



**C-20C**

**CUTSKILL®**  
**PLASMA CUTTING**  
**SYSTEM**



**Operation Manual**

Rev. AA.01

Issue Date: March 26, 2007

Manual 0-4687

Operating Features:



**20**  
AMP



**1**  
PHASE

**115**  
V

**230**  
V





## WARNINGS

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*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.*

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Plasma Cutting Power Supply  
CutSkill®  
SL100™ 1Torch™  
Operation Manual Number 0-4687

Covered under U.S. Patents.

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

[www.thermal-dynamics.com](http://www.thermal-dynamics.com)

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Printed in the United States of America

Publication Date: March 26, 2007

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

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

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

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

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



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# SECTION 1: GENERAL INFORMATION

## 1.01 Notes, Cautions and Warnings

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

### NOTE

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

### CAUTION

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



### WARNING

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

## 1.02 Important Safety Precautions



### WARNINGS

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

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

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



### GASES AND FUMES

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

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

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

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



### ELECTRIC SHOCK

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

- Never touch any parts that are electrically "live" or "hot."

- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Install and maintain equipment according to NEC code, refer to item 9 in Subsection 1.03, Publications.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.



### FIRE AND EXPLOSION

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

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



### NOISE

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

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



### PLASMA ARC RAYS

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

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

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

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

## 1.03 Publications

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

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



6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

## 1.04 Statement of Warranty

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

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

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

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

### LIMITED WARRANTY PERIOD

Product	Power Supply Components (Parts and Labor)	Torch and Leads (Parts and Labor)
20C	1 Year	1 Year
35C	1 Year	1 Year

This warranty does not apply to:

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

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

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

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

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

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

**This warranty is invalid if the Thermadyne product is sold by non - authorized persons.**

Effective May 31, 2005

## 2.0 INTRODUCTION

### 2.01 INTRODUCTION

Plasma is a gas which has been heated to an extremely high temperature and ionized so that it becomes electrically conductive. The plasma arc cutting process uses this plasma to transfer an electrical arc to the work-piece. The metal to be cut is melted by the heat of the arc and then blown away.

### 2.02 GENERAL SPECIFICATION

Model 20C		
Input power	115V, 1-ph, 50/60 Hz	230V, 1-ph, 50/60 Hz
Maximum Output	20 A	25 A
Output Current Range	8-20 A	10-25 A
Current Input Fuse	20A	30A
Input Current	4.9 kVA	1.6 kVA
Duty Cycle	30% @ 20A @ 88v	30% @ 25A @ 90v
	60% @ 15A @ 86v	
	100% @ 10A @ 84v	
Genuine Cutting Capacity	3/16" (5 mm)	1/4" (6 mm)
Maximum Cutting Capacity	5/16" (8 mm)	3/8" (10 mm)
No Load Voltage	330v	
Load Voltage	88v	
Post flow time	15 Seconds	
Air flow	130 scfh (61 lpm)	
Dimensions (W * D * H)	10.5" x 15.5" x 11" (267 mm x 394 mm x 279 mm)	
Gross Weight	56 lbs (25.4 kg )	

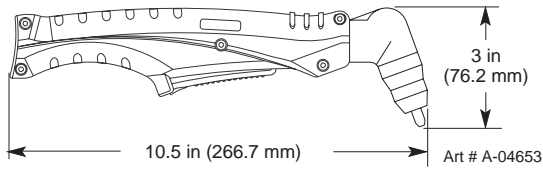
#### NOTE:

*Refer to Local and National Codes or local authority having jurisdiction for proper wiring requirements. Under certain cutting conditions using 115V input power, nuisance tripping of 20 Amp Input fuse may occur.*

### 2.03 Features

- **COMPACT and LIGHT** - Designed for easy transportation.
- **ENERGY EFFICIENCY** - Advanced technology reduces power consumption.
- **HIGH SPEED GENUINE CUTTING** - The constricted plasma arc provides high speed cutting as well as a good quality genuine, narrow cut.
- **LOW COST WITH COMPRESSED AIR** - The unit includes a compressor for its cutting and cooling air.
- **ALL KINDS OF METALS** - Useful for most metals such as stainless steel, aluminum, mild steel, copper and their alloys.
- **PILOT ARC IGNITION FROM TORCH** - The Pilot Arc ignites the cutting arc.
- **POWERFUL CUTTING PERFORMANCE** - Genuine cutting capacity is 3/16" (5mm) for single phase and 1/4" (6mm) for three phase. Maximum cutting capacity is 5/16" (8mm) for single phase and 3/8" (10mm) for three phase.
- **ABILITY TO CUT PAINTED MATERIALS** - Pilot Arc ignition allows the 20C to cut painted materials.
- **EXTENDED PARTS LIFE** - Consumable parts life is longer.

## 2.04 Torch Specifications



PCH-42 Torch Ratings	
Torch Configuration	Torch Head at 70° to Torch Handle
Torch Leads Length	20 feet / 6.1 m
Duty Cycle	100% @ 40 Amps @ 200 scfh
Ambient Temperature	104° F 40° C
Maximum Current	40 Amps, DC, Straight Polarity
Voltage ( $V_{peak}$ )	500V
Arc Striking Voltage	12kV
Type of Cooling	Ambient air and gas stream through torch
Parts-in-Place:	Built-in Switch in Torch Head
Gas Requirement:	Single Gas, Compressed Air Only
Input Gas Pressure	65 psi (4.5 bar) - 125 psi (8.6 bar)
Minimum Gas Flow	200 SCFH (142 lpm)
Direct Contact Hazard	For operation with exposed tip the recommended standoff height is 1/8 - 3/8" (3-9 mm).
Plasma Power Supply Used With:	20C

## 2.05 System Contents

Description	ITEMS	Q'ty
Power source	Model 20C	1
Torch Set	PCH-42, with 20' (6.1 m) leads	1
Accessories & Consumables	Air Regulator	1
	Work Cable	1
	Manual	1
	Torch Electrodes	2
Input Power Cable	Torch Tips	3
	3 Meter NEMA 10 AWG / 4.8 mm <sup>2</sup> with 6 - 50 P molded plug	1

## 2.06 Transporting Methods

Lift unit with handle on top of case. Use handcart or similar device of adequate capacity for transporting.



### WARNINGS

***ELECTRIC SHOCK can kill. DO NOT TOUCH live electrical parts. Disconnect input power from supply before moving the power source.***

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

## 3.0 Installation

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### 3.01 Site Selection

- Place in a clean and dry area.
- Provide adequate ventilation and fresh air supply.
- Ideal ambient temperature should not exceed 40°C / 104°F. Temperatures exceeding that may diminish cutting capacity or quality.
- The cutting machine must be placed on an even, firm surface so that it stands firmly.



#### **WARNING**

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*This equipment must be electrically connected by a qualified electrician.*

---

### 3.02 Electrical Input Connections

- Input voltage is 115V / 230V  $\pm$  10%, 50/60 Hz single phase.



#### **CAUTION**

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*Check your power source for correct voltage before plugging in or connecting the unit. The primary power source, fuse, and any extension cords used must conform to local electrical code and the recommended circuit protection and wiring requirements as specified in Section 2.0.*

### 3.03 Torch

- Make sure that the torch cable and torch switch terminals are connected to the power supply.
- Make sure the Work Cable is connected properly to the power supply.
- Before activating, turn torch away from yourself and others.



#### **DANGER**

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*Do not cut in humid or wet surroundings.*

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- Before you maintain or replace torch parts, wait for the post flow air cycle (approximately 10 seconds), to stop, then turn the machine off.
- Always use original manufacturers parts. The use of aftermarket parts could result in shorter parts life and in unsatisfactory cutting results. Any warranty claims would be waived.
- Worn parts should be recycled according to local requirements.

#### **NOTE**

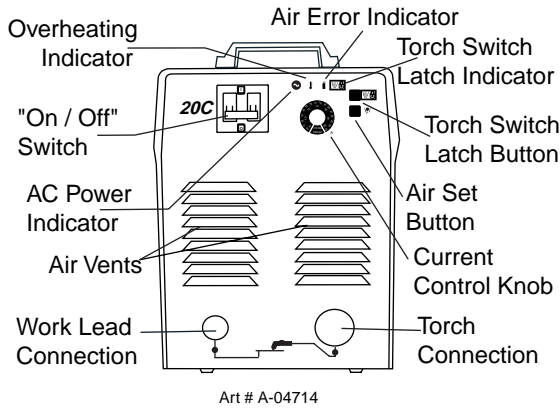
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*Repairs must be done by skilled and qualified personnel only.*

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# 4.0 OPERATION

## 4.01 Front Control Panel



### A. INDICATOR LAMP

- Power Indicator - Lights when primary power switch is turned on.
- TEMPERATURE Indicator - Indicator is normally OFF. Indicator is ON when internal temperature exceeds normal limits. Shut unit OFF; let the unit cool before continuing operation.
- Air Error Indicator - This indicator lights and is accompanied by an intermittent audible tone when there is not enough air pressure to operate the power supply.

**NOTE**

*It is possible to have enough air pressure to operate the power supply but not enough air flow to operate the torch.*

- Torch Switch Latch Indicator - This indicator lights when the Torch Switch Latch Button has been pressed for continuous cutting.

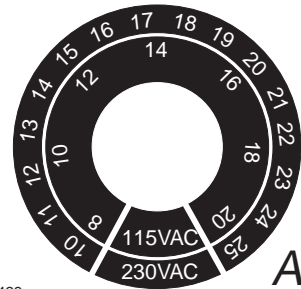
### B. BUTTONS

- Torch Switch Latch Button - For continuous cutting performance. Depress this button ( turn "On" ) while cutting with the torch. Release the torch trigger and the torch will continue to cut without depressing the torch trigger.

- Air Set Button - To check for air flow and to cool down heated torch.

### C. MAIN CURRENT CONTROL KNOB

To adjust cutting current. Turning clockwise increases the cutting current and counter clockwise decreases the cutting current.



### D. PRIMARY POWER SWITCH, ON / OFF

The power switch is located on the front panel. Placing the primary power switch to the "ON" position energizes the power source.



**WARNING**

*When the power source is overloaded, the switch turns to the OFF position automatically. DO NOT TURN ON BY FORCE.*

## 4.02 Preparations For Operating

At the start of each operating session:

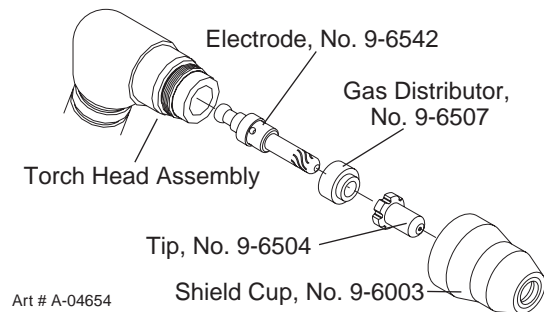


### WARNING

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

### A. Torch Parts Selection

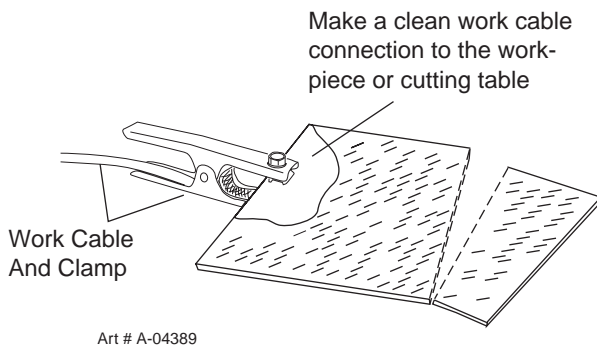
Check the torch for proper assembly and appropriate torch parts. The torch parts must correspond with the type of operation, and with the amperage output of this Power Supply (25 amps maximum). Use only genuine manufacturer's parts with this torch.



### B. Torch Connection

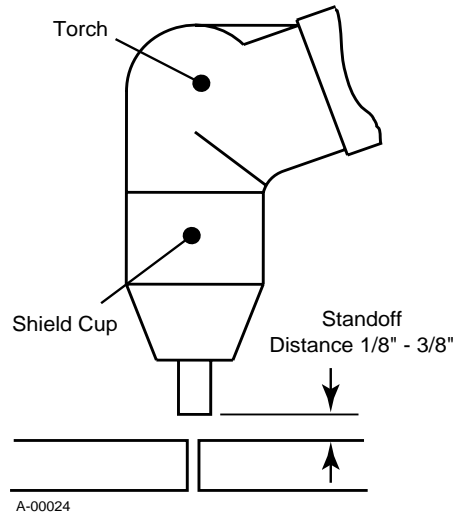
Check that the torch is properly connected.

### C. Connect Work Cable



### D. Torch Operation

- Wear gloves and protective goggles.
  - Do not place bare hand on work piece.
1. For drag cutting, keep the torch in contact with the workpiece.
  2. For **standoff cutting**, hold the torch  $1/8$  -  $3/8$  in (3-9 mm) from the workpiece as shown below.



3. With the torch in starting position, press and hold the Torch Trigger. After an initial two second pre-flow, the pilot arc will come on and remain on until the cutting arc starts.
4. Once on, the main arc remains on as long as the Torch Trigger is held down, unless the torch is withdrawn from the work or torch motion is too slow.
5. To shut off the torch simply release the Torch Trigger. When the trigger is released a gas post-flow will occur. If the Torch Trigger is pushed during the post-flow, the cutting arc will restart immediately when the torch is brought within range of the workpiece.



## E. Typical Cutting Speeds

Cutting speeds vary according to torch output, the type of material being cut, and operator skill. Speeds shown are typical for this cutting system using air plasma to cut mild steel, with output current at the highest setting and torch held at the indicated standoff height.

Unit	Standoff	Material Thickness	Maximum Travel Speed		Recommended Travel Speed	
			Inches per minute	Milimeters per minute	Inches per minute	Milimeters per minute
C-20C	Drag Only	(10GA) 0.135" (3mm)	42.7	1067	34.1	853
C-20C	Drag Only	(7GA) 0.179" (4.5mm)	26.2	655	21.0	524
C-20C	Drag Only	1/4" (6mm)	16.0	401	12.8	321

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**NOTE:**

*Drag or Drag mode refers to the torch tip being in contact with the work piece at all times.*

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# SECTION 5: SERVICE

## 5.01 Basic Troubleshooting Guide



### WARNING

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

### A. Basic Troubleshooting, Overview

This guide covers basic troubleshooting. It is helpful for solving many of the common problems that can arise with this system. If major complex subassemblies are faulty, the unit must be returned to an authorized service center for repair.

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

### B. Common Symptoms

#### A. Primary power switch is ON, but power indicator doesn't light.

1. *Improper electrical connection.*
  - a. Check the input cable line & connection.
  - b. Check that the input power is turned on.
  - c. Check the input power fuse.
2. *System was overloaded.*
  - a. Turn Primary Power Switch Off and then On again.
3. *Switch may be faulty.*
  - a. Return to an authorized service center for repair.

#### B. Primary power switch is on, but the cooling fan does not work.

1. *No power / incorrect power to fan or failed fan.*
  - a. Return to an authorized service center for repair.

#### C. No air flow at torch when air check switch is turned on.

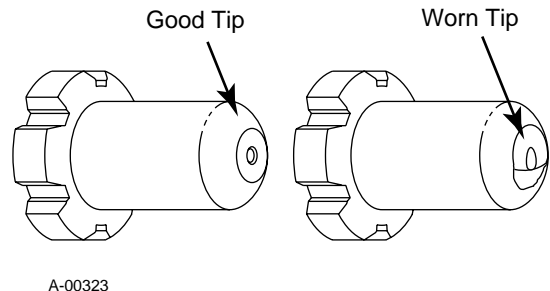
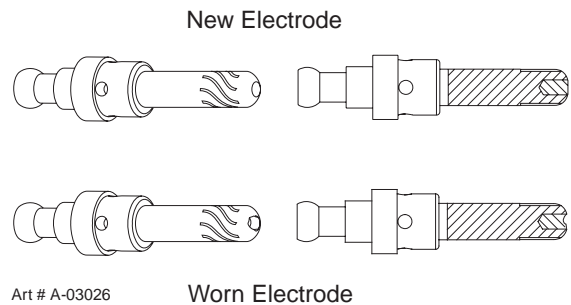
1. *Internal connection is disconnected or loose.*
  - a. Check all air line connections and fittings.
2. *Internal air supply / compressor not working.*
  - a. Return to an authorized service center for repair.
3. *Control PCB faulty.*
  - a. Return to an authorized service center for repair.

#### D. Torch will not pilot when torch switch is activated.

1. *Gas pressure too high or too low.*
  - a. There is no adjustment. Return to authorized service center for repair.
2. *Torch tip, start cartridge, or electrode missing.*
  - a. Turn off power supply. Remove shield cup. Install missing parts.
3. *Worn or faulty torch parts*
  - a. Inspect torch consumable parts. Replace if necessary.

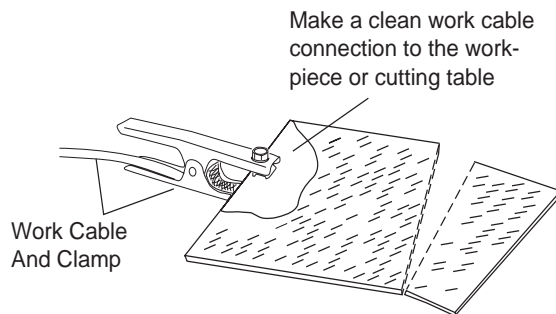
#### E. Cut performance is diminished.

1. *Worn torch parts.*
  - a. Check current setting. Check the Electrode and Tip for excess wear.



2. *Poor Work Lead connection.*

- a. Check the connection of the Work Lead to the work piece.



3. *Current sensor or PWM PCB faulty.*

- a. Return to an authorized service center for repair.

**F. Air flows continuously and torch switch latch button doesn't work properly.**

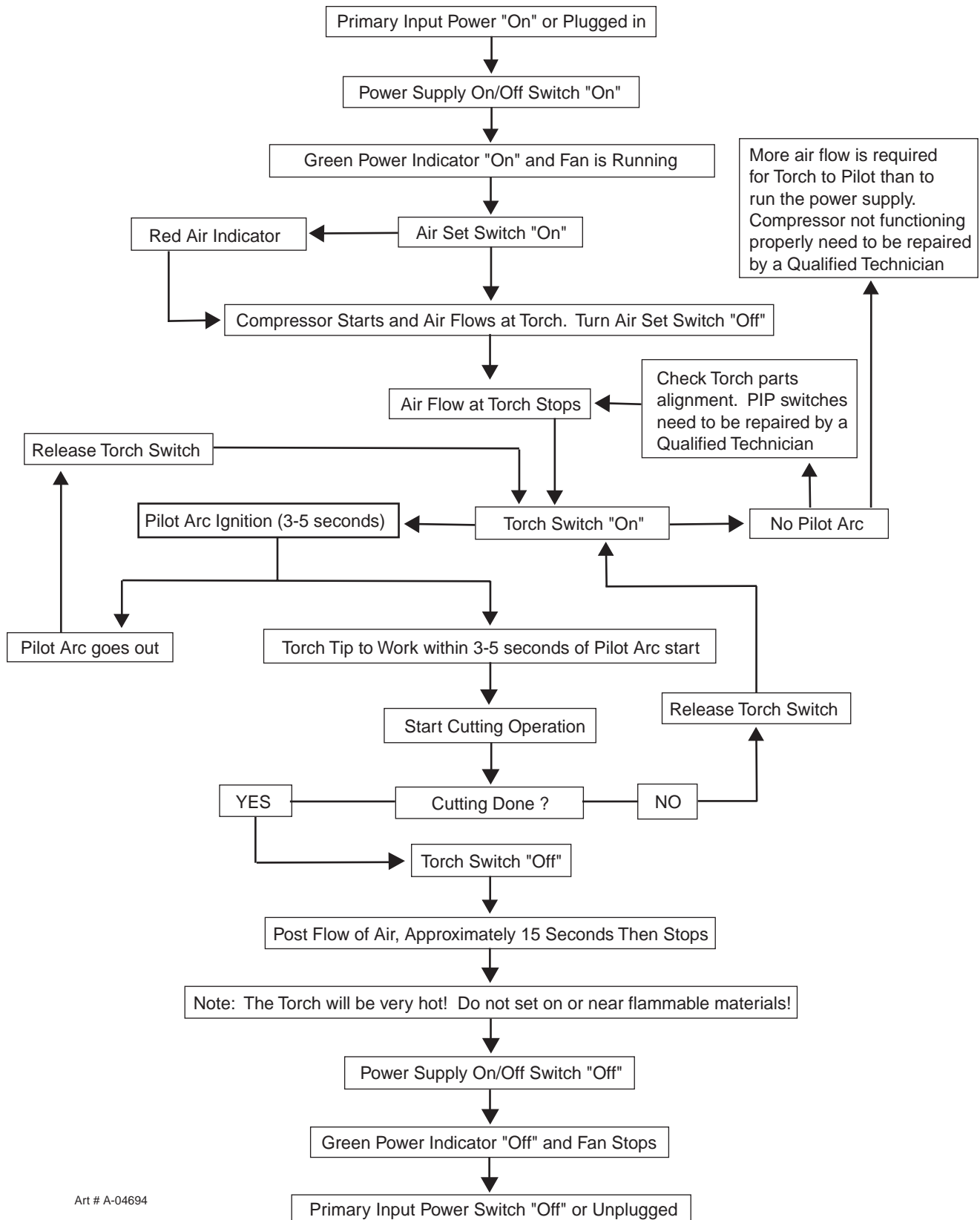
1. *Torch Switch Latch button on front panel faulty.*

- a. Return to an authorized service center for repair.

2. *Control PCB faulty.*

- a. Return to an authorized service center for repair.

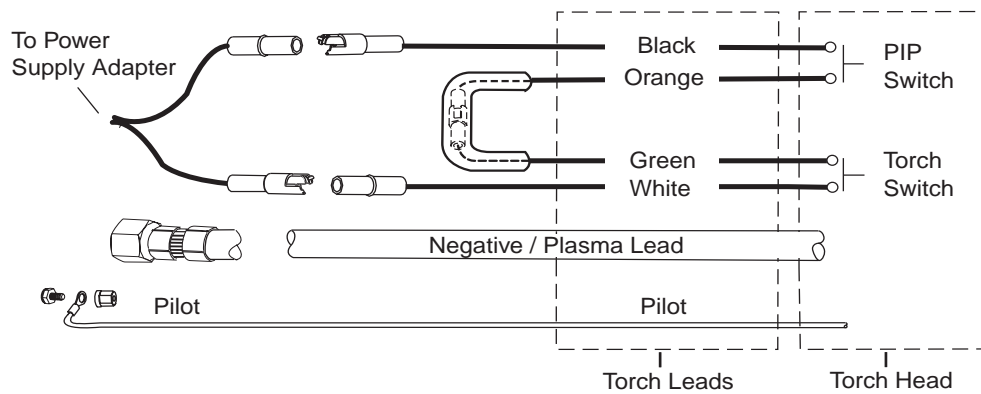
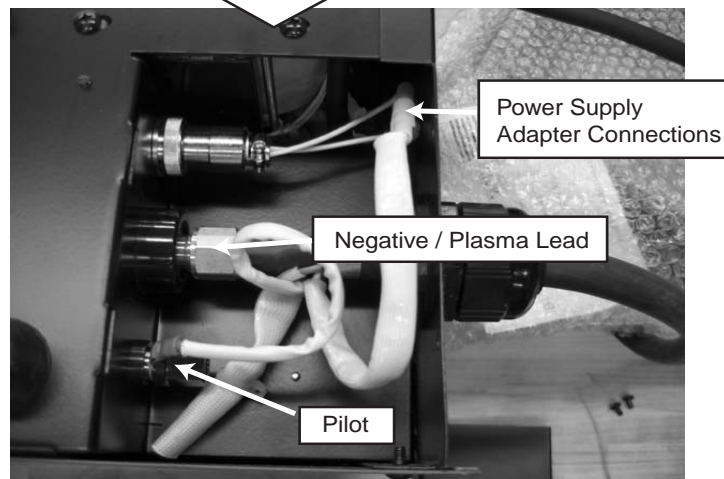
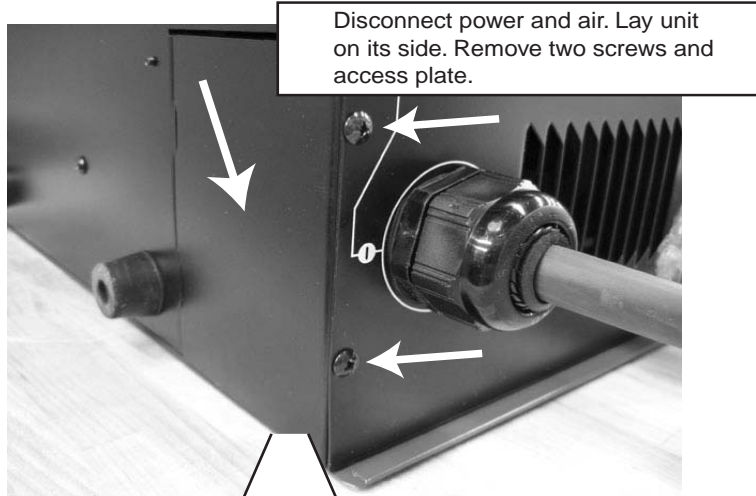
# Appendix 1: Operating Sequence, Block Diagram



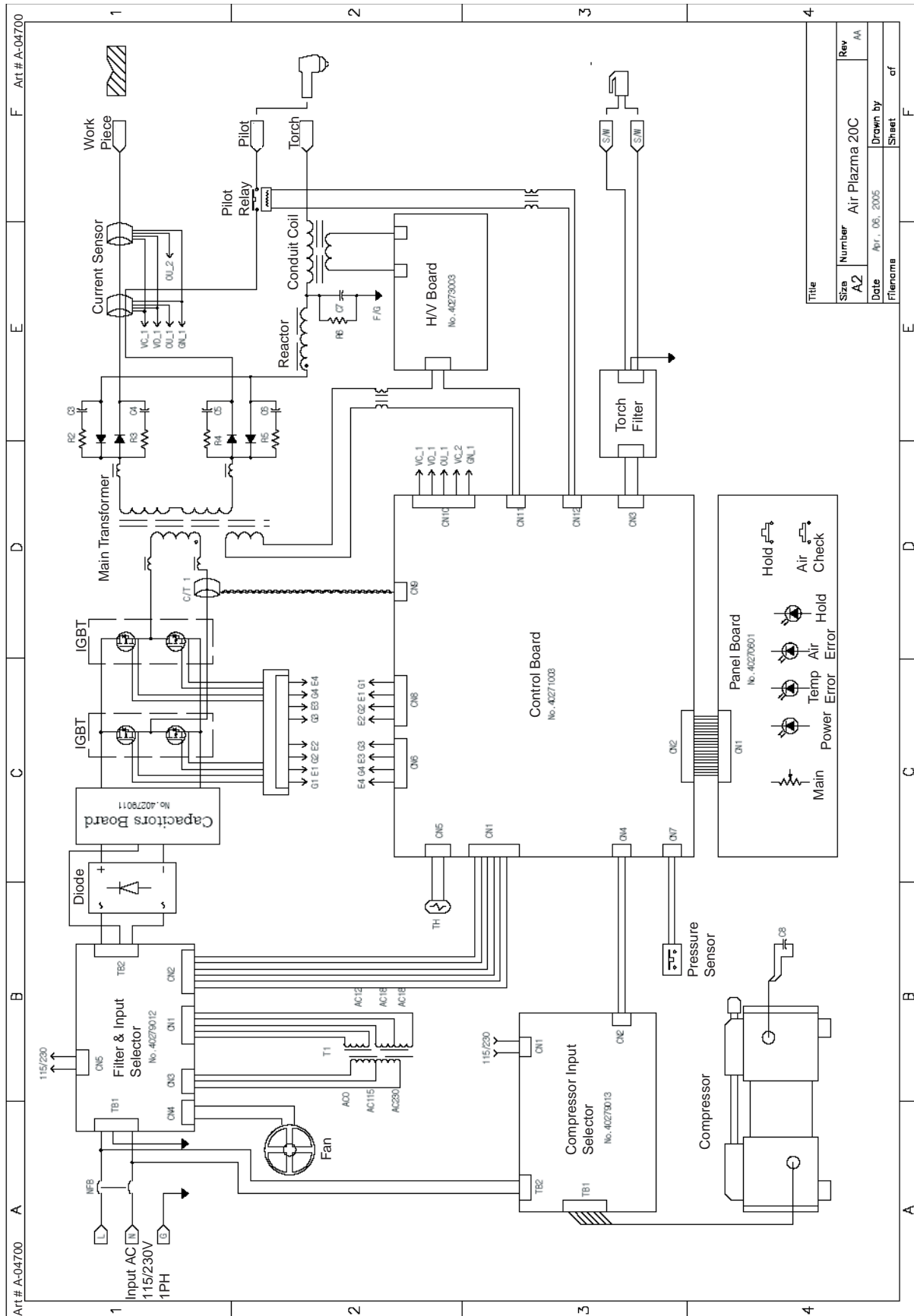
Art # A-04694

# Appendix 2: Torch Connection

Art # A-04695



# Appendix 3: System Schematic



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