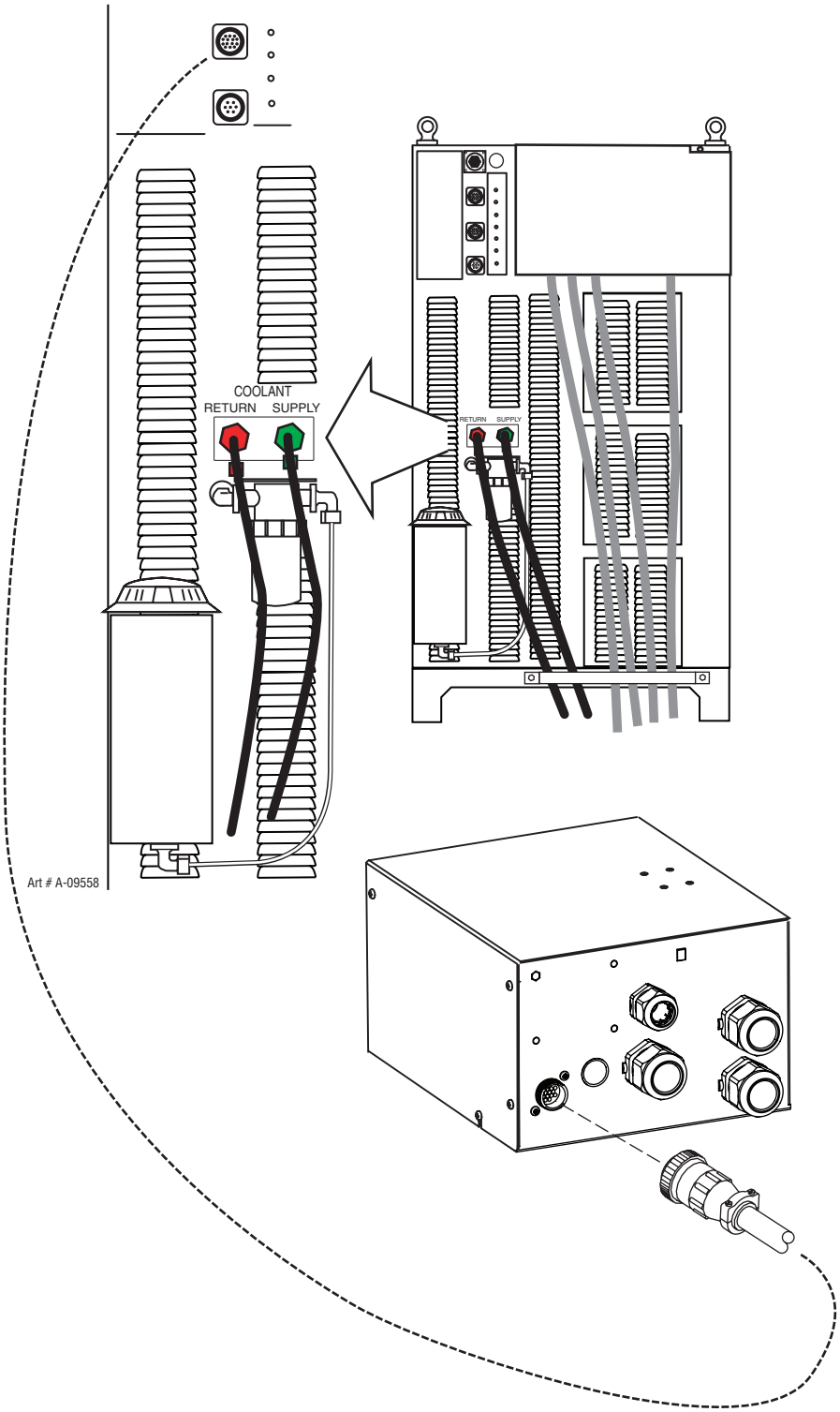


- Use a clamp to secure the Torch Lead Shield braid brass ring to the port on the Remote Arc Starter as shown.



Connect Control Cable

1. Connect the Remote Arc Starter cable to the Remote Arc Starter receptacle.

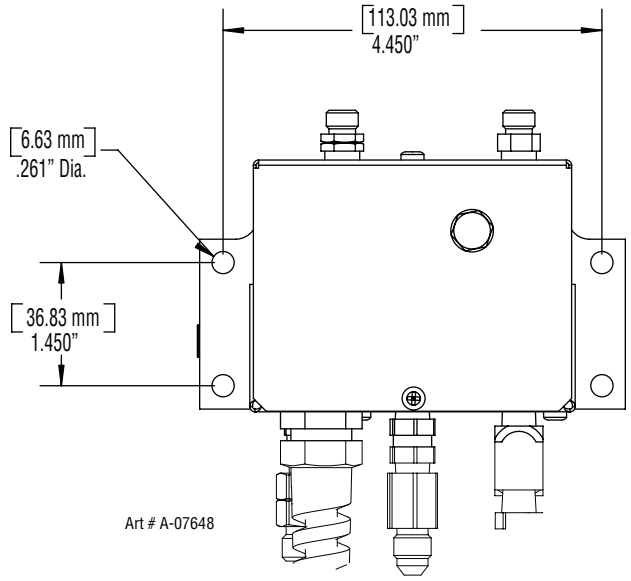


3.19 Torch Valve Installation

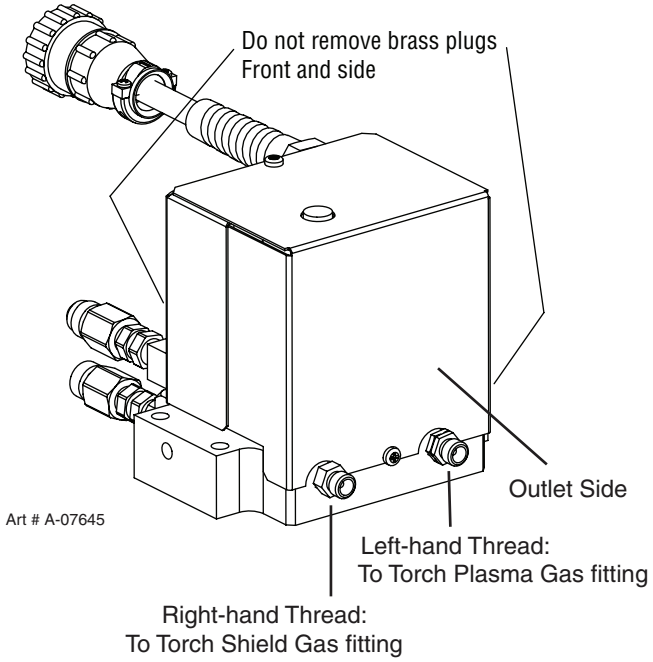
General Information

This assembly mounts as close as possible to the torch head. It accepts preflow, plasma, and shield gases from the Gas Control Module and supplies these gases to the Torch.

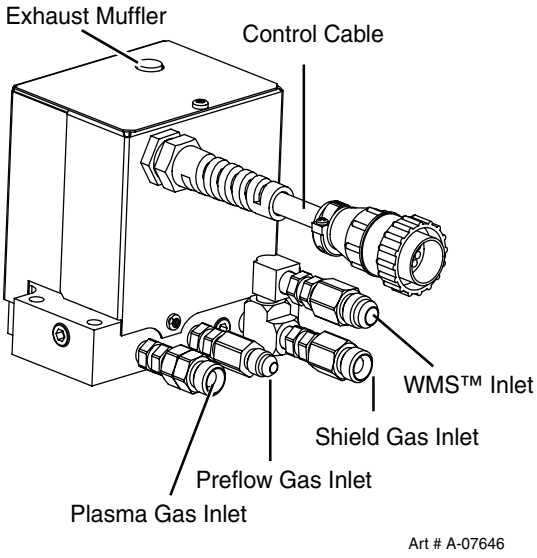
Mounting



1. Mount the Valve Kit as close as possible to the Torch. The valve kit can be mounted in any convenient position, provided the outlet side (with two fittings) is closer to the torch than the inlet side (with three fittings and a control cable connector).
2. Connect the Valve Kit outlets to the torch leads as shown. (XTL shown)



3. Connect the gas supply lines and the control cable connector from the Gas Control Module to the Valve Kit as shown. Hold the check valves stationary while attaching the gas lines. (XTL shown)

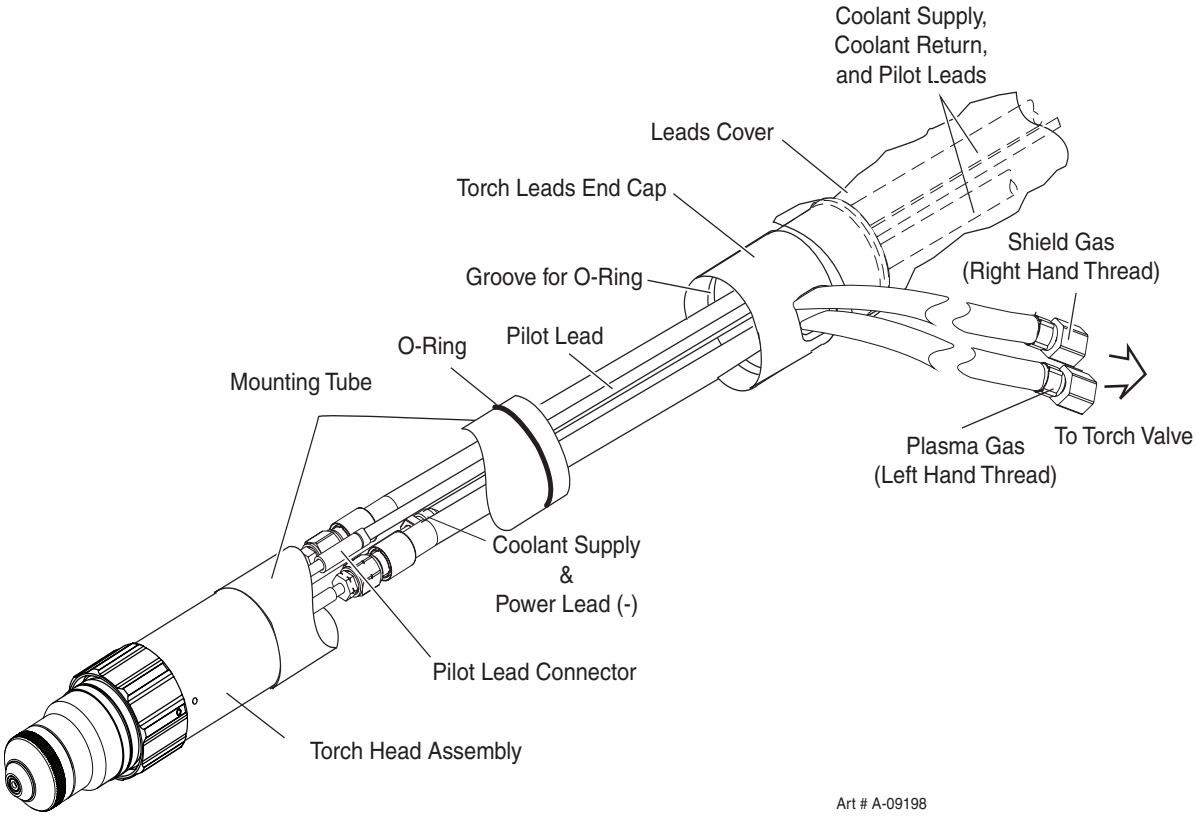


CAUTION

Hold all fittings stationary while attaching hoses or leaks can be created. Side pressure can break the check valves or weaken their connection to the torch valve assembly. All fittings must be checked for leaks after assembly.

3.20 Connecting Torch

Connect the Torch as follows:



1. Lay out the torch leads on a clean, dry working surface.
2. Hold the Torch Leads End Cap stationary. Pull approximately 18” (0.5 m) of leads through the End Cap.
3. Remove and discard the protective end caps from the Mounting Tube.
4. Install the O-ring in the groove at the upper end of the Mounting Tube.
5. Install the Mounting Tube as follows:
   a. Position the Mounting Tube at the end of the leads assemblies as shown.
   b. Slide the Mounting Tube upward onto the leads assemblies.
   c. Press the upper end of the Mounting Tube into the lower end of the Torch Leads End Cap. Ensure that the O-Ring on the Tube engages the mating groove inside the Torch Leads End Cap.
   d. Ensure that the Mounting Tube is free to rotate within the Torch Leads End Cap.
6. Connect the gas and coolant leads to the Torch Head.
   a. Coolant supply and return connections to the Torch Head are of different lengths.
   b. Plasma and secondary gas connections to the Torch Head are threaded differently; the plasma gas connection is left-hand thread, the shield gas connection is right-hand thread.
   c. Hold the Torch Head leads connectors stationary; turn the leads fittings with a wrench to secure the leads to the Torch Head. Do not overtighten.

CAUTION

The gas and coolant leads include compression fittings. Do not use sealant on these connections.

Slowly apply pressure to the gas lines. Check for leaks at all connections before continuing. If there are no leaks, shut off the gas supplies and continue with installation.

7. Connect the pilot lead to the Torch Head. Press the two ends of the connector firmly together. Thread the plastic lead cover/connector onto the mating Torch Head connector.
8. Press the Torch Head Assembly upward to connect to the Mounting Tube. Pull the leads back as needed to ensure a proper fit through the Mounting Tube and Torch Leads End Cap. Hold the Torch Head Assembly stationary; rotate the Mounting Tube to thread it onto the Torch Head.

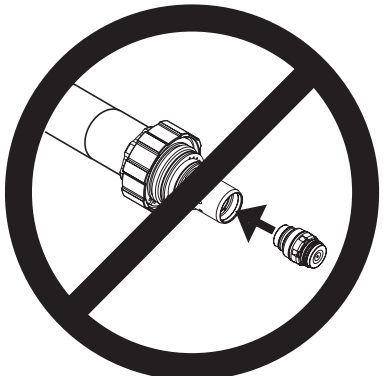
CAUTION

Ensure that the leads do not twist within the mounting tube. Leads must lie as shown in the installation sketch.

9. The lower end of the Mounting Tube includes four threaded holes. Install an Allen set screw in any of the threaded holes to secure the Torch Head Assembly to the Mounting Tube.
10. Install the appropriate consumable parts as shown on the following pages. The torch manual includes diagrams showing the correct parts to install, depending on the metal to be cut and the gases in use.

3.21 Install Consumable Torch Parts

Install the consumable parts as follows to ensure proper operation. These steps will help ensure that parts are seated correctly.



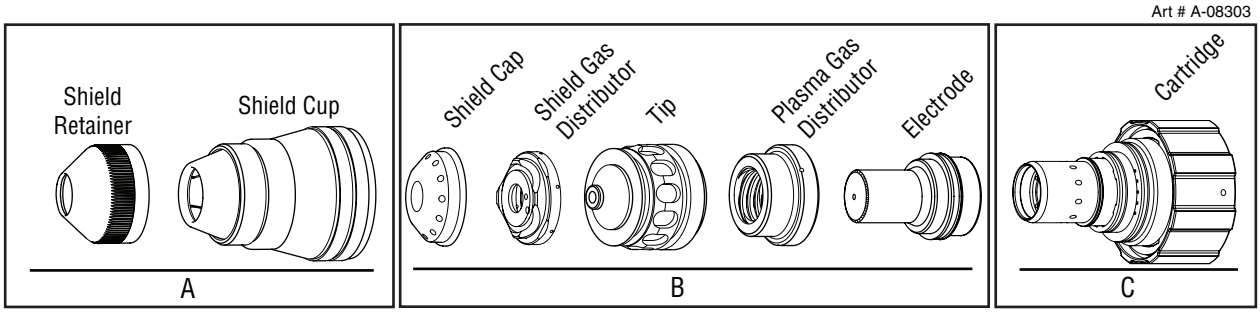
WARNINGS

Do not install consumables into the Cartridge
while the Cartridge is attached to the Torch Head.
Keep foreign materials out of the consumables and Cartridge.
Handle all parts carefully to avoid damage,
which may affect torch performance.

Art # A-03887

1. Check the appropriate cut chart for the right combination of parts for the cutting application.
2. For 200 Amp parts only, thread the Shield Retainer onto the Shield Cup.

3. Stack the consumable parts together.

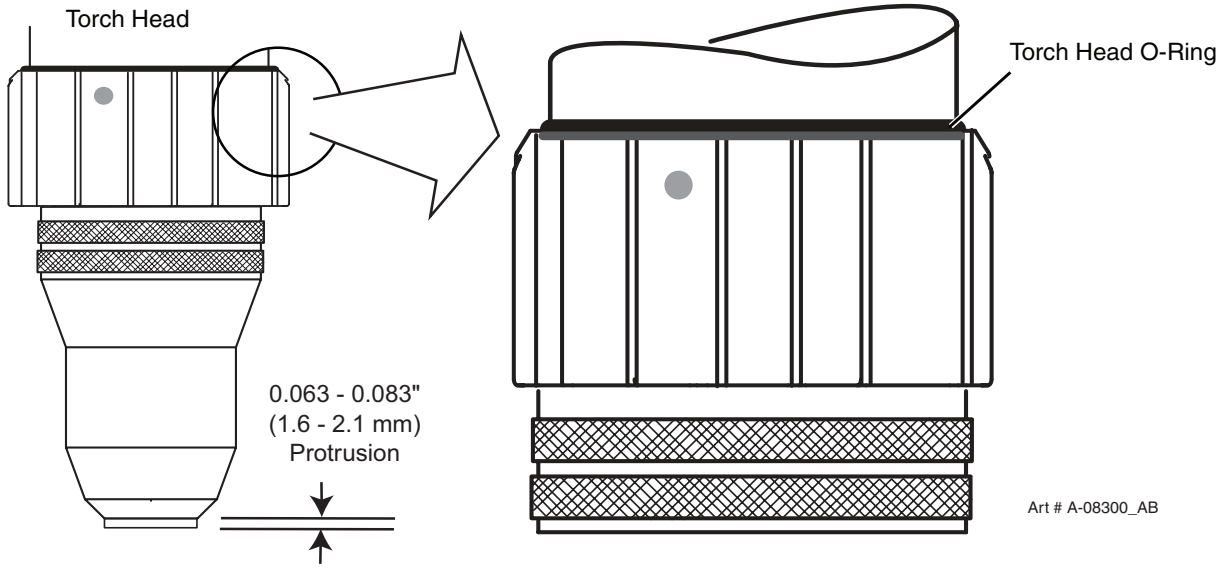


1 - Assemble “A” 200 A only. 2 - Assemble “B”. 3 - Assemble “B” to “C”. 4 - Assemble “A” to “B-C” assembly.

4. Insert the stack of consumable parts into the cartridge. Ensure that the large O-ring on the torch tip fits completely into the cartridge. If any part of the O-ring protrudes from the cartridge, the parts are not seated properly.

5. Use the cartridge tool to hold the cartridge assembly, while turning the shield cup (and shield retainer for 200 Amp parts) onto the cartridge assembly. For 300 Amp parts turn the shield retainer onto the shield cup now. When this group is fully assembled, the shield should protrude from the front of the shield cup or shield retainer. Without this protrusion the shield cup is not properly tightened onto the cartridge assembly.

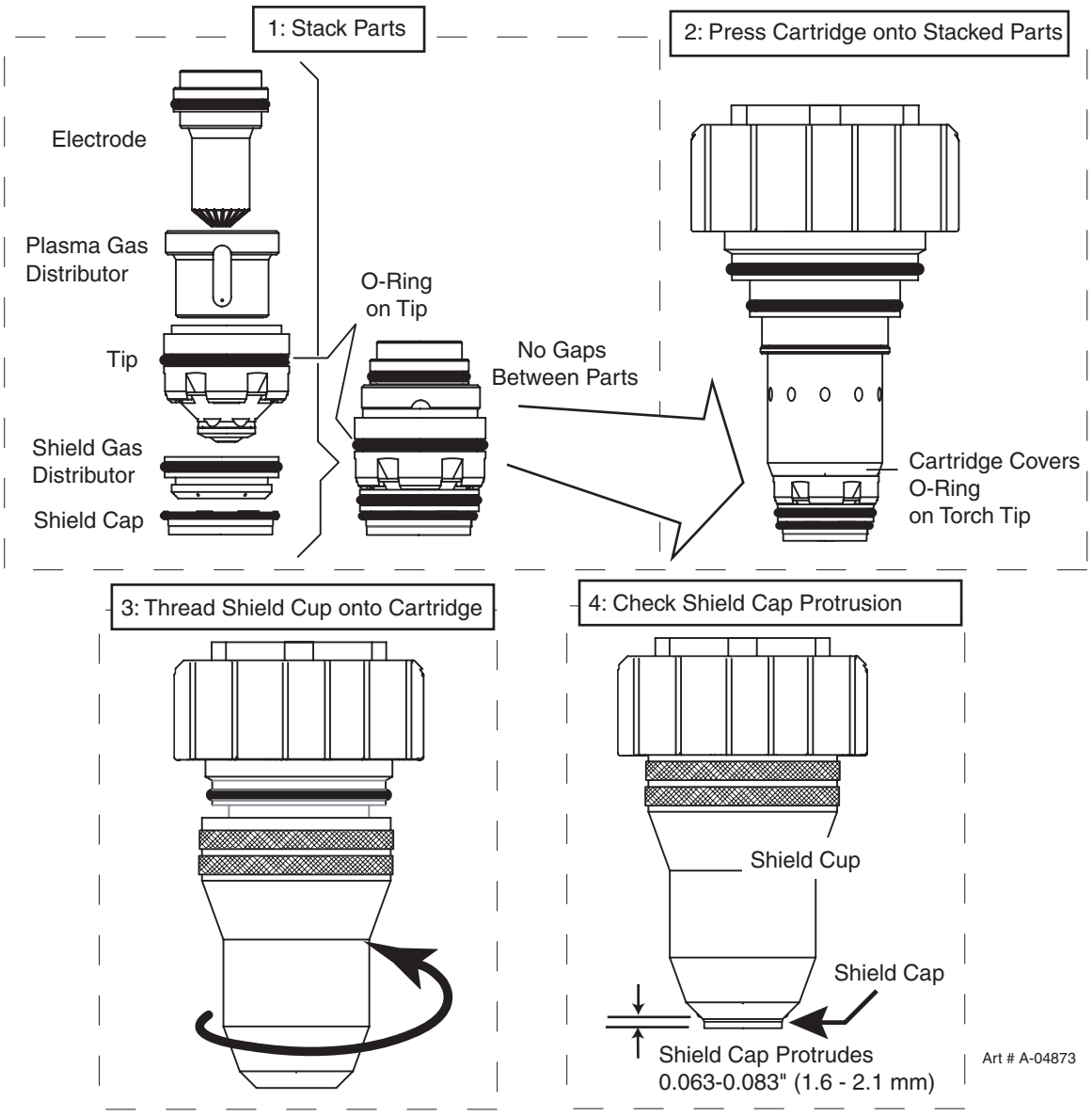
6. Take the cartridge tool off the cartridge. Fit the cartridge assembly onto the torch head. The Speed Lok ring should click into place and the cartridge assembly should touch the large O-ring on the torch body.



Installing Assembled Cartridge Onto Torch Head

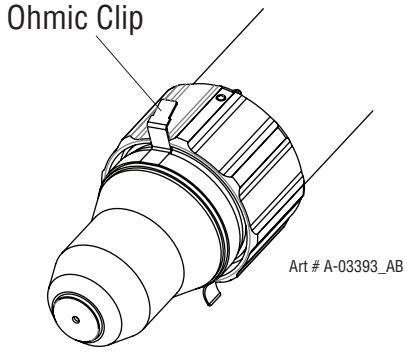
7. Slide the ohmic clip over the shield cup if using ohmic torch height sensing.

30 - 100 Amp Parts Assembly



Installing Assembled Cartridge Onto Torch Head

7. Connect the wire lead from the height finder to the ohmic clip if using ohmic torch height sensing.



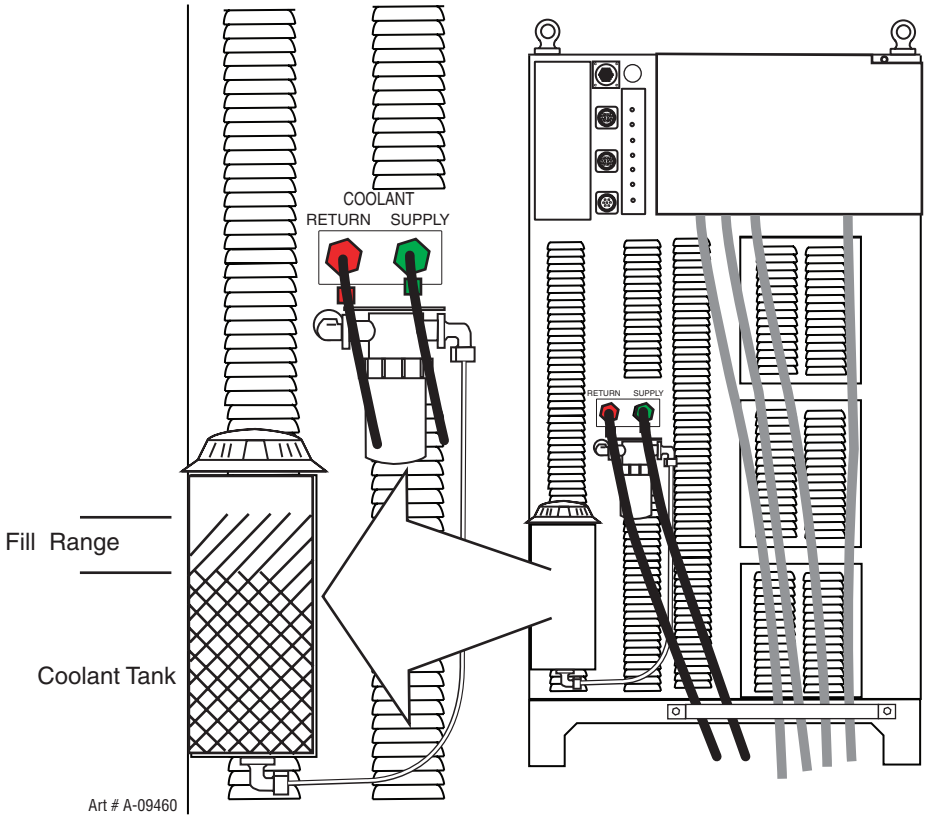
NOTE

Ohmic height sensing is not recommended with water shield. Water on the plate interferes electrically with the ohmic sensing circuit.

3.22 Complete the Installation

1. Remove the cap from the coolant tank. Fill the coolant tank to the level shown, with Thermal Dynamics coolant. The coolant level is visible through the translucent coolant tank. The amount of coolant required varies with torch leads length.

Coolant Capabilities		
Cat. Number and Mixture	Mixture	Protects To
7-3580 'Extra-CoolTM'	25 / 75	10° F / -12° C
7-3581 'Ultra-CoolTM'	50 / 50	27° F / -33° C
7-3582 'Extreme CoolTM'	Concentrate*	-65° F / -51° C
* For mixing with D-I CoolTM 7-3583		



2. After the complete system has been installed, check that the coolant has been pumped through the system as follows (see NOTE):

NOTE

Depending on the length of the torch leads, the system may require more coolant after turning the system ON for the first time.

a. Place the ON/OFF Switch to ON.

b. After about 4 minutes the system may shut down if the leads are not full of coolant.

c. Place the ON/OFF switch to OFF. Add more coolant if needed

d. After 10 seconds place the ON/OFF switch to ON again.

e. Repeat steps ‘b’ through ‘d’ until the system no longer shuts down. Depending on the length of the torch leads this sequence may need to be repeated.

f. After the system stays operational allow the pump to operate for ten minutes to properly purge any air from the coolant lines before using the system.

3. Refill the reservoir and reinstall the filler cap.

4. Purge coolant from the torch before firing the torch. Ensure there are no leaks before use. If leaks are evident, consult the coolant leak troubleshooting guide in the maintenance section of this manual.

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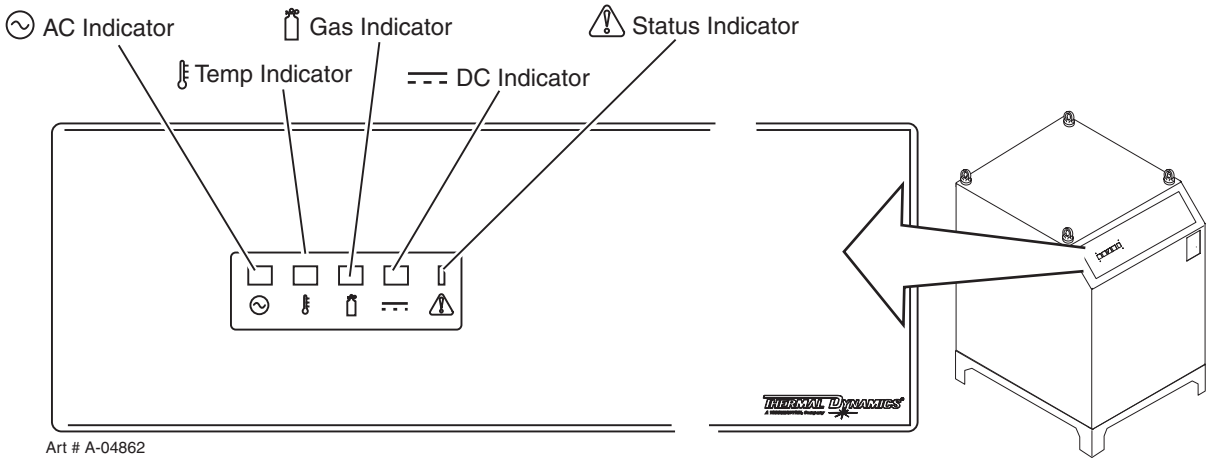
SECTION 4: OPERATION

4.01 Power Supply Control Panel



Art # A-04862

AC Power Indicator

Indicates AC power is being supplied to the inverters when the ON/OFF switch is in ON position. When switch is first set to ON, the indicator stays off until the inrush cycle is complete and the correct voltage is confirmed.

TEMP Indicator: Normally OFF. Indicator turns ON when the internal temperature sensors detect temperatures above normal limits. Let the unit cool before continuing operation.

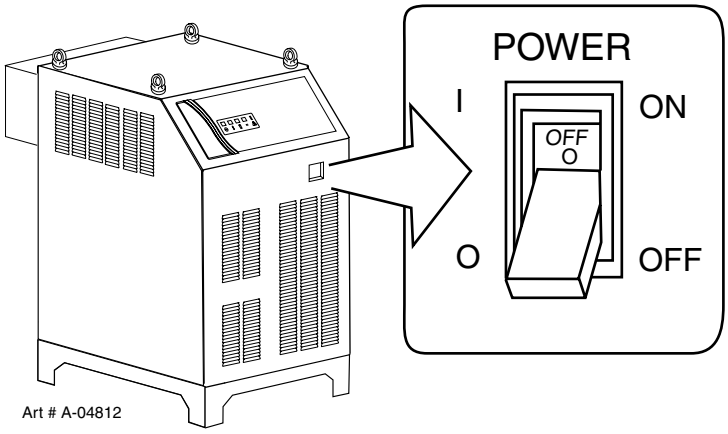
GAS Indicator: Normally ON. Indicates gas control is ready for operation. The indicator blinks during the purge cycle or when the gas control is not in the RUN mode or when there is a communication error. Indicator is off when there is no call for gas flow.

DC Indicator: Indicates the power supply is generating output DC voltage.

Status Indicator: Shows system status. The number of flashes indicates the status. Refer to the Status Code Section for details. On power supply start-up, the indicator flashes to show the revision level of the operating software installed in the system.

4.02 Start-Up Sequence

1. Connect system to primary input power.
2. Turn ON/OFF switch to ON (up) position. AC Indicator ~ turns ON after about 5 seconds.

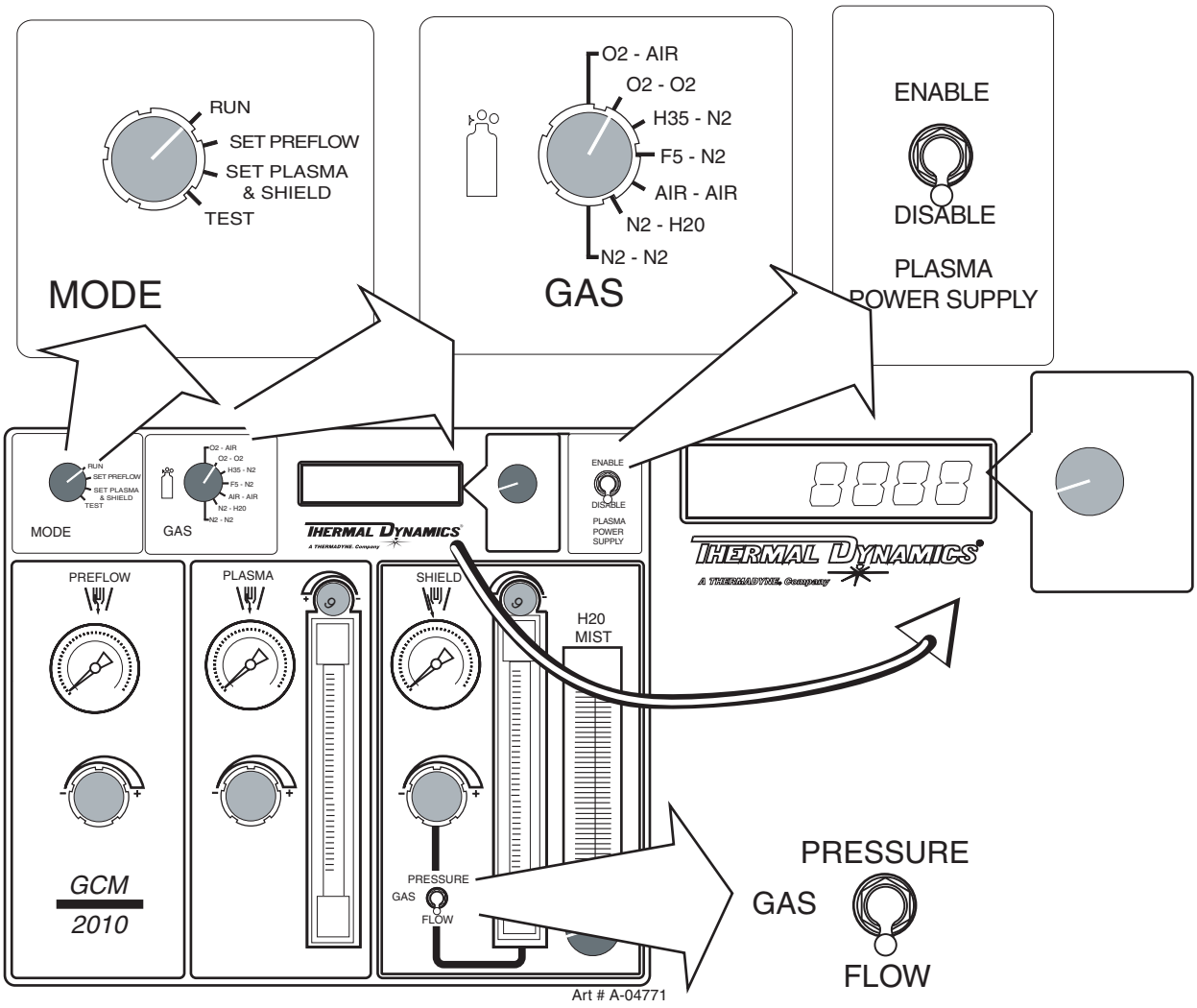


3. Check the AC indicator. If the inverter modules are correctly configured for the input voltage and the switch is ON, then voltage has been applied to the inverter modules (input contactors are ON). If the indicator does not light after a few seconds disconnect power and check that each inverter is correctly configured for the input voltage and all 3 phases are present. Check Status Indicator for any codes that can help. Once it is determined that input is OK, it is necessary to select and load a process.

4.03 Gas Control Module Operation

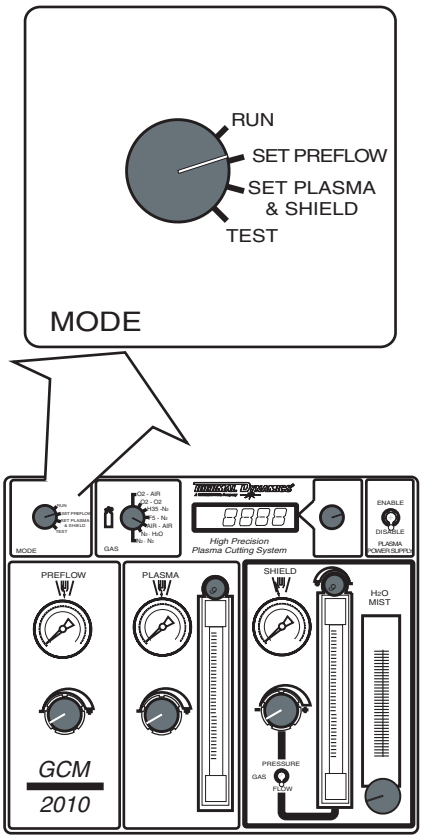
Functional Overview

The Gas Control Module provides all Plasma and Secondary gas selection and control instrumentation. There are various controls and indicators used to set gas pressures and flows.



Gas Control Module: Controls & Indicators

1. MODE Selection Switch

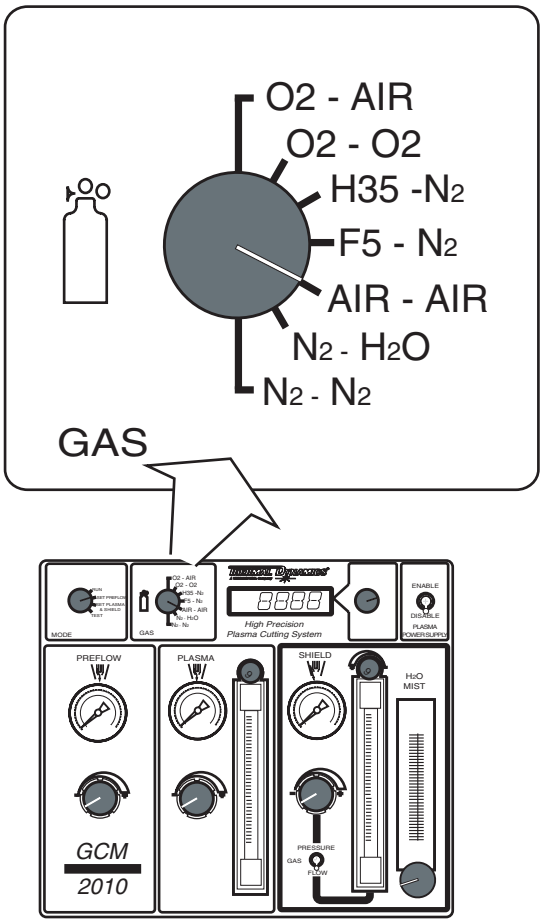


Art # A-04765

- Normally in the RUN position during torch operation.
- In the SET PREFLOW position, Preflow or Piloting gas (Air or N_2) flows to the torch allowing the operator to adjust pressure. Gas automatically shuts off after 2 minutes if left in the SET PREFLOW position.
- In the SET PLASMA & SHIELD position, selected cutting gases, Plasma & Shield, flow to the torch to allow operator to set the pressure (regulator & gauge) and flow (knob at top of flowmeter). Gases automatically shut off after 2 minutes if left in the SET PLASMA & SHIELD position. GCM 2010 gas control revision AG or later includes inlet pressure sensors. In SET PLASMA & SHIELD position the LCD display shows alternately the plasma an shield inlet pressure. If either gas pressure is outside the acceptable range, the display shows "PSI low (or high), the actual pressure and the limit it is below (or above).
- In the TEST position , selected cutting gasses, Plasma & Shield, also flow to the torch. The Plasma outlet pressure (pressure going to the torch), is displayed.
- For GCM 2010 gas control revision AG or later the Mode Selection Switch includes a hidden function used at initial setup to configure the gas control for the gas lead length. See Sequence of Operation, initial setup.

2. GAS Selection Switch

Selects combinations of plasma and shield gases.



Art # A-04766

3. LCD Display

LED display shows Gas Control Status, such as Waiting for Communication, Plasma Power Supply Disabled, Initializing, Purging and Output Current setting. It also shows operational states like Preflow, Piloting, Cutting, and Postflow. In addition there are some low level CANBus errors that are indicated by message ^E#.

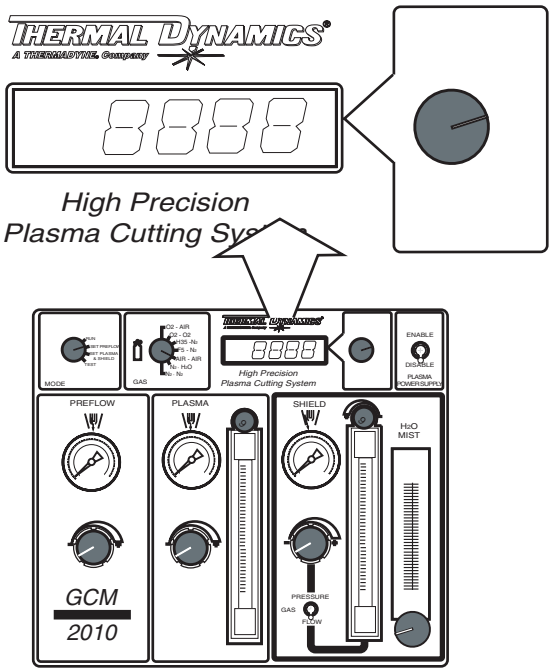
^E4 = CANBus error unacknowledged message.

^E5 = CANBus error Bus off

^E6 = CANBus error communication timed out.

4. Current Control

Adjusts the output current of the power supply.



Art # A-04767

5. Plasma Power Supply Enable / Disable Switch

The DISABLE position removes input power from the Power Supply inverters, disables the coolant pump and fan, the pilot contactor & HF and removes AC power from the gas control solenoids shutting off all gas flow. When the switch is returned to the ENABLE position an automatic gas purge is started and then the system is returned to normal operation under control of the CNC device.

6. PREFLOW Control Knob and Pressure Gauge

Used to set preflow gas pressure and flow. MODE switch must be in SET PREFLOW position.

7. PLASMA and SHIELD Control Knobs, Pressure Gauges and Flow Meter

Used to set plasma and shield gas pressures and flows. Mode switch must be in SET PLASMA & SHIELD position.

8. Gas Pressure Flow Switch

At lower flow rates shield gas pressure is first set per the cut charts then the flow is set using the flow meter with the GAS switch set in the FLOW position. Some torch parts require higher flow rates that exceed the capacity of the flow meter. In that case, Gas switch is set in the PRESSURE position and the regulator and gauge is used to set pressure per the cut charts when no "Ball" setting is shown.

9. H_2O Mist Control Knob and Flow Meter

Used to set water flow rate. MODE switch must be in SET PLASMA & SHIELD position. GAS selection switch must be in N_2-H_2O position.

NOTE

Water mist is not used in all applications.

4.04 First Time Operation Matching Gas Control to Lead Length

For initial operation of GCM2010 with software version 2.1 or later.

1. Before applying AC power set the Power Supply **ENABLE/DISABLE** switch on the gas control module to **DISABLE**.
2. Set Gas Selection switch to the correct position for cutting process being used.
3. Turn on AC power and set Power Supply **ENABLE/DISABLE** switch to **ENABLE**. After a short delay to establish communications, the gas control will start the Purge and priming sequence. (If torch and coolant leads were not already full of coolant you may be required to repeat this power on cycle and add coolant until the priming is complete).
4. Once the purge sequence is finished set the Mode Switch between Run and Set Precharge. Display says "SET HOSE LENGTH" on the first line and LENGTH xxx FEET on the second. The xxx is most likely the factory default of 175' which is the system maximum.
5. Press in and hold the Current Control knob. Display changes to SELECT HOSE LENGTH and second line steps downwards from 175' to 50' in 25' increments. As soon as the correct length is displayed, release the knob.
6. Set the Mode Switch back to Run.
7. The initial/first time set up is complete and does not have to be done again unless the Gas Control or it's main PC Board is replaced.

4.05 Sequence Of Operation

For first time operation see previous steps, "First Time Operation..."

1. Set the Plasma Power Supply **Enable / Disable** switch to **Disable**.

DANGER

Always shut off input power to the system before changing or inspecting torch parts.

   a. Change the torch parts if necessary.

   b. Set the Plasma Power Supply **Enable / Disable** switch (on the Gas Control Module) to **Enable**. The Module performs purges of 15 seconds, 11 seconds, and another 11 seconds. This removes water from the torch parts.

2. Select the desired plasma and shield gas by setting the Gas Selection switch to the desired position. 2 seconds after gas selection, the module purges the new gas(es) through the leads.
3. Set the preflow gas pressure.

   a. Set the MODE switch to SET PREFLOW.

   b. Use the PREFLOW control knob to set preflow gas pressure. Refer to the torch manual for pressure settings.

   c. Use the AMPERAGE SET-UP control knob to set the desired pre-charge pressure set point. Press the control knob for 2 seconds without rotating. Then rotate the knob to adjust pressure.

4. Set the plasma and shield gas pressures and flows.

   a. Set the MODE switch to SET PLASMA & SHIELD.

   b. Use the PLASMA and SHIELD control knobs, pressure gauges, and flow meters to set plasma and shield gas pressures and flows. Refer to the torch manual for pressure settings.

   c. In installations using water shield, use the H_2O MIST control knob and flow meter to set water flow rate. Refer to the torch manual for flow rates.

5. Use the AMPERAGE SET-UP control knob to set the desired amperage output. The module will update the amperage every 2 seconds after the last adjustment to the knob. The module keeps the set point in memory.
6. Place the MODE switch to the RUN position.
7. Set the Plasma Power Supply **Enable / Disable**switch (on the Gas Control Module) to **Enable**. The Module performs purges of 15 seconds, 11 seconds, and another 11 seconds. This removes water from the torch parts.

NOTE

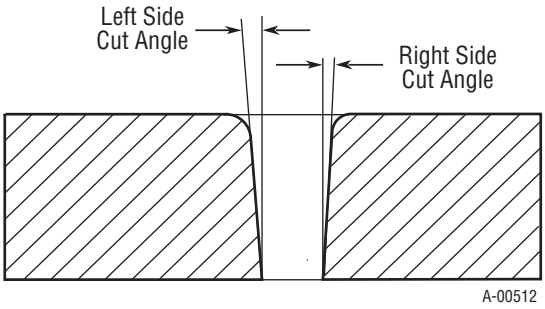
When switching gases between operations, allow enough purge time to clear the prior gas from the torch leads.

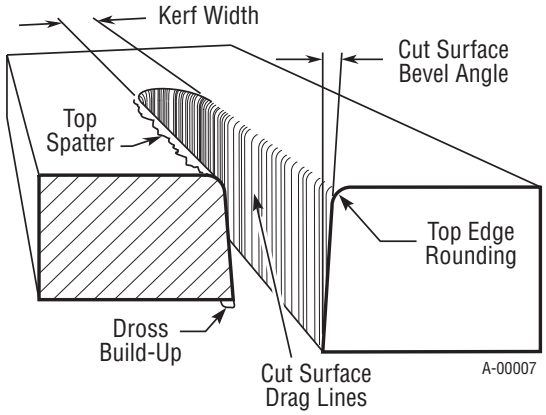
CAUTION

While nothing prevents the operator from switching gases during piloting or cutting it is not recommended to do so. If the operator switches gases during piloting or cutting, the power supply will finish the cut with the first gas chosen. Then the gas control will switch to the new gas. Switching gases during piloting or cutting may damage torch parts, torch leads, the control module, or the piece being cut.

Cut Quality

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. Cut quality will vary on different materials and thicknesses.





Cut Surface

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

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.

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.

Dross Build-up and Top Spatter

Dross is molten material which is not blown out of the cut area and re-solidifies on the plate. Top spatter is dross which accumulates on the top surface of the workpiece. Excessive dross may require secondary cleanup operations after cutting.

Kerf Width

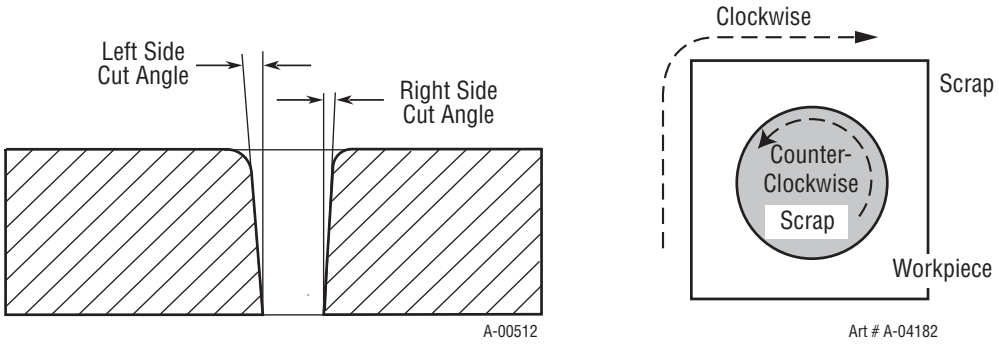
The width of material removed during the cut.

Nitride Build-up

Nitride deposits which may remain on the cut edge of the carbon steel when nitrogen is present in the plasma gas stream. Nitride buildups may create difficulties if the steel is welded after the cutting process.

Direction of Cut

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.



Swirl Effect on 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.

Underwater Cutting

Cutting on a water table either underwater or with the water touching the plate or with a water muffler system is not recommended. If a water table is used the water level must be a minimum of 4 inches from the bottom of the plate. Failure to follow this recommendation could result in poor cut quality and short consumable parts life.

Ohmic Height Sensing

Ohmic height sensing is not recommended with water shield. Water on the plate interferes electrically with the ohmic sensing circuit.

Marking

Marking requires adjusting the pre-charge pressures. Refer to the torch data section for details.

4.06 Gas Selection

A. Plasma Gases

1. Air Plasma

- Most often used on ferrous or carbon base materials for good quality at faster cutting speeds.
- Air plasma is normally used with air shield.
- Only clean, dry air is recommended for use as plasma gas. Any oil or moisture in the air supply will substantially reduce torch parts life.
- Provides satisfactory results on nonferrous materials.

2. Argon/Hydrogen (H35) Plasma

- Recommended for use on 3/4 in (19 mm) and thicker stainless steel. Recommended for 1/2 inch (12 mm) and thicker nonferrous materials. Ar/H2 is not normally used for thinner nonferrous materials because less expensive gases can achieve similar cut quality.
- Poor cut quality on ferrous materials.
- Provides faster cutting speeds and high cut quality on thicker materials to offset the higher cost.
- A 65% argon / 35% hydrogen mixture should be used.

3. Oxygen (O_2) Plasma

- Oxygen is recommended for cutting ferrous materials.
- Provides faster cutting speeds.
- Provides very smooth finishes and minimizes nitride build-up on cut surface (nitride build-up can cause difficulties in producing high quality welds if not removed).

4. Nitrogen (N_2) Plasma

- Provides better cut quality on nonferrous materials such as stainless steel and aluminum.
- Can be used in place of air plasma with air shield or carbon dioxide (CO_2).
- Provides much better parts life than air.
- A good clean welding grade nitrogen should be used.

5. H17 Plasma (17.5% Hydrogen / 32.5% Argon / 50% Nitrogen)

- Recommended for 1/2 inch (12 mm) and thicker nonferrous materials. H17 is not normally used for thinner nonferrous materials because less expensive gases can achieve similar cut quality.
- Alternative to H35 Plasma. Yields slightly higher cut speeds and similar cut quality.
- When using H17, the gas should be supplied to the gas supply port marked “H35”.
- Poor cut quality on ferrous materials.

B. Shield Gases

1. Compressed Air Shield

- Air shield is normally used when operating with air plasma.
- Improves cut quality on some ferrous materials.
- Inexpensive - reduces operating costs.

2. Nitrogen (N2) Shield

- Nitrogen shield is used with Ar/H2 (H35) plasma.
- Provides smooth finishes on nonferrous materials.
- May reduce smoke when used with Ar/H2 plasma.

3. Water Shield

- Water shield should be used only in mechanized applications - never in hand cutting!
- Normally used with nitrogen, Ar/H2, or air plasma.
- Provides very smooth cut surface.
- Reduces smoke and heat input to the workpiece.
- Effective up to 1/2 inch (12.7 mm) maximum material thickness.
- Tap water provides low operating expense.

4.07 Power Supply Status Codes

On start-up and during operation, the power supply control circuitry performs various tests. If the circuitry detects a condition requiring operator attention, the status indicator on the control panel flashes a 2-part code to indicate a code group and then a particular condition within the group. After 4 seconds, the sequence repeats.

Example: Indicator flashes 4 times; the condition is in group 4. After a 1.2 second delay, the indicator blinks 3 times; the condition code is 4-3, indicating that the coolant is overheating. After a 4-second delay, the indicator repeats the sequence until the condition is corrected.

Some conditions can be active indefinitely, while others are momentary. The power supply latches momentary conditions; some momentary conditions can shut down the system. The indicator may show multiple conditions in sequence; it is important to recognize all possible conditions that may be displayed.

NOTE

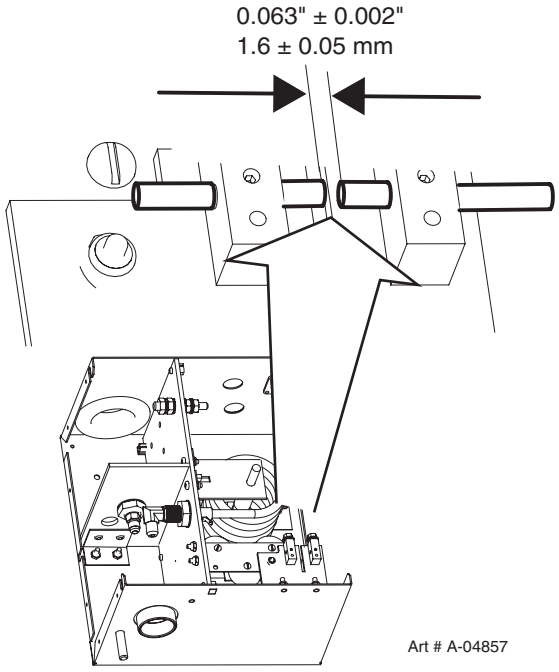
These codes are for systems with Firmware versions 2.4 or later. If your system's Firmware is a prior version, contact your distributor for updates.

Fault Code Key		
Error Code	**Error**	**Remedy / Comments**
1-1	Plasma Disabled or Missing AC Input Phase	Plasma Enable Off ; External E-Stop Activated or CCM TB1-1&2 jumper missing; Missing AC Phase; No power to GCM 2000 or 2010 Gas Control, check GCM control cable connected, reset CP4 or CP5 circuit breaker in power supply, blown fuse F19 in GCM.
1-2	Pilot Ignition Failure	Pilot did not start within 15 seconds. Preflow pressure too high; Defective Arc Starter
1-3	Lost Pilot	Pilot went out while CNC Start active Ensure process loaded agrees with torch parts installed; If custom process cut current too low or preflow pressure too high. Torch consumable parts worn
1-4	Transfer Lost	Arc was transferred to work for more than 50 ms and then went out while CNC Start still active. Standoff too high; Current set too low.
1-5	Off the Plate	Function not currently enabled
1-6	Pilot Timed out no Transfer	Must transfer from Pilot to Cutting Arc in 85 ms. (SW8-1 OFF) or 3 sec. (SW8-1 ON). Standoff too high or void in work under torch; cut current too low for consumables; Preflow pressure too low.
1-7	Reserved	No information available; Contact customer service
1-8	Possible Shorted Torch	Tip voltage too close to electrode voltage. Plasma supply pressure too low; Leak in Plasma hose to torch; plasma pressure / flow may be too low or cut current too high. Torch consumable parts worn; Shorted torch body
1-9	Reserved	No information available; Contact customer service
1-10	Reserved	No information available; Contact customer service

Fault Code Key		
Error Code	**Error**	**Remedy / Comments**
2-1	Missing AC Phase	Blown fuse, Broken or loose connection on power cable
2-2	Wrong input voltage	Inverter(s) not configured correctly for input voltage; Poor power quality (brownouts, dropouts); Input power capacity / wiring too small causing voltage drop; broken or loose power cable connections.
2-3	Inverter or Pilot Regulator Over Temperature	
2-4	Power Supply not Ready	
2-5	DC Output Low	Less than 60 VDC; Defective inverter, shorted output; CCM voltage sense (J6) wire open or disconnected. Negative lead short to gnd. Shorted chopper (100-300A only).
2-6	Inverter input fault	Capacitor bank voltage imbalance (400-460-600V only) or inverter primary switching circuit overcurrent. If occasional may be line voltage surge; remove power to reset. If persists defective inverter; LED on inverter indicate which one.
2-7	Unexpected current	Current above 20A in work or pilot leads before pilot ignition; Possible shorted torch; Defective current sensor.
2-8	Unexpected current in pilot circuit	Current above 5A in pilot circuit; wrong or mismatched consumables; Pilot lead shorted to negative in torch tube; Possible shorted torch
2-9	Unexpected current in work lead	Current above 5A in work lead; Short to chassis in RAS; Negative lead short to ground.
2-10	Reserved	No information available; Contact customer service
2-11	Reserved	No information available; Contact customer service
3-1	Gas Control Communication fault.	Cannot establish Communication with gas control. If Gas Control is GCM 200 or (rest of text unchanged.)
3-2	Gas Control reply fault.	Connection was established but (rest of text unchanged.)
3-3	Gas Supply Pressure out of range.	If Gas Control is GCM 200 or GCM 1000 Plasma may be less than 51 PSI; faulty or disconnected pressure SW. If GCM 2010 is rev AG or GCM2000 is rev AC (or later) or Gas Control has been updated with 19X2219_AG (or later) PCB then Plasma or Shield supply pressure may be outside the range of 105-135 PSI. Unplugged or faulty pressure sensor; faulty gas control PCB.
3-4	Gas Control not ready	Purging; Not in RUN mode; Gas Control faulty, replace PCB
3-5	Gas Control Protocol Error	Verify Firmware revison for compatiblity with CCM
3-6	Reserved	No information available; Contact customer service
3-7	Gas Control sequencing error	Verify Firmware revison for compatiblity with CCM
3-8	Gas Control Type Mismatch	CCM must be Ultracut type for GCM 2010; Autocut type for GCM 2000, GCM 1000 or GCM 200
3-9	Gas Control Command fault	Verify Firmware revison for compatiblity with CCM
3-10	Reserved	No information available; Contact customer service
3-11	Reserved	No information available; Contact customer service
3-12	Reserved	No information available; Contact customer service
3-13	Reserved	No information available; Contact customer service

Fault Code Key		
Error Code	**Error**	**Remedy / Comments**
4-1	Coolant Level low	Check coolant level, add as needed.
4-2	Low coolant flow	Fault response time: Process Never started since last power cyle: Below 0.7 GPH for 15 Seconds. Else below 0.5 GPH no delay or after 3 seconds if below 0.7 GPH Possible cause: Suction leak introducing air into coolant, suspect rear panel filter seal; clogged filter; defective pump.
4-3	Coolant overheated	Coolant return temperature exceeded 70 degrees Celcius (158F). Coolant fan failed; radiator fins clogged with dirt; operating with side panel loose or removed. Ambient temperature > 40 deg C.
4-4	Coolant System not ready.	Proper coolant flow of 0.7 GPH was not obtained during up to 4 minutes of Priming. New installation can require additional Priming cycle(s) to fill hoses with coolant; cylce power to restart Priming; Suction leak introducing air into coolant; suspect rear panel filter seal; Clogged coolant filter; Damaged torch coolant tube; Defective pump assembly.
4-5	Low Coolant Level Warning	Low coolant level during cut, does not stop cut. Add coolant as required.
5-1	CANBUS Acknowledge fault.	If GCM 1000, Basic ID signal missing; Other gas controls, Fiber disconnected or broken, Transceiver (what fiber plugs into) fault, replace Gas control PCB or CCM
5-2	CANBUS Off	Dirt on fiber ends or in connectors, blow out with clean dry air; fiber not locked into connector; sharp bends in fiber; fiber defective;
5-3	CANBUS Errors Warning.	Dirt on fiber ends or in connectors, blow out with clean dry air; fiber not locked into connector; sharp bends in fiber; fiber defective;
5-4	Reserved	No information available; Contact customer service
6-1	CCM Analog Voltage Error	Replace CCM
6-2	CCM ADC or DAC error	Replace CCM
6-3	Coolant Flow too High	Torch coolant tube broken or missing; CCM fault, replace CCM
6-4	CCM Data Memory error	Replace CCM
6-5	CCM Program memory fault	Replace CCM
6-6	+5V Logic supply low	Replace CCM
6-7	CCM processor over temp	Reduce ambient tempurature; Defective CCM; replace
6-8	5V supply for RS 485/422 communication low.	Replace CCM

4.08 Remote Arc Starter: Spark Gap Adjustment



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SECTION 5: MAINTENANCE

5.01 General Maintenance

Perform the following checks periodically to ensure proper system performance.

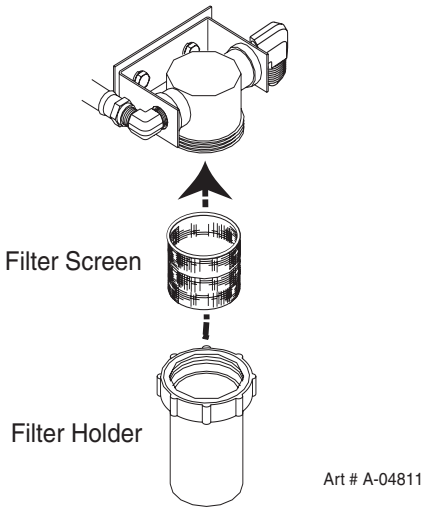
Power Supply Maintenance Schedule
Daily
Check coolant level; add coolant as needed.
Check gas hose connections and pressures.
UC-AC Maintenance schedule
Monthly
Check cooling fan and radiator; clean as needed.
Check gas hoses for cracks, leaks, or abrasion. Replace as needed.
Check all electrical connections for cracks or abrasion. Replace as needed.
Six Months
Clean or replace external coolant filter.
Clean coolant tank.
Vacuum out any dust buildup inside power supply.
Check internal coolant filter

5.02 External Coolant Filter Cleaning Procedure

Periodic cleaning of the coolant filter ensures maximum coolant flow efficiency. Poor coolant flow causes inefficient torch parts cooling with consequent faster consumable wear.

Clean the coolant filter as follows:

1. Disconnect the system from main input power.



2. Unscrew and remove the filter bowl by hand. Be sure to keep the O-ring.
3. Remove and clean the filter. Re-install the bowl, tightening it **by hand.** Be sure the O-ring is in place.
4. Turn the system on and check for leaks.

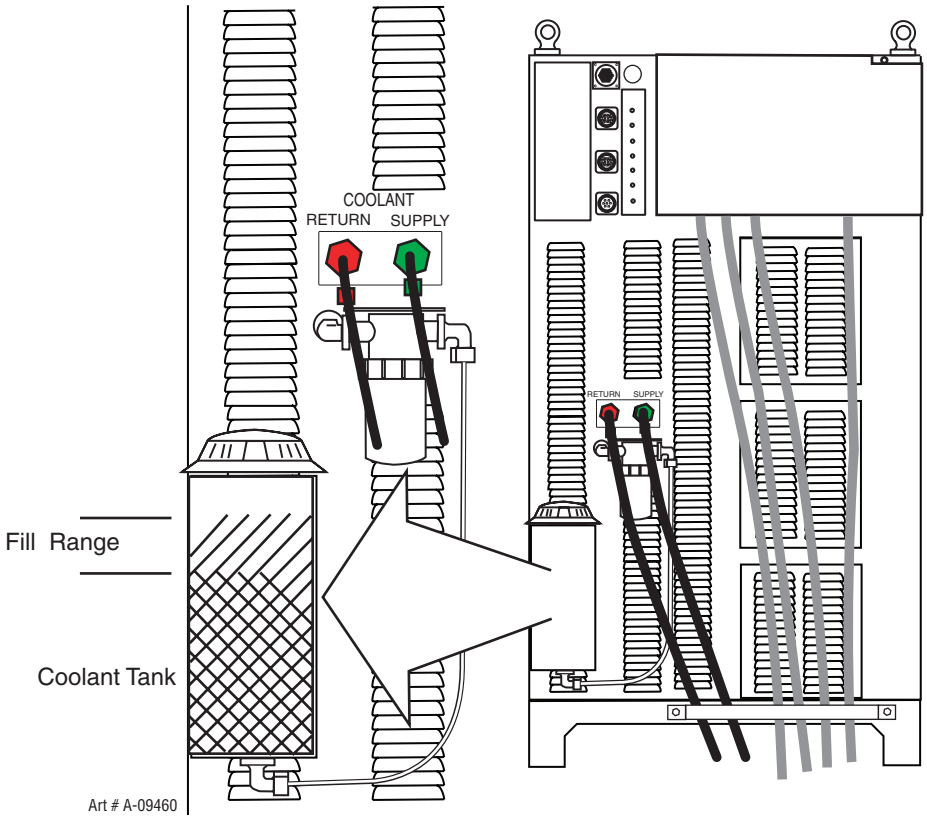
5.03 Internal Coolant Filter Cleaning Procedure

The in-line filter screen should be cleaned periodically. To gain access to the In-Line Filter Assembly remove the right side panel (viewed from the front of unit) of the Power Supply. Remove the filter screen by unscrewing the filter holder from the In-Line Filter Assembly. Clean the filter screen by rinsing with hot soapy water. Remove soap residue by rinsing with clean hot water. Be sure that all the soap has been removed and the screen is dry of water before re-installing in the In-Line Filter Assembly.

5.04 Coolant Replacement Procedure

Replace coolant as follows:

1. Disconnect the system from main input power. At the bottom of the coolant tank, disconnect the coolant line fitting and collect coolant in a disposable container.
2. Connect the system to main input power and turn it on to allow the pump to empty the tank. The pump will run approximately for 20 seconds before the flow switch causes an interlock. This procedure may be repeated a few times until the tank is completely empty.
3. Connect the coolant line fitting and fill the tank with fresh coolant until the right level is reached.



4. Turn system on, let it run for a few minutes and check coolant level, refill if necessary.

5.05 Remote Arc Starter: Service Chart

Arc Starter Service Chart			
Symptom	**Cause**	**Check**	**Remedy**
No Pilot ignition: Spark in Arc Starter but no ignition	Coolant has become conductive	Use conductivity meter	Flush system, replace coolant.
	Pilot return wire not connected	Visual inspection	Connect Wire.
	Spark gap set too close	Check with feeler gauge	Set to 0.063" ±0.002"
	High Frequency cap (C4) possibly open	Use capacitance meter	Reconnect or replace.
	Broken or missing ferrites	Visual inspection	Replace.
	Short across in inductor (L1)	Visual inspection	Remove short; increase coil gaps.
	Spark gap bus caps (C1, C2, C3) broken or defective	Capacitance meter	Replace.
	Negative supply not connected correctly	Visual inspection	Reconnect.
No Pilot ignition: No Spark in Arc Starter	Spark gap set too large	Check with feeler gauge	Set to 0.063" ±0.002"
	Faulty transformer	Resistance measurement	Replace.
	No 120V supply	Check input voltage at EMI filter	Make connections; replace harness.
	No/ loose connection to spark gap	Visual inspection	Reconnect.
	Faulty EMI filter	Voltage/ Resistor measurement	Replace.
No cooling or insufficient cooling: Leaks coolant	Loose fitting(s)	Visual inspection	Tighten fittings.
	Failure to braze joints (L1)	Visual inspection	Replace HF Coil.
	Damaged or punctured coolant line(s).	Visual inspection	Replace coolant line(s).
No cooling or insufficient cooling: No Coolant Flow	Supply & return hose reversed	Visual Inspection of color-coded connections	Match coolant connection colors to arc starter fitting colors.
	Blockage in coil or supply/return hoses	Loosen fitting slightly and check for coolant flow	Flush system.
Erratic System Behavior (EMI Interference)	Shield Drain / Torch lead inner shield connector missing or loose.	Visual inspection of lead attachment to Arc Starter	Reconnect / tighten lead connectors.
	Missing or loose ground connection	Visual inspection of ground wire to Arc Starter	Make or tighten connections to good ground.
	Cap C5 not connected, open or loose	Visual inspection / capacitor measurement	Replace PCB.

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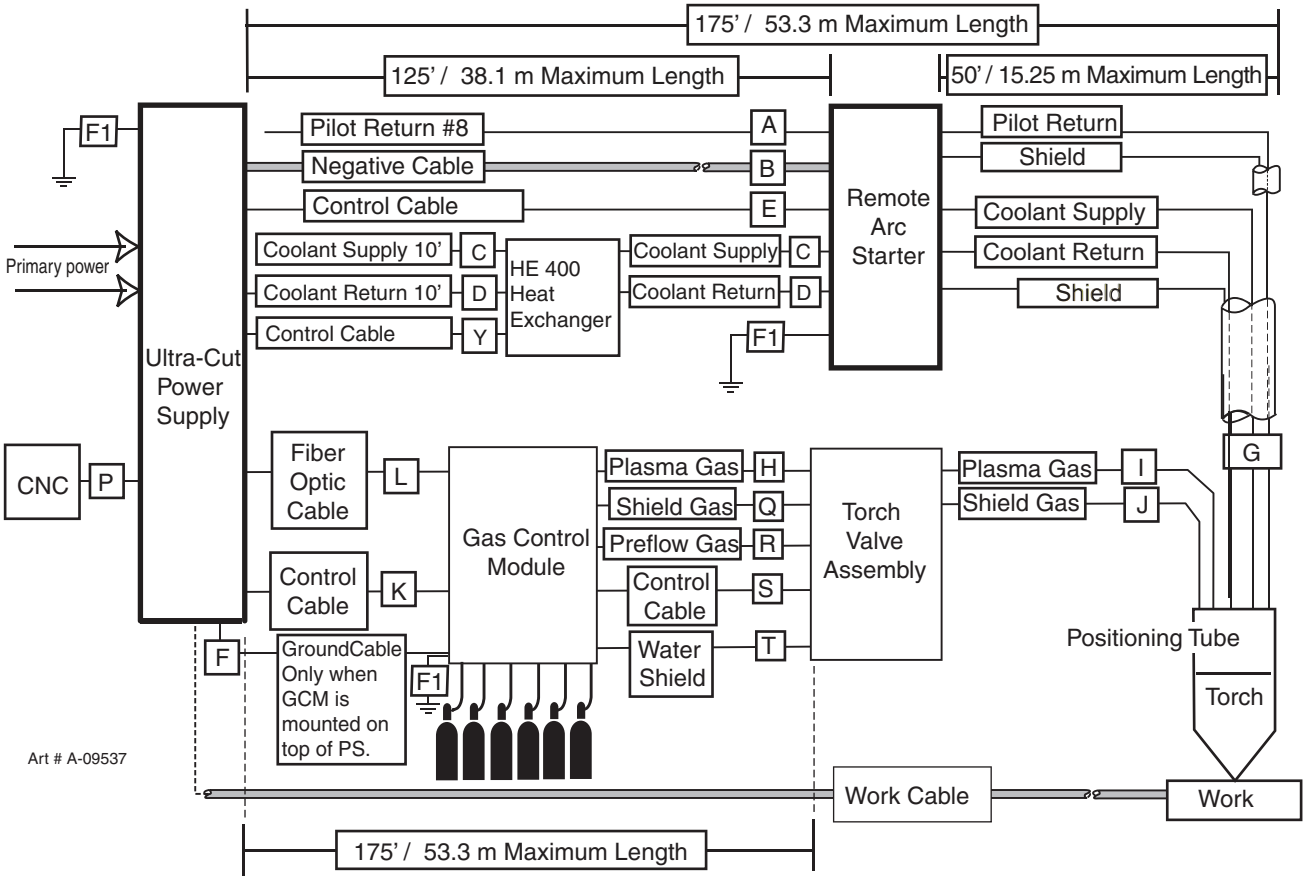
SECTION 6: REPLACEMENT ASSEMBLIES & PARTS

6.01 Replacement Power Supply

Complete Unit / Component	Catalog Number
Ultra-Cut® 400 Power Supply, 208/230V	3-9120-1
Ultra-Cut® 400 Power Supply, 460V	3-9120-2
Ultra-Cut® 400 Power Supply, 400V (CCC)	3-9120-3
Ultra-Cut® 400 Power Supply, 400V, (CE)	3-9120-4
Gas Control Module (GCM-2010) with XTL Torch Valve Assembly (Requires Firmware version 3.2 or higher for C.C.M.)	3-9131
Gas Control Module (GCM-2010) Only	7-4000
Original Torch Valve Assembly Repair Part Only	4-3049
XTL Torch Valve Assembly Only (Requires C.C.M. Firmware version 3.2 or higher and GCM 2010 Firmware version 3.1 or higher)	4-3054
Remote Arc Starter (RAS-1000)	3-9130
OPTIONAL EQUIPMENT:	
Wheel Kit	9-9379

6.02 System Layout

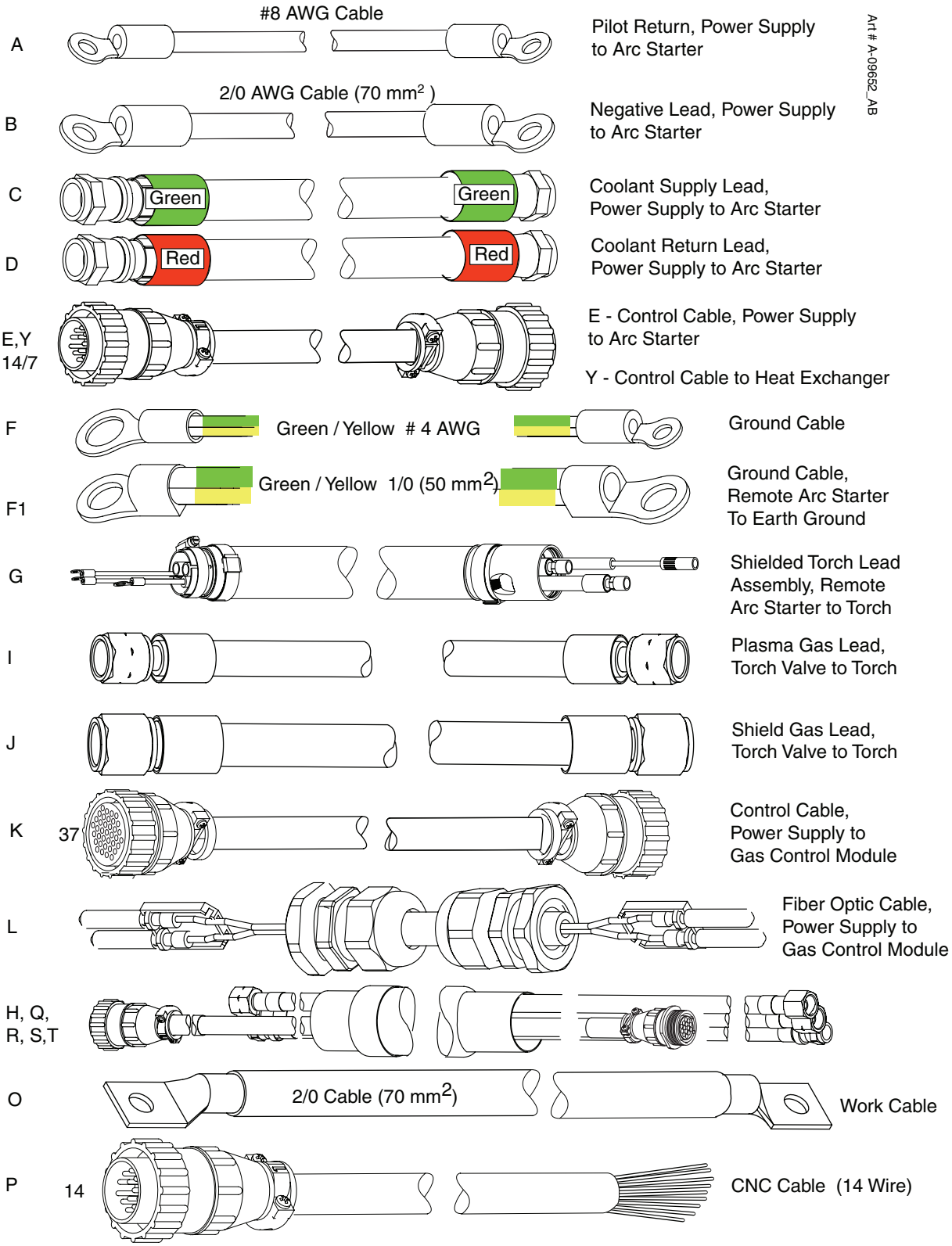
Refer to section 3.05 for ground connections and ground cables.



6.03 Recommended Gas Supply Hose

Item #	Qty	Description	Catalog #
	1	3/8"Gray Synflex Hose. No fittings included. Catalog number per foot	9-3616

6.04 Leads and Cables



Key	Description	Catalog #
A,B,C,D,E	Supply Lead Set, 4’ / 1.3 m (See Note 1)	4-3096
A,B,C,D,E	Supply Lead Set, 10’ / 3.05 m (See Note 1)	4-3097
A,B,C,D,E	Supply Lead Set, 15’ / 4.5 m (See Note 1)	4-3098
A,B,C,D,E	Supply Lead Set, 25’ / 7.6 m (See Note 1)	4-3099
A,B,C,D,E	Supply Lead Set, 35’ / 10.6 m (See Note 1)	4-3100
A,B,C,D,E	Supply Lead Set, 50’ / 15.2 m (See Note 1)	4-3101
A,B,C,D,E	Supply Lead Set, 75’ / 22.9 m (See Note 1)	4-3102
A,B,C,D,E	Supply Lead Set, 100’ / 30.5 m (See Note 1)	4-3103
A,B,C,D,E	Supply Lead Set, 125’ / 38.1 m (See Note 1)	4-3104
A	Pilot Return Cable (only), 4’ / 1.2 m	9-4890
A	Pilot Return Cable (only), 10’ / 3.05 m	9-4891
A	Pilot Return Cable (only), 15’ / 4.5 m	9-4790
A	Pilot Return Cable (only), 25’ / 7.6 m	9-4791
A	Pilot Return Cable (only), 35’ / 10.6 m	9-9426
A	Pilot Return Cable (only), 50’ / 15.2 m	9-4792
A	Pilot Return Cable (only), 75’ /22.8 m	9-4793
A	Pilot Return Cable (only), 100’ /30.5 m	9-4794
A	Pilot Return Cable (only), 125’ /38.1m	9-4796
B	Negative Cable (only), 10’ / 3.05 m	9-0449
B	Negative Cable (only), 15’ / 4.5 m	9-0450
B	Negative Cable (only), 25’ / 7.6 m	9-0451
B	Negative Cable (only), 35’ / 10.6 m	9-0452
B	Negative Cable (only), 50’ / 15.2 m	9-0453
B	Negative Cable (only), 75’ / 22.8 m	9-0454
B	Negative Cable (only), 100’ / 30.5 m	9-0455
B	Negative Cable (only), 125’ / 38.1 m	9-0456
C	Hose, Coolant Supply, (only), 3’ / 1 m	9-4886
C	Hose, Coolant Supply, (only), 10’ / 3.05 m	9-4887
C	Hose, Coolant Supply, (only), 15’ / 4.6 m	9-4780
C	Hose, Coolant Supply, (only), 20’ / 6 m	9-4781
C	Hose, Coolant Supply, (only), 25’ / 7.6 m	9-4782
C	Hose, Coolant Supply, (only), 30’ / 9.1 m	9-4783
C	Hose, Coolant Supply, (only), 35’ / 10.6 m	9-4784
C	Hose, Coolant Supply, (only), 40’ / 12 m	9-4785

NOTE 1:

Supply lead sets include Pilot Return Cable, Negative Cable, Coolant Supply & Return Hoses, and Control Cable.

Key	Description	Catalog #
C	Hose, Coolant Supply, (only), 50’ / 15.2 m	9-4786
C	Hose, Coolant Supply, (only), 75’ / 23 m	9-4787
C	Hose, Coolant Supply, (only), 100’ / 30.5 m	9-4788
D	Hose, Coolant Return, (only), 3’ / 1 m	9-4888
D	Hose, Coolant Return, (only), 10’ / 3.05 m	9-4889
D	Hose, Coolant Return, (only), 15’ / 4.6 m	9-4762
D	Hose, Coolant Return, (only), 20’ / 6 m	9-4763
D	Hose, Coolant Return, (only), 25’ / 7.6 m	9-4764
D	Hose, Coolant Return, (only), 30’ / 9.1 m	9-4765
D	Hose, Coolant Return, (only), 35’ / 10.6 m	9-4766
D	Hose, Coolant Return, (only), 40’ / 12 m	9-4767
D	Hose, Coolant Return, (only), 50’ / 15.2 m	9-4768
D	Hose, Coolant Return, (only), 75’ / 23 m	9-4769
D	Hose, Coolant Return, (only), 100’ / 30.5 m	9-4770
E	Control Cable (only), Power Supply to Arc Starter 3’ / 1 m	9-4941
E	Control Cable (only), Power Supply to Arc Starter 10’ / 3.05 m	9-4916
E	Control Cable (only), Power Supply to Arc Starter 15’ / 4.5 m	9-4917
E	Control Cable (only), Power Supply to Arc Starter 25’ / 7.6 m	9-4918
E	Control Cable (only), Power Supply to Arc Starter 50’ / 15.2 m	9-4942
E	Control Cable (only), Power Supply to Arc Starter 75’ / 22.9 m	9-4943
E	Control Cable (only), Power Supply to Arc Starter 100’ / 30.5 m	9-4944
E	Control Cable (only), Power Supply to Arc Starter 125’ / 38.1 m	9-4922
F	Ground Wire, Power Supply to Gas Control Module, 3’ / 1 m	9-4923
F	Ground Wire, Power Supply to Gas Control Module, 15’ / 4.5 m	9-4924
F	Ground Wire, Power Supply to Gas Control Module, 25’ / 7.6 m	9-4925
F	Ground Wire, Power Supply to Gas Control Module, 50’ / 15.2 m	9-4926
F	Ground Wire, Power Supply to Gas Control Module, 75’ / 22.9 m	9-4927
F	Ground Wire, Power Supply to Gas Control Module, 100’ / 30.5 m	9-4928
F	Ground Wire, Power Supply to Gas Control Module, 125’ / 38.1 m	9-4929
F	Ground Wire, Power Supply to Gas Control Module, 150’ / 45.7 m	9-4930
F1	Ground Wire, Remote Arc Starter to Earth, 3’ / 1 m	9-4931
F1	Ground Wire, Remote Arc Starter to Earth, 15’ / 4.5 m	9-4932
F1	Ground Wire, Remote Arc Starter to Earth, 25’ / 7.6 m	9-4933
F1	Ground Wire, Remote Arc Starter to Earth, 50’ / 15.2 m	9-4934
F1	Ground Wire, Remote Arc Starter to Earth, 75’ / 22.9 m	9-4935
F1	Ground Wire, Remote Arc Starter to Earth, 100’ / 30.5 m	9-4936
F1	Ground Wire, Remote Arc Starter to Earth, 125’ / 38.1 m	9-4937
F1	Ground Wire, Remote Arc Starter to Earth, 150’ / 45.7 m	9-4938

Key	Description	Catalog #
G	Assembly, Torch Lead, 10’ / 3.05 m	4-5200
G	Assembly, Torch Lead, 15’ / 4.6 m	4-5201
G	Assembly, Torch Lead, 20’ / 6 m	4-5202
G	Assembly, Torch Lead, 25’ / 7.6 m	4-5203
G	Assembly, Torch Lead, 30’ / 9.1 m	4-5204
G	Assembly, Torch Lead, 35’ / 10.6 m	4-5205
G	Assembly, Torch Lead, 40’ / 12 m	4-5206
G	Assembly, Torch Lead, 50’ / 15.2 m	4-5207
H,Q,R,S, T	Gas Lead Set, 10’ / 3.05 m (See Note 2)	4-3035
H,Q,R,S, T	Gas Lead Set, 15’ / 4.5 m (See Note 2)	4-3036
H,Q,R,S, T	Gas Lead Set, 25’ / 7.6 m (See Note 2)	4-3037
H,Q,R,S, T	Gas Lead Set, 35’ / 10.6 m (See Note 2)	4-3051
H,Q,R,S, T	Gas Lead Set, 50’ / 15.2 m (See Note 2)	4-3038
H,Q,R,S, T	Gas Lead Set, 75’ / 22.9 m (See Note 2)	4-3039
H,Q,R,S, T	Gas Lead Set, 100’ / 30.5 m (See Note 2)	4-3040
H,Q,R,S, T	Gas Lead Set, 125’ / 38.1 m (See Note 2)	4-3041
H,Q,R,S, T	Gas Lead Set, 150’ / 45.7 m (See Note 2)	4-3042
H,Q,R,S, T	Gas Lead Set, 175’ / 53.3 m (See Note 2)	4-3043
I	Plasma Lead 4’/ 1.22 m (Torch Valve Assembly to Torch)	9-3333
J	Shield Lead 4’ / 1.22 m (Torch Valve Assembly to Torch)	9-3334
K	Control Cable, Power Supply to Gas Control Module, 3’ / 1 m	9-4907
K	Control Cable, Power Supply to Gas Control Module, 15’ / 4.5 m	9-4908
K	Control Cable, Power Supply to Gas Control Module, 25’ / 7.6 m	9-4909
K	Control Cable, Power Supply to Gas Control Module, 35’ / 10.6 m	9-9332
K	Control Cable, Power Supply to Gas Control Module, 50’ / 15.2 m	9-4910
K	Control Cable, Power Supply to Gas Control Module, 75’ / 22.9 m	9-4911
K	Control Cable, Power Supply to Gas Control Module, 100’ / 30.5 m	9-4912
K	Control Cable, Power Supply to Gas Control Module, 125’ / 38.1 m	9-4913
K	Control Cable, Power Supply to Gas Control Module, 150’ / 45.7 m	9-4914
L	Control Cable, Fiber Optic, 3’ / 1 m	9-4898
L	Control Cable, Fiber Optic, 15’ / 4.5 m	9-4899
L	Control Cable, Fiber Optic, 25’ / 7.6 m	9-4900
L	Control Cable, Fiber Optic, 35’ / 10.6 m	9-9335
L	Control Cable, Fiber Optic, 50’ / 15.2 m	9-4901
L	Control Cable, Fiber Optic, 75’ / 22.9 m	9-4902

NOTE 2:

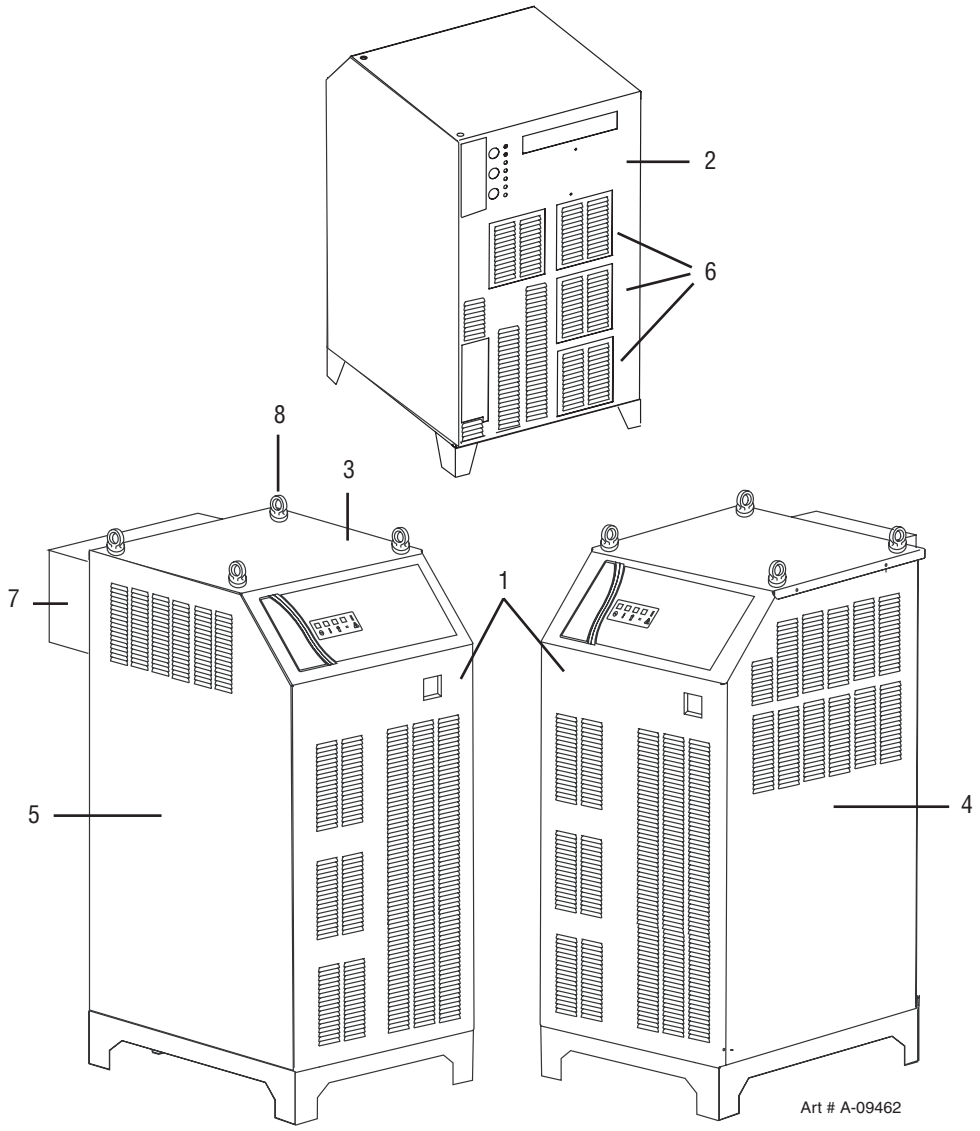
Auto Gas lead sets include Plasma Gas Hose, Shield Gas Hose, Preflow Gas Hose, Water Shield Hose, Fiber Optic Cable, Marking Hose, and Control Cable.

Key	Description	Catalog #
L	Control Cable, Fiber Optic, 100’ / 30.5 m	9-4903
L	Control Cable, Fiber Optic, 125’ / 38.1 m	9-4904
L	Control Cable, Fiber Optic, 150’ / 45.7 m	9-4905
L	Control Cable, Fiber Optic, 175’ / 53.3 m	9-4906
O	Work Cable, 10’ / 3.05 m	9-9300
O	Work Cable, 15’ / 4.5 m	9-9301
O	Work Cable, 25’ / 7.6 m	9-9302
O	Work Cable, 35’ / 10.6 m	9-9303
O	Work Cable, 50’ / 15.2 m	9-9304
O	Work Cable, 75’ / 22.9 m	9-9305
O	Work Cable, 100’ / 30.5 m	9-9306
O	Work Cable, 125’ / 38.1 m	9-9307
P	Control Cable, CNC to Power Supply, 25’ / 7.6 m	9-8312
P	Control Cable, CNC to Power Supply, 50’ / 15.2 m	9-8313
P	Control Cable, CNC to Power Supply, 75’ / 22.9 m	9-8315
P	Control Cable, CNC to Power Supply, 100’ / 30.5 m	9-8316
P	Control Cable, CNC to Power Supply, 125’ / 38.1 m	9-8317
Q	Shield Gas Hose 10’ / 3.05 m	9-7277
Q	Shield Gas Hose 15’ / 4.5 m	9-7278
Q	Shield Gas Hose 25’ / 7.6 m	9-7279
Q	Shield Gas Hose 35’ / 10.6 m	9-7280
Q	Shield Gas Hose 50’ / 15.2 m	9-7281
Q	Shield Gas Hose 75’ / 22.9 m	9-7282
Q	Shield Gas Hose 100’ / 30.5 m	9-7283
Q	Shield Gas Hose 125’ / 38.1 m	9-7284
Q	Shield Gas Hose 150’ / 45.7 m	9-7285
Q	Shield Gas Hose 175’ / 53.3 m	9-7286
R	Pilot Gas/Pre-Flow Hose 10’ / 3.05 m	9-6956
R	Pilot Gas/Pre-Flow Hose 15’ / 4.5 m	9-6957
R	Pilot Gas/Pre-Flow Hose 25’ / 7.6 m	9-6959
R	Pilot Gas/Pre-Flow Hose 35’ / 10.6 m	9-6961
R	Pilot Gas/Pre-Flow Hose 50’ / 15.2 m	9-6963
R	Pilot Gas/Pre-Flow Hose 75’ / 22.9 m	9-6964
R	Pilot Gas/Pre-Flow Hose 100’ / 30.5 m	9--7080

Key	Description	Catalog #
R	Pilot Gas/Pre-Flow Hose 125’ / 38.1 m	9-7081
R	Pilot Gas/Pre-Flow Hose 150’ / 45.7 m	9-4876
R	Pilot Gas/Pre-Flow Hose 175’ / 53.3 m	9-4877
S	Control Cable 10’ / 3.05 m	9-4878
S	Control Cable 15’ / 4.5 m	9-4753
S	Control Cable 25’ / 7.6 m	9-4755
S	Control Cable 35’ / 10.6 m	9-4757
S	Control Cable 50’ / 15.2 m	9-4759
S	Control Cable 75’ / 22.9 m	9-4760
S	Control Cable 100’ / 30.5 m	9-4761
S	Control Cable 125’ / 38.1 m	9-4879
T	Water Shield 10’ / 3.05 m	9-6985
T	Water Shield 15’ / 4.5 m	9-6986
T	Water Shield 25’ / 7.6 m	9-6988
T	Water Shield 35’ / 10.6 m	9-6996
T	Water Shield 50’ / 15.2 m	9-6992
T	Water Shield 75’ / 22.9 m	9-6993
T	Water Shield 100’ / 30.5 m	9-7073
T	Water Shield 125’ / 38.1 m	9-7074
T	Water Shield 150’ / 45.7 m	9-7075
T	Water Shield 175’ / 53.3 m	9-7076
Y	Power Control Cable, HE 10’/ 3.05m	9-0404

6.05 Power Supply External Replacement Parts

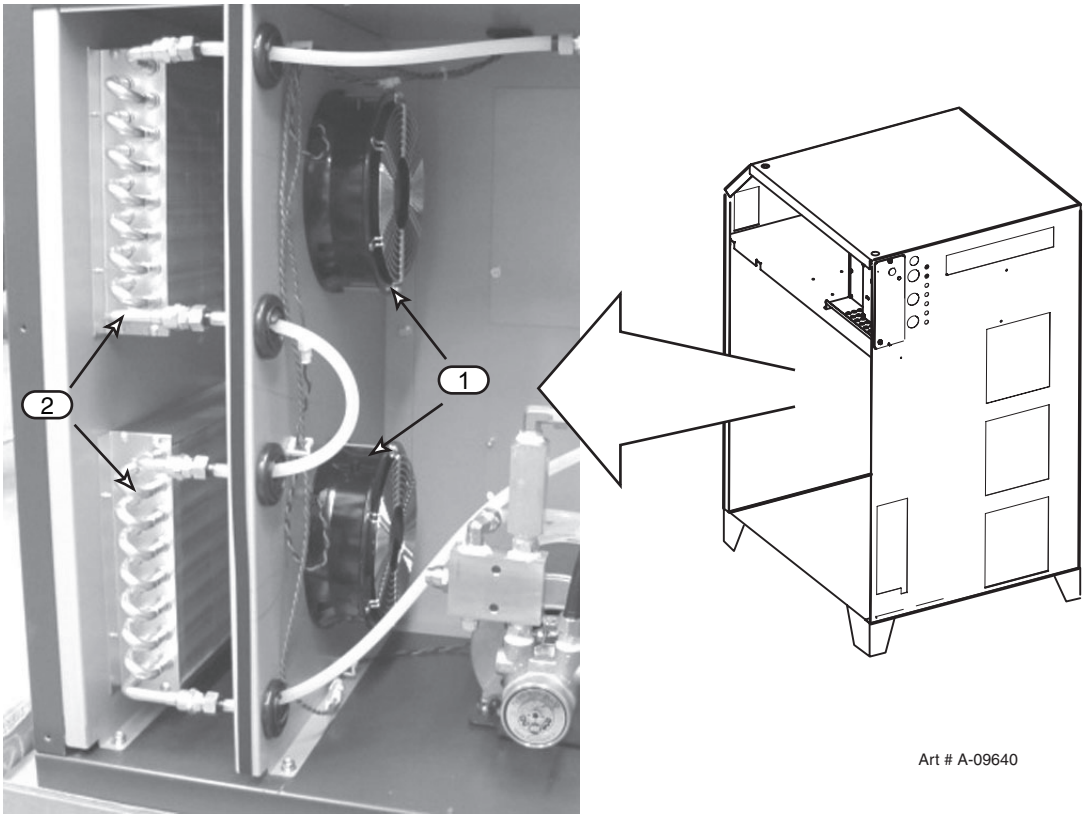
Item #	Qty	Description	Catalog #
1	1	Power Supply Front Panel	N/A
2	1	Power Supply Rear Panel	N/A
3	1	Power Supply Top Panel, Blue	9-0445B
4	1	Power Supply Right Side, Blue	9-0500B
5	1	Power Supply Left Side, Blue	9-0501B
6	1	Louver Panel	9-0444B
7	1	Power Supply Connections Cover	N/A
8	1	Lifting Eye	9-9373



6.06 Power Supply Replacement Parts - Right Side

Item #	Qty	Description	Ref. Des.	Catalog #
1	2	Heat Exchanger Fan (used with radiator)	FAN1,2	9-9338
2	2	Radiator		9-9339

NOTE: Heat Exchanger Fan is the same fan used with the Inverter and not the HE-400.



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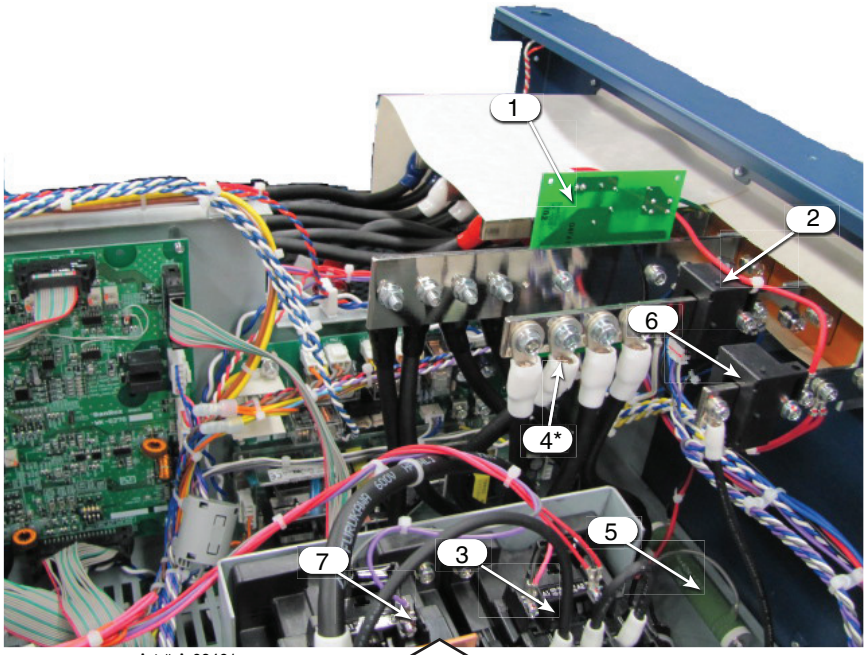
6.07 Power Supply Replacement Parts - Right Side

Item #	Qty	Description	Ref. Des.	Catalog #
1	1	Output Filter PC	PCB8	9-9341
2	1	Sensor, Work	HCT2	9-9368
3	1	Magnetic Contactor, pilot	MC2	9-9343
4*	1	Resistor	R6	9-9340
5	1	Resistor	R9	9-8170
6	1	Sensor, Pilot	HCT1	9-9342
7	1	Magnetic Contactor	MC6	9-9364

* Not visible in photo. Hidden behind other components.



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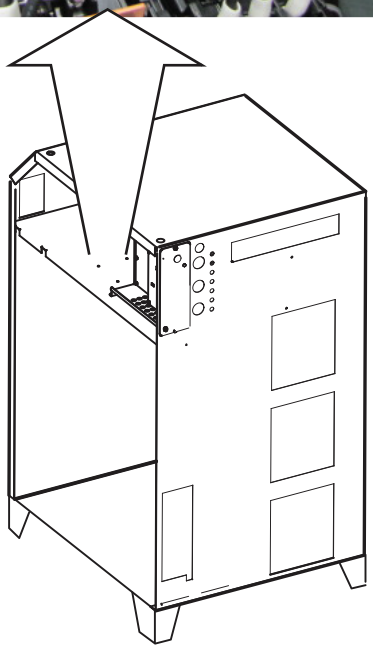
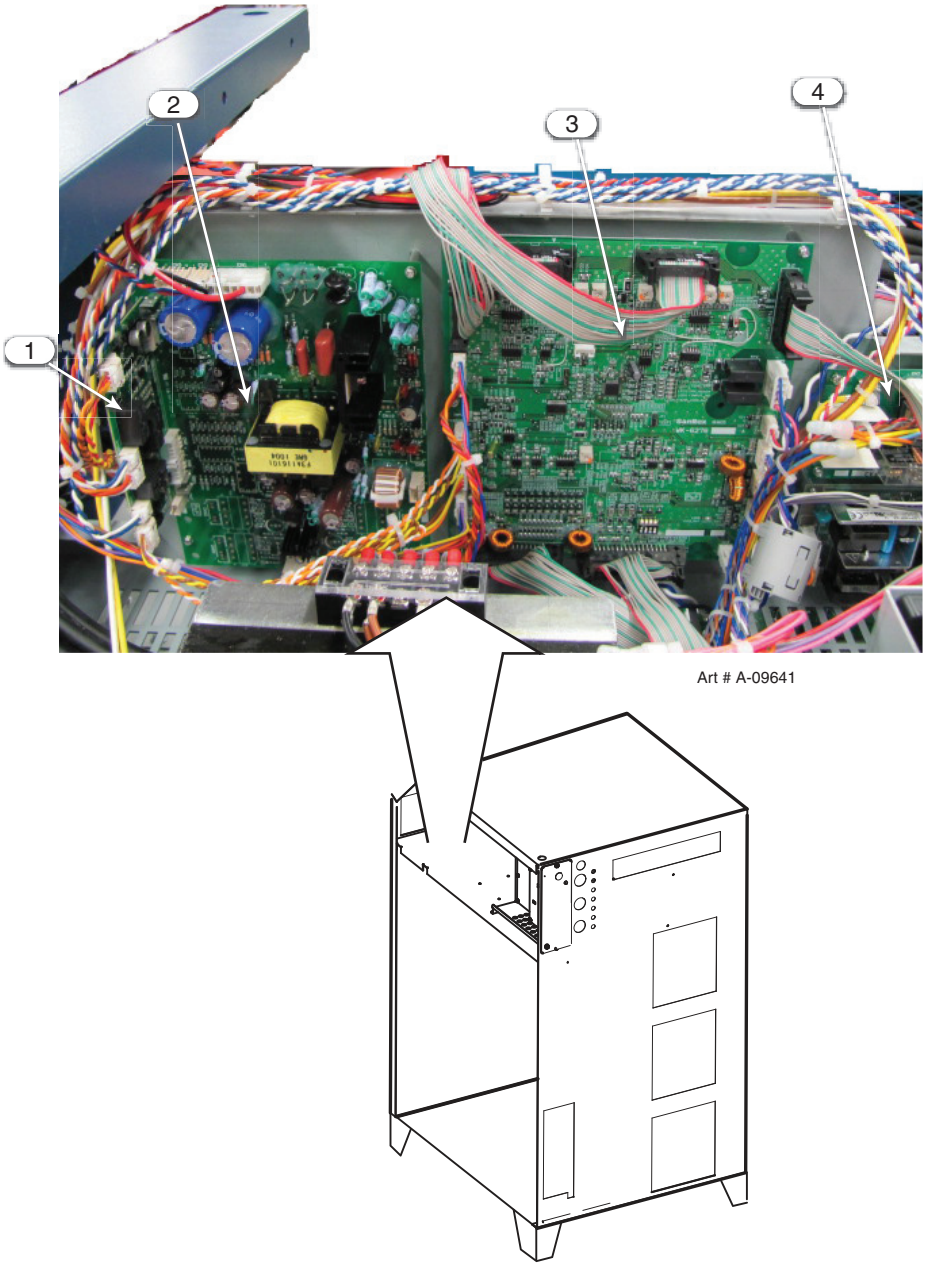


6.08 Power Supply Replacement Parts - Right Side

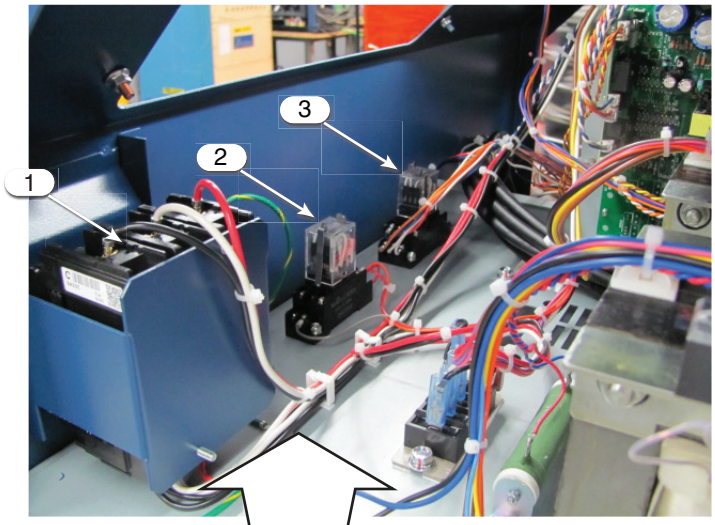
Item #	Qty	Description	Ref. Des.	Catalog #
1	1	PC Board 230/460VAC	PCB4	9-9370
2	1	PC Board	PCB3	9-9365
3	1	Internal Control PC Board	PCB5	9-8169
4	1	Relay PC Board	PCB7	9-9366



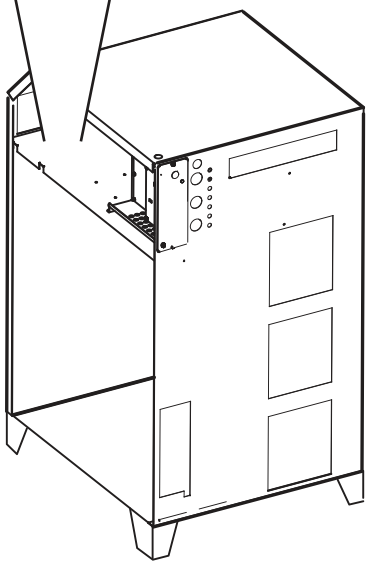
Art # A-09641

6.09 Power Supply Replacement Parts - Front Panel

Item #	Qty	Description	Ref. Des.	Catalog #
1	1	Main Power Switch (‘Circuit Protector’)		
		for 230-400-460 VAC units	CP1	9-9344
	1	for 600 VAC units	CP1	9-9514
2	1	Relay, 110-120VAC DPDT	RY1	9-8171
3	1	Relay, 12VDC, 4PDT	RY2	9-8172

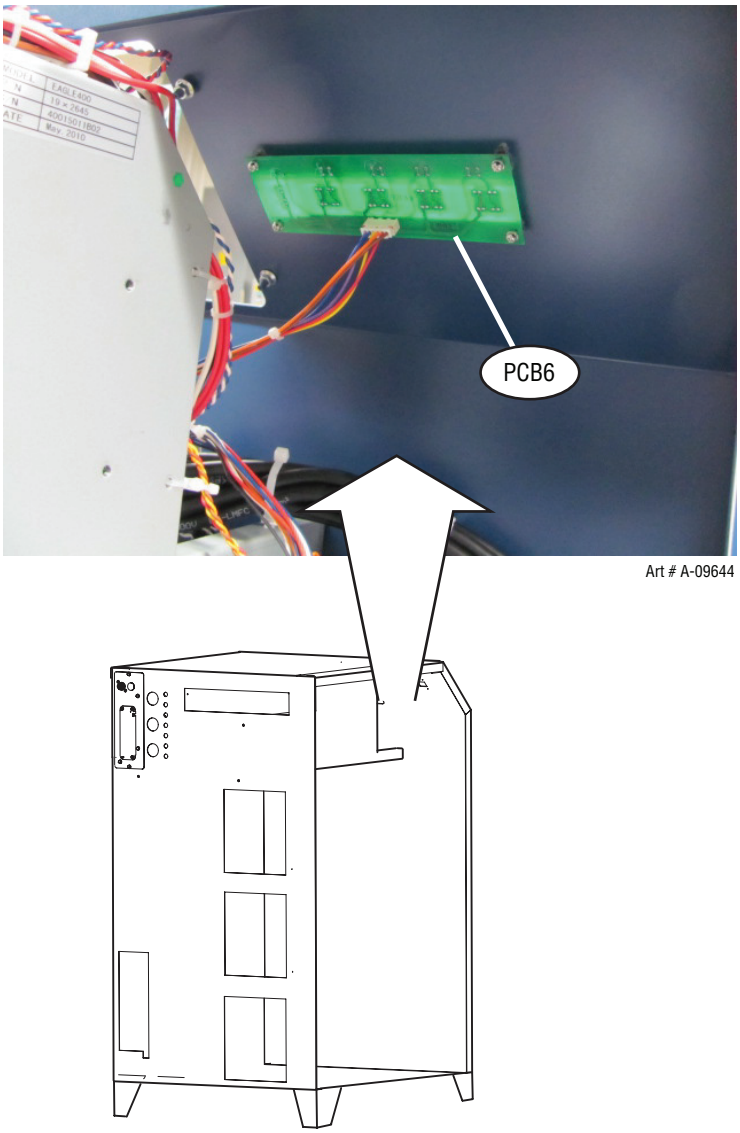


Art # A-09639



6.10 Power Supply Replacement Parts - Front Panel

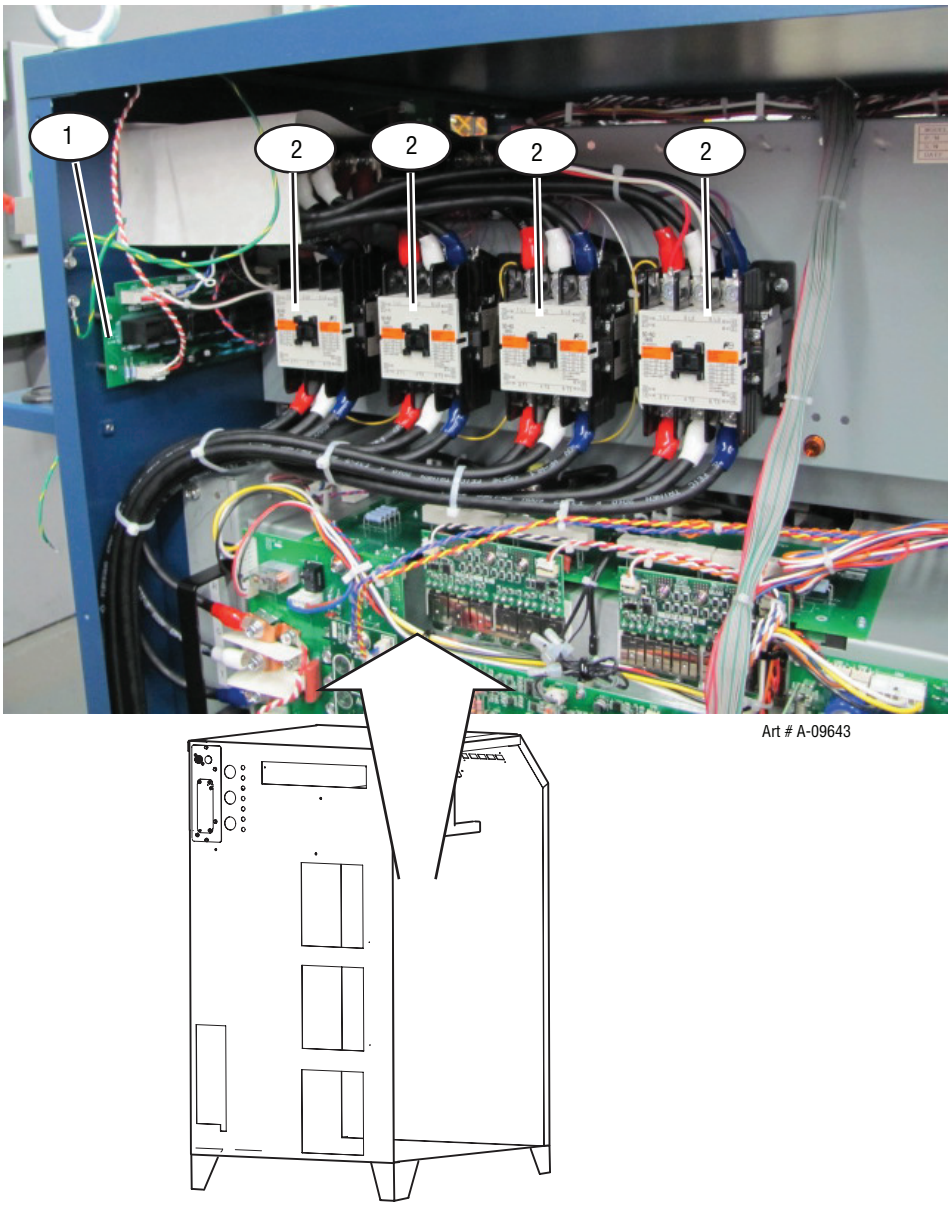
Item #	Qty	Description	Ref. Des.	Catalog #
	1	Display PC Board	PCB6	9-9347



Art # A-09644

6.11 Power Supply Replacement Parts - Right Side

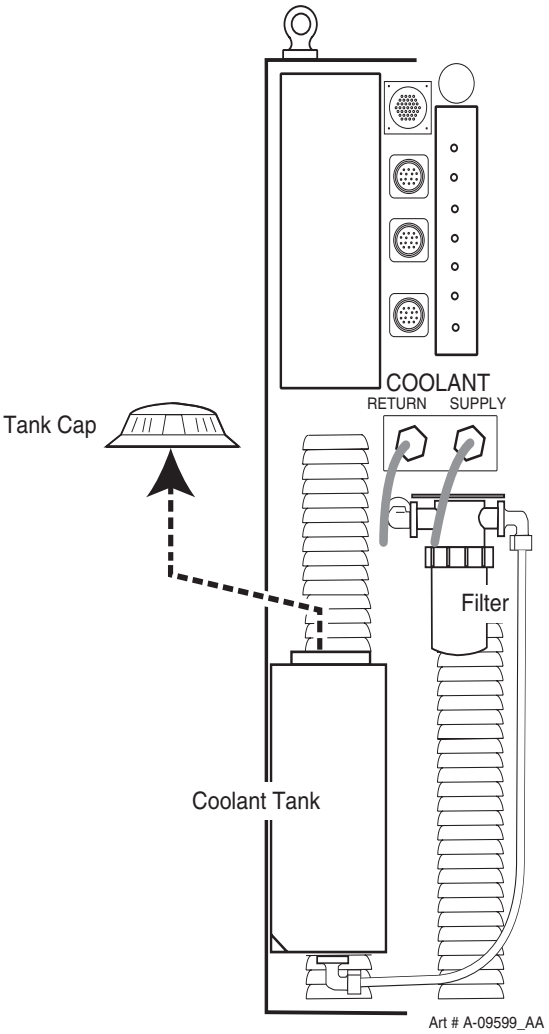
Item #	Qty	Description	Ref. Des.	Catalog #
1	1	PCBoard 230-400-460VAC	PCB1	9-9362
2	1	Magnetic Contactor	MC1,MC3,MC4,MC5	9-9364

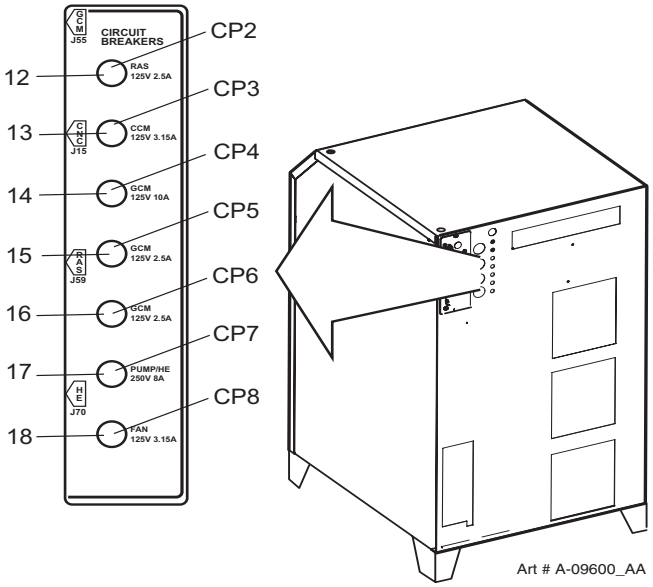


Art # A-09643

6.12 Power Supply Replacement Parts - Rear Panel

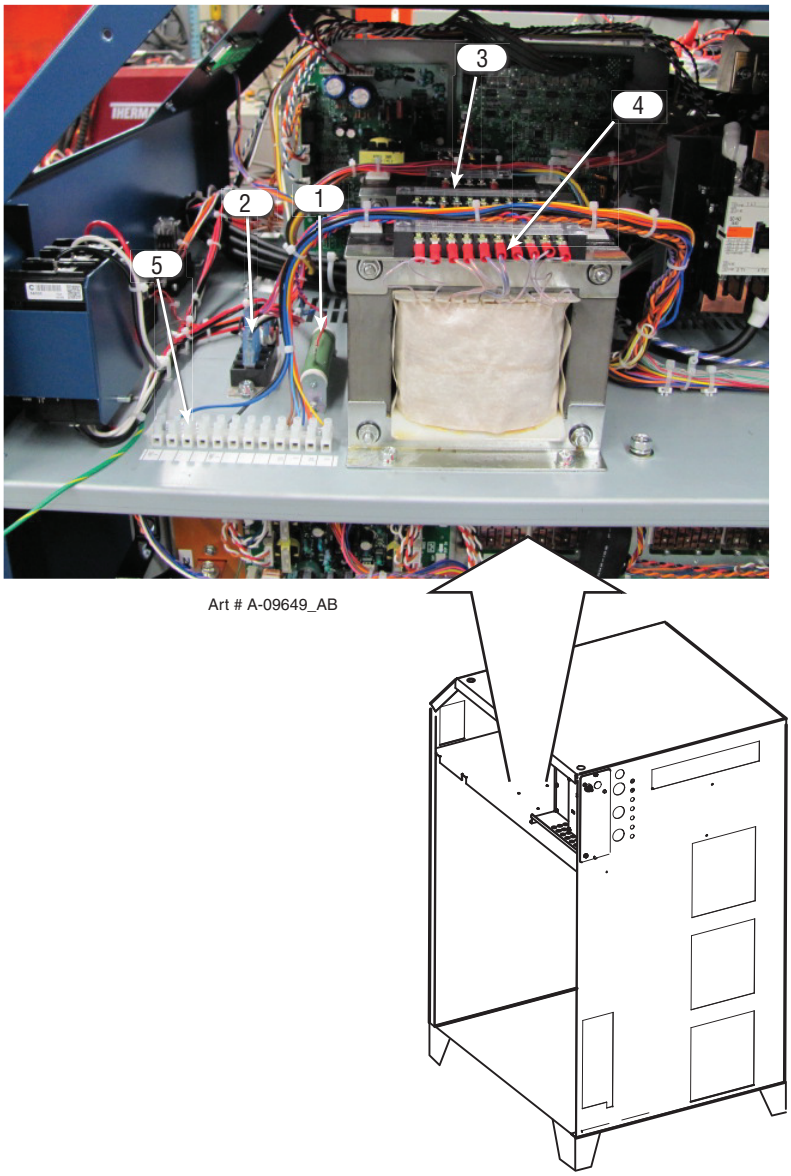
Item #	Qty	Description	Breaker Rating	Circuit Rating	Ref. Des.	Catalog #
12	1	Circuit Breaker (RAS)	125V, 2.5 A	120VAC @ 1A	CP2	9-9348
13	1	Circuit Breaker ('TDC')	125V, 3.15A	24VAC @ 1A	CP3	9-9349
14	1	Circuit Breaker (AGC)	125V, 10A	24VAC @ 5A	CP4	9-9350
15	1	Circuit Breaker (AGC)	125V, 2.5A	120VAC @ 1A	CP5	9-9348
16	1	Circuit Breaker (AGC)	125V, 2.5A	15VDC @ 1A	CP6	9-9348
17	1	Circuit Breaker (Pump/HE)	250V, 8A	230VAC @ 5A	CP7	9-8165
18	1	Circuit Breaker (Fan)	125V, 3.15A	24VDC @ 1A	CP8	9-9349
	1	Coolant Tank				9-5948
	1	Tank Cap				8-5142
	1	Filter, Coolant				8-4276





6.13 Power Supply Replacement Parts - Right Side

Item #	Qty	Description	Ref. Des.	Catalog #
1	1	Resistor	R7	9-9363
2	1	Rectifier (Diode)	D1	9-9345
3	1	Transformer	T2	9-???
4	1	Transformer		
		for 230/460 VAC units	T1	9-9355
	1	for 400/600 VAC units	T1	9-???
5	1	Terminal Strip	TB3	N/A

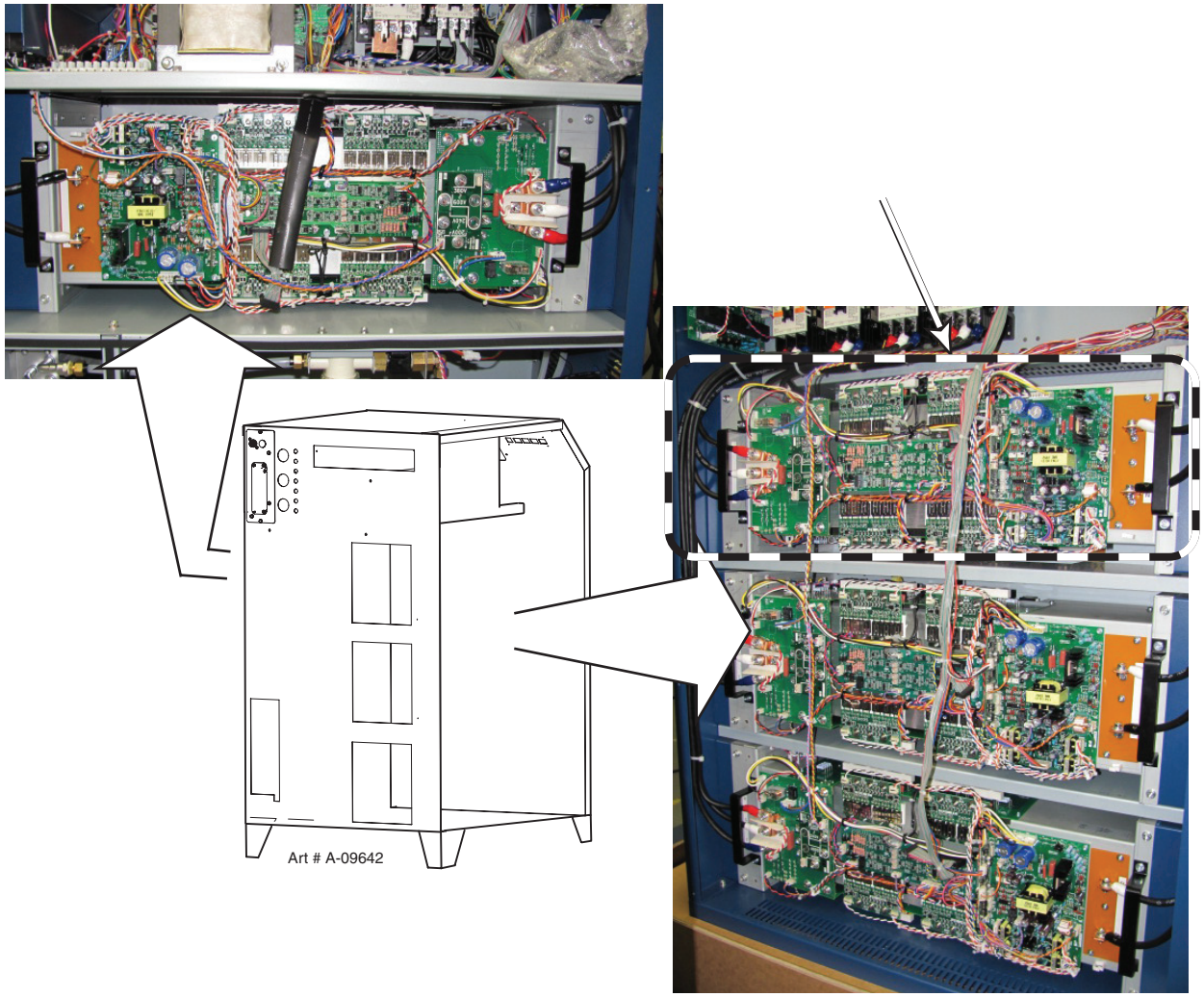


Art # A-09649_AB

6.14 Power Supply Replacement Parts

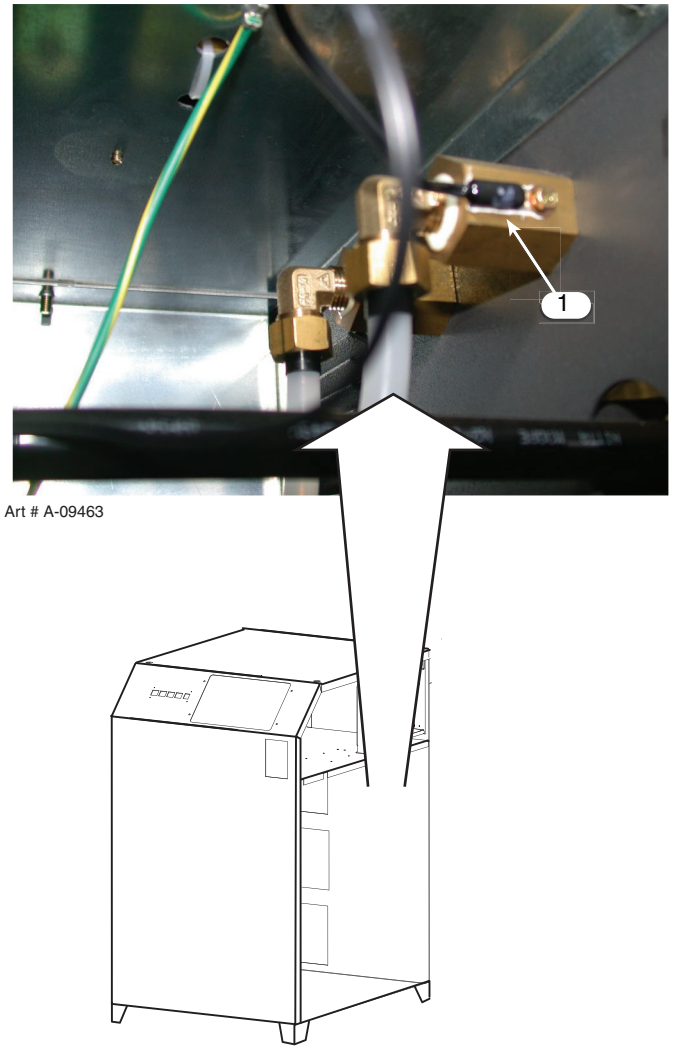
Item #	Qty	Description	Catalog #
29	3	Inverter Module 208/230V/460V	9-9360D
	3	Inverter Module 400V CE and 400V Non CE	9-9482D
Not Shown:			
	3	Inverter Cooling Fan	9-9338

NOTE: The Inverter Cooling Fan is the same fan used for internal Heat Exchanger cooling.



6.15 Power Supply Replacement Parts - Right Side

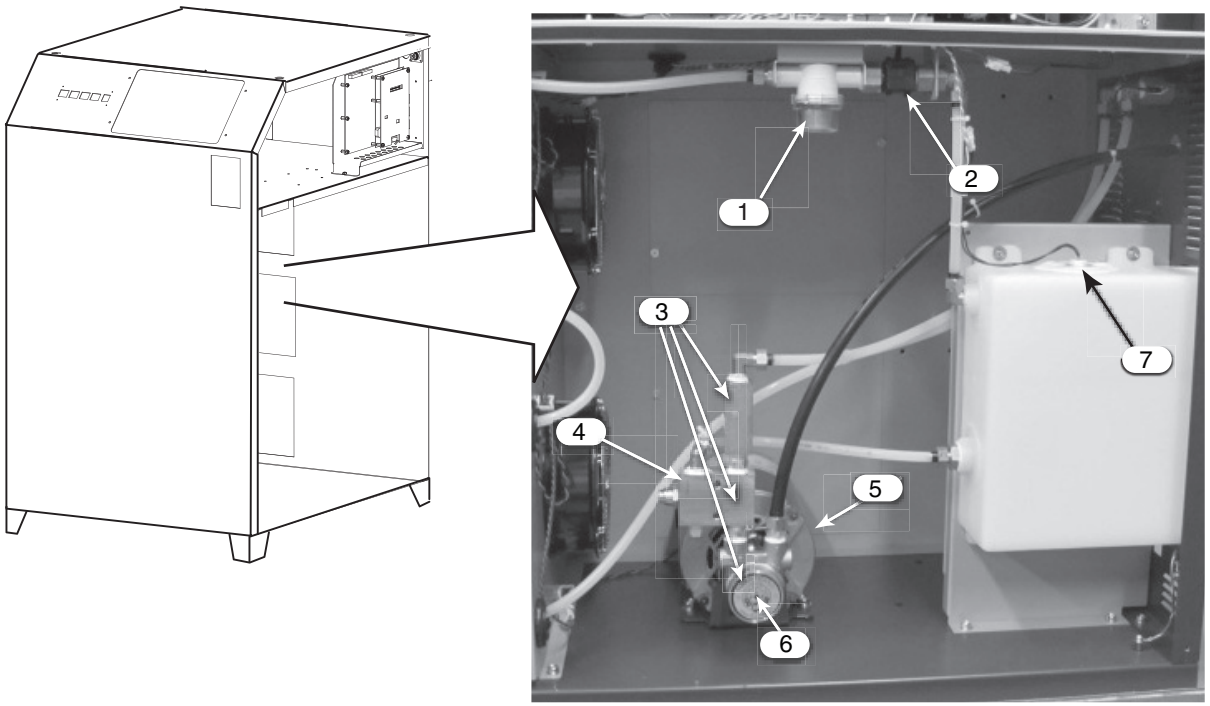
Item #	Qty	Description	Ref. Des.	Catalog #
1	1	Thermistor, Coolant	TH1	9-9361



Art # A-09463

6.16 Power Supply Replacement Parts - Right Side

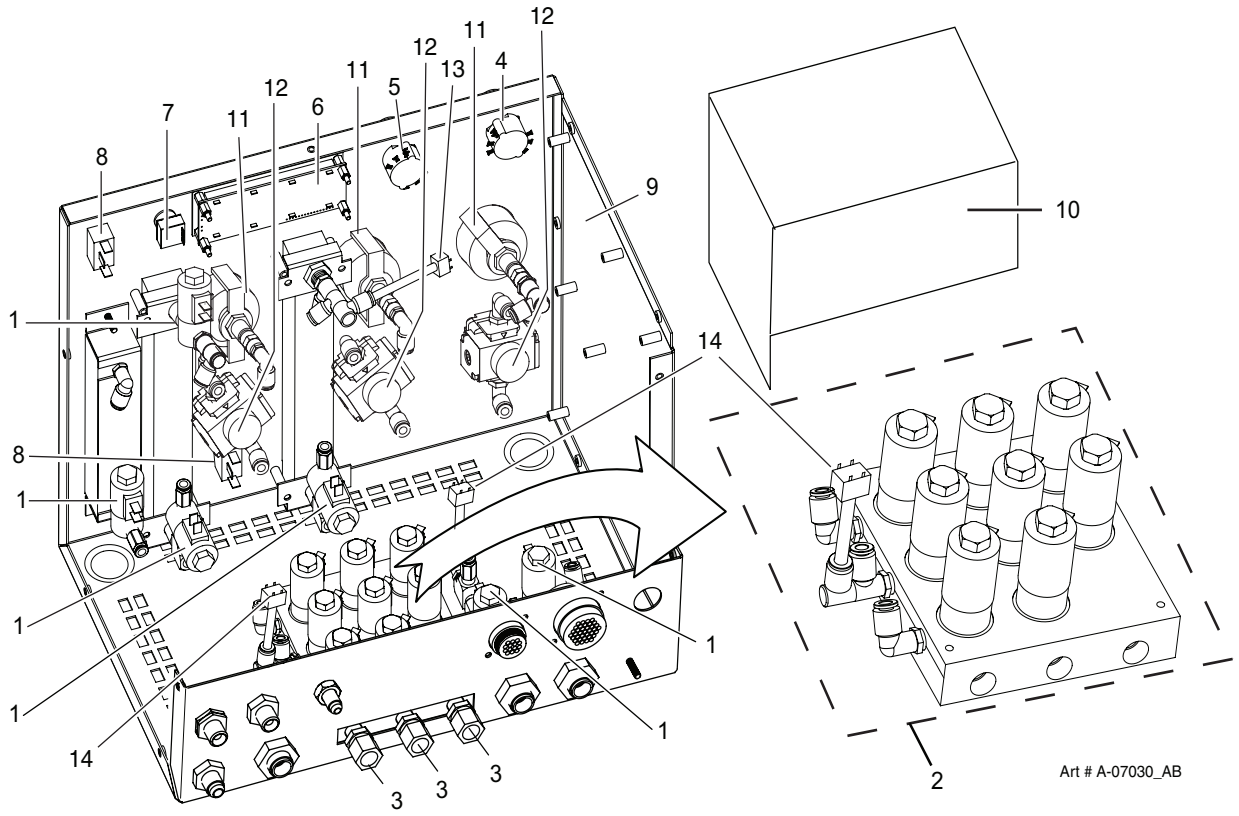
Item #	Qty	Description	Ref. Des.	Catalog #
1	1	Inline filter		8-3460
2	1	Sensor (Coolant Flow)	FL1	9-9359
3	1	Pump/Check Valve/Bypass Valve Assembly		?
4	1	Bypass Valve (part of assembly)	BYPV	9-8168
5	1	Motor	MOT1	9-8166
6	1	Pump (part of assembly)		9-8167
7	1	Sensor (Level Switch)	LSW1	9-9354



Art # A-09637

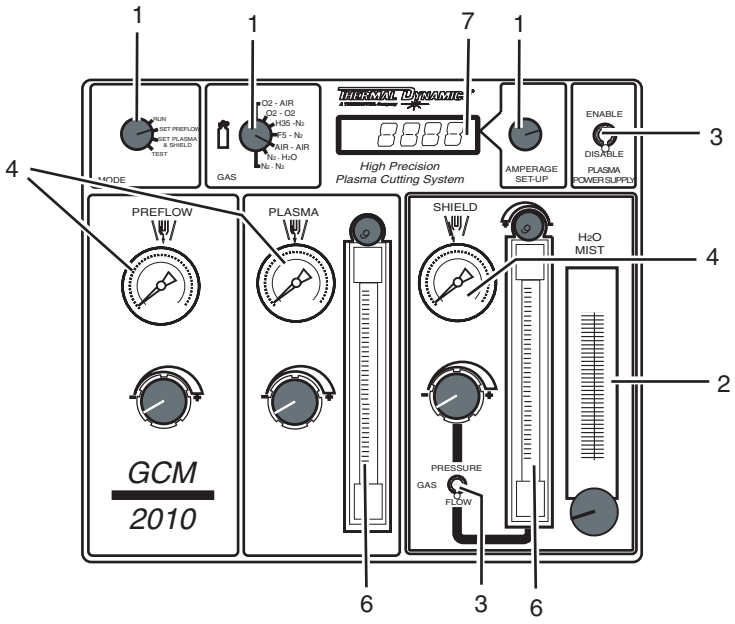
6.17 Gas Control Module (GCM-2010) Replacement Parts

Item #	Qty	Description	Catalog #
1	6	7W Solenoid for O2 use	9-9393
2	1	Gas Selection Manifold Assembly	9-9391
3	1	Check Valve, 1/4 NPT .5 PSI	9-9390
4	1	Mode Switch Assembly	9-9406
5	1	Gas Selection Switch Assembly	9-9403
6	1	LCD Interface PC Board	9-9408
7	1	Rotary Encoder (Switch)	9-9398
8	1	Toggle Switch	9-3426
9	1	Solenoid / Logic PC Board	9-9409
10	1	Cover	9-9410
11	3	Gauge, 0-160 psi	8-6800
12	1	Regulator	8-3223
13	3	Pressure Transducer and wire harness 100 PSI	9-9407
14	2	Pressure Transducer and wire harness 250 PSI	9-9508
NOT SHOWN:			
	1	Torch Valve Assembly Wire Harness (J13 to J57)	9-9399
	1	Power Supply Connection Wire Harness (J3 & J5 to J56)	9-9400
	1	LCD Interface PC Board Wire Harness	9-9401
	1	Rotary Encoder (Switch) Wire Harness	9-9402
	1	Solenoid Drive A Wire Harness (J12 to Solenoids 1-6)	9-9404
	1	Solenoid Drive B Wire Harness (J1 to Solenoids 7-12)	9-9405



6.18 Gas Control Module (GCM-2010) Replacement Parts

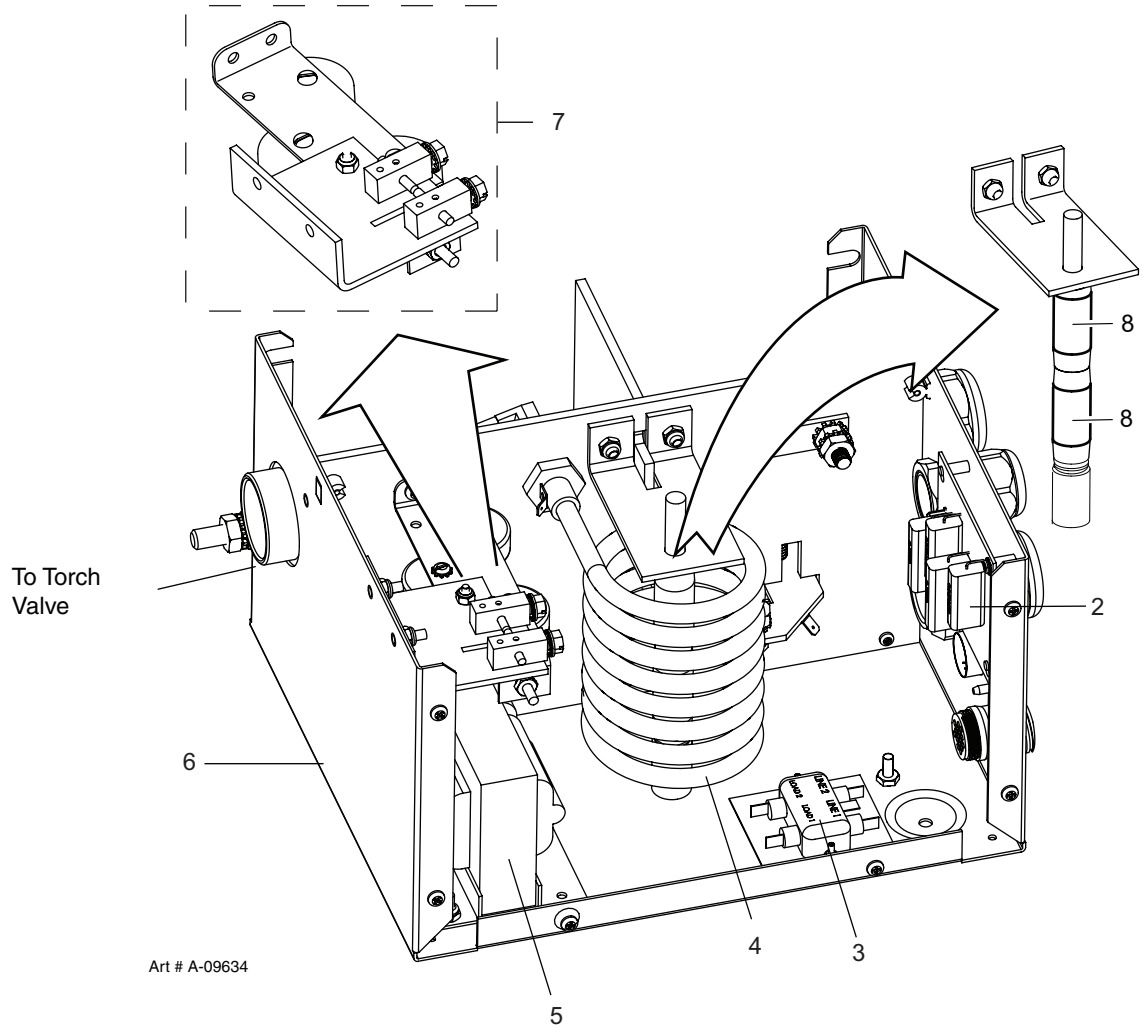
Item #	Qty	Description	Catalog #
1	1	1” Black Instrument Knob	9-4233
2	1	Water Flow Meter with Valve	9-7005
3	1	Toggle Switch, 2 position SPDT	9-3426
4	1	Pressure gauge, 2” diameter	8-6800
5	1	Pressure gauge, 2” diameter	8-4313
6	1	Flow Meter	8-6801
		Not shown -	
		Valve Assembly	9-9382
		Tube	9-9383
		Knob	9-9384
7	1	Protective Display Lens (only)	9-9395



Art # A-04814

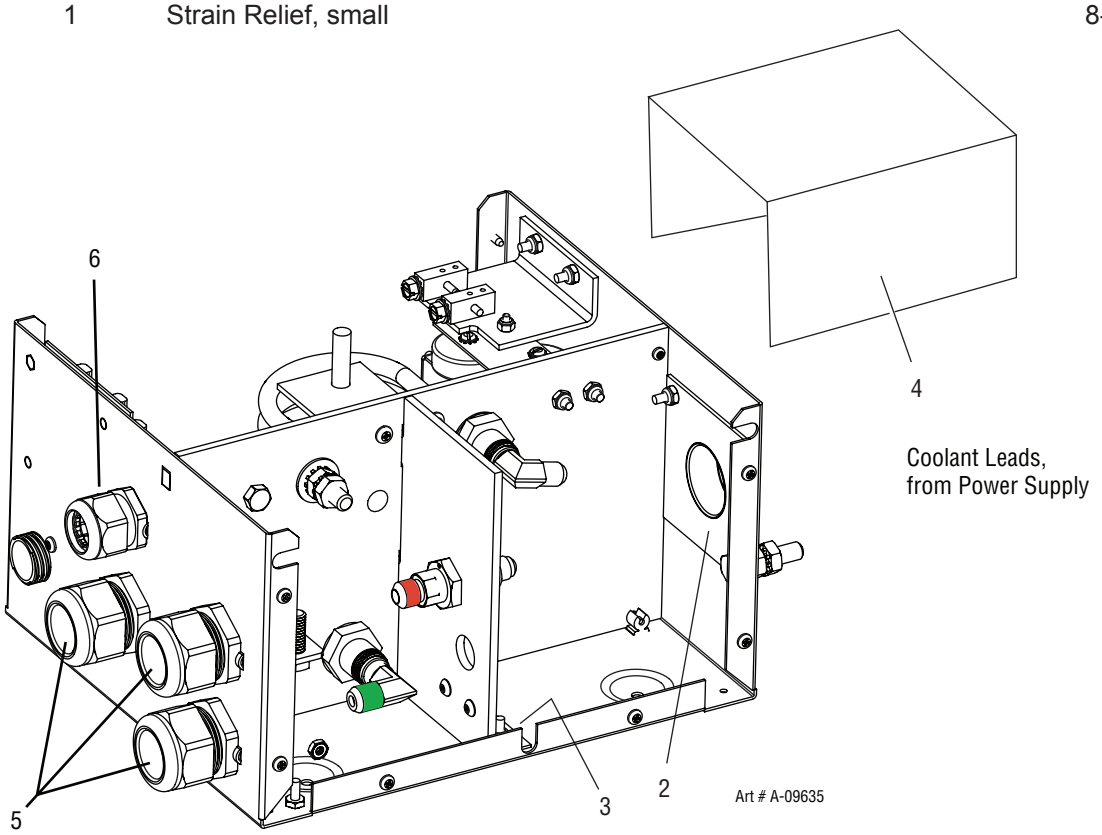
6.19 Remote Arc Starter (RAS-1000) Replacement Parts

Item #	Qty	Description	Catalog #
1	1	Harness, Internal (Not Shown)	9-4956
2	1	Pilot Cap Assembly	9-9423
3	1	EMI Filter	9-1023
4	1	HF Water Cooled Coil Assembly	9-4958
5	1	HF Transformer Assembly, Arc Starter	9-4959
6	1	Enclosure, Arc Starter Base	9-4961
7	1	Spark Gap/Cap Assembly HF	9-4957
8	1	Ferrite Bead 2” Long	9-4965



6.20 Remote Arc Starter (RAS-1000) Replacement Parts

Item #	Qty	Description	Catalog #
1	1	Retainer, ABS Wall	9-4964
2	1	(Outer) Torch Lead Ground Assembly	9-4955
3	1	Bracket, Bulkhead Holder	9-4963
4	1	Cover, Arc Starter	9-4962
5	1	Strain Relief, large	9-7571
6	1	Strain Relief, small	8-7072

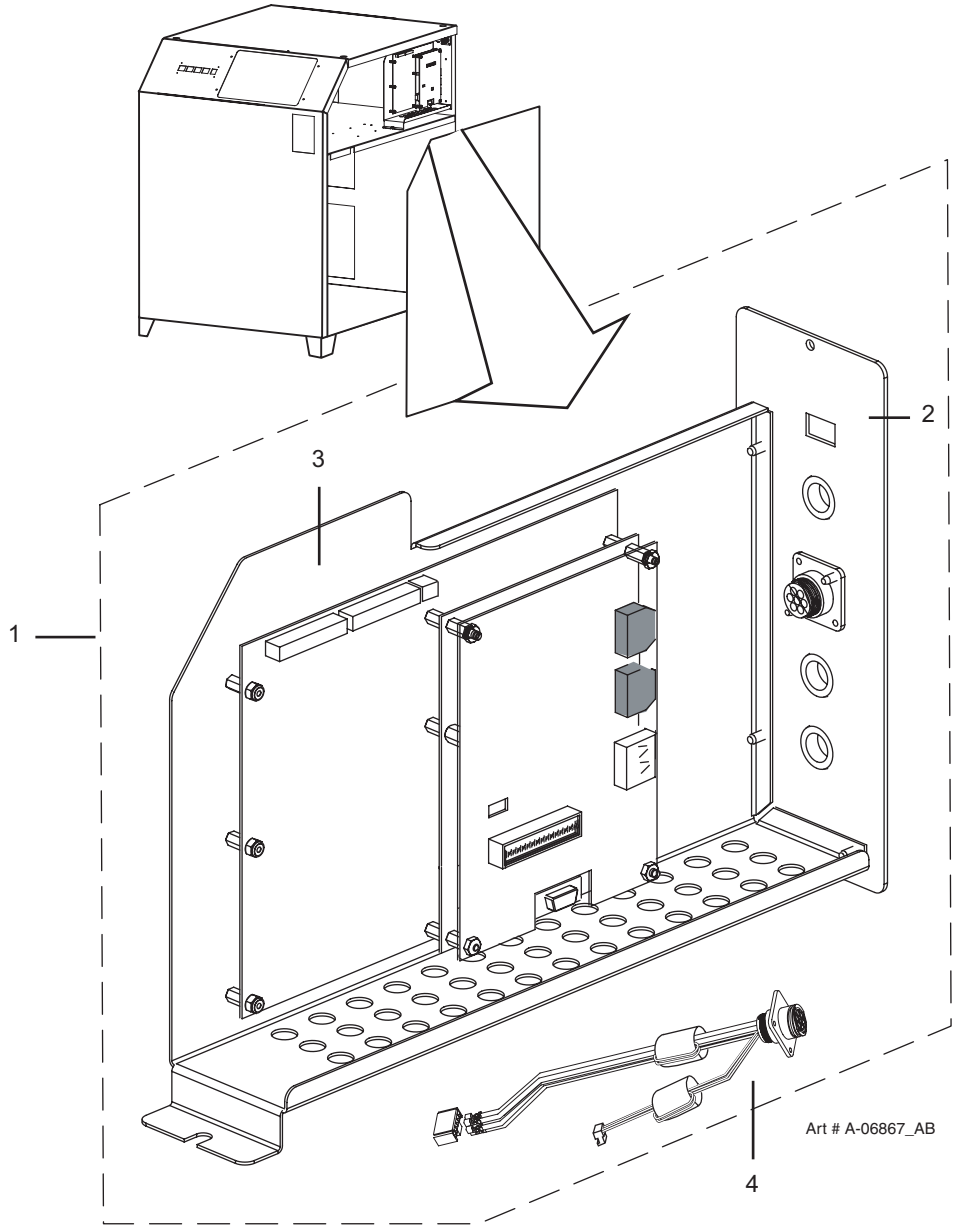


6.21 Command & Control Module - Replacement Parts

Item #	Qty	Description	Catalog #
1	1	Assembly, CCM (Ultra-Cut)	*9-9417
			**9-4954
2	1	Plate, CCM Face	9-9419
3	1	Panel, CCM Mount	Not Available
4	1	Harness, CCM I/O Board	9-9421

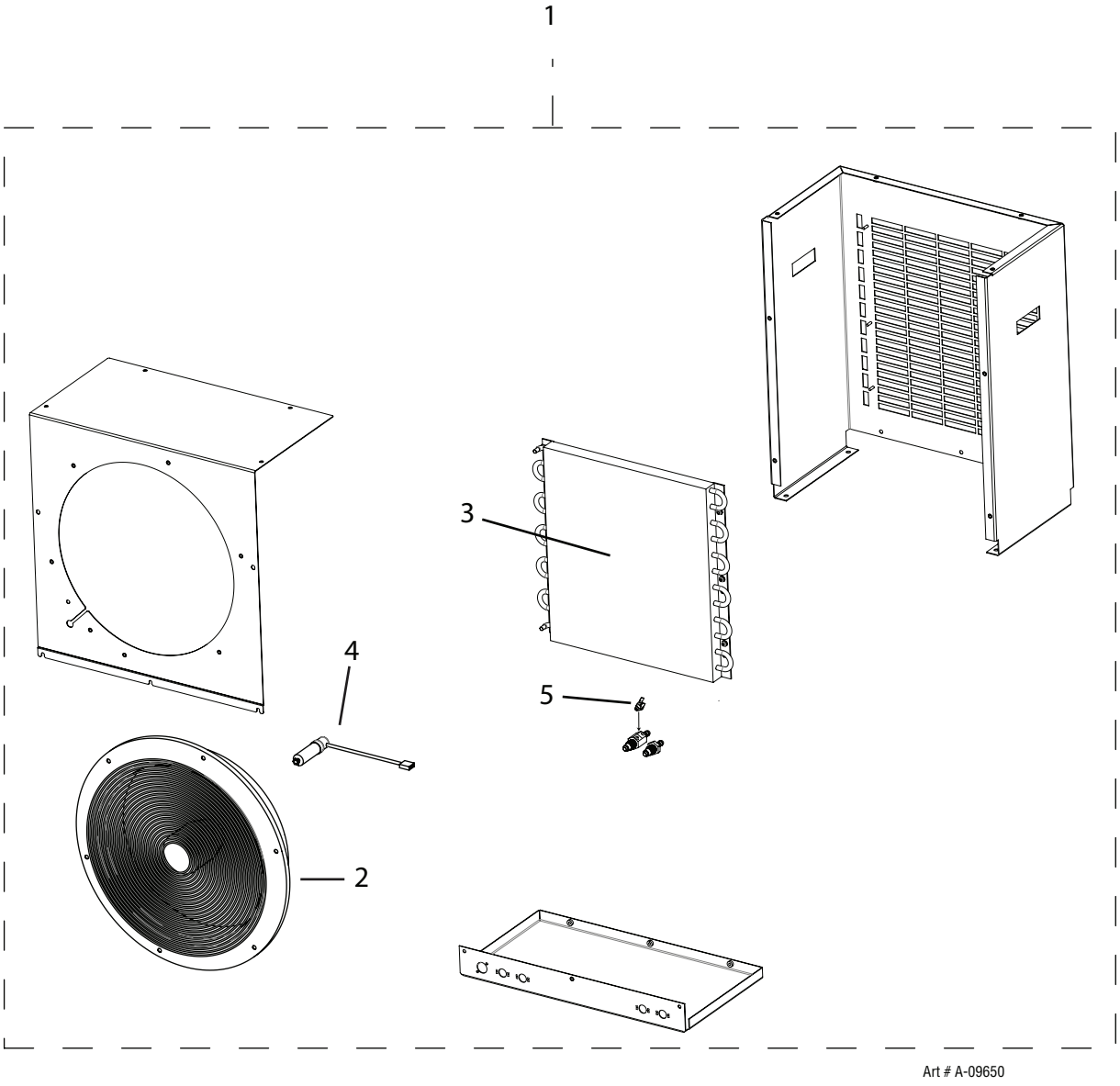
*For systems using older 300A non XTL parts

**For systems using newer 300A XTL parts released June 2012



6.22 HE 400 Heat Exchanger - Replacement Parts

Item #	Qty	Description	Catalog #
1	1	Assembly, HE 400 Heat Exchanger	9-9416
2	1	Fan	8-6312
3	1	Radiator	8-1347
4	1	Capacitor	8-3263
5	1	Thermal Switch	9-1448

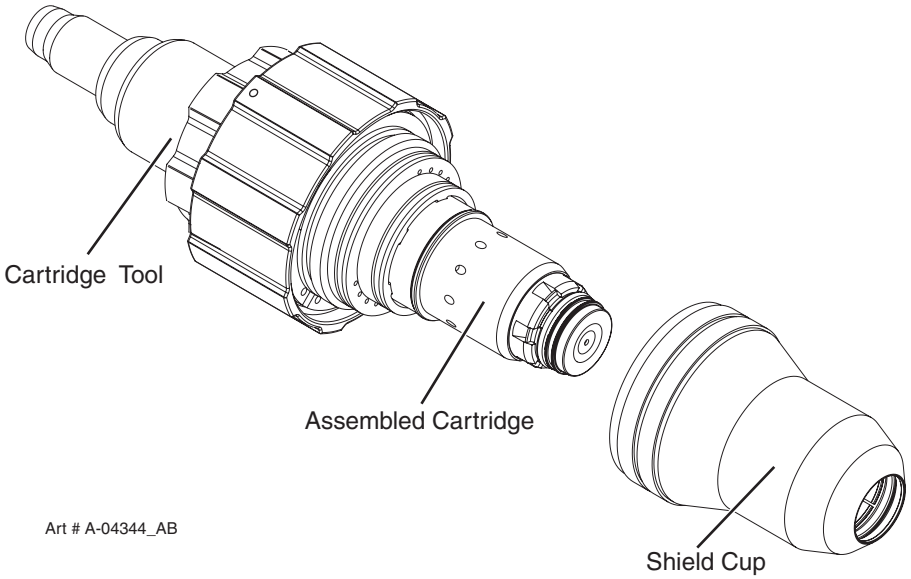


Art # A-09650

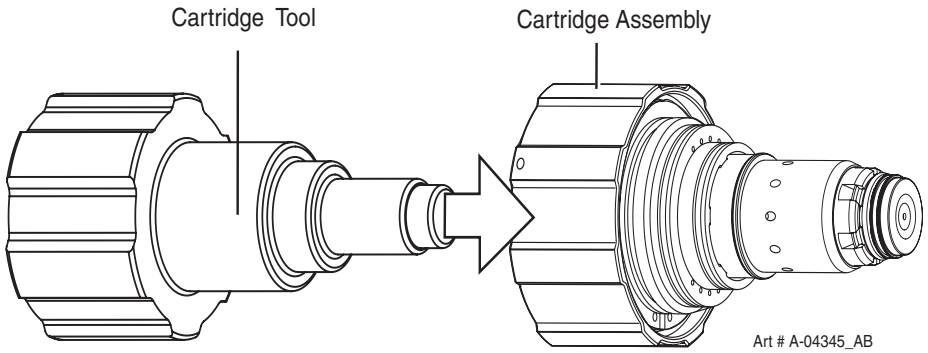
SECTION 7: TORCH MAINTENANCE

7.01 Consumable Removal

1. Use the removal tool to hold the Shield Cup & Cartridge Assembly stationary. Turn the Shield Cup to remove it from the Cartridge Assembly.

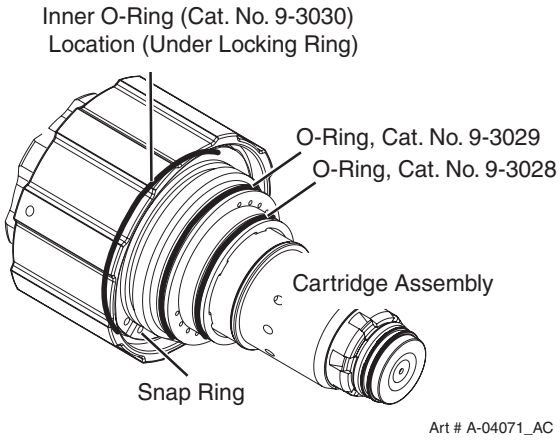


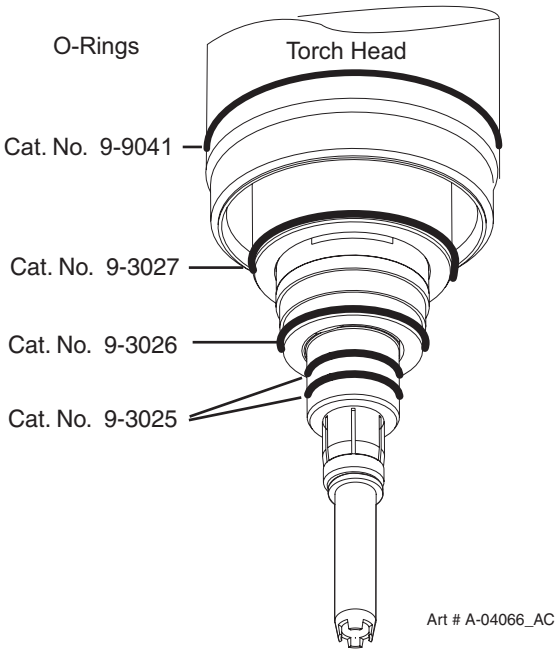
2. Take the Removal Tool off the back of the Cartridge Assembly Use the removal tool to push the consumable parts out of the Cartridge.



7.02 O-Ring Lubrication

Lubricate all three O-Rings on the Cartridge Assembly and all three O-Rings on the Torch Head periodically with O-Ring Lubricant supplied. Remove the snap ring on the cartridge assembly and slide the locking ring downward for access to the O-Ring under the locking ring.





CAUTION

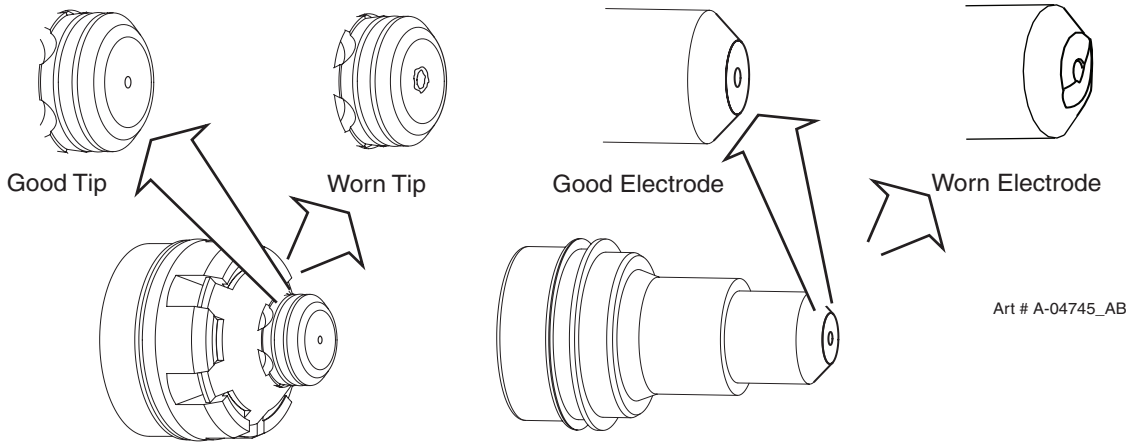
Use only Thermal Dynamics No. 9-4893 O-Ring Lubricant (Christo Lube MCG-129) with this torch part. Use of other lubricants may cause irreparable damage to the torch.

7.03 Parts Wear

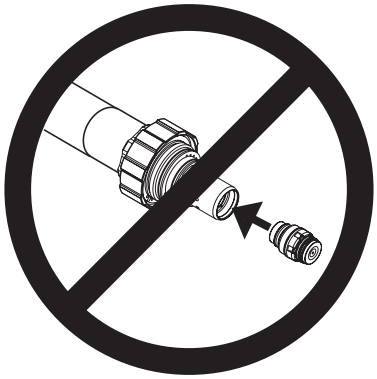
Replace the Gas Distributor if it is charred or cracked.

Replace the Gas Distributor if the flange is damaged in any way.

Replace the tip and/or electrode if they are worn.



7.04 Torch Consumables Installation

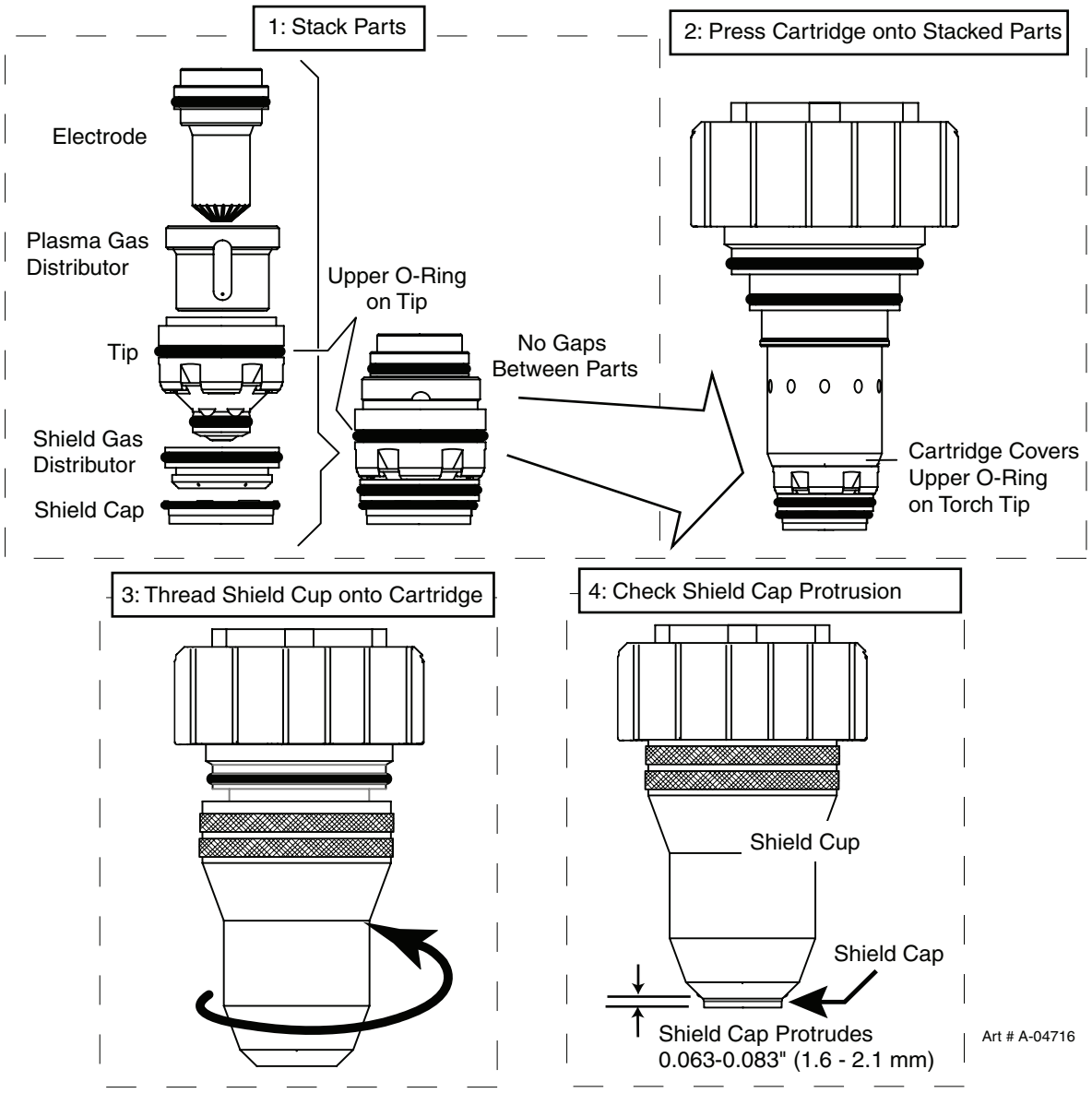


WARNINGS

Do not install consumables into the Cartridge
while the Cartridge is attached to the Torch Head.
Keep foreign materials out of the consumables and Cartridge.
Handle all parts carefully to avoid damage,
which may affect torch performance.

Art # A-03887

1. Install the consumables as follows:

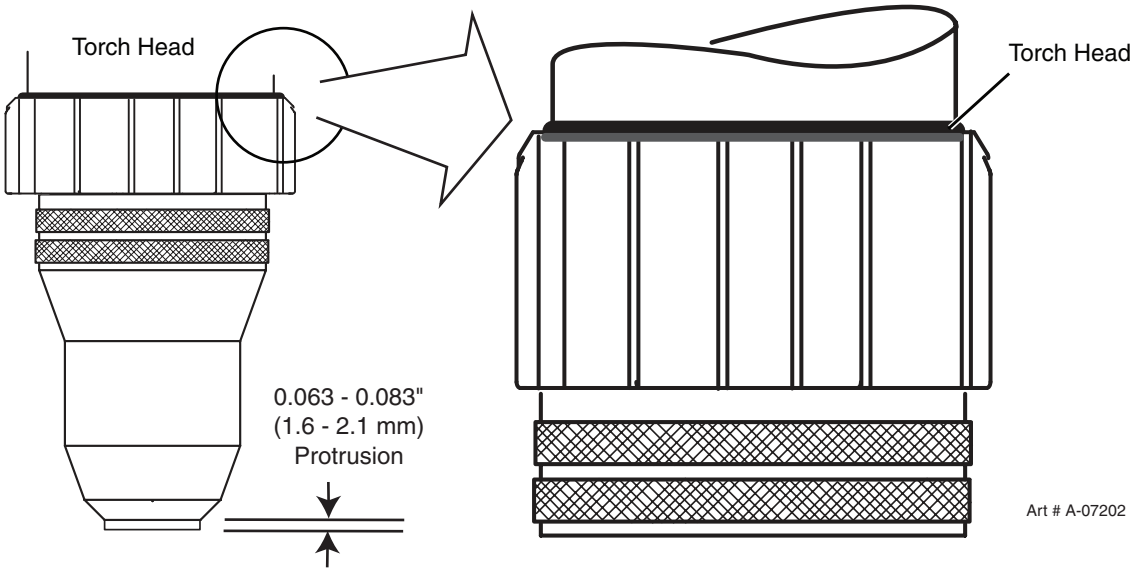


2, Remove the Removal Tool from the Cartridge and install the assembled Cartridge onto the Torch Head.

CAUTION

The cartridge assembly must cover the O-Ring on the torch head.

Do not force the cartridge if it will not tighten fully. Remove the cartridge assembly and gently clean the threads on the torch head with a wire brush. Apply oxygen-compatible lubricant (supplied with the torch) to the threads.

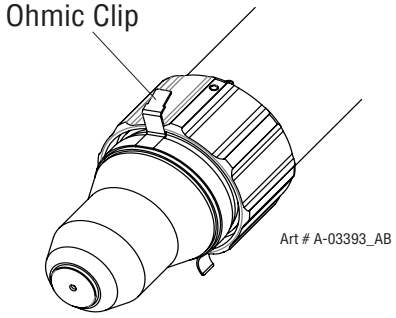


Installing Assembled Cartridge Onto Torch Head

3. Slide the ohmic clip over the shield cup if using ohmic torch height control sensing.

NOTE

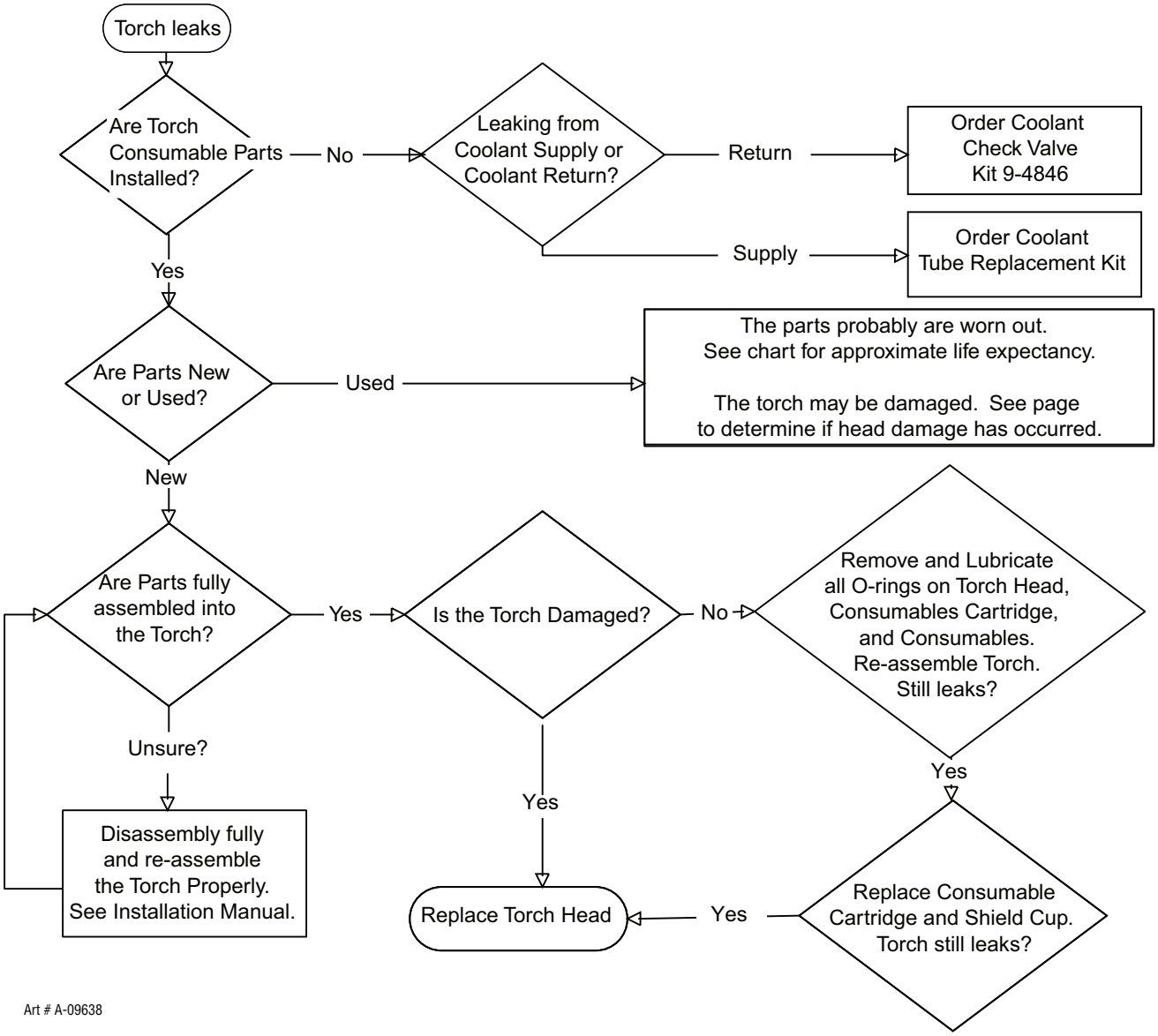
Ohmic height sensing is not recommended with water shield. Water on the plate interferes electrically with the ohmic sensing circuit.

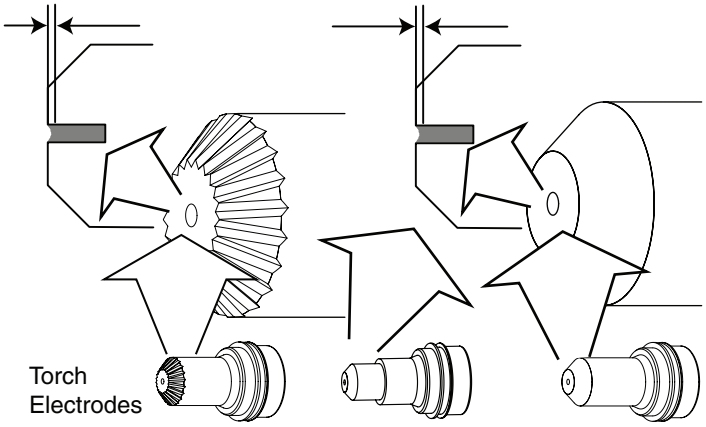


4. Connect the wire lead from the height finder to the ohmic clip.

7.05 Coolant Leak Trouble-Shooting

Never operate the system if coolant leaks from the torch. A steady drip indicates that torch parts are damaged or installed improperly. Operating the system in this condition can damage the torch head. Refer to the following chart for guidance on coolant leakage from the torch head.

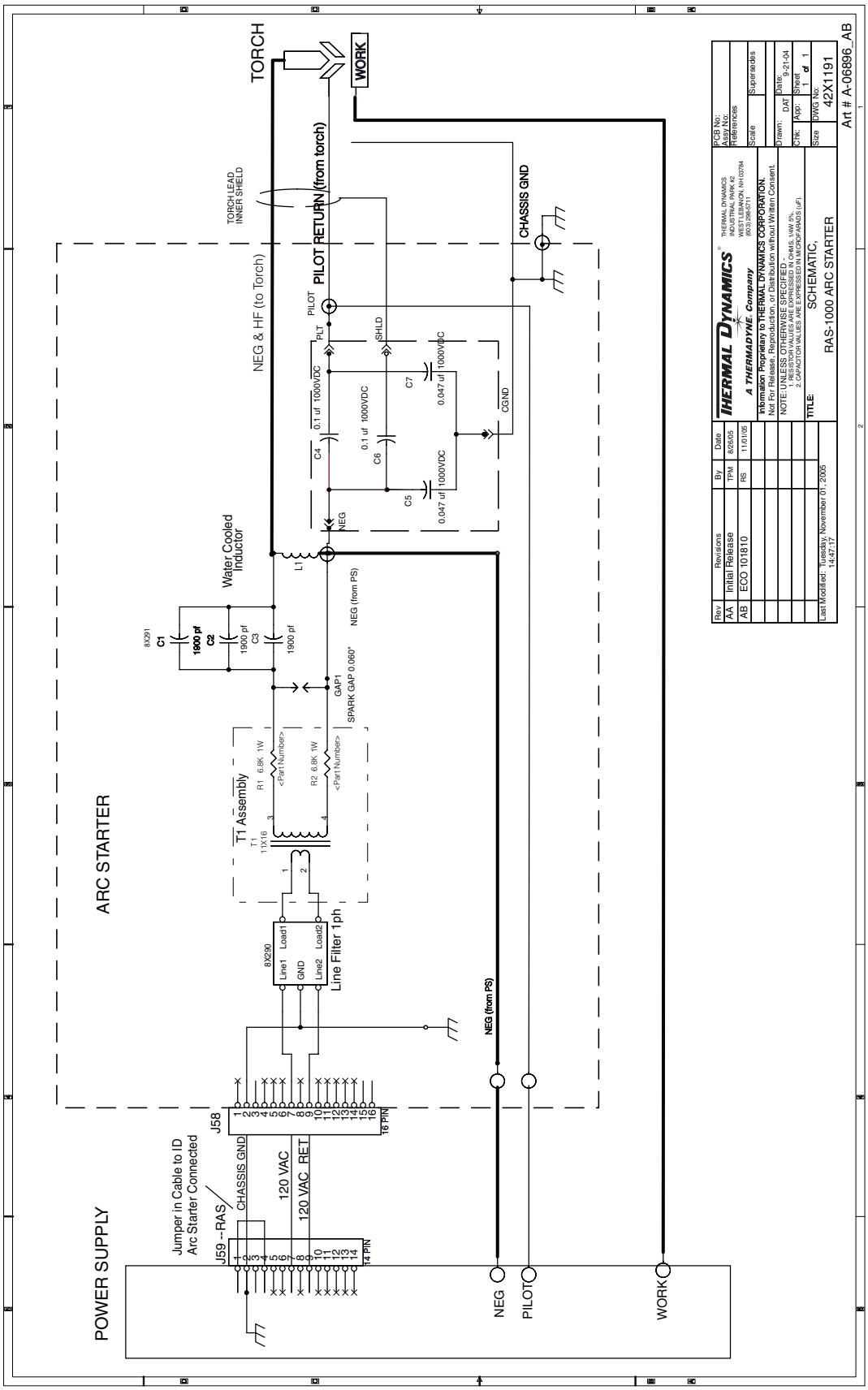




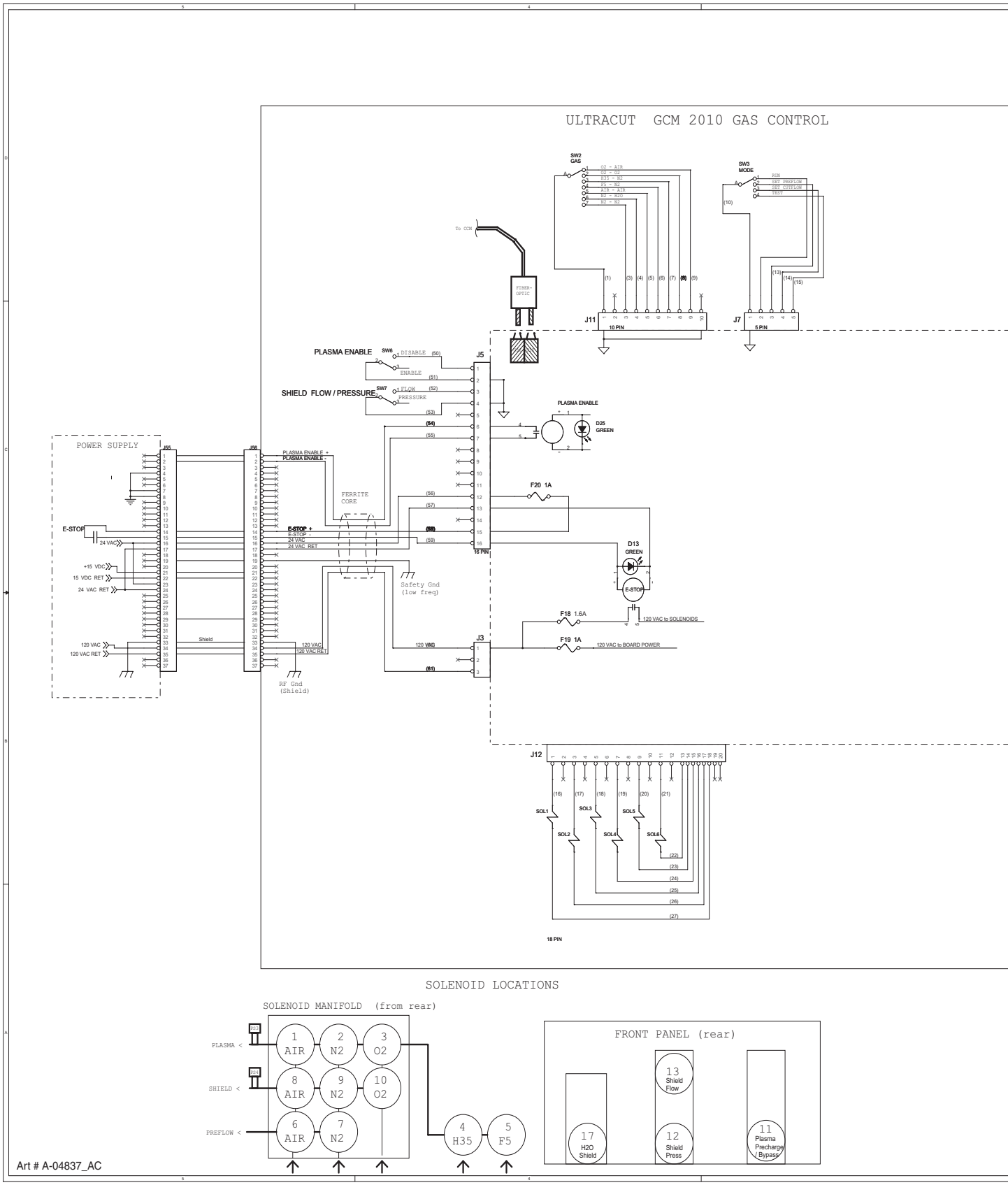
Art # A-09653

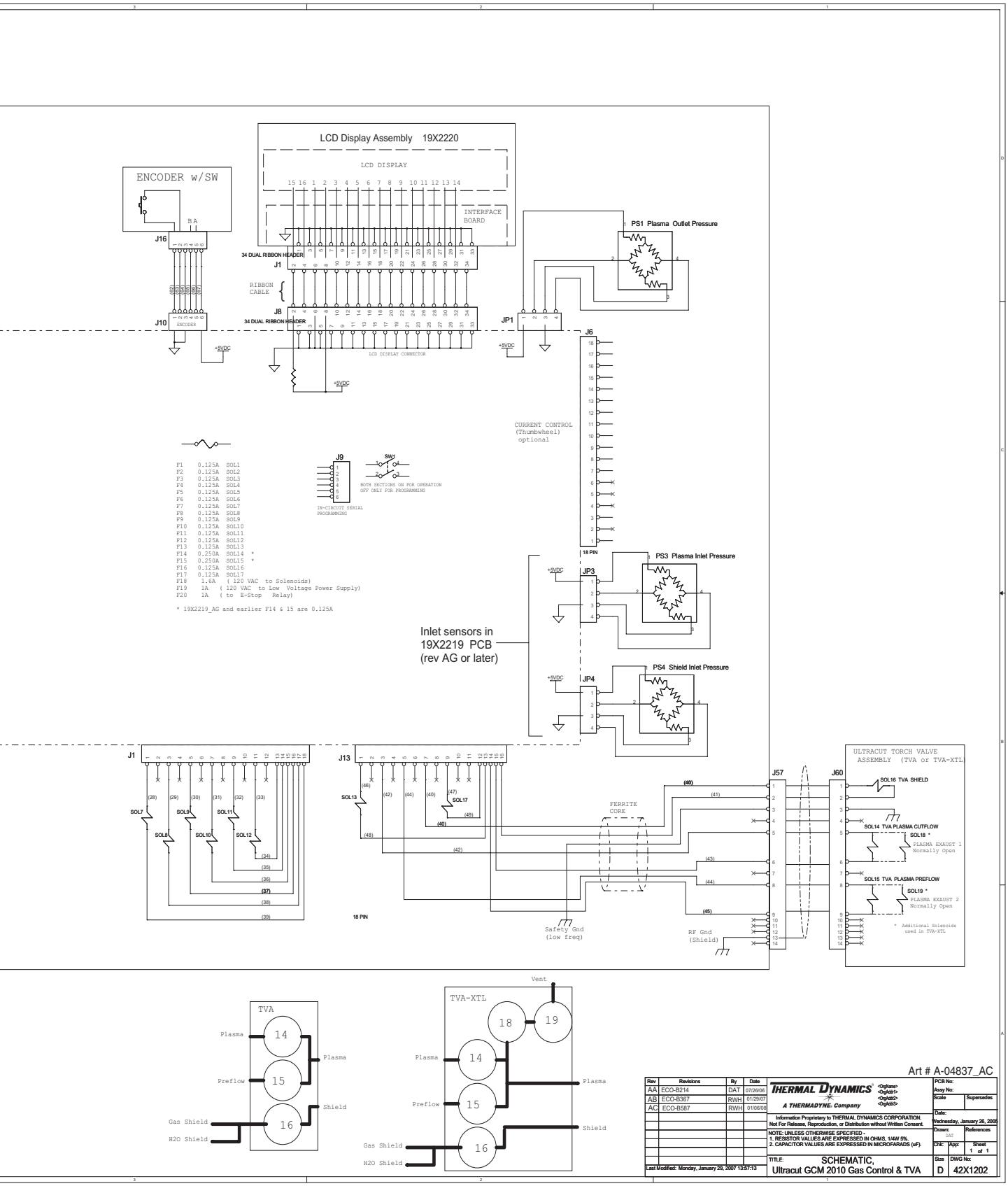
Amperage	Plasma Gas	Recommended Wear Depth for Electrode Replacement	
		Inch	mm
30	O2	0.04	1
	Air	0.04	1
	N2	0.04	1
50	O2	0.04	1
	Air	0.08	2
	N2	0.04	1
70	O2	0.04	1
	Air	0.08	2
	N2	0.04	1
85	Air	0.08	2
100	O2	0.04	1
	H35	0.08	2
	N2	0.08	2
150	O2	0.06	1.5
	H35	0.08	2
	N2	0.08	2
200	O2	0.06	1.5
	H35	0.08	2
	N2	0.08	2
250	O2	0.06	1.5
300	O2	0.06	1.5
	H35	0.08	2
	N2	0.08	2
400	O2	0.08	2
	H17	0.08	2
	H35	0.08	2
	N2	0.08	2

APPENDIX 1: Remote Arc Starter Schematic



APPENDIX 2: Gas Control and Torch Valve Schematic





Art # A-04837_AC

Rev	Revisions	By	Date
AA	ECO-B214	DAT	07/26/06
AB	ECO-B367	RWH	01/29/07
AC	ECO-B587	RWH	01/06/08

Last Modified: Monday, January 29, 2007 13:57:13

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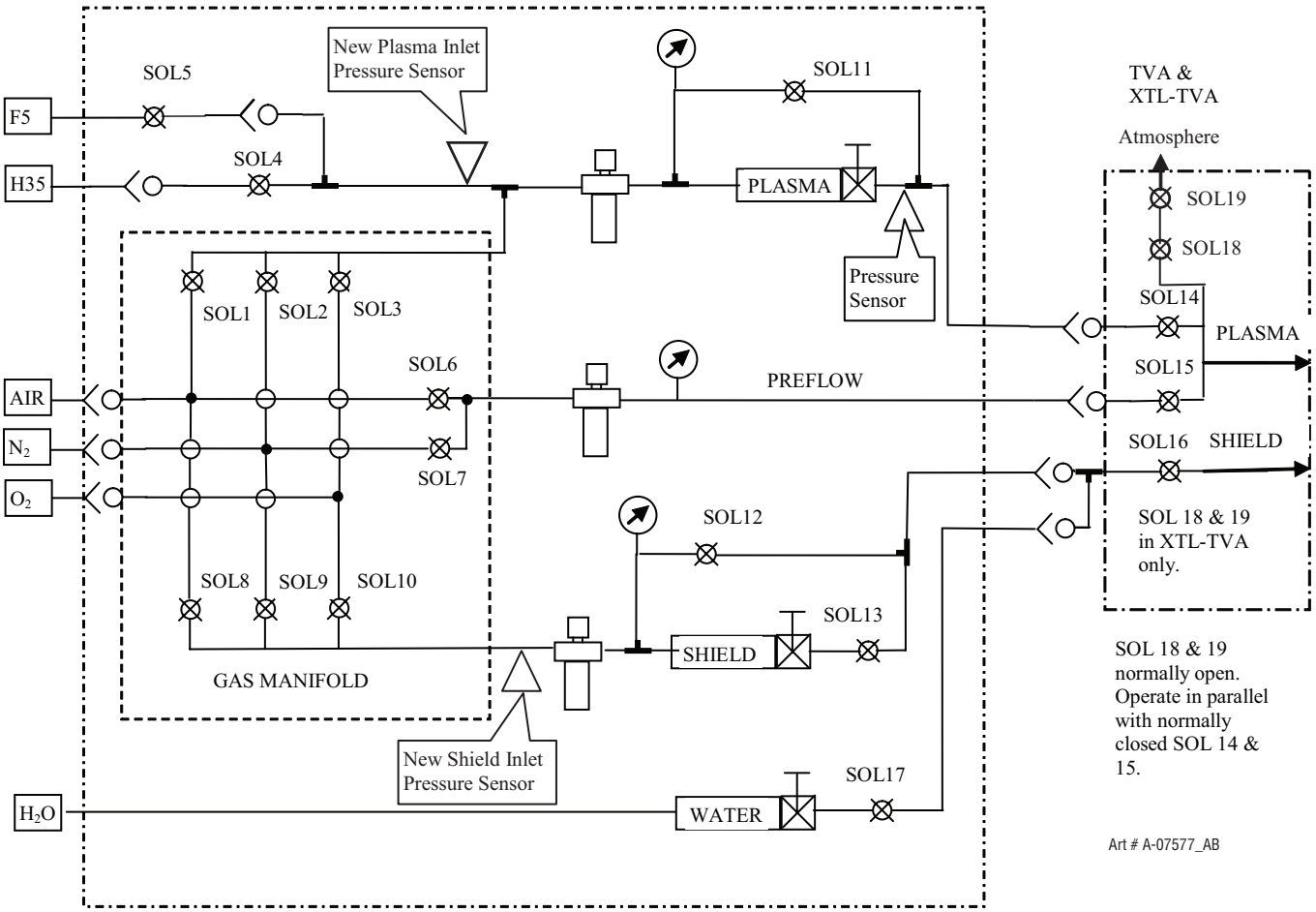
NOTE: UNLESS OTHERWISE SPECIFIED -
1. RESISTOR VALUES ARE EXPRESSED IN OHMS, 1/4W 5%.
2. CAPACITOR VALUES ARE EXPRESSED IN MICROFARADS (uF).

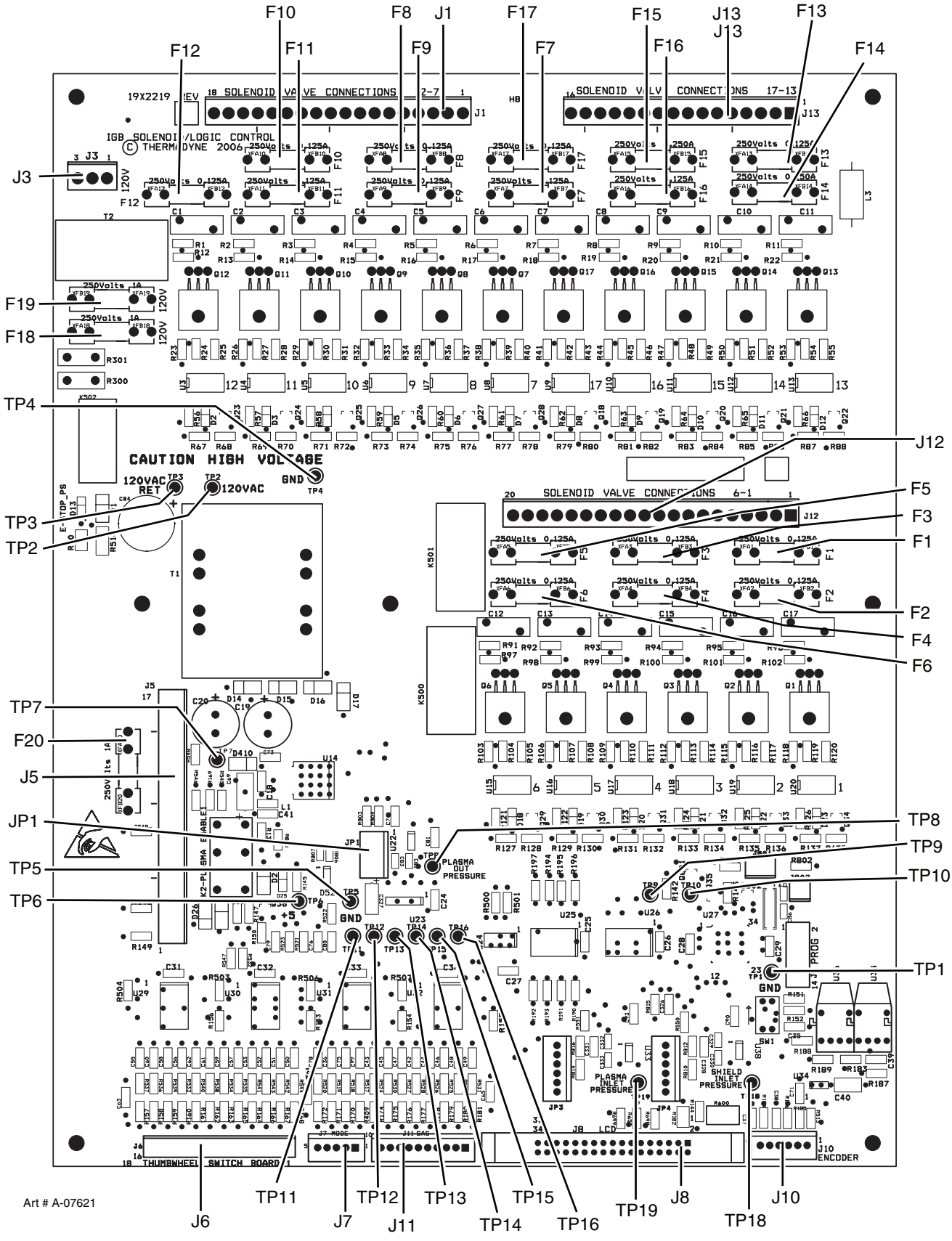
TITLE: SCHEMATIC, Ultracut GCM 2010 Gas Control & TVA

PCB No:
Assy No:
Scale
Supersedes
Date: Wednesday, January 26, 2005
Drawn: DAT
References
Chk:
App:
Sheet 1 of 1
Size D
DWG No: 42X1202

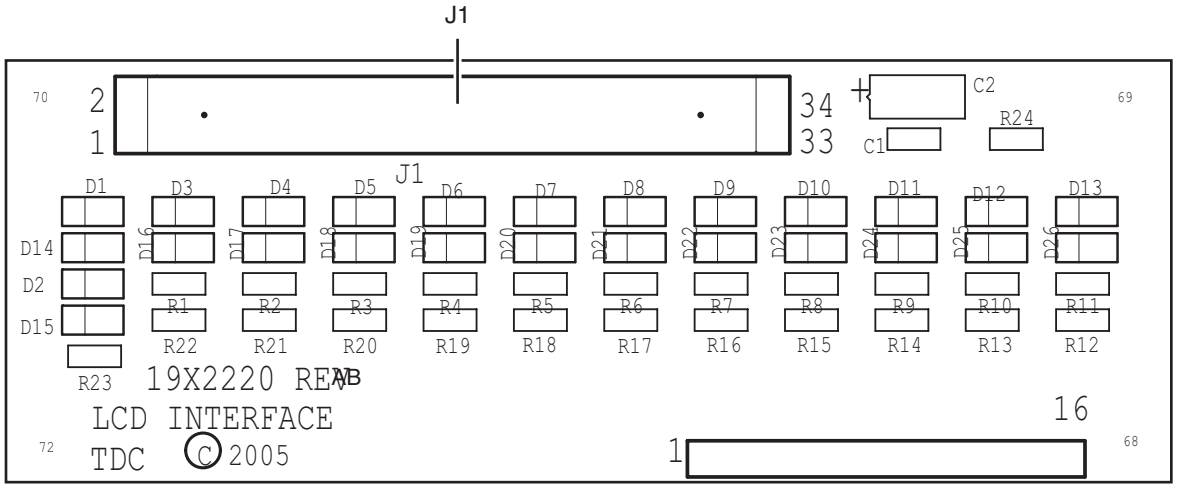
APPENDIX 3: Gas Control Module Plumbing Diagram



APPENDIX 4: Gas Control Module PCB Layout

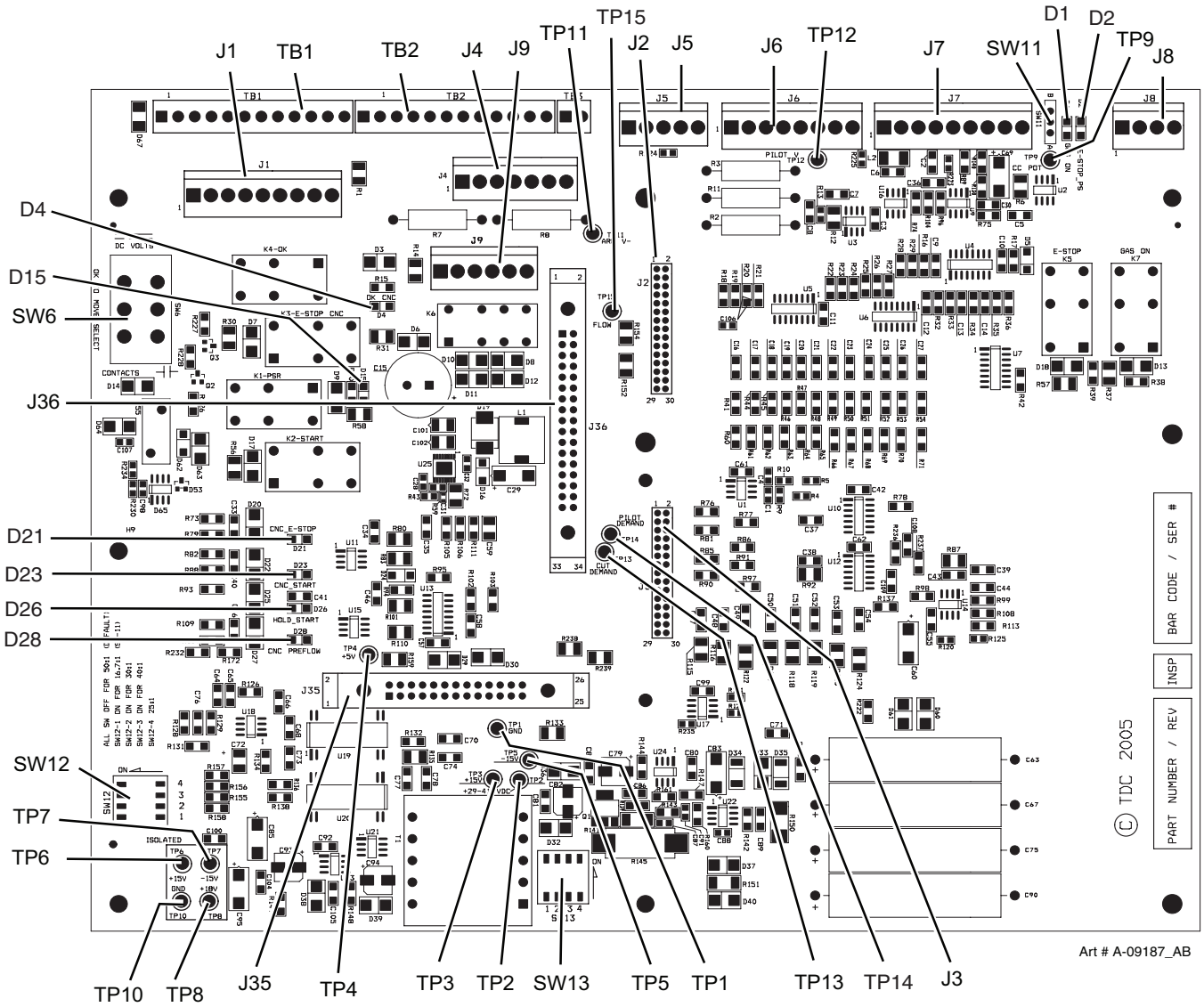


APPENDIX 5: Gas Control Display Module PCB Layout

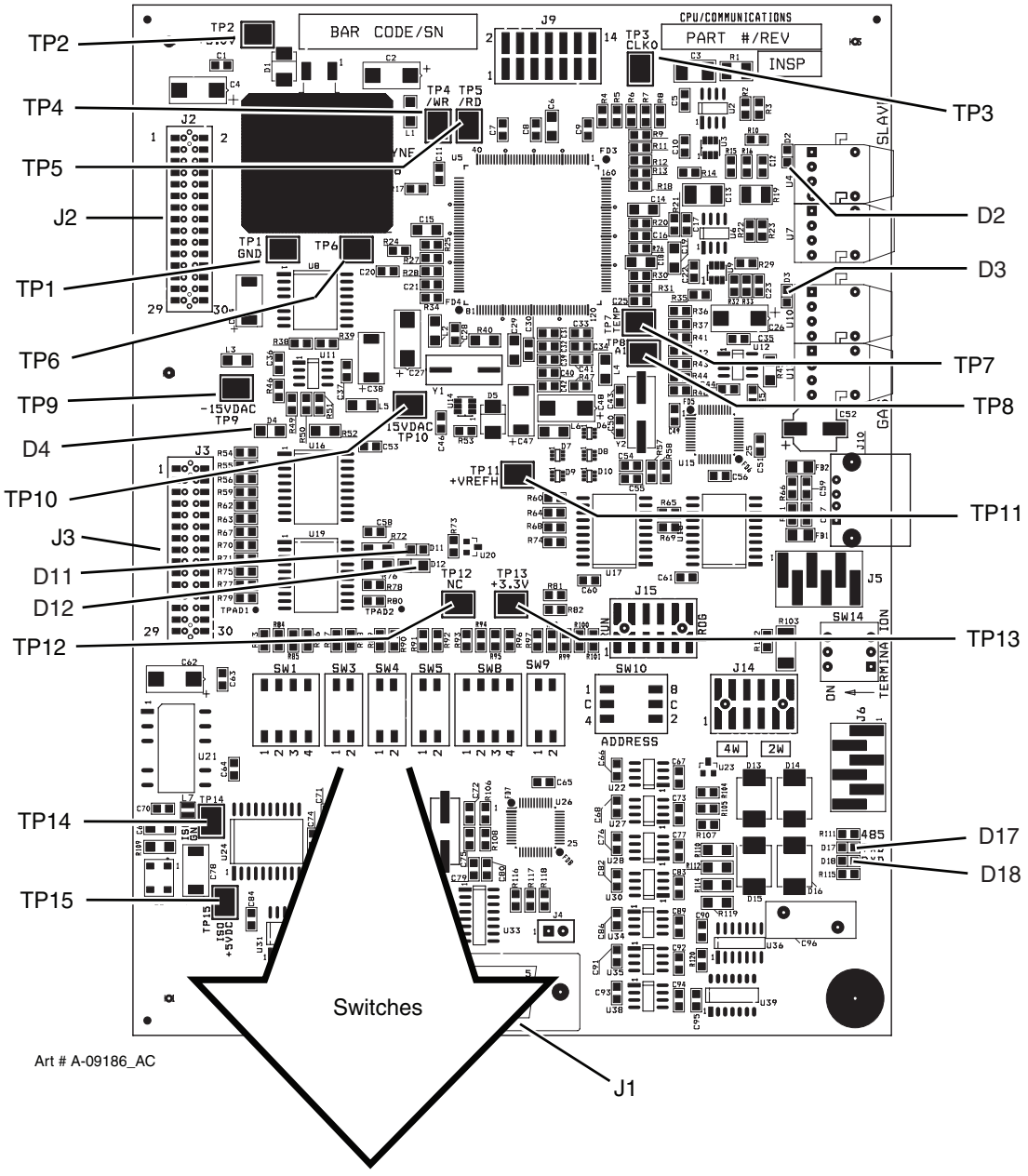


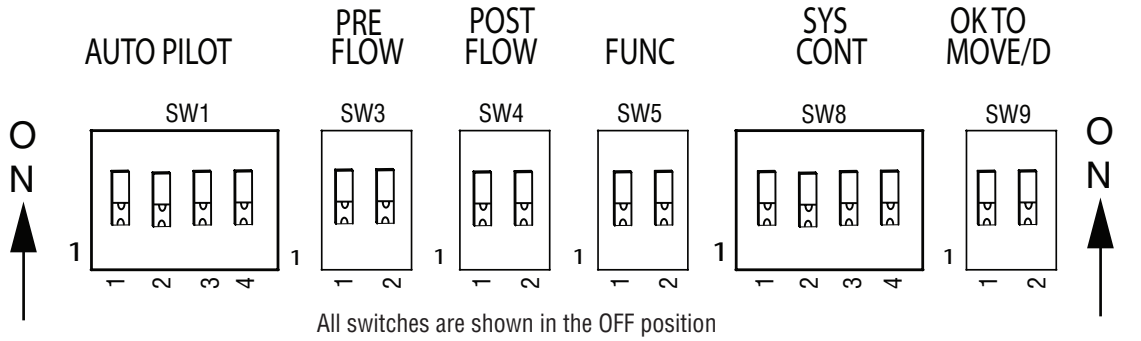
Art # A-06904

APPENDIX 6: CCM Input / Output PCB Layout



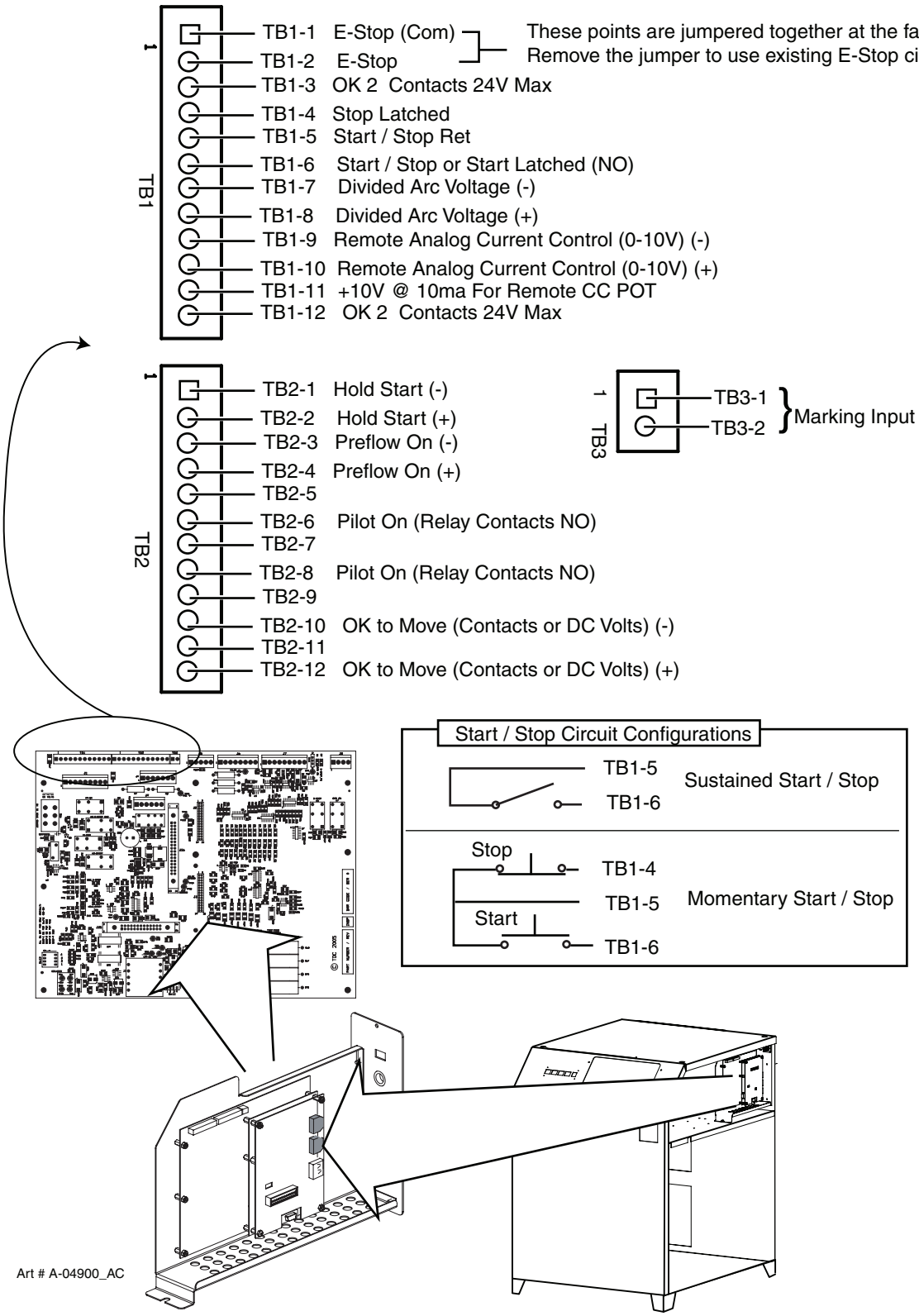
APPENDIX 7: CCM CPU PCB Layout





All switches are shown in the OFF position

APPENDIX 8: CNC - Control Module PCB Connections



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APPENDIX 9: CNC

CNC functions

CNC I/O circuits provide at least 1000V galvanic isolation from the plasma power supply.

While the CNC circuits are isolated from the power supply, many of the signal returns on J15 and TB1 & 2 are common to each other. J15 pins 1, 4, 5 & 10 and TB1-1, 5, 7, 9, and TB2-1 & 3 are all common. J15 pin 12 and TB2-10 are also connected to the others when SW6 (OK to Move select) is set for voltage.

Rear Panel CNC Connector J15:	
14 Circuit (Amp CPC) Remote Standard:	
Chassis gnd (for SC-11 cable shield)	1
[1] Start/Stop	3 (+); 4 (-)
[1] Ok to Move (contacts or voltage [2])	12(-); 14(+)
[1] Divided Arc volts (selectable ratio 50:1; 40:1; 30:1; 16.6:1)	5 (-); 6 (+)
Arc Volts (w/100K series res)	7 (-); 9 (+)
[1] Analog Current Control (0-10V) [3]	10 (-); 11 (+)
Isolated Circuit Comm (for SC-11)	8
Chassis Gnd	13

[1] These are also duplicated on TB1 & TB2, use one or the other not both. Additional functions are only available on TB1 & 2.

[2] SW6 on CCM I/O PCB selects OK to Move for isolated contact closure or DC Volts (15-18V) at <100ma. When set for contacts, OK to Move circuit is rated for 120 VAC / 28 VDC @ 1A.

Internal CNC connections. TB1 & TB2 on CCM module.

Connections are provided on the CCM module TB1 & TB2 terminal blocks including most of the rear panel functions plus some additional features. All these signals are isolated from the plasma power supply but signals marked (comm.) and (-) are common to each other.

Users are expected to install their own CNC cable to these connections. Knockout hole is provided in rear panel of CCM module. User shall provide strain relief / cord grip for user installed cable.

Function	**Connection**
E-Stop	TB1-1 (comm.) & TB1-2
OK To Move 2 (Contact)[5]	TB1-3: TB1-12
Stop Latched (NC) [4]	TB1-4
Start/Stop Ret [4]	TB1-5 (comm.)
Start /Stop or Start Latched (NO) [4]	TB1-6
Divided Arc Voltage	TB1-7(-); TB1- 8(+)
Remote Analog Current Control (0-10V)	TB1-9(-); TB1-10(+)
+10V @ 10ma For Remote CC POT[5]	TB1-11
Hold Start	TB2-1(-); TB2-2(+)
Preflow On	TB2-3(-); TB2-4(+)

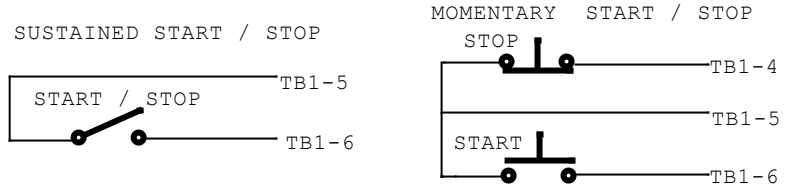
Pilot On (Relay Contacts NO)	TB2-6; TB2-8
Function	**Connection**
OK to Move (Contacts or DC Volts)	TB2-10(-); TB2-12(+)
Plasma Marking Remote Select	TB3-1: TB3-2

CNC Input / Output Descriptions

E-Stop input— Requires closed connection rated for 35ma. @ 20VDC for unit to operate. Factory installed jumper between TB1-1&2 must be removing when connecting user supplied E-Stop circuit.

[4] **Start/Stop input**—Switch (momentary or sustained) rating 35ma. @ 20 VDC

Start / Stop circuit configurations. Momentary Start / Stop (Latched) is only available at TB1.



Divided Arc Voltage output — Arc Voltage signal is isolated from plasma supply, however (-) is common with other isolated CNC signals. Max Divided Arc Voltage signal level depends on actual arc voltage times divide ratio however can not exceed approximately 12 V.

[3] **Analog Current Control input**— Analog Current Control includes analog isolation module, separate isolation module not usually required however it's low input is common with the other isolated CNC inputs. Scaling of Analog Current Control input is 0V = 0A, 10V. = MAX output and is linear in between. However MIN output is 10A. User is responsible for setting correct analog voltage to maintain at least 10A output. To use Analog Current Control on the I/O PCB set SW 11 to down position and on the CPU PCB set SW8-2 ON (up).

Hold Start input—Normally open, close to hold start. Circuit rating 10 ma. @ 20VDC. Delays pilot ignition, gas preflow continues. Used for synchronizing starts when multiple plasma supplies are used on same cutting table. User supplies circuit to keep Hold Start inputs active until all torches have found height.

Preflow On input— Normally open, close to start preflow prior to normal START signal. Circuit rating 10 ma. @ 20VDC. Torch Height Controls (THC) normally issue START signal to plasma supply after torch height has been found. Then the plasma takes 1-2 seconds (or more) to perform preflow before igniting pilot. Some THCs have an output that can start preflow early during height finding saving 1-2 seconds on each cut.

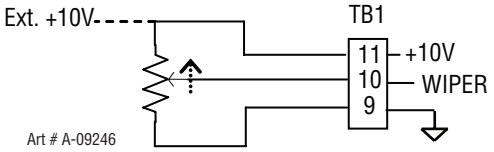
Pilot On output – Relay contacts rated 1A @ 120 VAC / 28 VDC. Contacts close when pilot on. Can be wired parallel with Ok to Move contacts to start machine motion when pilot established. Used when starting over holes. Starting over holes requires setting SW8-1 ON (up) on the CPU PCB for extended pilot time. Using extended pilot time to start over holes or for cutting over holes will reduce parts life.

OK to Move output — Active when cutting arc is established, arc is transferred. Used to signal cutting table to start X-Y motion. Relay contacts rated 1A @ 120 VAC or 28 VDC when SW6 set for contacts. When SW6 is set for DCV, output supplies 15-18 VDC @ 100 ma. May be wired parallel with Pilot On to start cutting machine motion as soon as pilot established.

[5] The following features are available in Ultracut CCM revision level BA and higher or S/N 05517201 and higher.

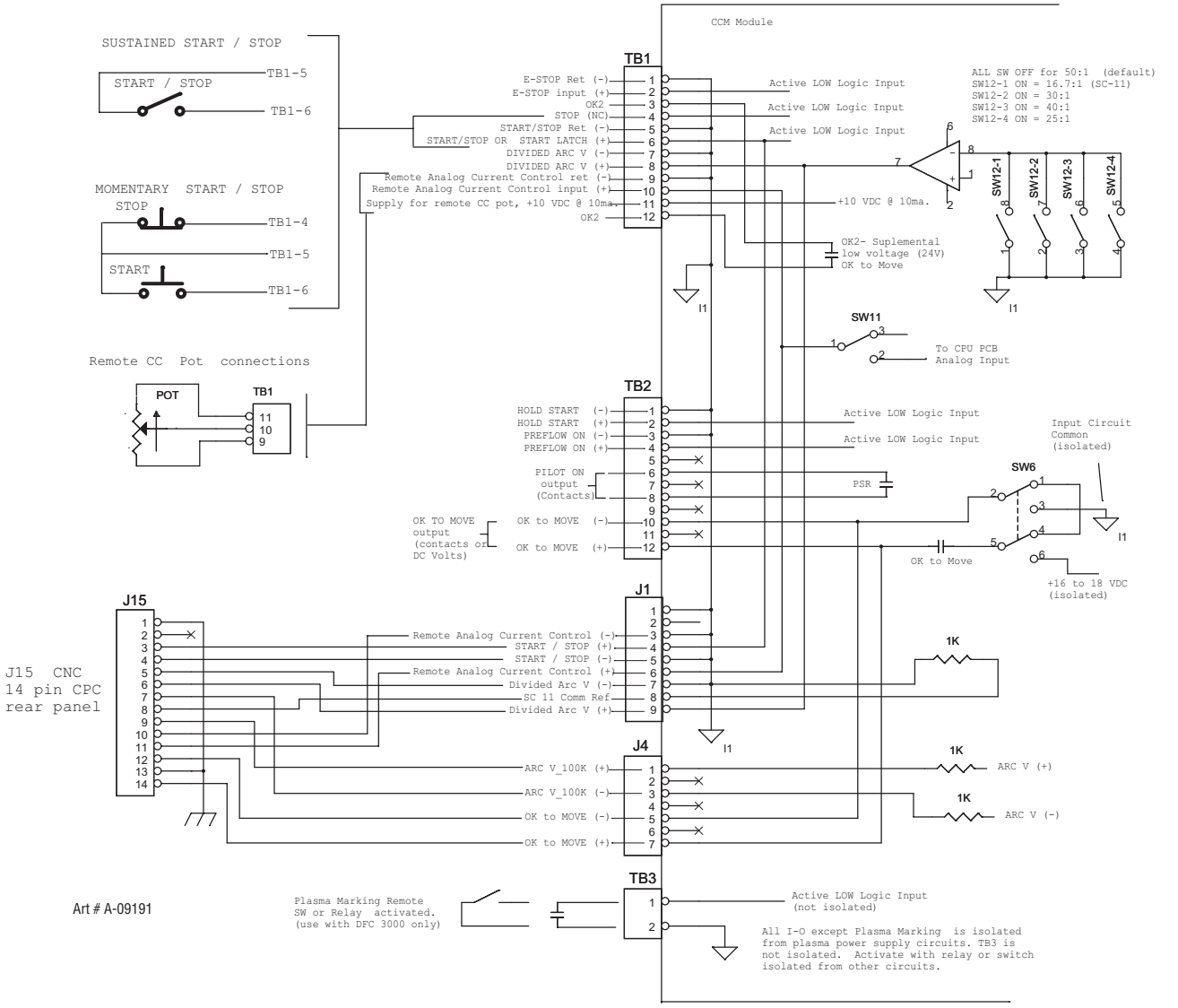
[5] **OK to Move2** – Provides a second set of N.O. contacts that close when arc transfer is detected. Contacts are rated for maximum of 24 VAC/DC @ 1A. Simplified CNC Circuit.

[5] **+10V @ 10ma. For Remote CC Pot** – Previously CCM versions if one wanted to use a potentiometer for the Remote Analog Current Control (CC) input an external 10 V supply was required for Pot High.. Now an isolated (from main plasma circuits) 10V supply is provided. Recommended value of the pot is 5K or 10K.

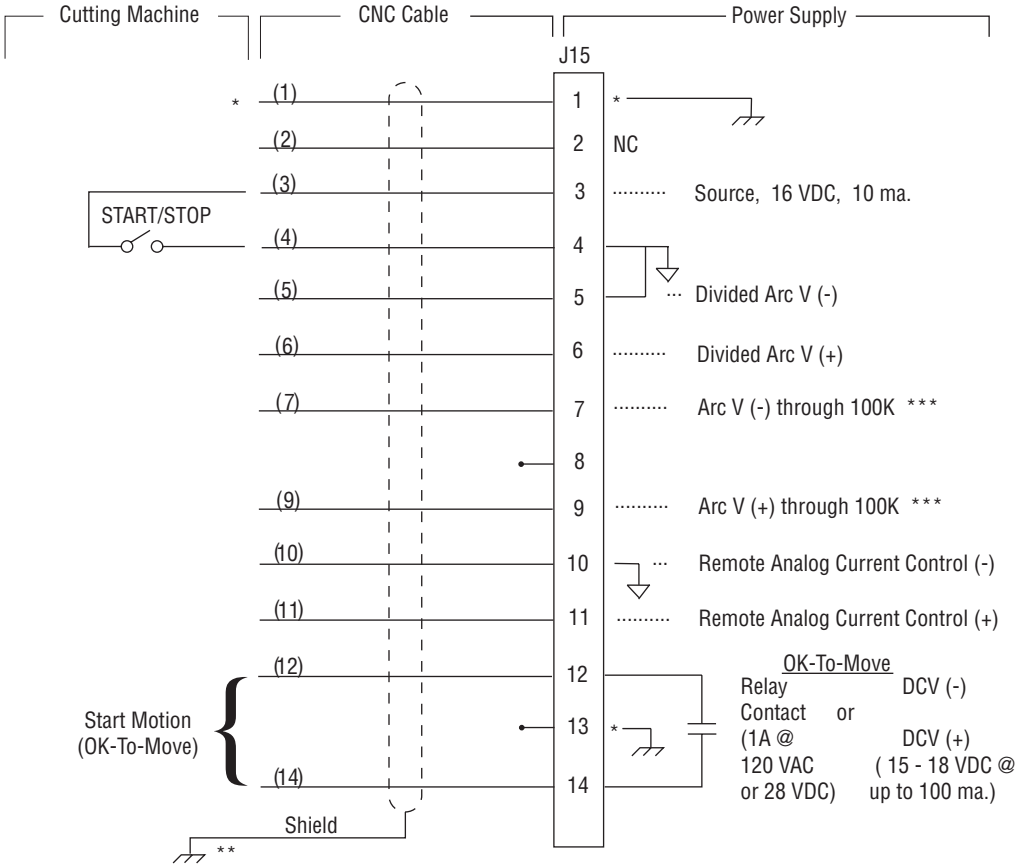


[5] **Plasma Marking Select (Remote)** – Plasma Marking, available only with DFC 3000, may be activated with a contact closure between TB3-1 & TB3-2 if SW8-4, DIP switch on the CPU board (smaller of the 2 CCM boards), is also on. Opening the connection between TB3-1 & TB3-2 switched back to normal cutting mode. For Ultracut power supplies It is OK to leave SW8-4 on whether you are marking or not.

Simplified CNC Circuit.



CNC Connections.

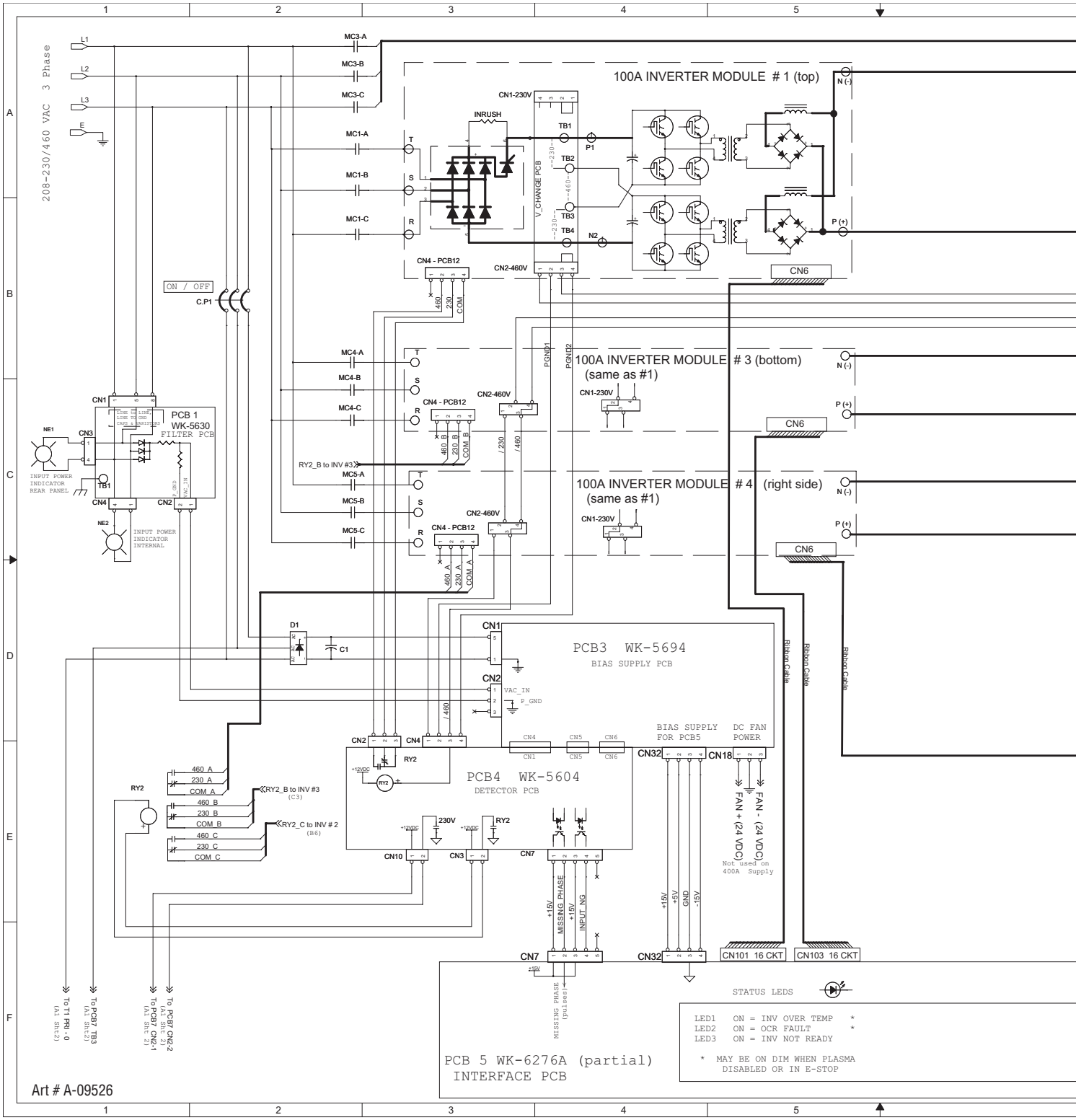


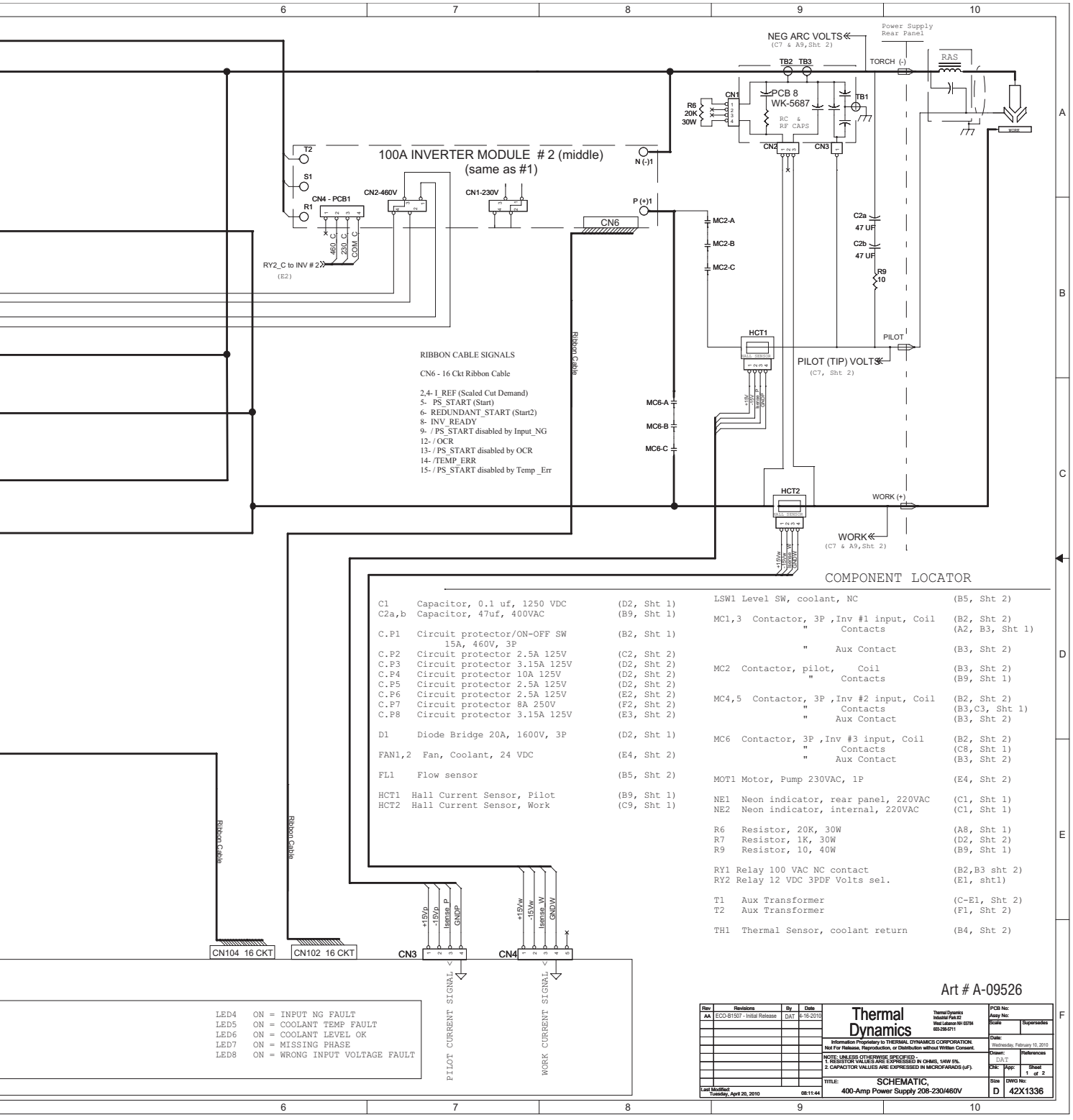
* Power Supply Gnd not used for CNC cable
Do not connect wire #1 to anything.

** Cable Shield drain wire must be connected to ground at cutting machine.

*** Used only for special Torch Height Control

APPENDIX 10: Schematic, 230-460V Power Supply





COMPONENT LOCATOR

C1	Capacitor, 0.1 uf, 1250 VDC	(D2, Sht 1)
C2a,b	Capacitor, 47uf, 400VAC	(B9, Sht 1)
C.P1	Circuit protector/ON-OFF SW 15A, 460V, 3P	(B2, Sht 1)
C.P2	Circuit protector 2.5A 125V	(C2, Sht 2)
C.P3	Circuit protector 3.15A 125V	(D2, Sht 2)
C.P4	Circuit protector 10A 125V	(D2, Sht 2)
C.P5	Circuit protector 2.5A 125V	(D2, Sht 2)
C.P6	Circuit protector 2.5A 125V	(E2, Sht 2)
C.P7	Circuit protector 8A 250V	(F2, Sht 2)
C.P8	Circuit protector 3.15A 125V	(E3, Sht 2)
D1	Diode Bridge 20A, 1600V, 3P	(D2, Sht 1)
FAN1,2	Fan, Coolant, 24 VDC	(E4, Sht 2)
FL1	Flow sensor	(B5, Sht 2)
HCT1	Hall Current Sensor, Pilot	(B9, Sht 1)
HCT2	Hall Current Sensor, Work	(C9, Sht 1)
LSW1	Level SW, coolant, NC	(B5, Sht 2)
MC1,3	Contactor, 3P ,Inv #1 input, Coil	(B2, Sht 2)
	" Contacts	(A2, B3, Sht 1)
	" Aux Contact	(B3, Sht 2)
MC2	Contactor, pilot, Coil	(B3, Sht 2)
	" Contacts	(B9, Sht 1)
MC4,5	Contactor, 3P ,Inv #2 input, Coil	(B2, Sht 2)
	" Contacts	(B3,C3, Sht 1)
	" Aux Contact	(B3, Sht 2)
MC6	Contactor, 3P ,Inv #3 input, Coil	(B2, Sht 2)
	" Contacts	(C8, Sht 1)
	" Aux Contact	(B3, Sht 2)
MOT1	Motor, Pump 230VAC, 1P	(E4, Sht 2)
NE1	Neon indicator, rear panel, 220VAC	(C1, Sht 1)
NE2	Neon indicator, internal, 220VAC	(C1, Sht 1)
R6	Resistor, 20K, 30W	(A8, Sht 1)
R7	Resistor, 1K, 30W	(D2, Sht 2)
R9	Resistor, 10, 40W	(B9, Sht 1)
RY1	Relay 100 VAC NC contact	(B2,B3 sht 2)
RY2	Relay 12 VDC 3PDF Volts sel.	(E1, sht1)
T1	Aux Transformer	(C-E1, Sht 2)
T2	Aux Transformer	(F1, Sht 2)
TH1	Thermal Sensor, coolant return	(B4, Sht 2)

Art # A-09526

Rev	Revisions	By	Date
AA	ECO-B1507 - Initial Release	DAT	4-16-2010

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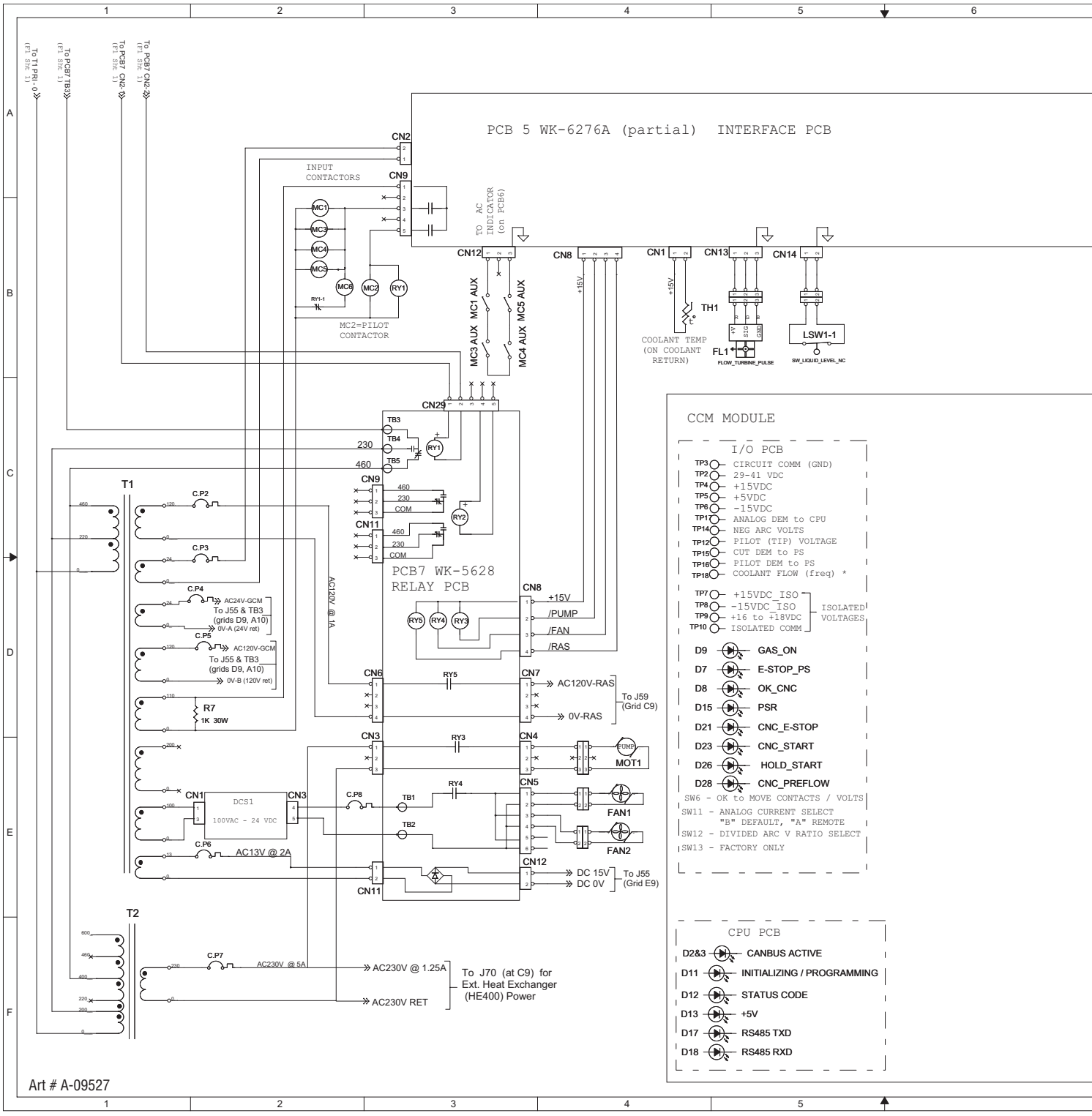
1. RESISTOR VALUES ARE EXPRESSED IN OHMS, 1/4W 5%.
2. CAPACITOR VALUES ARE EXPRESSED IN MICROFARADS (uF).

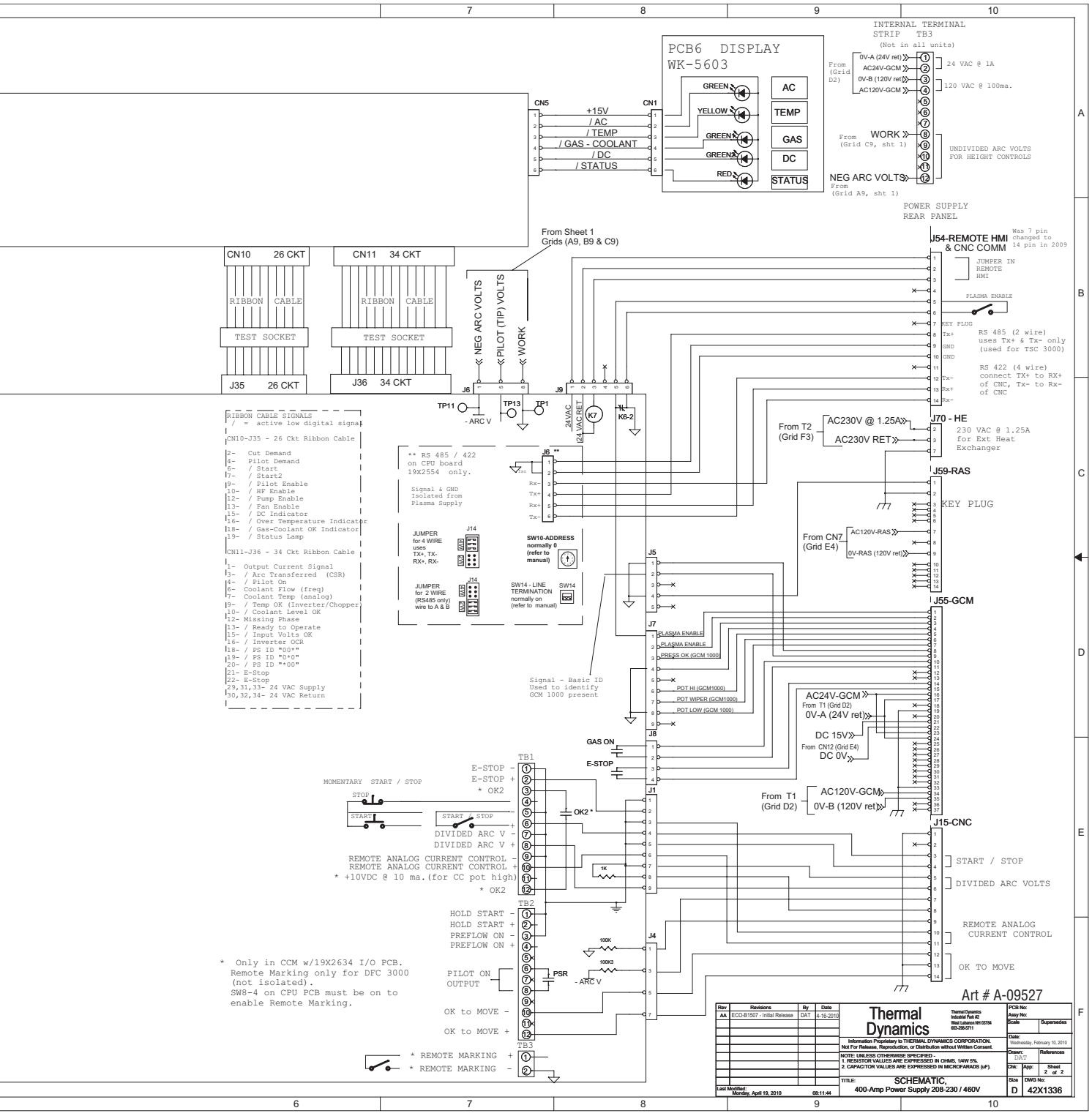
Last Modified: Tuesday, April 20, 2010 08:11:44

TITLE: SCHEMATIC, 400-Amp Power Supply 208-230/460V

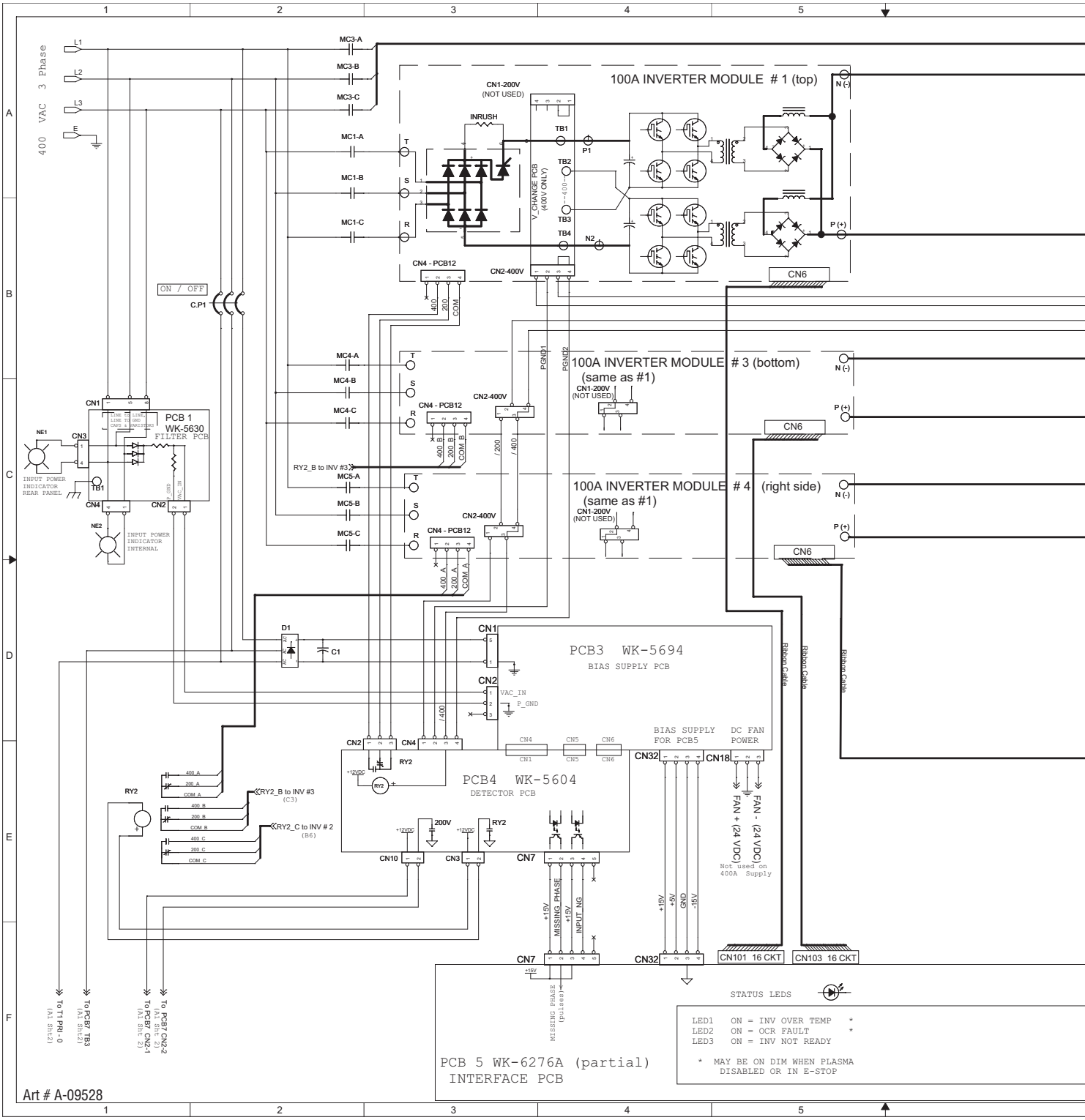
PCB No:
Assy No:
Scale: Supersedes
Date: Wednesday, February 10, 2010
Drawn: DAT References
Chk: App: Sheet 1 of 2
Size: D DWG No: 42X1336

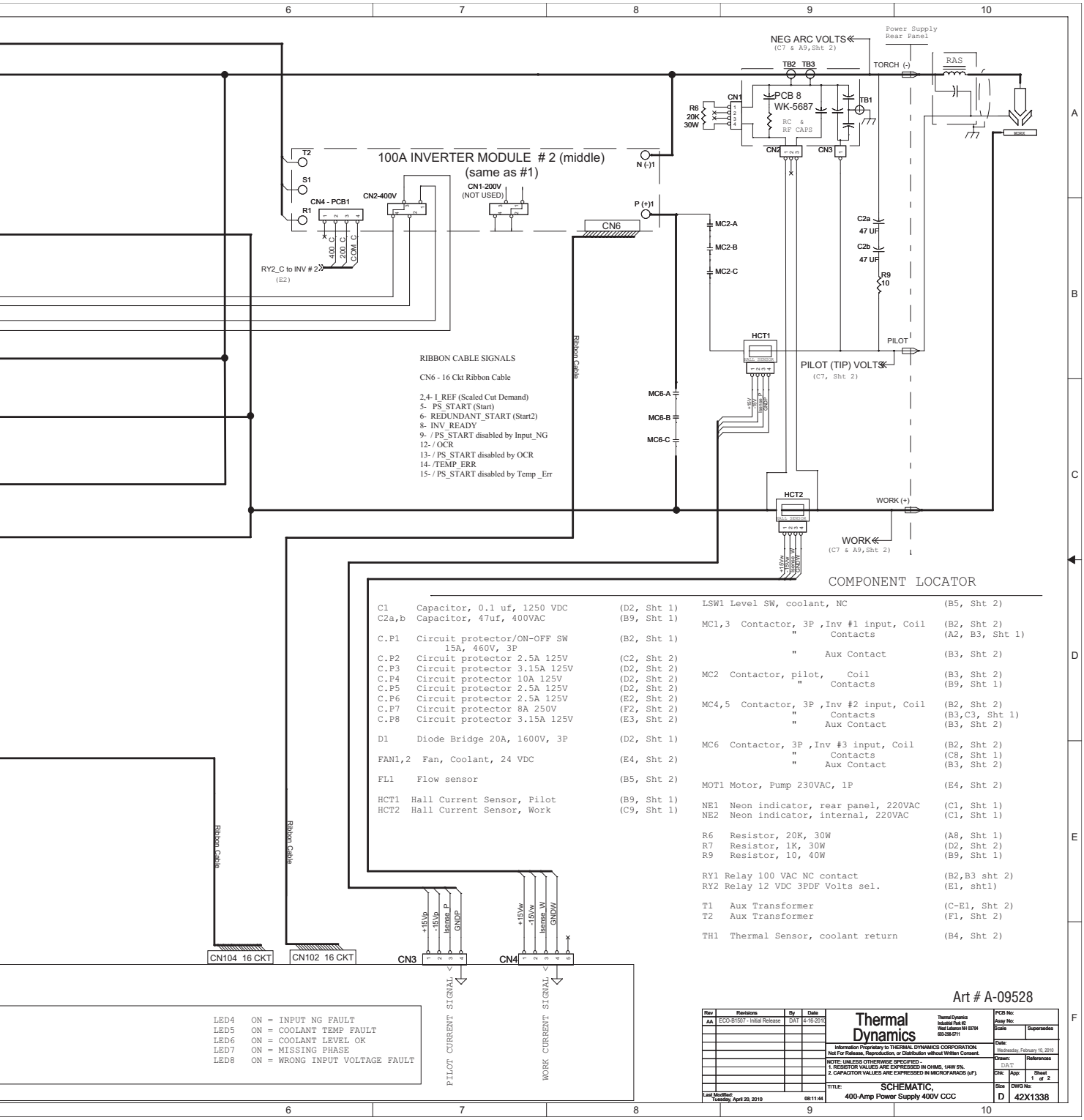
APPENDIX 10: Schematic, 230-460V, Power Supply Cont.




PCB6 DISPLAY
WK-5603
GREEN
YELLOW
GREEN
GREEN
RED
AC
TEMP
GAS
DC
STATUS
CN5
CN1
+15V
/ AC
/ TEMP
/ GAS - COOLANT
/ DC
/ STATUS
INTERNAL TERMINAL STRIP TB3
(Not in all units)
0V-A (24V ret)
AC24V-GCM
0V-B (120V ret)
AC120V-GCM
24 VAC @ 1A
120 VAC @ 100ma.
WORK
UNDIVIDED ARC VOLTS FOR HEIGHT CONTROLS
NEG ARC VOLTS
POWER SUPPLY REAR PANEL
From Sheet 1 Grids (A9, B9 & C9)
CN10 26 CKT
CN11 34 CKT
RIBBON CABLE
TEST SOCKET
J35 26 CKT
J36 34 CKT
NEG ARC VOLTS
PILOT (TIP) VOLTS
WORK
J6
J9
TP11
TP13
TP1
- ARC V
24VAC
24 VAC RET
K7
K6-2
J54-REMOTE HMI & CNC COMM
Was 7 pin changed to 14 pin in 2009
JUMPER IN REMOTE HMI
PLASMA ENABLE
KEY PLUG
RS 485 (2 wire) uses Tx+ & Tx- only (used for TSC 3000)
RS 422 (4 wire) connect TX+ to RX+ of CNC, Tx- to Rx- of CNC
From T2 (Grid F3)
AC230V @ 1.25A
AC230V RET
J70 - HE
230 VAC @ 1.25A for Ext Heat Exchanger
J59-RAS
KEY PLUG
From CN7 (Grid E4)
AC120V-RAS
0V-RAS (120V ret)
J55-GCM
AC24V-GCM
From T1 (Grid D2)
0V-A (24V ret)
DC 15V
From CN12 (Grid E4)
DC 0V
From T1 (Grid D2)
AC120V-GCM
0V-B (120V ret)
J15-CNC
START / STOP
DIVIDED ARC VOLTS
REMOTE ANALOG CURRENT CONTROL
OK TO MOVE
RIBBON CABLE SIGNALS
/ = active low digital signal
CN10-J35 - 26 Ckt Ribbon Cable
2- Cut Demand
4- Pilot Demand
6- / Start
7- / Start2
9- / Pilot Enable
10- / HF Enable
12- / Pump Enable
13- / Fan Enable
15- / DC Indicator
16- / Over Temperature Indicator
18- / Gas-Coolant OK Indicator
19- / Status Lamp
CN11-J36 - 34 Ckt Ribbon Cable
1- Output Current Signal
3- / Arc Transferred (CSR)
4- / Pilot On
6- Coolant Flow (freq)
7- Coolant Temp (analog)
9- / Temp OK (Inverter/Chopper)
10- / Coolant Level OK
12- Missing Phase
13- / Ready to Operate
15- / Input Volts OK
16- / Inverter OCR
18- / PS ID "00*"
19- / PS ID "0*0"
20- / PS ID "*00"
21- E-Stop
22- E-Stop
29,31,33- 24 VAC Supply
30,32,34- 24 VAC Return
** RS 485 / 422 on CPU board 19X2554 only.
Signal & GND Isolated from Plasma Supply
JUMPER for 4 WIRE uses TX+, TX-, RX+, RX-
JUMPER for 2 WIRE (RS485 only) wire to A & B
SW10-ADDRESS normally 0 (refer to manual)
SW14 - LINE TERMINATION normally on (refer to manual)
Signal - Basic ID Used to identify GCM 1000 present
PLASMA ENABLE
PRESS OK (GCM 1000)
POT HI (GCM1000)
POT WIPER (GCM1000)
POT LOW (GCM 1000)
GAS ON
E-STOP
MOMENTARY START / STOP
STOP
START
E-STOP -
E-STOP +
* OK2
OK2 *
DIVIDED ARC V -
DIVIDED ARC V +
REMOTE ANALOG CURRENT CONTROL -
REMOTE ANALOG CURRENT CONTROL +
* +10VDC @ 10 ma.(for CC pot high)
HOLD START -
HOLD START +
PREFLOW ON -
PREFLOW ON +
PILOT ON OUTPUT
PSR
OK to MOVE -
OK to MOVE +
* REMOTE MARKING +
* REMOTE MARKING -
1K
100K
100K3
* Only in CCM w/19X2634 I/O PCB.
Remote Marking only for DFC 3000 (not isolated).
SW8-4 on CPU PCB must be on to enable Remote Marking.
Art # A-09527
Thermal Dynamics
SCHEMATIC,
400-Amp Power Supply 208-230 / 460V
42X1336

APPENDIX 11: Schematic, CCC 400V Power Supply





COMPONENT LOCATOR

C1	Capacitor, 0.1 uf, 1250 VDC	(D2, Sht 1)
C2a,b	Capacitor, 47uf, 400VAC	(B9, Sht 1)
C.P1	Circuit protector/ON-OFF SW 15A, 460V, 3P	(B2, Sht 1)
C.P2	Circuit protector 2.5A 125V	(C2, Sht 2)
C.P3	Circuit protector 3.15A 125V	(D2, Sht 2)
C.P4	Circuit protector 10A 125V	(D2, Sht 2)
C.P5	Circuit protector 2.5A 125V	(D2, Sht 2)
C.P6	Circuit protector 2.5A 125V	(E2, Sht 2)
C.P7	Circuit protector 8A 250V	(F2, Sht 2)
C.P8	Circuit protector 3.15A 125V	(E3, Sht 2)
D1	Diode Bridge 20A, 1600V, 3P	(D2, Sht 1)
FAN1,2	Fan, Coolant, 24 VDC	(E4, Sht 2)
FL1	Flow sensor	(B5, Sht 2)
HCT1	Hall Current Sensor, Pilot	(B9, Sht 1)
HCT2	Hall Current Sensor, Work	(C9, Sht 1)
LSW1	Level SW, coolant, NC	(B5, Sht 2)
MC1,3	Contactor, 3P ,Inv #1 input, Coil	(B2, Sht 2)
	" Contacts	(A2, B3, Sht 1)
	" Aux Contact	(B3, Sht 2)
MC2	Contactor, pilot, Coil	(B3, Sht 2)
	" Contacts	(B9, Sht 1)
MC4,5	Contactor, 3P ,Inv #2 input, Coil	(B2, Sht 2)
	" Contacts	(B3,C3, Sht 1)
	" Aux Contact	(B3, Sht 2)
MC6	Contactor, 3P ,Inv #3 input, Coil	(B2, Sht 2)
	" Contacts	(C8, Sht 1)
	" Aux Contact	(B3, Sht 2)
MOT1	Motor, Pump 230VAC, 1P	(E4, Sht 2)
NE1	Neon indicator, rear panel, 220VAC	(C1, Sht 1)
NE2	Neon indicator, internal, 220VAC	(C1, Sht 1)
R6	Resistor, 20K, 30W	(A8, Sht 1)
R7	Resistor, 1K, 30W	(D2, Sht 2)
R9	Resistor, 10, 40W	(B9, Sht 1)
RY1	Relay 100 VAC NC contact	(B2,B3 sht 2)
RY2	Relay 12 VDC 3PDF Volts sel.	(E1, sht1)
T1	Aux Transformer	(C-E1, Sht 2)
T2	Aux Transformer	(F1, Sht 2)
TH1	Thermal Sensor, coolant return	(B4, Sht 2)

Art # A-09528

Rev	Revisions	By	Date
AA	ECO-81507 - Initial Release	DAT	4-16-2010

Thermal Dynamics
Thermal Dynamics Industrial Park #2 West Lebanon NH 03784 603-298-5711

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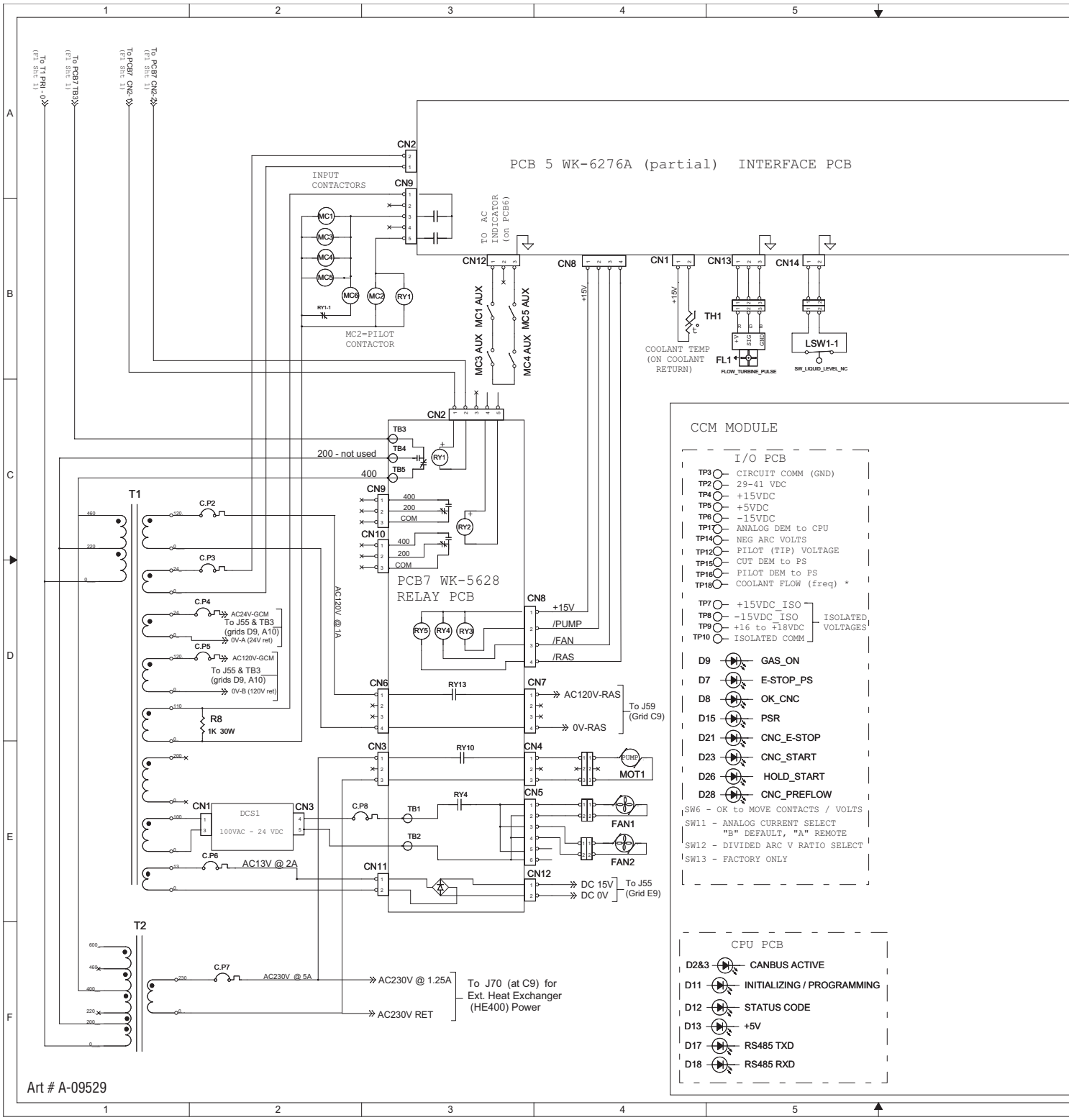
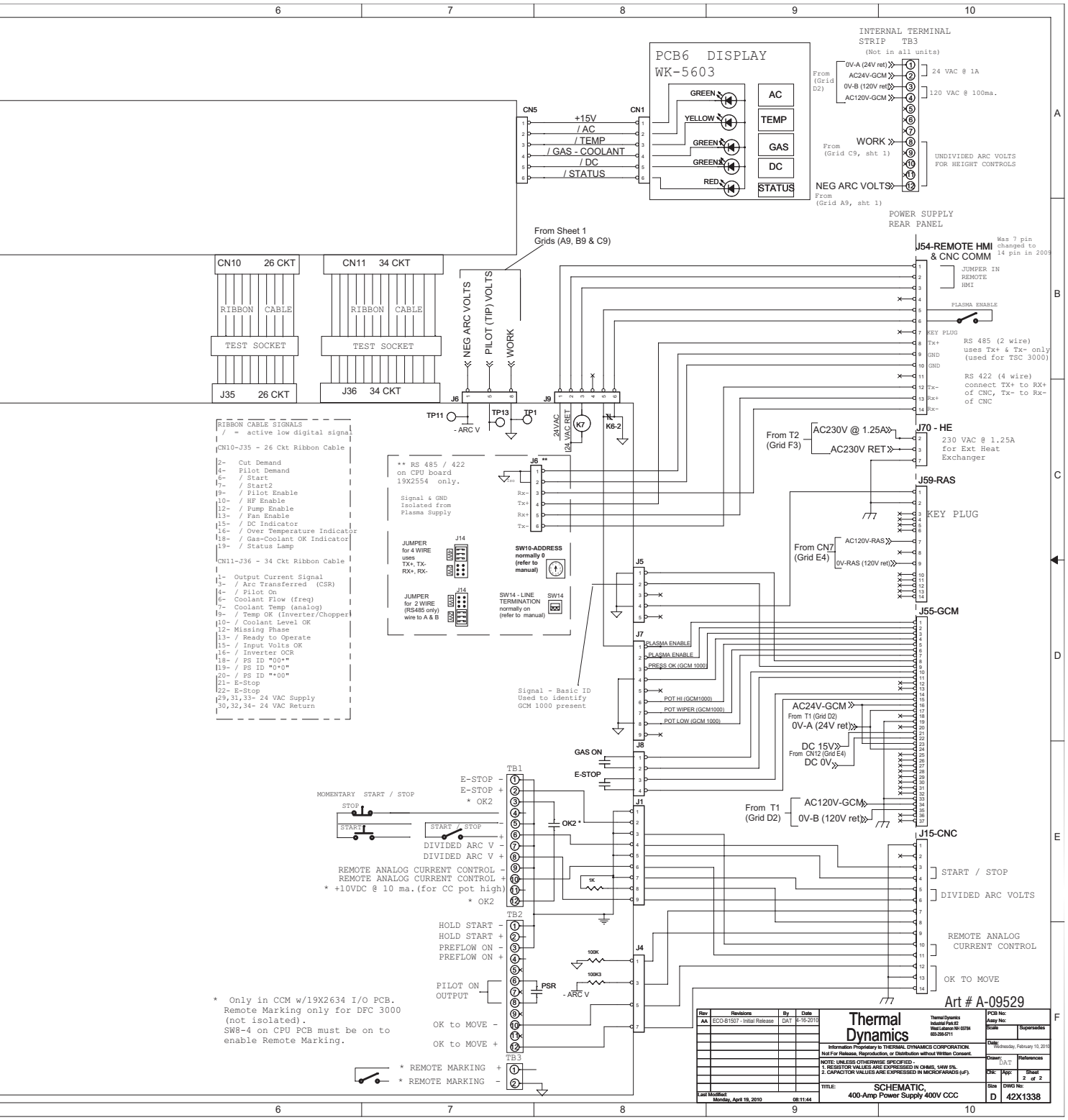
TITLE: SCHEMATIC, 400-Amp Power Supply 400V CCC

PCB No:
Assy No:
Scale: Supersedes
Date: Wednesday, February 10, 2010
Drawn: DAT References
Chk: Appr: Sheet 1 of 2
Size: D DWG No: 42X1338

Last Modified: Tuesday, April 20, 2010 08:11:44

APPENDIX 11: Schematic, CCC 400V Power Supply Cont.




PCB6 DISPLAY
WK-5603
GREEN
YELLOW
GREEN
GREEN
RED
AC
TEMP
GAS
DC
STATUS
CN5
CN1
+15V
/ AC
/ TEMP
/ GAS - COOLANT
/ DC
/ STATUS
INTERNAL TERMINAL STRIP TB3
(Not in all units)
0V-A (24V ret)
AC24V-GCM
0V-B (120V ret)
AC120V-GCM
24 VAC @ 1A
120 VAC @ 100ma.
WORK
UNDIVIDED ARC VOLTS FOR HEIGHT CONTROLS
NEG ARC VOLTS
POWER SUPPLY REAR PANEL
From Sheet 1 Grids (A9, B9 & C9)
CN10 26 CKT
CN11 34 CKT
RIBBON CABLE
TEST SOCKET
J35 26 CKT
J36 34 CKT
NEG ARC VOLTS
PILOT (TIP) VOLTS
WORK
J6
J9
TP11
TP13
TP1
- ARC V
24VAC
24 VAC RET
K7
K6-2
J54-REMOTE HMI & CNC COMM
Was 7 pin changed to 14 pin in 2009
JUMPER IN REMOTE HMI
PLASMA ENABLE
KEY PLUG
RS 485 (2 wire) uses Tx+ & Tx- only (used for TSC 3000)
RS 422 (4 wire) connect TX+ to RX+ of CNC, Tx- to Rx- of CNC
From T2 (Grid F3)
AC230V @ 1.25A
AC230V RET
J70 - HE
230 VAC @ 1.25A for Ext Heat Exchanger
J59-RAS
KEY PLUG
From CN7 (Grid E4)
AC120V-RAS
0V-RAS (120V ret)
RIBBON CABLE SIGNALS
/ = active low digital signal
CN10-J35 - 26 Ckt Ribbon Cable
2- Cut Demand
4- Pilot Demand
6- / Start
7- / Start2
9- / Pilot Enable
10- / HF Enable
12- / Pump Enable
13- / Fan Enable
15- / DC Indicator
16- / Over Temperature Indicator
18- / Gas-Coolant OK Indicator
19- / Status Lamp
CN11-J36 - 34 Ckt Ribbon Cable
1- Output Current Signal
3- / Arc Transferred (CSR)
4- / Pilot On
6- Coolant Flow (freq)
7- Coolant Temp (analog)
9- / Temp OK (Inverter/Chopper)
10- / Coolant Level OK
12- Missing Phase
13- / Ready to Operate
15- / Input Volts OK
16- / Inverter OCR
18- / PS ID "00*"
19- / PS ID "0*0"
20- / PS ID "*00"
21- E-Stop
22- E-Stop
29,31,33- 24 VAC Supply
30,32,34- 24 VAC Return
** RS 485 / 422 on CPU board 19X2554 only.
Signal & GND Isolated from Plasma Supply
JUMPER for 4 WIRE uses TX+, TX-, RX+, RX-
JUMPER for 2 WIRE (RS485 only) wire to A & B
SW10-ADDRESS normally 0 (refer to manual)
SW14 - LINE TERMINATION normally on (refer to manual)
Signal - Basic ID Used to identify GCM 1000 present
J55-GCM
PLASMA ENABLE
PLASMA ENABLE
PRESS OK (GCM 1000)
POT HI (GCM1000)
POT WIPER (GCM1000)
POT LOW (GCM 1000)
AC24V-GCM
From T1 (Grid D2)
0V-A (24V ret)
DC 15V
From CN12 (Grid E4)
DC 0V
GAS ON
E-STOP
From T1 (Grid D2)
AC120V-GCM
0V-B (120V ret)
J15-CNC
START / STOP
DIVIDED ARC VOLTS
REMOTE ANALOG CURRENT CONTROL
OK TO MOVE
MOMENTARY START / STOP
STOP
START
START / STOP
TB1
E-STOP -
E-STOP +
* OK2
OK2 *
DIVIDED ARC V -
DIVIDED ARC V +
REMOTE ANALOG CURRENT CONTROL -
REMOTE ANALOG CURRENT CONTROL +
* +10VDC @ 10 ma.(for CC pot high)
* OK2
TB2
HOLD START -
HOLD START +
PREFLOW ON -
PREFLOW ON +
PILOT ON OUTPUT
PSR
OK to MOVE -
OK to MOVE +
TB3
* REMOTE MARKING +
* REMOTE MARKING -
1K
100K
100K3
- ARC V
* Only in CCM w/19X2634 I/O PCB. Remote Marking only for DFC 3000 (not isolated). SW8-4 on CPU PCB must be on to enable Remote Marking.
Art # A-09529
Rev AA ECO-B1507 - Initial Release DAT 4-16-2013
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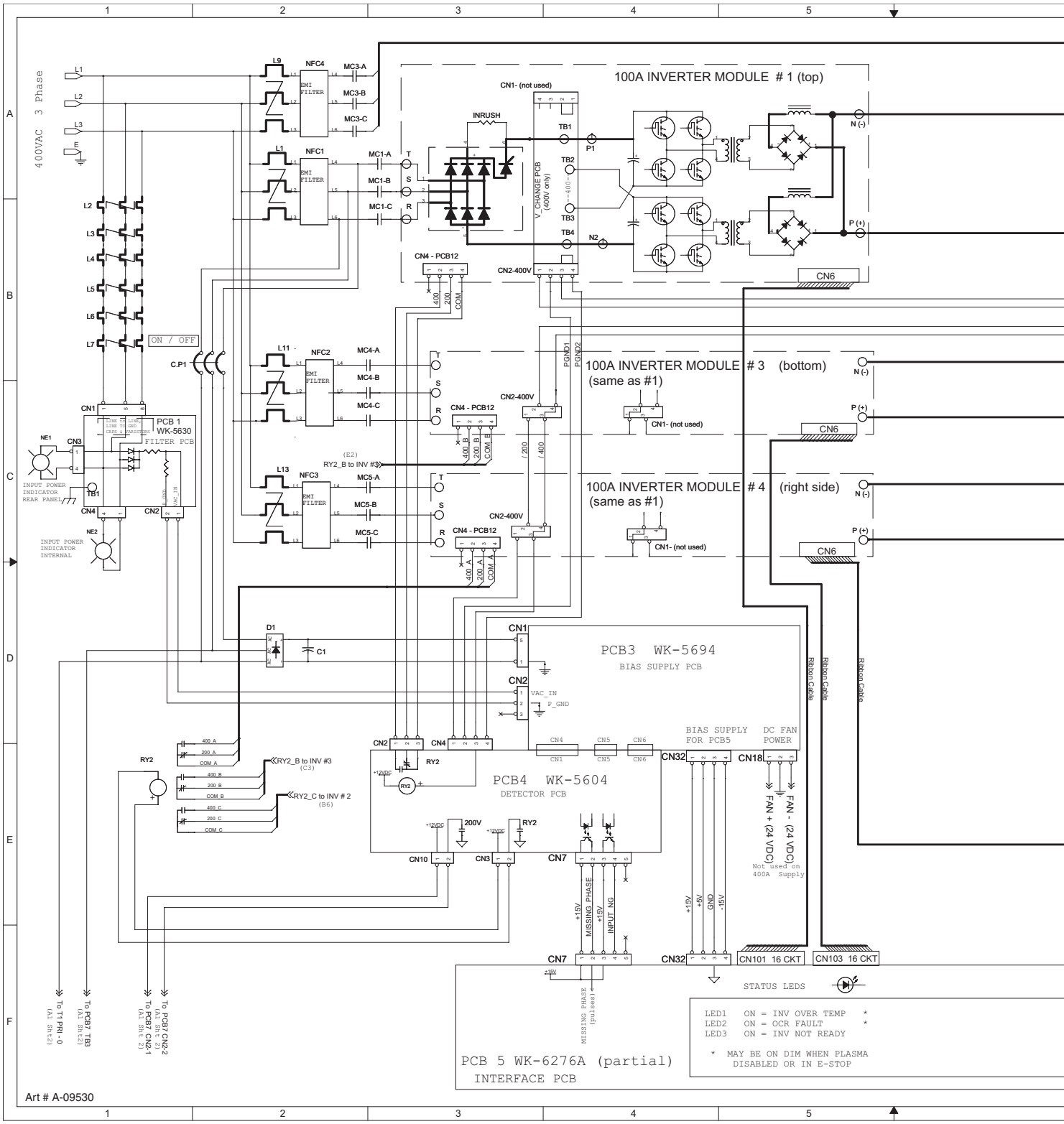
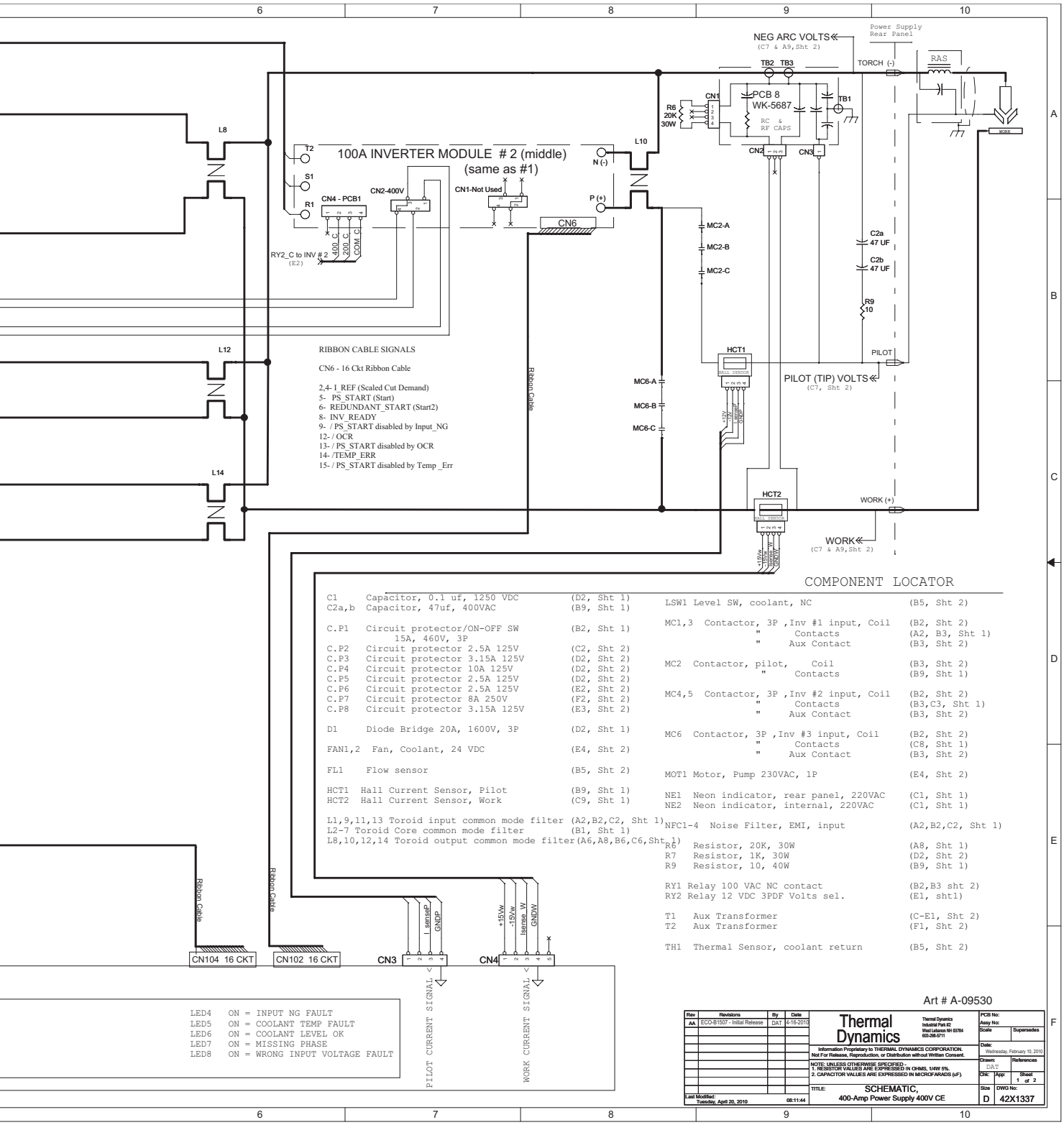
Last Modified: Monday, April 19, 2010 08:11:44
TITLE: SCHEMATIC, 400-Amp Power Supply 400V CCC
PCB No:
Assy No:
Scale
Supersedes
Date: Wednesday, February 10, 2010
Drawn: DAT
References
Chk:
App:
Sheet 2 of 2
Size D
DWG No: 42X1338

APPENDIX 12: Schematic, CE 400V Power Supply





COMPONENT LOCATOR

C1	Capacitor, 0.1 uf, 1250 VDC	(D2, Sht 1)
C2a,b	Capacitor, 47uf, 400VAC	(B9, Sht 1)
C.P1	Circuit protector/ON-OFF SW 15A, 460V, 3P	(B2, Sht 1)
C.P2	Circuit protector 2.5A 125V	(C2, Sht 2)
C.P3	Circuit protector 3.15A 125V	(D2, Sht 2)
C.P4	Circuit protector 10A 125V	(D2, Sht 2)
C.P5	Circuit protector 2.5A 125V	(D2, Sht 2)
C.P6	Circuit protector 2.5A 125V	(E2, Sht 2)
C.P7	Circuit protector 8A 250V	(F2, Sht 2)
C.P8	Circuit protector 3.15A 125V	(E3, Sht 2)
D1	Diode Bridge 20A, 1600V, 3P	(D2, Sht 1)
FAN1,2	Fan, Coolant, 24 VDC	(E4, Sht 2)
FL1	Flow sensor	(B5, Sht 2)
HCT1	Hall Current Sensor, Pilot	(B9, Sht 1)
HCT2	Hall Current Sensor, Work	(C9, Sht 1)
L1,9,11,13	Toroid input common mode filter	(A2,B2,C2, Sht 1)
L2-7	Toroid Core common mode filter	(B1, Sht 1)
L8,10,12,14	Toroid output common mode filter	(A6,A8,B6,C6,Sht 1)
LSW1	Level SW, coolant, NC	(B5, Sht 2)
MC1,3	Contactor, 3P ,Inv #1 input, Coil	(B2, Sht 2)
	" Contacts	(A2, B3, Sht 1)
	" Aux Contact	(B3, Sht 2)
MC2	Contactor, pilot, Coil	(B3, Sht 2)
	" Contacts	(B9, Sht 1)
MC4,5	Contactor, 3P ,Inv #2 input, Coil	(B2, Sht 2)
	" Contacts	(B3,C3, Sht 1)
	" Aux Contact	(B3, Sht 2)
MC6	Contactor, 3P ,Inv #3 input, Coil	(B2, Sht 2)
	" Contacts	(C8, Sht 1)
	" Aux Contact	(B3, Sht 2)
MOT1	Motor, Pump 230VAC, 1P	(E4, Sht 2)
NE1	Neon indicator, rear panel, 220VAC	(C1, Sht 1)
NE2	Neon indicator, internal, 220VAC	(C1, Sht 1)
NFC1-4	Noise Filter, EMI, input	(A2,B2,C2, Sht 1)
R6	Resistor, 20K, 30W	(A8, Sht 1)
R7	Resistor, 1K, 30W	(D2, Sht 2)
R9	Resistor, 10, 40W	(B9, Sht 1)
RY1	Relay 100 VAC NC contact	(B2,B3 sht 2)
RY2	Relay 12 VDC 3PDF Volts sel.	(E1, sht1)
T1	Aux Transformer	(C-E1, Sht 2)
T2	Aux Transformer	(F1, Sht 2)
TH1	Thermal Sensor, coolant return	(B5, Sht 2)

Art # A-09530

Rev	Revisions	By	Date
AA	ECO-B1507 - Initial Release	DAT	4-16-2010

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2. CAPACITOR VALUES ARE EXPRESSED IN MICROFARADS (uF).

PCB No:
Assy No:
Scale
Supersedes
Date: Wednesday, February 10, 2010
Drawn: DAT
References
Chk:
App:
Sheet 1 of 2

TITLE: SCHEMATIC, 400-Amp Power Supply 400V CE

Size D
DWG No: 42X1337

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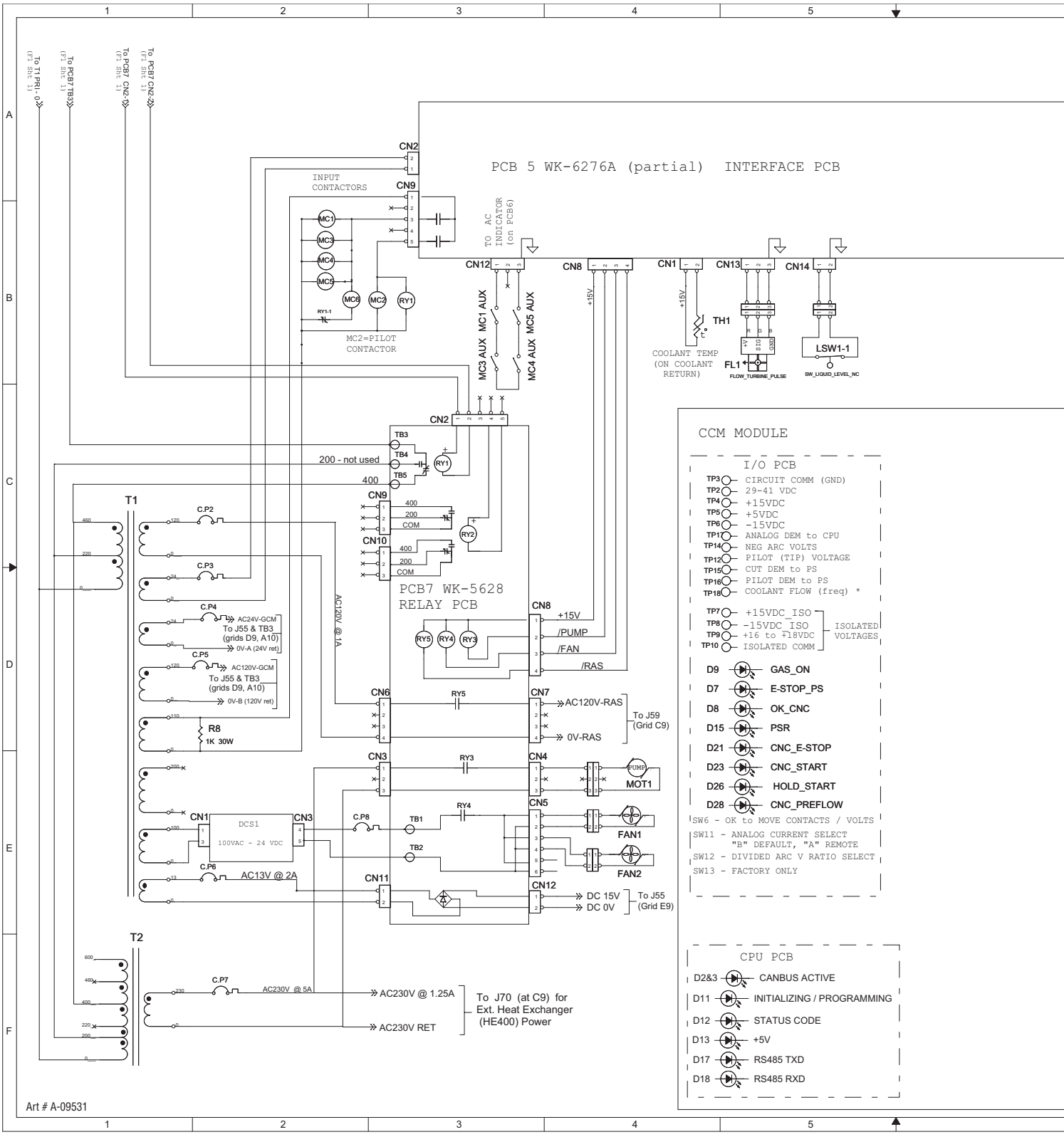
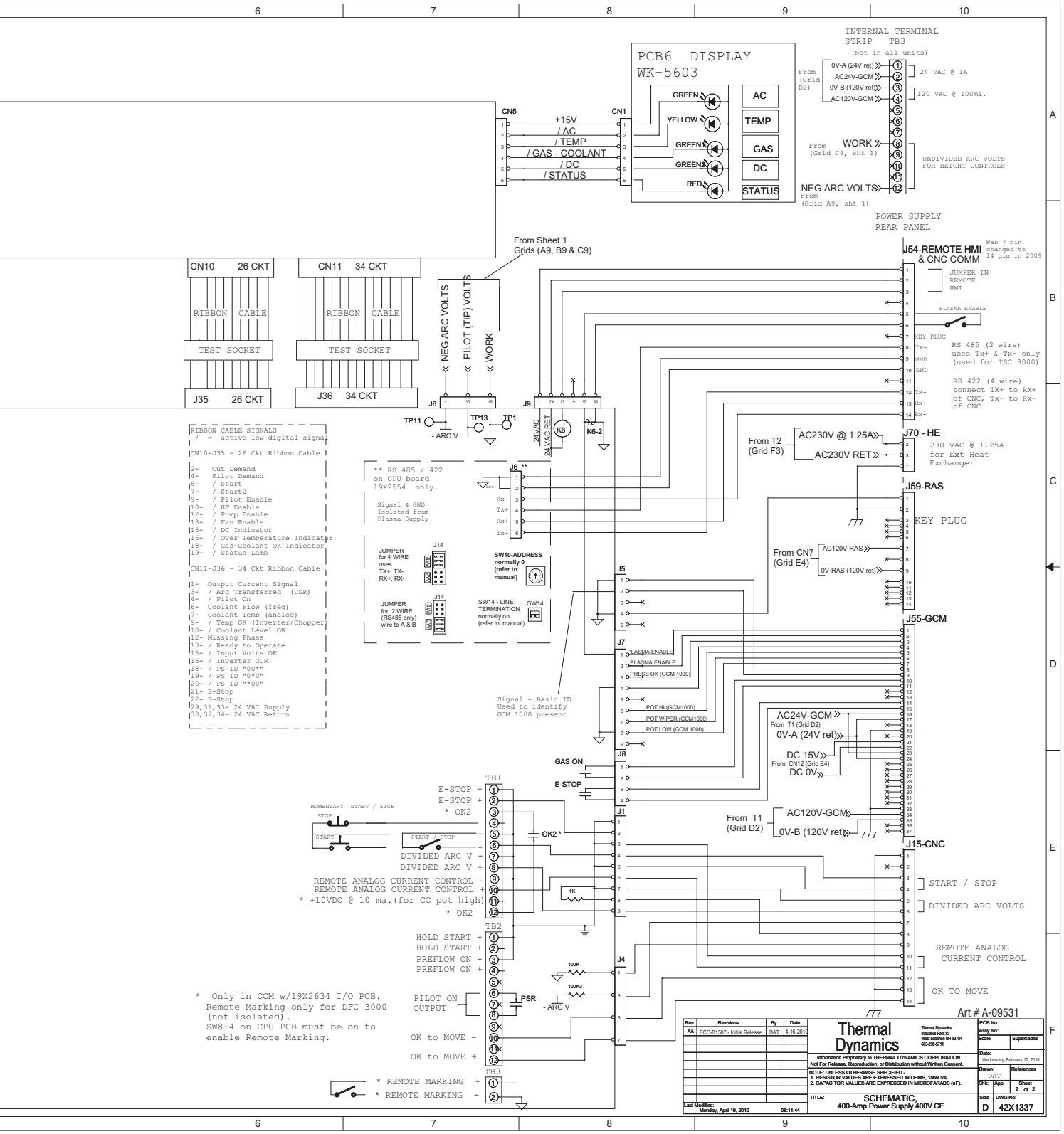
APPENDIX 12: Schematic, CE 400V Power Supply Cont.




PCB6 DISPLAY
WK-5603
GREEN
YELLOW
GREEN
GREEN
RED
AC
TEMP
GAS
DC
STATUS
CN5
CN1
+15V
/ AC
/ TEMP
/ GAS - COOLANT
/ DC
/ STATUS
INTERNAL TERMINAL STRIP TB3
(Not in all units)
From (Grid D2)
0V-A (24V ret)
AC24V-GCM
0V-B (120V ret)
AC120V-GCM
24 VAC @ 1A
120 VAC @ 100ma.
From (Grid C9, sht 1)
WORK
UNDIVIDED ARC VOLTS FOR HEIGHT CONTROLS
NEG ARC VOLTS
From (Grid A9, sht 1)
POWER SUPPLY REAR PANEL
From Sheet 1 Grids (A9, B9 & C9)
CN10 26 CKT
CN11 34 CKT
RIBBON CABLE
TEST SOCKET
J35 26 CKT
J36 34 CKT
NEG ARC VOLTS
PILOT (TIP) VOLTS
WORK
J6
J9
TP11
TP13
TP1
- ARC V
24VAC
24VAC RET
K6
K6-2
J54-REMOTE HMI & CNC COMM
Was 7 pin changed to 14 pin in 2009
JUMPER IN REMOTE HMI
PLASMA ENABLE
KEY PLUG
RS 485 (2 wire) uses Tx+ & Tx- only (used for TSC 3000)
RS 422 (4 wire) connect TX+ to RX+ of CNC, Tx- to Rx- of CNC
From T2 (Grid F3)
AC230V @ 1.25A
AC230V RET
J70 - HE
230 VAC @ 1.25A for Ext Heat Exchanger
J59-RAS
KEY PLUG
From CN7 (Grid E4)
AC120V-RAS
0V-RAS (120V ret)
RIBBON CABLE SIGNALS
/ = active low digital signal
CN10-J35 - 26 Ckt Ribbon Cable
2- Cut Demand
4- Pilot Demand
6- / Start
7- / Start2
9- / Pilot Enable
10- / HF Enable
12- / Pump Enable
13- / Fan Enable
15- / DC Indicator
16- / Over Temperature Indicator
18- / Gas-Coolant OK Indicator
19- / Status Lamp
CN11-J36 - 34 Ckt Ribbon Cable
1- Output Current Signal
3- / Arc Transferred (CSR)
4- / Pilot On
6- Coolant Flow (freq)
7- Coolant Temp (analog)
9- / Temp OK (Inverter/Chopper)
10- / Coolant Level OK
12- Missing Phase
13- / Ready to Operate
15- / Input Volts OK
16- / Inverter OCR
18- / PS ID "00*"
19- / PS ID "0*0"
20- / PS ID "*00"
21- E-Stop
22- E-Stop
29,31,33- 24 VAC Supply
30,32,34- 24 VAC Return
** RS 485 / 422 on CPU board 19X2554 only.
Signal & GND Isolated from Plasma Supply
J6 **
Rx-
Tx+
Rx+
Tx-
J14
JUMPER for 4 WIRE uses TX+, TX- RX+, RX-
JUMPER for 2 WIRE (RS485 only) wire to A & B
SW10-ADDRESS normally 0 (refer to manual)
SW14 - LINE TERMINATION normally on (refer to manual)
SW14
Signal - Basic ID Used to identify GCM 1000 present
J5
J7
PLASMA ENABLE
PLASMA ENABLE
PRESS OK (GCM 1000)
POT HI (GCM1000)
POT WIPER (GCM1000)
POT LOW (GCM 1000)
J55-GCM
AC24V-GCM
From T1 (Grid D2)
0V-A (24V ret)
DC 15V
From CN12 (Grid E4)
DC 0V
From T1 (Grid D2)
AC120V-GCM
0V-B (120V ret)
J8
GAS ON
E-STOP
J1
TB1
E-STOP -
E-STOP +
* OK2
MOMENTARY START / STOP
STOP
START
START / STOP
OK2 *
DIVIDED ARC V -
DIVIDED ARC V +
REMOTE ANALOG CURRENT CONTROL -
REMOTE ANALOG CURRENT CONTROL +
* +10VDC @ 10 ma.(for CC pot high)
* OK2
1K
J15-CNC
START / STOP
DIVIDED ARC VOLTS
REMOTE ANALOG CURRENT CONTROL
OK TO MOVE
TB2
HOLD START -
HOLD START +
PREFLOW ON -
PREFLOW ON +
100K
100K3
J4
PILOT ON OUTPUT
PSR
- ARC V
OK to MOVE -
OK to MOVE +
TB3
* REMOTE MARKING +
* REMOTE MARKING -
* Only in CCM w/19X2634 I/O PCB. Remote Marking only for DFC 3000 (not isolated). SW8-4 on CPU PCB must be on to enable Remote Marking.
Art # A-09531
Rev
Revisions
By
Date
AA
ECO-B1507 - Initial Release
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PCB No:
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Date: Wednesday, February 10, 2010
Drawn: DAT
References
Chk:
App:
Sheet 2 of 2
Size D
DWG No: 42X1337

APPENDIX 13: PUBLICATION HISTORY

Cover Date	Rev	Change(s)
Sept. 8, 2010	AA	First issue
Oct. 28, 2010	AB	Added EMC filter information to section 3 and corrected TSC-3000 part numbers per ECOB1844
Jan. 13, 2011	AC	Corrected part numbers for “S” cables in section 6 per ECOB1889.
June 1, 2011	AD	Updated flow chart for gas requirements on pg. 2-5 per ECOB1901.
Jan. 25, 2012	AE	Updated A-04066 O-Ring art on pg. 7-2 per ECOB2120.
Jan. 31, 2012	AF	Updated A-04071 other O-Ring art on pg. 7-2 per ECOB2185
Apr. 10, 2012	AG	Corrected all “G” torch leads catalog numbers in section 6 per ECOB2225
Aug. 6, 2012	AH	Updated section 6 CCM parts per ECOB2273.
Sept. 20, 2012	AI	Updated section 2 flow chart per ECOB2284.

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