HT2000®

Plasma Arc Cutting System

Instruction Manual
802070 - Rev. 3

HYPERTHERM®

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Plasma Arc Cutting System

Instruction Manual
IM-207
(P/N 802070)

for Serial Numbers
beginning with
2000-001295

Revision 3 June, 1995

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ATTENTION

Genuine Hypertherm parts are the factory-recommended replacement parts for your Hypertherm system. Any damage caused by the use of other than genuine Hypertherm parts is not covered by the Hypertherm warranty.

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HYPERTHERM, Inc. warrants that Products shall be free from defects in materials and workmanship, under proper and normal use for which such Equipment is recommended, for a period of two (2) years, except only with respect to the Torch, for which the warranty period shall be one (1) year, from the date of its delivery to you.

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Section 1 SAFETY

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SAFETY

INTRODUCTION

WARNING!

- **Never touch the torch body, workpiece or water in the water table when operating the plasma system!**
- **When using a water table, be sure that it is correctly connected to earth ground!**

Operating the plasma system completes an electrical circuit between the torch and the workpiece and anything touching the workpiece. The workpiece is part of the electrical circuit!

Electric shock can kill!

Abbreviated safety precautions are printed on the power supply.

Before using the plasma arc cutting equipment (including compressed gas), each person operating, maintaining or supervising the use of this equipment must read the following safety instructions.

NOTES, CAUTIONS & WARNINGS

This manual contains notes, cautions, and warnings to describe situations that require additional information. The following formats apply for each:

Notes: A note offers additional information, such as an operating tip, that aids the user in operating the plasma system.

Caution: A caution describes a situation that may cause damage to the plasma system and offers advice to avoid or rectify the situation.

WARNING

A warning describes a situation that presents a physical danger to the operator, and offers advice to avoid or rectify the situation. Each type of warning displays an applicable danger symbol, ie. fire, explosion, electrical shock, etc.

WARNING!!

ELECTRIC SHOCK CAN KILL!!

- Do not touch live electrical parts.
- Keep all panels and covers in place when the machine is connected to a power source.
- Insulate yourself from work and ground: wear insulating gloves, shoes and clothing.
- Keep gloves, shoes, clothing, work area, torch, and this machinery dry.

PRESSURIZED CONTAINERS WILL EXPLODE IF CUT WITH A PLASMA TORCH!

ARC RAYS CAN INJURE EYES AND BURN SKIN!

- Wear correct eye and body protection.

NOISE FROM A PLASMA SYSTEM CAN DAMAGE HEARING!

- Wear correct ear protection.

FUMES AND GASES CAN CAUSE HEALTH PROBLEMS!

- Keep your head out of the fumes.
- Provide ventilation, exhaust at the arc, or both to keep the fumes and gases from your breathing zone and the general area.
- If ventilation is inadequate, use an approved respirator.

HEAT, SPLATTER AND SPARKS CAUSE FIRE AND BURNS!

- Do not cut near combustible material.
- Do not cut containers that have held combustibles.
- Do not carry on your person any combustibles such as butane lighters or matches when operating a plasma system.
- The torch pilot arc can cause burns. Keep the torch nozzle away from yourself and others when the start switch is depressed.
- Wear correct eye and body protection.

SAFETY

SAFETY INSTRUCTIONS

Burn Prevention

Eye Safety

To protect eyes against burns caused by high-intensity ultraviolet light, sparks and hot metal:

- Wear dark safety glasses/goggles with side shields or a welding helmet. Refer to the chart below for recommended lens shades:

Arc Current	Shield Shade
Up to 100 Amps	Shade No. 8
100 - 200 Amps	Shade No. 10
200 - 400 Amps	Shade No. 12
Over 400 Amps	Shade No. 14

- Replace the glasses/goggles or helmet when the shield becomes pitted or broken.
- Warn other people in the area not to look directly at the arc unless they wear glasses/goggles or a helmet.
- Prepare the cutting area in a manner that reduces the reflection and transmission of ultraviolet light:
  - Paint walls and other surfaces with dark colors to reduce reflection.
  - Install protective screens or curtains to reduce ultraviolet transmission.

Skin Safety

To protect skin against burns caused by high-intensity ultraviolet light, sparks and hot metal:

- Wear protective clothing:
  - Gauntlet gloves, safety shoes and hat.
  - Flame-retardant clothing which covers all exposed areas.
  - Cuffless trousers to prevent entry of sparks and slag.
- Position any torch away from your body when pressing the start button because the pilot arc may come on immediately.

- Do not touch the front of the torch when starting it.
- After cutting, allow time for the front of the torch to cool before touching.

Toxic Fume Prevention

To protect against the danger of toxic fumes which may be produced during cutting:

- Keep the cutting area well-ventilated.
- Remove all chlorinated solvents from the cutting area before cutting. Certain chlorinated solvents decompose when exposed to ultraviolet radiation to form phosgene gas.
- Wear proper breathing mask and use proper ventilation when cutting galvanized metal.
- Do not cut containers with toxic materials inside.
- Clean containers that have held toxic materials thoroughly before cutting.

WARNING!

Do not cut metal or painted metals containing zinc, lead, cadmium or beryllium unless the operator, or anyone else subjected to the fumes, wears respiratory equipment or an air-supplied helmet.

Fire Prevention

Cutting with a plasma system produces hot metal, sparks and slag. Take the following precautions against fire:

- Make fire extinguishers available in the cutting area.
- Remove combustible material from the immediate cutting area to a distance of at least 35 feet (10 meters).
- Quench freshly cut metal or allow metal to cool before handling it or bringing it into contact with combustible materials.
- Never use a plasma system to cut containers with potentially flammable materials inside. Such containers must be thoroughly cleaned prior to cutting.

- Ventilate potentially flammable atmospheres before cutting with a plasma system. **When cutting with oxygen as the plasma gas, an exhaust ventilation system is required.** Never operate the plasma system in an atmosphere which contains heavy concentrations of dust, flammable gas or combustible liquid vapors.

Electric Shock Prevention

All Hypertherm plasma systems use high voltage (up to 280 VDC) to initiate the plasma arc. Take the following precautions when operating the plasma system:

- Keep your body and clothing dry.
- Do not stand in, sit, lie on or touch any wet surface when using the plasma system.
- Wear insulated gloves and boots. Maintain proper insulation against electrical shock. If you must work in or near a damp area, use extreme caution.
- Provide a wall-mounted disconnect switch with properly sized fuses close to the power supply. This switch allows the operator to turn the power supply off quickly in an emergency situation.
- Conform to all local electrical codes for primary wiring sizes and types.
- Do not use the system with a damaged power cord. Inspect the primary power cord frequently for damage or cracking of the cover.

BARE WIRING CAN KILL!

Immediately replace a damaged power cord.

- Inspect the torch leads. Replace if frayed or damaged.
- Never operate the plasma system unless the power supply unit covers are in place. Exposed power supply connections present a severe electrical hazard.
- Do not pick up the workpiece, including the waste cutoff, while you cut. Leave the workpiece in place or on the workbench with the work cable attached at all times.
- Before changing the torch parts, disconnect the main power or unplug the power supply.
- Never bypass or shortcut the safety interlocks.
- Before removing a power supply cover for maintenance, disconnect the main power at the wall disconnect switch or unplug the power supply. To avoid exposure to severe electrical hazard, wait five minutes after disconnecting the main power to allow capacitors to discharge.

Explosion Prevention

WARNING

The plasma system uses compressed gas. Observe proper precautions when handling and using compressed gas equipment and cylinders. Refer to the Standards Index in this manual.

When cutting with the plasma system:

- Do not cut in atmospheres containing explosive dust or vapors.
- Do not cut pressurized cylinders or any closed container.

Pressure Regulators

- Maintain all pressure regulators in proper working condition. Faulty regulators can cause damage or operator injury and must be serviced by trained repair technicians.
- Never use a regulator for any gas other than that for which it is intended.
- Never use a regulator that leaks, creeps excessively or is physically damaged in any way.
- Never attempt to lubricate a regulator with oil or grease.

Compressed Gas Cylinders

- Handle and use compressed gas cylinders in accordance with safety standards published by the Compressed Gas Association (CGA), American Welding Society (AWS) and Canadian Standards Association (CSA).
- Never use a cylinder that leaks or is physically damaged.
- Never use a cylinder that is not upright and secured in place.
- Never move or transport a cylinder without the protective valve cover in place.
- Never use a gas cylinder or its contents for any purpose other than that for which it is intended.
- Never lubricate cylinder valves with oil or grease.

- Never allow electrical contact between the plasma arc and a cylinder.
- Never expose cylinders to excessive heat, sparks, slag or open flame.
- Never use hammers, wrenches or other tools to open stuck cylinder valves.

Hoses

Label and color-code all gas hoses in order to clearly identify the type of gas in each hose. Consult applicable national or local codes.

- Never use the oxygen hose for any gas other than oxygen.
- Examine hoses at regular intervals for leaks, wear, loose connections or other hazard.
- Replace hose that is damaged in any way.
- Keep hose lengths to a minimum to prevent damage, reduce pressure drop and to prevent possible volume flow restriction.
- Prevent kinking by laying out hose as straight as possible between termination points.
- Coil any excess hose and place it out of the way to prevent damage and to eliminate tripping danger.

Hydrogen Detonation with Aluminum Cutting

WARNING


When cutting aluminum underwater or with the water touching the underside of the aluminum, free hydrogen gas may collect under the workpiece. Detonation of the hydrogen gas may occur while plasma cutting under these conditions.

- An effective means of eliminating the possibility of hydrogen detonation is to install an aeration manifold on the floor of the water table. Refer to the **Appendix** section at the rear of this manual for instructions on how to make an aeration manifold.

Noise Prevention

The plasma cutting process can generate high levels of noise. Depending on the arc current, material being cut, acoustics and size of the cutting room, distance from the torch and other factors, acceptable noise levels as defined by local and/or national codes may be exceeded by your plasma system.

- Always wear proper ear protection when cutting or gouging with the plasma system.

Grounding

Before operating the plasma system:

Input Power

- Be sure to connect the power cord ground wire to the ground in the disconnect box.
- If installation of the plasma system involves connecting the power cord to the power supply, be sure to properly connect the power cord ground wire. Conform to CSA standards by placing the power cord ground wire on the stud first; then place any other ground wires on top of the power cord ground. Fasten the retaining nut tightly.
- Tighten all electrical connections to avoid excessive heating.

Work Cable

- Attach the work cable securely to the work table by making good metal-to-metal contact.

Work Table

- Connect the work table to a good earth ground. Consult the U.S. National Electrical Code, Article 250, Section H *Grounding Electrode System*, or other appropriate national or local codes.

For additional information, refer to the *Standards Index* in this manual.

SAFETY REMINDERS

- All Hypertherm torches are designed with a safety interlock, which prevents firing of the plasma arc when the retaining cap is loosened.
- Never bypass or shortcut the safety interlocks on any of the plasma system units.
- Never operate the plasma system with any of its covers not in place. This would be hazardous to the operator and other people in the area, and prevents the proper cooling of the equipment.

- Each Hypertherm plasma system is designed to be used only with specific Hypertherm torches. Do not substitute other torches which could overheat and present a potentially dangerous situation to the operator and any personnel in the area.

STANDARDS INDEX

The *Standards Index* contains a list of publications dealing with plasma arc cutting equipment safety practices. For additional information, refer to this *Standards Index*.

Section 2 DESCRIPTION & SPECIFICATIONS

In this section:

DESCRIPTION & SPECIFICATIONS

DESCRIPTION

Hypertherm's HT2000 is designed as a machine-mounted plasma cutting system for cutting most metals from gauge to two-inch (50mm) thick. A micro-controller on the power supply control board helps to provide extended life for the torch consumable parts. To achieve consumable long life, **all cuts must begin and end on the plate surface**; this allows for the proper ramping of gases and DC current to extend the life of the torch nozzle and electrode.

The HT2000 system provides the user with capability of locating the power supply and the torch apart by a maximum of 200 feet. This is accomplished by using a remote high frequency (RHF) console.

The HT2000 provides continuously variable current output from 40 to 200 amps for optimum performance on all thicknesses of metal. This allows the operator wide variations in cutting speeds on the same thickness of metal. Three nozzle sizes are provided to produce high quality cuts throughout its range of cut thicknesses.

The HT2000 can be configured for air, oxygen, nitrogen, or argon/hydrogen cutting. For cutting stainless steel, aluminum, and other non-ferrous materials, nitrogen or argon-hydrogen can be used as the plasma gas. (Hypertherm recommends a mixture of 35% hydrogen and 65% argon). When cutting mild (carbon) steel, oxygen can be used as the plasma gas. Shield gases other than air which can be used are nitrogen and carbon dioxide.

The following descriptions briefly describe the purpose and configuration of the major units which comprise the HT2000 system.

HT2000 Power Supply

This unit houses two 100-amp, 15kHz chopper power supplies to produce constant current DC output, variable from 40 to 200 amps. Also located in this unit is the Torch Height Control (THC). The power supply interconnects with the RHF console, the gas console, the motor valve console, the machine computer, the remote V/C, the IHS, water muffler, and the workpiece.

The HT2000 power supply conforms with Low Voltage Directive, 72/23/EEC and is designed in full, or in part, with the Arc Welding Power Source Standard, EN 60 974-1.

Remote High Frequency (RHF) Console

This unit houses the high frequency starting circuit which permits more effective RF shielding and allows the power supplies to be installed at a distance of up to 200 feet from the torch. Also located in the console is a door interlock switch, a torch cap-sensing switch and valve, and the shield gas valve. The RHF console interfaces with the power supply, gas console, and the torch.

Gas Console

This unit houses metering and solenoid valves for shield and plasma gases, flow meters and pressure gauges for nitrogen and oxygen plasma, and a pressure gauge for the shield gas supply. The gas console interfaces with the plasma and shield gas supplies, the power supply, the RHF console, and the motor valve console.

Motor Valve Console

This unit houses a motorized metering valve for plasma gas as well as a solenoid valve that switches to allow plasma gas flow for both preflow and operation modes. The motor valve console interfaces with the power supply, gas console and the torch. Note: The motor valve console must be mounted 10 feet (3 m) from the torch.

Argon-Hydrogen Manifold - Optional

This unit houses a flowmeter for argon-hydrogen, a metering valve, a plasma gas outlet switch and a separate plasma-off valve. (The plasma-off valve for nitrogen and oxygen is located at the torch). The argon-hydrogen manifold interfaces with the supply gas, the power supply, and the torch.

Remote Voltage/Current (V/C) Control - Optional

This unit provides accurate operator control of the arc voltage and current. It includes high intensity LED displays which indicate the setpoints for volts and amperes prior to starting the arc. After the arc is initiated, the displays automatically switch to show the actual values of the voltage and current reached. This unit interfaces with the power supply. Two different types of remote V/C controls are available:

Digital Remote - Includes the voltage and current displays and two potentiometers used to select the desired values. It is used with guidance machinery that already includes plasma control switches.

Programmable Remote - Includes the voltage and current displays. No switches or potentiometers are included. All functions are controlled by the guidance machinery computer. This unit also interconnects with the computer interface.

Initial Height Sensing (IHS) - Optional

This unit, used with two inductive probes, is designed to automatically detect the workpiece surface and index the torch to the pierce position. This system can be used for underwater, at the water line, or above-water applications. This unit interconnects with the power supply and the inductive probes, and requires an air supply to operate.

Timer/Counter - Optional

This unit allows the operator to monitor the number of arc starts and the cumulative time that the arc is on in hours. The arc starts can be reset. This unit connects with the power supply.

Water Muffler - Optional

The water muffler for the HT2000 system is an option which greatly improves cutting safety and pollution control capabilities. The water muffler can be used to cut both above and below water. Refer to the Water Muffler Instruction Manual (#802050) for more detailed information.

SPECIFICATIONS

System Requirements

Power Requirements:
Refer to HT2000 power supply specifications below:

Gas Requirements:

Plasma Gas Types	Oxygen (O_2), Nitrogen (N_2), Air, Argon-Hydrogen (H35 = 35% Hydrogen/ 65% Argon
Shield Gas Types	Air, Nitrogen (N_2), Carbon Dioxide (CO_2)
Gas Quality:	
Oxygen	99.5% pure (liquid gas recommended)
Nitrogen	99.995% pure (liquid gas recommended)
Air	Clean, dry, oil-free (compressed or liquid gas recommended)
Carbon Dioxide	99.5% pure (compressed or liquid gas recommended)
Plasma Gas Inlet Pressures and Flowrates	
Air	90 psi (6.2 bar) at 82 scfh (2322 l/h)
Oxygen	120 psi (8.3 bar) at 80 scfh (2265 l/h)
Nitrogen	120 psi (8.3 bar) at 80 scfh (2265 l/h)
Argon-Hydrogen	120 psi (8.3 bar) at 105 scfh (2973 l/h)
Shield Gas Inlet Pressures and Flowrates	
Air	90 psi (6.2 bar) at 280 scfh (7929 l/h)
Carbon Dioxide	90 psi (6.2 bar) at 220 scfh (6230 l/h)
Nitrogen	90 psi (6.2 bar) at 275 scfh (7787 l/h)

HT2000 Power Supply

Maximum OCV (U_0)	280 VDC
Output Current (I_2)	40 to 200 amps
Output Voltage (U_2)	150 VDC
Duty Cycle Rating (X)	100% up to 30kW. Beyond 30kW, Duty Cycle (X)= (30kW/ Actual Power)^2 Ex: If Actual Power = 32kW, then Duty Cycle (X)= (30kW/32kW)^2 = 88%
Ambient Temperatures/Duty Cycle	Power supplies will operate between +14° and 104°F (-10° and +40°C). Power supplies operated in an ambient temperature above 86°F (30°C) may show some decrease in duty cycle.

Input Power (Input Voltage (U_1) x Input Current (I_1)):

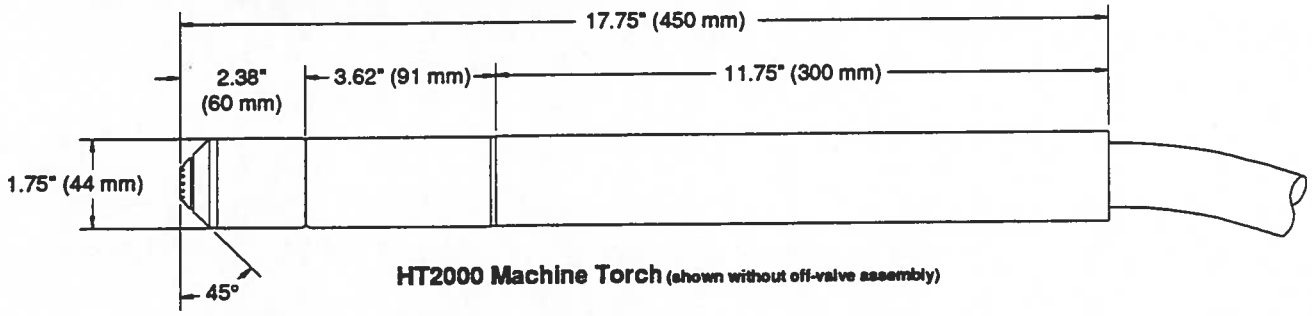
#073054 with THC/ **#073106** without THC	240/480 VAC, 3PH, 60 Hz, 90/45 amps
#073064 with THC/ **#073105** without THC	208 VAC, 3PH, 60 Hz, 104 amps
#073065 with THC/ **#073107** without THC	220/380/415 VAC, 3PH, 50 Hz, 98/57/52 amps
#073063 with THC/ **#073104** without THC	200 VAC, 3PH, 50 Hz, 108 amps
#073066 with THC/ **#073108** without THC	600 VAC, 3PH, 60 Hz, 36 amps

HT2000 Power Supply (cont.)

Dimensions and Weight:

Width	28-1/4" (71 cm)
Height	35-1/2" (90 cm)
Depth	41-1/4" (104 cm)
Weight	780 pounds (351 kg)
Cooling	Forced Air (Class F)
Torch Coolant Tank Capacity	2.9 gallons (11 liters)

HT2000 Machine Torch (#028548)



HT2000 Machine Torch (shown without off-valve assembly)

Maximum cutting thickness	2 inch (50 mm)
Maximum current at 100% duty cycle	200 amps
Plasma Gas Flow	Refer to the *Cut Charts* in the **Operation**
Shield Gas Flow	section for specific gas requirements.
Water coolant flow rate	0.8 gpm (3.0 l/min)
Weight	2-1/2 pounds (1.13 kg)

Remote High Frequency Console (#073067)

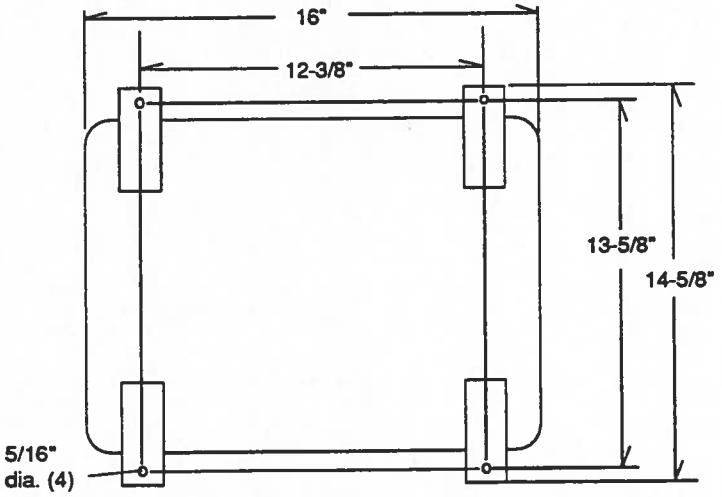


Figure 2-1 Mounting Dimensions - RHF Console

Remote High Frequency Console (cont.)

Dimensions and Weight:

Width ..... 16" (40.6 cm)
Height ..... 16.75" (42.5 cm)
Depth ..... 12.75" (32 cm)
Weight ..... 75 pounds (34 kg)

Gas Console (#073068)

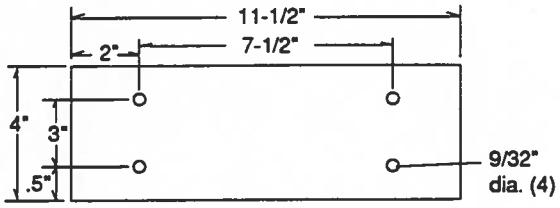


Figure 2-2 Mounting Dimensions - Gas Console

Dimensions and Weight:

Width ..... 11.5" (29 cm)
Height ..... 14.5" (37 cm)
Depth ..... 4" (10 cm)
Weight ..... 23 pounds (10.4 kg)

Motor Valve Console (#073069)

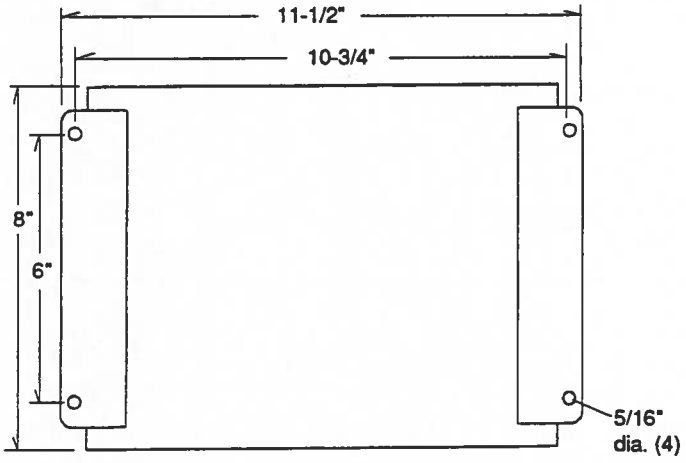


Figure 2-3 Mounting Dimensions - Motor Valve Console

Dimensions and Weight:

Width ..... 11.5" (29 cm)
Height ..... 4" (10 cm)
Depth ..... 8" (20 cm)
Weight ..... 18 pounds (8.2 kg)

Argon-Hydrogen Manifold (#073109) - Optional

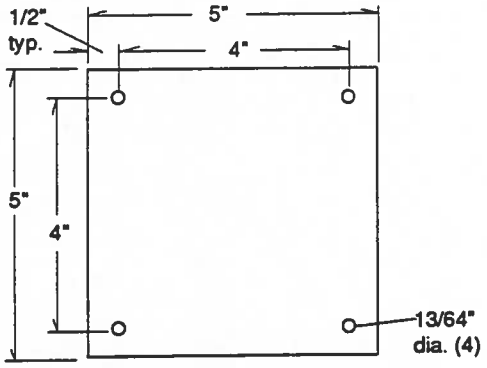


Figure 2-4 Mounting Dimensions - Argon-Hydrogen Manifold

Dimensions and Weight:

Width ..... 5" (12.7 cm)
Height ..... 10" (25.4 cm)
Depth ..... 5" (12.7cm)
Weight ..... 5-3/4 lb (2.6 kg)

Digital Remote (DR) V/C Control (#073007) - Optional

Controls ..... Voltage adjust pot:
Adjusts arc cutting voltage and displays value on LEDs.
Current adjust pot:
Adjusts arc cutting current and displays value on LEDs.

Control Range ..... Current: 40 to 200 Amps
Voltage: 100 to 200 Volts

Control Resolution ..... Current: 10 Amps
Voltage: 5 Volts

Dimensions and Weight:

Width ..... 11-1/2" (29 cm)
Height ..... 3" (7.6 cm)
Depth ..... 13-3/8" (34 cm)
Weight ..... 5 pounds-5 oz. (2.4 kg)

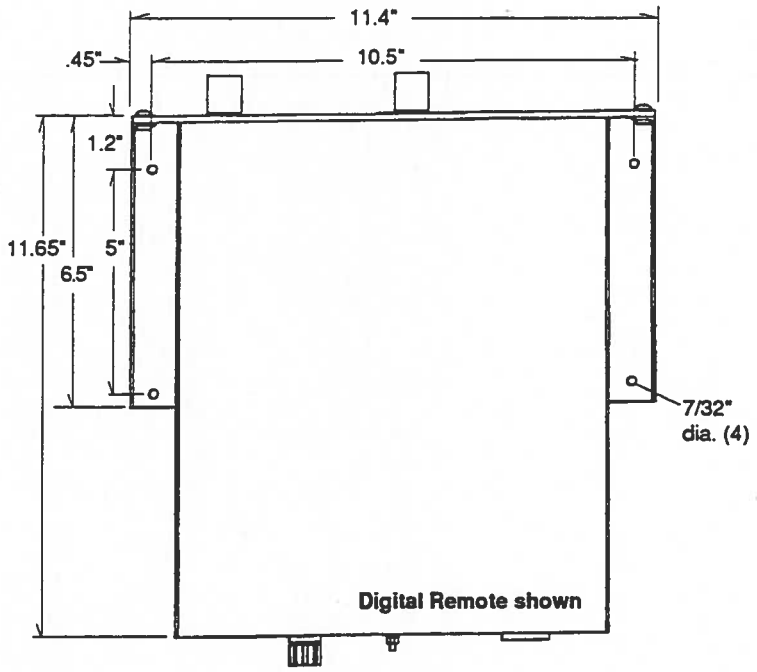


Figure 2-5 Mounting Dimensions - Remote V/C Modules

Programmable Remote (PR) V/C Control (#055004) - Optional

Controls	None. Controlled through guidance machinery computer.
Control Range	Current: 40 to 200 Amps Voltage: 100 to 200 Volts
Control Resolution	Current: 10 Amps Voltage: 5 Volts
Dimensions and Weight:	
Width	11-1/2" (29 cm)
Height	3" (7.6 cm)
Depth	12-1/2" (31.8 cm)
Weight	5 pounds-5 oz. (2.4 kg)

Initial Height Sensing (#028390) - Optional

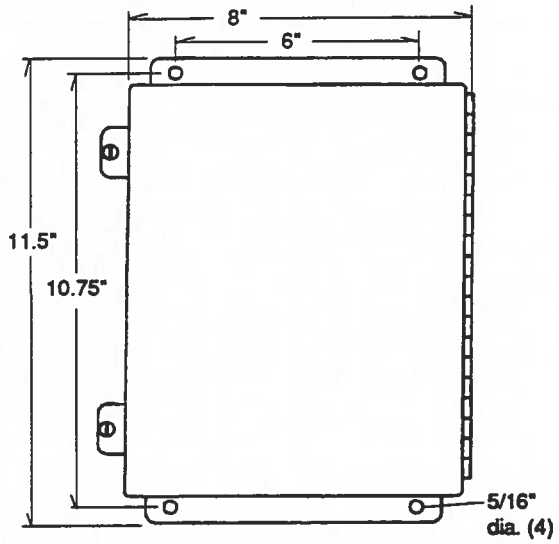


Figure 2-6 Mounting Dimensions - IHS Console

Input Power ..... 120 VAC from power supply
Air Pressure ..... 20 psi (1.4 bar) regulated shop air input to solenoid.

Dimensions and Weight:
Width ..... 9" (23 cm)
Height ..... 4.5" (11 cm)
Depth ..... 11-1/2" (29 cm)
Weight ..... 13 pounds (6 kg)

Timer/Counter (#073194) - Optional

Dimensions and Weight:
Width ..... 6-1/2" (16.5 cm)
Height ..... 2-1/2" (6.4 cm)
Depth ..... 8-5/8" (21.9 cm)
Weight ..... 3 pounds (1 kg)

Water Muffler - Optional

Refer to Water Muffler Instruction Manual (#802050).

Section 3 PRE-INSTALLATION

In this section:

PRE-INSTALLATION

INTRODUCTION

Prior to the installation of the HT2000 plasma cutting system, the following requirements must be fulfilled. Please read these requirements carefully. Their purpose is to aid you in the installation of your plasma cutting system and to allow maximum performance.

Installation and service of the electrical and plumbing systems must conform to local electrical and plumbing codes. This work should be performed only by qualified, licensed personnel.

Note: Before positioning the power supplies, see *Upon Receipt* in the **Installation** section (**Section 4**) of this manual.

If questions arise at any time, please feel free to call the Hypertherm service department at 1-800-643-9878.

GAS REQUIREMENTS

The source gas supplies are provided **by the customer.** Refer to page 2-5 for specifications on gas purity.

Note: If the purity level of the gas is too low or if there are leaks in the supply hoses or connections:

- Cut speeds can decrease
- Cut quality can deteriorate
- Cutting thickness capability can decrease
- Parts life can shorten

Air as Plasma Gas

Two different sources of air can be used to supply the plasma gas requirements of the HT2000 system: cylinder compressed air or shop compressed air.

From Cylinder Compressed Air or Shop Air to Gas Console

Use an inert gas hose to connect the air supply to the input connection on the gas console. Hosing can be purchased through Hypertherm.

When using air as the plasma or shield gas, Hypertherm recommends a three-stage coalescing filtration system. See Appendix section for suggested filtration.

With air cylinder or shop air, the customer must provide a regulator capable of delivering air at a pressure of **90 psi (6.2 bar)** at **82 scfh (2322 l/h)** to the gas console.

Oxygen, Nitrogen, or Argon-Hydrogen as Plasma Gas

From Source Supply to Gas Console

The customer must provide regulators capable of delivering the following to the gas console:

120 psi (8.3 bar) at a flow of: **80 scfh (2265 l/h)** for O_2 or N_2
105 scfh (2973 l/h) for Argon/Hydrogen

For hard plumbing connections, use type K hard copper pipe properly prepared. All joints must be joined by carefully using soft solder to avoid excessive heating. Overheating may create oxides which can flake off and contaminate the gases. After installation, pressurize the entire system and check for leaks. Never use teflon tape on any joint preparation. Use a liquid pipe-thread sealant when required. If **not** using hard plumbing to supply plasma gas to the gas console, we recommend using standard oxygen hose with the system.

Note: If cutting with oxygen as the plasma gas, nitrogen must also be connected to the gas console to achieve the proper oxygen/nitrogen mixtures in the preflow and cut flow conditions.

From Gas Console to Motor Valve Console

Hosing from the gas console to the motor valve console is provided by Hypertherm.

WARNING

Cutting with oxygen as the plasma gas can cause a potential fire hazard due to the oxygen-enriched atmosphere that it creates. As a precaution, Hypertherm recommends that an exhaust ventilation system be installed if you will be cutting with oxygen.

Shield Gas

From Source Supply to Gas Console

The customer must provide a shield gas regulator capable of delivering the following to the gas console:

90 psi (6.2 bar) at a flow of: **280 scfh (7929 l/h)** for Air
220 scfh (6230 l/h) for CO_2
275 scfh (7787 l/h) for N_2

For hard plumbing connections, use type K hard copper pipe properly prepared. All joints must be joined by carefully using soft solder to avoid excessive heating. Overheating may create oxides which can flake off and contaminate the gases. After installation, pressurize the entire system and checked for leaks. Never use teflon tape on any joint preparation. Use a liquid pipe-thread sealant when required. If **not** using hard plumbing, use 3/8-inch I.D. hose with the system. Hose can also be purchased through Hypertherm.

From Gas Console to RHF Console

Hosing from the gas console to the RHF console is provided by Hypertherm.

TORCH COOLANT REQUIREMENTS

The power supply is shipped to the customer without any coolant in the tank. A mixture of ethylene glycol (25%) and deionized water (75%), which resists freezing to +10° F (-12° C), is recommended. This mixture is available in one-gallon containers by ordering 028393. 100% glycol is available under 028419.

Caution: For operating temperatures colder than the temperature stated above, the percentage of ethylene glycol must be increased. Failure to do so could result in a cracked torch head, hoses, or other damage to the torch coolant system due to the torch coolant freezing.

See Figure b-1 chart in **Appendix B** to determine if a stronger ethylene glycol/ deionized water solution is needed for your particular application.

Observe the warning and cautions below. Refer to the Material Safety Data Sheets on ethylene glycol for data on safety, handling, and storage in **Appendix B**.

WARNING

Ethylene Glycol is irritating to skin and eyes, and harmful or fatal if swallowed. Upon contact, flush skin or eyes with water. If swallowed, induce vomiting and call a physician immediately.

Caution: Always use ethylene glycol in the coolant mixture. Do not use anti-freeze in place of ethylene glycol. Antifreeze contains corrosion inhibitors which will damage the torch coolant system. Always use deionized water in the coolant mixture in order to prevent corrosion in the torch coolant system.

GROUNDING REQUIREMENTS

Proper grounding is essential for reasons of personal safety and to prevent emission of high frequency interference.

Connect the worktable to a high-quality earth ground from 3 feet to 20 feet of the table. A suitable ground consists of a solid copper rod of at least 1/2-inch diameter

driven to a depth of at least 8 feet into the earth below the permanent moisture level. For additional information consult the National Electric Code, Article 250, Section H *Grounding Electrode System*, or other appropriate code.

POWER REQUIREMENTS

All switches, slow-blow fuses and power cables are customer supplied and must be chosen as outlined by applicable national and/or local electrical codes. Installation must be performed by qualified personnel.

Use a separate primary line disconnect switch for the HT2000 power supply. Size the disconnect box to the following requirements:

Input Voltage	Phase	Rated Input Current @ 30 kw Output	Recommended Slow-Blow Fuse Size
200 VAC	3	108 amps	150 amps
208 VAC	3	104 amps	150 amps
220 VAC	3	98 amps	150 amps
240 VAC	3	90 amps	150 amps
380 VAC	3	57 amps	80 amps
415 VAC	3	52 amps	70 amps
480 VAC	3	45 amps	60 amps
600 VAC	3	36 amps	50 amps

Line Disconnect Switch

The line disconnect switch serves as the supply voltage disconnecting (isolating) device. Install this switch on a wall near the power supply for easy accessibility by the operator. **The line disconnect switch must be installed by qualified personnel following all applicable local and national codes. The switch should:**

- Isolate the electrical equipment and disconnect all live conductors from the supply voltage when in "OFF" position
- Have one "OFF" and one "ON" position clearly marked with "0" (OFF) and "1" (ON)
- Have an external operating handle capable of being locked in the "OFF" position
- Contain a power operated mechanism that serves as an emergency stop
- Have slow-blow fuses installed for the proper breaking capacity (see table above)

Power Cable

Power Source to HT2000 Power Supply

Wire sizes vary based on the distance of the receptacle from the main box. The wire sizes listed on the following page were taken from the National Electric

Code 1990 handbook, table 310.16. **Use a 4-conductor Type SO** input power cable with a conductor temperature rating of 140°F (60°C) according to the following requirements:

Input Voltage	Cable Size (AWG)	Current Rating
200 VAC	1	107 amps
208 VAC	1	107 amps
220 VAC	1	107 amps
240 VAC	1	107 amps
380 VAC	4	69 amps
415 VAC	4	69 amps
480 VAC	6	52 amps
600 VAC	8	39 amps

Positioning the Power Supply

WARNING

Remove all electrical connections to power supply before moving or positioning. Transporting unit can cause personal injury and equipment damage.

Positioning the Power Supply

Prior to making electrical connections to the power supply, position the supply as follows:

Note: A lifting eye is provided for moving the power supply into place with a crane or hoist. It may also be moved by forklift if the forks are long enough to extend the entire length of the base. Care should be used when lifting with the forks so that the underside of the power supply is not damaged.

1. Place the power supply in an area that is free of excessive moisture, has proper ventilation, and is relatively clean. Allow room for accessing the sides of the power supply for servicing.

2. Place the power supply so that air flow is not blocked in any way. (Cooling air is drawn in through the front panel grating, and is exhausted through the rear of the unit by a cooling fan.)

3. Do not place any filter device over the air intake locations. This reduces cooling efficiency and VOIDS THE WARRANTY.

4. After placement of the power supply, the line disconnect switch box can be placed close to the power supply for safety purposes.

ELECTRICAL CONFIGURATIONS

Prior to connecting the power cable, ensure that the 240 / 480V power supply is configured to the required input line voltage as described below. If for any reason the voltage must be re-configured after the power supply has been powered up, observe the following warning:

WARNING

Danger: High Voltage. Line voltage is present in the power supply unless disconnected. Always disconnect input power at the line disconnect switch before servicing.

240/480V Linkboard Configurations

- The 240/480-volt units are shipped from the factory linked for 480-volt operation. The links must be moved for 240-volt operation. Ensure that the linkboard is configured properly to the appropriate voltage line (see Figure 3-1).

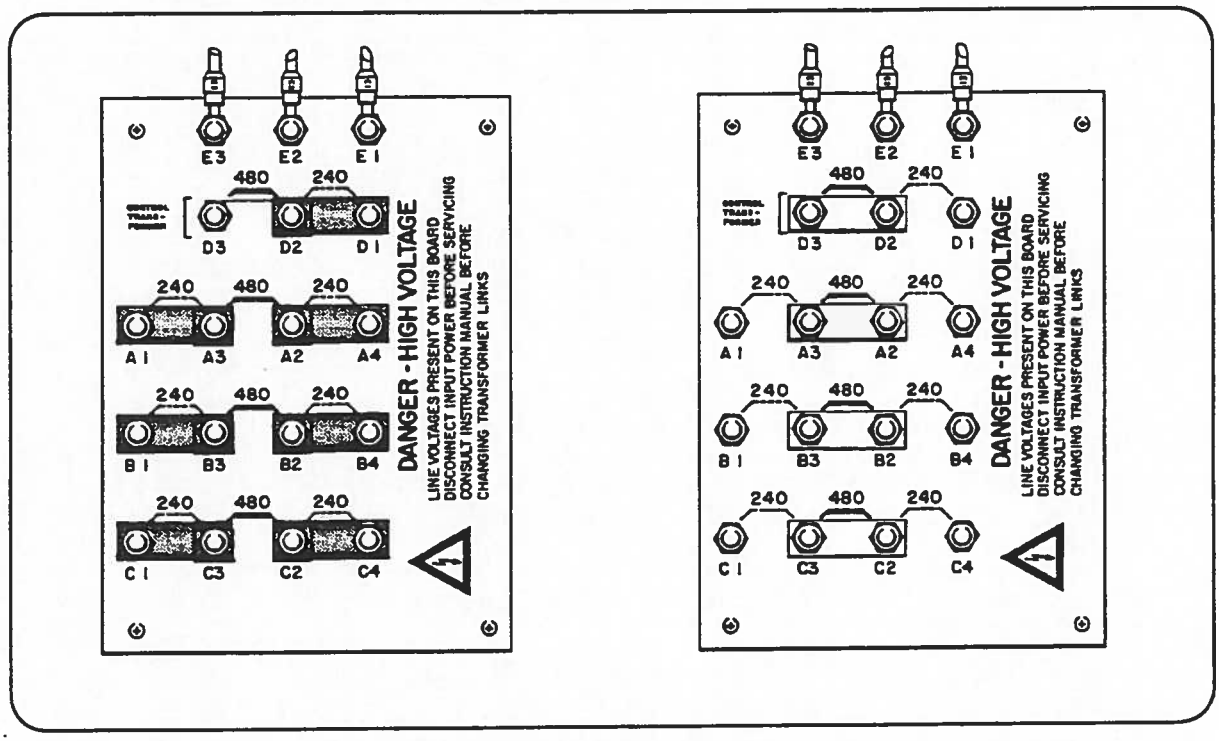
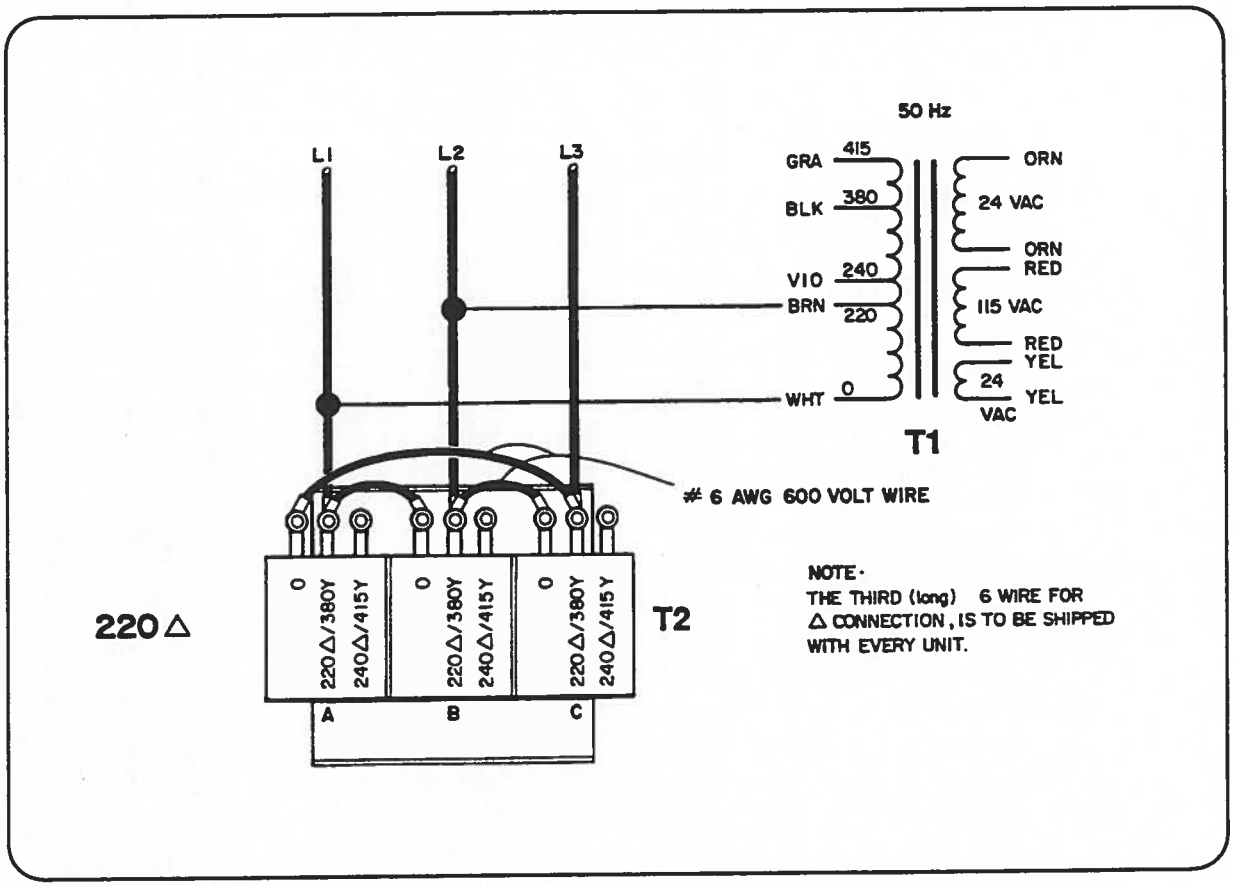


Figure 3-1 Dual Voltage 240/480-Volt Linkboard Configurations

220/380/415V Transformer T1 and T2 Configurations

- The 220/380/415-volt, 3PH, 50 Hz power supply is normally shipped from the factory set up for 380-volt operation, unless otherwise specified. To change the power supply to a different voltage (220 or 415 volts), the control transformer T1 and 30 kw transformer T2 must be re-configured (see Figure 3-2).



* The long #6 wire, required for a Δ connection, is shipped with every unit.

Figure 3-2 220/380/415V Transformer T1 and T2 Configurations - 1 of 2

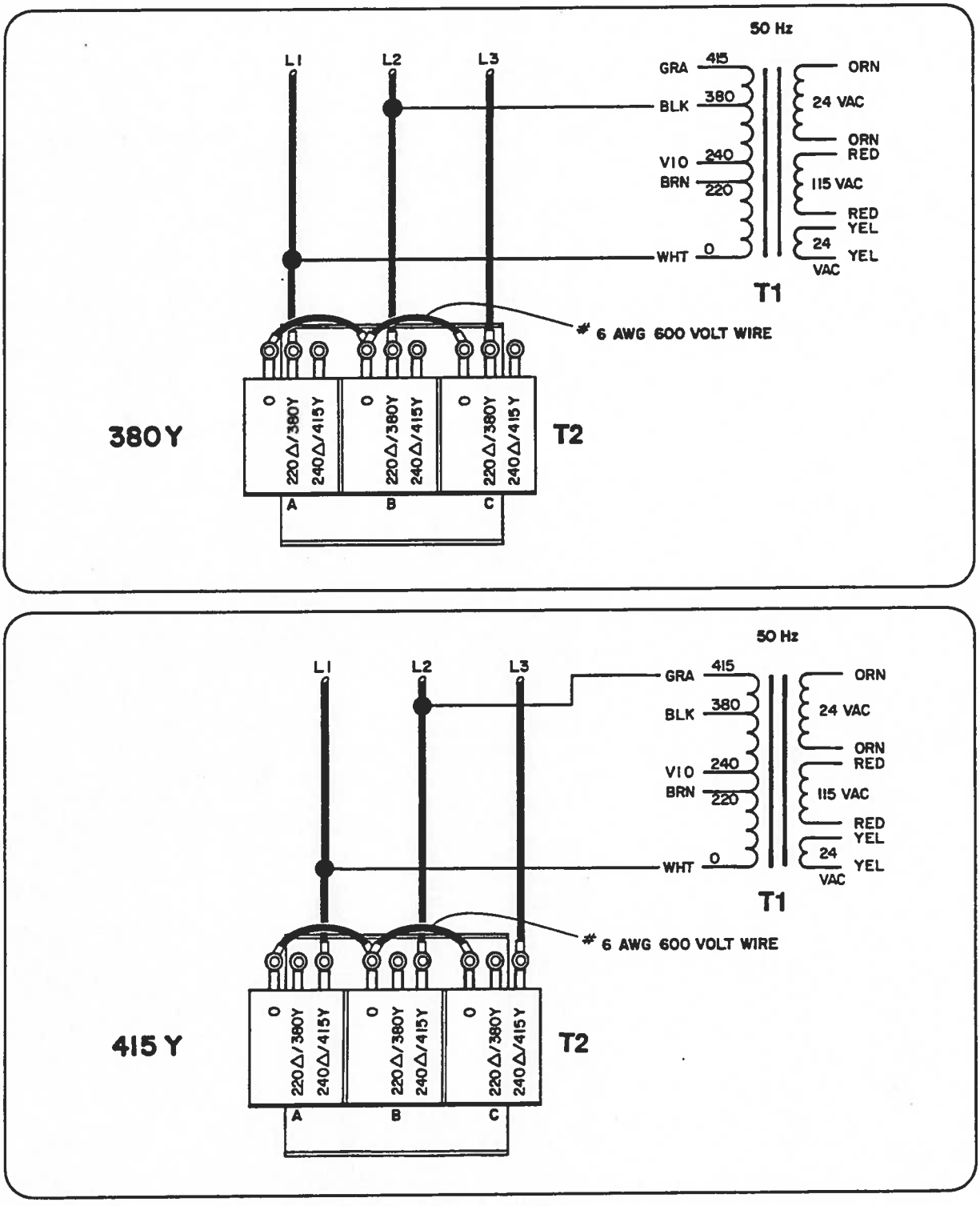


Figure 3-2 220/380/415V Transformer T1 and T2 Configurations - 2 of 2

CONNECTING THE POWER

WARNING!

The line disconnect switch must be in the OFF position before making the power cable connections!

Power Cable to HT2000 Power Supply

1. Insert the power cable through the strain relief at the lower left rear of the power supply. Connect the power cable leads to **TB1** at the rear center panel of the right side.
2. Connect the power leads to the **L1**, **L2**, and **L3** terminals of **TB1.** See Fig. 3-3.
3. Connect the ground lead to the yellow/green terminal of **TB1.**

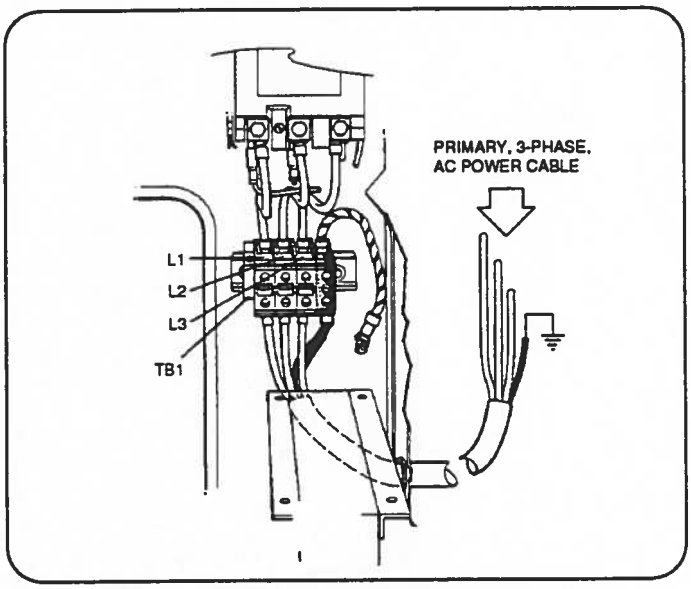


Figure 3-3 Power Cable Connections

WARNING

The neon light attached to the contactor will turn ON as soon as the line disconnect switch is ON. This indicator is a warning that there is line voltage at the contactor even if the ON (1) pushbutton on the HT2000 power supply has not been pressed. As a common safety practice, ALWAYS verify that the line disconnect switch is in the OFF position before installing, disconnecting or servicing in this area.

Power Cable from HT2000 Power Supply to Power Source.

1. **Be certain that the line disconnect switch is in the OFF position.**

2. Connect the power cord leads to the line disconnect switch following local and applicable electrical codes.

WARNING

The line disconnect switch must remain in the OFF position during the rest of the pre-installation and installation of the HT2000 system!

TORCH LIFTER REQUIREMENT

The HT2000 system requires a high-quality, motorized torch lifter with sufficient travel to cover all cutting thickness requirements. A lifter which provides **10 inches (254 mm) of vertical travel** should be adequate. The unit should have a constant speed of at least **20 ipm (508 mm/min)** and braking should be positive. A unit which drifts through the stop point is not acceptable.

OPTIONAL EQUIPMENT

Water Muffler

The water table provides the supply of water to the Water Muffler pump. It is **mandatory** that this water be filtered. A strainer filter, Hypertherm 027009, is provided with all Water Muffler systems.

Plumbing Requirements

Four feet of 3/4 inch I.D. **#12** hosing is required to attach the filter to the pump. It is important that the pump be placed as close as possible to the water table. Longer distances result in pump priming problems, as well as water lag problems during start up. This results in excessive noise and smoke during the initial starting.

Water pump and water hosing can be purchased by the customer, or supplied by Hypertherm when ordering a Water Muffler system. Please refer to Water Muffler System part numbers listed below, and Water Muffler instruction manual 802050 for further information.

Power Requirements

A power cable for the Water Muffler pump must be provided by the customer. The pumps provided by Hypertherm take a three-phase input. Part numbers and corresponding voltages are listed below. Input current information is provided on the motor data plate. Present pump systems all draw less than 20 amps and cable sizes should be selected accordingly.

Water Muffler System Part Number	Water Pump Part Number	Input Voltage
034096 (w/hoses)	028042	240-480 Volt/60 Hz
034100 (w/hoses)	028299	380-415 Volt/50 Hz
034098 (w/hoses)	028308	600 Volts/60 Hz
034097 (wo/hoses)	028042	240-480 Volt/60 Hz
034101 (wo/hoses)	028299	380-415 Volt/50 Hz
034099 (wo/hoses)	028308	600 Volts/60 Hz

Initial Height Sensing (IHS)

The customer must provide the Initial Height Sensing system a source of compressed air to activate the inductive probes positioning rod.

Air Requirements

Use a clean, dry source of air to prevent possible problems created by moisture and water in the line.

A regulator is required to reduce shop air pressure to **20 psi (1.4 bar)**.

A **1/4 inch** I.D. hose is required between the regulator and the inductive height control module.

In addition to the above requirements for the IHS system, an upper-limit switch and cable may be desirable. Please refer to *Initial Height Sensing Connections* in the **Installation** section of this manual for further information.

Section 4 INSTALLATION

In this section:

INSTALLATION

UPON RECEIPT

The HT2000 system is shipped mounted on skid(s) and protected by heavy carton covers. Before unpacking, inspect the cartons for evidence of damage during shipment. If there is evidence of damage, refer to *Claims for Damage During Shipment* for details.

1. Remove the units and items from the shipping cartons.

2. Verify that the components of the HT2000 system, optional units, cables and hoses, and items listed below are included.

   Alert your distributor or Hypertherm if any of the items are damaged or missing. All communications regarding this equipment must include the model number and serial number (located on the back of the HT2000 power supply). Refer to *Claims for Defective or Missing Merchandise* for details.

HT2000 System Components

- HT2000 Power Supply
- Remote High Frequency (RHF) Console
- Gas Console
- Motor Valve Console
- Cables
- Cooling hoses
- Valve/Torch Cable/Hose SA (to Motor Valve Console)
- Shielded torch lead set (to RHF Console)
- Machine torch
- Consumable spare parts kit

Optional Units

- Remote Voltage/Current (V/C) Control
  Digital Remote
  or
  Programmable Remote
- Argon-Hydrogen Manifold
- Initial Height Sensing (IHS)
- Water Muffler
- Timer/Counter

CLAIMS

Claims for Damage During Shipment

If your unit was damaged during shipment, you must file a claim with the carrier. Hypertherm will furnish you with a copy of the bill of lading upon request. If you need additional assistance, call our Customer Service department at 1-800-643-0030 or Field Service at 1-800-643-9878.

Claims for Defective or Missing Merchandise

All units shipped from Hypertherm undergo rigorous quality control inspections for defects. If any of the merchandise is defective or missing, call your distributor. He will be able to help you. If you need additional assistance, call our Customer Service department at 1-800-643-0030 or Field Service at 1-800-643-9878.

MODULE GROUNDING and GROUNDING CHECKS

Please refer to *Grounding Requirements* in the **Pre-Installation** section of this manual for earth ground specifications.

All accessory modules in the HT2000 system must be grounded to earth. Use a minimum of **8 AWG customer-supplied wire** connected from the stud on the side of each module enclosure to the worktable ground. Note: the power supply enclosure is grounded through the incoming AC conductor and does not require the additional ground.

Before operating the HT2000, perform the following grounding checks to ensure proper operation, personal safety, and to reduce emission of radio-frequency interference:

- Ensure the power cord ground wire is properly connected to the ground in the line disconnect box.
- Ensure the power cord ground wire is properly connected to the HT2000 power supply terminal **TB1**. Refer to *Connecting the Power* in the **Pre-Installation** section of this manual.
- Ensure that all electrical connections are tight to avoid excessive heating.

NOISE LEVELS

Figure 4-1 represents the noise levels in decibels experienced by an operator standing 10 feet from the torch in a confined area under varied conditions while cutting 1-inch steel using oxygen/air at a travel speed of 20 ipm (508 mm/min).

Above water 6" without Water Muffler	106 dbs
Above water 6" with Water Muffler	104 dbs
Water at bottom of plate without Water Muffler	100 dbs
Water at bottom of plate with Water Muffler	95 dbs
Water 3" over plate without Water Muffler	75 dbs
Water 3" over plate with Water Muffler	72 dbs

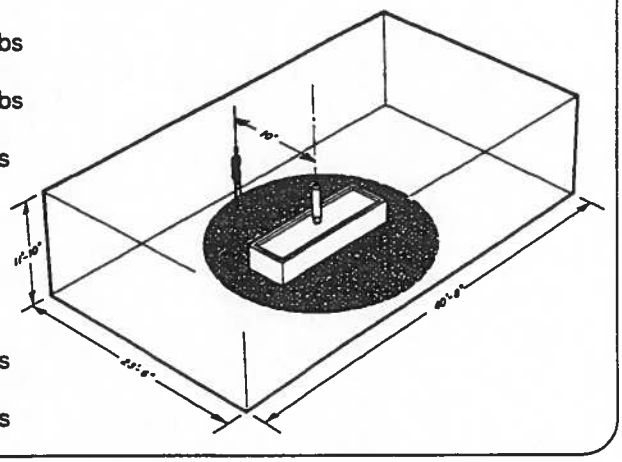


Figure 4-1 Noise Levels (Decibels)

INSTALLATION

SYSTEM UNITS PLACEMENT

Position all required units prior to making electrical, gas, and interface connections. Refer to Figure 4-2 to view typical unit placements on or near a typical cutting machine configuration. Note that the motor valve console must be located within 10 ft (3 m) of the torch, and the IHS console must be located within 40 ft (12 m) of the torch.

Note: Ground all external modules in the HT2000 system to earth.

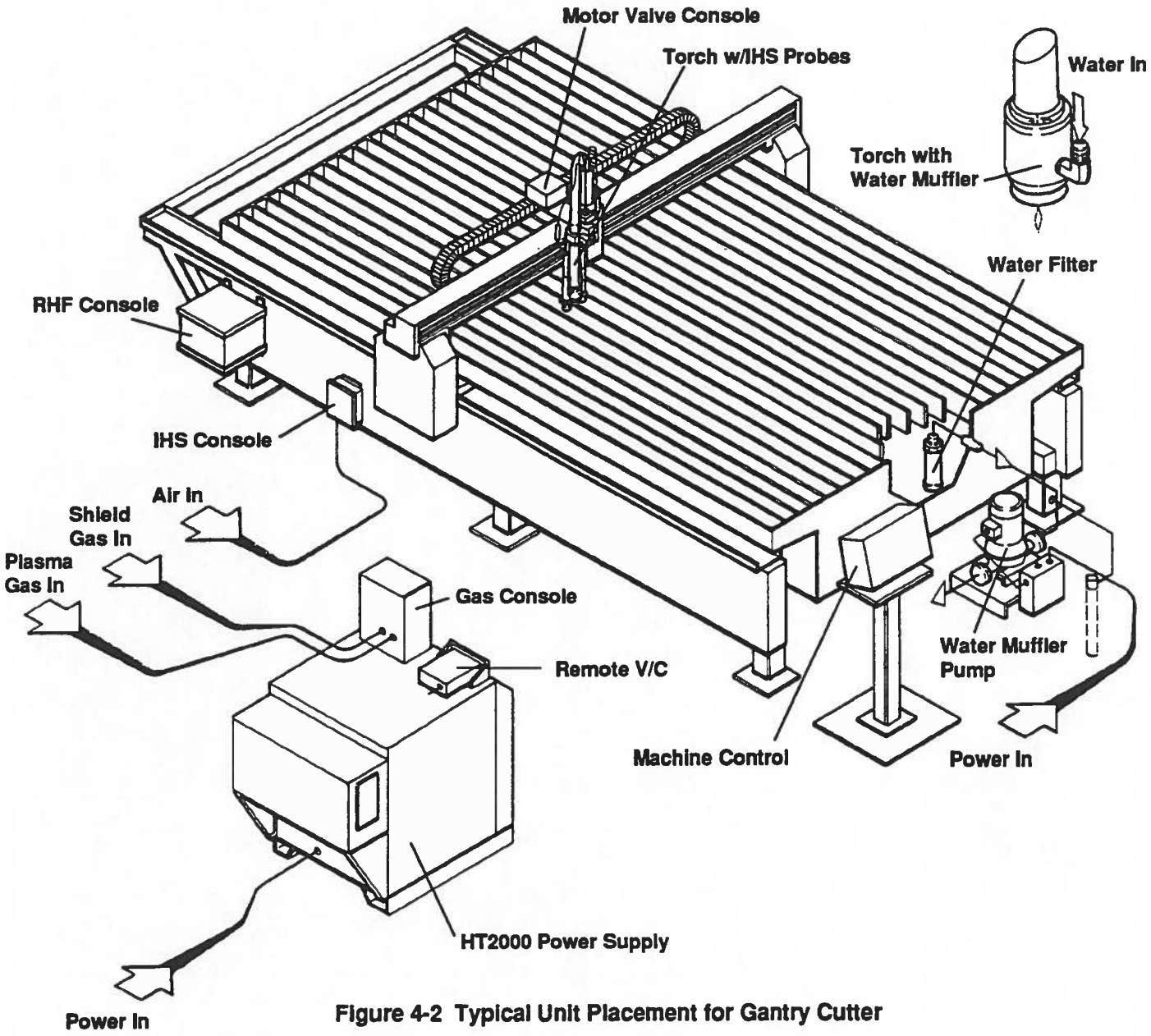


Figure 4-2 Typical Unit Placement for Gantry Cutter

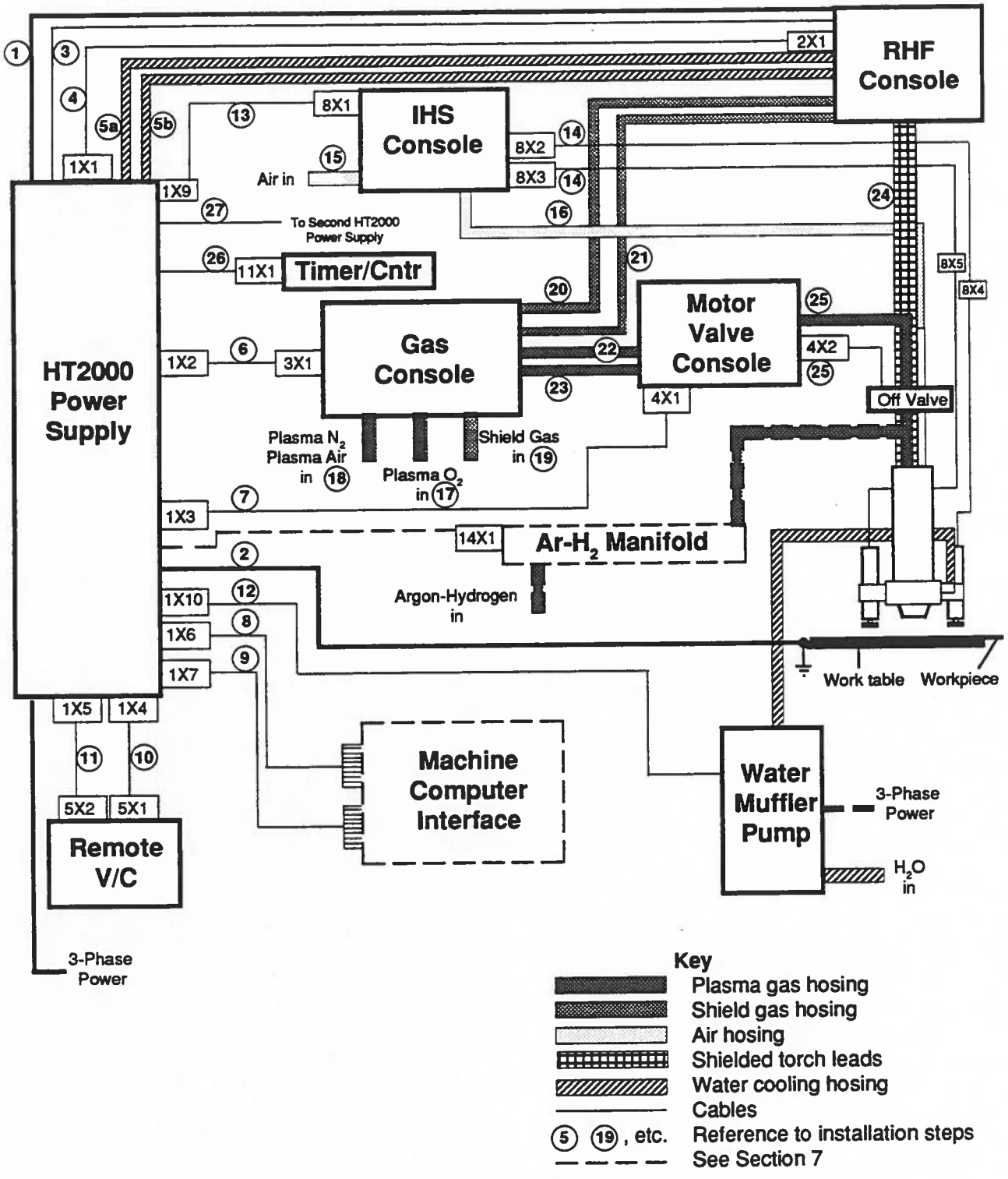


Figure 4-3 HT2000 Interconnect System Diagram with IHS and Water Muffler

INSTALLATION

POWER SUPPLY CONNECTIONS

Match step numbers in figures on right-hand pages to make connections. Any special instructions for installation are explained on the left-hand page.

WARNING!

All power must be turned OFF before performing installation!!

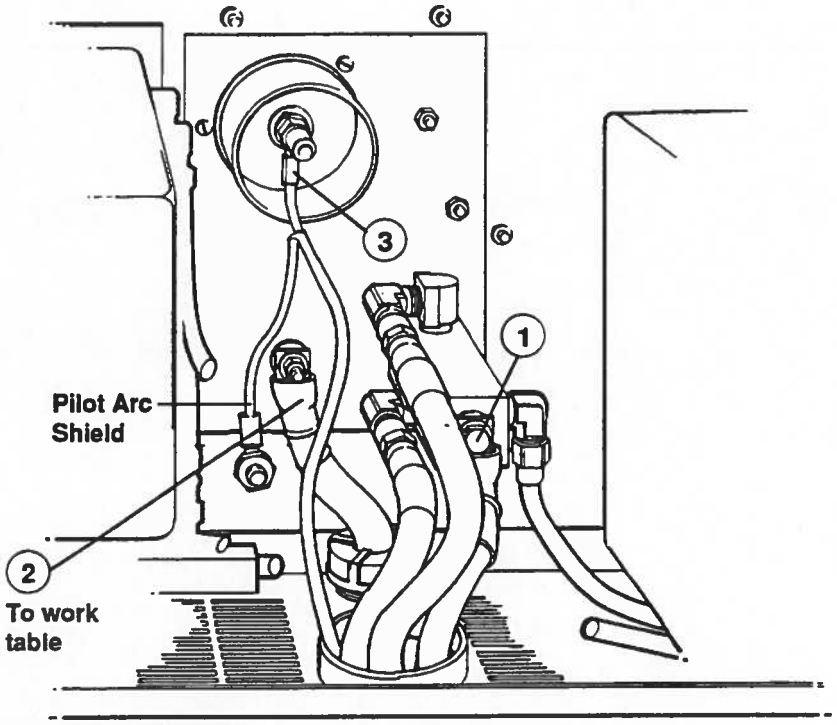
(1) ***Negative Lead - Power Supply (PS) o RHF Console***

(2) ***Positive Lead - PS to Work Table***

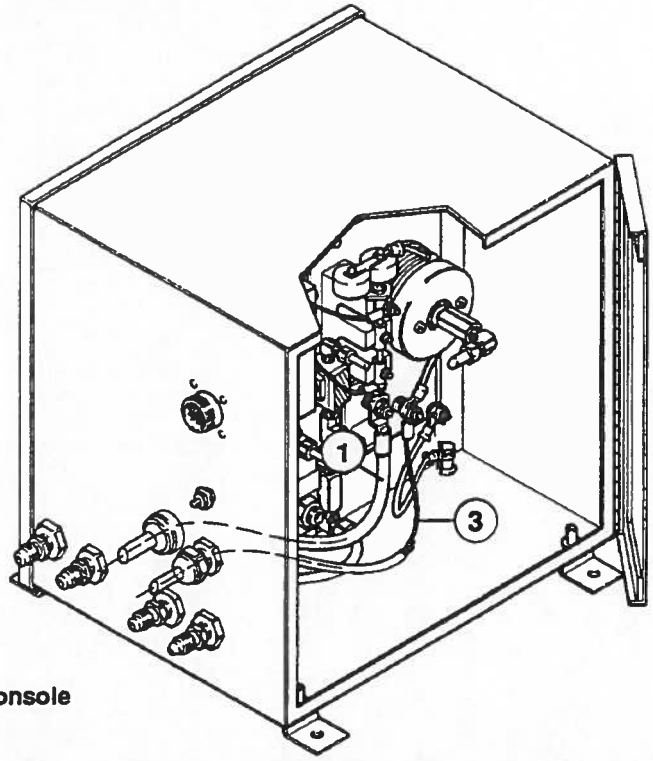
Part No.	Length	Part No.	Length
023403	15 ft (4.6 m)	023407	100 ft (30.5 m)
023404	25 ft (7.6 m)	023408	150 ft (46 m)
023405	50 ft (15 m)	023644	200 ft (62 m)
023406	75 ft (23 m)		

(3) ***Pilot Arc lead - PS to RHF Console***

Part No.	Length	Part No.	Length
023631	25 ft (7.6 m)	023634	100 ft (30.5 m)
023632	50 ft (15 m)	023635	150 ft (46 m)
023633	75 ft (23 m)	023652	200 ft (62 m)



Power Supply - Rear

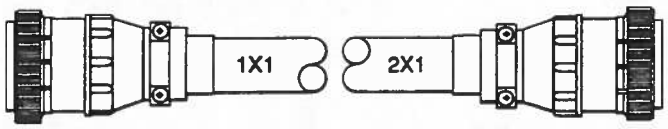


RHF Console

Figure 4-4 Power Supply Connections to RHF Console and Work Table

(4) *RHF Cable - PS to RHF Console*

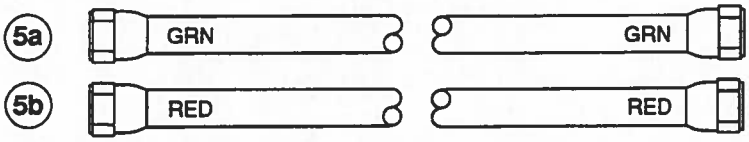
Connect the end of the cable marked 1X1 to the receptacle on the rear of the power supply labeled RHF 1X1 (Fig. 4-6). Connect the 2X1 end to the RHF Console as shown in Fig. 4-5



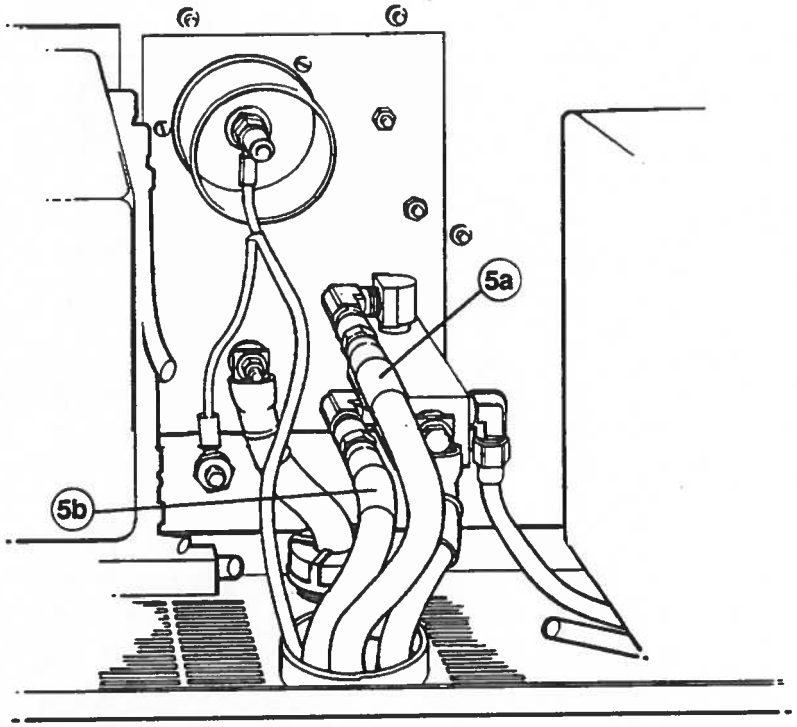
From 1X1	To 2X1	Color	Signal
34	1	Black	RHF Door Intrlck
35	4	Red	RHF Door Intrlck
36	3	Shld	Shield
4	2	Black	PS3 / Shield Gas
8	5	White	PS3 / Shield Gas
9	6	Shld	Cable Shield
23	7	Black	SV6 / Shield ON
24	8	Green	SV6 / Shield ON
25	11	Shld	Shield
10	10	Black	SV7 / Cap OFF
11	13	Blue	SV7 / Cap OFF
12	14	Shld	Shield
1	12	Black	T1 / HV Xfrmer
2	15	Yellow	T1 / HV Xfrmer
3	16	Shld	Shield
14		Black	Unused
15		Brown	Unused
21		Shld	Shield

Part No.	Length
023550	15 ft (4.6 m)
023610	25 ft (7.6 m)
023611	50 ft (15 m)
023612	75 ft (23 m)
023613	100 ft (30.5 m)
023614	150 ft (46 m)
023645	200 ft (62 m)

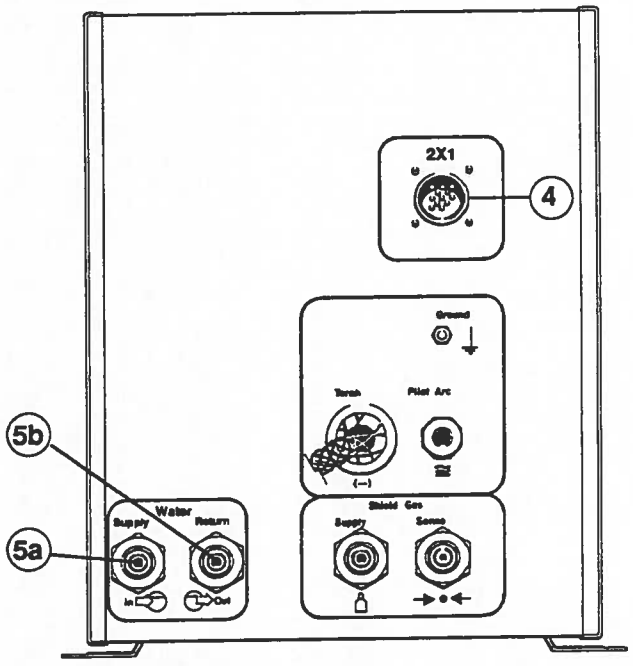
(5) *Cooling Hoses - PS to RHF Console*



Part No.	Length	Part No.	Length
028652	10 ft (3 m)	028443	75 ft (23 m)
028440	15 ft (4.6 m)	028444	100 ft (30 m)
028653	20 ft (6 m)	028445	150 ft (46 m)
028441	25 ft (7.6 m)	028637	200 ft (61 m)
028442	50 ft (15 m)		



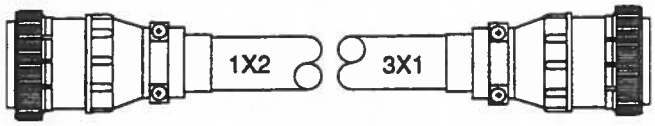
Power Supply - Rear



RHF Console - Rear

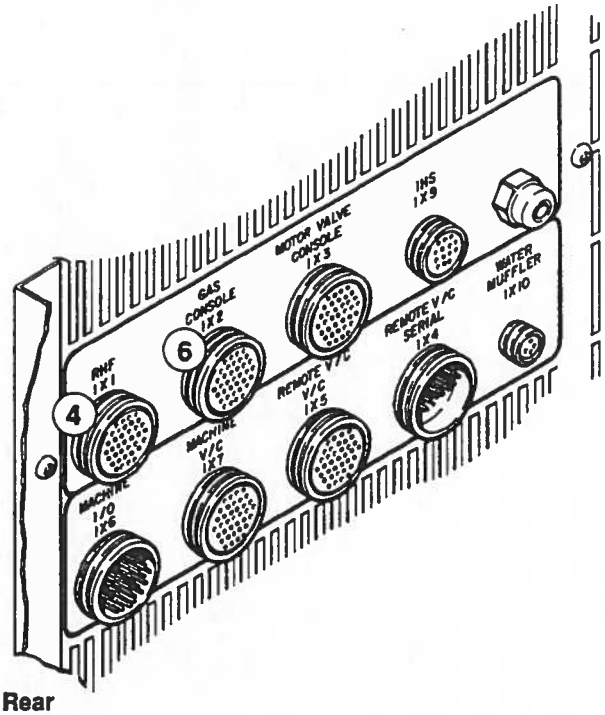
Figure 4-5 Power Supply Connections to RHF Console

(6) *Gas Console Cable - PS to Gas Console*

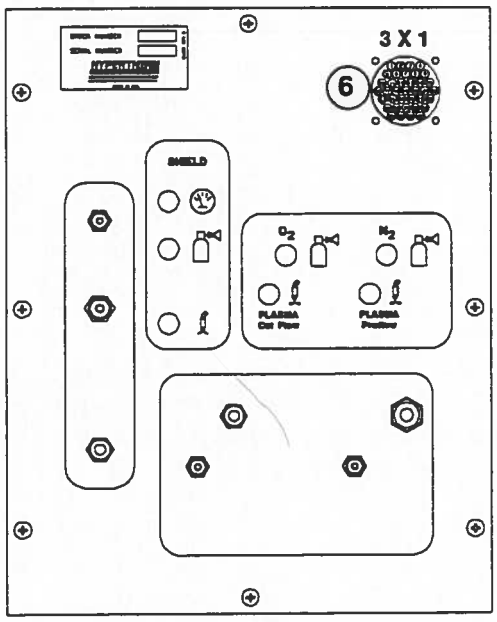


From 1X2	To 3X1	Color	Signal
29	29	Black	S3 / MV2 Increase
30	30	Red	Spare
34	34	Shld	Shield
5	5	Black	S3 / MV2 Decrease
6	6	White	S3 / MV2 Common
1	1	Shld	Shield
2	2	Black	LT1 / DC ON
3	3	Green	LT1 / DC ON
7	7	Shld	Shield
8	8	Black	SV1 / O2 / N2
9	9	Blue	SV1 / O2 / N2
4	4	Shld	Shield
16	16	Black	SV2 / O2 / N2
17	17	Yellow	SV2 / O2 / N2
10	10	Shld	Shield
11	11	Black	SV3 / Preflow Trap
12	12	Brown	SV3 / Preflow Trap
18	18	Shld	Shield
19	19	Black	S1 / N2 / O2
20	20	Orange	S1 / N2 / O2
13	13	Shld	Shield
14	14	Red	S2 / Test / Preflow
15	15	White	S2 / Test / Common
21	21	Shld	Shield
35	35	Red	S2 / Test / Operate
36	36	Green	S2 / Test / Common
31	31	Shld	Shield
32	32	Red	PS1&PS2
33	33	Blue	PS1&PS2
37	37	Shld	Shield

Part No.	Length
023549	15 ft (4.5 m)
023605	25 ft (7.5 m)
023757	38 ft (11.5 m)
023606	50 ft (15 m)
023607	75 ft (23 m)
023608	100 ft (30.5 m)
023743	125 ft (38 m)
023609	150 ft (46 m)



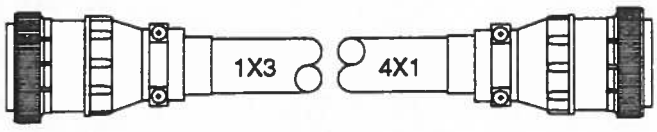
Power Supply - Rear



Gas Console

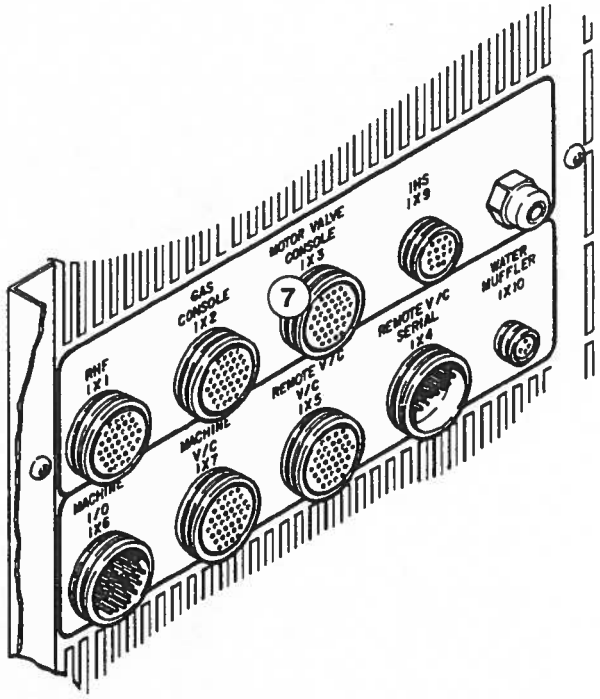
Figure 4-6 Power Supply Connection to Gas Console

⑦ *Motor Valve Console Cable - PS to Motor Valve Console*

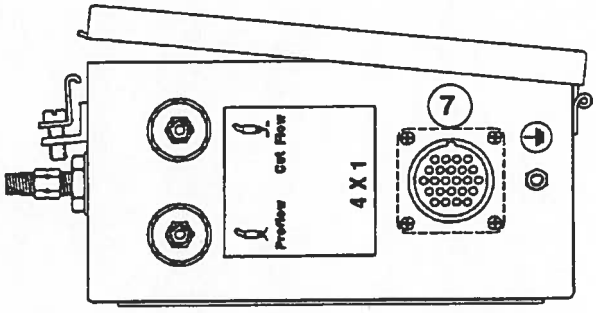


From 1X3	To 4X1	Color	Signal
34	34	Black	PS1 / Plasma
35	35	Red	PS1 / Plasma
30	30	Shld	Shield
16	16	Red	SV4/ Preflow /Operate
17	17	Brown	SV4/ Preflow /Operate
10	10	Shld	Shield
4	4	Black	SV8 / MV2 Bypass
8	8	Green	SV8 / MV2 Bypass
9	9	Shld	Shield
29	29	Black	SV5 / Plasma OFF
30	30	Blue	SV5 / Plasma OFF
34	34	Shld	Shield
12	12	Black	MV2 Decrease
11	11	Yellow	MV2 Decrease
18	18	Shld	Shield
14	14	Brown	MV2 Motor Increase
21	21	Shld	Shield

Part No.	Length
023551	15 ft (4.5 m)
023590	25 ft (7.6 m)
023776	35 ft (10.5 m)
023591	50 ft (15 m)
023592	75 ft (23 m)
023593	100 ft (30.5 m)
023594	150 ft (46 m)
023658	200 ft (61 m)



Power Supply - Rear

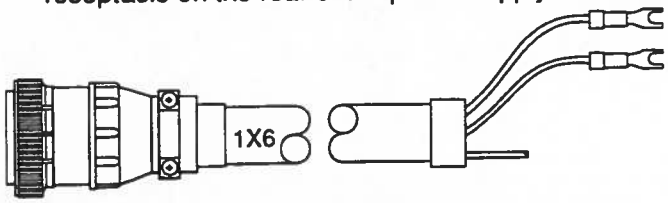


Motor Valve Console

Figure 4-7 Power Supply Connection to Motor Valve Console

(8) *Machine I/O Interface Cable - PS to Machine Interface*

Connect the plug end of the machine interface cable marked 1X6 to the receptacle on the rear of the power supply marked MACHINE I/O 1X6 (Fig. 4-10).



From 1X6	Color	Lug	Signal
2	Yellow	2	Initial Height Sig. (OFF=Closed)
6	Black	6	Initial Height Com.
11	Shld		Shield
4	Orange	4	Auto Height Sig. (OFF=Closed)
8	Black	8	Auto Height Com.
13	Shld		Shield
34	Red	34	*†Lifter DOWN Load (DOWN=Closed)
29	Black	29	Lifter DOWN Line
23	Shld		Shield
35	Green	35	*†Lifter UP Load (UP=Closed)
30	Black	30	Lifter UP Line
24	Shld		Shield
36	Red	36	Upper Limit Switch (OFF=Closed)
31	Blue	31	Upper Limit Switch
25	Shld		Shield
33	Red	33	Arc Voltage (1/50 Arc Voltage)
28	Yellow	28	Arc Voltage
27	Shld		Shield
9	Blue	9	Plasma START (START=Closed)
15	Black	15	Plasma START
14	Shld		Shield
37	Red	37	*†Arc Transfer (TRANSFER=Closed)
32	Green	32	Arc Transfer
26	Shld		Shield
1	White	1	Hold Ignition Sig. (HOLD=Closed)
5	Black	5	Hold Ignition Com.
10	Shld		Shield
3	Brown	3	Test Sig.
7	Black	7	Test Com.
12	Shld		Shield

Part No.	Length
023841	6 ft (2 m)
023842	15 ft (4.6 m)
023843	25 ft (7.6 m)
023844	35 ft (10.6 m)
023845	50 ft (15 m)
023846	75 ft (23 m)
023847	100 ft (30.5 m)
023848	125 ft (38 m)
023849	150 ft (46 m)
023850	200 ft (61 m)

* Signals are AC relays. DC relays available as an option from Hypertherm

†WARNING

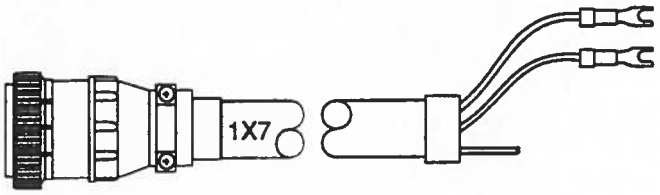
When installing or servicing the HT2000, AC or DC line voltages may be present on the UP, DOWN and TRANSFER signals even if the power supply line disconnect switch is OFF. Make certain that all line disconnect switches relating to the HT2000 system are OFF during installation and when servicing.

Figure 4-8 Machine I/O Interface Cable - PS to Machine Computer Interface

(9) *Machine V/C Interface Cable - PS to Machine Interface*

Note: If you are using a remote V/C to set voltage and current, skip this step.

Connect the plug end of the machine interface cable marked 1X7 to the receptacle on the rear of the power supply marked MACHINE V/C 1X7 (Fig. 4-10).



From 1X7	Color	Signal
2	White	Current 10
3	Red	Current 20
4	Green	Current 40
5	Orange	Current 80
6	Blue	Current 100
7	White/Black	Current 200
10	Shld	Shield
11	Blue/Black	Current ICom
12	Black/White	Spare
13	Red/White	Spare
14	Green/White	Voltage V1
15	Blue/White	Voltage V2
16	Black/Red	Voltage V5
17	White/Red	Voltage V10
18	Orange/Red	Voltage V20
19	Blue/Red	Voltage V40
20	Red/Green	Voltage V80
21	Orange/Green	Voltage V100
22	Black/White/Red	Voltage V200
23	White/Black/Red	Voltage VCOM

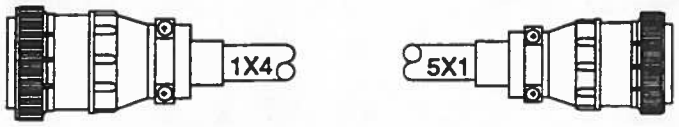
Part No.	Length
023902	6 ft (2 m)
023851	15 ft (4.6 m)
023852	25 ft (7.6 m)
023853	35 ft (10.6 m)
023854	50 ft (15 m)
023855	75 ft (23 m)
023856	100 ft (30.5 m)
023903	125 ft (38 m)
023857	150 ft (46 m)
023858	200 ft (61 m)

Figure 4-9 Machine V/C Interface Cable - PS to Machine Computer Interface

(10) *Remote V/C cable - PS to Digital (DR)/Programmable (PR) V/C*

Note: If you are using a machine computer interface to set voltage and current and don't want the programmable V/C readout, skip this page.

PS End **Remote V/C End**



Legend-PS End		
Pin	Color	Function
4	Grn	SID Data
8	Blk	SID Common
9	Red	SOD Data
13		Shield-Grn/Blk
14		Shield-Red/Blk
15	Blk	SOD Common
31		Shield (AC PWR) Wht/Blk
35	Wht	AC Power
36	Blk	AC Power

Legend-Remote V/C End		
Socket	Color	Function
1	Grn	SID Data
2	Blk	SID Common
3	Red	SOD Data
5		Key
6	Blk	SOD Common
7	Wht	AC Power
8	Blk	AC Power

Part No.	Length	Part No.	Length
023911	15 ft (4.5 m)	023883	150 ft (46 m)
023878	25 ft (7.6 m)	023884	200 ft (61 m)
023879	50 ft (15 m)	023885	250 ft (76 m)
023880	75 ft (23 m)	023886	275 ft (84 m)
023881	100 ft (30.5 m)	023887	300 ft (92 m)
023882	125 ft (38 m)		

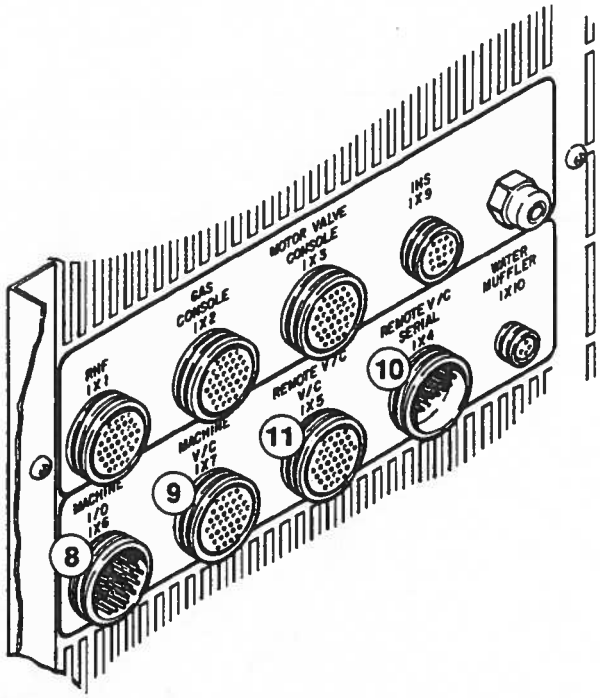
(11) *Programmable Remote V/C Cable - PS to PR V/C*

Note: If you are using the digital remote to set voltage and current, skip this step.

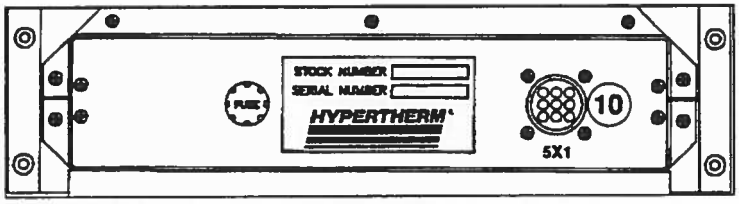
PS End **PR V/C End**

PS End	PR V/C End	Color	Signal	PS End	PR V/C End	Color	Signal
1	1	Black	Current 20	8	8	White/Blue	Voltage 5
2	2	Blue	Current 40	9	9	Black/Blue	Voltage 10
3	3	Green	Current 80	10	10	Black/Green	Voltage 20
4	4	White	Current 100	11	11	Black/Orange	Voltage 40
5	5	Orange	Current 200	12	12	Black/Red	Voltage 80
6	6	Red	Current 400	13	13	White/Grey	Voltage 100
7	7	White/Black	Common	14	14	White/Red	Voltage 200
				15	15	Black/White	Spare
				16	16	Shld	Shield

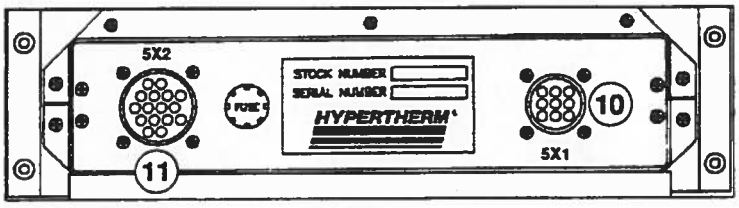
Part No.	Length	Part No.	Length
023834	15 ft (4.5 m)	023839	150 ft (46 m)
023835	25 ft (7.6 m)	023840	200 ft (61 m)
023836	50 ft (15 m)	023899	250 ft (76 m)
023837	75 ft (23 m)	023900	275 ft (84 m)
023838	100 ft (30.5 m)	023901	300 ft (92 m)
023898	125 ft (38 m)		



Power Supply - Rear



Digital Remote - Rear



Programmable Remote - Rear

Figure 4-10 Power Supply Connections to Remote V/C Modules

(12) *Water Muffler Pump Cable - Power supply to Water Muffler Pump*

See IM205 (802050) to connect cable to pump motor, and to make remaining water muffler connections.

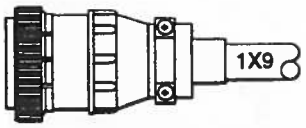
PS End

From 1X10 Pin	To WM Pump Contactor	Color	Function
2	Coil	Black	Water Muffler Coil
4	AC Neut.	White	AC Neutral
3	Ground	Green	Ground

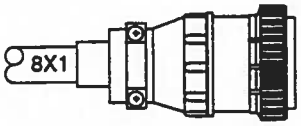
Part No.	Length
023866	50 ft (15 m)
023867	75 ft (23 m)
023868	100 ft (30.5 m)

(13) *IHS Interface cable - PS to IHS*

PS End



IHS End



Legend-PS End		
PIN	COLOR	FUNCTION
1	Red	IHS Complete Sig.
2	Grn	Upper Limit Sw Sig
4	Blk	IHS Complete Com
5	Blk	Upper Limit Sw Com
8	Drain	Shield-Wht/Blk
9	Drain	Shield-Red/Blk
7	Drain	Shield-Grn./Blk
11	Blk	AC Power
14	Wht	AC Power

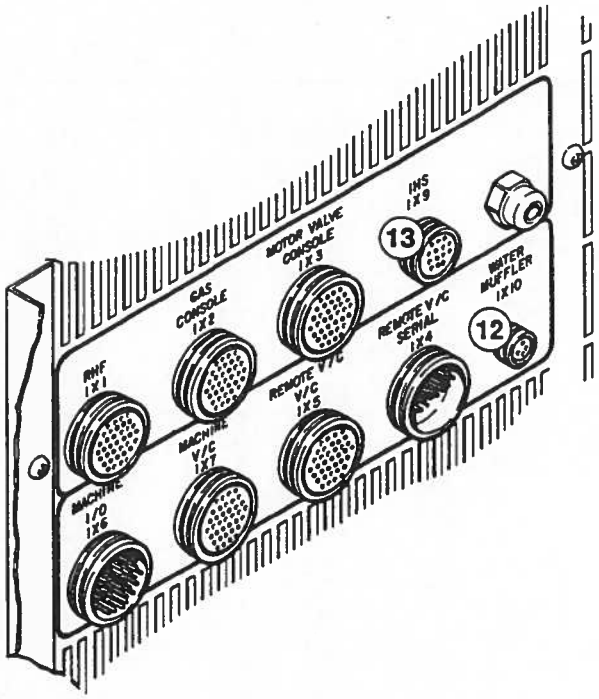
Legend-IHS End		
PIN	COLOR	FUNCTION
1	Red	IHS Complete Sig.
2	Grn	Upper Limit Sw Sig
3	Blk	Upper Limit Sw Com
4	Blk	IHS Complete Com
5	Drain	Shield-Grn/Blk
7		Key
8	Wht	AC Power
9	Blk	AC Power

Part No.	Length
023859	25 ft (7.6m)
023860	50 ft (15m)
023861	75 ft (23m)
023862	100 ft (30.5m)
023863	150 ft (46m)
023864	200 ft (61m)

Indicates Pairs

Indicates Pairs w/Drain

Note: On IHS End, cut Red/Black Shield & White/Black Shield Wires



Power Supply - Rear

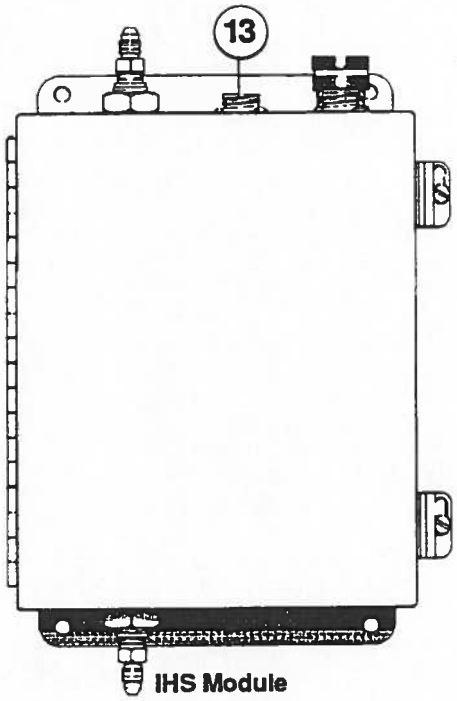


Figure 4-11 Power Supply Connections to Water Muffler and IHS Console

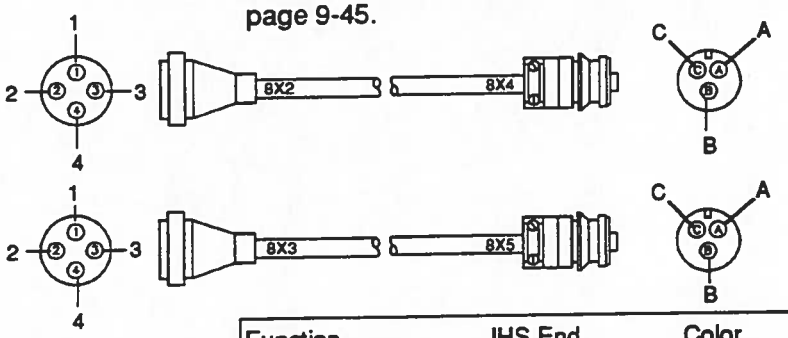
INSTALLATION

INITIAL HEIGHT SENSING (IHS) CONNECTIONS

See page 4-18 for IHS connection to power supply.

(14) *IHS Sensor cables/Inductor Probes - IHS to Inductor Probes*

The two sensor cables are components of the IHS leads packages - see page 9-45.

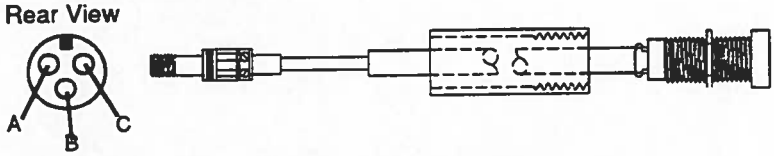


Part No.	Length
023888	2 ft (.6 m)
023869	40 ft (12 m)

Part No.	Length
023889	2 ft (.6 m)
023870	40 ft (12 m)

Function	IHS End	Color	Probe End
Power (+15 VDC)	4	Red	A
Common	2	Black	B
Signal	1	Clear	C
Shield	3	Braid	

The two inductive probes come as part of the IHS torch mounting subassembly - see page 9-45.



Function	Pin	Color
Power (+15 VDC)	A	Brown
Common	B	Blue
Signal	C	Black

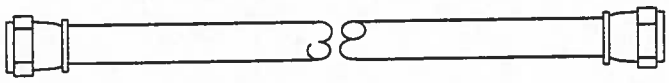
Part No.
005074

(15) *IHS Air Supply - Air Supply to IHS Module*

The customer must supply the 20 psig regulated shop air and the air hose. A #4 swivel fitting (# 015006) comes with the IHS console assembly.

(16) *Air Hose Assembly - IHS Module to Inductive Sensor Air Cylinder*

The 40-foot air hose is a component of the IHS leads packages - see page 9-45.



Part No.	Length
024144	50 ft (15m)

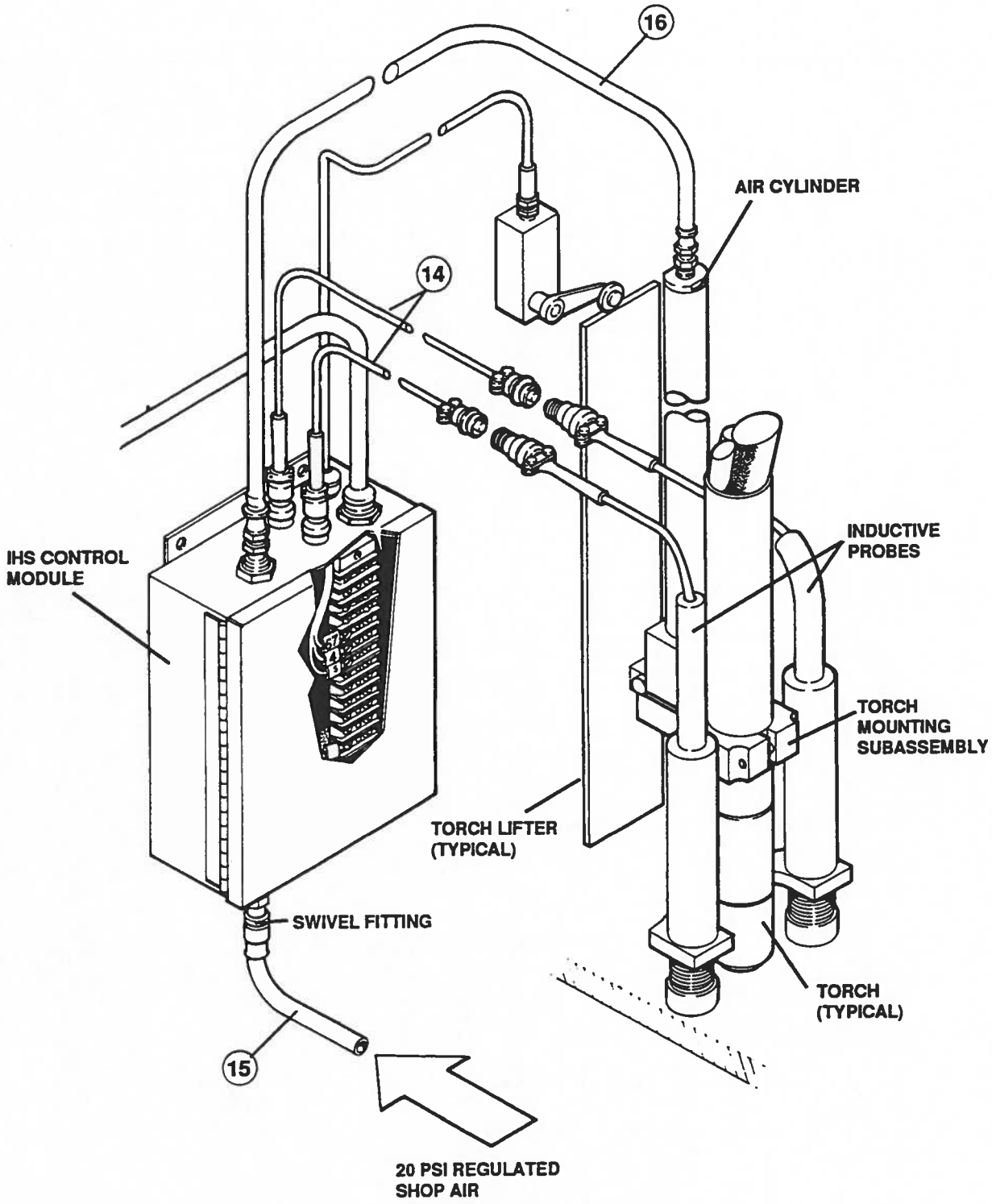


Figure 4-12 Initial Height Sensing Connections

INITIAL HEIGHT SENSING CONNECTIONS (CONT.)

Upper Limit Switch and Cable - Upper Limit Switch to IHS Module

Note: The customer must supply the upper limit switch option.

Switch specifications: **+12 VDC @ 1.2 ma**. Gold-type contacts preferred. Select a normally closed switch that opens when the lever is up (when the torch fully retracts). Install the upper limit switch behind the torch lifter as in figure 4-13.

Caution: Follow the cable installation procedure below to avoid electromagnetic interference problems with the torch lead set.

1. Use a shielded, twisted pair of 22-24 gauge wire (stranded). Use Belden #8761.
2. At the upper limit switch, connect the common wire (black) and signal wire (clear) to the upper limit switch. Cut the shield drain wire (uninsulated). Wrap the cut end with electrician's tape.
3. At the IHS control module, loosen the two (2) latches and open the front cover.
4. Route the cable through the strain relief to connect the cable wires to 1TB.
5. Connect the shield drain wire (uninsulated) to 1TB-10 (#S). This connects the cable shield to the HT2000 frame. The shield drain must not touch the IHS module case.
6. Connect the common wire (black) to 1TB-11 (#4).
7. Connect the signal wire (clear) to 1TB-12 (#67).

Note: If the upper limit switch signal comes from an interface on the cutting machine, the shield must be electrically isolated from other shields in other cables. Using a separate cable will avoid ground-loop problems.

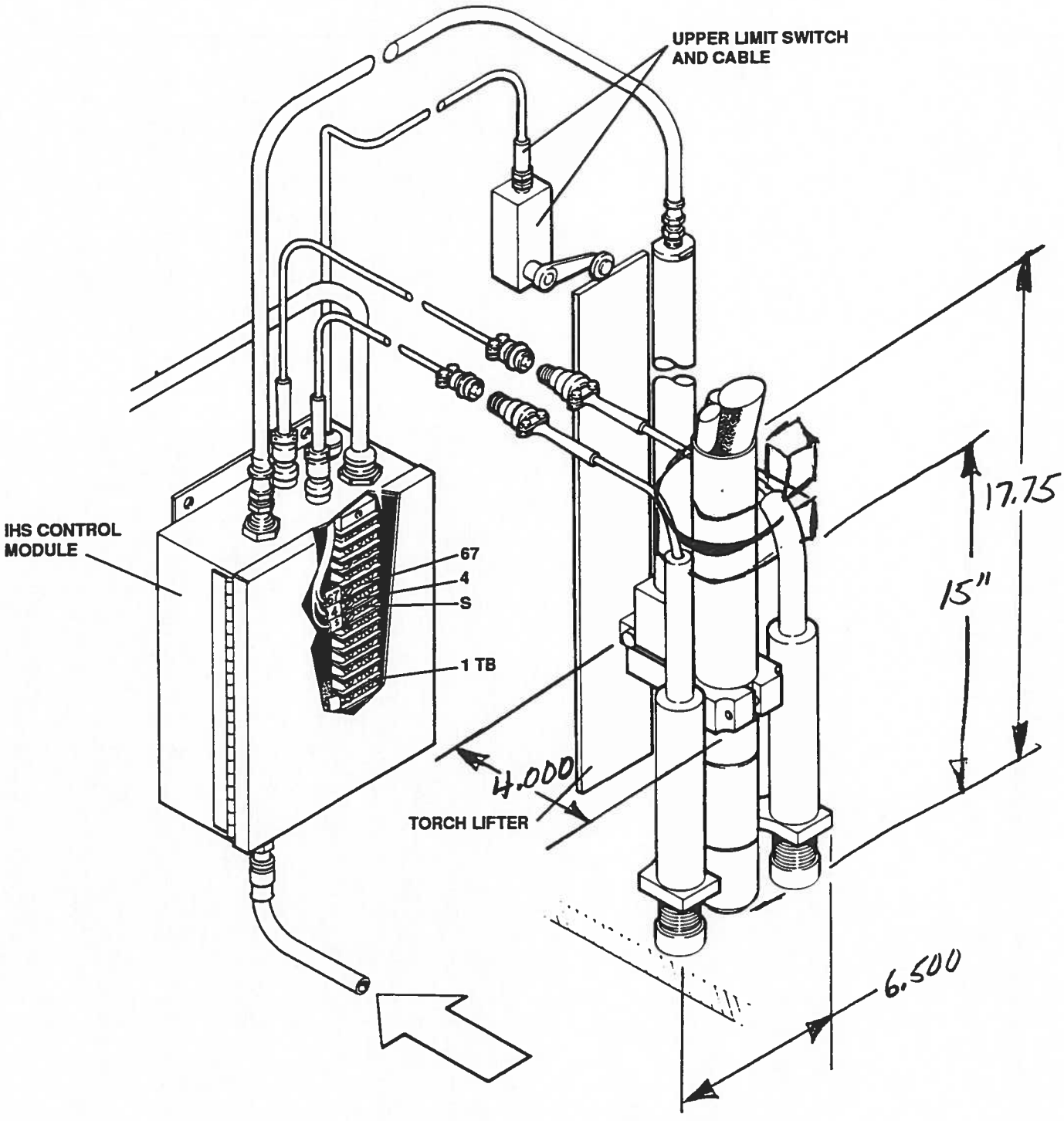


Figure 4-13 Intial Height Sensing Upper Limit Switch Connections

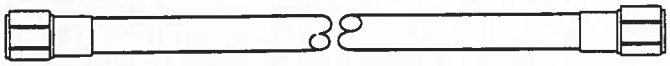
GAS CONSOLE CONNECTIONS

See page 4-10 for gas console connection to power supply.

Plasma Gas Supplies

(17) ***Oxygen Plasma Supply Hose - Oxygen Supply to Gas Console***

Note: If cutting with oxygen as the plasma gas, nitrogen must also be connected to the gas console to achieve the proper oxygen/nitrogen mixtures in the preflow and cut flow conditions.



Part No.	Length	Part No.	Length
024204	15 ft (4.6 m)	024206	100 ft (30 m)
024205	25 ft (7.6 m)	024159	150 ft (46 m)
024155	50 ft (15 m)		

(18) ***Nitrogen Plasma Supply Hose - Nitrogen Supply to Gas Console***

Part No.	Length	Part No.	Length
024210	10 ft (3 m)	024148	75 ft (23 m)
024203	15 ft (4.6 m)	024116	100 ft (30 m)
024232	20 ft (6 m)	024120	150 ft (46 m)
024134	25 ft (7.6 m)	024185	180 ft (55 m)
024211	35 ft (10.6 m)	024124	200 ft (61 m)
024112	50 ft (15 m)		

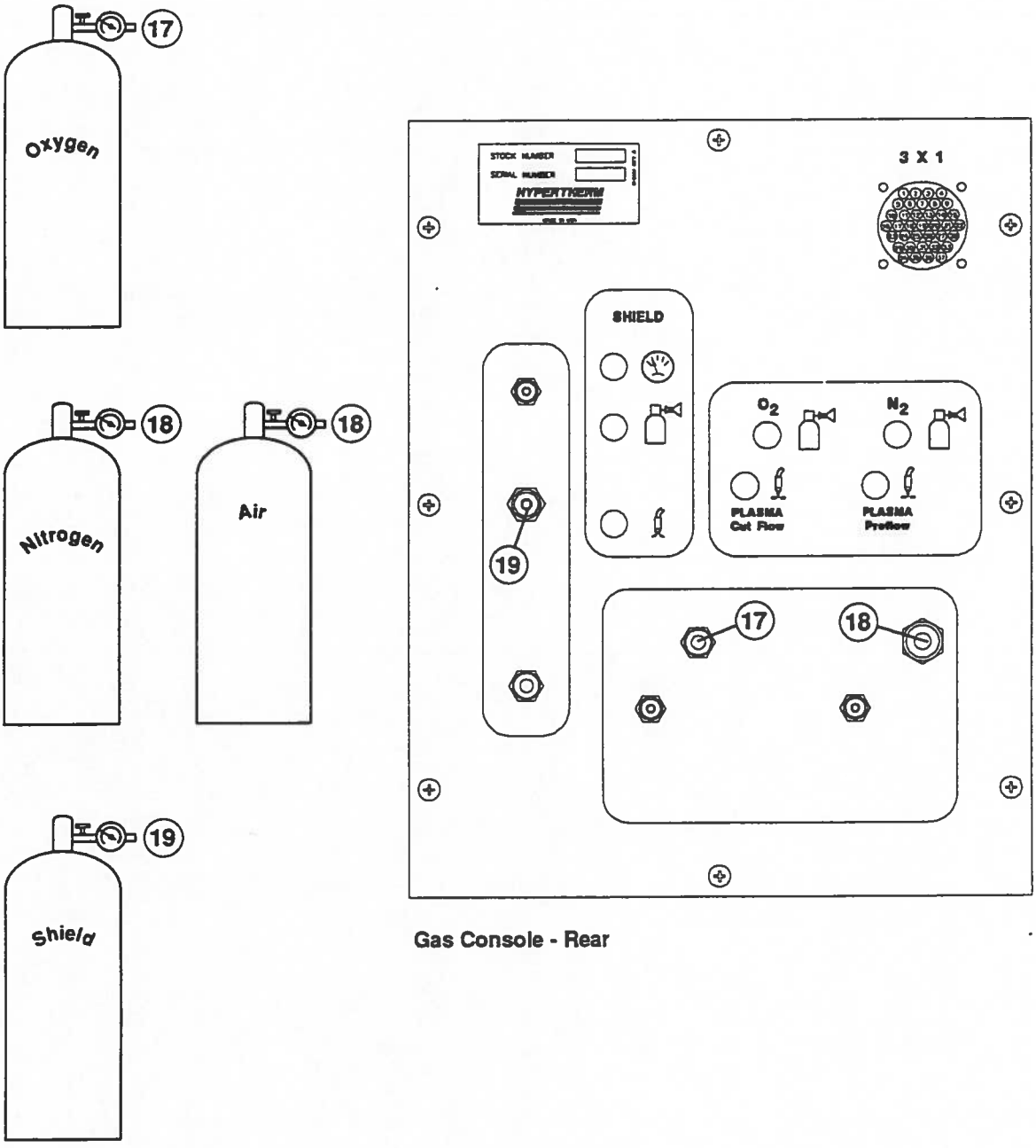
(18) ***Air Plasma Supply Hose*** **(Customer Supplied)** ***- Air Supply to Gas Console -***

Shield Gas Supplies

Any supply gases that will be used for the shield gas, attach to the same point on the gas console - see Fig. 4-14.

(19) ***Shield Gas Supply Hose - Shield Supply to Gas Console***

Part No.	Length	Part No.	Length
024043	4 ft (1.2 m)	024147	75 ft (23 m)
024341	10 ft (3 m)	024115	100 ft (30 m)
024342	20 ft (6 m)	024119	150 ft (46 m)
024133	25 ft (7.6 m)	024184	180 ft (55 m)
024012	50 ft (15 m)	024123	200 ft (61 m)

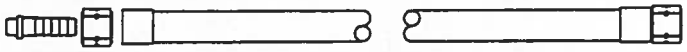


Gas Console - Rear

Figure 4-14 Gas Console Connections - Gas Console to Gas Supplies

GAS CONSOLE CONNECTIONS (cont.)

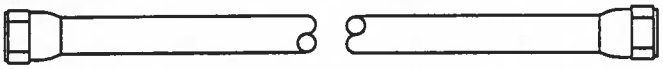
(20) *Shield Gas Hose - Gas Console to RHF Console*



Note: Turn counterclockwise to tighten

Part No.	Length	Part No.	Length
024313	10 ft (3 m)	024305	75 ft (23 m)
024302	15 ft (4.6 m)	024306	100 ft (30 m)
024303	25 ft (7.6 m)	024312	150 ft (46 m)
024304	50 ft (15 m)		

(21) *Shield Gas Sense Hose - Gas Console to RHF Console*



Part No.	Length	Part No.	Length
024061	5 ft (1.5 m)	024071	30 ft (9.1 m)
024063	10 ft (3 m)	024092	40 ft (12.4 m)
024065	15 ft (4.6 m)	024096	50 ft (15 m)
024067	20 ft (6.2 m)	024174	60 ft (18.2 m)
024069	25 ft (7.6 m)		

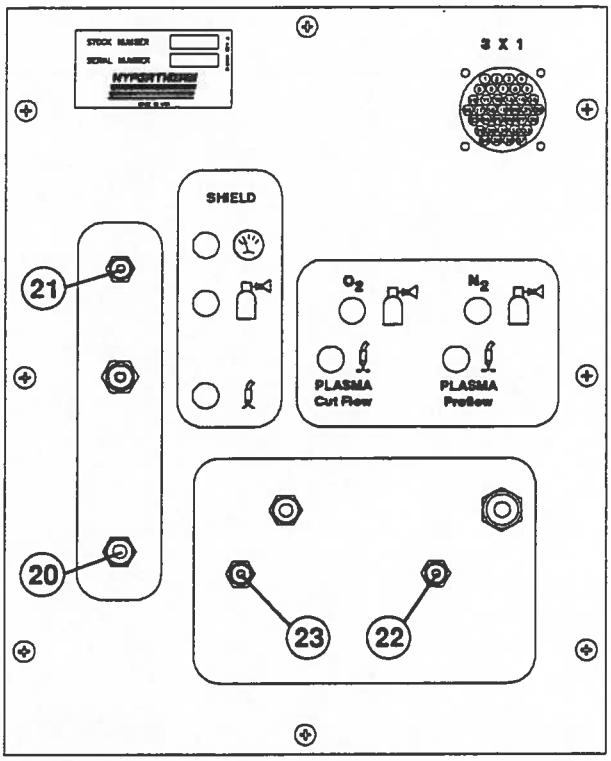
(22) *Plasma Preflow Gas Hosing - Gas Console to Motor Valve Console*

Part No.	Length	Part No.	Length
024317	5 ft (1.5 m)	024028	25 ft (7.6 m)
024026	10 ft (3 m)	024029	30 ft (9.1 m)
024253	12 ft (3.6 m)	024030	35 ft (10.6 m)
024027	15 ft (4.6 m)	024031	40 ft (12.4 m)
024017	20 ft (6.2 m)	024207	45 ft (13.8 m)

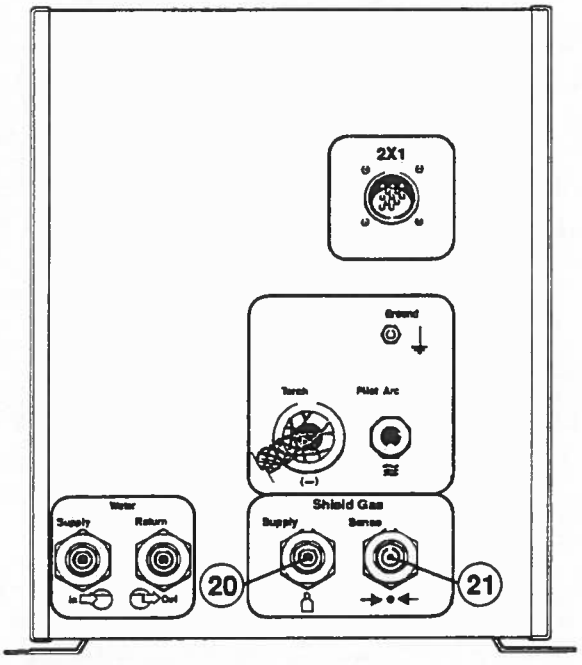
(23) *Plasma Cut Flow Gas Hosing - Gas Console to Motor Valve Console*

Note: Turn counterclockwise to tighten

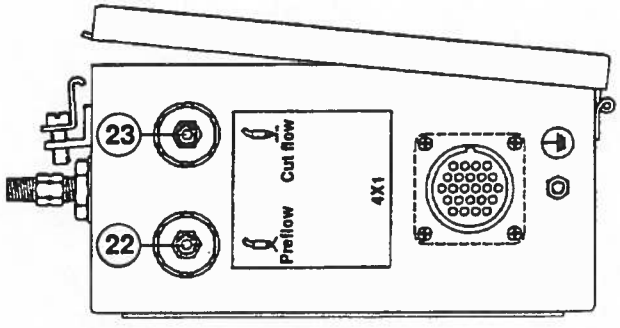
Part No.	Length	Part No.	Length
024316	5 ft (1.5 m)	024309	30 ft (9.1 m)
024307	10 ft (3 m)	024322	35 ft (10.6 m)
024320	15 ft (4.6 m)	024310	40 ft (12.4 m)
024308	20 ft (6.2 m)	024323	45 ft (13.8 m)
024321	25 ft (7.6 m)	024311	50 ft (15 m)



Gas Console - Rear



RHF Console - Rear



Motor Valve Console - Rear

Figure 4-15 Gas Console Connections - Gas Console to RHF and Motor Valve Consoles

RHF AND MOTOR VALVE CONSOLES TO TORCH CONNECTIONS

See pages 4-6 through 4-9 for RHF connections to power supply, and page 4-12 for motor valve console connection to power supply. See also page 4-26 for RHF and motor valve console connections to gas console.

Routing the Torch Leads

Prior to connecting the torch leads to the RHF console, motor valve console and torch, the torch leads must be routed between the cutting machine, RHF console, motor valve console and the torch. See Figure 4-2 for an example. You will generally need to route the leads through a festoon or a power track.

> Caution: Before routing the leads, **make sure the torch is removed from the torch leads.** Damage to the torch could result from dropping, banging, or scraping. Once the torch leads have been routed, proceed with torch connections.

Connecting the HF Torch Leads to the RHF Console

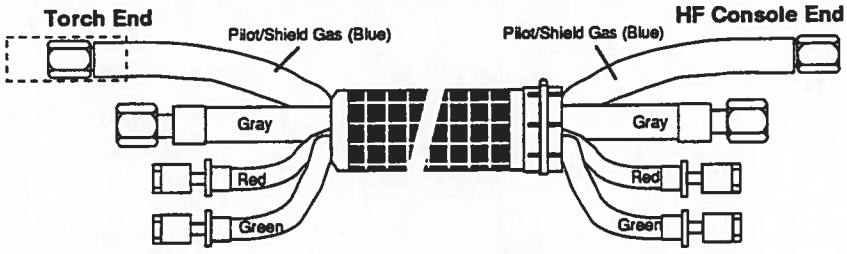
(24) ***Leads HT2000 Torch - HF Torch Leads to RHF Console - Fig. 4-16***

A. Route the HF torch leads through the **Torch Brass Fitting** on the RHF console and connect the **Torch Coolant Hose (w/ Red Band)** to the red fitting on the brass cathode block located in the RHF console. Tighten using a 1/2" open-end wrench.

B. Connect the **Torch Coolant Hose (w/ Green Band)** to the green fitting on the brass cathode block. Tighten using a 1/2" open-end wrench.

C. Connect the **Cap-On Sensor Hose (Gray)** to the adapter in the console.

D. Connect the **Pilot/Shield Gas Hose (Blue)** to the bulkhead adapter.



Part No.	Length	Part No.	Length
028657	10 ft (3 m)	028661	35 ft (10.6 m)
028658	15 ft (4.5 m)	028662	40 ft (12 m)
028659	20 ft (6 m)	028663	45 ft (13.7 m)
028546	25 ft (7.5 m)	028547	50 ft (15 m)
028660	30 ft (9 m)		

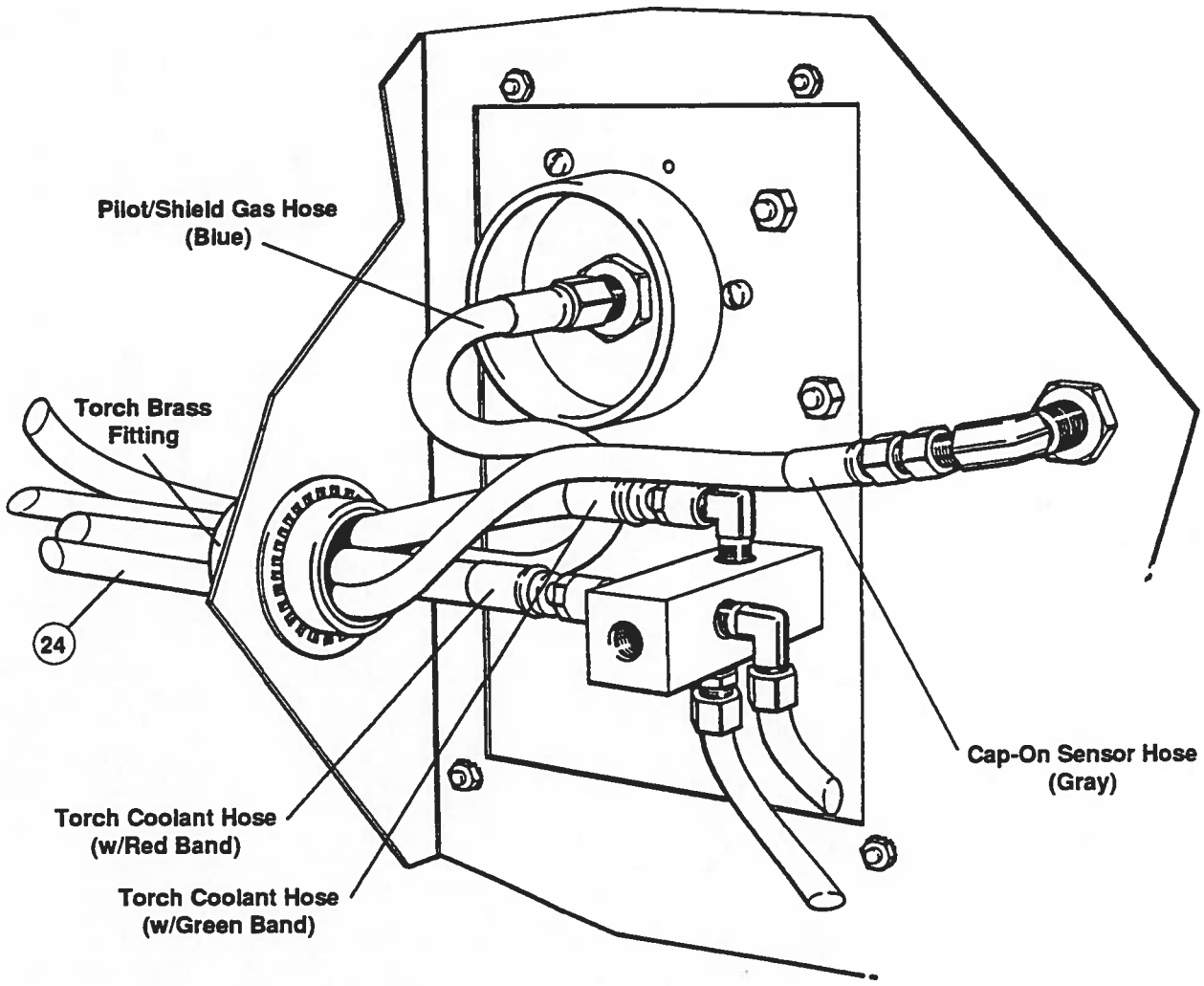


Figure 4-16 HF Torch Lead Connections in RHF Console

RHF AND MOTOR VALVE CONSOLES TO TORCH (cont.)

Connecting the HF Torch Leads to the Torch

(24) ***Leads HT2000 Torch - RHF Console to Torch (Fig. 4-17)***

A. If connected to the **Off-valve SA** (sub-assembly), remove the **12" Off-valve hose** from the **Off-valve SA**. Note that the fitting is left-hand threaded and turns in a clockwise direction to remove.

B. Slide the **Torch sleeve** over the RHF torch leads and out of the way.

C. With the red and green torch leads, use a 3/8" open-end wrench to hold the torch body fittings and a 1/2" open-end wrench to turn the torch lead fittings. Attach the leads to the **Red and Green tubes** of the **Torch main body.**

D. Attach the lead with the teflon tube (**Pilot/Secondary Gas (Blue)**) to the shortest tube (**Point 3**) on the torch main body. Use a 5/16" open-end wrench to hold the torch body fitting and a 7/16" open-end wrench to turn the torch lead fitting.

E. Finally, connect the gray torch lead hose to **Point 4** . Again, use a 5/16" open-end wrench to hold the torch body fitting and a 7/16" open-end wrench to turn the torch lead fitting.

Note: If the **12" Off-valve hose** is not connected to the torch, make the connection to **Point 5** (left-hand threaded connection) at this time. Use the same wrenches as in steps D&E.

F. Slide the **Torch sleeve** over the torch main body and screw together.

G. Connect the 12" hosing that extends beyond the end of the sleeve to the off-valve elbow connected to **Point 2** (left-hand threaded connection).

Connecting the Off-Valve Cable and Plasma Hose from the Torch to the Motor Valve Console

(25) ***Cable/Hose: Motor Valve Console to Torch (Fig. 4-17)***

A. Connect the **Plasma Hose** from the **Off-valve SA** to the **Plasma Flow** connector on the motor valve console.
Note that the fitting is left-hand threaded and is turned in a counterclockwise direction to tighten.

B. Connect the **Torch Off-Valve Cable** from the **Off-valve SA** to the **4X2** connector on the motor valve console.

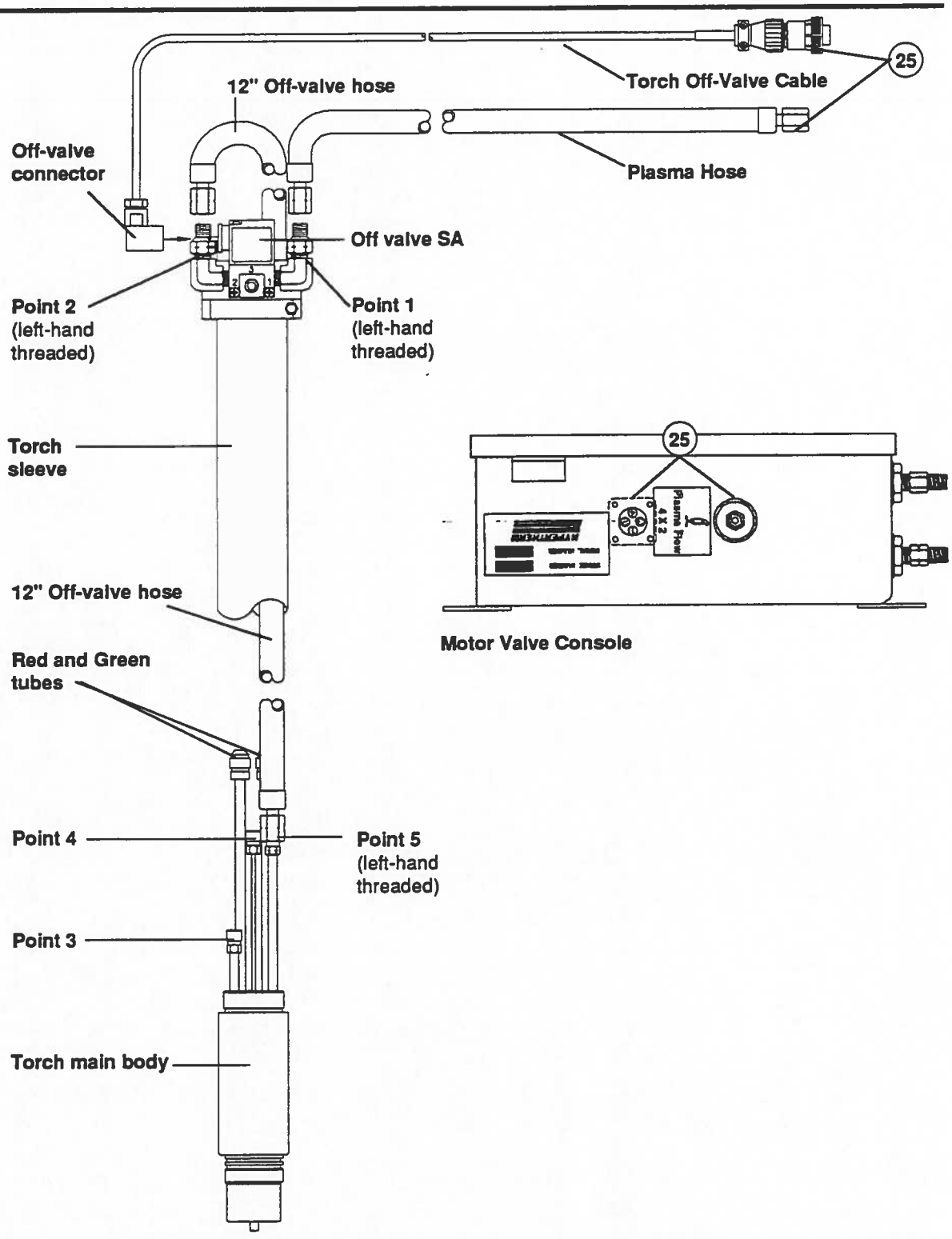
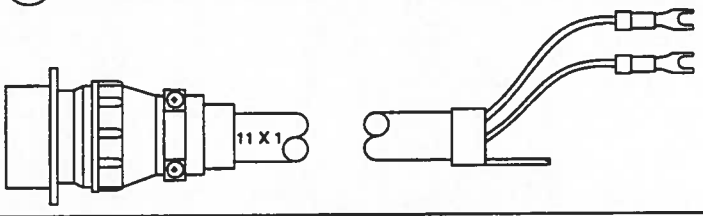


Figure 4-17 HT2000 Machine Torch Connections

OPTIONAL POWER SUPPLY CONNECTIONS

Timer/Counter to Power Supply

(26) ***Timer/Counter cable - Power Supply to Timer/Counter***



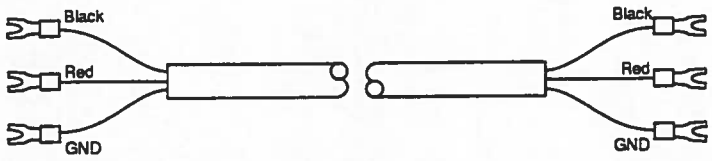
From Timer/Counter 11X1	To HT2000 TB3	Color	Function
1	2	White	Starts & Arc time (CON1 Closed)
2	1	Black	Starts & Arc time (CON1 Closed)
3	3	Drain	Drain
15	5	Red	Error Counter (Ramp Down Error)
16	4	Black	Error Counter (Ramp Down Error)
12	6	Drain	Drain

Part No.	Length	Part No.	Length
023687	10 ft (3 m)	023694	75 ft (23 m)
023692	25 ft (7.6 m)	023695	100 ft (30 m)
023758	38 ft (12 m)	023696	150 ft (46 m)
023693	50 ft (15 m)		

Hold Cable Connections (When using Multi-Torch Systems)

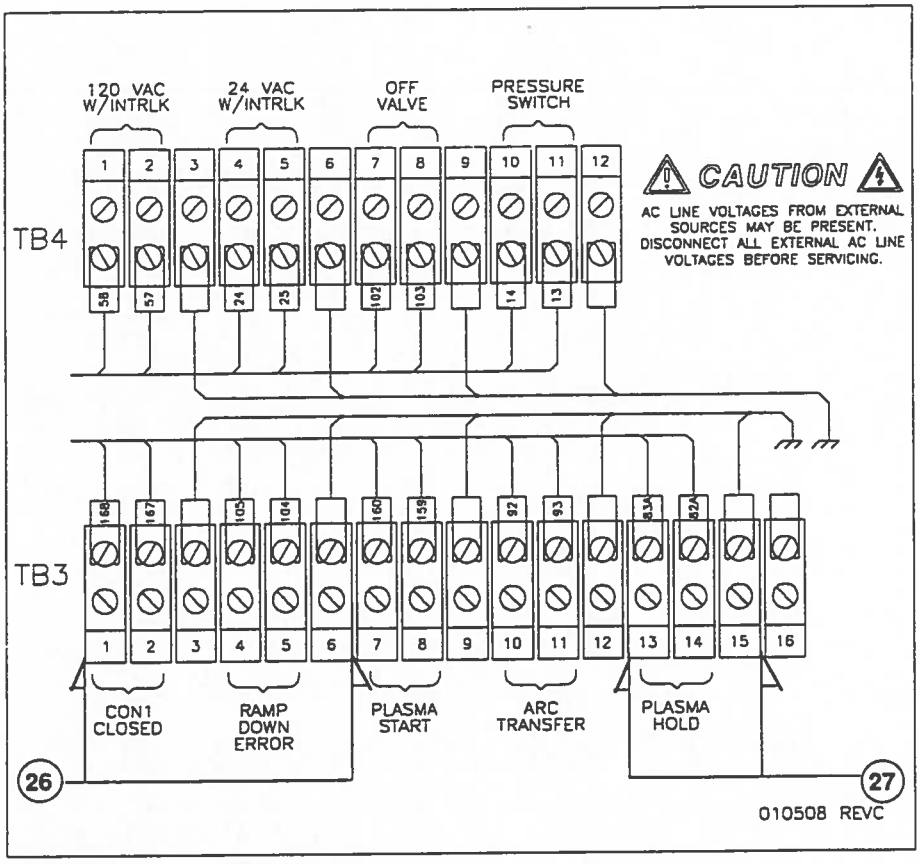
If a multi-torch system is being used (more than one power supply), make the following connections at both power supplies:

(27) ***Hold Cable Connections - Power Supply 1 to Power Supply 2***

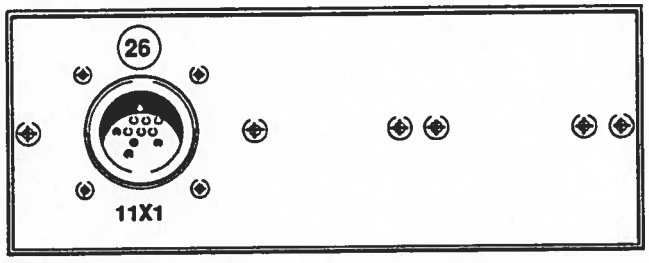


Legend - To HT2000 TB3 - Both Ends			
Wire	Color	To HT2000 TB3	Function
-	Black	13	Hold Signal
-	Red	14	Hold Common
GND	Shield	15	Hold Shield

Part No.	Length
023340	15 ft (4.5 m)
023341	25 ft (7.6 m)
023342	50 ft (15 m)
023343	100 ft (30 m)
023344	150 ft (46 m)



Power Supply - Inside Rear



Timer/Counter - Rear

Figure 4-18 Timer/Counter Cable Connections / Hold Cable Connections

Argon-Hydrogen Connections

See **Section 7**: Operation: Argon-Hydrogen Manifold.

MOUNTING THE MACHINE TORCH

1. Loosen **Securing screw(s)** and install the machine torch (with torch leads attached) in the torch mounting bracket or the torch mounting subassembly if IHS is used. See Figure 4-19 for **Torch mounting bracket 029334** with IHS, and Figure 4-20 for **Torch mounting bracket 020522.**

2. Position the torch until the torch body extends all the way through the bracket, so that the bracket is now around the plastic **Torch sleeve** and not touching the stainless steel torch body. Position the torch approximately .25 " (6mm) from the work surface.

3. Tighten the securing screw(s). Final adjustment of the torch height is detailed in **Section 5: Post-Installation.**

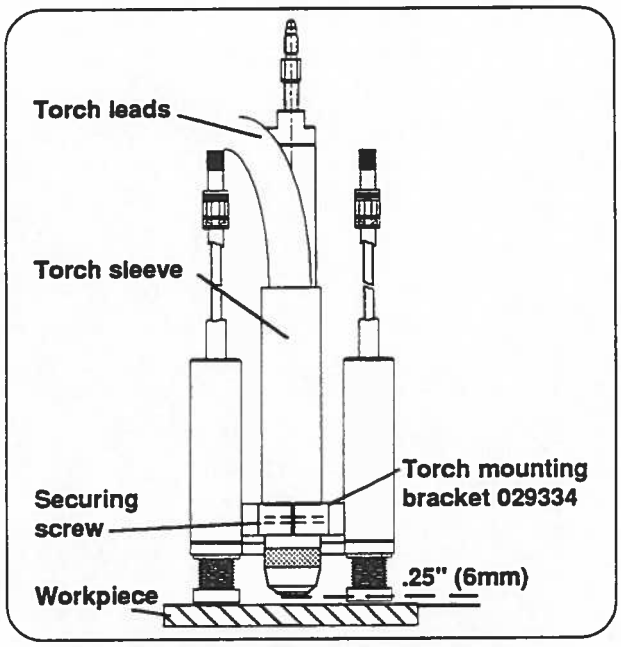


Figure 4-19 Mounting the Machine Torch (shown with IHS probes)

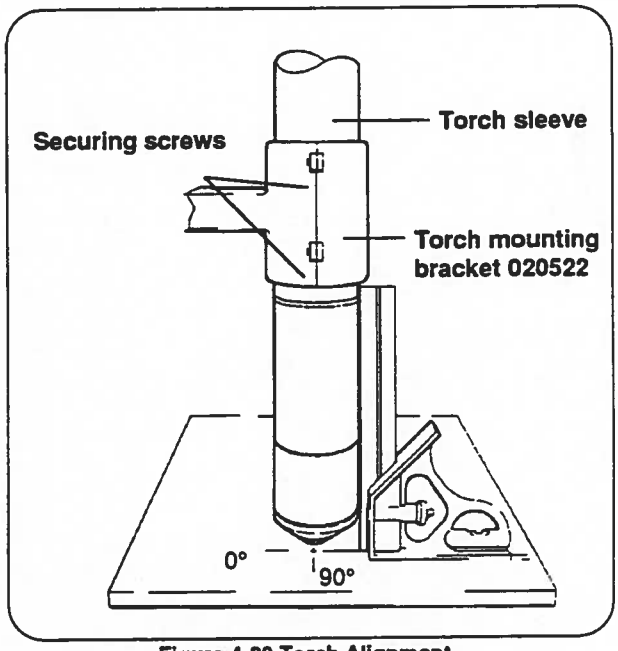


Figure 4-20 Torch Alignment (shown without IHS probes)

Torch Alignment

Prior to cutting with the machine torch, ensure that the torch is at right angles to the workpiece to get a clean, vertical cut. Use a square to align the torch. The torch should be aligned at 0° and 90°. (Figure 4-20)

Section 5 POST-INSTALLATION

In this section:

POST-INSTALLATION

INTRODUCTION

Prior to operating the HT2000, perform a post-installation system checkout to ensure that the pre-installation and installation requirements and connections are correct, and to make any necessary final adjustments before actual production cutting begins.

Before proceeding with the system checkout:

- Ensure that your cutting environment and that your clothing meet the safety requirements outlined in the **Safety** section of this manual.
- Be certain that all pre-installation and installation requirements have been met. Refer to Section 3 **Pre-Installation** and Section 4 **Installation** in this manual.

SYSTEM CHECKOUT

The following procedure assumes the HT2000 system includes an IHS system, and a Digital Remote (DR) V/C control module. Refer to Figure 5-1.

Set Switches and Check Torch

1. Ensure that the unit switches listed below are positioned as follows:

   The main disconnect switch for the power supply is set to **Off.**

   The **Test Preflow/Run/Test Cut Flow** toggle switch on the gas console is set to **Run.**

2. Ensure that the proper consumables are installed in the torch. Refer to the *Cut Charts* in **Section 6** to choose the correct consumables for your cutting needs. See also *Changing Consumable Parts* in **Section 6.**

3. Ensure that the torch is squared to the material. Refer to **Section 4** for the torch alignment procedure.

Turn Gases On

4. Set the plasma gas select switch on the gas console to **N_2/Air** or **O_2.**

5. Turn the required supply gases **On.**

   - When using **oxygen, nitrogen,** or **argon-hydrogen** as the **plasma gas,** adjust supply regulator to read **120 psi (8.3 bar).**

     When using **air** as the **plasma gas,** adjust supply regulator to read **90 psi (6.2 bar).**

   - Adjust supply regulator for **shield gas** to read **90 psi (6.2 bar).**

Turn Power Supply On and Adjust Voltage/Current

6. Set the main disconnect switch for the power supply to the **On** position and depress the **POWER ON (1)** button on the power supply.
   Ensure the green **POWER ON** indicator on the power supply lights.

7. Set the **VOLTAGE** and **CURRENT** on the DR V/C module. Select the arc current and arc voltage from the *Cut Charts* in **Section 6** for the type and thickness of metal to test cut.

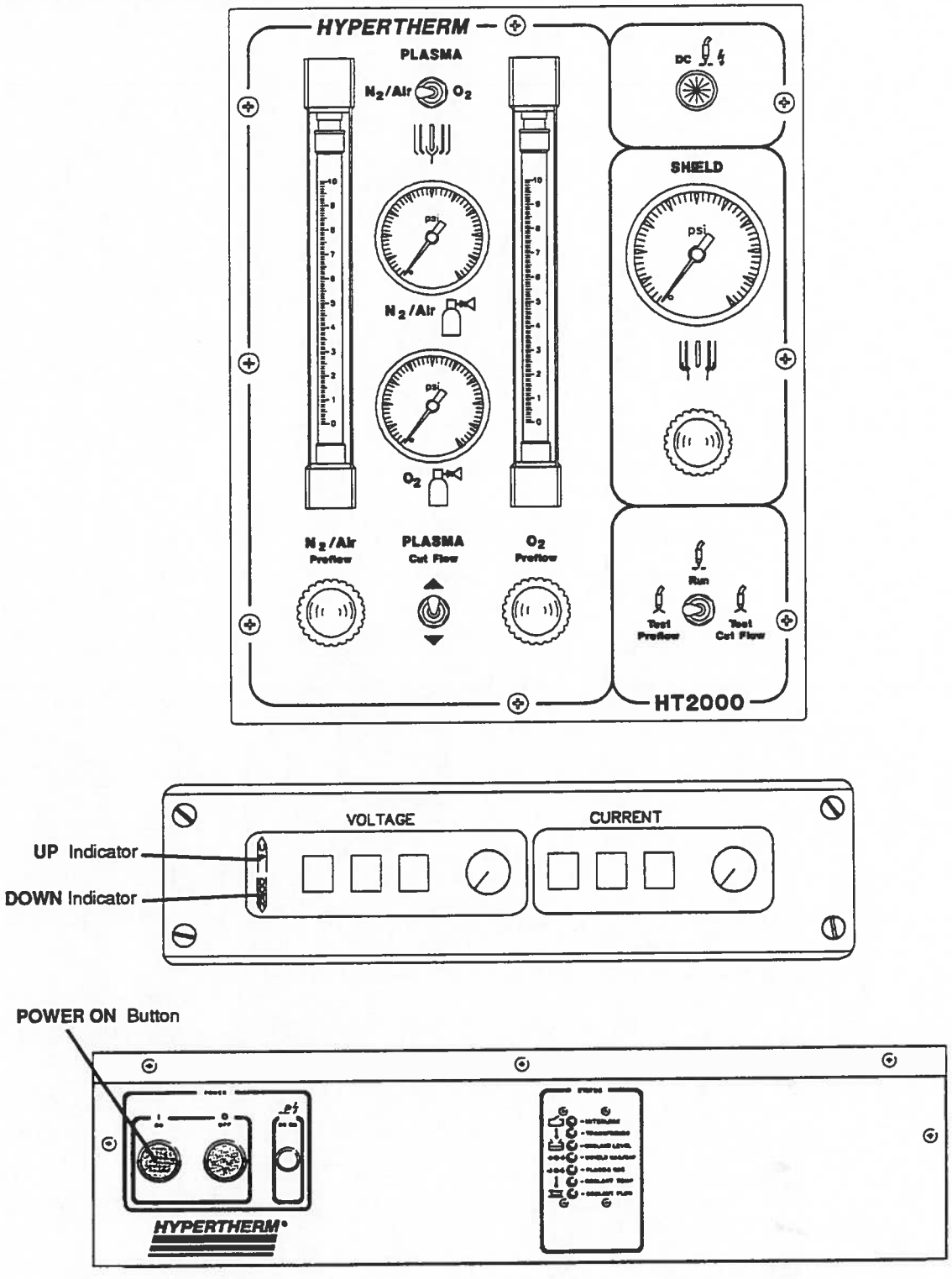


Figure 5-1 Controls and Indicators for System Checkout

Adjust Preflow Gases

8. Set the **Test Preflow/Run/Test Cut Flow** toggle switch to **Test Preflow** . Verify that the plasma gas pressure gauges on the gas console both read 120 psi (8.3 bar).

9. Look at the oxygen and/or nitrogen-air flowmeters and set the **Preflow** plasma gas flow rate % by referring to the *Cut Charts* in **Section 6** and turning the oxygen and/or nitrogen-air **Preflow** adjust knobs.

10. Look at the shield gas pressure gauge on the gas console, and set to the *Cut Chart* specifications by turning the shield gas adjust knob.

Adjust Cut Flow Gases and Check Initial Height Sensing (IHS)

11. Set the **Test Preflow/Run/Test Cut Flow** toggle switch to **Test Cut Flow.**

12. Look at the oxygen and/or nitrogen-air flowmeters and set the **Cut Flow** plasma gas flow rate % by referring to the *Cut Charts* in **Section 6.** Use the **Cut Flow** toggle switch to set the plasma gases in this mode.

13. Set the switch to **Run** after setting the preflow and plasma flow rates.

14. Check the pilot arc operation by positioning the torch a **minimum of 3 inches (75mm)** above the work.

15. Depress the **START** button. After two seconds of gas preflow, the primary contactor will close and the pilot arc will start. The pilot arc should emit a steady, hissing sound and a cone of light should appear at the face of the torch nozzle. The pilot arc will continue for approximately two seconds and then go out automatically.

16. Place the metal on the work table to make a test pierce. With manual starting, no machine motion will occur.

    Note: The cutting machine must retract the torch at least one inch (25.4 mm) from the work before the start cycle, or probes may hit the workpiece when **START** button is depressed.

17. Depress the **START** button. The probes will immediately descend and approximately 0.5 seconds later, the torch will index toward the work. The **DOWN** indicator light on the V/C control should be on. When the torch nears the work, probes will inductively detect work surface and down motion should stop. The **DOWN** indicator light on the V/C module will go off and the probes will start to retract.

    At this point, depress the **STOP** button and disable the Initial Height Sensing. You are now ready for Final Torch Adjustment.

Final Torch Adjustment (Fig. 5-2)

18. Make a reference mark on the top and bottom of the **Torch sleeve** where it meets the **Torch mounting bracket**.

19. Loosen the **Securing screw** on the **Torch mounting bracket** and position the torch higher in the mounting bracket until the arc will not transfer when the **START** button is depressed.

20. Once reaching this position, slowly lower the torch in 1/16" (1.6 mm) increments until the arc transfers after the **START** button is depressed. This should be the highest point from the workpiece that the arc will still transfer.
    Tighten the **Securing screw** at this position.

21. Enable the Initial Height Sensing and press the **START** button. Once the arc transfers and the machine delay time has elapsed, the metal should be pierced. Press the **STOP** button to terminate the plasma arc. Observe that the **UP** indicator lights and the torch retracts to the upper limit switch.

22. Disable the Initial Height Sensing.

Check Torch Height Control (THC) and V/C Module

23. Angle the workpiece on the work table (one end higher than the other) to check the auto height (torch height control) mode. Position the torch at the highest point on the workpiece. Program a square cut pattern into the controller. (See controller instruction manual.)

24. Enable the Auto Height Control for the THC.

25. Manually lower the torch to approximately .25 inches (6mm) above the workpiece.

26. Start the arc transfer from the controller.

27. When the arc transfers and the machine delay time has elapsed, the workpiece should be pierced and machine motion will start. As the torch travels from a high point to a low point, note that the torch stand-off distance from the workpiece should remain constant, and that the **DOWN** indicator lights on the DR V/C module.

    As the torch travels from a low point to a high point, note that the torch stand-off distance from the workpiece should remain constant and that the **UP** indicator lights on the DR V/C module.

    As the torch makes a corner cut, the machine motion speed should remain constant and the **UP** and **DOWN** indicators do not light. Machine motion and

plasma arc will automatically stop when the cut is complete.

The system is now operational.

If the system does not function as outlined in this procedure, recheck the pre-installation requirements and installation directions in this manual. If all pre-installation and installation directives have been followed and you are still experiencing difficulty with the system, feel free to call Hypertherm's Field Service group at 1-800-643-9878.

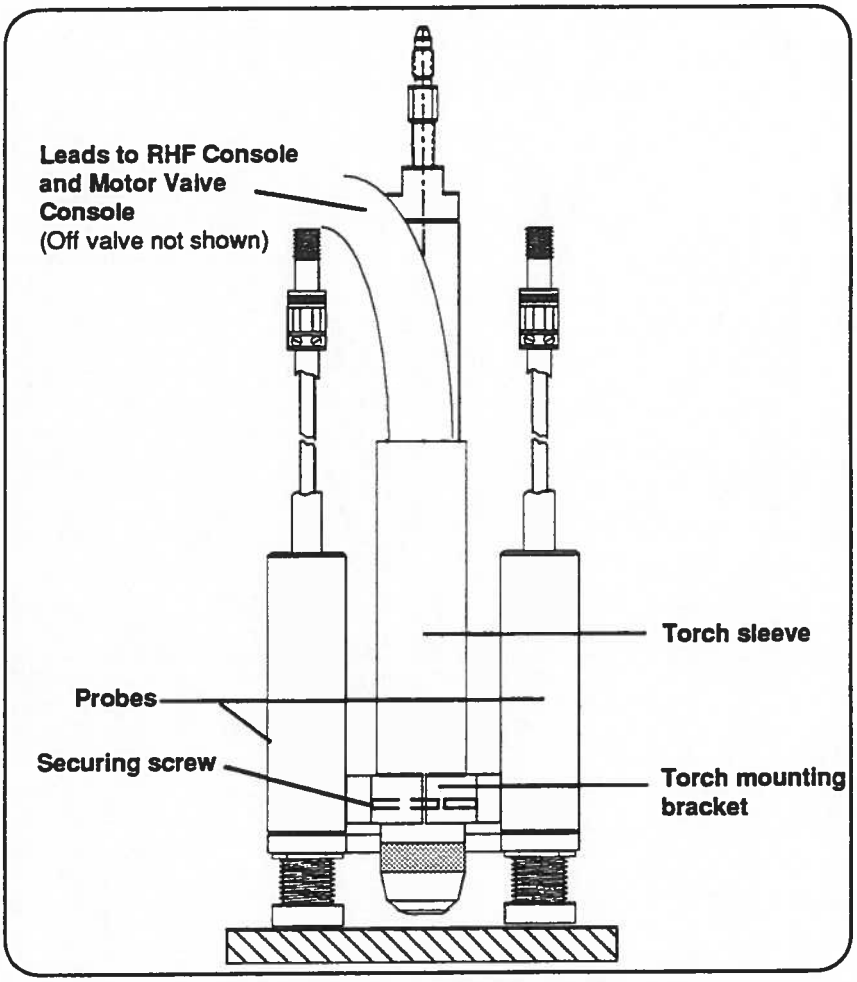


Figure 5-2 Torch with inductive probes

Section 6 OPERATION

In this section:

OPERATION

FRONT PANEL CONTROLS AND INDICATORS

HT2000 Power Supply (Fig. 6-1)

POWER

- **ON (1)** Pushbutton/indicator switch
  Activates the power supply and its control circuits. Indicator lights when power up is complete.

- **OFF (0)** Pushbutton switch
  Shuts the power supply down.

- **DC ON** Indicator
  Lights when main contactor closes, indicating DC power is being supplied to the torch.

STATUS

- **INTERLOCK** LED
  When lit, indicates that the RHF console door is engaged.

- **TRANSFORMER** LED
  When lit, indicates that the main transformer is operating at a temperature less than 165°C.

- **COOLANT LEVEL** LED
  When lit, indicates that the coolant level is adequate.

- **SHIELD GAS/CAP** LED
  When lit, indicates that the shield gas pressure is adequate, and that the cap is installed properly on the torch.

- **PLASMA GAS** LED
  When lit, indicates that the plasma gas is adequate.

- **COOLANT TEMP** LED
  When lit, indicates that the torch coolant temperature is less than 160°F.

- **COOLANT FLOW** LED
  When lit, indicates that the coolant flow from the torch is adequate.

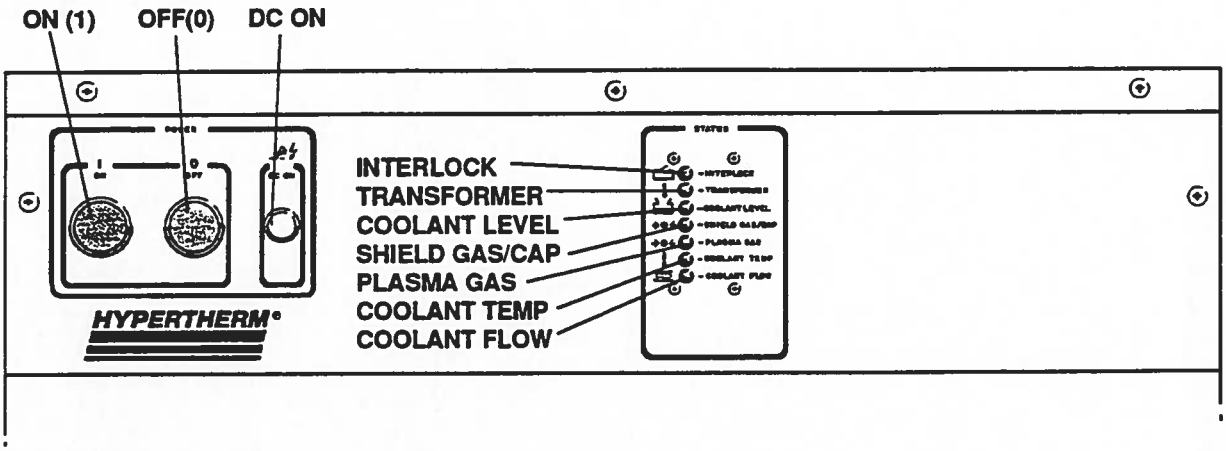


Figure 6-1 HT2000 Power Supply Front Panel Controls and Indicators

FRONT PANEL CONTROLS AND INDICATORS (Cont.)

Gas Console (Fig. 6-2)

- **N_2 Air / O_2** Toggle Switch **(S1)**
  Selects the use of either nitrogen, air or oxygen as the plasma cutting gas.

- **N_2 / Air** Pressure Gauge **(PG1)**
  Indicates the nitrogen or air plasma inlet pressure. Gas inlet pressures are specified in *Cut Charts* on pages 6-14 to 6-48.

- **N_2 / Air** Flowmeter **(FM1)**
  Indicates the percentage rate of nitrogen or air plasma gas flow. Nitrogen or air flow rate % is specified in *Cut Charts*.

- N_2 / Air **Preflow** Metering Valve **(MV2)**
  Adjusts nitrogen or air plasma gas flow rate % while in **Test/Preflow** mode. Preflow plasma gas flow rate percentages are specified in *Cut Charts*.

- **O_2** Pressure Gauge **(PG2)**
  Indicates the oxygen plasma inlet pressure. Gas inlet pressures are specified in *Cut Charts*.

- **O_2** Flowmeter **(FM2)**
  Indicates the percentage rate of oxygen plasma gas flow. Oxygen flow rate % is specified in *Cut Charts*.

- O_2 **Preflow** Metering Valve **(MV1)**
  Adjusts oxygen plasma gas flow rate % while in **Test/Preflow** mode. Preflow plasma gas flow rate percentages are specified in *Cut Charts*.

- **PLASMA Cut Flow** Switch **(S3)**
  Adjusts nitrogen, air or oxygen plasma gas flow rate % while in **Test Cut Flow** mode. Cut Flow plasma gas flow rate percentages are specified in *Cut Charts*.

- **Test Preflow/Run/Test Cut Flow** Toggle Switch **(S2)**

  Test Preflow - This test position is used when setting the plasma preflow flow rate on the flowmeter. In this position the contactor is disabled, so that current is not delivered to the electrode and the arc cannot be fired.

  Test Cut Flow - This test position allows the selected plasma gas flow rate to be adjusted on the flowmeter for cutting conditions. In this position also, the contactor is disabled so that current is not delivered to the electrode and the arc cannot be fired.

  Run - This position enables the contactor and the subsequent firing of the arc after the gas rates have been set in the **Test Preflow** and **Test Cut Flow** positions.

- **Shield** Pressure Gauge **(PG3)**
  Indicates shield gas pressure at the torch.

- **Shield** Gas Metering Valve **(MV4)**
  Adjusts shield gas pressure to the torch.

- **DC** Light **(LT1)**
  Lights when main contactor closes, indicating DC power is being supplied to the torch.

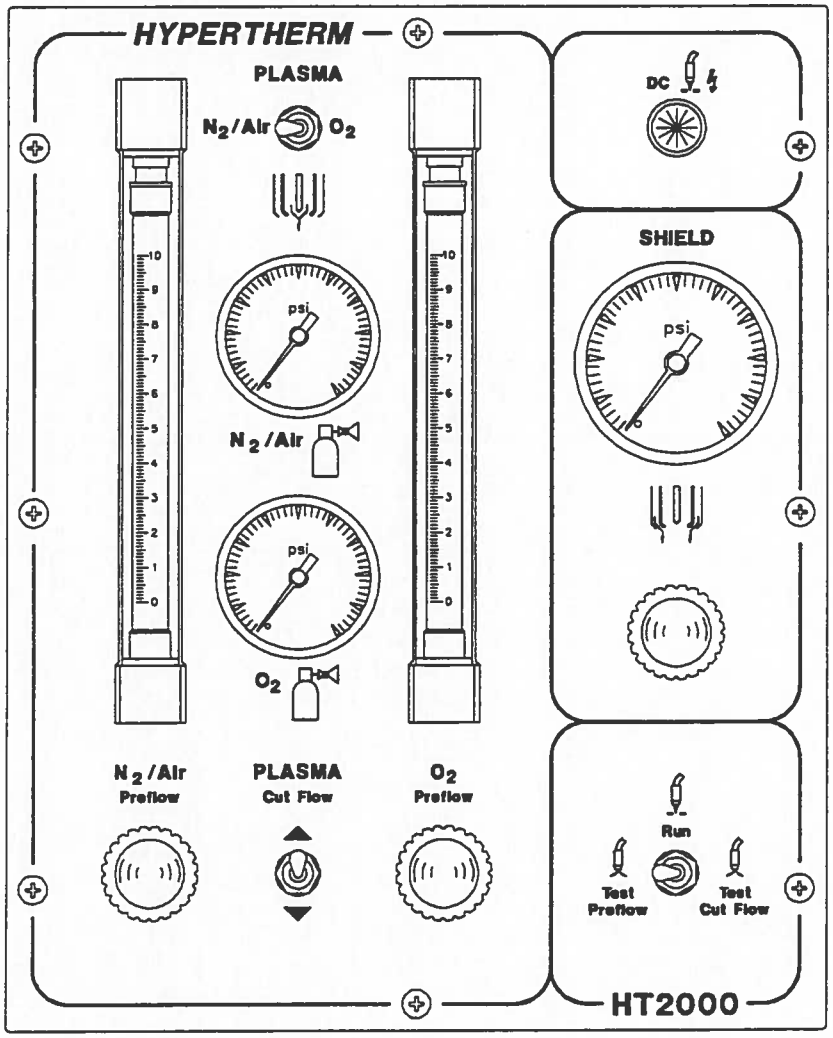


Figure 6-2 Gas Console Front Panel Controls and Indicators

FRONT PANEL CONTROLS and INDICATORS (Cont.)

Digital Remote (DR) V/C Module (Fig. 6-3)

- **VOLTAGE Adjust Pot**
  Adjusts the cutting arc voltage from 100 to 200 volts. Values are chosen from the *Cut Charts* and depend on the type of metal to cut, and metal thickness.
- **VOLTAGE** LEDs
  Displays cutting voltage.
- **CURRENT Adjust Pot**
  Adjusts the cutting arc current from 40 amps to 200 amps. Values are chosen from the *Cut Charts* and depend on the type of metal to cut, and metal thickness.
- **CURRENT** LEDs
  Displays cutting current.
- **UP / DOWN** LEDs
  Indicates that torch height is being adjusted up or down.

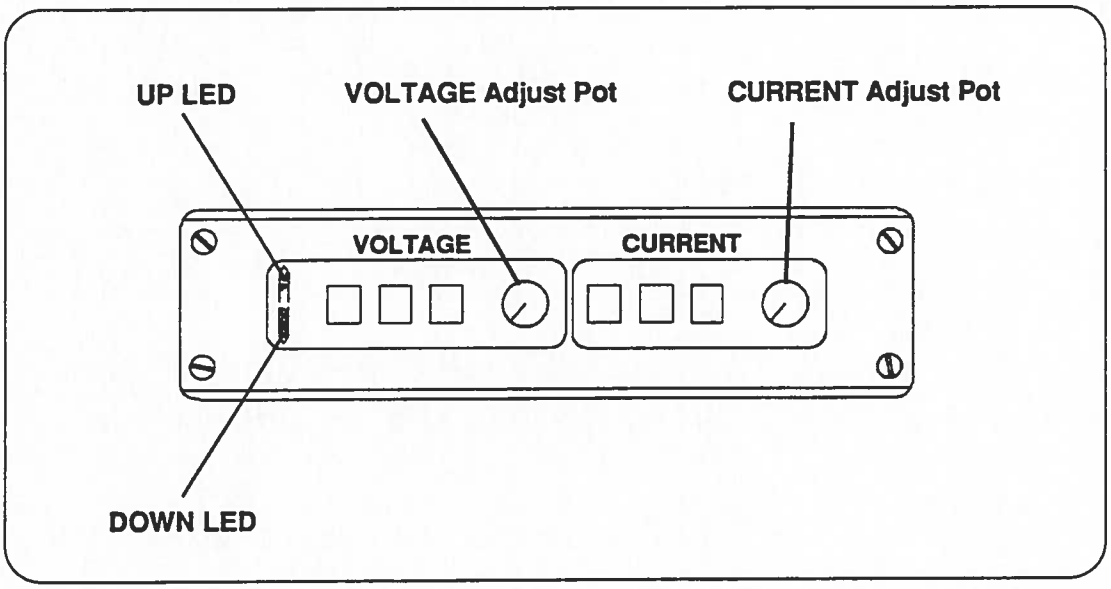


Figure 6-3 Digital Remote (DR) V/C Front Panel Controls and Indicators

Programmable Remote (PR) V/C Module (Fig. 6-4)

- **VOLTAGE** LEDs
  Displays cutting voltage during cut sequence.
- **CURRENT** LEDs
  Displays cutting current during cut sequence.
- **UP / DOWN** LEDs
  Indicates that torch height is being adjusted up or down.

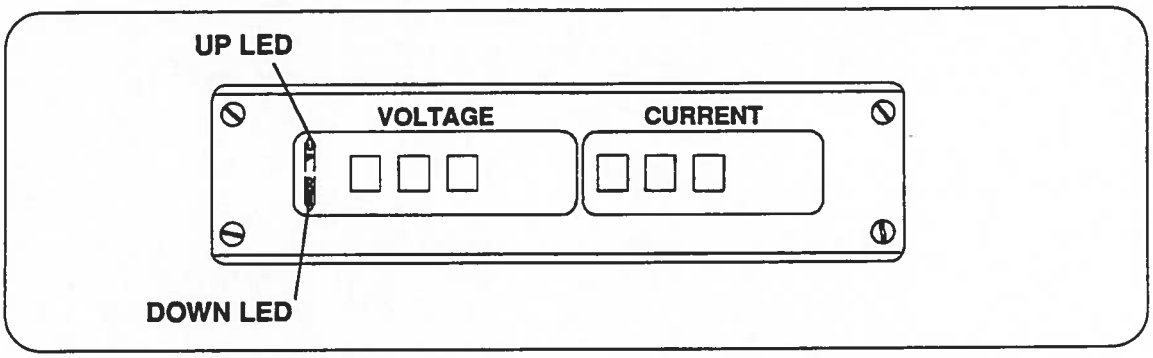


Figure 6-4 Programmable Remote (PR) V/C Front Panel Indicators

Timer / Counter (Fig. 6-5)

- **STARTS** LCD Counter (w/Reset)
  Indicates the number of arc starts
- **ARC TIME** LCD Counter
  Indicates the cumulative time that the arc is on in hours.
- **ERRORS** LCD Counter (w/Reset)
  Indicates the number of times that the arc cut cycle ended before the programmed current ramp-down time had elapsed.
  This reading provides a direct correlation to the long-life operation of the electrode; the higher the reading, the shorter the electrode life.

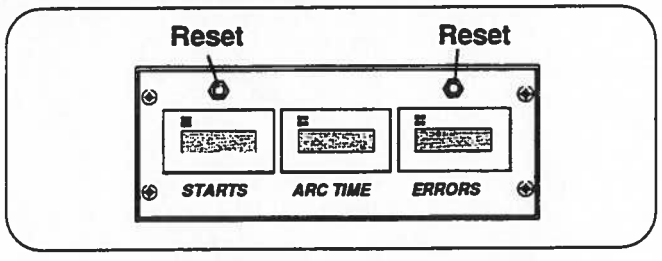


Figure 6-5 Timer / Counter

NOISE LEVELS (DECIBELS)

Decibels experienced by an operator standing 10 feet from the torch in a confined area (see dimensions below) under varied setup conditions while cutting one-inch mild steel using oxygen at a travel rate of 20 inches per minute..

- Above water 6" without Water Muffler @ 10 feet - 106 dbs
- Above water 6" with Water Muffler @ 10 feet - 104 dbs
- Water at bottom of plate without Water Muffler @ 10 feet- 100 dbs
- Water at bottom of plate with Water Muffler @ 10 feet- 95 dbs
- Water 3" over plate without Water Muffler @ 10 feet- 75 dbs
- Water 3" over plate with Water Muffler @ 10 feet- 72 dbs

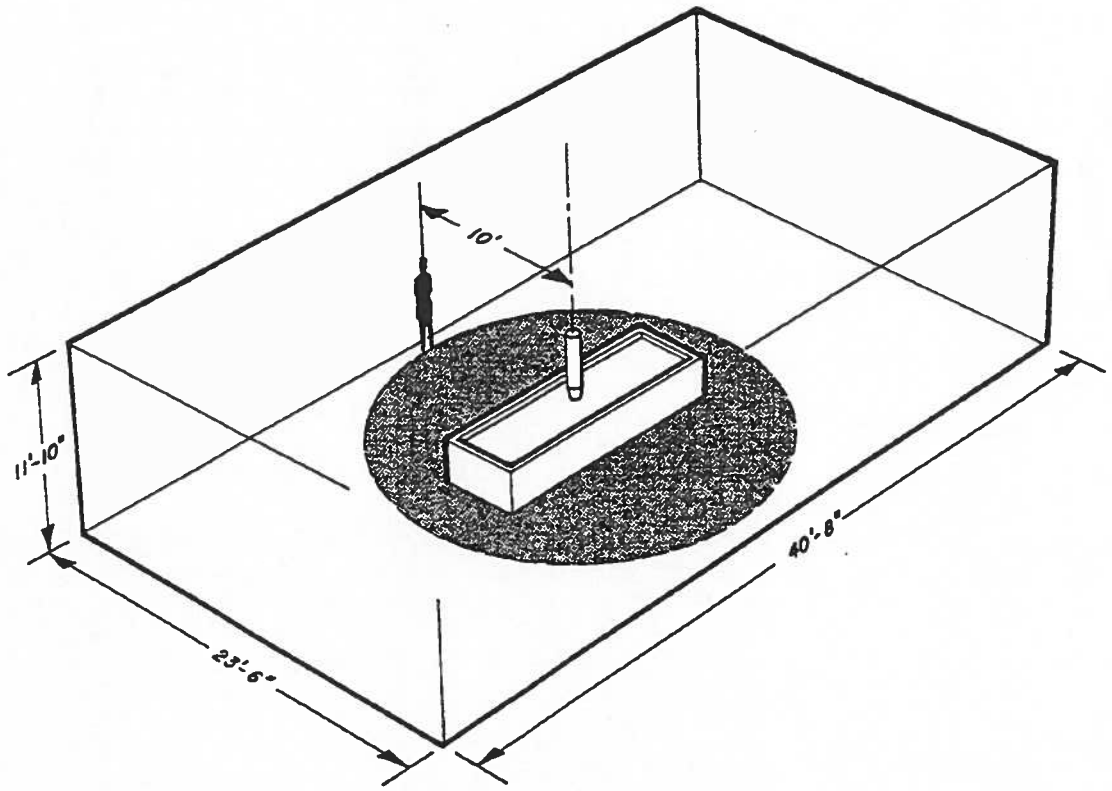


Figure 6-6 Noise Levels (Decibels)

DAILY START-UP

Prior to start-up, ensure that your cutting environment and that your clothing meet the safety requirements outlined in the *Safety* section of this manual. If problems occur during start-up, refer to **Section 5** for the system checkout requirements.

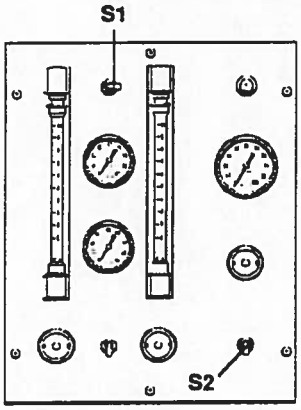
WARNING

Before operating this system, you must read the *Safety* section thoroughly! Turn main disconnect switch to the HT2000 power supply OFF before proceeding with the following steps

Note: For operation with argon-hydrogen manifold, see ***Section 7 Operation: Argon-Hydrogen Manifold***

Check Torch

1. Remove the consumables from the torch and check for worn or damaged parts. **Always place the consumables on a clean, dry, oil free surface after removing. Dirty consumables can cause the torch to malfunction.**
   - Check the pit depth of the electrode using the electrode gauge assembly. The electrode should be replaced when the depth exceeds .044 inch (1.1 mm).
   - Wipe the current ring in the torch with a clean paper towel or Q-tip (see Figure 6-7).
   - Refer to the *Cut Charts* on pages 6-14 through 6-48 to choose the correct consumables for your cutting needs.
2. Replace consumable parts. Refer to the *Changing Consumable Parts* section later in this manual for detailed information on replacing consumables.
3. Ensure that the torch is squared to the material. Refer to **Section 4**: Installation for the torch alignment procedure.



Turn Gases On

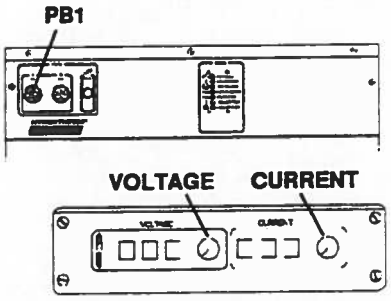
4. Set **S2** toggle switch on the gas console to **Run.**
5. Set **S1** on the gas console to **N_2/Air** (for nitrogen or air as plasma gas), or **O_2** (for oxygen as plasma gas).
6. Turn the required supply gases **On.**

- When using **oxygen, nitrogen, or argon-hydrogen** as the **plasma gas**, adjust supply regulator to read **120 psi (8.2 bar)**.

  When using **air** as the **plasma gas**, adjust supply regulator to read **90 psi (6.2 bar)**.

- Adjust supply regulator for **shield gas** to read **90 psi (6.2 bar)**.

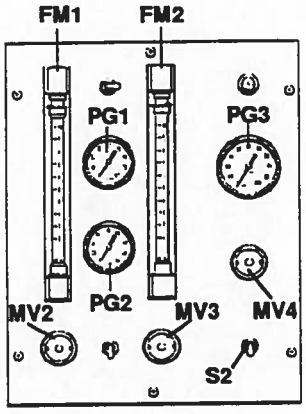
Turn Power Supply On and Adjust Voltage/Current



7. Turn main disconnect switch ON.

8. Turn on the power supply by depressing the **POWER ON (1)** button **(PB1)** on the HT2000 power supply. Ensure that the green **POWER ON** indicator lights. If the **POWER ON** light fails to come on, see **Section 4**: Installation for proper setup.

9. Set the **VOLTAGE** and **CURRENT** on the DR V/C module. Select the arc current and arc voltage from the *Cut Charts* on pages 6-14 through 6-48 for the type and thickness of metal to be test cut.



Adjust Preflow Gases

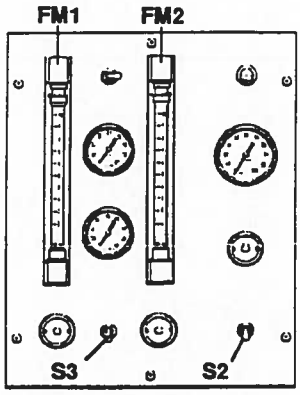
10. Set **S2** on the gas console to **Test Preflow.** Verify that the plasma gas pressure gauges **(PG1, PG2)** on the gas console both read 120 psi (8.2 bar).

11. Look at the oxygen **(FM2)** and/or nitrogen-air **(FM1)** flowmeters on the gas console and set the **Preflow** plasma gas flow rate % by referring to the *Cut Charts* and turning the oxygen **(MV3)** and/or nitrogen- air **(MV2)** preflow flowmeter adjust knobs.

12. Look at the shield gas pressure gauge **(PG3)** on the gas console, and set to the *Cut Chart* specifications by turning the shield gas adjust knob **(MV4)**.

Note: If you have changed consumable parts or if the power supply has been off for more than one hour, purge gas lines by leaving system in **Test Preflow** for one minute.

Adjust Cut Flow Gases and Prepare for Cutting



13. Set **S2** on the gas console to **Test Cut Flow.**

14. Look at the oxygen (**FM2**) and/or nitrogen-air (**FM1**) flowmeters on the gas console and set the **Cut Flow** plasma gas flow rate % by referring to the *Cut Charts* and toggling the **Cut Flow** switch (**S3**) up or down.

Note: If you have changed consumable parts or if the power supply has been off for more than one hour, purge gas lines by leaving system in **Test Cut Flow** for one minute.

15. Set **S2** to **Run** after the test preflow and test operate flow rates have been set.

The system is now ready for operation.

COMMON CUTTING FAULTS

- Torch pilot arc will initiate, but will not transfer. Cause can be:
  1. Work cable connection on cutting table not making good contact.
  2. Malfunction in HT2000 system. See **Section 8.**
- The workpiece is not totally penetrated, and there is excessive sparking on top of the workpiece. Causes can be:
  1. Current is set too low (check *Cut Chart* information).
  2. Cut speed is too high (check *Cut Chart* information).
  3. Torch parts are worn (see *Changing Consumable Parts*).
  4. Metal being cut is too thick.
- Dross forms on the bottom of the cut. Causes can be:
  1. Cutting speed is too slow or too fast (check *Cut Chart* information).
  2. Arc current set too low (check *Cut Chart* information).
  3. Torch parts are worn (see *Changing Consumable Parts*).
- Cut angle not square. Causes can be:
  1. Wrong direction of machine travel.

     High quality side is on the right with respect to the forward motion of the torch.

2. Torch-to-work distance is not correct (check *Cut Chart* information).

3. Cutting speed is not correct (check *Cut Chart* information).

4. Arc current is not correct (check *Cut Chart* information).

5. Damaged consumable parts (see *Changing Consumable Parts*).

- Short consumable life. Causes can be:

1. Arc current, arc voltage, travel speed, motion delay, gas flow rates, or initial torch height not set as specified in *Cut Charts.*

2. Attempting to cut highly magnetic metal plate (some metals such as armor plate with a high nickel content) will shorten consumable life. Long consumable life is difficult to achieve when cutting plate that is magnetized or becomes magnetized easily. Call Hypertherm's Technical Service (1-800-643-9878) if you suspect the type of metal you are cutting is causing shortened consumable life.

TECHNICAL QUESTIONS

Claims for defective merchandise -- All units shipped from Hypertherm undergo rigorous quality control testing. However, if your system does not function correctly:

1. Recheck all pre-installation and installation requirements and connections.

2. If you are unable to solve the problem, call your distributor. He (she) will be able to help you, or refer you to an authorized Hypertherm repair facility.

3. If you need assistance, call Hypertherm's Technical Service department at 1-800-643-9878.

CUT CHARTS

The Cut Charts on the following pages provide the necessary information in order for the operator using the HT2000 system to be successful in plasma arc cutting. The HT2000 provides a wide travel speed operating window: usually ± 10 ipm (± 254mm/min) on most materials. The data listed in the charts are for making drop cuts with minimal dross.

Caution: Before cutting, check all settings and adjustments and check for damaged torch parts and worn consumable parts.

CUT CHART AND CONSUMABLE PARTS INDEX

	Metal	Amps	Plasma Gas/ Shield Gas	Shield	Retaining Cap	Nozzle	Swirl Ring	Electrode	Page(s) Above Water / Under Water
 CUTTING	Mild Steel	200	Air / Air	020424	020423	020608	020679	020664	6-14 / 6-37
		100	Air / Air	020448	020423	020611	020607	020664	6-15 / 6-38
		40	Air / Air	020688	020423	020689	020613	020664	6-16
		200	O_2 / Air	020424	020423	020605	020678	020664	6-17 / 6-39
		100	O_2 / Air	020424	020423	020690	020613	020664	6-18 / 6-40
		200	N_2 / CO_2	020424	020423	020608	020607	020415	6-19
	Stainless Steel	200	Air / Air	020424	020423	020608	020679	020664	6-20 / 6-41
		100	Air / Air	020448	020423	020611	020607	020664	6-21 / 6-42
		40	Air / Air	020688	020423	020689	020613	020664	6-22
		200	N_2 / Air	020424	020423	020608	020607	020415	6-23 / 6-43
		200	N_2 / CO_2	020424	020423	020608	020607	020415	6-24 / 6-44
		200	H35 / N_2*	020602	020423	020608	020607	020415	6-25
		100	H35 / N_2*	020448	020423	020611	020607	020415	6-26
	Aluminum	200	Air / Air	020424	020423	020608	020679	020664	6-27 / 6-45
		100	Air / Air	020448	020423	020611	020607	020664	6-28 / 6-46
		40	Air / Air	020688	020423	020689	020613	020664	6-29
		200	N_2 / Air	020424	020423	020608	020607	020415	6-30 / 6-47
		200	N_2 / CO_2	020424	020423	020608	020607	020415	6-31 / 6-48
		200	H35 / N_2*	020602	020423	020608	020607	020415	6-32
		100	H35 / N_2*	020448	020423	020611	020607	020415	6-33
 GOUGING	Mild Steel	200	Air / Air	020485	020423	020615	020607	020664	6-34
	Stainless Steel	200	H35 / N2	020485	020423	020615	020607	020415	6-35
	Aluminum	200	H35 / N2	020485	020423	020615	020607	020415	6-36

* Argon-Hydrogen Manifold required. See Section 7 for installation and operation with argon-hydrogen manifold.

Consumables used with HT2000 Water Muffler**	200	Air / Air	020566	020423	020608	020679	020664
	100	Air / Air	020618	020423	020611	020607	020664
	200	O_2 / Air	020566	020423	020605	020678	020664
	100	O_2 / Air	020566	020423	020690	020613	020664
	200	N_2 / CO_2	020566	020423	020608	020607	020415
	200	N_2 / Air	020566	020423	020608	020607	020415

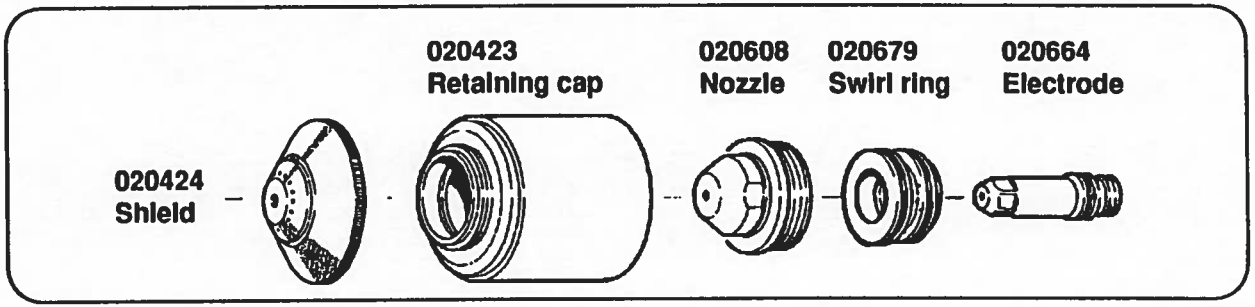
** Do not use the water muffler when cutting with argon-hydrogen (H35)!

HT2000 Machine Torch - Above Water

Mild Steel

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/16	5	54	66	60	1/8	3	200	130	100	200	5080		90	90
1/4	6				1/8	3		130	100	135	3400	0.5		
.315	8	(62.3	(76.1	(270	1/8	3		135	100	115	2900	0.5		
3/8	10	SCFH)	SCFH)	SCFH)	1/8	3		135	100	100	2540	1.0		
1/2	12				.157	4		140	100	80	2030	2.0		
5/8	15				.157	4		145	100	60	1520	2.0		
3/4	20				3/16	5		150	100	45	1140	2.5		
7/8	22				1/4	6		155	94	30	760	2.5		
1	25				1/4	6		160	88	25	635	2.5		
1-1/4	32				1/4	6		165	83	15	380	3.0		
1-1/2	38				1/4	6		170	78	10	250	3.0		
1-3/4	44				5/16	8		180	69	7	180	3.0		
2	50				5/16	8		185	66	5	130	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

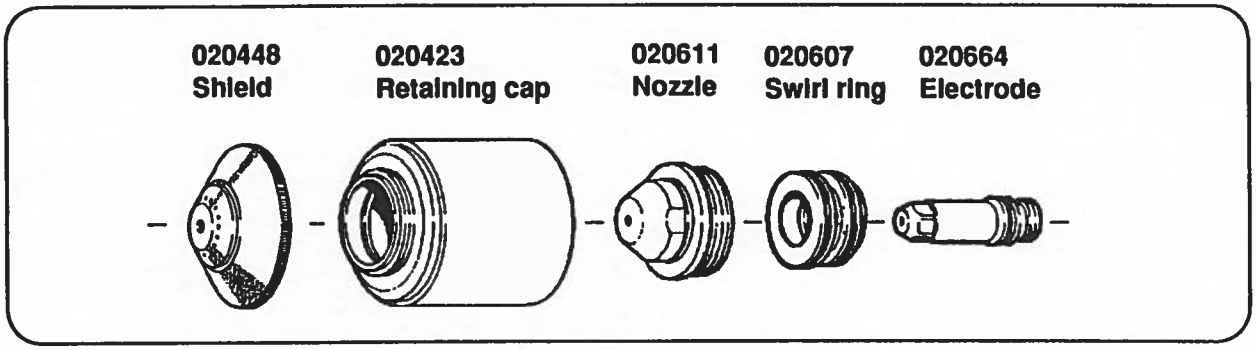
1 inch = . nm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Mild Steel

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross level and is very economical. Some surface nitriding can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
.075	2	**48**	**39**	**60**	3/32	2.5	**80**	120	100	235	6050		**90**	**90**
1/8	3				3/32	2.5	**100**	125	100	185	4700	0.5		
3/16	5	(55.3	(44.9	(270	1/8	3		125	100	175	4450	0.5		
1/4	6	SCFH)	SCFH)	SCFH)	1/8	3		130	100	125	3175	0.5		
3/8	10				1/8	3		135	100	50	1270	1.0		
1/2	12				1/8	3		140	100	35	890	1.5		
5/8	15				.157	4		145	100	25	635	2.0		
3/4	20				3/16	5		150	100	20	510			

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

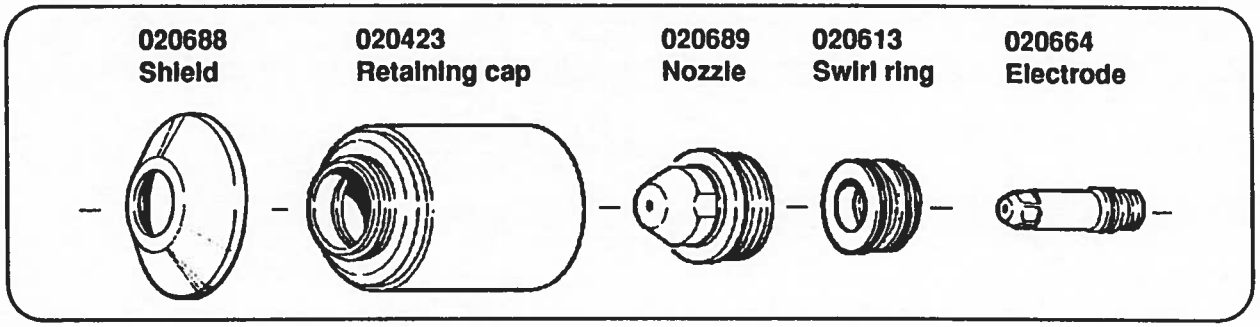
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Mild Steel

40 amps • Air Plasma / Air Shield

This gas combination gives good cut speeds, low dross levels and is very economical. Some surface nitriding can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
.036	(20 GA.)	40	20	60	3/32	2.5	40	110	100	340	8630		90	90
.050	(18 GA.)				3/32	2.5		110	100	320	8100			
1/16	1.5	(46.0	(23.1	(275	3/32	2.5		110	100	300	7600			
.075	2	SCFH)	SCFH)	SCFH)	3/32	2.5		110	100	220	5600			
1/8	3				3/32	2.5		110	100	140	3550	0.5		
.158	4				3/32	2.5		115	100	120	3050	0.5		
.197	5				3/32	2.5		115	100	50	1250	0.5		
1/4	6				3/32	2.5		120	100	35	850	1.0		
3/8	10				3/32	2.5		125	100	20	500	1.5		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

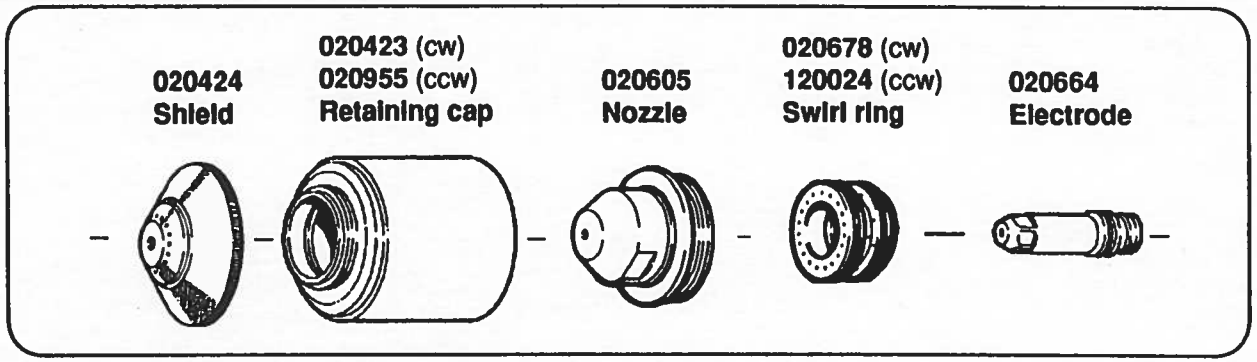
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Mild Steel

200 amps • O_2 Plasma / Air Shield

This gas combination gives superior cut speed, minimum dross, minimum amount of surface nitriding and excellent weldability.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (O_2 %)	Preflow (N_2 %)	Cut Flow (O_2 %)	Cut Flow (N_2 %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas Inlet Pressure O_2 (psi)	Plasma Gas Inlet Pressure N_2	Shield Gas (Air) Inlet Pressure (psi)
1/4	6	12	38	64	0	60	1/8	3	200	120	100	160	4060	0.5	120	120	90
.315	8						1/8	3		125	100	120	3000	0.5			
3/8	10	(14.9/50.4		(79.6		(270	1/8	3		125	100	100	2540	1.0			
1/2	12	SCFH)		SCFH)		SCFH)	.157	4		125	100	80	2030	2.0			
5/8	15						.157	4		130	100	70	1780	2.0			
3/4	20						3/16	5		135	100	55	1400	2.5			
7/8	22						1/4	6		135	100	45	1140	2.5			
1	25						1/4	6		140	100	35	890	2.5			
1-1/4	32						1/4	6		150	100	22	560	3.0			
1-1/2	38						1/4	6		155	94	15	380	3.0			
1-3/4	44						5/16	8		165	83	10	250	3.0			
2	50						5/16	8		170	78	7	180	3.0			

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

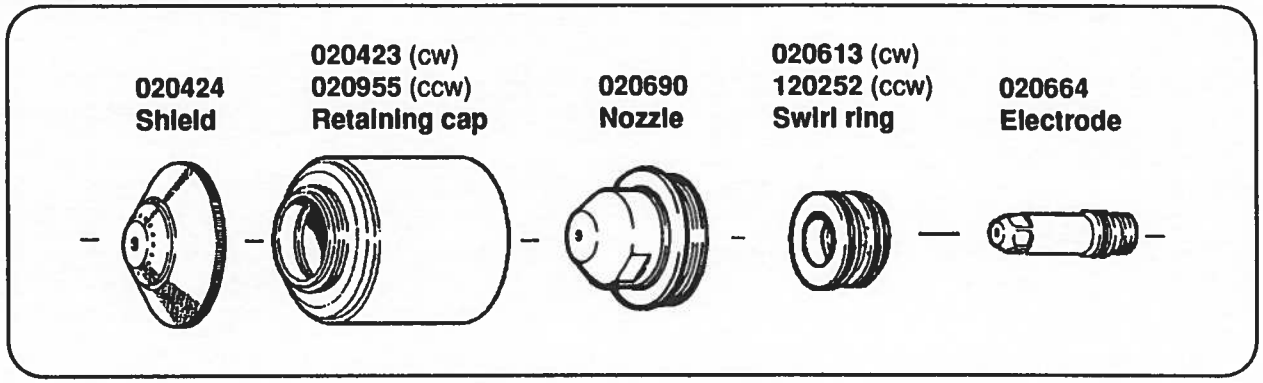
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Mild Steel

100 amps • O_2 Plasma / Air Shield

This gas combination gives good cut speed, low dross level and is very economical. Some surface nitriding can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (O_2 %)	Preflow (N_2 %)	Cut Flow (O_2 %)	Cut Flow (N_2 %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas Inlet Pressure O_2 (psi)	N_2	Shield Gas (Air) Inlet Pressure (psi)
1/8	3	5	20	36	0	60	3/32	2.5	100	125	100	240	6100		120	120	90
3/16	5						1/8	3		125	100	180	4570				
1/4	6	(11.2 / 47.8		(44.8		(270	1/8	3		125	100	120	3050	0.5			
3/8	10	SCFH)		SCFH)		SCFH)	1/8	3		130	100	90	2280	0.5			
1/2	12						1/8	3		130	100	60	1520	1.0			
5/8	15						.157	4		140	100	45	1140	1.0			
3/4	20						3/16	5		145	100	30	760	1.5			

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

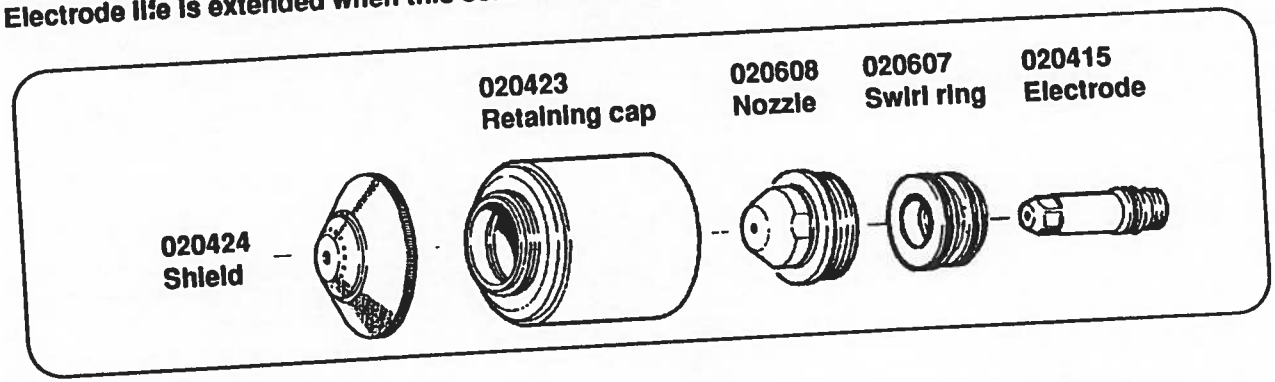
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Mild Steel

200 amps • N_2 Plasma / CO_2 Shield

This gas combination is used when cut edge quality and surface nitriding are less important. Electrode life is extended when this combination is used.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Plasma Gas Flow Rate % Cut Flow (N_2 %)	Shield Gas (CO_2) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (CO_2) Inlet Pressure (psi)
3/16	5	50	60	60	1/8	3	200	120	100	130	3300	0.5	120	90
1/4	6				1/8	3		125	100	110	2800	1.0		
3/8	10	(66.4	(79.6	(210	1/8	3		130	100	85	2160	1.5		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		130	100	55	1400	2.0		
5/8	15				1/8	3		135	100	45	1140	2.0		
3/4	20				.157	4		145	100	25	635	2.5		
7/8	22				3/16	5		150	100	20	510	3.0		
1	25				1/4	6		160	88	15	380	3.0		
1-1/4	32				1/4	6		165	83	10	250	3.0		
1-1/2	38				1/4	6		175	73	5	130	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

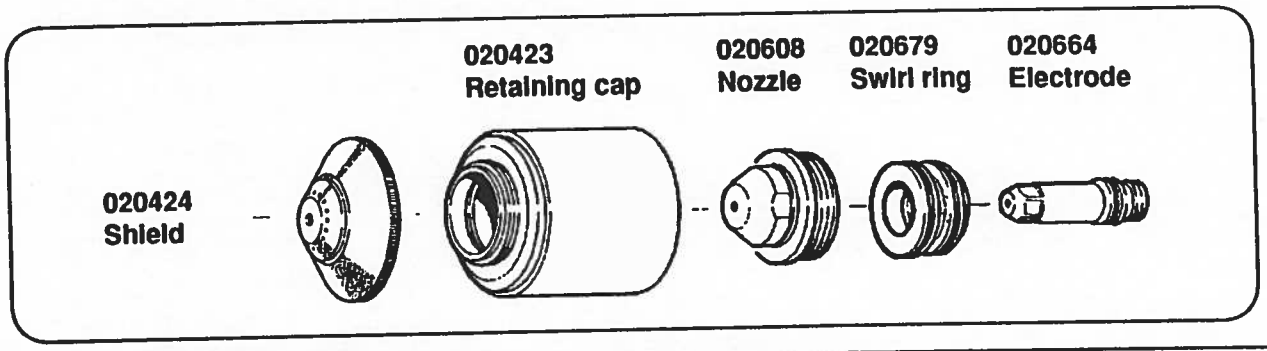
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Stainless Steel

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
					1/8	3	200	125	100	220	5600		90	90
3/16	5	54	66	60	1/8	3		130	100	195	5000	0.5		
1/4	6				1/8	3		130	100	145	3700	1.0		
3/8	10	(62.3	(76.1	(270	1/8	3		135	100	105	2700	2.0		
1/2	12	SCFH)	SCFH)	SCFH)	.157	4		140	100	75	1900	2.0		
5/8	15				3/16	5		140	100	55	1400	2.5		
3/4	20				1/4	6		145	100	40	1000	3.0		
7/8	22				1/4	6		150	100	30	760	3.0		
1	25				1/4	6		160	88	15	380	3.0		
1-1/4	32				1/4	6		170	78	10	250	3.0		
1-1/2	38													

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

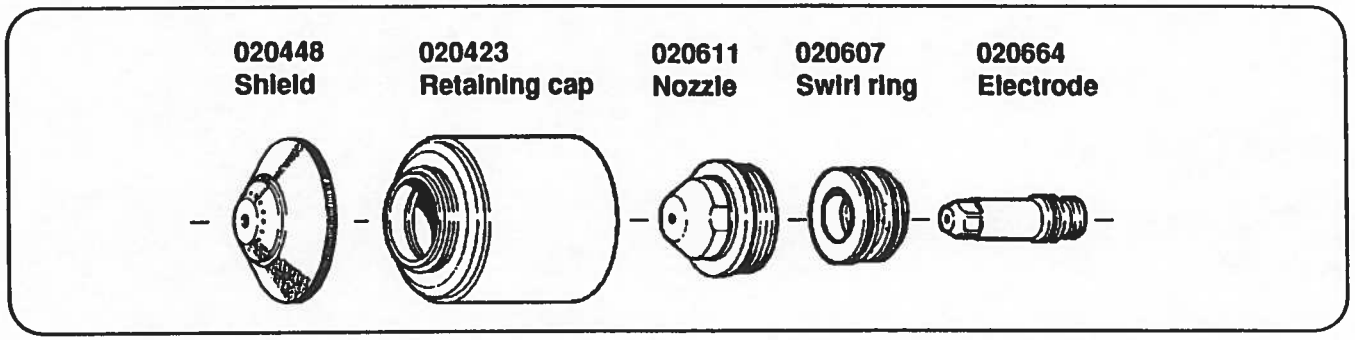
1 inch = ; ım; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Stainless Steel

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
1/8	3	48	39	60	3/32	2.5	100	125	100	140	3560		90	90
3/16	5				1/8	3		130	100	110	2800	0.5		
1/4	6	(53.3	(44.9	(270	1/8	3		130	100	80	2030	0.5		
3/8	10	SCFH)	SCFH)	SCFH)	1/8	3		135	100	55	1400	0.5		
1/2	12				1/8	3		140	100	35	890	1.0		
5/8	15				.157	4		145	100	25	635	1.5		
3/4	20				3/16	5		150	100	20	510	2.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

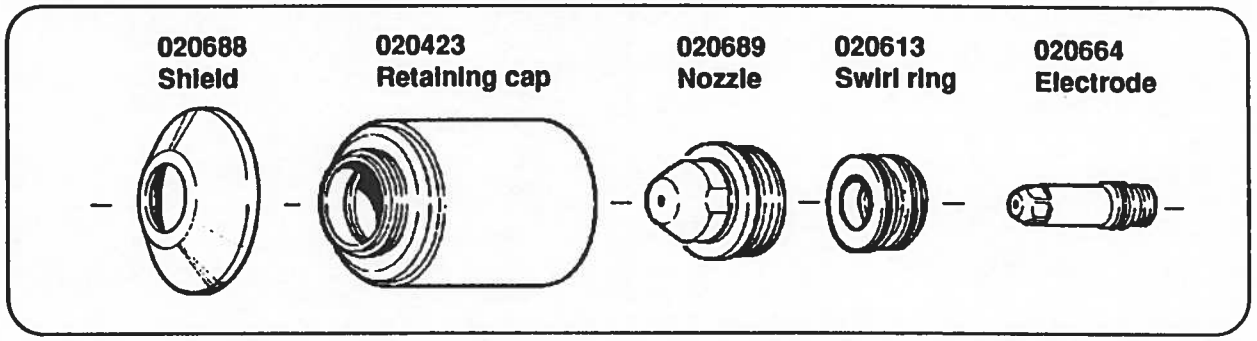
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Stainless Steel

40 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
.050	(18 GA.)	40	20	60	3/32	2.5	40	120	100	145	3700		90	90
1/16	1.5				3/32	2.5		120	100	120	3050			
1/8	3	(46	(23.1	(275	3/32	2.5		125	100	75	1900	0.5		
1/4	6	SCFH)	SCFH)	SCFH)	1/8	3		135	100	24	610	1.0		
3/8	10				1/8	3		140	100	12	300	1.5		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

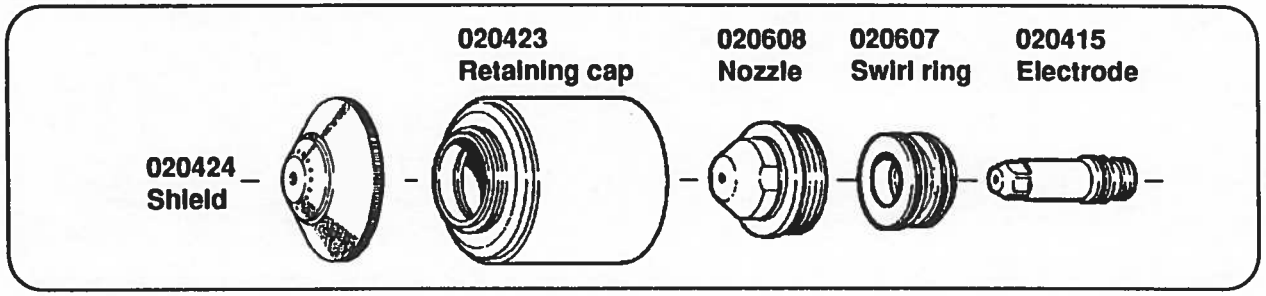
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Stainless Steel

200 amps • N_2 Plasma / Air Shield

This gas combination is used when cut edge quality, surface nitriding and surface oxidation of alloying elements are less important. Electrode life is extended when this combination is used.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Plasma Gas Flow Rate % Cut Flow (N_2 %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/16	5	50	60	60	1/8	3	200	125	100	135	3430		120	90
1/4	6				1/8	3		130	100	120	3050	0.5		
3/8	10	(66.4	(79.6	(270	1/8	3		130	100	100	2540	1.0		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		135	100	75	1900	2.0		
5/8	15				.157	4		140	100	60	1520	2.0		
3/4	20				3/16	5		140	100	45	1140	2.5		
7/8	22				1/4	6		145	100	35	890	2.5		
1	25				1/4	6		150	100	20	510	3.0		
1-1/4	32				1/4	6		160	88	15	380	3.0		
1-1/2	38				1/4	6		160	88	10	250	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

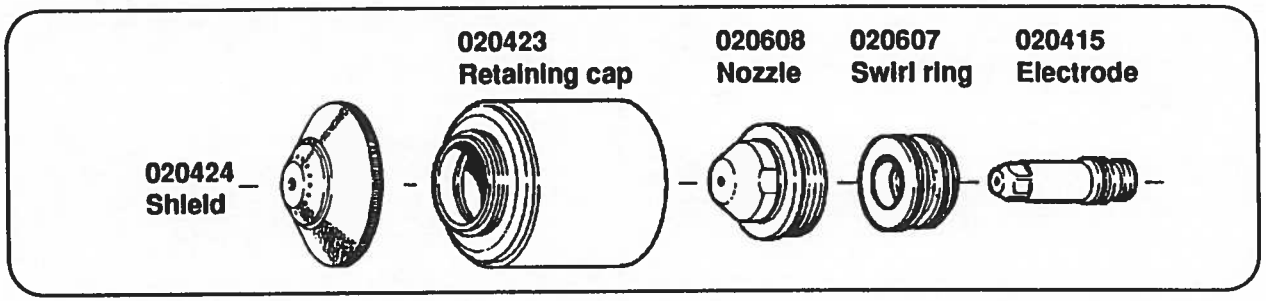
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Stainless Steel

200 amps • N_2 Plasma / CO_2 Shield

This gas combination is used when surface nitriding and surface oxidation of alloying elements is less important. Electrode life is extended when using this gas combination.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Plasma Gas Flow Rate % Cut Flow (N_2 %)	Shield Gas (CO_2) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (CO_2) Inlet Pressure (psi)
3/16	5	50	60	60	1/8	3	200	125	100	190	4800	0.5	120	90
1/4	6				1/8	3		130	100	170	4300	1.0		
3/8	10	(66.4	(79.6	(210	1/8	3		130	100	125	3200	1.5		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		135	100	95	2400	2.0		
5/8	15				.157	4		140	100	70	1800	2.0		
3/4	20				3/16	5		140	100	50	1250	2.5		
7/8	22				1/4	6		145	100	40	1000	3.0		
1	25				1/4	6		150	100	30	760	3.0		
1-1/4	32				1/4	6		160	88	15	380	3.0		
1-1/2	38				1/4	6		170	78	10	250	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Stainless Steel

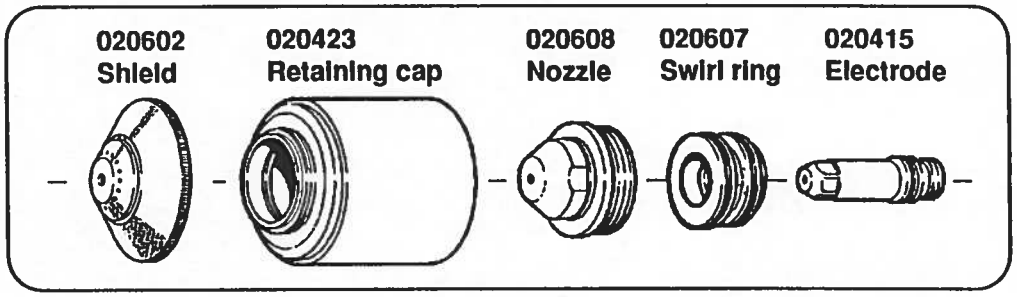
200 amps • H35 Plasma / N_2 Shield

Argon-Hydrogen Manifold (073109) Required*

This gas combination (Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas) gives maximum thickness cutting capability, minimum dross levels, minimum amount of surface contamination, excellect weldability and excellent cut quality on thicknesses greater than 1/2". On thicknesses less than 1/2", excessive dross levels may be experienced. Electrode life is extended when this combination is used.

WARNING

Do not use water muffler when cutting with argon-hydrogen!



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (H35 %)	Plasma Gas Flow Rate % Cut Flow (H35 %)	Shield Gas (N_2) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (H35) Inlet Pressure (psi)	Shield Gas (N_2) Inlet Pressure (psi)
1/4	6	25	25	60	3/16	5	200	135	100	62	1600	1.0	120	90
3/8	10				3/16	5		140	100	52	1300	1.0		
1/2	12	(89.9	(89.9	(275	3/16	5		140	100	42	1100	2.0		
5/8	15	SCFH)	SCFH)	SCFH)	1/4	6		145	100	37	940	2.0		
3/4	20				1/4	6		150	100	32	810	2.5		
7/8	22				5/16	8		155	94	27	690	2.5		
1	25				5/16	8		155	94	22	560	2.5		
1-1/4	32				5/16	8		165	83	16	400	3.0		
1-1/2	38				5/16	8		170	78	11	280	3.0		
1-3/4	44				5/16	8		180	69	8	200	3.0		
2	50				5/16	8		185	66	6	150	3.0		

*** See Section 7 for installation and operation with Argon-Hydrogen Manifold.**

Notes: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.
Maximum piercing thickness 3/4" (20 mm) and IHS recommended.

1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Stainless Steel

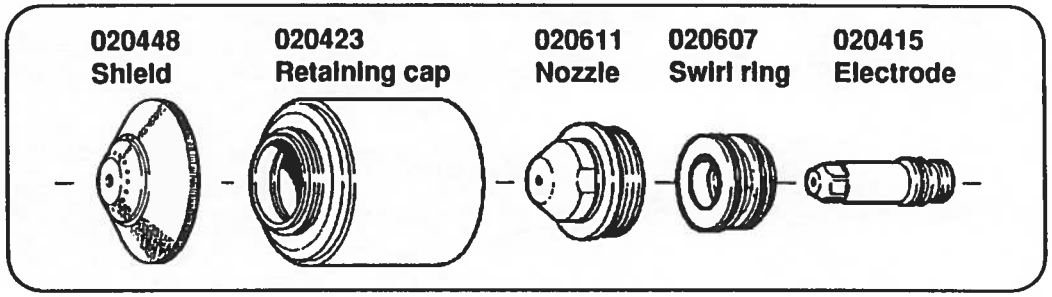
100 amps • H35 Plasma / N_2 Shield

Argon-Hydrogen Manifold (073109) Required*

This gas combination gives good cut speed, but may result in excessive dross. Some surface nitriding and surface oxidation of alloying elements can occur.

WARNING

Do not use water muffler when cutting with argon-hydrogen!



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (H35 %)	Plasma Gas Flow Rate % Cut Flow (H35 %)	Shield Gas (N_2) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (H35) Inlet Pressure (psi)	Shield Gas (N_2) Inlet Pressure (psi)
1/8	3	13	13	60	3/32	2.5	100	130	100	50	1260		120	90
3/16	5				1/8	3		135	100	40	1060	0.5		
1/4	6	(46.7	(46.7	(270	3/16	5		140	100	35	890	0.5		
3/8	10	SCFH)	SCFH)	SCFH)	3/16	5		140	100	30	750	0.5		
1/2	13				3/16	5		145	100	25	630	1.0		

*** See Section 7 for installation and operation with Argon-Hydrogen Manifold.**

Notes: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.
Maximum piercing thickness 3/4" (20 mm) and IHS recommended.

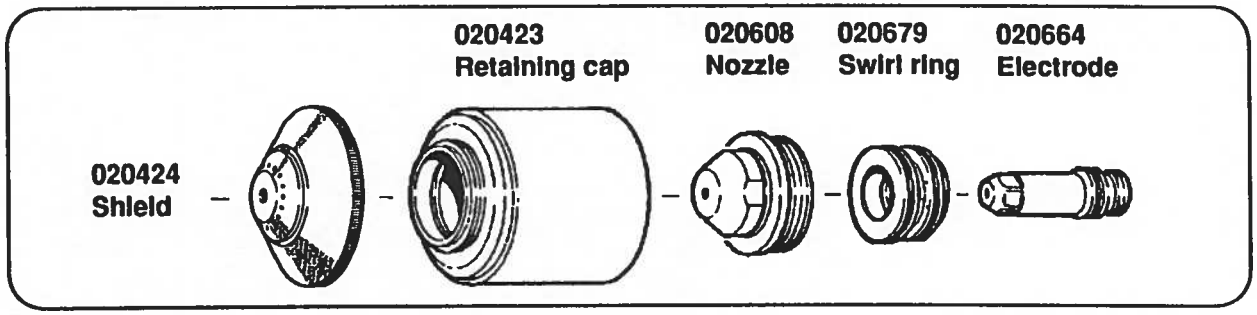
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Aluminum

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/16	5	54	66	60	1/8	3	200	130	100	220	5600	0.5	90	90
1/4	6				1/8	3		140	100	190	4800	1.0		
3/8	10	(62.3	(76.1	(270	1/8	3		140	100	145	3700	2.0		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		145	100	110	2800	2.5		
5/8	15				.157	4		150	100	85	2200	2.5		
3/4	20				3/16	5		155	94	65	1650	2.5		
7/8	22				1/4	6		160	88	50	1300	2.5		
1	25				1/4	6		165	83	35	900	3.0		
1-1/4	32				1/4	6		170	78	20	500	3.0		
1-1/2	38				1/4	6		175	73	12	300	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

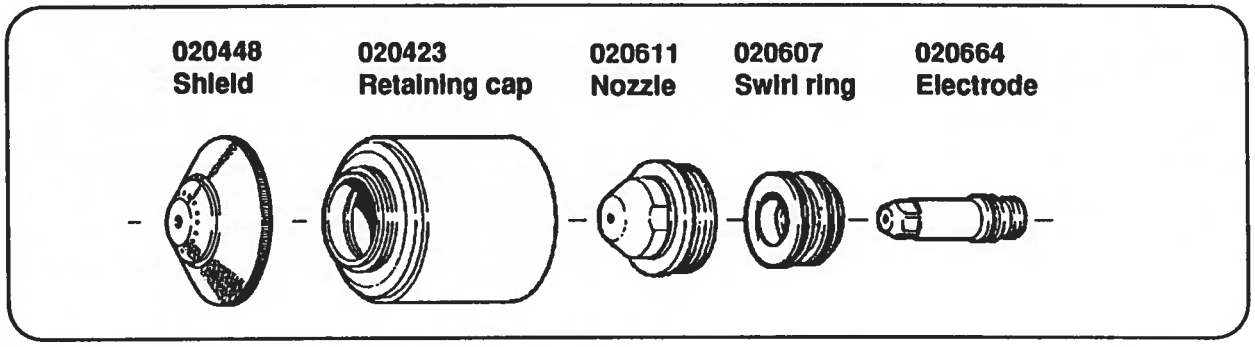
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Aluminum

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
1/8	3	48	39	60	3/32	2.5	100	135	100	110	2800		90	90
3/16	5	(55.3	(44.9	(270	1/8	3		140	100	90	2290	0.5		
1/4	6	SCFH)	SCFH)	SCFH)	1/8	3		145	100	70	1780	0.5		
3/8	10				1/8	3		145	100	50	1270	0.5		
1/2	12				1/8	3		150	100	40	1010	1.0		
5/8	15				.157	4		155	100	30	760	1.5		
3/4	20				3/16	5		160	100	25	635	2.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

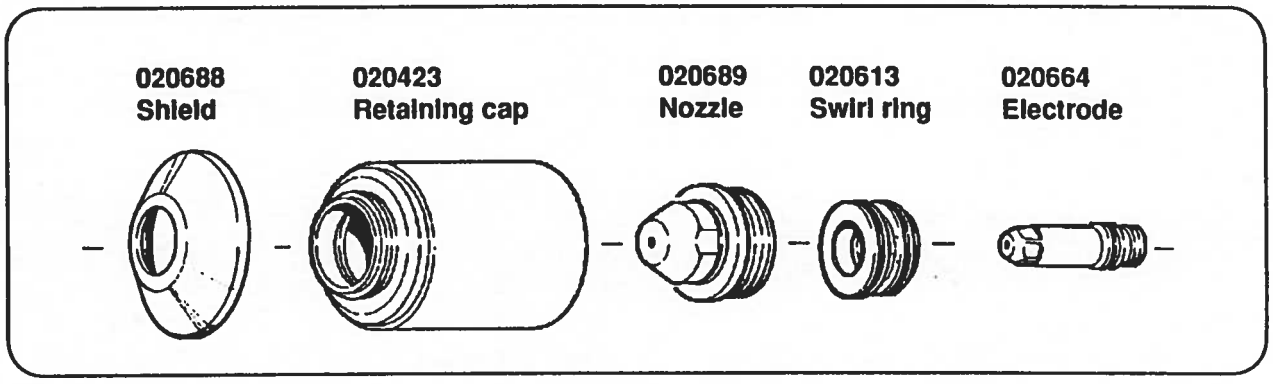
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Aluminum

40 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical.



Material Thickness (Inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (Inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/32	2.5	40	20	60	3/32	2.5	40	120	100	140	3550		90	90
1/8	3	(46.0	(23.1	(275	3/32	2.5		130	100	100	2550	0.5		
1/4	6	SCFH)	SCFH)	SCFH)	1/8	3		140	100	35	900	1.0		
3/8	10				1/8	3		150	100	15	350	1.5		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

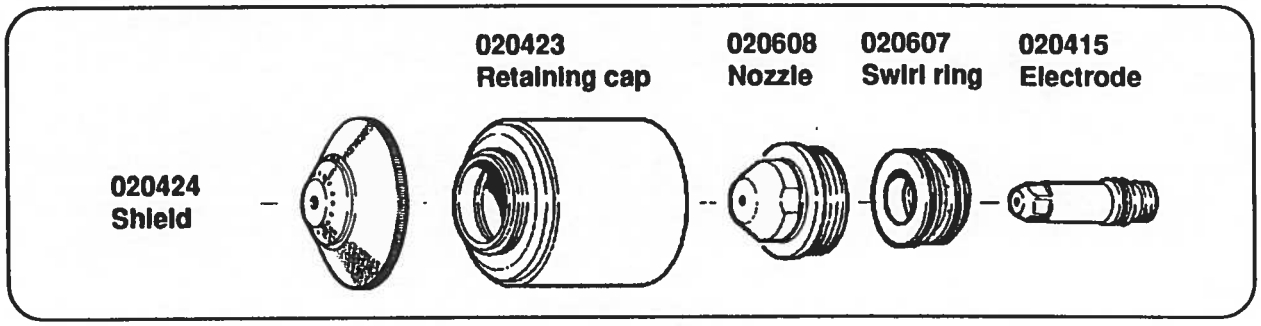
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Aluminum

200 amps • N_2 Plasma / Air Shield

This gas combination is used when cut edge quality is less important. Electrode life is extended when this combination is used.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Cut Flow (N_2 %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/16	5	50	60	60	1/8	3	200	130	100	180	4570	0.5	120	90
1/4	6	(66.4 SCFH)	(79.6 SCFH)	(270 SCFH)	1/8	3		135	100	160	4060	1.0		
3/8	10				1/8	3		135	100	120	3050	1.5		
1/2	12				1/8	3		140	100	80	2030	2.0		
5/8	15				.157	4		140	100	70	1780	2.0		
3/4	20				3/16	5		150	100	50	1270	2.5		
7/8	22				1/4	6		160	88	35	890	2.5		
1	25				1/4	6		165	83	25	635	3.0		
1-1/4	32				1/4	6		175	73	20	510	3.0		
1-1/2	38				1/4	6		185	66	10	250	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

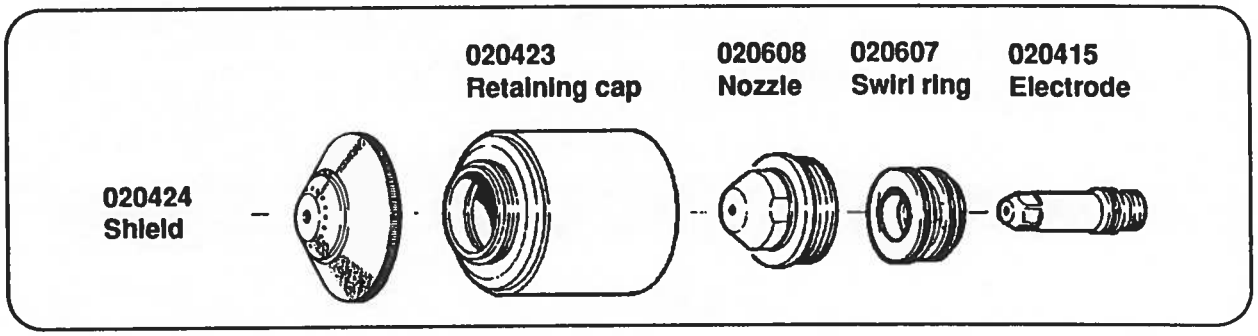
1 inch = ...am; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Aluminum

200 amps • N_2 Plasma / CO_2 Shield

This gas combination is used when cut edge quality is less important. Electrode life is extended when this combination is used.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Plasma Gas Flow Rate % Cut Flow (N_2 %)	Shield Gas (CO_2) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (CO_2) Inlet Pressure (psi)
3/16	5	50	60	60	1/8	3	200	130	100	185	4700	0.5	120	90
1/4	6	(66.4 SCFH)	(79.6 SCFH)	(210 SCFH)	1/8	3		135	100	160	4050	1.0		
3/8	10				1/8	3		135	100	120	3050	2.0		
1/2	12				1/8	3		140	100	95	2400	2.5		
5/8	15				.157	4		140	100	70	1800	2.5		
3/4	20				3/16	5		150	100	55	1400	3.0		
7/8	22				1/4	6		160	88	42	1050	3.0		
1	25				1/4	6		165	83	33	840	3.0		
1-1/4	32				1/4	6		175	73	20	510	3.0		
1-1/2	38				5/16	8		185	66	11	280	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - Above Water

Aluminum

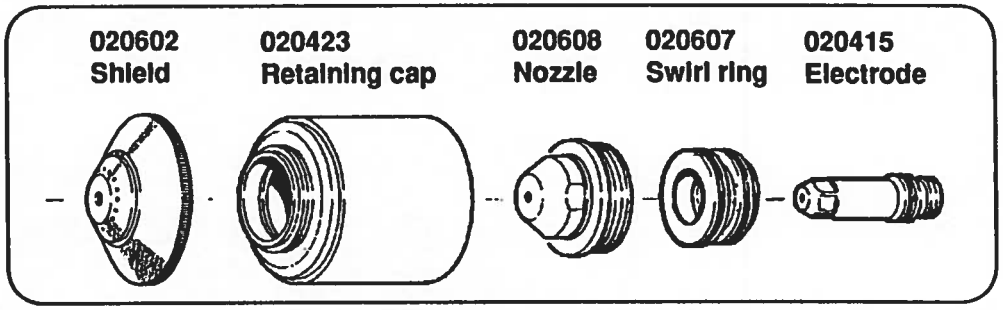
200 amps • H35 Plasma / N_2 Shield

Argon-Hydrogen Manifold (073109) Required*

This gas combination (Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas) gives maximum thickness cutting capability, excellent cut quality and excellent weldability. Electrode life is extended when this combination is used.

WARNING

Do not use water muffler when cutting with argon-hydrogen!



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (H35 %)	Plasma Gas Flow Rate % Cut Flow (H35 %)	Shield Gas (N_2) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (H35) Inlet Pressure (psi)	Shield Gas (N_2) Inlet Pressure (psi)
3/16	5	25	25	60	3/16	5	200	130	100	170	4300	0.5	120	90
1/4	6				3/16	5		130	100	155	4000	1.0		
3/8	10	(89.9	(89.9	(275	1/4	6		135	100	120	3000	2.0		
1/2	12	SCFH)	SCFH)	SCFH)	1/4	6		140	100	100	2550	2.0		
5/8	15				1/4	6		145	100	80	2000	2.5		
3/4	20				5/16	8		150	100	60	1500	2.5		
7/8	22				5/16	8		155	94	50	1250	2.5		
1	25				5/16	8		155	94	40	1000	3.0		
1-1/4	32				5/16	8		165	83	26	660	3.0		
1-1/2	38				5/16	8		170	78	18	460	3.0		
1-3/4	44				5/16	8		180	69	12	300	3.0		
2	50				5/16	8		185	66	7	180	3.0		

*** See Section 7 for installation and operation with Argon-Hydrogen Manifold.**

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

HT2000 Machine Torch - Above Water

Aluminum

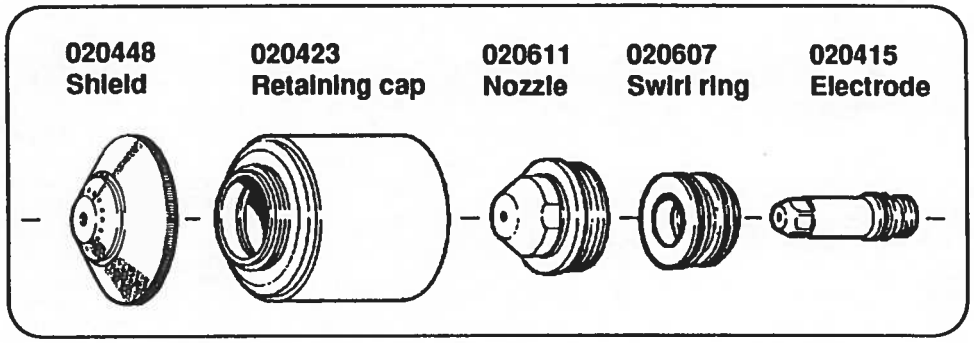
100 amps • H35 Plasma / N_2 Shield

Argon-Hydrogen Manifold (073109) Required*

This gas combination gives good cut speed, low dross levels and is very economical.

WARNING

Do not use water muffler when cutting with argon-hydrogen!



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (H35 %)	Plasma Gas Flow Rate % Cut Flow (H35 %)	Shield Gas (N_2) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (H35) Inlet Pressure (psi)	Shield Gas (N_2) Inlet Pressure (psi)
1/8	3	13	13	60	3/32	2.5	100	135	100	95	2440		120	90
3/16	5				1/8	3		140	100	85	2200	0.5		
1/4	6	(46.7	(46.7	(270	1/8	3		145	100	80	1980	0.5		
3/8	10	SCFH)	SCFH)	SCFH)	1/8	3		145	100	60	1530	0.5		
1/2	12				1/8	3		150	100	50	1280	1.0		

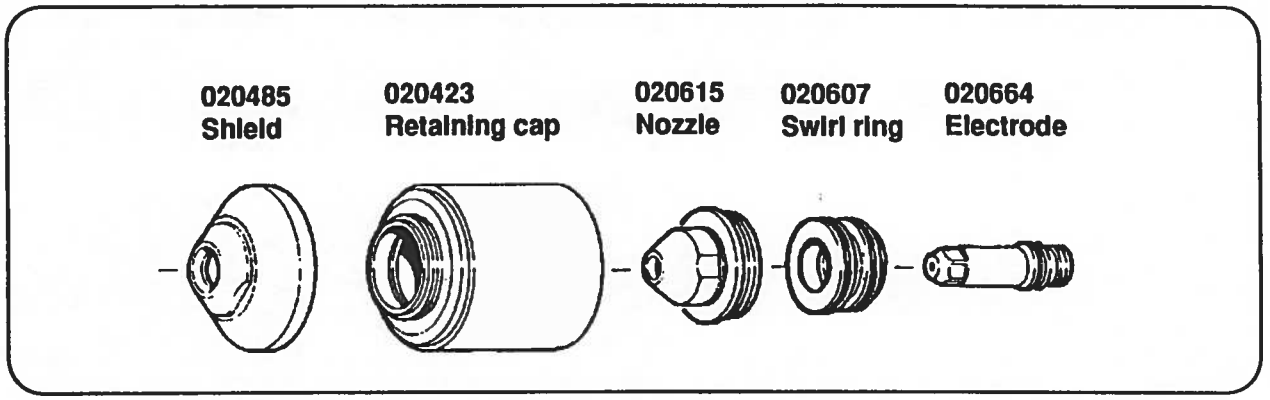
*** See Section 7 for installation and operation with Argon-Hydrogen Manifold.**

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

Mild Steel Gouging

200 amps • Air Plasma / Air Shield



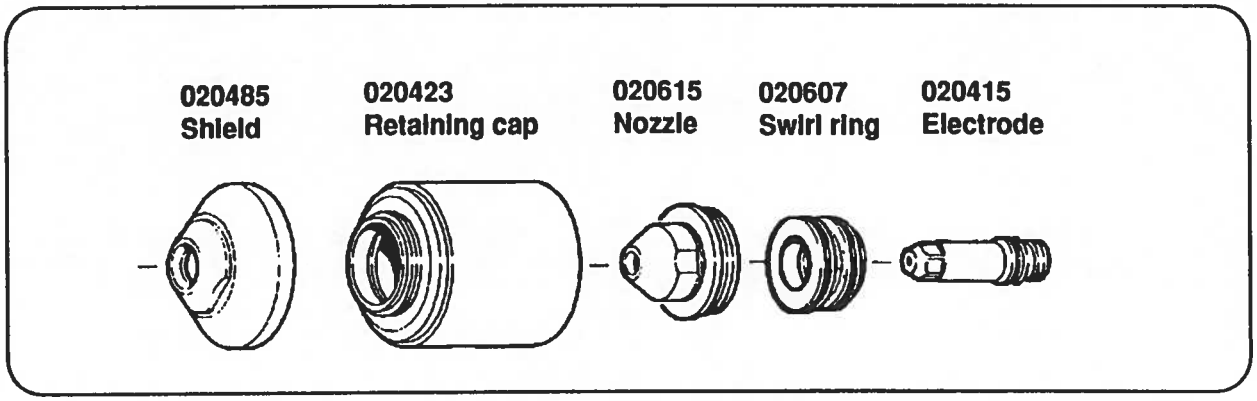
Plasma Gas Flow Rate %		Shield Gas (Air) Pressure (psi)	Arc Current Setting (amps)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
Preflow (Air %)	Cut Flow (Air %)				
71 (81.8 SCFH)	71	50	200	90	90

1 psi = .0689 bar = 6.895 KPa

Stainless Steel Gouging

200 amps • H35 Plasma / N_2 Shield

Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas.



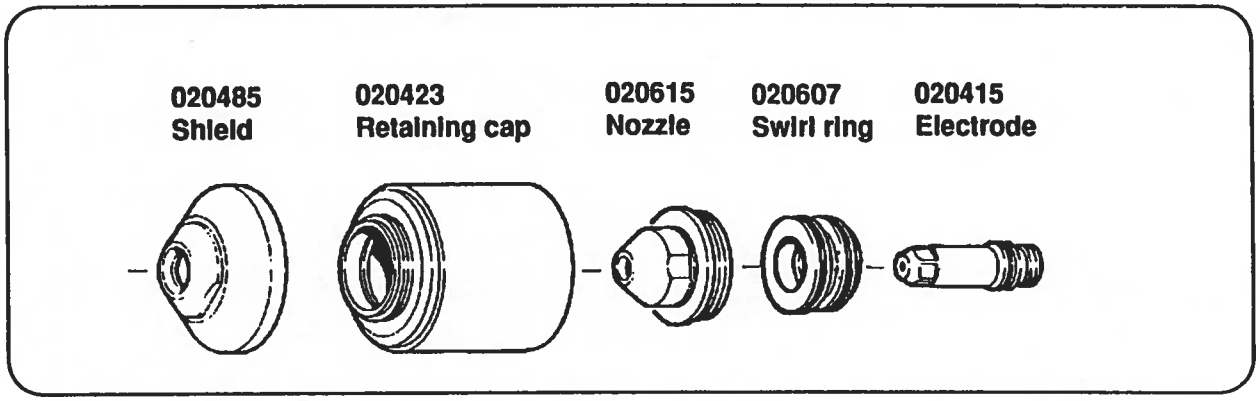
Plasma Gas Flow Rate %		Shield Gas (N_2) Pressure (psi)	Arc Current Setting (amps)	Plasma Gas (H35) Inlet Pressure (psi)	Shield Gas (N_2) Inlet Pressure (psi)
Preflow (H35%)	Cut Flow (H35%)				
29 (104.3 SCFH)	29	50	200	120	90

1 psi = .0689 bar = 6.895 KPa

Aluminum Gouging

200 amps • H35 Plasma / N_2 Shield

Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas..



Plasma Gas Flow Rate %		Shield Gas (N_2) Pressure (psi)	Arc Current Setting (amps)	Plasma Gas (H35) Inlet Pressure (psi)	Shield Gas (N_2) Inlet Pressure (psi)
Preflow (H35%)	Cut Flow (H35%)				
29 (104.3 SCFH)	29	50	200	120	90

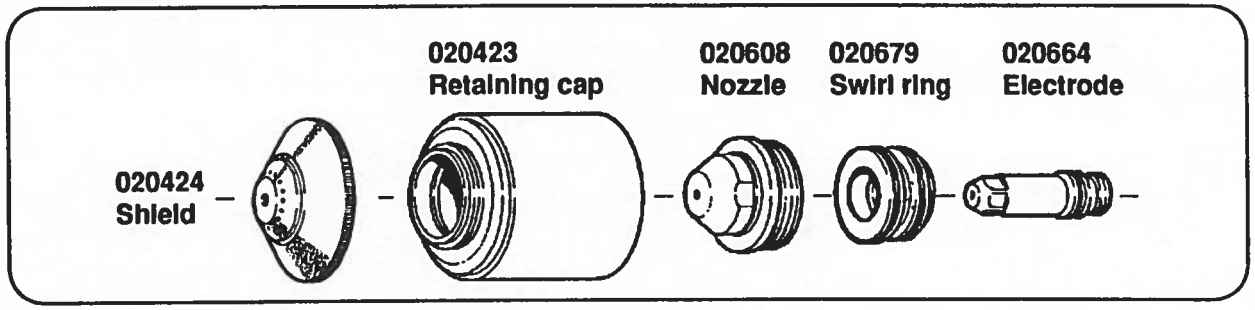
1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Mild Steel

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding can occur.



Material Thickness (Inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (Inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
1/4	6	54	66	70	1/8	3	200	130	100	130	3300	0.5	90	90
.315	8				1/8	3		135	100	110	2700	0.5		
3/8	10	(67.3	(76.1	(280	1/8	3		135	100	95	2400	1.0		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		140	100	75	1900	2.0		
5/8	15				.157	4		145	100	50	1200	2.0		
3/4	20				3/16	5		150	100	35	850	2.5		
7/8	22				1/4	6		155	94	20	530	3.0		
1	2550				1/4	6		165	83	15	400	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

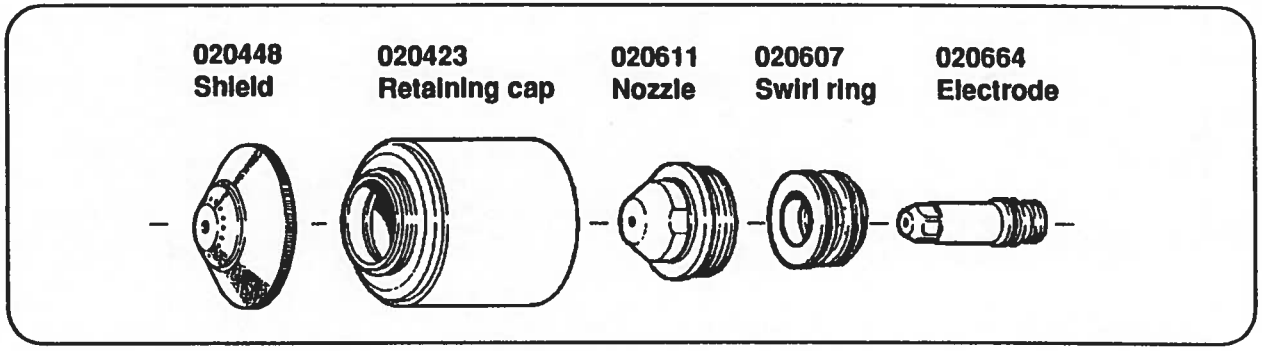
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Mild Steel

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross level and is very economical. Some surface nitriding can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
1/8	3	48	39	70	5/64	2	100	130	100	120	3050		90	90
3/16	5				1/8	3		135	100	90	2300	0.5		
1/4	6	(55.3	(44.9	(280	1/8	3		140	100	70	1730	0.5		
3/8	10	SCFH)	SCFH)	SCFH)	1/8	3		145	100	42	1050	0.5		
1/2	12				1/8	3		145	100	28	700	1.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

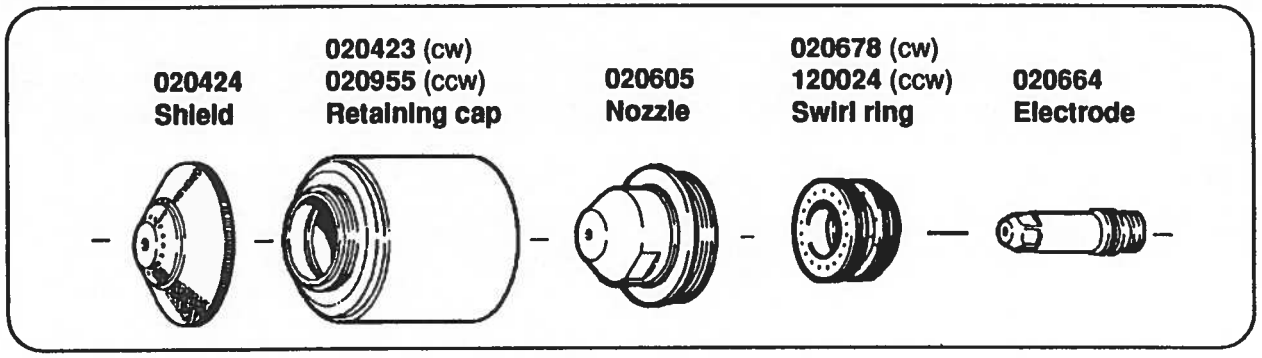
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Mild Steel

200 amps • O_2 Plasma / Air Shield

This gas combination gives superior cut speed, minimum dross, minimum amount of surface nitriding and excellent weldability.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (O_2%)	Preflow (N_2%)	Cut Flow (O_2%)	Cut Flow (N_2%)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas Inlet Pressure O_2 (psi)	N_2	Shield Gas (Air) Inlet Pressure (psi)
1/4	6	12	38	64	0	70	1/8	3	200	125	100	145	3700	0.5	120	120	90
.315	8						1/8	3		125	100	110	2800	0.5			
3/8	10	(14.9 / 50.4		(79.6		(280	1/8	3		130	100	80	2000	1.0			
1/2	12	SCFH)		SCFH)		SCFH)	1/8	3		130	100	70	1800	2.0			
5/8	15						.157	4		135	100	60	1500	2.0			
3/4	20						3/16	5		140	100	48	1200	2.5			
7/8	22						1/4	6		140	100	38	950	3.0			
1	25						1/4	6		145	100	25	680	3.0			

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

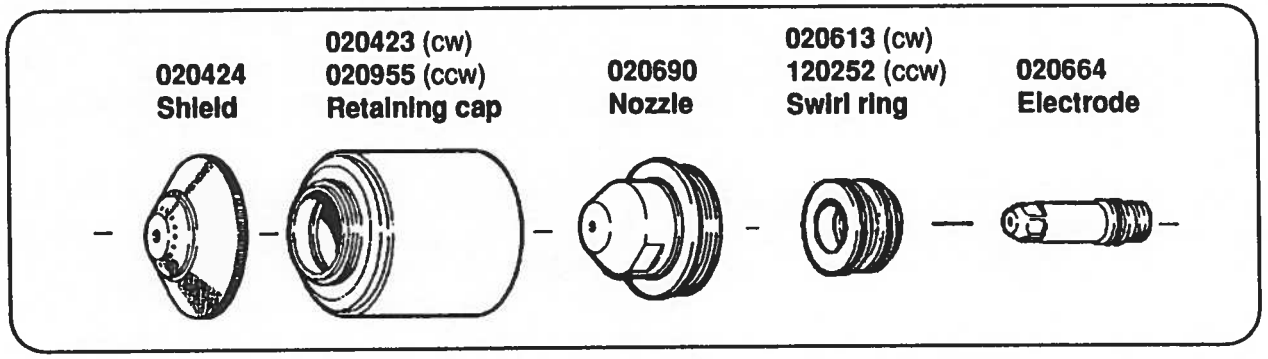
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Mild Steel

100 amps • O_2 Plasma / Air Shield

This gas combination gives good cut speed, low dross level, and is very economical. Some surface nitriding can occur.



Material Thickness (Inches)	(mm)	Plasma Gas Flow Rate % Preflow (O_2%)	Preflow (N_2%)	Cut Flow (O_2%)	Cut Flow (N_2%)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (Inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas Inlet Pressure O_2 (psi)	N_2	Shield Gas (Air) Inlet Pressure (psi)
1/8	3	5	20	36	0	60	5/64	2	100	125	100	280	5580		120	120	90
3/16	5						1/8	3		125	100	160	4060	0.5			
1/4	6	(11.2 / 47.8		(44.8		(270	1/8	3		125	100	110	2790	0.5			
3/8	10	SCFH)		SCFH)		SCFH)	1/8	3		130	100	85	2160	0.5			
1/2	12						1/8	3		135	100	60	1520	1.0			

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

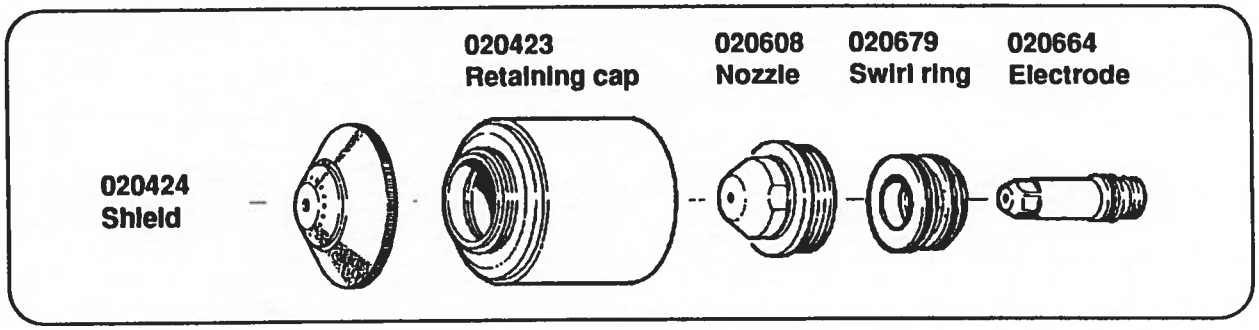
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Stainless Steel

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness (Inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (Inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (Ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/16	5	54	66	70	1/8	3	200	125	100	210	5320		90	90
1/4	6				1/8	3		130	100	180	4500	0.5		
3/8	10	(62.3	(76.1	(280	1/8	3		135	100	125	3150	1.0		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		140	100	90	2300	2.0		
5/8	15				.157	4		145	100	60	1520	2.0		
3/4	20				3/16	5		145	100	45	1150	2.5		
7/8	22				1/4	6		150	100	30	750	3.0		
1	25				1/4	6		155	94	22	570	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

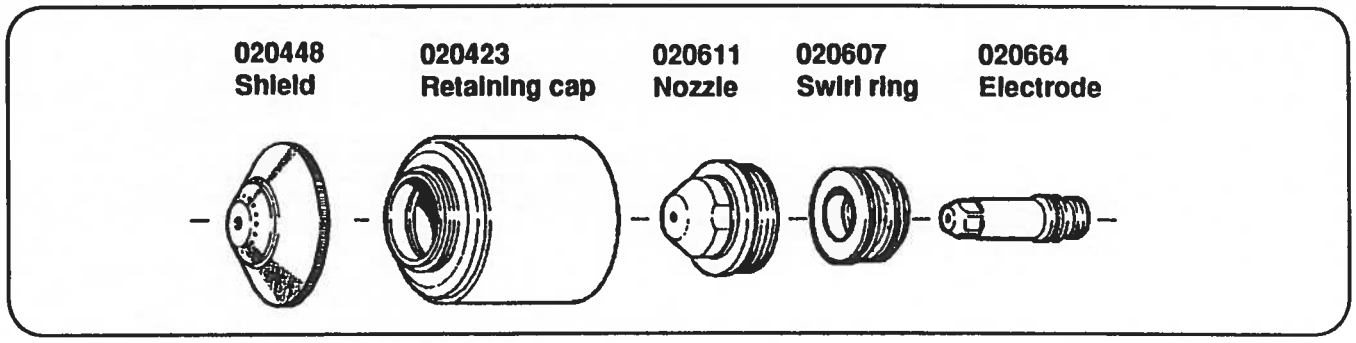
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Stainless Steel

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
1/8	3	48	39	60	5/64	2	100	125	100	135	3400		90	90
3/16	5				1/8	3		130	100	100	2520	0.5		
1/4	6	(53.3	(44.9	(270	1/8	3		135	100	65	1720	0.5		
3/8	10	SCFH)	SCFH)	SCFH)	1/8	3		140	100	45	1120	0.5		
1/2	12				1/8	3		145	100	25	670	1.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

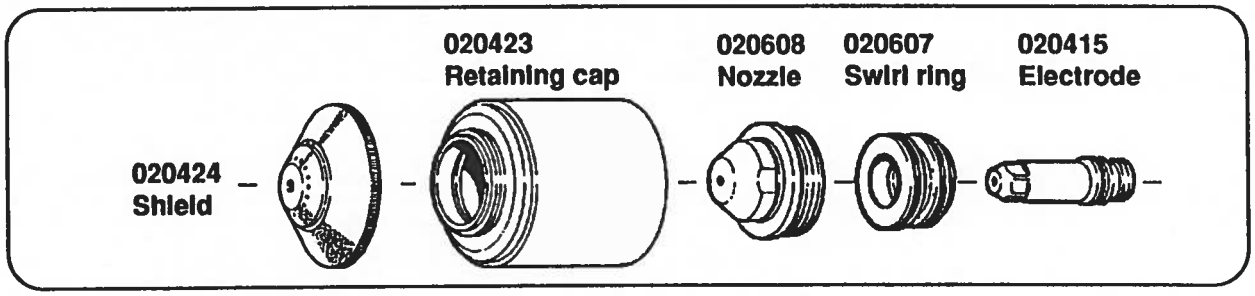
1 inch = 25 4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Stainless Steel

200 amps • N_2 Plasma / Air Shield

This gas combination is used when cut edge quality, surface nitriding and surface oxidation of alloying elements are less important. Electrode life is extended when this combination is used.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Cut Flow (N_2 %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/16	5	50	60	70	1/8	3	200	125	100	130	3250		120	90
1/4	6				1/8	3		130	100	110	2750	0.5		
3/8	10	(66.4	(79.6	(280	1/8	3		135	100	85	2160	1.0		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		140	100	60	1520	2.0		
5/8	15				.157	4		145	100	45	1140	2.0		
3/4	20				3/16	5		145	100	30	800	2.5		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

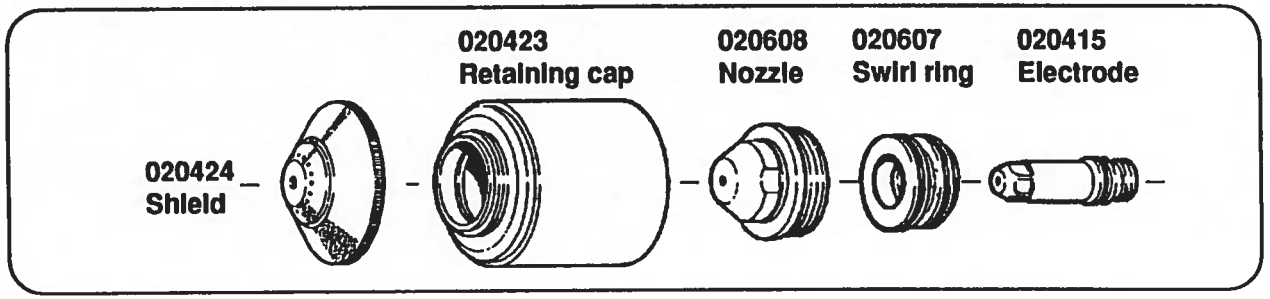
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Stainless Steel

200 amps • N_2 Plasma / CO_2 Shield

This gas combination is used when surface nitriding and surface oxidation of alloying elements is less important. Electrode life is extended when using this gas combination.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Plasma Gas Flow Rate % Cut Flow (N_2 %)	Shield Gas (CO_2) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (CO_2) Inlet Pressure (psi)
3/16	5	50	60	60	1/8	3	200	125	100	180	4550	0.5	120	90
1/4	6				1/8	3		130	100	150	3850	1.0		
3/8	10	(66.4	(79.6	(210	1/8	3		135	100	110	2700	1.5		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		140	100	75	1920	2.0		
5/8	15				.157	4		145	100	50	1350	2.0		
3/4	20				3/16	5		145	100	38	950	2.5		
7/8	22				1/4	6		150	100	28	700	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

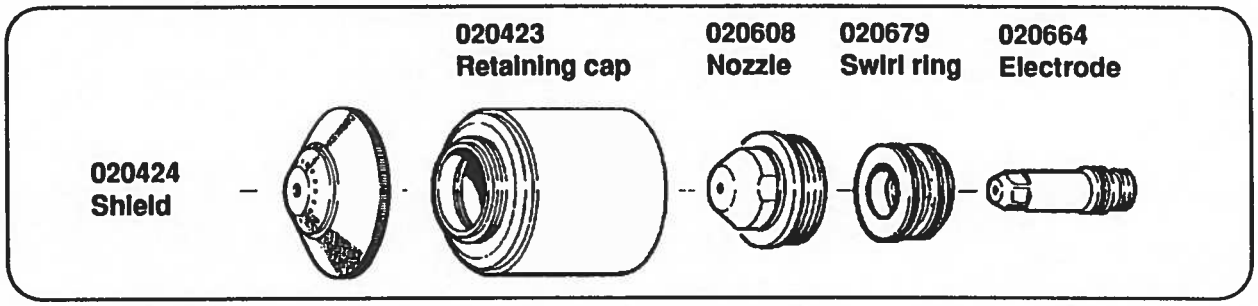
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Aluminum

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/16	5	54	66	70	1/8	3	200	135	100	210	5300	0.5	90	90
1/4	6				1/8	3		140	100	170	4300	1.0		
3/8	10	(62.3	(76.1	(280	1/8	3		145	100	125	3150	2.0		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		150	100	90	2240	2.5		
5/8	15				.157	4		155	94	65	1650	3.0		
3/4	20				3/16	5		160	88	45	1150	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

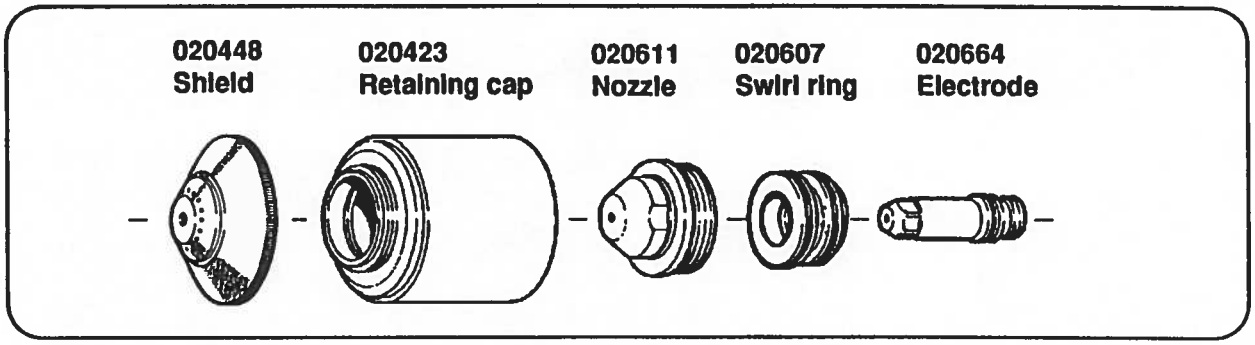
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Aluminum

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical.



Material Thickness (Inches)	(mm)	Plasma Gas Flow Rate % Preflow (Air %)	Plasma Gas Flow Rate % Cut Flow (Air %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (Inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	Travel Speed (mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (Air) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
1/8	3	48	39	70	5/64	2	100	135	100	100	2650		90	90
3/16	5				1/8	3		140	100	80	2050	0.5		
1/4	6	(55.3	(44.9	(280	1/8	3		145	100	60	1510	0.5		
3/8	10	SCFH)	SCFH)	SCFH)	1/8	3		150	100	40	1000	0.5		
1/2	12				1/8	3		155	100	30	750	1.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

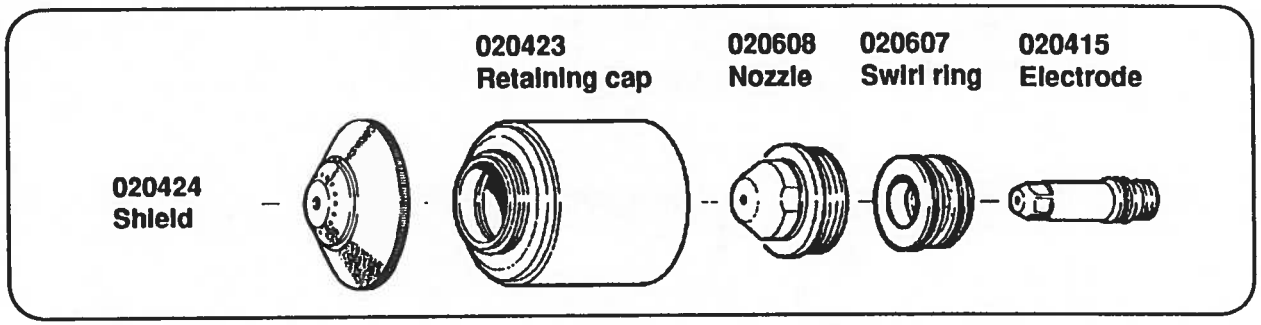
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Aluminum

200 amps • N_2 Plasma / Air Shield

This gas combination is used when cut edge quality is less important. Electrode life is extended when this combination is used.



Material Thickness (inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Plasma Gas Flow Rate % Cut Flow (N_2 %)	Shield Gas (Air) Pressure (psi)	Torch-to-work Distance (inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (Air) Inlet Pressure (psi)
3/16	5	50	60	70	1/8	3	200	135	100	170	4350	0.5	120	90
1/4	6				1/8	3		140	100	140	3650	1.0		
3/8	10	(66.4	(79.6	(280	1/8	3		140	100	100	2600	1.5		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		145	100	65	1620	2.0		
5/8	15				.157	4		145	100	55	1350	2.5		
3/4	20				3/16	5		155	94	35	890	3.0		
7/8	22				1/4	6		165	83	25	620	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

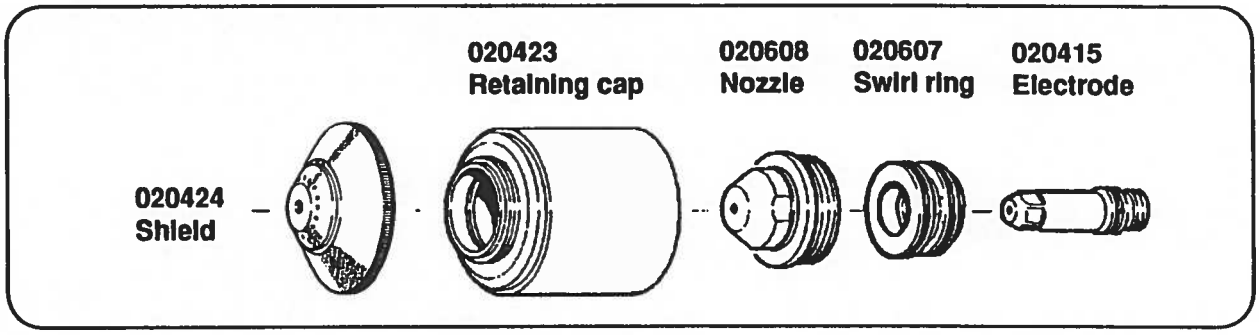
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

HT2000 Machine Torch - 3" Under Water

Aluminum

200 amps • N_2 Plasma / CO_2 Shield

This gas combination is used when cut edge quality is less important. Electrode life is extended when this combination is used.



Material Thickness (Inches)	(mm)	Plasma Gas Flow Rate % Preflow (N_2 %)	Plasma Gas Flow Rate % Cut Flow (N_2 %)	Shield Gas (CO_2) Pressure (psi)	Torch-to-work Distance (Inches)	(mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Travel Speed (ipm)	(mm/min)	Approx. Motion Delay Time (sec)	Plasma Gas (N_2) Inlet Pressure (psi)	Shield Gas (CO_2) Inlet Pressure (psi)
3/16	5	50	60	70	1/8	3	200	130	100	175	4450	0.5	120	90
1/4	6				1/8	3		135	100	145	3650	1.0		
3/8	10	(66.4	(79.6	(220	1/8	3		140	100	100	2600	2.0		
1/2	12	SCFH)	SCFH)	SCFH)	1/8	3		145	100	75	1820	2.5		
5/8	15				.157	4		145	100	55	1350	2.5		
3/4	20				3/16	5		155	94	40	980	3.0		
7/8	22				1/4	6		165	83	30	750	3.0		

Note: Set initial torch height (before piercing) to approximately twice the Torch-to-work Distance for the material you are cutting.

1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

CHANGING CONSUMABLE PARTS

WARNING

Always disconnect power to the power supply before inspecting or changing torch consumable parts.

Check the consumable parts daily for wear before cutting. Before removing parts, bring the torch to the edge of the machine, with the lifter raised to its highest point. This prevents the danger of dropping the consumables into the water of the water table.

Removal and Inspection - Refer to Figure 6-7

1. Remove **Retaining cap** and **Shield** by unscrewing the retaining cap by hand.

2. Check the shield for external signs of wear. It should be clean and clear of metal debris. The gas holes along the edge of the shield should not be blocked with debris. The center hole should not have any nicks or gouges, and should show no signs of arcing activity.

3. Unscrew and remove the shield from the retaining cap. Inspect the gas holes from the inside. The holes should be clear of metal or other debris. (Debris can cause arcing.)

4. Inspect the two O-rings on the **Torch body**. They should be lubricated and undamaged. If they are dry, lubricate them lightly with a very thin film of the lubricant provided in the spare parts kit. If they are damaged, replace them.

5. Using the 3/4" side of the wrench supplied with the consumable parts kit, remove the **Nozzle**. Inspect it for damage or signs of wear. You can clean the inside of the nozzle with steel wool, but be sure to remove any remnants of the steel wool afterward. The hole in the nozzle should not be worn or oval-shaped.

6. Using the 3/8" center hole in the wrench, remove the **Electrode** and inspect it. If the center of the electrode has a pit more than .044" (1.1 mm) deep, replace it. If the electrode is still good, inspect its O-ring: it should be lubricated and undamaged. If it is dry, lubricate it lightly with a very thin film of lubricant provided in the spare parts kit. If it is damaged, replace it.

7. Remove the **Swirl ring** from the electrode and inspect it. It should be clean, and the holes on the top and sides should not be plugged. Inspect its O-ring. It should be lubricated and undamaged. If it is dry, lubricate it lightly with a very thin film of lubricant provided in the spare parts kit. If it is damaged, replace it.

8. Inspect the inside of the **Torch body** by using a mirror, or by looking carefully inside. The **Current ring** inside of the torch body should be clean and undamaged. Use a clean paper towel or Q-tip to remove dirt, grease, etc. A preferred method to clean the current ring is with a clean paper towel or Q-tip dipped in water or 3% hydrogen peroxide.
If the **Water tube** is damaged at all, it may need to be replaced. See *Changing the Water Tube* .

Replacement

1. Before installing the **Electrode**, be sure to lightly grease the O-ring with a small amount of silicon lubricant. Replace the electrode and tighten it with the wrench. **Do not overtighten.**

2. Before installing the **Swirl ring**, be certain that the O-rings have been lubricated with a small amount of silicon grease. Install the swirl ring with the bottom O-ring facing the inside of the torch. Push it into place. Be sure to hold the swirl ring in place until the nozzle is installed to avoid dropping it into the water of the water table.

3. Before installing the **Nozzle**, be certain that the O-ring has been lubricated with a small amount of silicon grease. Install the nozzle and finger-tighten it. Finish tightening it with the wrench. **Do not overtighten.**

4. Screw on the **Shield** to the **Retaining cap** and tighten by hand. Screw on the retaining cap to the torch by hand. Make sure that it is tightened snugly; if it is loose, it can affect the shield gas flow.

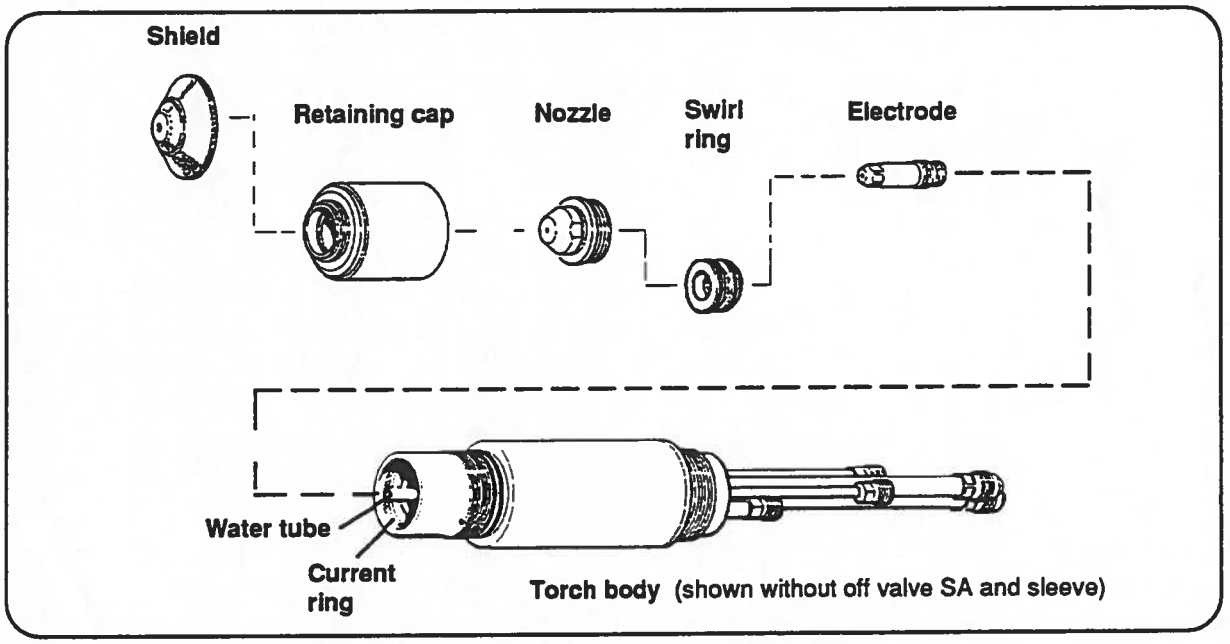


Figure 6-7 Changing Consumable Parts

Changing the Water Tube

Problems and causes you may find with a defective or improperly installed water tube:

- Short electrode life: Water tube not screwed in tightly
- Flow switch interlock shutting down the system: Water flow restricted due to loose water tube.
- Humming or rattling sound coming from the torch: Water tube bent or loose

If you suspect a problem with the water tube, you may need to replace it.

1. Disconnect power supply from power source.
2. Remove all consumables from torch (see *Changing Consumable Parts*).
3. Look for any damage or bends in the water tube.
4. Remove and replace the water tube by using the water tube wrench (027347) supplied by Hypertherm - Fig. 6-8. **When installing water tube, do not over tighten!** Snug down by hand only.

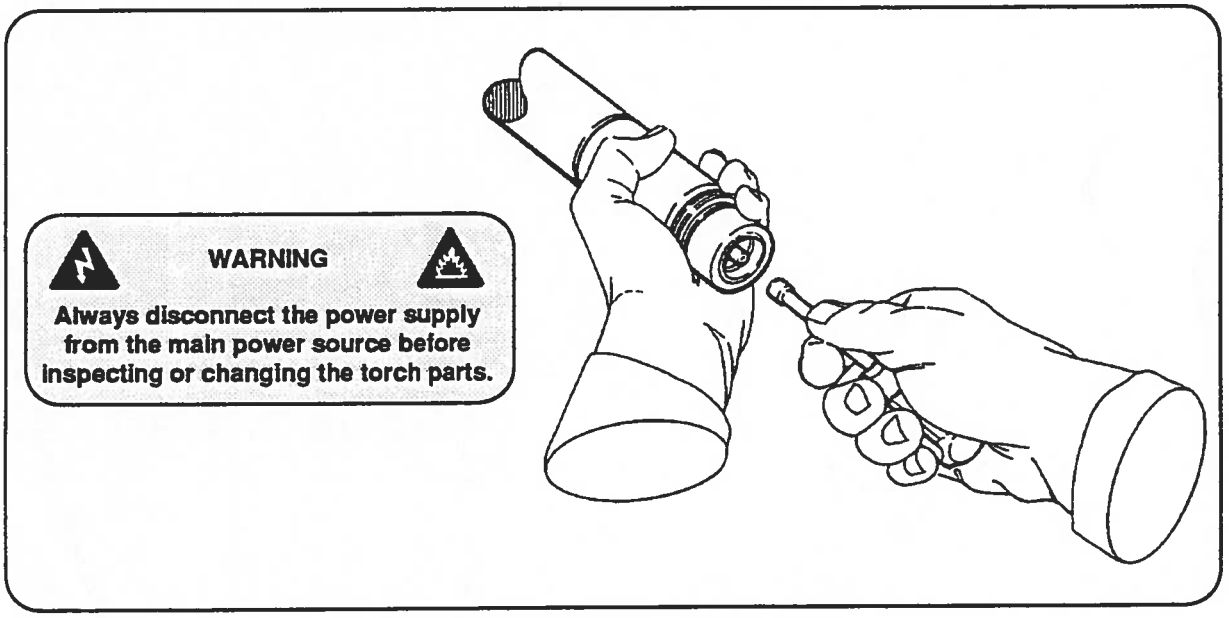


Figure 6-8 Changing the Water Tube

Section 7 OPERATION: ARGON-HYDROGEN MANIFOLD

In this section:

OPERATION: ARGON-HYDROGEN MANIFOLD

FRONT PANEL CONTROLS and INDICATORS (Fig. 7-1)

- **Flowmeter Adjust Valve (MV1)**
  Adjusts argon-hydrogen plasma gas flow rate % in **Test/Preflow** mode. Preflow plasma gas flow rate percentages are specified in *Cut Charts*.

- **Argon-Hydrogen Flowmeter (FM1)**
  Indicates the argon-hydrogen plasma gas flow rate %. Flow rates for argon-hydrogen are specified in *Cut Charts*.

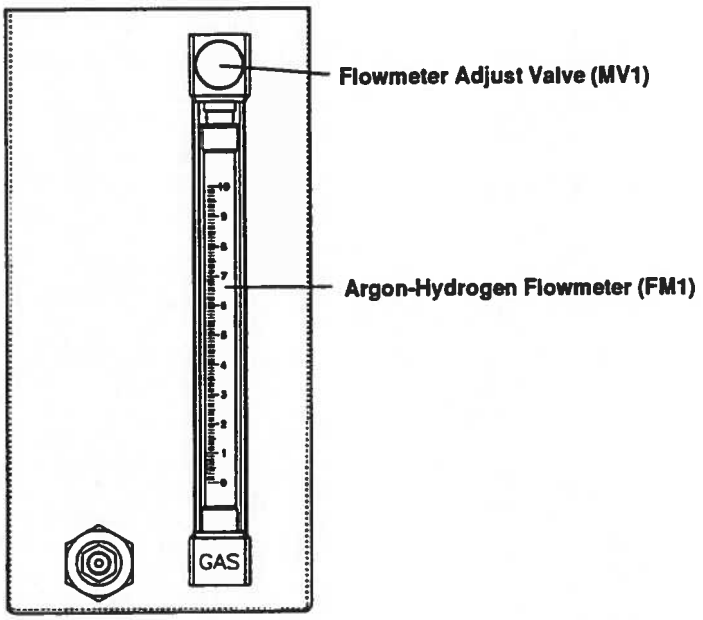


Figure 7-1 Argon-Hydrogen Manifold Front Panel Controls and Indicators

OPERATION: ARGON-HYDROGEN MANIFOLD

INSTALLATION

WARNING

Before operating the argon-hydrogen manifold, turn all power and gases connected to the HT2000 OFF. Follow the installation and operation procedures before turning power and gases ON.

Argon-Hydrogen Cable - Argon-Hydrogen Manifold to Power Supply (PS)

A. Connect the receptacle end of the argon-hydrogen cable (Fig. 7-3) to **Cable Connection Point** on the argon-hydrogen manifold. (Fig.7-2)

B. Connect the other end of the cable to TB4 (smaller terminal strip on the inside rear panel of the power supply). Match up wires 102, 103, 13 and 14 to wires already connected to the strip. Connect the two shield wires to points labeled as PE (protective earth).

Argon-Hydrogen supply to Argon-Hydrogen Manifold

A. Attach one end of the supply hosing to the argon/hydrogen supply tank or regulator, and attach the other end to the **Argon-Hydrogen Supply Hose Connection** on the manifold. (Fig. 7-2)

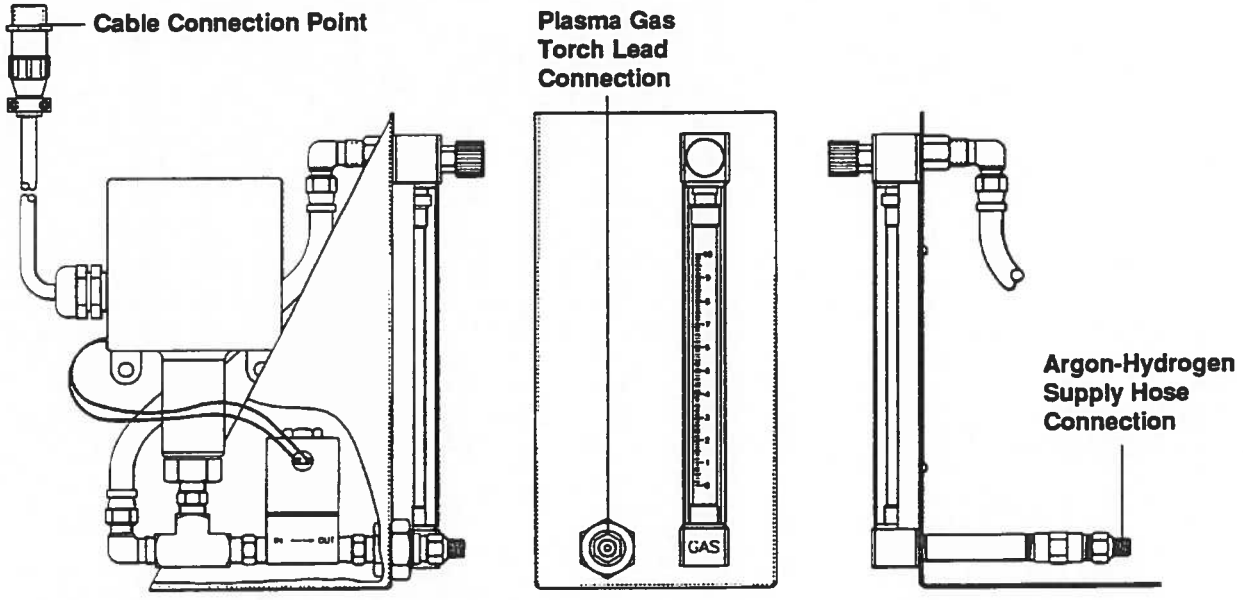
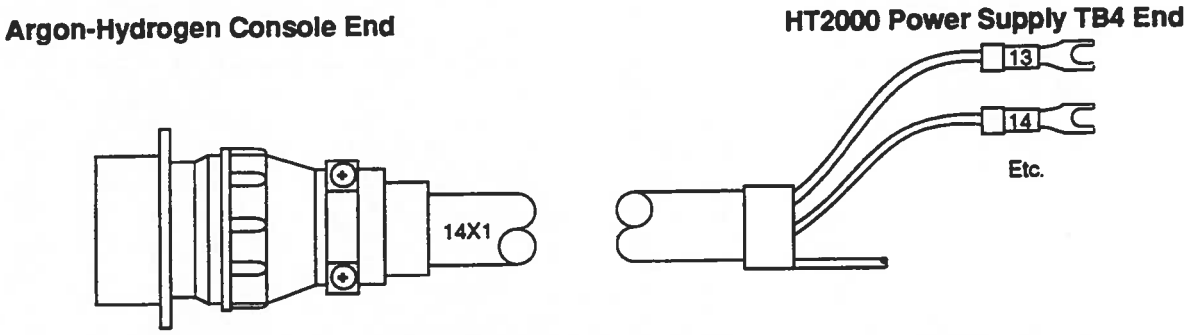


Figure 7-2 Argon-Hydrogen Manifold Connection Points

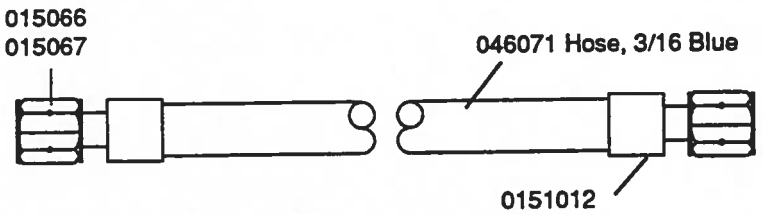
OPERATION: ARGON-HYDROGEN MANIFOLD



Wire Color	HT2000 Power Supply TB4 End	Signal
Red	13	PS1 / Plasma
Black	14	PS1 / Plasma
Shield	12	Shield
Green	102	SV5 / Plasma OFF
Black	103	SV5 / Plasma OFF
Shield	9	Shield

Part No.	Length	Part No.	Length
023660	15 ft (4.6 m)	023663	75 ft (23 m)
023661	25 ft (7.6 m)	023664	100 ft (30 m)
023662	50 ft (15 m)	023665	150 ft (46 m)

Figure 7-3 Argon-Hydrogen Manifold Cable - Argon-Hydrogen Manifold to Power Supply



Part Number	Length
024355	12 in (305 mm)
024354	10 ft (3 m)
024368	20 ft (6.2 m)
024369	30 ft (9.1 m)
024370	40 ft (12.4 m)

Figure 7-4 Plasma Gas Torch Lead - Argon-Hydrogen Manifold to Torch

Plasma gas torch lead - Argon-Hydrogen Manifold to torch (Fig. 7-5)

If your system is now hooked up for oxygen, nitrogen or air as the plasma gas:

A. Remove the **Plasma hose** from **Point 1.**

B. Attach one end of the plasma gas torch lead (Fig. 7-4) to the **Plasma Gas Torch Lead Connection** located on the front of the manifold. (Fig. 7-5)

C. Attach the other end of the plasma gas torch lead to **Point 1** on the torch. (Fig. 7-5)

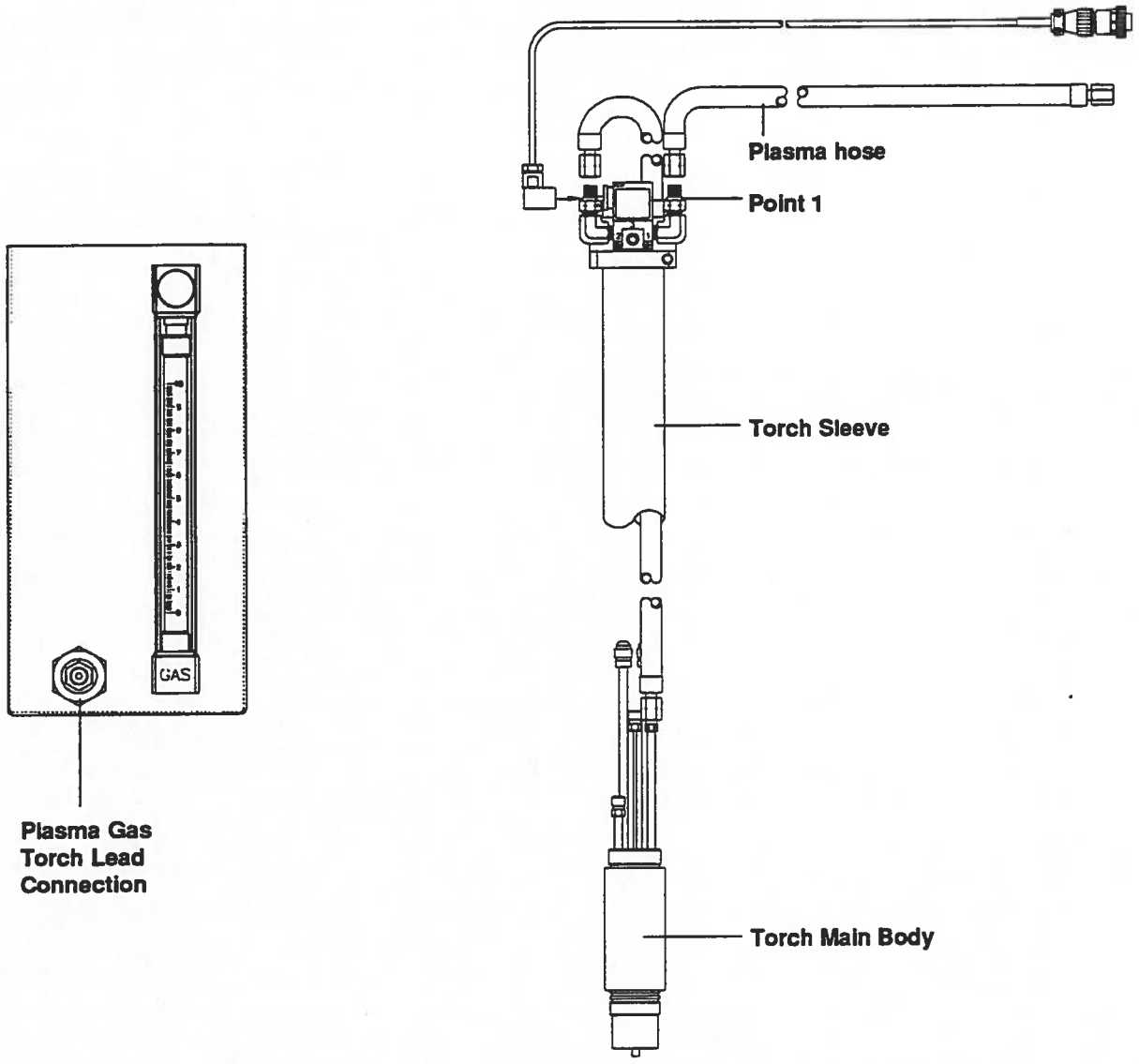


Figure 7-5 Argon-Hydrogen Manifold to Torch Connection Points

OPERATION: ARGON-HYDROGEN MANIFOLD

OPERATION

Prior to operation, ensure that your cutting environment and that your clothing meet the safety requirements outlined in the ***Safety*** section of this manual. If problems occur during operation, refer to the *Installation* portion of this section as well as **Section 4.**

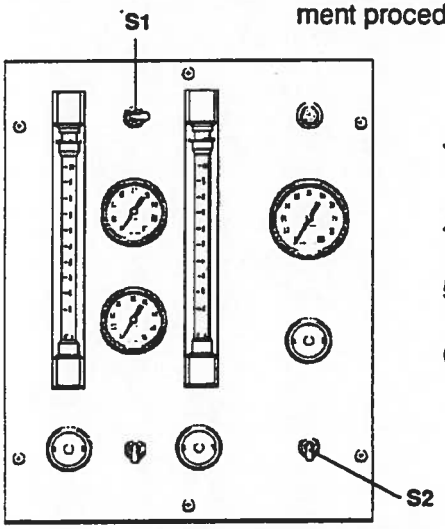
WARNING

Before operating this system, you must read the *Safety* section thoroughly! Verify main disconnect switch to the HT2000 power supply is OFF before proceeding with the following steps

Note: For operation without argon-hydrogen manifold, see **Section 6: Operation.**

Check Torch

1. Remove the consumables from the torch and check for worn or damaged parts. **Always place the consumables on a clean, dry, oil-free surface after removing. Dirty consumables can cause the torch to malfunction.**
   - Check the pit depth of the electrode using the electrode gauge assembly. The electrode should be replaced when the depth exceeds .044 inch (1.1 mm).
   - Wipe the current ring in the torch with a clean paper towel or Q-tip (see Figure 6-7).
   - Refer to the *Cut Charts* on pages 6-14 through 6-48 to choose the correct consumables for your cutting needs.
2. Replace consumable parts. Refer to *Changing Consumable Parts* in ***Section 6*** for detailed information on replacing consumables.
3. Ensure that the torch is squared to the material. Refer to **Section 4** for the torch alignment procedure.

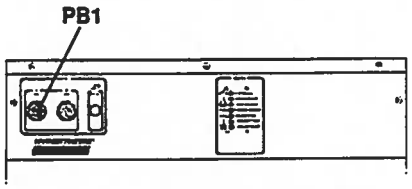


Turn Gases On

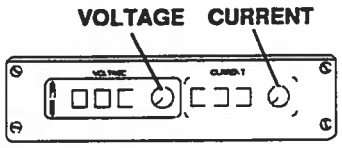
4. Set **S2** toggle switch on the gas console to **Run.**
5. **S1** can be in either position.
6. Turn the argon-hydrogen supply gas **On.**

- Adjust the argon-hydrogen **plasma gas** supply regulator to read **120 psi (8.2 bar)**.
- Adjust supply regulator for **shield gas** to read **90 psi (6.2 bar)**.

Turn Power Supply On and Adjust Voltage/Current

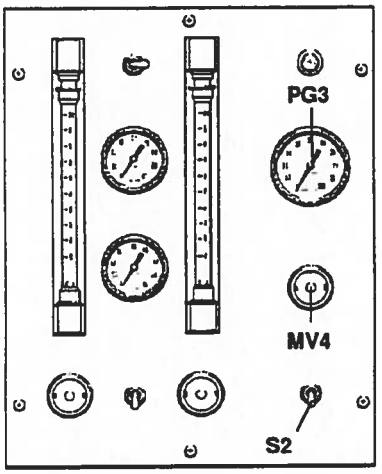


7. Turn main disconnect switch ON.
8. Turn on the power supply by depressing the **POWER ON (1)** button (**PB1**) on the HT2000 power supply. Ensure that the green **POWER ON** indicator lights. If the **POWER ON** light fails to come on, see **Section 4** for proper setup.

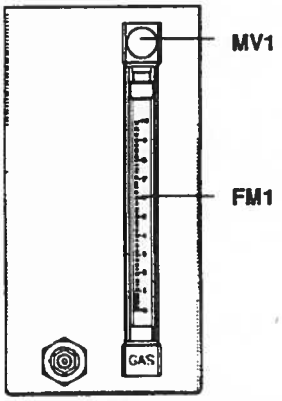


9. Set the **VOLTAGE** and **CURRENT** on the DR V/C module. Select the arc current and arc voltage from the *Cut Charts* on pages 6-14 through 6-48 for the type and thickness of metal to be test cut.

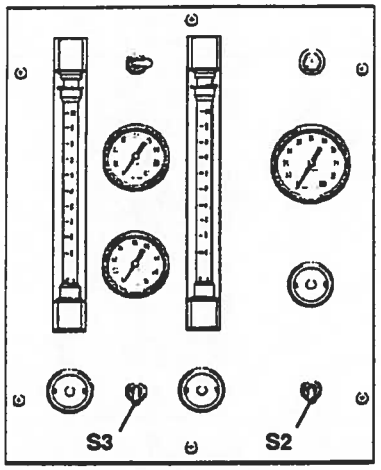
Adjust Preflow Gases



10. Set **S2** on the gas console to **Test Preflow.** Verify that the argon-hydrogen supply regulator reads 120 psi (8.2 bar).
11. Look at the flowmeter (**FM1**) on the argon-hydrogen manifold and set the **Preflow** plasma gas flow rate % by referring to the *Cut Charts* and turning the argon-hydrogen flowmeter adjust knob (**MV1**).
12. Look at the shield gas pressure gauge (**PG3**) on the gas console, and set to the *Cut Chart* specifications by turning the shield gas adjust knob (**MV4**).



OPERATION: ARGON-HYDROGEN MANIFOLD



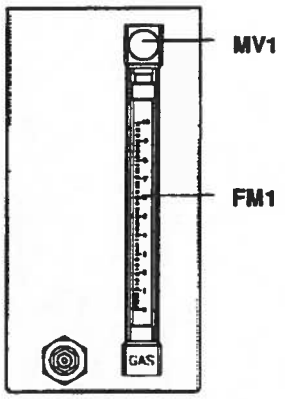
Adjust Cut Flow Gases and Prepare for Cutting

13. Set **S2** on the gas console to **Test Cut Flow.**

14. Look at the flowmeter (**FM1**) on the argon-hydrogen manifold and set the **Cut Flow** plasma gas flow rate % by referring to the *Cut Charts* and toggling the **Cut Flow** switch (**S3**) on the gas console up or down.

15. Set **S2** to **Run** after the test preflow and test operate flow rates have been set.

The system is now ready for operation.



Section 8 MAINTENANCE

In this section:

MAINTENANCE

INTRODUCTION

The HT2000, and all Hypertherm plasma systems, undergo rigorous testing prior to shipment and should require little maintenance if proper installation and operation procedures as outlined in this manual are followed.

After a routine maintenance section, a system initialization sequence of events flowchart is presented. Following the flowchart, an initial checks procedure is then given, followed by a troubleshooting guide to aid in servicing the HT2000 system, a troubleshooting guide for the STATUS indicators and a chopper checkout procedure. The microcontroller error code listing has also been included as a diagnostic tool. A gas schematic, timing diagram and a complete wiring diagram are also available in **Section 10 Wiring Diagrams**.

It is assumed that the service personnel performing the troubleshooting testing are high-level electronic service technicians that have worked with high voltage electro-mechanical systems. Knowledge of final isolation troubleshooting techniques is also assumed.

In addition to being technically qualified, maintenance personnel must perform all testing with safety in mind. Refer to the *Safety* section for operating precautions and warning formats.

If you need additional assistance or need to order parts, call our Customer Service or Technical Service Group at 1-800-643-9878.

WARNING

SHOCK HAZARD: The large electrolytic capacitor(s) (blue-cased cylinder(s)) store large amounts of energy in the form of electric voltage. Even if the power is off, dangerous voltages exist at the capacitor terminals, on the chopper, and the diode heatsinks. Never discharge the capacitor(s) with a screwdriver or other implement...explosion, property damage and/or personal injury will result. Wait at least five minutes after turning the power supply off before touching the chopper or the capacitor(s).

ROUTINE MAINTENANCE

The HT2000 system is designed to require little regular maintenance under normal use. The following maintenance checks, are suggested to keep your system in top running condition.

Torch and Torch Leads

Inspection

Inspect the torch and torch leads on a routine basis.

- The torch consumable parts and torch main body should always be inspected prior to cutting. Worn or damaged parts can cause gas and water leaks which can affect the cut quality. Check for pitting and burn marks on the consumable parts and replace, if necessary. See *Changing Consumable Parts* in **Section 6**.
- Ensure that all connections are tight, but do not overtighten.
- The torch leads should be checked occasionally for cracking and damage.

Power Supply

Inspection

Inspect the power supply on a routine basis.

- Check the exterior for any damage. If there is damage, ensure it does not affect safe operation of the power supply.
- Remove covers and inspect the interior. Check wiring harnesses and connections for wear and damage. Check for loose connections, and look for areas of discoloration due to overheating.
- At the rear of the power supply, inspect the de-ionizing filter element of the water/coolant sub-assembly. The filter element aids in preventing the coolant from becoming ionized. Ionized coolant can cause an internal electrical breakdown in the torch by allowing another path for the high frequency to travel, which could inhibit the arc. If the filter is at fault, flush out the coolant system, replace the filter element and add new coolant. The filter element, which is purple when new, changes to a brown color when exhausted. Replace the filter element when it starts to turn color. As a general rule, **replace the filter after every 100 arc hours of operation**. The filter element part number is: **027137**.

Cleaning

Cleaning the power supply periodically is necessary to keep dust and foreign matter from inside the unit.

- Remove the covers and blow out the unit with compressed air. In an excessively dirty environment, clean the power supply on a weekly basis.

MAINTENANCE

Gas Console

Inspection

Inspect the gas console on a routine basis.

- Check the exterior for any damage. Look for damaged glass tubes in the flowmeters and check the pressure gauges for damage.
- Inspect all interconnecting cables, hoses and leads for wear and damage. Ensure all connections are tight and that there are no leaks. Do not overtighten fittings.

Cleaning

Keep the flowmeters and pressure gauges free of dirt, dust and foreign matter.

Motor Valve Console

Inspection

Inspect the motor valve console on a routine basis.

- Check the exterior for any damage.
- Inspect all interconnecting cables, hoses and leads for wear and damage. Ensure all connections are tight and that there are no leaks. Do not overtighten fittings.

Cleaning

Check the motor valve console periodically for dust and foreign matter inside the unit.

- Open the cover and blow out the unit with compressed air. It is important to keep the cover closed except when cleaning or when maintenance is being performed.

RHF Console

Inspection

Inspect the RHF console on a routine basis.

- Check the exterior for any damage. If there is damage, ensure that it does not affect safe operation of the console.
- Open the cover and inspect the interior. Check all cables and hoses for wear and damage. Check for loose connections, look for areas of discoloration due to overheating. Check for plumbing leaks.

Cleaning

- Open the cover and blow out the unit with compressed air. It is important to keep the cover closed except when cleaning or when maintenance is being performed.

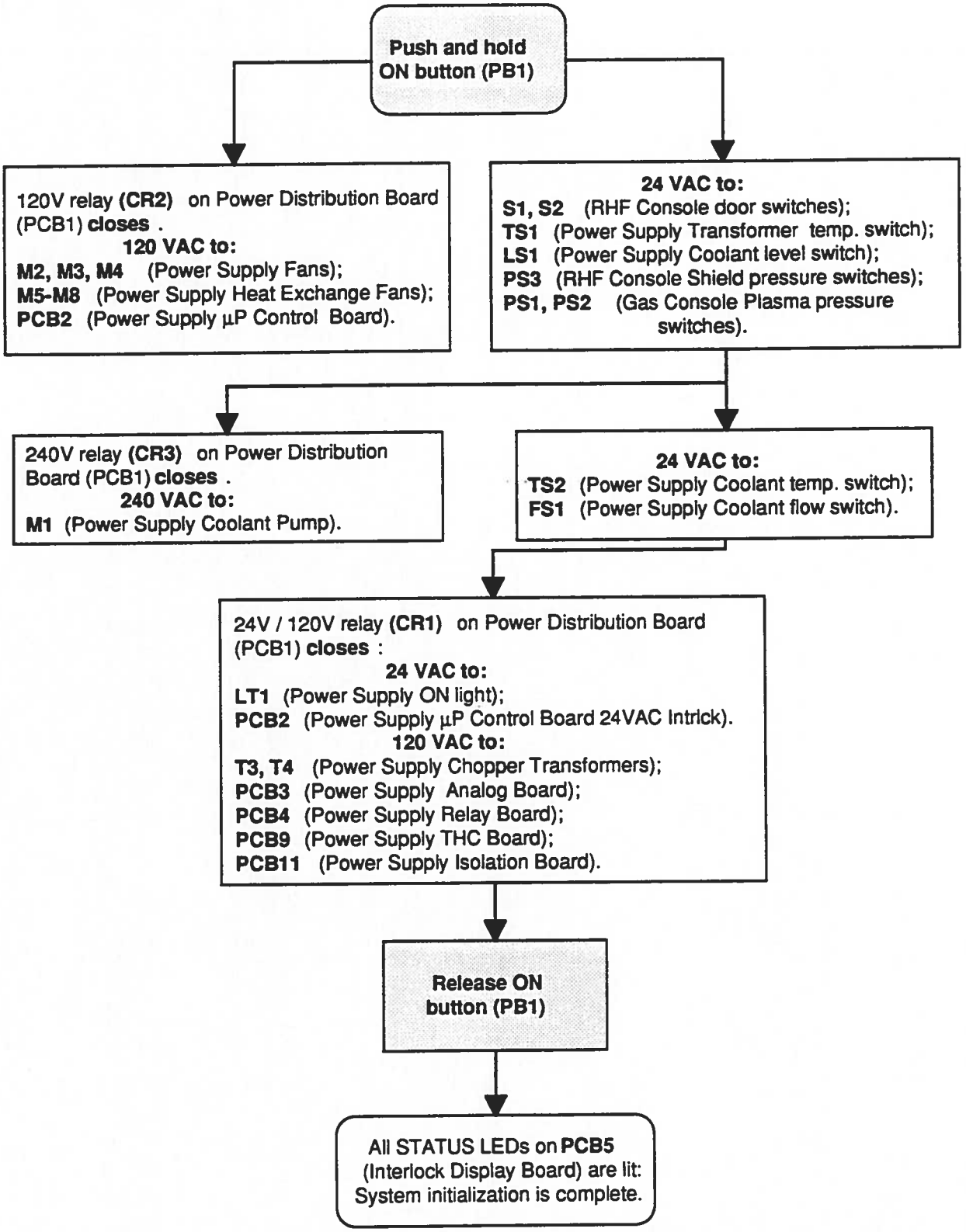
STARTUP SEQUENCE OF HT2000

On the following page is a detailed flowchart outlining the startup sequence during proper HT2000 operation. This flowchart details system functioning from the time the POWER ON button is pushed, up to the ready state (before START button is pushed). Shaded boxes represent action taken by the operator. The timing diagram on page 9 of 9 in **Section 10** outlines the functional sequence of the HT2000 system after the START command is given.

The following symbols used in the flowchart are ANSI standard flowcharting symbols. Their names and definitions are as follows:

Terminus The terminus is used to indicate the beginning or ending point of a flowchart.

Task/Process Box The process or task box is used to indicate any process or task other than an input/output operation or a decision.


Push and hold ON button (PB1)
120V relay (CR2) on Power Distribution Board (PCB1) closes .
120 VAC to:
M2, M3, M4 (Power Supply Fans);
M5-M8 (Power Supply Heat Exchange Fans);
PCB2 (Power Supply µP Control Board).
24 VAC to:
S1, S2 (RHF Console door switches);
TS1 (Power Supply Transformer temp. switch);
LS1 (Power Supply Coolant level switch);
PS3 (RHF Console Shield pressure switches);
PS1, PS2 (Gas Console Plasma pressure switches).
240V relay (CR3) on Power Distribution Board (PCB1) closes .
240 VAC to:
M1 (Power Supply Coolant Pump).
24 VAC to:
TS2 (Power Supply Coolant temp. switch);
FS1 (Power Supply Coolant flow switch).
24V / 120V relay (CR1) on Power Distribution Board (PCB1) closes :
24 VAC to:
LT1 (Power Supply ON light);
PCB2 (Power Supply µP Control Board 24VAC Intrick).
120 VAC to:
T3, T4 (Power Supply Chopper Transformers);
PCB3 (Power Supply Analog Board);
PCB4 (Power Supply Relay Board);
PCB9 (Power Supply THC Board);
PCB11 (Power Supply Isolation Board).
Release ON button (PB1)
All STATUS LEDs on PCB5 (Interlock Display Board) are lit: System initialization is complete.

INITIAL CHECKS

Before tracking down specific problems, it is good practice to do a visual check, and verify proper voltages are present at the power source, transformer and power distribution board.

WARNING

SHOCK HAZARD: Always use caution when servicing a power supply when plugged in and the covers are removed. Dangerous voltages exist within the power supply which could cause injury or death.

1. Disconnect line power by turning main disconnect switch off.
2. Using a Phillips head screwdriver, remove top plate, two side plates, front plate, and rear plate.
3. Inspect interior of unit for discoloration on pc boards, or other apparent damage. If a component or module is obviously defective upon visual inspection, remove and replace it before doing any testing. Refer to the *Parts List* section (**Section 9**) to identify parts and part numbers.
4. If no damage is apparent, plug in the power supply unit, and apply power by turning on the main disconnect switch.
5. Measure the voltage at TB1 between L1, L2 and L3. Refer to Figure 8-1 for detail of TB1. The voltage between any two of the three points at TB1 should be equal to your supply voltage (200, 208, 220, 240, 380, 415, 480, or 600VAC). If there is a problem at this point, disconnect main power and check connections, power cable, and fuses or circuit breaker at main power disconnect box. Repair and/or replace defective component(s) if necessary.

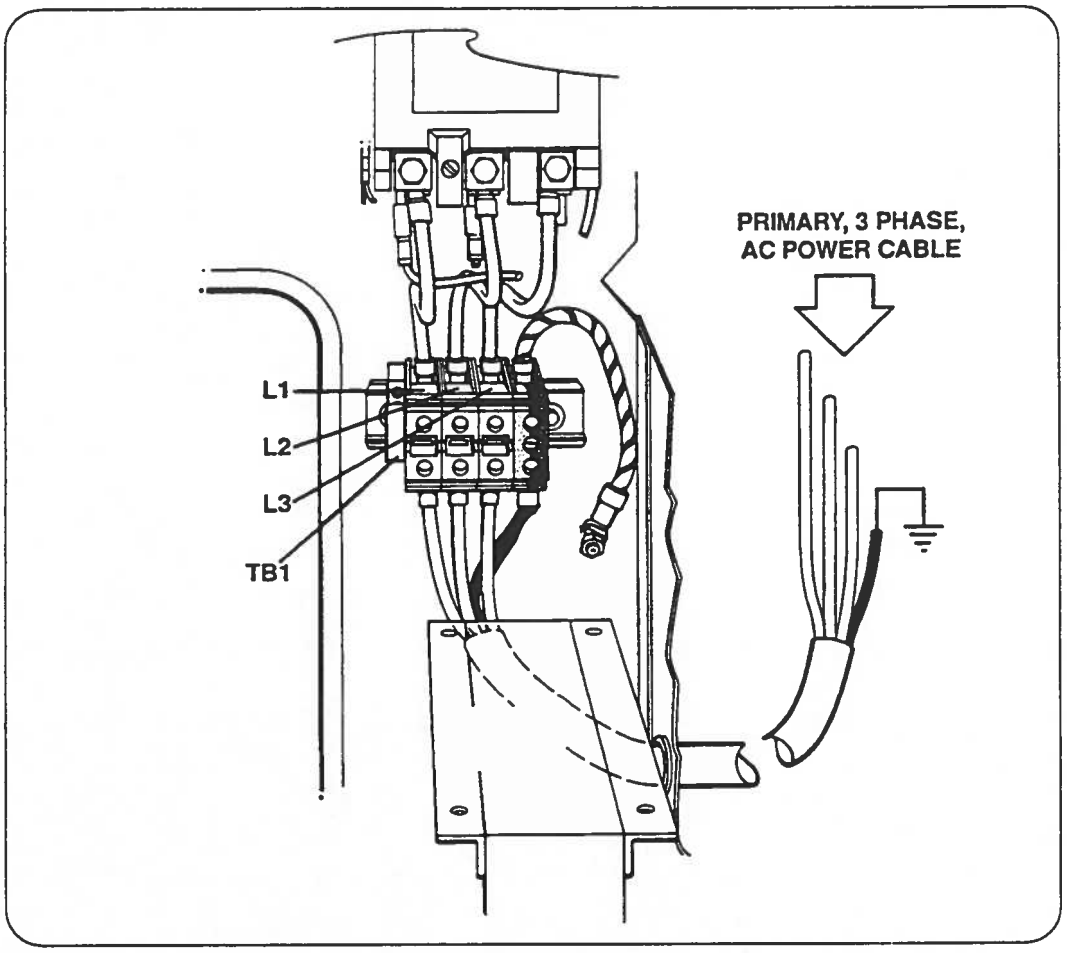


Figure 8-1 Primary Power Measurement Location - HT2000

WARNING

The neon light attached to the contactor will turn ON as soon as the line disconnect switch is ON. This indicator is a warning that there is line voltage at the contactor even if the ON (1) pushbutton on the HT2000 power supply has not been pressed. Use extreme care when measuring primary power in this area. Voltages present at the terminal block and contactor can cause injury or death!

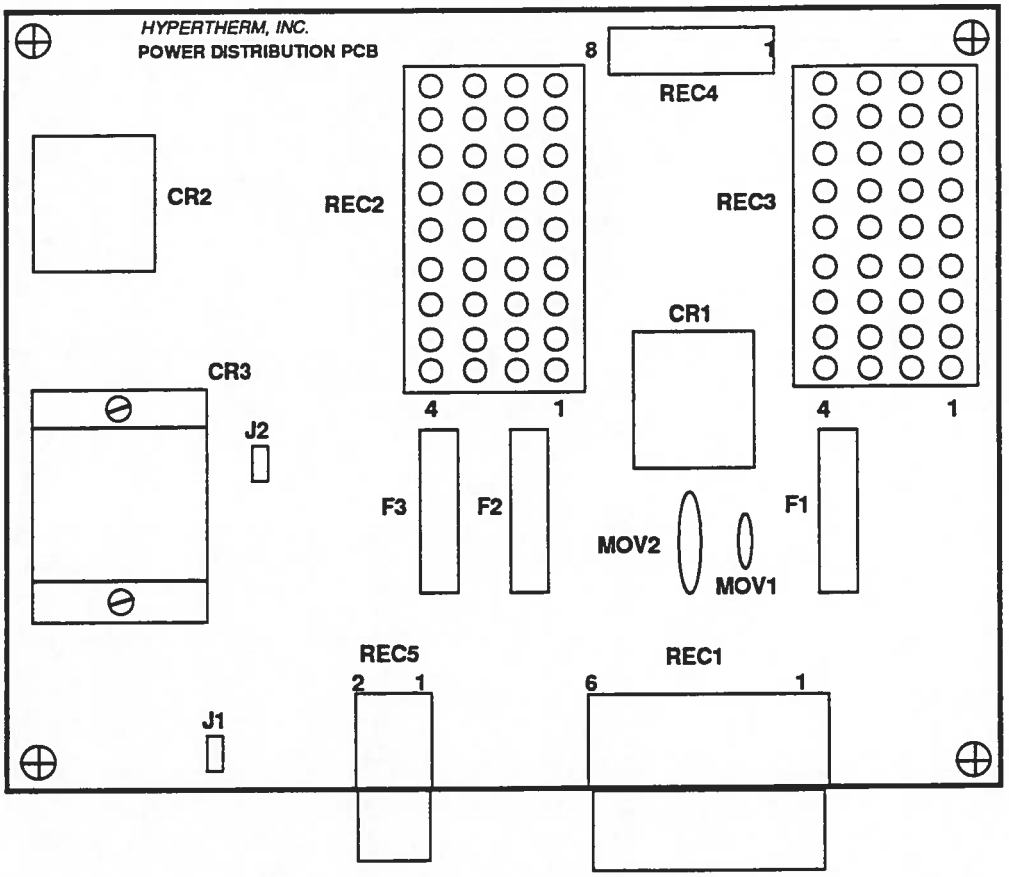


Figure 8-2 Power Distribution Board PCB1

6. Measure voltage at Power Distribution Board PCB1. Refer to Figure 8-2 for detail of PCB1. Look on the board for fuses F1, F2, and F3. Measurements between each fuse and chassis ground should be as follows:

F1:	24VAC
F2:	120VAC
F3:	240VAC

If voltages are not present, or incorrect at one or more of these points, disconnect power and troubleshoot PCB1 fuses and associated pins, connectors and wiring between power distribution board connector REC1 and transformer secondary T1. Refer to Figure 9-4 for location of T1.

Also, check main power circuit breaker CB1 located in Figure 9-4, and associated wiring and connections between T1 and points L1 and L2 (including linkboard).

Repair and/or replace defective component(s) if necessary.

MAINTENANCE

TROUBLESHOOTING

The troubleshooting section is presented by following normal operational sequence.

Before troubleshooting for specific problems, be sure that unit passes *Initial Checks* as outlined earlier in this section.

WARNING

SHOCK HAZARD: Always use caution when servicing a power supply when the covers are removed. Dangerous voltages exist within the power supply which could cause injury or death. If questions or problems arise during servicing, call the Hypertherm Technical Services Department at 1-800-643-9878.

Problem	Possible Causes and Solutions
1. The green POWER ON pushbutton switch PB1 is pressed, but the fans are not operating and the green POWER ON indicator does not light.	**1.1.** *The green POWER ON (1) PB1 pushbutton is defective.* Check that switch is operating correctly, and that good contact is being made. The POWER ON switch is normally open. **1.2.** *The red POWER OFF (0) PB2 pushbutton is defective.* Check that switch is operating correctly, and that good contact is being made. The POWER OFF switch is normally closed. **1.3.** *Associated wiring not making good contact.* Check wiring and repair or replace, if necessary.
2. The green POWER ON pushbutton switch PB1 is pressed, the POWER ON indicator lights, but the fans are not running.	**2.1.** *CR2 on the power distribution board is defective.* Check that CR2 switches when POWER ON pushbutton is pressed. See Figure 8-2 for location of CR2. If CR2 is defective, replace PCB1. **2.2.** *PL25 and REC20 located near the fans (see Figure 9-1 for location of fans) are not seated together securely and/or not getting 120VAC from power distribution board.* • Check pins, connectors and associated wiring for good continuity. • Check for 120VAC at PL25.

Problem	Possible Causes and Solutions
	2.3. *PL2 and REC2 on power distribution board (see Figure 8-2 for location of REC2) are not seated well.* Check pins, connectors and associated wiring for good continuity. Repair or replace, if necessary.
3. The green POWER ON pushbutton switch PB1 is pressed, the fans are operating, but the green POWER ON indicator does not light.	**3.1.** *Pushbutton PB1 was not held down long enough.* Press and hold PB1 for a minimum of five seconds. **3.2.** *Relay CR1 on the power distribution board is defective.* Check that CR1 switches when POWER ON pushbutton is pressed. See Figure 8-2 for location of CR1. If CR1 is defective, unsolder CR1 and replace. **3.3.** *One or more of the green STATUS LEDs does not light, indicating a fault condition.* Release PB1 and observe that all the STATUS LEDs go out. Press and hold PB1 again to observe which indicators are not lit. The LEDs are connected in series, so the topmost LED that is not lit is the first problem that must be corrected. To troubleshoot STATUS fault conditions, see *Status LED Troubleshooting* later in this section.
4. The green POWER ON indicator is lit, the START command is given and DC ON indicator is lit, but there is no high frequency and no pilot arc.	**4.1.** *There is no spark between the spark gap electrodes.* Clean (with emery cloth), align, and/or regap (.020" per gap) the electrodes, if necessary. Ensure that the electrode surfaces between the gaps are flat. If surfaces are rounded, replace and regap. See Figure 9-12 for part number information. • Visually inspect the high voltage transformer T1 in the RHF console for leaking oil or overheating. See Figure 9-11 for location of T1. Replace T1 if leaking or overheating. • Check for 120VAC at T1 after START command is given. Note that door interlock switches S1 and S2 have to be closed in order to pass the START sequence. Switches will close in both IN position, and if pulled OUT. • If there is no 120VAC at T1, use wiring diagrams in **Section 5** and check pins, connectors and associated wiring from T1 to relay board PCB4. If connections are

Problem	Possible Causes and Solutions
	OK, there may be a problem with either PCB4 or PCB2. See sheet 4 of 9 in **Section 10** for location of the relay that controls RHF transformer T1. • If there <u>is</u> 120VAC at T1, shut down system and remove RHF capacitors C3 and C4. (See Figure 9-12 for location of C3 and C4) Restart system and see if a faint spark is now observed across the gaps. • If a spark is <u>not</u> observed at the gaps, replace T1. If there <u>is</u> a spark, shut down system, and replace capacitors C3 and C4. **(Always replace the capacitors in pairs).** **4.2.** *There is no high frequency at the torch.* Check for a shorted torch, a damaged pilot arc lead, or loose lead connections. Replace the torch or pilot arc lead or tighten the lead connections.
5. The green POWER ON indicator is lit, the torch START command is given and the DC ON indicator lights, and there is high frequency, but there is no pilot arc.	**5.1.** *Pilot arc relay CR1 is not closing (not getting 120VAC from the relay board PCB4).* See if the CR1 relay contacts close after the START command is given. See Figure 9-8 for location of CR1. If CR1 does <u>not</u> close: • With an AC voltmeter across the relay, see if 120VAC is coming from PCB4 after START command is given. • If there is no 120VAC, check connectors, terminals, pins, and associated wiring to PCB4. • If wiring is OK, there is a problem either with PCB4 or PCB2. See sheet 4 of 9 in **Section 10** for location of the relay that controls pilot arc relay CR1. **5.2.** *Pilot arc relay CR1 is defective.* If there <u>is</u> 120VAC across the relay (see above steps), and CR1 does not close, replace CR1. **5.3.** *Main contactor (CON1) or PCB4 is defective.* • With an AC voltmeter, see if contactor CON1 is getting 120VAC after START command is given.

Problem	Possible Causes and Solutions
	If there is no 120VAC, check pins, connectors and associated wiring from CON1 to PCB4. • If wiring is OK, PCB4 or PCB2 may be defective. See sheet 4 of 9 in **Section 10** for location of the relay that controls main contactor CON1. • If CON1 is getting 120VAC from the relay board as described above, measure the voltage between all terminals 1A, 1B and 1C and 2A, 2B and 2C of main transformer T2 after the START command is given. See Figure 9-3 for location of T2. The voltage between any two of the three points should be equal to 200VAC. If there is no voltage at any of the above points, replace CON1. If there is voltage at some but not all of the above points, check wiring and connections to and from T2. If wiring checks out OK, return to *Initial Checks* section and repeat steps 1-5. **5.4.** *Choppers are defective or not functioning.* See *Chopper Module Test Procedure* later in this section to troubleshoot.
6. The unit stops cutting during cut, or cuts poorly.	**6.1.** *The work cable is not connected or it is broken.* Connect or repair the work cable. **6.2.** *Arc not transferring to workpiece.* Check work cable connection to workpiece. Good contact must be made in order for the arc to transfer to the work-piece. **6.3.** *There is insufficient air or gas pressure.* Check gas inlet pressure specifications under *Cut Charts* in **Operation** section . Check plasma and shield gas pressures in TEST and RUN modes as specified under *Cut Charts* in **Operation** section. **6.4.** *Torch is getting insufficient current.* Check the arc current setting for the type and thickness of

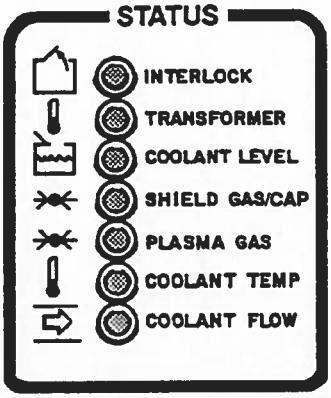
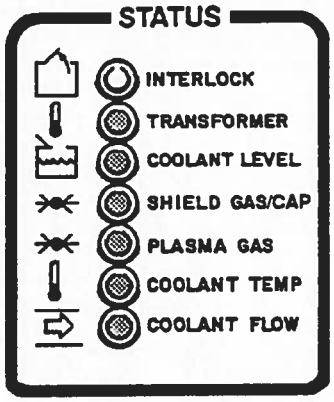
Problem	Possible Causes and Solutions
	metal you are cutting from the *Cut Charts* .
	6.5. *The power supply has overheated.* Shut down system and wait for unit to cool down. If unit will not restart, see *Status LED Troubleshooting* guide later in this section.
	6.6. *Choppers are defective or not functioning.* See *Chopper Module Test Procedure* later in this section.

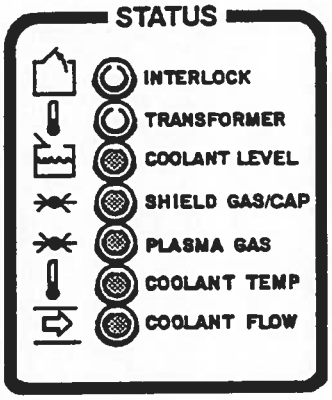
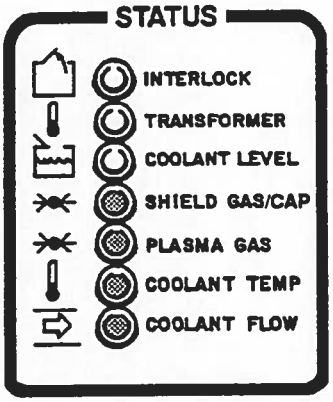
STATUS LED TROUBLESHOOTING

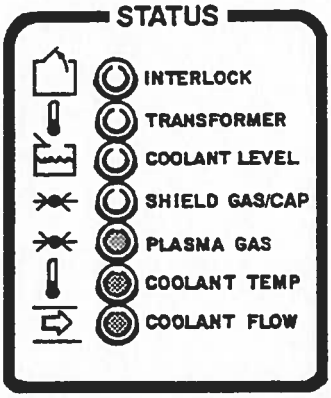
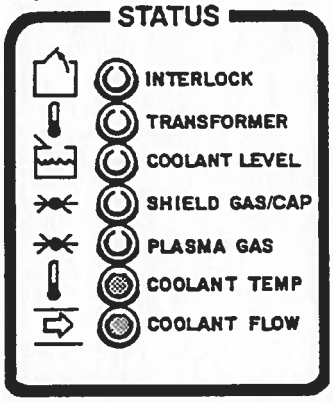
Be certain that the power supply has been through the *Initial Checks* as outlined earlier in this section before troubleshooting STATUS LEDs.

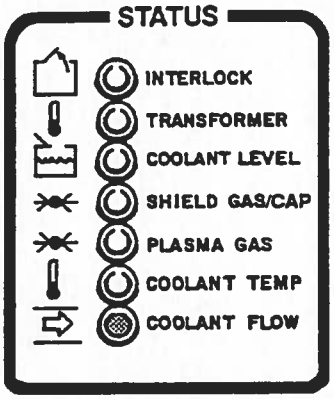
When any one of the STATUS LEDs does not light, there is a fault condition that must be corrected in order for the HT2000 power supply to become operational. The LEDs are connected in series, so the upper-most light that does not light represents the first condition that must be corrected.

See **Section 10 Wiring Diagrams** in this manual for reference.

Problem	Possible Causes and Solutions
1. INTERLOCK LED not lit: 	1.1 *Door(s) to Remote RHF Console not completely shut.* This LED will light when switches S1 and S2 located in the RHF console are closed. They will close when the RHF console doors are closed. If the doors are closed, check pins, connectors and associated wiring for good continuity from receptacle 1X1 to 2X1. Repair and/or replace defective component(s), if necessary.
2. TRANSFORMER LED not lit: 	2.1. *Main Transformer T2 is overheating.* This LED will light when the main transformer (T2) is operating in a normal temperature range (under 165° C). Temperature switch TS1 will open and turn off LED when transformer overheats. • If transformer is not hot, take TS1 connector apart (PL22 and REC22) and check for continuity. TS1 is normally closed. • Check pins, connectors and associated wiring from TS1 to REC3 of PCB1. • If transformer T2 is excessively hot, it needs to cool down. Leave the fans running, and try restarting the unit after one hour. If transformer still overheats, re-check incoming voltage (See *Initial Checks* earlier in this section). If incoming voltage is OK, T2 may need to be replaced.

Problem	Possible Causes and Solutions
3. COOLANT LEVEL LED not lit: 	**3.1.** *Coolant level is low.* This LED will light when a proper coolant level in the coolant reservoir is maintained. Level switch LS1 is located in the coolant reservoir, and will open when it senses that coolant level is too low. • Check coolant level. • If coolant level is adequate, disconnect PL23 from REC23 (located near reservoir) and check to see if LS1 switch is closed. • Check connections and associated wiring from PL23 to REC3 of PCB1. Repair and/or replace defective component(s), if necessary.
4. SHIELD GAS/CAP LED not lit: 	**4.1.** *Shield gas pressure too low.* This LED will light when shield gas pressure of 60 psi or greater is sensed by PS3 (located in the RHF console). • Check to see that shield gas supply is set to **120 psi** as defined in the *Introduction and Specifications* section of this manual. • Verify that all shield gas connections are secure, and that there are no leaks in any hosing connected to the RHF console or gas console. **4.2.** *Torch cap not tightened securely.* If the torch retaining cap is not tightened securely, or there is debris in the retaining cap, shield gas may escape and cause pressure switch PS3 to remain open. • Listen at the torch for a hissing sound during startup. • Remove retaining cap and check for debris or O-ring damage. Clean or replace, if necessary. See *Changing Consumable Parts* in the **Operation** section. **4.2.** *Pressure switch PS3 in RHF console not functioning.* PS3 is normally open, and closes when shield gas pressure is 60 psi or greater. After PS3 is closed, the 24VAC lights the **SHIELD GAS/CAP** LED.

Problem	Possible Causes and Solutions
	• Using wiring diagrams, check pins, connectors and associated wiring from REC3 on the power distribution board (PCB1) to PS3.
	Repair and/or replace defective component(s), if necessary.
5. PLASMA GAS LED not lit: 	**5.1.** *Plasma gas pressure too low.* This LED will light when PS1 and/or PS2 in the gas console senses plasma gas pressure of 70 psi or greater. • Verify that plasma gas supply is set to **120 psi** as defined in the *Introduction and Specifications* section of this manual. • Verify that all plasma gas connections are secure, and that there are no leaks in any hosing connected to the gas console. **5.2.** *Pressure switches PS1 and/or PS2 not functioning.* These switches are normally open, and close when plasma gas pressure is at or above 70 psi. After PS1 and PS2 are closed (in O_2 mode) or PS1 is closed (in N_2 mode), the 24VAC lights the **PLASMA GAS** LED. • Using the wiring diagrams, check pins, connectors and associated wiring from REC3 on the power distribution board (PCB1) to PS1 and PS2. Repair and/or replace defective component(s), if necessary.
6. COOLANT TEMP LED not lit: 	**6.1.** *Coolant too hot.* This LED will light when temperature switch TS2 senses that the temperature of coolant in the coolant reservoir is under 160°F. • Check to see if water coolant is above **160°F**. • Disconnect PL24 (located in the rear of the power supply near the coolant reservoir) from REC24 and check to see if TS2 is open. TS2 is normally closed, and is opened when a temperature above 160°F is reached.

Problem	Possible Causes and Solutions
	• Using the wiring diagrams, check pins, wires and connections from PL24 to REC3 of PCB1. Repair and/or replace defective component(s), if necessary.
7. COOLANT FLOW LED not lit:  	**7.1.** *Coolant flow too slow.* This LED will light when flowswitch (FS1) senses a coolant flow of at least .5 gpm to the torch. See Figure 9-10 for location of flowswitch FS1, motor M1, and pump P1. **7.2.** *Motor M1 not functioning.* • Check to see if 240VAC is available at PL21. PL21 is located near the pump. Note: The 240VAC relay (CR3) on PCB1 will not close until the first five (5) interlocks (STATUS indicators) are satisfied. (See *Startup Sequence of HT2000* flowchart) • Using the wiring diagrams, check pins, connections and associated wiring from PL21 to REC5 of PCB1. If 240VAC is not available at REC5, CR3 may be defective. Replace PCB1 if CR3 is defective. **7.3.** *Pressure switch FS1 not functioning.* FS1 is a normally open switch that is closed when a flow greater than .25 gpm is sensed. When FS1 is closed, 24VAC lights the **COOLANT FLOW** LED. • Check coolant hoses and connections for leaks. • Check wiring and connections from PL25 to REC3 of PCB1. Repair and/or replace defective component(s), if necessary.

CHOPPER MODULE TEST PROCEDURE

Note: Take voltages with a digital multimeter capable of storing min. and max. readings.

WARNING

SHOCK HAZARD: Use extreme care when working near the chopper modules. The large electrolytic capacitor(s) (blue-cased cylinder(s)) store large amounts of energy in the form of electric voltage. Even if the power is off, dangerous voltages exist at the capacitor terminals, on the chopper, and the diode heatsinks. Never discharge the capacitor(s) with a screwdriver or other implement...explosion, property damage and/or personal injury will result.

1. Turn all power to the HT2000 OFF.
   Disconnect mating receptacles in the RHF console to disable the high frequency transformer T1. See Figure 9-11 for location of T1.
   Note: RHF console door must be re-shut before attempting to start system.

2. Remove large fuses F1 and F2. Check to see if fuse(s) is (are) open.

3. Place the positive lead to the + side of the bridge and the negative lead to the – side of the bridge. See Figure 8-3. Note that actual connection points are hidden by cap support bracket in Figure 8-3.

4. Turn power to the HT2000 ON, and start system up. After the START command has been given, check voltage. The input to the chopper at these points should be about +280 VDC. If the input is OK and corresponding fuse F1 or F2 was blown, replace the chopper module.
   If there is no +280 VDC input, check input to bridge for shorts. Also, check contactor (CON1), connections and associated wiring to the contactor. Repair and/or replace defective component(s) if necessary.

5. If voltage from above step is +280 VDC and corresponding fuse is not blown, check output of CH1 by placing the positive lead of the voltmeter at point + WORK on the chopper module (wire #48A) and negative lead at point - TORCH (wire #39A). (Check output of CH2 by placing leads of voltmeter at the corresponding points on the other chopper module.)

6. Turn the system on and press the START command. After the START command has been given, check the voltage. If the output from each chopper at these points is +280 VDC, then choppers are OK.

7. If the chopper does not output +280 VDC, check to see if LED1 logic power light is on. If LED1 is not on, check if 120V is going to JP6. If there is no 120V at JP6, check wiring back to power distribution board. Repair or replace defective component(s), if necessary.

Also check to see if LED3 is turning green when enabled (normal condition). If LED1 is on and LED3 is red when enabled (fault condition), then make sure that JP9 is seated properly. If JP9 is connected, disconnect one side of the thermo switch wire (TS1) and try again. If voltage comes up and LED3 turns green, the unit is either too hot or thermo switch is shorted. Allow unit to cool and repeat test. If LED3 still turns green, replace chopper module.

8. If chopper still does not output 280V after completing step 7, there may be a problem with the control signal or the chopper module. The chopper drive signal comes through the analog board PCB3 as an analog level from 0 to +8 VDC, which varies the duty cycle and subsequent output current of the chopper. These analog signals are on pins 3&4 REC1 of PCB3 for CH1, and 5&6 REC1 for CH2.

   To determine if there is a problem with the chopper modules or with control board PCB2 or analog board PCB3, proceed as follows:

   - Ensure that high frequency is still disabled (see step 1).
   - Disconnect PL3.1 from REC1 on PCB3.
   - Place voltmeter across output of chopper and press the START command.
   - If the voltmeter reads +280 VDC, then replace either control board PCB2 or analog board PCB3.
   - If the voltmeter reads 0 volts, then replace corresponding chopper module CH1 or CH2.

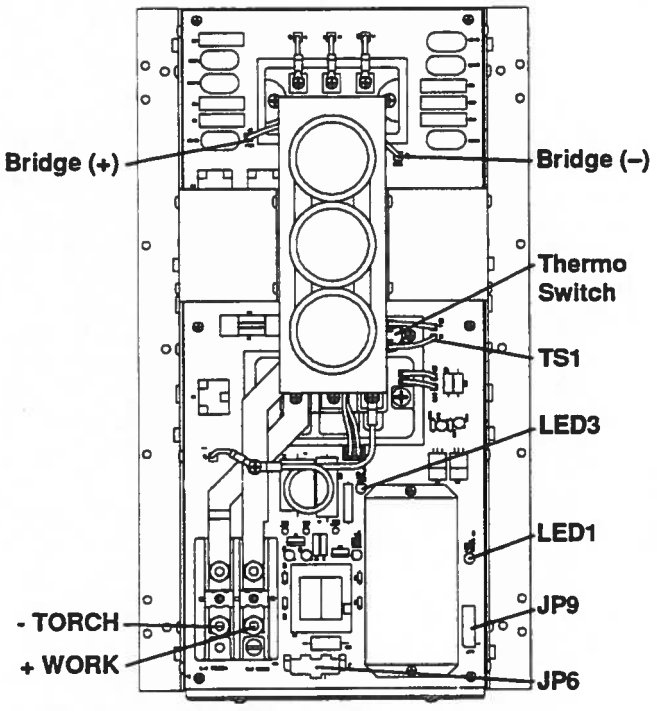


Figure 8-3 Chopper Module - Front View

ERROR CODES

The microcontroller on control board PCB2 will alert the user when certain errors occur in the HT2000 system, by flashing the **ERROR CODE** LED on the control board . The power supply front cover must be removed to observe control board PCB2 and the **ERROR CODE** LED (see Figure 9-1 for location of PCB2 and Figure 8-4 for location of **ERROR CODE** LED on PCB2).

The **ERROR CODE** LED will blink on for .5 seconds and off for .5 seconds with a two second gap before repeating the blinking sequence. The number of blinks between the two second gap is one of ten error indications listed on the following page.

During the error code flashing, all outputs from the control board are turned off, and the power supply is in an idle mode. After the error is corrected, you may resume operation of the system.

Note: Eight or nine blinks will occur during normal operation.
If the **ERROR CODE** LED remains on without blinking, this indicates that a microcontroller internal RAM or ROM self-check error has occurred (power supply will hang up).

For troubleshooting purposes, the PLASMA START LED is also shown in Figure 8-4. When lit, this LED indicates that the plasma START command has been received at the control board.

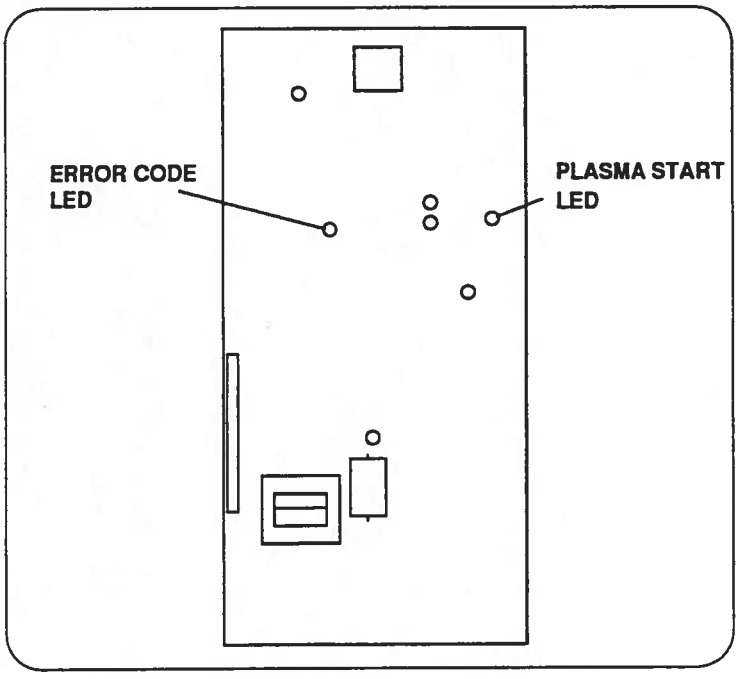


Figure 8-4 HT2000 Control Board Error Code LED Location

Number of blinks	Explanation
1	One blink indicates that the IHS Complete signal has not been returned within 30 seconds after the plasma START command has been given.
2	Two blinks indicates that an "interlock" error has occurred.
3	Three blinks indicates that the HOLD input (for multi-torch systems) was not released within 30 seconds after the end of preflow.
4	Four blinks indicates that the high frequency was unable to ignite the pilot arc within one second.
6	Six blinks indicates that the transfer of the arc to the workpiece was not sensed within two seconds of torch ignition.
7	Seven blinks indicates that the arc was extinguished after current transferred to the workpiece but before steady-state operation.
8	Eight blinks indicates that the current was lost from chopper #1 (CH1).
9	Nine blinks indicates that the current was lost from chopper #2 (CH2).
11	Eleven blinks indicates that the arc was lost during current ramp down but before the programmed ramp down time has elapsed.
20	20 blinks indicates that the software has an error.

Figure 8-5 Error Codes

Section 9 PARTS LIST

In this section:

PARTS LIST

INTRODUCTION

The format to list and call out Hypertherm parts is as follows:

Item	Part Number	Description	Designator	Qty.
	029320	**Chopper SA, 15KW, HT2000**	**CH1**	1
1	001232	Bracket, HT2000 Chopper Module		2
35	**041118**	**PC BD Assy Snubber**	**PCB1**	1

Item: Refers to item call out on same or opposing page.
Number (Ex. 1) refers to numbered call out (1) on same or opposing page.

Part Number: Refers to Hypertherm part numbers.
Bold part numbers (Ex. **029320**) signify parent or subassemblies that contain additional items.
Normal-style part numbers (Ex. 001232) signify items that may or may not be under a parent or subassembly.

Description: Describes the item.
Bold descriptions not indented (Ex. **Chopper SA, 15KW, HT2000**) signify parent assemblies that contain additional items.

Normal-style part numbers that are indented (Ex. Bracket, HT2000 Chopper Module) signify items under parent or subassembly. In this example, parent is **Chopper SA, 15KW, HT2000.**

Bold descriptions that are indented (Ex. **PC BD Assy Snubber**) represent subassemblies that are under a parent assembly.

Designator: Represents a cross reference to wiring diagrams or pneumatic diagrams.
(Ex. **CH1** refers to chopper assembly CH1 shown in wiring diagrams)

Note: When referencing components to the wiring diagrams in Section 10, designations may appear to be repeated. Ex: C1 appears on sheet 2 of 9 in the wiring diagrams in five separate locations. Sections of the power supply on that page are outlined with a dotted box and a label. Within different sections, the same designation may appear. Be certain to check the dotted box label when looking for or cross-referencing HT2000 parts.

Qty.: Refers to the number of items in the parent or subassembly.

SYSTEM PARTS DIAGRAM

On the following page is a system parts diagram with reference numbers to system components, cabling, and hosing. To locate a part, find the system component reference number in the diagram, and find the same reference number in the parts list. Components with many parts (such as the HT2000 power supply) are additionally broken down to major components and subassemblies.

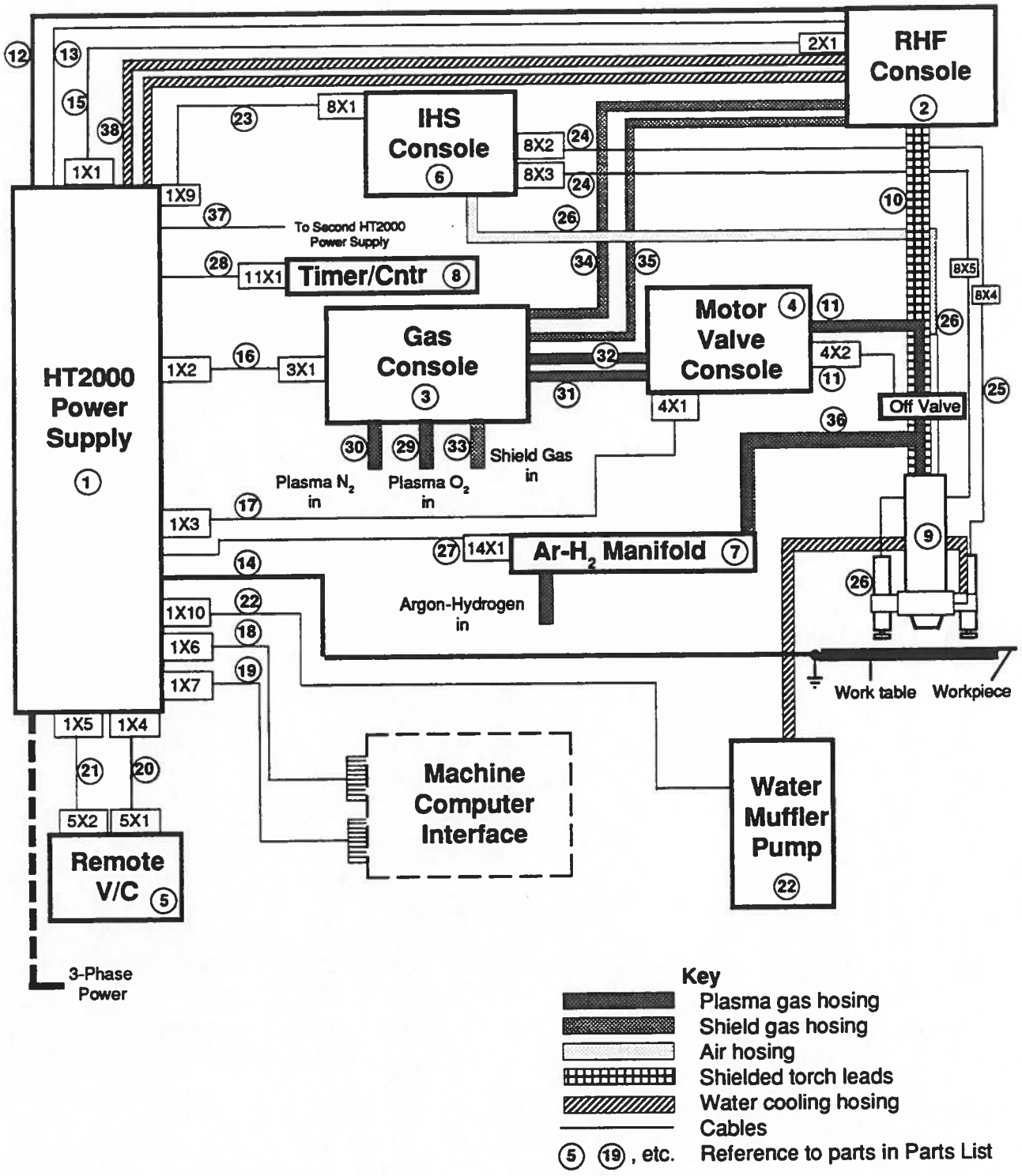


Figure 9-0 HT2000 System Parts Diagram with IHS and Water Muffler

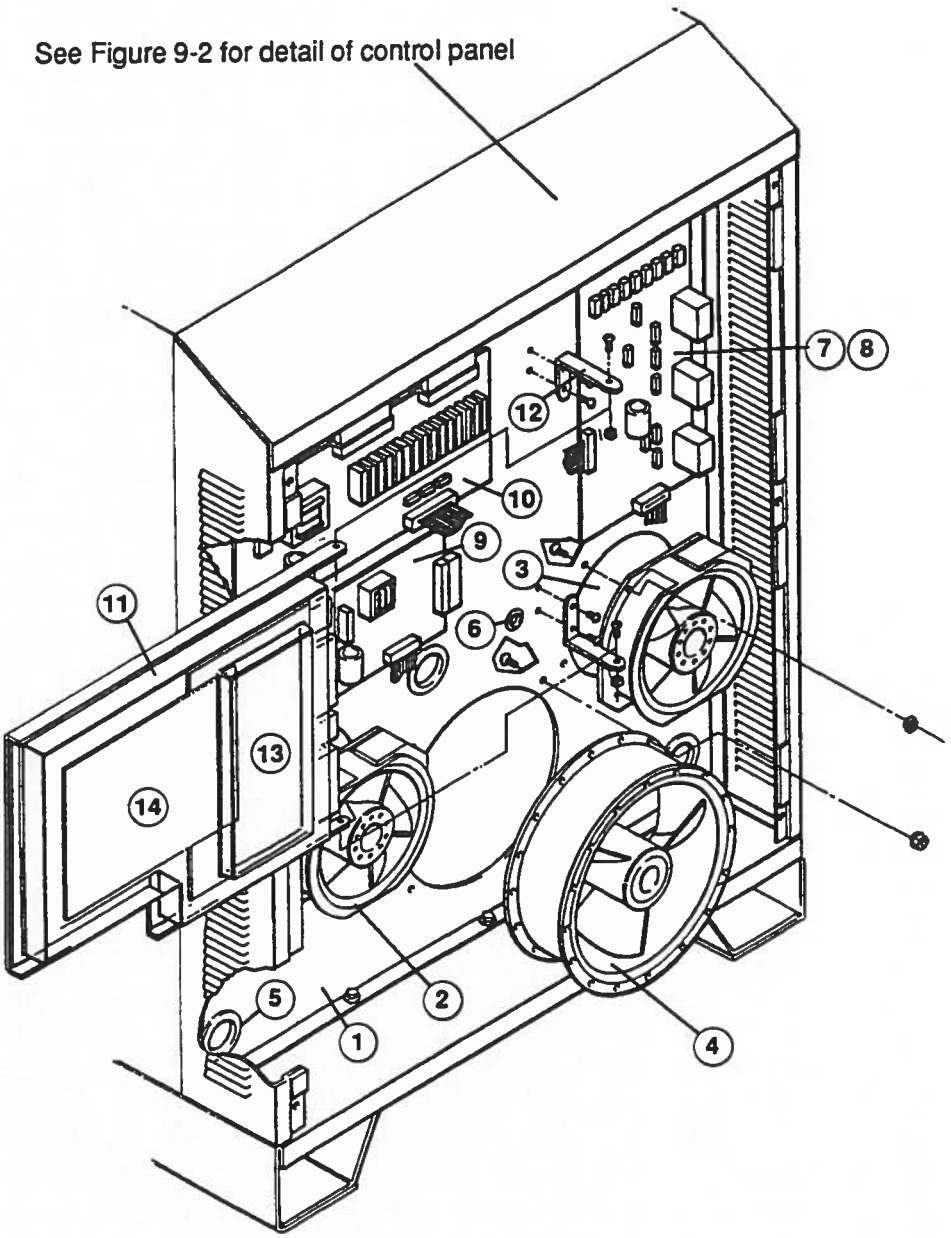


Figure 9-1 HT2000 Power Supply - Front Panel

HT2000 Power Supply (1) : Front Panel

Item	Part Number	Description	Designator	Qty.
1	001233	Panel, HT2000 Front		1
2	027080	Fan 225 CFM 120VAC 50/60Hz	M3	1
3	027080	Fan 225 CFM 120VAC 50/60Hz	M2	1
4	027079	Fan 450-550 CFM 120VAC 50/60Hz	M4	1
5	008509	Bushing 1.75 MTG X 1.37 ID		3
6	008245	Bushing, 7/8" Hole X 11/16" ID		1
7	**041280**	**PCB Assy: HT2000 Miprcs**	PCB2	1
8	081004	Firmware: HT2000		1
9	**041276**	**PCB Assy: HT2000 Anlg**	PCB3	1
10	**041246**	**PCB Assy: Relay, HD1070 / HT2000**	PCB4	1
	029697	**HT2000 THC SA**		
11	001297	Cov: HT2000 THC Dust		1
12	004338	Hinge - THC Pan, HT2000		2
13	**041294**	**PCB Assy: HT2000 THC M other**	PCB9	1
14	**041186**	**PCB Assy: HT2000 Torch Hght Cntrl**	PCB10	1

PARTS LIST

HT2000 Power Supply (1) : Control Panel

Item	Part Number	Description	Designator	Qty.
	029646	**Contr Pnl SA, HT2000**		1
1	001301	Pnl :HT2000 Cont		1
2	005151	Lamp holder		1
3	005149	Bulb, 28VDC, 40 ma	LT1	1
4	005089	Lens:White for 005088		1
	041149	**PC BD Assy Intlk Dsply 200/1070**	PCB5	1
5	008516	Post Header, 8-pin RA MTA-156		1
6	008517	Spcr, .19 OD .12 ID .50 LG		7
7	009399	Diode, Ind LED Grn		7
8	041148	PC BD only Intlck Dsply 200/1070		1
9	005121	Pushbutton, 2 NO Green Illumin	PB1	1
10	005122	Pushbutton, 2 NC Red Extended	PB2	1

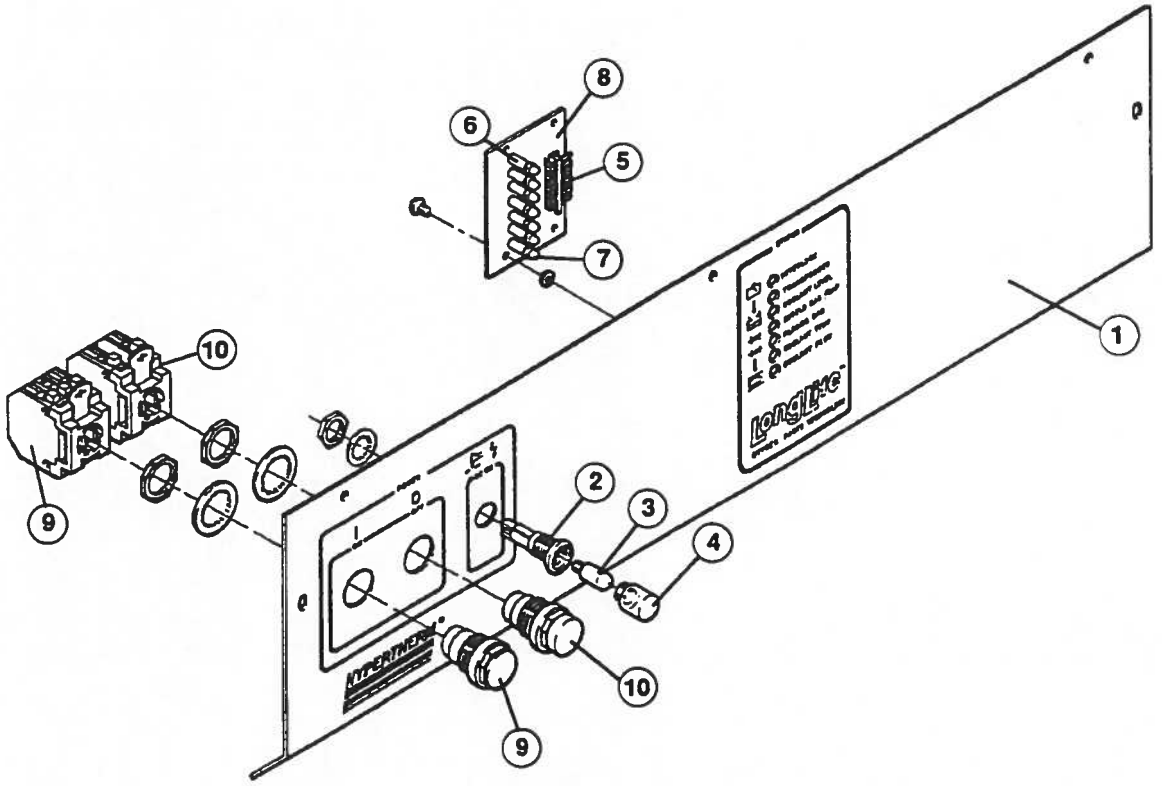


Figure 9-2 HT2000 Power Supply - Control Panel

HT2000 Power Supply (1) : Base Plate and Components

Item	Part Number	Description	Designator	Qty.
1	001229	Base, HT2000		1
2	014078	Transf'mer 30KW 240-480/3PH/60	T2	1
2	*014097	Transf'mer 30KW 208/3/60	T2	1
2	** 014088	Transf"mer 30KW 220-380-415/50	T2	1
2	***014111	Transf'mer 30KW 200V/3PH/50Hz	T2	1
2	****014082	Transf'mer 30KW 600/3/60	T2	1
3	005102	Thermostat, 160°C, 6 Amp	TS1	1
4	014080	Inductor, 4mh 100A	L1	1
5	014080	Inductor, 4mh 100A	L2	1
6	075241	M/S, 1/4-20 X1/2,SL, IHW, S/Z		4
7	075199	Flwshr, 1/2, .532, 1.06, .099, S/Z		4
8	075242	M/S, 1/4-20 X 3/4, SL, IHW, S/Z		1

* Used on 208 volt power supplies
** Used on 220/380/415 volt power supplies
*** Used on 200 volt power supply
**** Used on 600 volt power supplies

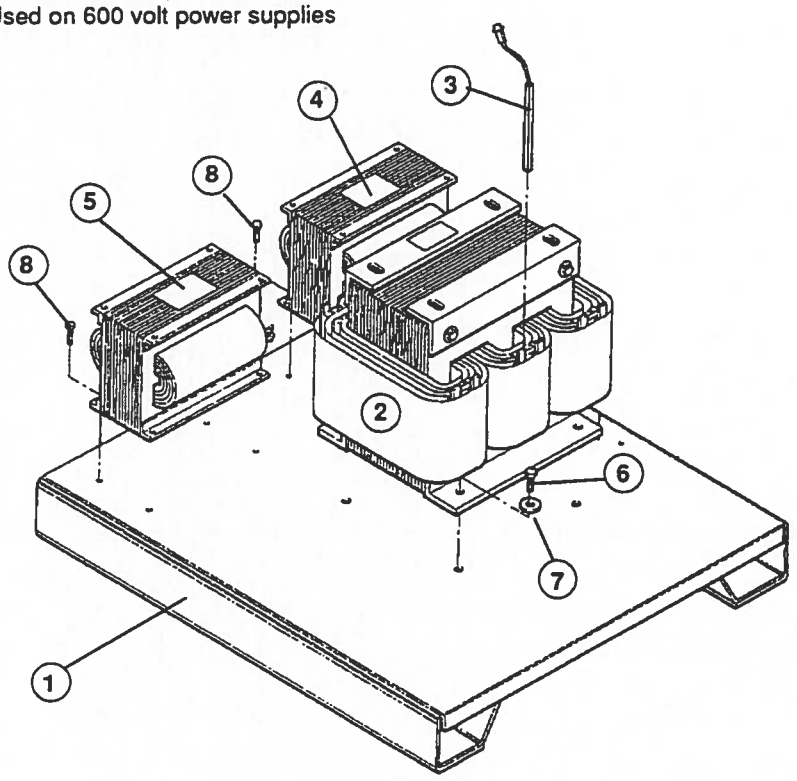


Figure 9-3 HT2000 Power Supply - Base Plate and Components

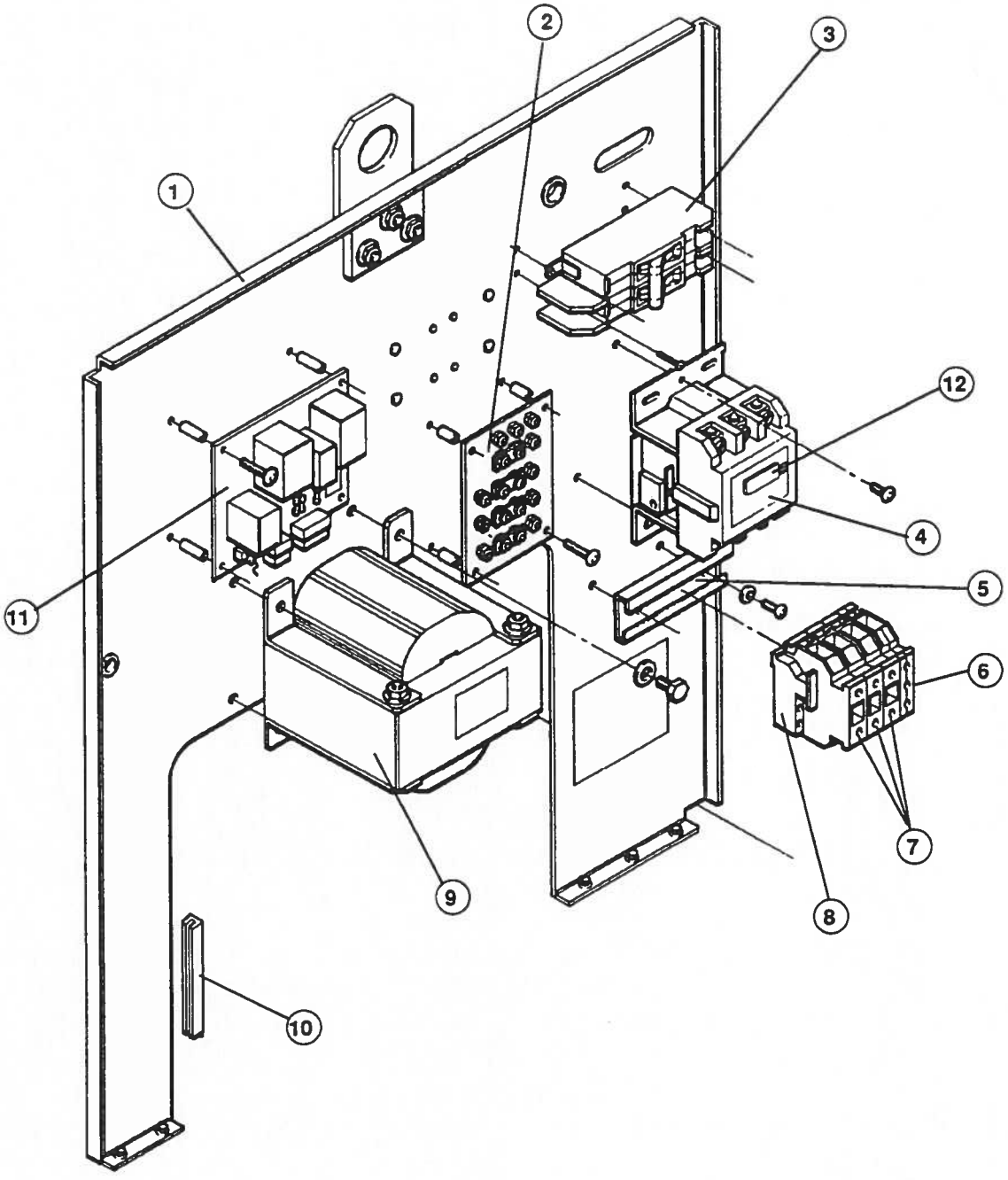


Figure 9-4 HT2000 Power Supply - Center Wall Right Side

HT2000 Power Supply (1) : Center Wall Right Side

Item		Part Number	Description	Designator	Qty.
1		001230	Panel, MAX200 Center		1
2	*	**029359**	**Linkboard SA, MAX200 240-480V**		**1**
3		003138	Circuit Breaker, 2 Pole, 600V 100A	**CB1**	1
4		003139	Contactor:90A 3P 120VAC	**CON1**	1
		029316	**Incoming Power TB1 SA, MAX200**	**TB1**	**1**
5		004290	Rail, 400E TB12/200 TB1		1
6		008358	Terminal Block		1
7		008485	Terminal Block		3
8		008295	Holder, E/UK Term Blk End		1
9	*	**029318**	**Cont Transf'mer SA 240-480/3PH/60**	**T1**	**1**
9	**	**029441**	**Cont Transf'mer SA 208/3/60**	**T1**	**1**
9	***	**029362**	**Cont Transf'mer SA 220-380-415/50**	**T1**	**1**
9	****	**029422**	**Cont Transf'mer SA 200V/3PH/50Hz**	**T1**	**1**
9	*****	**029404**	**Cont Transf'mer SA 600/3/60**	**T1**	**1**
10		008603	Grommet Strip. Panel		18"
11		**041147**	**PC BD Assy, Power Distribution 200/1070**	**PCB1**	**1**
12		029967	Pilot Light SA	**LT3**	1

* Used on 240/480 volt power supplies

** Used on 208 volt power supplies

*** Used on 220/380/415 volt power supplies

**** Used on 200 volt power supply

***** Used on 600 volt power supplies

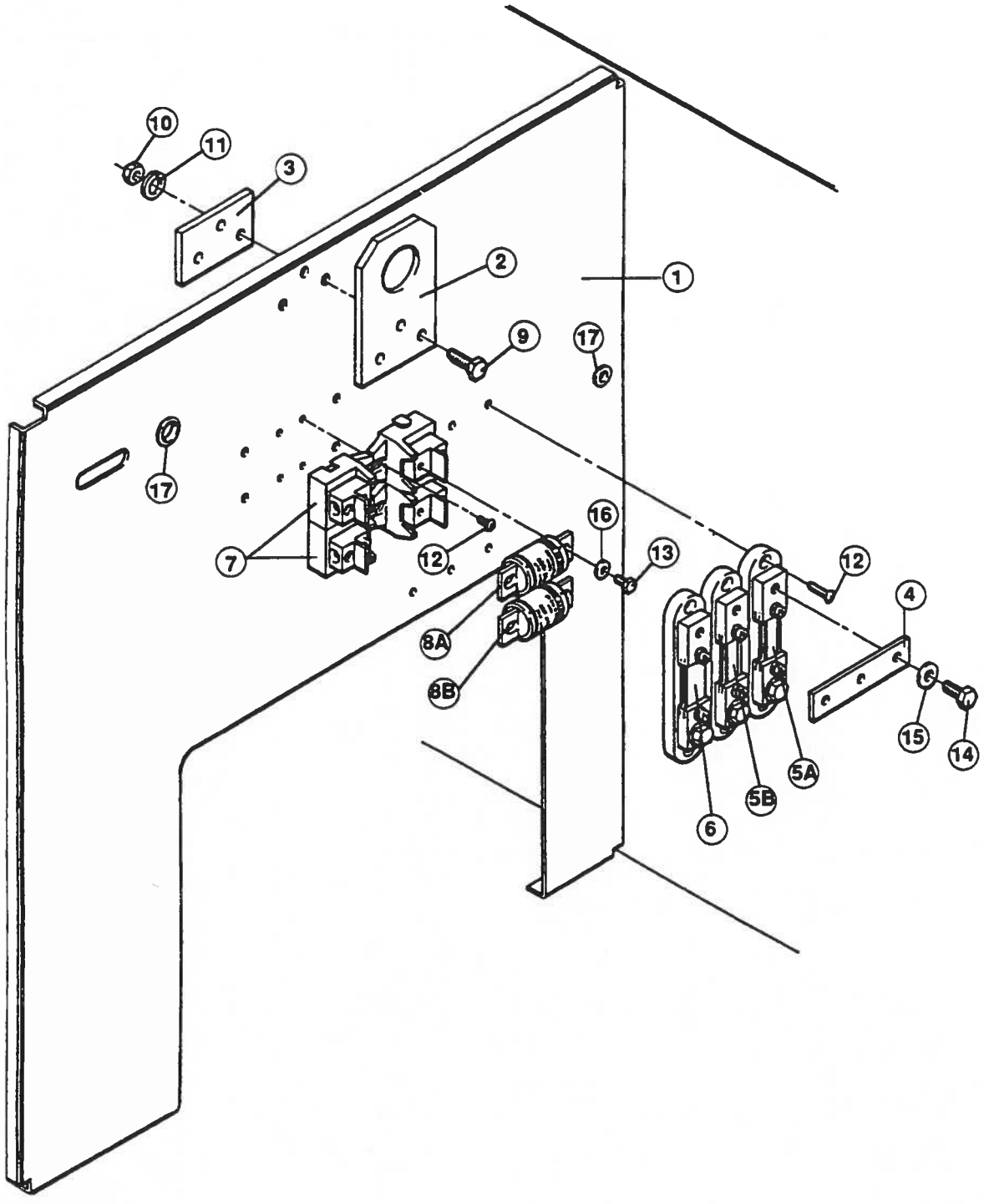


Figure 9-5 HT2000 Power Supply - Center Wall Left Side

HT2000 Power Supply (1) : Center Wall Left Side

Item	Part Number	Description	Designator	Qty.
1	001230	Panel, HT2000 Center		1
2	004261	Bar, Lift, MAX100 & 80		1
3	004262	Plate, Lift, MAX100 & 80		1
4	004334	Busbar, HT2000 Shunt		1
5A	007022	Shunt, 100A, 100mv	R2	1
5B	007022	Shunt, 100A, 100mv	R1	1
6	007024	Shunt, 200A, 100mv	R3	1
7	008316	Fuseholder, 100A		2
8A	008317	Fuse, Semiconductor 125A, 250V	F1	1
8B	008317	Fuse, Semiconductor 125A, 250V	F2	1
9	075137	Hhdcap, 3/8-16 X 1 1/4, Hex, S/Z		3
10	075166	Hexnut, 3/8-16, S/Z		3
11	075194	Lkwshr, 3/8, Splitlock		3
12	075092	M/S, 10-32 X 1/2, PH, Pan		10
13	075241	M/S, 1/4-20 X 1/2, SL, IHW		4
14	075136	Hhdcap, 3/8-16 X 3/4, Hex, S/Z		3
15	075216	Flwshr, 5/16		3
16	075192	Lkwshr, 1/4, Splitlock		4
17	008245	Bushing, 7/8" hole X 11/16" ID		2

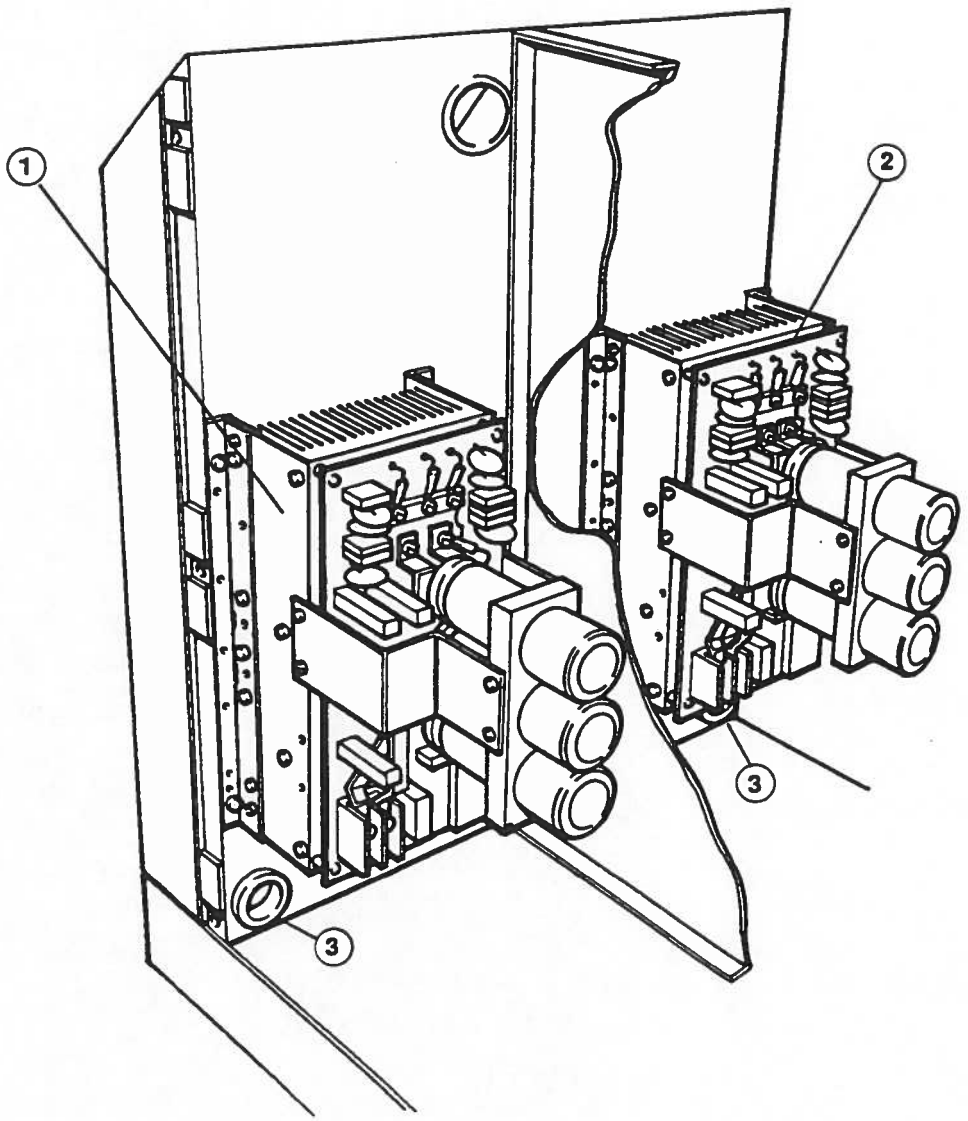


Figure 9-6 HT2000 Power Supply - Front Wall Inside

HT2000 Power Supply (1) : Front Wall Inside

Item	Part Number	Description	Designator	Qty.
1	029922	CH130 Chopper SA	CH1	1
2	029922	CH130 Chopper SA	CH2	1
3	008509	Bushing 1.75 MTG X 1.37 ID		3

PARTS LIST

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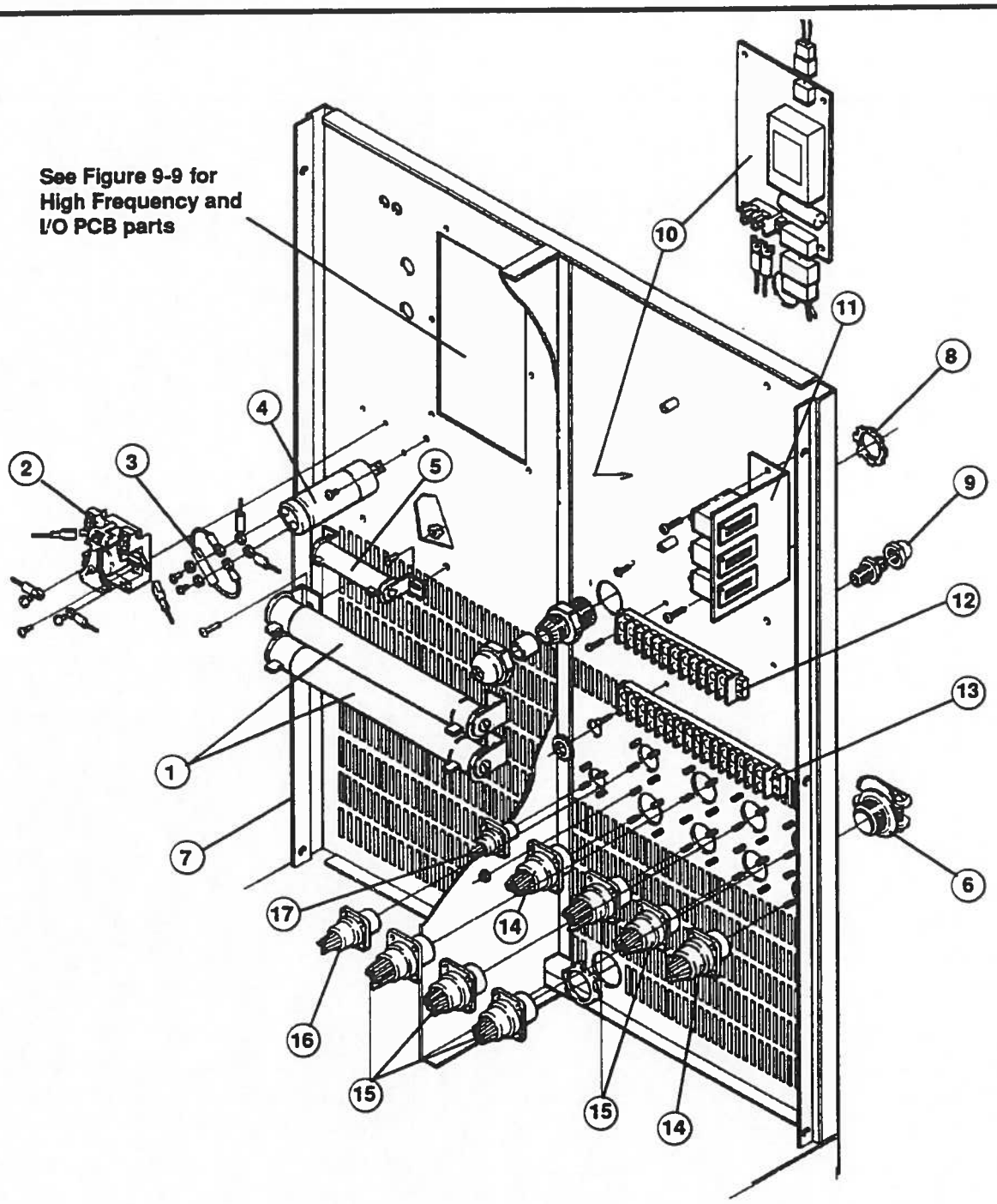


Figure 9-8 HT2000 Power Supply -- Rear Wall Inside

HT2000 Power Supply (1) : Rear Wall Inside

Item	Part Number	Description	Designator	Qty.
1	009466	Res: 4 Ohm 420W	R6	2
2	003021	Relay, 120VAC NO SPST	CR1	1
3	009015	Res: 10K Ohm, 10W	R5	1
4	009506	Cap: 250µF, 350VDC	C1	1
5	009438	Res: 5 Ohm, 50W	R4	1
6	008610	Strain Relief, 1-1/2 NPT, 1.5 ID 2 Screw		1
7	001378	Panel, HT2000 Rear		1
8	008483	Strain Relief, 1" NPS Bskt		1
9	008212	Strain Relief, 1/2 X .125-.375		1
10	**041274**	**PC BD Assy, ISO**	**PCB11**	1
11	**028666**	**Timer/Counter**		1
	004545	Bracket		1
	027274	Counter, Self Powered		2
	027275	Meter, Elapsed Time		1
	003140	Relay; 120VAC		2
	009204	Capacitor		3
	029645	**Harness SA HT2000**		
12	008079	Terminal Strip (8)	TB4	1
13	008073	Terminal Strip (16)	TB3	1
14	008447	Receptacle, 23-37, Std Sex	1X6, 1X5	2
15	008208	Receptacle, 23-37, Rev Sex	1X1,1X2, 1X3 1X7, 1X4	5
16	008201	Receptacle, 17-14, Rev Sex	1X9	1
17	008210	Receptacle, 11-4, Rev Sex	1X10	1

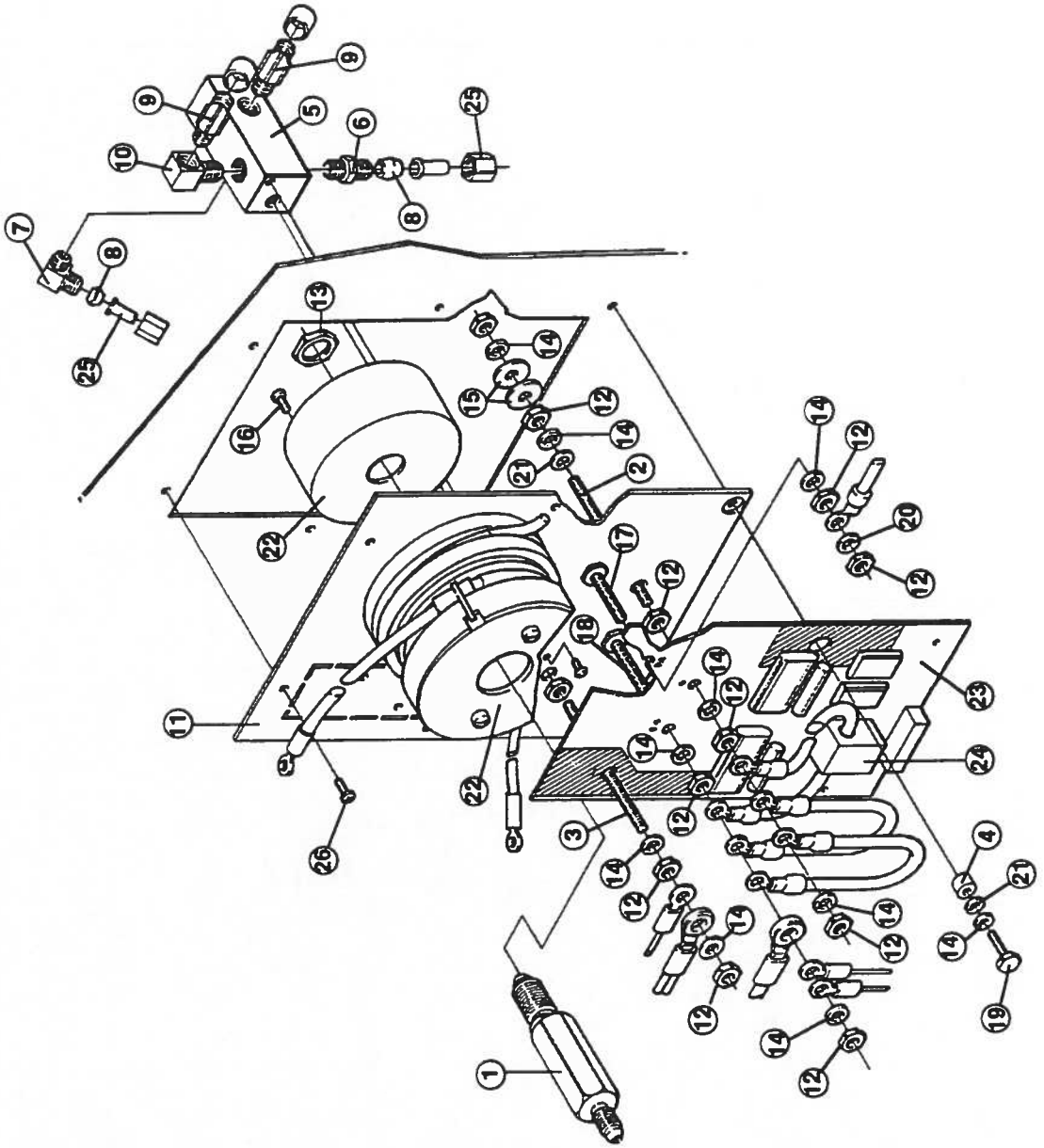


Figure 9-9 HT2000 Power Supply - High Frequency & I/O PCB Assembly

HT2000 Power Supply (1) : High Frequency and I/O PCB

Item	Part Number	Description	Designator	Qty.
	029514	**HF & I/O PCB SA Pwr Sup/RHF**		1
1	004136	Connector, cathode		1
2	004311	Standoff, MAX200 Anode		1
3	004312	Standoff, MAX200 Cathode		1
4	004313	Spacer, .42ID X .750 X .50 lg		1
5	004314	Block, MAX200 Cathode		1
6	015131	Fitting, 3/8 Tube X 1/4 NPT		1
7	015132	Fitting, 90, 3/8 Tube X 1/4 NPT		1
8	015133	Ferrule, 3/8 OD Tube Delrin		2
9	015157	Adapter, 90 1/4 NPT X #5		2
10	015532	Street Elbow 1/4		1
11	041152	Panel, MAX200 Output		1
12	075153	Hexnut, 3/8-16, Finish, Brs		10
13	075156	Hexnut, 1/2-20, Finish/Jam, Brs		1
14	075194	Lkwshr, 3/8, Splitlock, Brz		9
15	075217	Flwshr, 3/8, .390,.875,.063, Brs		2
16	075335	M/S, 8-32 X 1/2, SL, Bin, Nyl		3
17	075347	Bolt, 5/16 X 11/4, Hex, Brz		1
18	075229	Bolt, 3/8-16 X 1 1/2, FTH, Hex, Brs		1
19	075351	Bolt, 3/8-16 X 1, Hex, Brs		1
20	075360	Flwshr, 5/16, .328,.520,.032, Brs		1
21	075361	Flwshr, 3/8, .394, .625, .032, Brs		2
22	**009356**	**Coil, A.C.T., 8G THHN**	**T1**	1
23	**041145**	**PC BD Assy MAX200 I/O**	**PCB8**	1
24	**029202**	**Current Sensor SA**	**CS1**	1
25	015134	Insert, 3/8 OD X .062 Brass		2
26	075072	M/S, 8-32 X 1/2		6

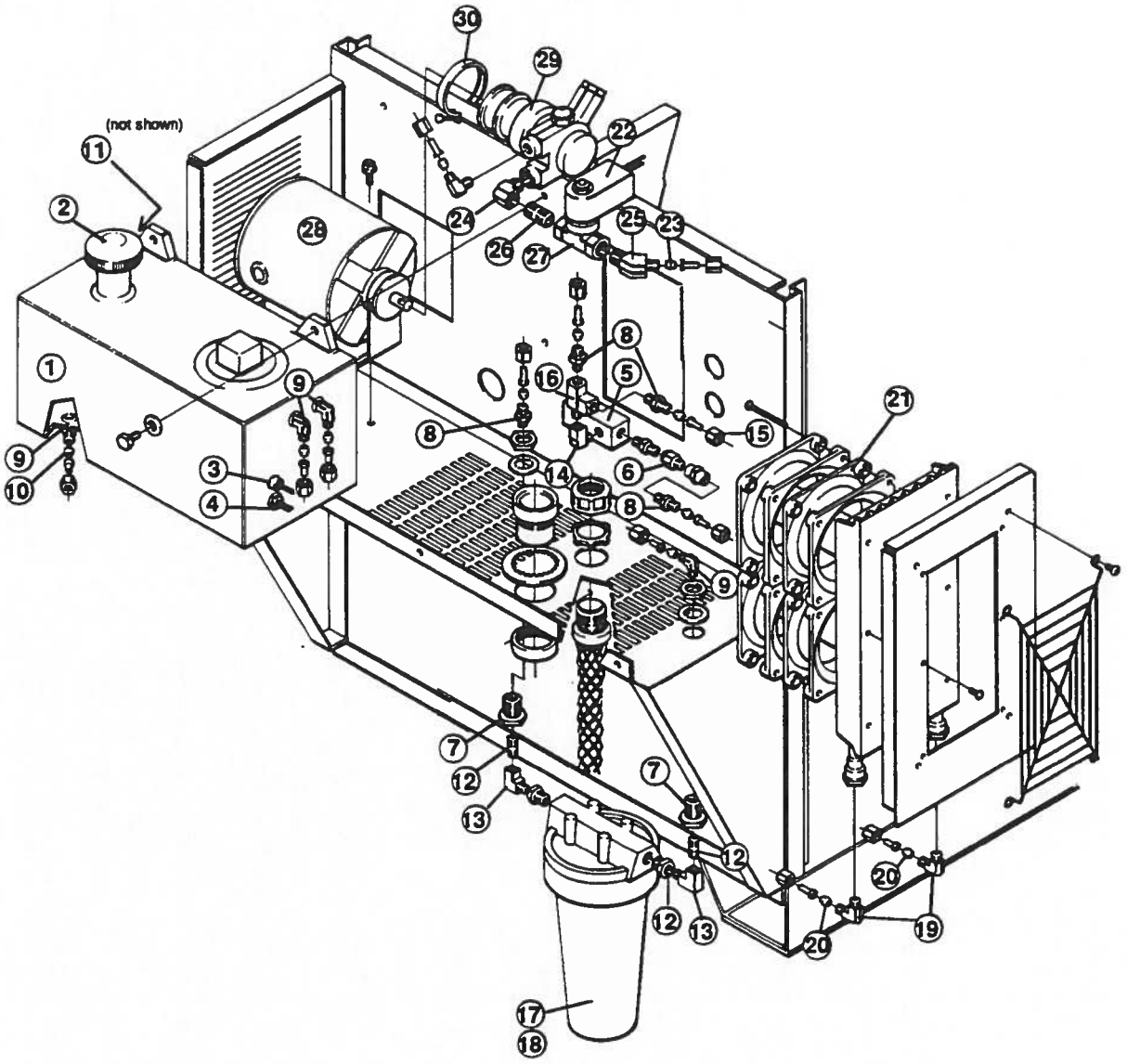


Figure 9-10 HT2000 Power Supply -- Rear Wall Outside

HT2000 Power Supply (1) : Rear Wall Outside

Item	Part Number	Description	Designator	Qty.
	029313	**Water Cooling SA, MAX200**		1
1	002174	Coolant Res. MAX200/HD1070		1
2	004346	Cap, MAX200 Reservoir		1
3	**029326**	**Switch, Level SA, 1/2 NPT**	**LS1**	1
4	**029323**	**Switch, Temp SA, 162 Deg F**	**TS2**	1
5	**029361**	**Flowswitch, 0.5GPM**	**FS1**	1
6	006053	Valve, Check 1/3 PSI, 1/4 NPTM		1
7	015001	Adapter, Bulkhead, 1/4 NPTF		2
8	015131	Fitting, 3/8 Tube X 1/4 NPT		4
9	015132	Fitting 90, 3/8 Tube X 1/4 NPT		4
10	015133	Ferrule, 3/8 OD Tube Delrin		8
11	015141	Fitting 90, 1/8 Tube X 1/8 NPT		1
12	015502	Nipple 1/4 X CL		3
13	015521	Elbow, 1/4 90 Deg		2
14	015532	Street Elbow 1/4		1
15	015551	Coupling, 1/4 Brass		1
16	015593	Street Tee 1/4		1
17	027137	Filter, 10" De-ion Clear		1
18	027139	Filter Housing, 10" X 3/8 NPT		1
	029324	**Heat Exchanger SA, MAX200**		1
19	015132	Fitting 90, 3/8 Tube X 1/4 NPT		2
20	015133	Ferrule, 3/8 OD Tube Delrin		2
21	027136	Heat Exchanger, Water/Air	**MX1**	1
	029325	**Coolant Pump SA, MAX200**		1
22	006046	Valve, Sol 240V 3/8 NPT NC	**V7**	1
23	015133	Ferrule, 3/8 OD Tube Delrin		2
24	015156	Adapter, 3/8 NPT X 3/8 Tube 90		1
25	015172	Adapter, 3/8 NPT X 3/8 Tube 45		1
26	015503	Nipple 3/8 X CL Brass		1
27	015531	Street Elbow 3/8		1
28	031113	Motor, 1/3 HP Carbon 230/50-60	**M1**	1
29	031114	Pump, 70 GPH Positive Displace		1
30	031115	Clamp, V-Band		1

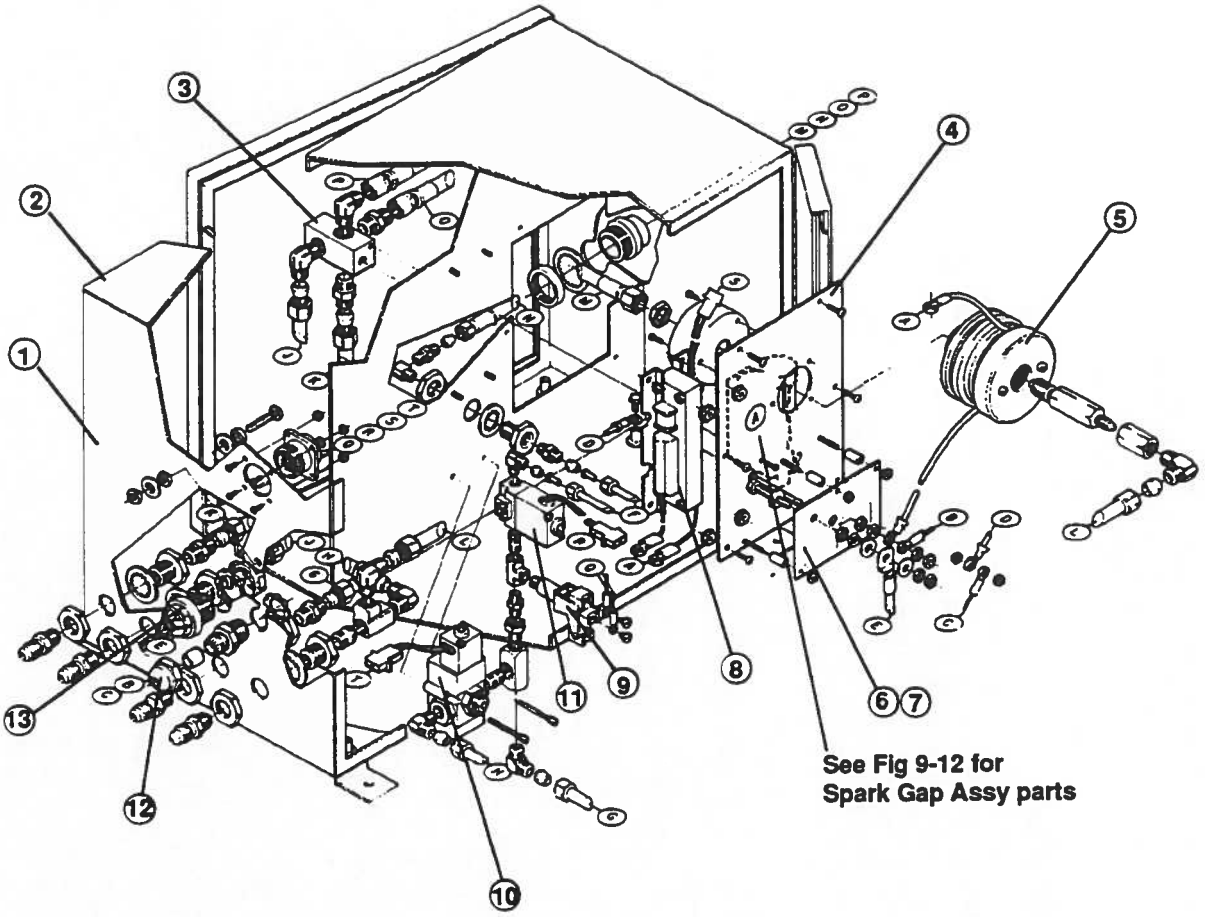


Figure 9-11 Remote High Frequency Console

Remote High Frequency Console (2) #073067

Item	Part Number	Description	Designator	Qty.
1	001390	Encl: HT2000 RHF Cons		1
2	005100	Switch, Door Interlock	S1, S2	2
	029699	**HT2000 HF/IO PCB SA**		**1**
3	004314	Blk: 200 Cath		1
4	041152	Panel, MAX200 Output		1
5	**009793**	**Coil Assy, HI Freq**	**T2/HF Coil**	**1**
6	**041287**	**PCB Assy: HD1070 I/O**		**1**
7	009281	Cap: Pol .22UF 10% 1000	C1, C2	2
8	**029317**	**HV Transformer SA, MAX200**	**T1**	**1**
9	005093	Switch, Pressure 0-90 PSI	PS3	1
10	006032	Valve, Sol	SV6	1
11	006057	Valve Sol 3-way 120VAC 1/8NPT	SV7	1
12	008212	Strain Relief, 1/2 x .125-.375		1
13	008483	Strain Relief, .70/.97 Dia.		1

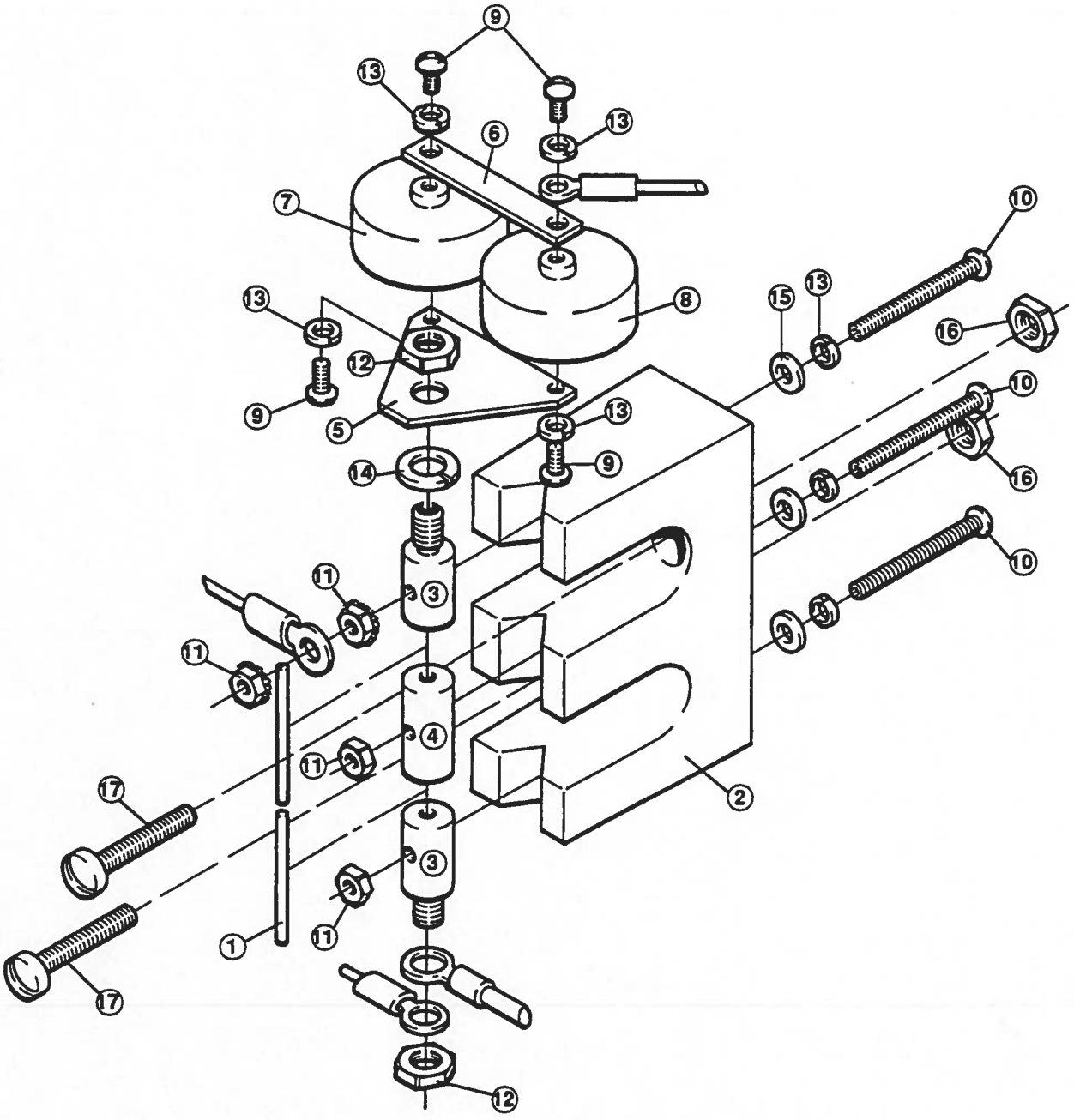


Figure 9-12 Remote High Frequency Console - Spark Gap Assembly

Remote High Frequency Console (2) :Spark Gap Assembly #009350

Item	Part Number	Description	Designator	Qty.
	009350	**Spark Gap Assembly**	SG1	1
1	004061*	Electrode, Spark Gap 1/8 X 1.6		3
2	004140	Block, Spark Gap		1
3	004141	Tungsten Mount End		2
4	004142	Tungsten Mount Center		1
5	004143	Plate, Capacitor Mtg		1
6	004144	Bar, Capacitor Mtg		1
7	009280	Cap: .022µF 15KV	C3	1
8	009280	Cap: .022µF 15KV	C4	1
9	075034	M/S, 8-32 X 1/4, SL, Rnd, Brs		4
10	075036	M/S, 8-32 X 3/4, SL, Rnd, Brs		3
11	075147	Hexnut, 8-32, Brs		3
12	075152	Hexnut, 5/16-18, Finish Brs		1
13	075191	Lkwshr, #8, Splitlock, Brz		7
14	075193	Lkwshr, 5/16, Splitlock, Brz		1
15	075213	Flwshr, #8, .202,.436, .037, Brs		3

* Two of three electrodes shown

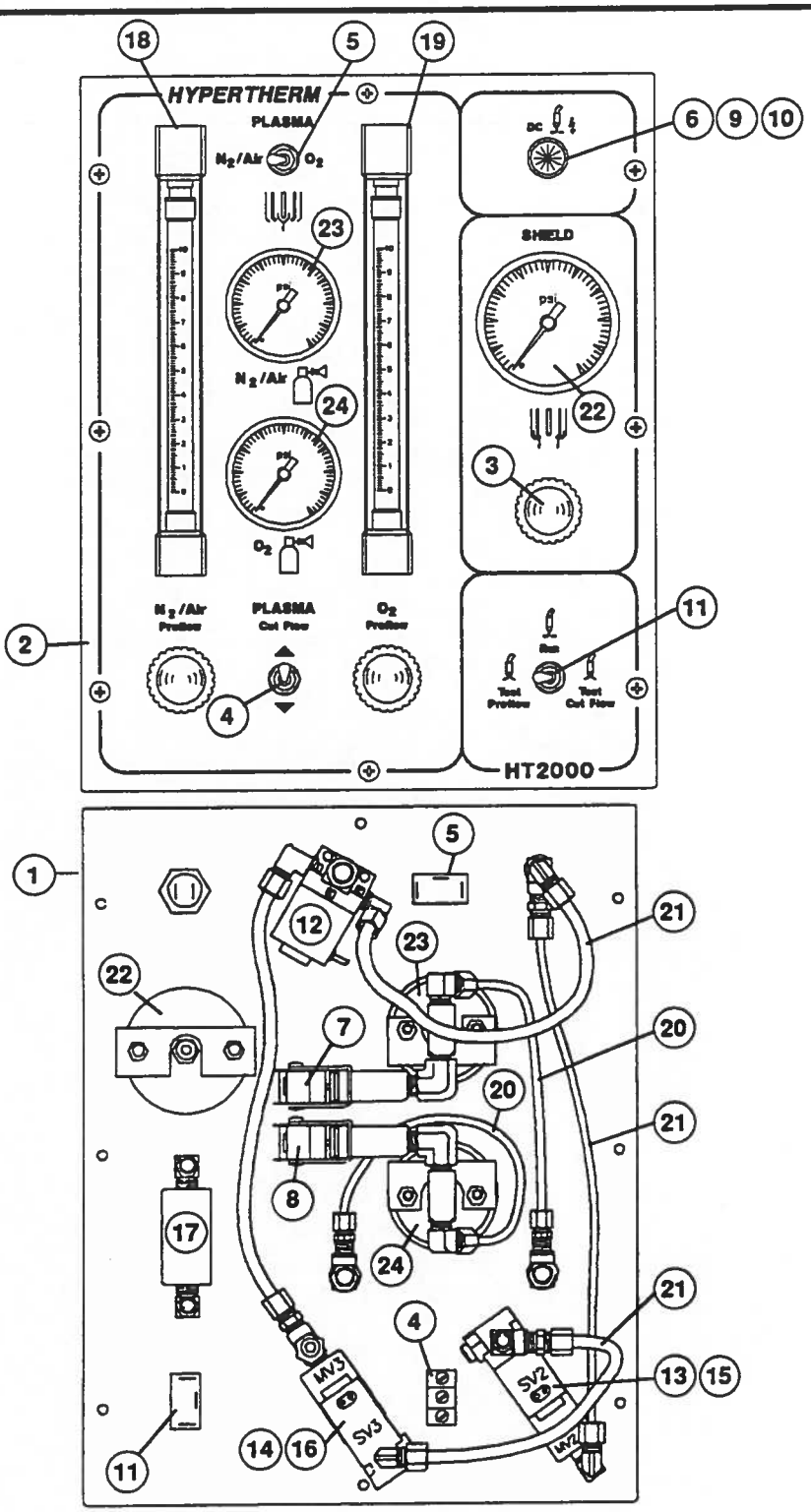


Figure 9-13 Gas Console

Gas Console (3) #073068

Item	Part Number	Description	Designator	Qty.
	073068	**HT2000 Gas Console**		
1	001335	Encl: 2X200 Gas CSL		1
2	001393	Pnl: HT2000 Operator's Pnl		1
3	004117	Cap: Ndl Valve		3
4	005042	Tgl Sw: Sp Mom ON/OFF/ON	**S3**	1
5	005181	Tgl Sw: DPDT Maint ON/NONE/ON	**S1**	1
6	005089	Lens:White for 005088		1
7	005093	Switch, Pressure 0-90 PSI	**PS1**	1
8	005093	Switch, Pressure 0-90 PSI	**PS2**	1
9	005149	Bulb, 120VAC T-2	**LT1**	1
10	005151	Lamp, 2800 Socket		1
11	005180	Tgl Sw: SP3T, Maint ON/OFF/ON	**S2**	1
12	006057	Valve Sol 3-way 120VAC 1/8 NPT	**SV1**	1
13	006057	Valve Sol 3-way 120VAC 1/8 NPT	**SV2**	1
14	006057	Valve Sol 3-way 120VAC 1/8 NPT	**SV3**	1
15	006064	Valve, Ndl 1/8 FPT .125 Orf	**MV2**	1
16	006064	Valve, Ndl 1/8 FPT .125 Orf	**MV3**	1
17	006064	Valve, Ndl 1/8 FPT .125 Orf	**MV4**	1
18	011053	Flowmeter: 7.8 GPM/44 CFH	**FM1**	1
19	011053	Flowmeter: 7.8 GPM/44CFH	**FM2**	1
20	046048	Tubing, 1/8 OD Blk Air Brake		1.25'
21	046077	Tubing, 1/4 OD X .040 Blu Nyl		3.16'
22	022008	Gauge, Press 2 1/2" Dia. 1-100	**PG3**	1
23	022020	Gauge, Press 160 PSI/Bar Pnl Mt	**PG1**	1
24	022020	Gauge, Press 160 PSI/Bar Pnl Mt	**PG2**	1

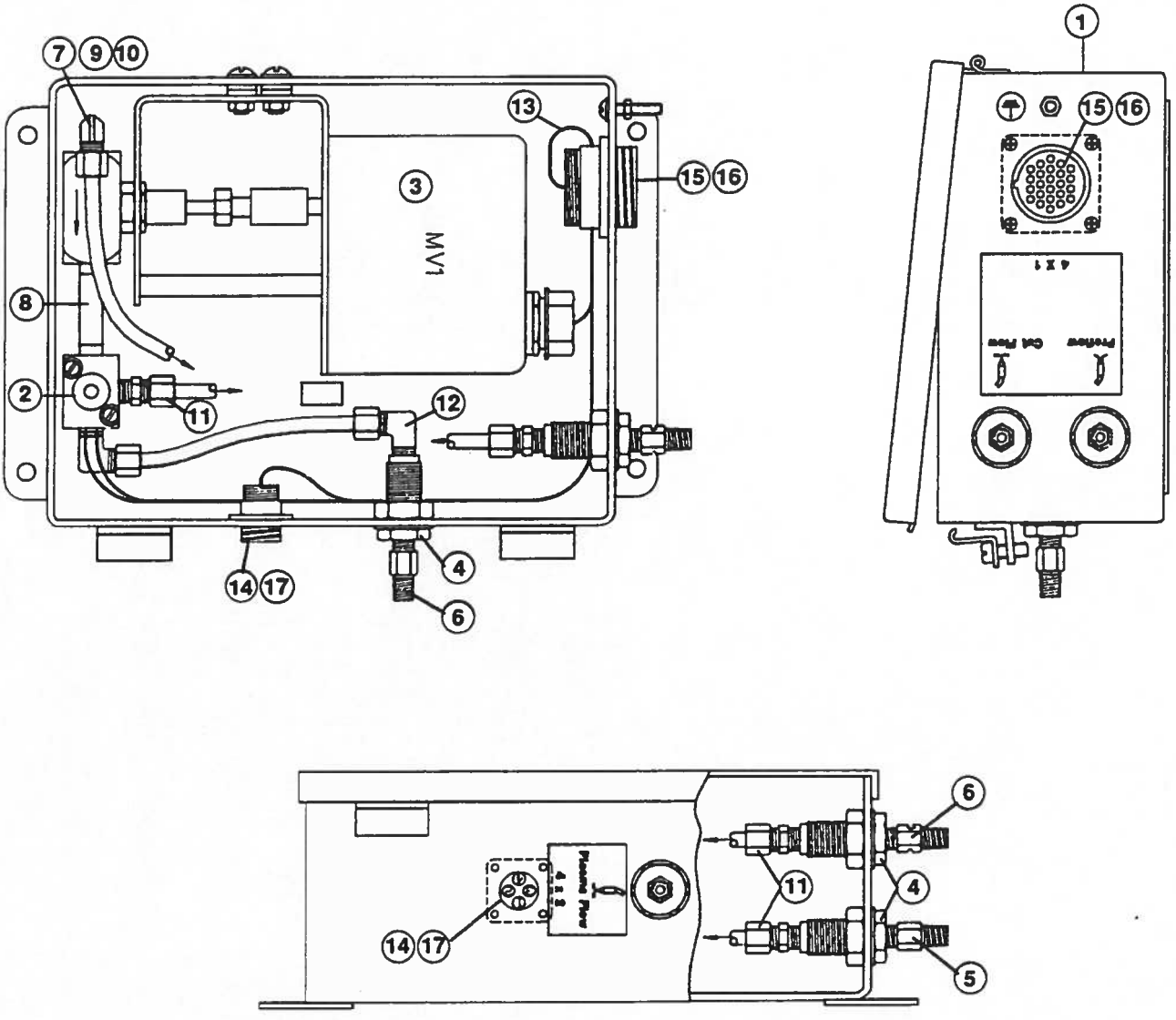


Figure 9-14 Motor Valve Console

Motor Valve Console (4) #073069

Item	Part Number	Description	Designator	Qty.
	073069	**Motor Valve Console, HT2000**		
1	002218	Encl: HT2000 Mot Valve Csl		1
2	006057	Valve, Sol 3-Way 120 VAC 1/8 NPT	**SV4**	1
3	006063	Mtr Valve: Elec 1/8 FPT .125 Orf	**MV2**	1
4	015050	Adapter, Bulkhead, 1/8 x 1-1/2		3
5	015116	Adapter, 1/8 NPT x Oxy 'A'		1
6	015210	Adapter, 1/8 NPT x Acet 'A'-LH		2
7	015530	Street Elbow 1/8		1
8	015588	Nipple, 1/8 x 2"		1
9	015608	Sleeve, Delrin 1/4" OD		6
10	015609	Insert Brass (1/4 OD)		6
11	015611	Connector Male 1/4 Tube x 1/8		3
12	015612	Elbow, Male 1/4 Tube x 1/8 NPT		3
13	**029759**	**Harn: HT2000 Mtr Valve Csl**		1
14	008210	Receptacle, 11-4 Rev Sex	**4X2**	1
15	008447	Receptacle, 23-37, Std Sex	**4X1**	1
	029765	**Wire GP: HT2000 Mtr Valve Csl**		1
16	008176	Pin, 20-24 AWG Type III+		8
17	008186	Socket, 20-24 AWG Type III+		3

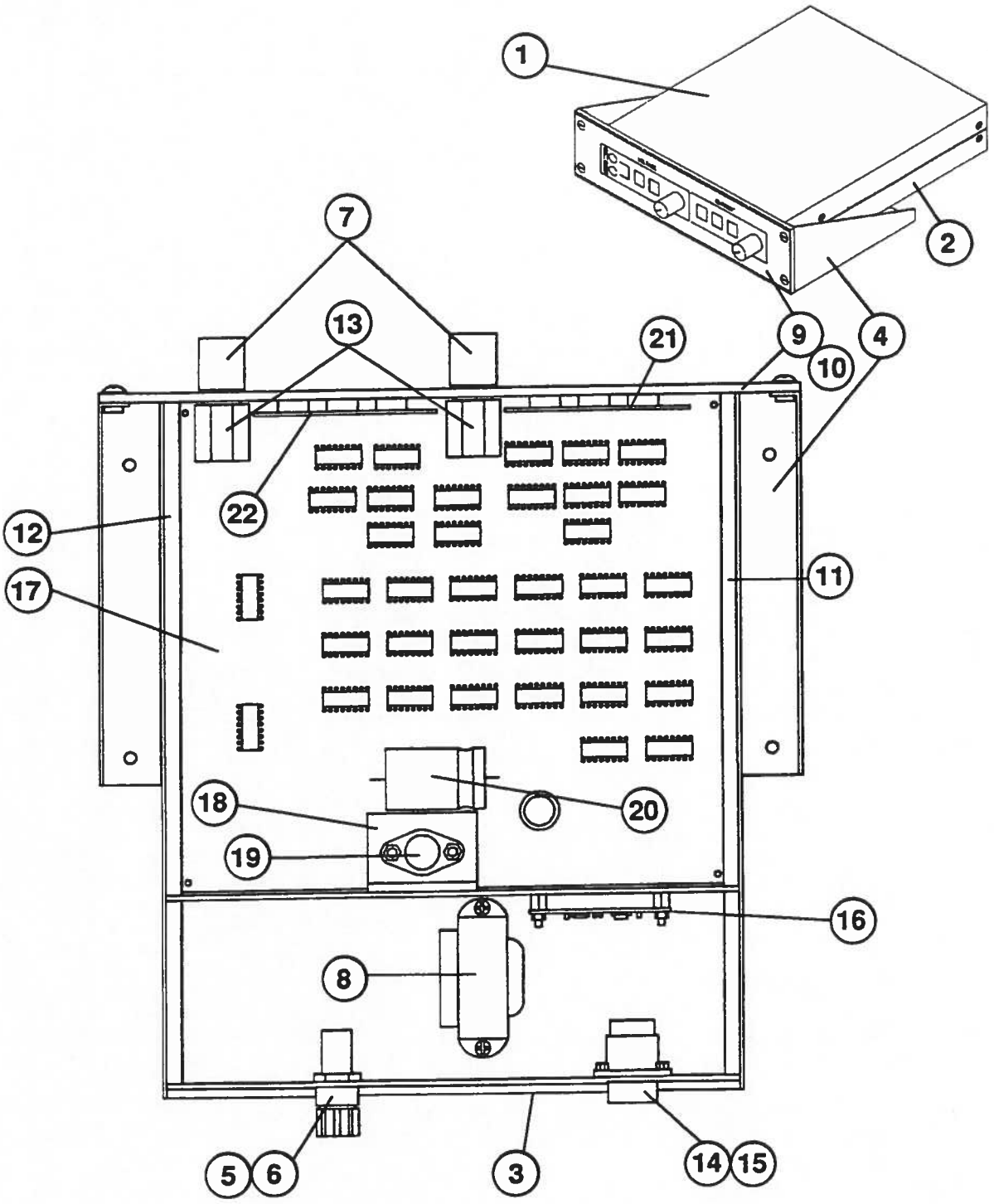


Figure 9-15 Remote V/C - Digital (DR) Control Station

Remote V/C (5) : Digital (DR) Control Station #073007

Item	Part Number	Description	Qty.
	073007	**Control Station, Digital Remote V/C MAX200**	1
1	002107	Cov: DR/PR V/C Top	1
2	002106	Cov: DR/PR V/C Bottom	1
3	002119	Panel, Rear, DR V/C	1
4	004119	Bracket, Mtg, DR/PR V/C	1
5	008069	Fuse, 3/8 Amp 313, 375	1
6	008165	Fuseholder, REM V/C	1
7	008164	Knob	2
8	014012	Transf'mer, DR/PR/SR V/C	1
	002118	**Encl, Assy DR V/C**	1
9	001133	Pl: HT400 DR V/C MDL FR	1
10	001131	Flg: HT400 DR/PR V/C MDL Fr	1
11	001137	FR: HT400 DR/PR/ST V/C Mdl LS	1
12	001138	FR: HT400 DR/PR/ST V/C Mdl RS	1
	029302	**Filter PNL-PCB SA DR/SR V/C**	1
13	009336	Potentiometer, 500 Ohm 10 turn	2
14	008175	Receptacle, Shell Size 13-9	1
15	008176	Pin, 20-24 AWG Type III+	6
	074016	Term 22-18 .250 FEM QC Insul	2
	074038	Term 22-18 FEM QC Insul	11
	074041	Term 22-18 #6 Ring Uninsul	1
	074067	Term 22-18 .25 MAL QC Insul	2
16	**041070**	**PC BD Assy Opto-Iso**	1
	008097	Terminal, PC HHS 2022C	4
17	**041187**	**PC BD Assy Dig/Sta V/C MAX200**	1
18	004116	Heatsink, DR/PR SR V/C	1
19	042059	IC, LM340AK-5.0	1
20	009274	Capacitor, 2600 UF 15VDC	1
	008097	Terminal, PC HHS 2022C	11
	008098	Terminal, PC CAM	9
21	**041076**	**PC BD Assy Rem Volt Disp**	1
22	**041077**	**PC BD Assy Rem Curr Disp**	1

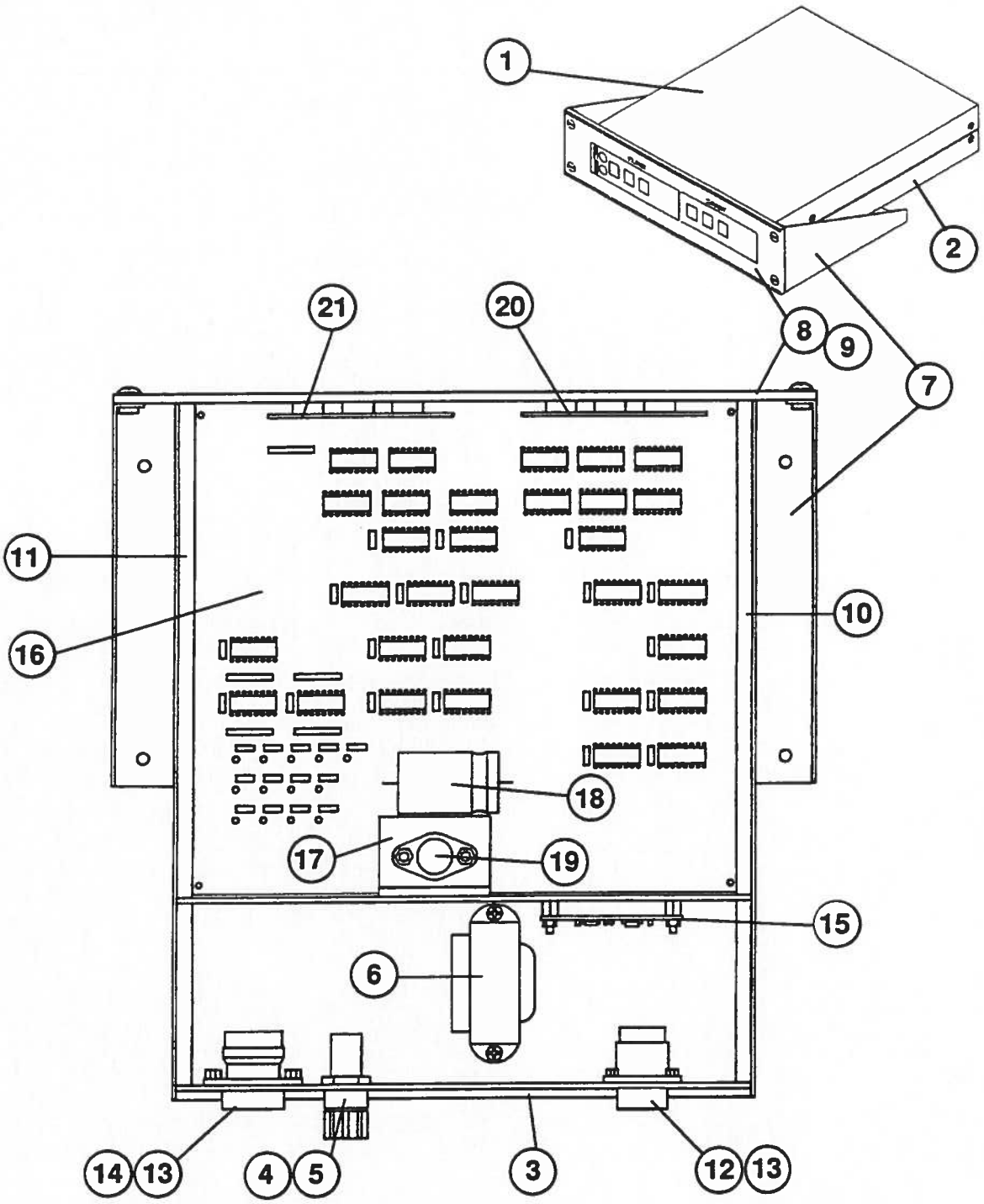


Figure 9-16 Remote V/C - Programmable (PR) Control Station

Remote V/C (5) : Programmable (PR) Control Station #055004

Item	Part Number	Description	Qty.
	055004	**Control, Programmable V/C**	1
1	002107	Cov: DR/PR V/C Top	1
2	002106	Cov: DR/PR V/C Bottom	1
3	002123	Panel, Rear, PR V/C	1
4	008069	Fuse, 3/8 Amp 313, 375	1
5	008165	Fuseholder, REM V/C	1
6	014012	Transf'mer, DR/PR/SR V/C	1
7	004119	Bracket, Mtg, DR/PR V/C	1
	002122	**Encl Assy, PR V/C**	1
8	001139	PL: HT400 PR V/C MDL FR	1
9	001131	Flg: HT400 DR/PR V/C MDL Fr	1
10	001137	FR: HT400 DR/PR/ST V/C Mdl LS	1
11	001138	FR: HT400 DR/PR/ST V/C Mdl RS	1
	029089	**Filter PNL-PCB SA PR V/C**	1
12	008175	Receptacle, Shell 13-9 Size	1
13	008176	Pin, 20-24 AWG Type III+	22
14	008193	Recp, CPC 17-16 Standard Sex	1
	074016	Term 22-18 .250 FEM QC Insul	2
	074038	Term 22-18 FEM QC Insul	5
	074041	Term 22-18 #6 Ring Uninsul	4
	074067	Term 22-18 .25 MAL QC Insul	2
15	**041070**	**PC BD Assy Opto-Iso**	1
	008097	Terminal, PC HHS 2022C	4
16	**041085**	**PC BD Assy, PR V/C**	1
17	004116	Heatsink, DR/PR SR V/C	1
18	009274	Capacitor, 2600 UF 15VDC	1
19	042059	IC, LM340AK-5.0	1
	008097	Terminal, PC HHS 2022C	18
	008098	Terminal, PC CAM	7
20	**041076**	**PC BD Assy, Rem Volt Disp**	1
21	**041077**	**PC BD Assy, Rem Curr Disp**	1

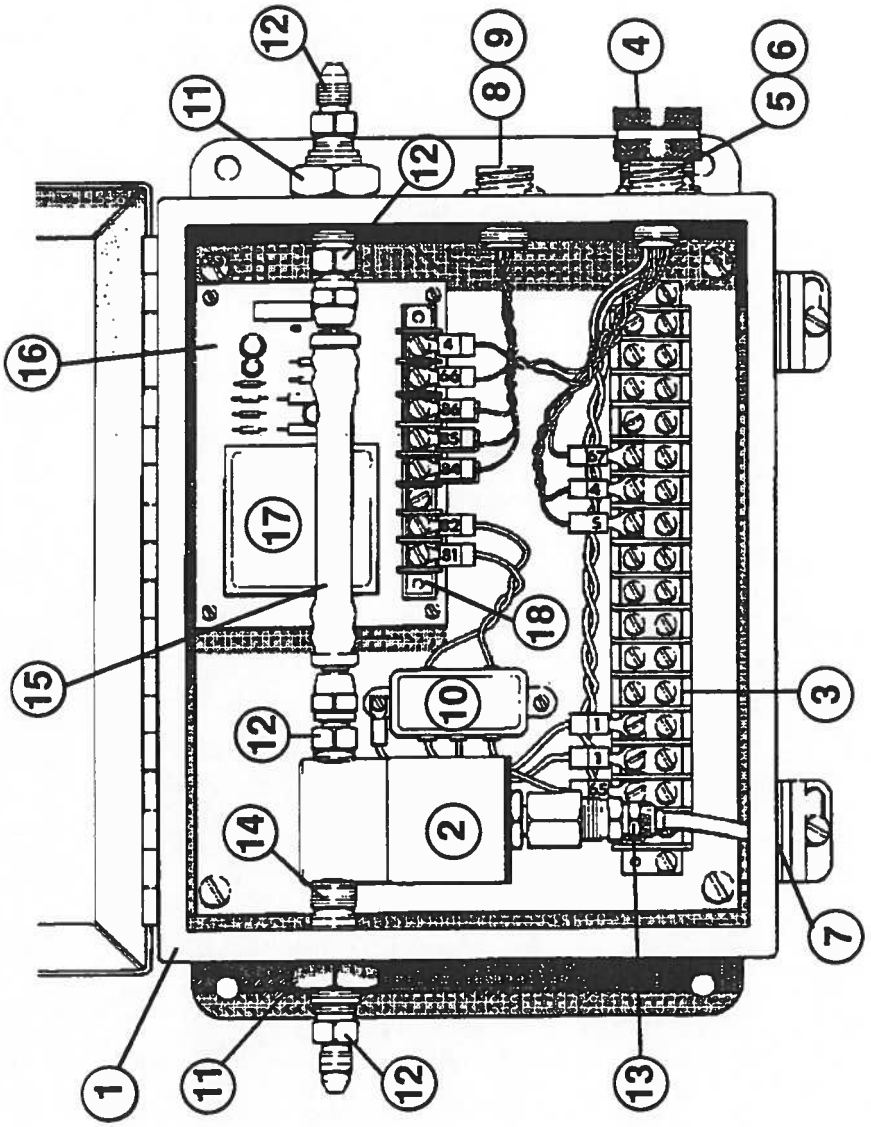


Figure 9-17 IHS Console

IHS Console (6) #053016

Item	Part Number	Description	Qty.
	053016	**Control Module, IND IHS, HT400**	
1	002095	Encl., Control Module UW-IHS	1
2	006021	Valve, SOL 75# 1/4 NPTF	1
3	008073	Terminal Strip (16)	1
4	008071	Strain Relief, 1/2 X .375-.500	1
5	008175	Receptacle, Shell Size 13-9	1
6	008176	Pin, 20-24 AWG Type III+	7
7	008177	Grommet, HHS 91107	1
8	008186	Socket, 20-24 AWG Type III+	8
9	008210	Receptacle, 11-4	2
10	009041	Filter, AC, 1 Amp 1B3	1
11	015001	Adapter, Bulkhead, 1/4 NPTF	2
12	015005	Adapter, 1/4 NPT x #4	4
	015006	Swivel, #4	1
13	015100	Adapter, 1/4 NPT x 1/4 Poly	1
14	015502	Nipple, 1/4 x CL	1
15	**024038**	**Hose Assy, #4 x 7"**	1
16	**041043**	**PC BD Assy UW-IHS**	1
17	041023	Power Source, IHS	1
18	008094	Terminal Strip (8)	1

PARTS LIST

Argon-Hydrogen Manifold (7) #073109

Item	Part Number	Description	Designator	Qty.
	073109	**Argon-Hydrogen Manifold**		1
1	002050	Bracket: Ar/H2 Manifold		1
2	011005	Flowmeter: 0-10 SC/BT-8 w/valve	**FM1**	1
3	015014	Adapter: 1/4NPT X #4 Male 90° Brass		1
4	015047	Adapter: 1/4NPT X AC 'A' Male Brass		1
5	015512	Nipple: 1/4 X 3" long Brass		1
6	015551	Coupling: 1/4 Brass		1
7	**024143**	**Hose Assy, #4 X 9"**		1
	029831	**Manifold SA: 073109 H35 Manifold**		1
8	005046	Pressure Switch: 0-200 1/4FPT	**PS1**	1
9	006009	Solenoid Valve:200# 1/4FPT 120V NC	**SV5**	1
10	015001	Adapter: 1/4FPT X 15/16 Brass		1
11	015014	Adapter: 1/4NPT X #4 Male 90° Brass		1
12	015047	Adapter: 1/4NPT X AC 'A' Male Brass		1
13	015596	Tee: 1/4 Brass		1
	023702	**Cable: HT2000 H35 Manifold Press. Sw.**		1
14	008195	CACLP:CPC Size 11		1
15	008205	Pin: 18-16 AWG Type III + CRP		4
16	008807	Receptacle Shell:CPC 11-4	**14X1**	1
17	047055	Cable, 18-2 TW PR, Unshielded		6 ft

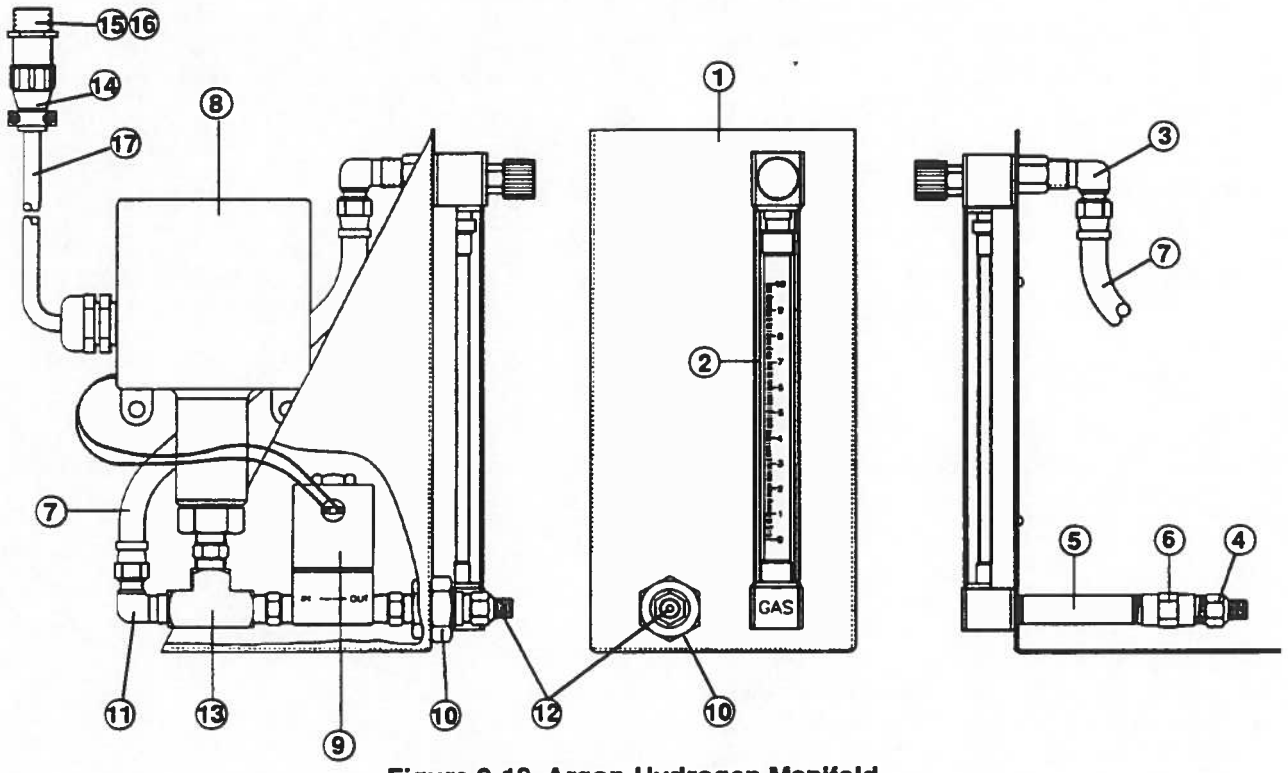


Figure 9-18 Argon-Hydrogen Manifold

Timer / Counter (8) #073194

Item	Part Number	Description	Designator	Qty.
	073194	**HT2000 Cntr-Tmr**		
1	001068	Encl:DCC/PCC/RCC RVR		1
2	001391	Pnl:DCC RCVR Rear		1
3	001392	Pnl:DCC RCVR Front		1
4	005161	PB Sw:Blk SPST NO Sub-Mini		2
5	008176	Pin:24-20 AWG Type III + CRP		4
6	008193	RCPT Shell:CPC 17-16 Std Sex	**11X1**	1
7	027274	Counter, Self Powered LCD		2
8	027275	Meter, Elapsed Time LCD		1
–	003140	Relay:120VAC DP AU Cont (See HT2000 wiring diagram)		2

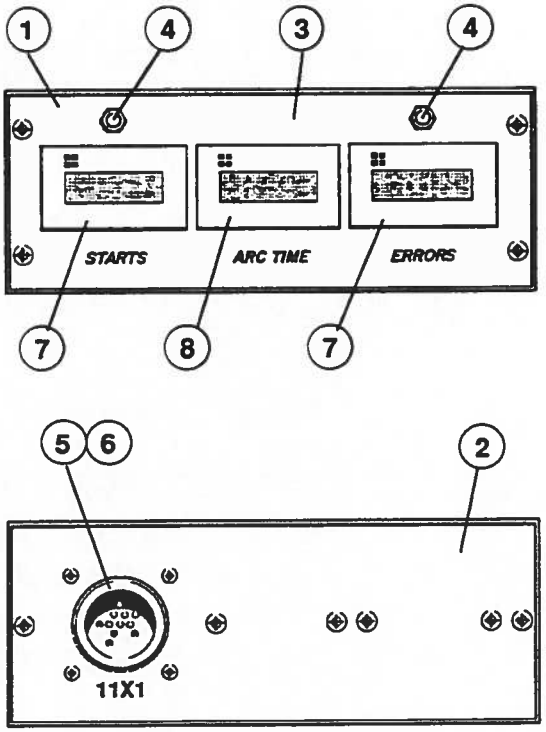


Figure 9-19 Timer/Counter

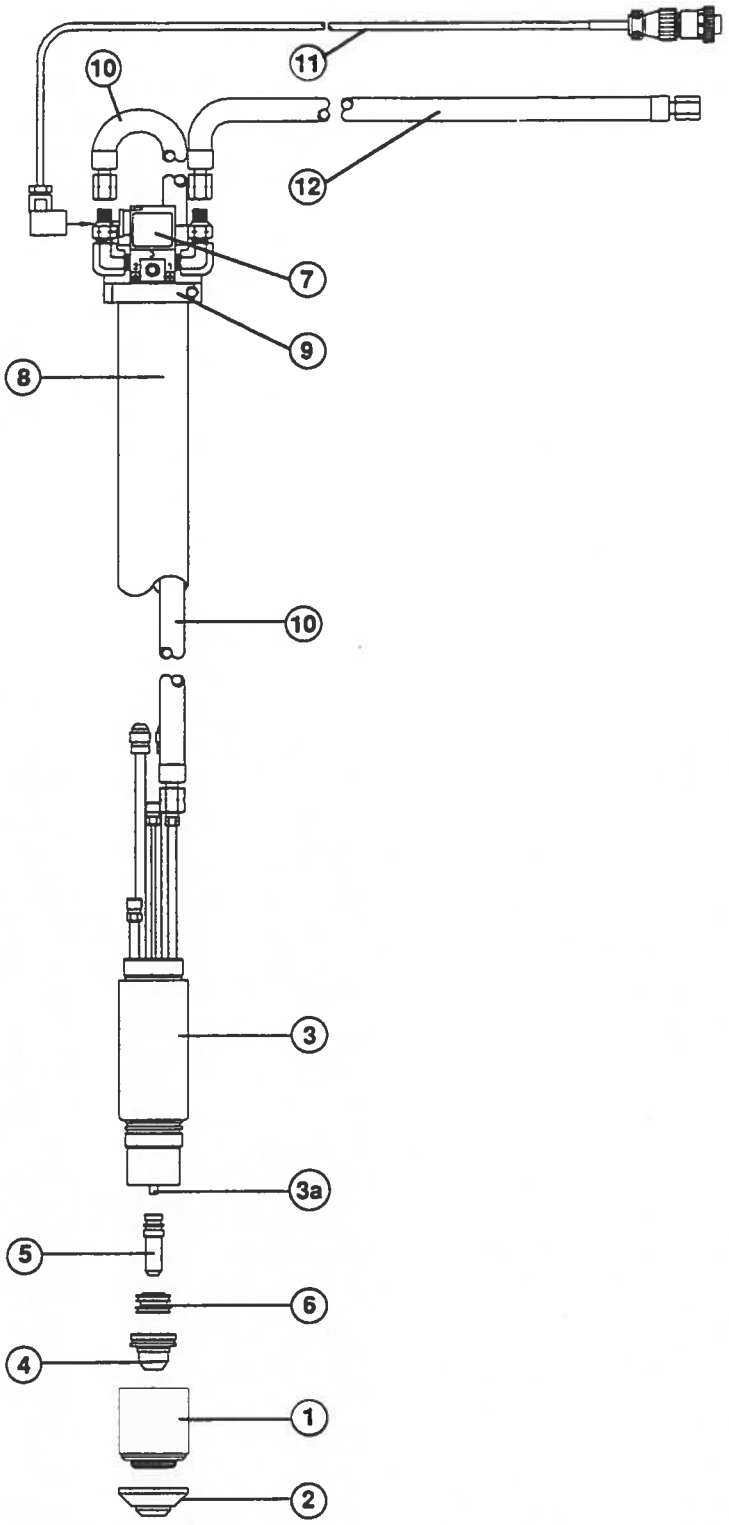


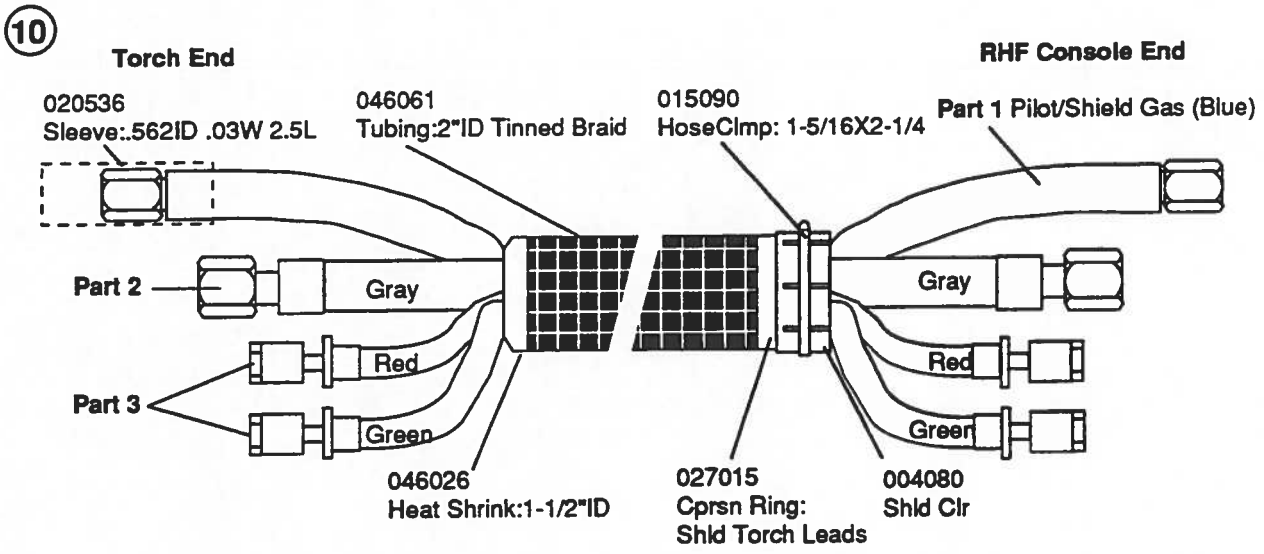
Figure 9-20 HT2000 Machine Torch

Machine Torch (9) #028548

Part Item	Number	Description	Designation	Qty.
	028548	**HT2000 Machine Torch Assy w/Valve**		
1	020423	Cap, Nozzle Retaining, MAX200		1
2	020424	Shield, MAX200 Mch 200A		1
3	**020470**	**MAX200 Machine Torch Main Body**		1
3a	020963	Water Tube:PAC200T/2000 Electd Cool		1
4	020605	Nozzle, MAX200 200A .082 O2		1
5	020664	Electrode: HT2000 200A O2		1
6	020678	Swirl Ring: 200LL O2		1
	029703	**Off-Valve SA: HY2000 Mch Tch**		1
7	006082	Sol Valve:120# 1/8FPT 120V 3W	**SV5**	1
8	020431	Tch Mtg Sleeve:1-3/4" GNRC		1
9	020686	Brckt: 1.75 Dia. Valve Mntg		1
10	024355	Hose Assy:3/16Blu LH'A' 1'		1 ft
11	**023804**	**Cable, Torch Off-Valve**	**4X2**	1
12	**024354**	**Hose SA, 3/16 Blu AC' A**		1

Torch Mounting Bracket #020522

Part Number	Description	Designation	Qty.
020522	**Torch Mntg Brckt with Clevis**		1
020044	Adapter, Brckt, Torch		1
020432	Torch Mntg Brckt, Machine Torch		1



Shielded Torch Leads Part No.	Part 1	Part 2	Part 3	Length
028657	023429	024221	023032 (2)	10 ft (3 m)
028658	023430	024222	023034 (2)	15 ft (4.5 m)
028659	023431	024223	023012 (2)	20 ft (6 m)
028546	023326	024192	023013 (2)	25 ft (7.5 m)
028660	023432	024224	023014 (2)	30 ft (9 m)
028661	023433	024225	023015 (2)	35 ft (10.5 m)
028662	023434	024226	023016 (2)	40 ft(12 m)
028663	023435	024227	023387 (2)	45 ft (13.5 m)
028547	023327	024193	023199 (2)	50 ft (15 m)

Figure 9-21 HT2000 Torch Leads

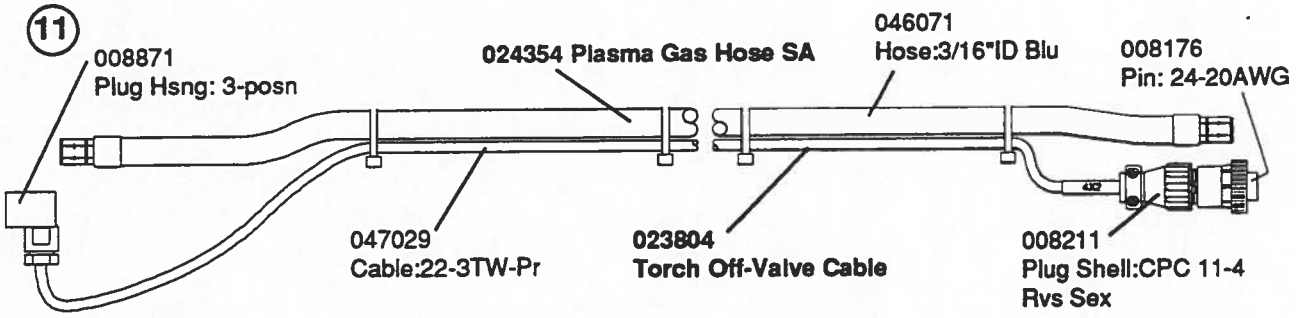
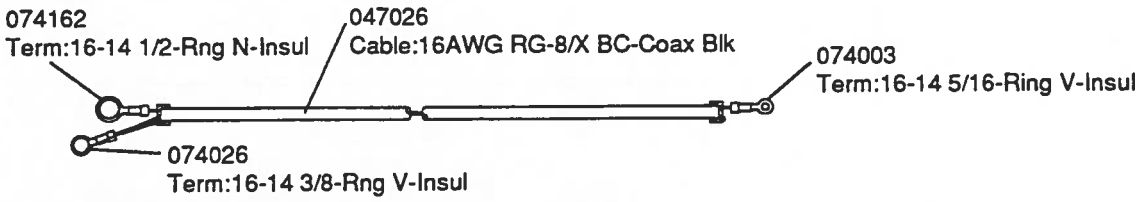


Figure 9-22 Cable & Hose from Motor Valve Console to Off-Valve on Torch

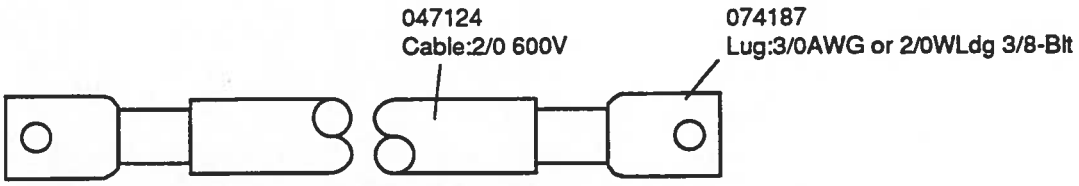
(12)



Part No.	Length	Part No.	Length
023631	25 ft (7.5 m)	023634	100 ft (30.5 m)
023632	50 ft (15 m)	023635	150 ft (46 m)
023633	75 ft (23 m)		

Figure 9-23 Pilot Arc Cable - PS to RHF Console

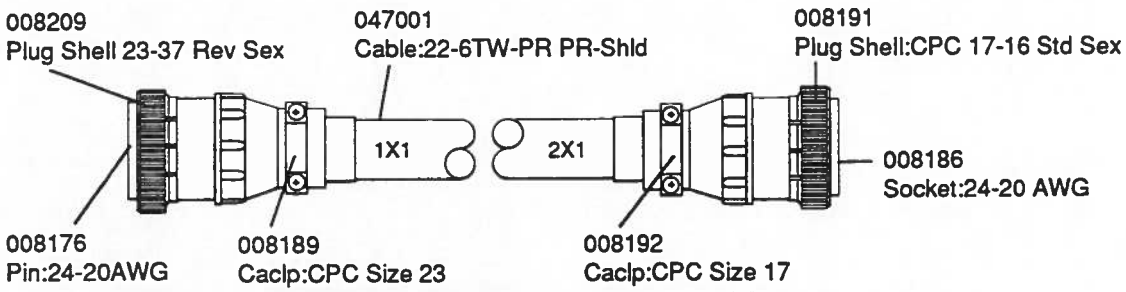
(13) (14)



Part No.	Length	Part No.	Length
023403	15 ft (4.5 m)	023407	100 ft (30.5 m)
023404	25 ft (7.5 m)	023408	150 ft (46 m)
023405	50 ft (15 m)	023644	200 ft (61 m)
023406	75 ft (23 m)		

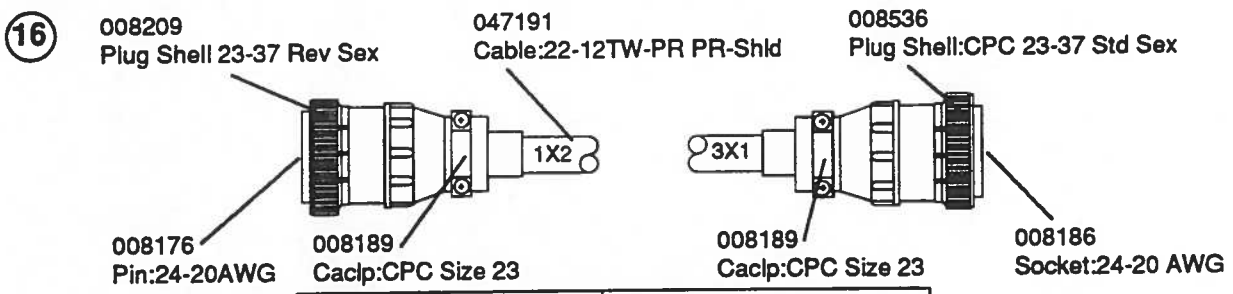
Figure 9-24 Negative Lead and Work Cable - PS to RHF Console / PS to Work Table

(15)



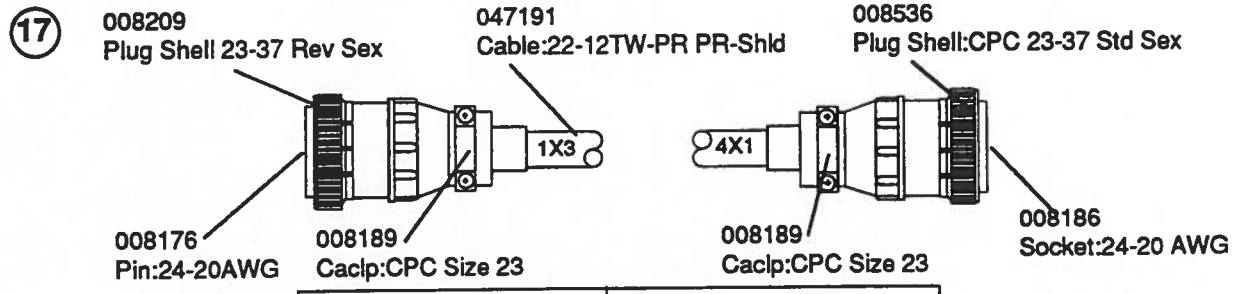
Part No.	Length	Part No.	Length
023550	15 ft (4.6 m)	023613	100 ft (30.5 m)
023610	25 ft (7.6 m)	023614	150 ft (46 m)
023611	50 ft (15 m)	023645	200 ft (61 m)
023612	75 ft (23 m)		

Figure 9-25 HT2000 RHF Cable - PS to RHF Console



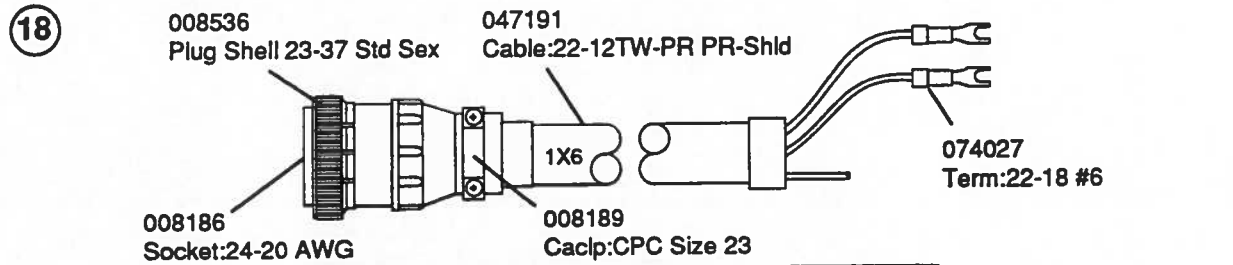
Part No.	Length	Part No.	Length
023549	15 ft (4.5 m)	023607	75 ft (23 m)
023605	25 ft (7.5 m)	023608	100 ft (30.5 m)
023757	38 ft (11.5 m)	023743	125 ft (38 m)
023606	50 ft (15 m)	023609	150 ft (46 m)

Figure 9-26 Gas Console Cable - PS to Gas Console



Part No.	Length	Part No.	Length
023551	15 ft (4.6 m)	023592	75 ft (23 m)
023590	25 ft (7.6 m)	023593	100 ft (30.5 m)
023776	35 ft (10.5 m)	023594	150 ft (46 m)
023591	50 ft (15 m)	023658	200 ft (61 m)

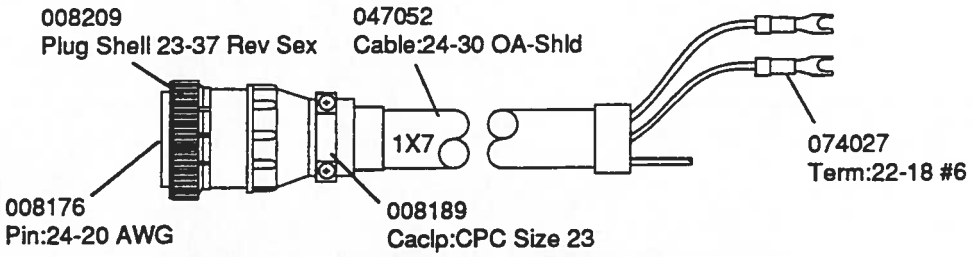
Figure 9-27 Motor Valve Console Cable - PS to Motor Valve Console



Part No.	Length	Part No.	Length
023841	6 ft (2 m)	023846	75 ft (23 m)
023842	15 ft (4.5 m)	023847	100 ft (30.5 m)
023843	25 ft (7.5 m)	023848	125 ft (38 m)
023844	35 ft (10.5 m)	023849	150 ft (46 m)
023845	50 ft (15 m)	023850	200 ft (61 m)

Figure 9-28 Machine Interface Cable - PS to Machine I/O

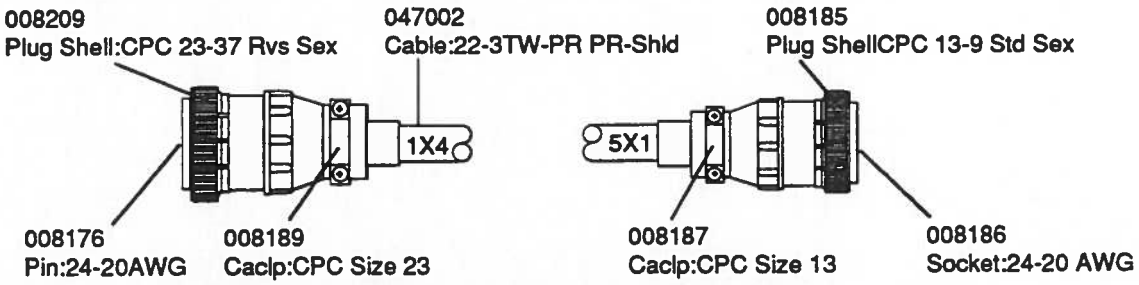
(19)



Part No.	Length	Part No.	Length
023902	6 ft (2 m)	023855	75 ft (23 m)
023851	15 ft (4.5 m)	023856	100 ft (30.5 m)
023852	25 ft (7.5 m)	023903	125 ft (38 m)
023853	35 ft (10.5 m)	023857	150 ft (46 m)
023854	50 ft (15 m)	023858	200 ft (61 m)

Figure 9-29 Machine Interface V/C Cable - PS to Machine Computer

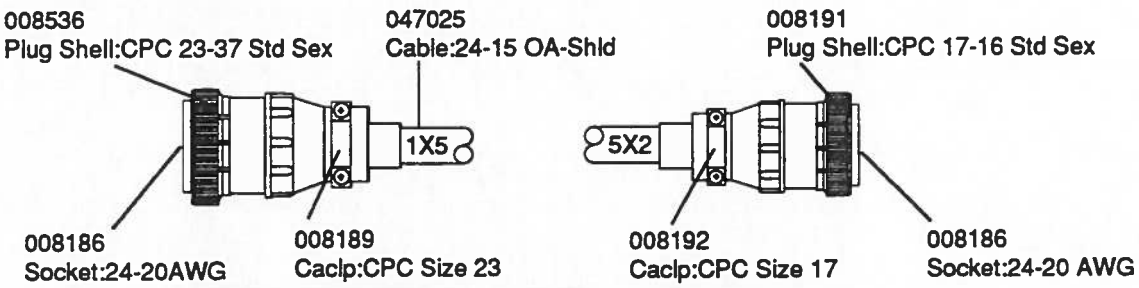
(20)



Part No.	Length	Part No.	Length
023911	15 ft (4.5 m)	023882	125 ft (38 m)
023878	25 ft (7.6 m)	023883	150 ft (46 m)
023879	50 ft (15 m)	023884	200 ft (61 m)
023880	75 ft (23 m)	023885	250 ft (76 m)
023881	100 ft (30.5 m)	023886	275 ft (84 m)
		023887	300 ft (92 m)

Figure 9-30 Remote V/C Cable - PS to Digital (DR)/Programmable (PR) V/C

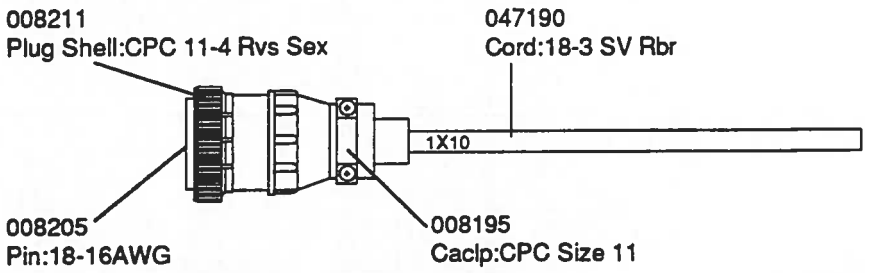
(21)



Part No.	Length	Part No.	Length
023834	15 ft (4.5 m)	023898	125 ft (38 m)
023835	25 ft (7.5 m)	023839	150 ft (46 m)
023836	50 ft (15 m)	023840	200 ft (61 m)
023837	75 ft (23 m)	023899	250 ft (76 m)
023838	100 ft (30.5 m)	023900	275 ft (84 m)
		023901	300 ft (92 m)

Figure 9-31 Power Supply/Programmable Remote (PR) Cable - PS to PR V/C

(22)

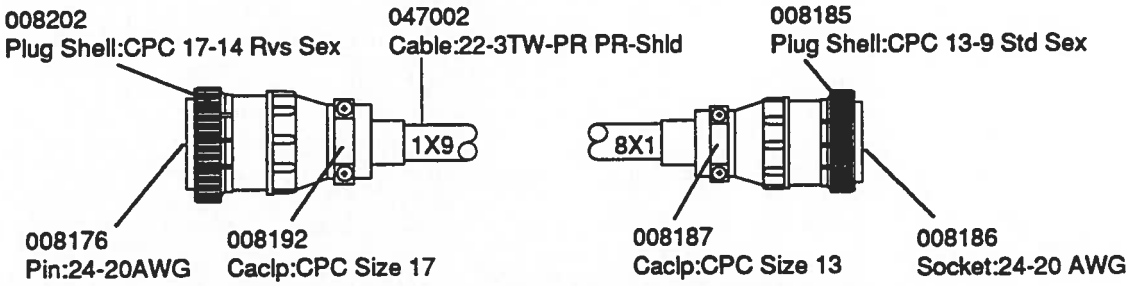


Part No.	Length
023866	50 ft (15 m)
023867	75 ft (23 m)
023868	100 ft (30.5 m)

See IM205 (#802050) for Water Muffler Pump information.

Figure 9-32 Water Muffler Pump Cable - PS to WM

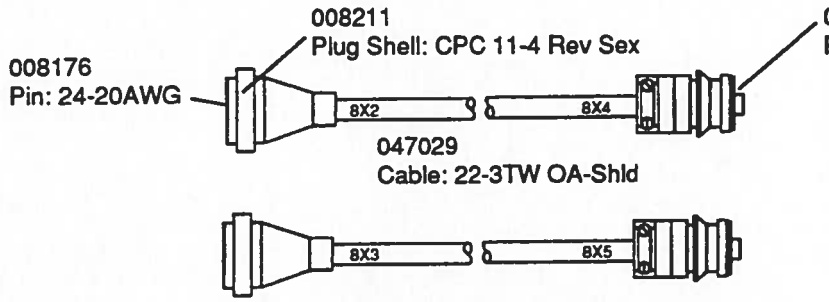
(23)



Part No.	Length	Part No.	Length
023859	25 ft (7.5 m)	023862	100 ft (30.5 m)
023860	50 ft (15 m)	023863	150 ft (46 m)
023861	75 ft (23 m)	023864	200 ft (61 m)

Figure 9-33 Initial Height Sensing Cable - PS to IHS

(24)



Part No.	Length
023888	2 ft (.6 m)
023869	40 ft (12 m)

Part No.	Length
023889	2 ft (.6 m)
023870	40 ft (12 m)

Figure 9-34 Cables from IHS to Sensors

(25)

Part No.
005074

Figure 9-35 Inductive Sensor Assembly

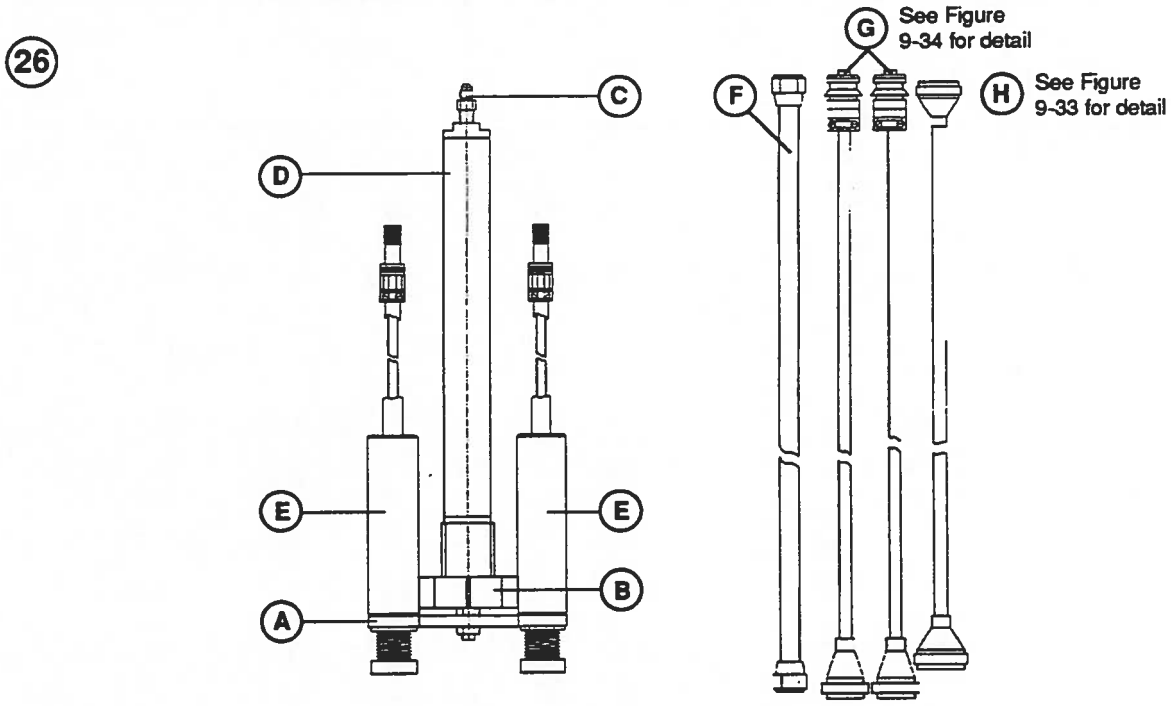


Figure 9-36 Inductive IHS Torch Mounting Assembly with Interconnecting Leads for IHS Assembly

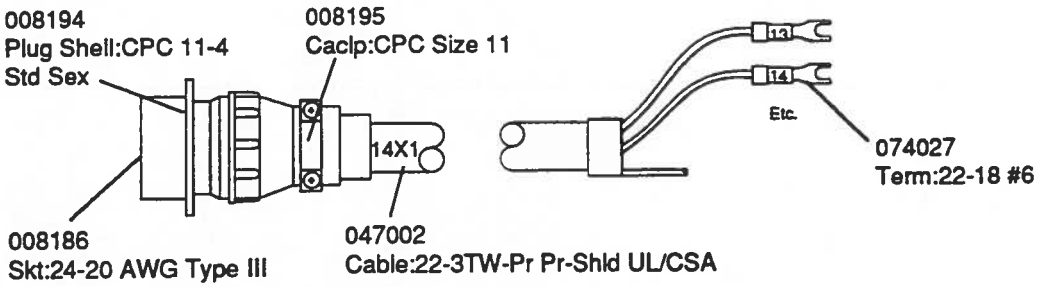
Parent Item No. **028390 Inductive IHS, MAX200** includes items listed below, as well as **IHS Control Module 053016** which appears on pages 9-34 and 9-35.

Item	Part Number	Description	Qty.
	029334	**Torch MTG SA, Induct IHS MAX200**	
A	004082	Bracket, IND Sensor, UW-IHS	1
B	004349	Bracket, MTG Torch, UW-IHS MAX200	1
C	015005	Adapter, 1/4 NPT x #4	1
D	027024	Cylinder, IND Sensor, UW-IHS	1
E	**005074**	**Inductive Sensor Assembly**	**2**

Interconnecting Leads for Inductive IHS System

Item	028811 (25 ft)	028812 (50 ft)	028813 (75 ft)	028814 (100 ft)	028815 (150 ft)	028816 (200 ft)
F	024144	024144	024144	024144	024144	024144
G	023869/023870	023869/023870	023869/023870	023869/023870	023869/023870	023869/023870
H	023859	023860	023861	023862	023863	023864

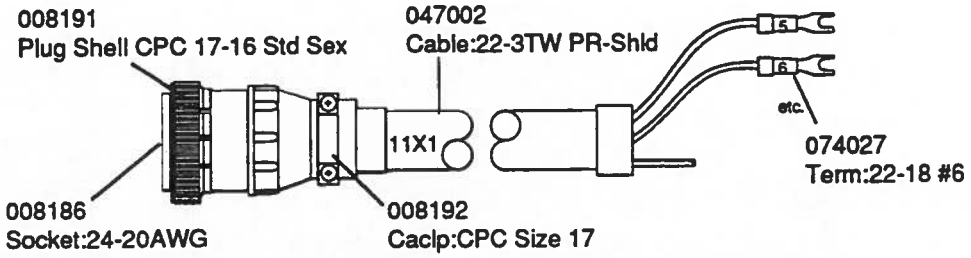
(27)



Part No.	Length	Part No.	Length
023660	15 ft (4.5 m)	023663	75 ft (23 m)
023661	25 ft (7.5 m)	023664	100 ft (30.5 m)
023662	50 ft (15 m)	023665	150 ft (46 m)

Figure 9-37 Power Supply to Argon / Hydrogen Console Cable

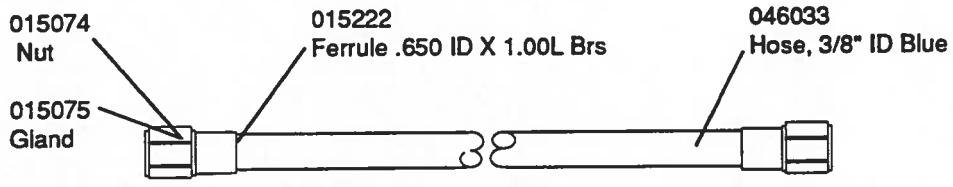
(28)



Part No.	Length	Part No.	Length
023687	10 ft (3 m)	023694	75 ft (23 m)
023692	25 ft (7.5 m)	023695	100 ft (30.5 m)
023758	38 ft (12 m)	023696	150 ft (46 m)
023693	50 ft (15 m)		

Figure 9-38 Timer / Counter Cable - PS to Timer / Counter

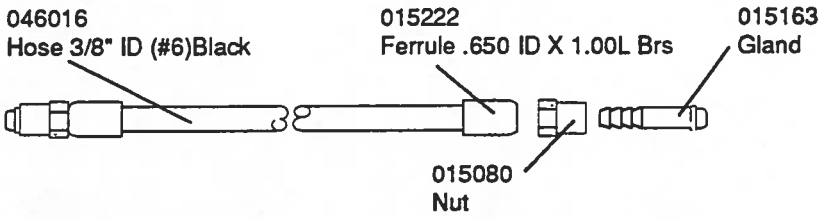
(29)



Part No.	Length	Part No.	Length
024204	15 ft (4.6 m)	024206	100 ft (30 m)
024205	25 ft (7.6 m)	024159	150 ft (46 m)
024155	50 ft (15 m)		

Figure 9-39 Oxygen Supply Hose - Oxygen Supply to Gas Console

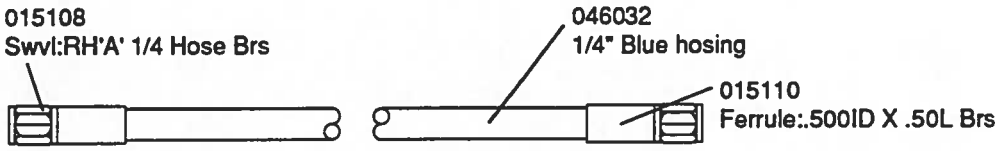
(30)



Part No.	Length	Part No.	Length
024210	10 ft (3 m)	024148	75 ft (23 m)
024203	15 ft (4.5 m)	024116	100 ft (30.5 m)
024232	20 ft (6 m)	024120	150 ft (46 m)
024134	25 ft (7.5 m)	024185	180 ft (55 m)
024211	35 ft (10.5 m)	024124	200 ft (61 m)
024112	50 ft (15 m)		

Figure 9-40 Nitrogen Supply Hose - Nitrogen Supply to Gas Console

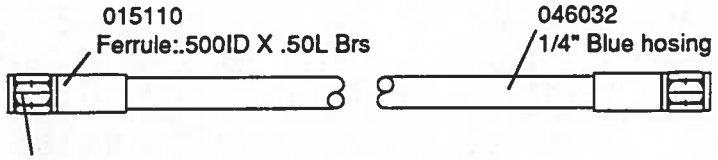
(31)



Part No.	Length	Part No.	Length
024253	12 in (.3 m)	024026	25 ft (7.5 m)
024317	5 ft (1.5 m)	024029	30 ft (9 m)
024026	10 ft (3 m)	024030	35 ft (10.5 m)
024027	15 ft (4.5 m)	024031	40 ft (12 m)
024017	20 ft (6 m)	024207	45 ft (14 m)

Figure 9-41 Plasma Preflow Gas Hosing - Gas Console to Motor Valve Console

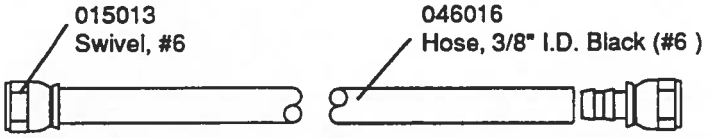
(32)



Part No.	Length	Part No.	Length
024316	5 ft (1.5 m)	024309	30 ft (9 m)
024307	10 ft (3 m)	024322	35 ft (10.5 m)
024320	15 ft (4.5 m)	024310	40 ft (12.5 m)
024308	20 ft (6 m)	024323	45 ft (14 m)
024321	25 ft (7.5 m)	024311	50 ft (15 m)

Figure 9-42 Plasma Cut Flow Gas Hosing - Gas Console to Motor Valve Console

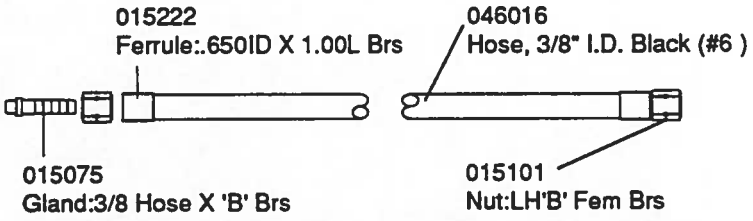
(33)



Part No.	Length	Part No.	Length
024043	4 ft (1 m)	024147	75 ft (23 m)
024341	10 ft (3 m)	024115	100 ft (30 m)
024342	20 ft (6 m)	024119	150 ft (46 m)
024133	25 ft (7.5 m)	024184	180 ft (55 m)
024012	50 ft (15 m)	024123	200 ft (61 m)

Figure 9-43 Shield Gas Hose - Shield Gas Supply to Gas Console

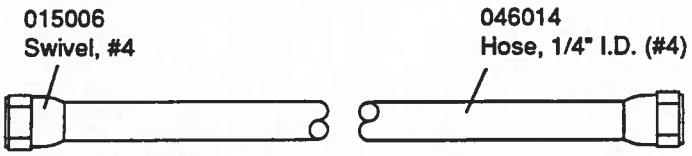
(34)



Part No.	Length	Part No.	Length
024313	10 ft (3 m)	024305	75 ft (23 m)
024302	15 ft (4.5 m)	024306	100 ft (30 m)
024303	25 ft (7.5 m)	024312	150 ft (46 m)
024304	50 ft (15 m)		

Figure 9-44 Shield Gas - Gas Console to RHF Console

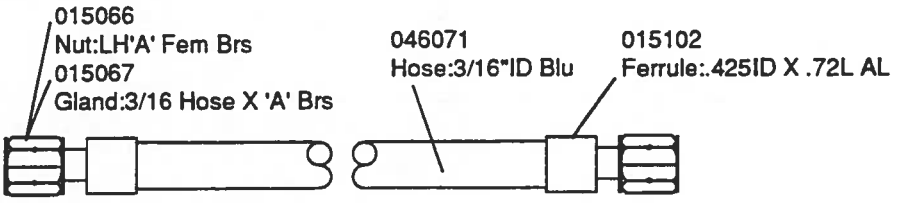
(35)



Part No.	Length	Part No.	Length
024061	5 ft (1.5 m)	024071	30 ft (9 m)
024063	10 ft (3 m)	024092	40 ft (12 m)
024065	15 ft (4.5 m)	024096	50 ft (15 m)
024067	20 ft (6 m)	024174	60 ft (18 m)
024069	25 ft (7.5 m)		

Figure 9-45 Shield Gas Sense Hose - Gas Console to RHF Console

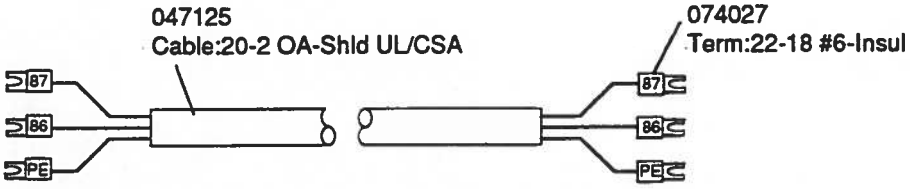
(36)



Part No.	Length	Part No.	Length
024355	12 in (.3 m)	024369	30 ft (9 m)
024354	10 ft (3 m)	024370	40 ft (12 m)
024368	20 ft (6 m)		

Figure 9-46 Argon/Hydrogen Gas Hosing - Argon/Hydrogen Console to Torch

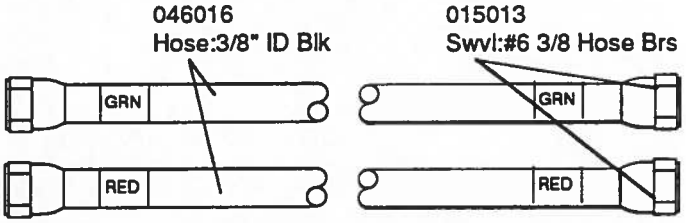
(37)



Part No.	Length	Part No.	Length
023340	15 ft (4.5 m)	023343	100 ft (30.5 m)
023341	25 ft (7.5 m)	023344	150 ft (46 m)
023342	50 ft (15 m)		

Figure 9-47 Hold Cable - Power Supply to Power Supply

(38)



Part No.	Length	Part No.	Length
028652	10 ft (3 m)	028443	75 ft (23 m)
028440	15 ft (4.5 m)	028444	100 ft (30 m)
028653	20 ft (6 m)	028445	150 ft (46 m)
028441	25 ft (7.5 m)	028637	200 ft (61 m)
028442	50 ft (15 m)		

Figure 9-48 Cooling Hose Set - Power Supply to RHF Console

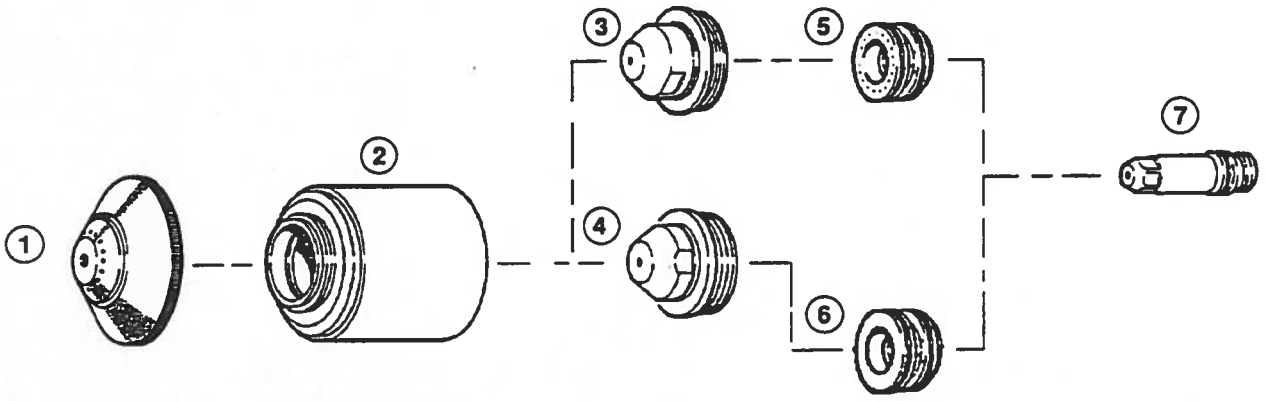


Figure 9-49 Consumable Parts

CONSUMABLE PARTS KIT #028602

Item	Part Number	Description	Qty.
	028602	**Kit: HT2000 Spare Parts**	
	001067	Box: Gra Plstc	1
1	**020424**	**Shield, 200A**	1
1	**020448**	**Shield, 100A**	1
2	**020423**	**Cap, Nozzle Retaining**	1
3	**020605**	**Nozzle, 200A .082 O2**	5
4	**020608**	**Nozzle, 200A .086 Air/N2/H35**	5
4	**020611**	**Nozzle, 100A .059 Air**	5
5	**020678**	**Swirl Ring: HT2000 O2**	1
6	**020607**	**Swirl Ring, Air/N2/H35**	1
7	**020664**	**Electrode:HT2000 200A Oxy**	5
7	**020415**	**Electrode, N2/H35**	5
	027055	Lubricant, Silicon, 1/4 Oz Tube	1
	027194	Wrench, Nozzle, 3/4"	1
	044027	O-Ring, Buna-N	1
	027347	Tool: Water Tube Removal	1

LEAD PACKAGES

HT2000 Power Supply to Remote High Frequency Console - Cables and Hoses

Part Number	Length
028604	25 ft (7.6 m)
028605	50 ft (15 m)
028606	75 ft (23 m)
028607	100 ft (30 m)
028608	150 ft (45 m)
028651	200 ft (61 m)

Remote High Frequency Console to Gas Console - Hoses

Part Number	Length
028683	10 ft (3 m)
028684	15 ft (4.6 m)
028685	20 ft (6.2 m)
028686	25 ft (7.6 m)
028687	30 ft (9.1 m)
028688	35 ft (10.6 m)
028689	50 ft (15 m)

Gas Console to Motor Valve Console - Hoses

Part Number	Length
028622	10 ft (3 m)
028623	15 ft (4.6 m)
028624	20 ft (6.2 m)
028625	25 ft (7.6 m)
028626	30 ft (9.1 m)
028627	35 ft (10.6 m)
028654	50 ft (15 m)
028655	75 ft (23 m)
028656	100 ft (30 m)

RECOMMENDED SPARE PARTS

Power Supply

Part Number	Description	Designation	Qty.	Pg. Ref.
005121	Pushbutton: 2 NO Green Illumin	PB1	1	9-6
005122	Pushbutton: 2 NC Red Extended	PB2	1	9-6
005149	Bulb: 28VDC, 40ma	LT1	2	9-6
027080	Fan: 225CFM 120VAC 50/60 Hz	M2,M3	1	9-5
027079	Fan: 450-550 CFM 120VAC 50/60 Hz	M4	1	9-5
041280	PCB Assy: HT2000 Miprcs	PCB2	1	9-5
081004	Firmware: HT2000		2	9-5
041246	PCB Assy: Relay, HD1070/HT2000	PCB4	1	9-5
041294	PCB Assy: HT2000 THC Mother	PCB9	1	9-5
041186	PCB Assy: HT2000 THC	PCB10	1	9-5
005102	Thermostat: 160°C, 6 Amp	TS1	1	9-7
003138	Circuit Breaker, 2 Pole, 600V 100A	CB1	1	9-9
003092	Contactor: 90A 3 Pole, 24VAC	CON1	2	9-9
041147	PCB Assy: Power Distribution	PCB1	1	9-9
008317	Fuse: Semiconductor 125A, 250V	F3,F4	5	9-11
029922	CH130 Chopper SA	CH1,CH2	1	9-13
009466	Res: 4 Ohm 420W	R6	1	9-17
003021	Relay, 120VAC NO SPST	CR1	1	9-17
009794	Coil: Air Core Transformer, 8AWG	T1	1	9-19
029202	Current Sensor SA	CS1	1	9-19
029326	Switch, Level SA, 1/2 NPT	LS1	1	9-21
029323	Switch, Temp SA, 162 Deg. F	FS1	1	9-21
006046	Valve, Sol 240V 3/8 NPT NC	V7	1	9-21
031114	Pump, 70 GPH Positive Displace		1	9-21

Remote High Frequency Console

Part Number	Description	Designation	Qty.	Pg. Ref.
009281	Cap: Poly .22µF 10% 1000	C1,C2	2	9-23
009280	Cap: .022µF 15kV	C3,C4	2	9-25
004061	Electrode:Sprk Gap 1/8 x 1.6		3	9-25
029317	HV Transformer SA, 5000V, 20 ma	T1	1	9-23
005093	Switch, Pressure 0-90 psi	PS3	1	9-23
006032	Solenoid Valve:150# 1/4 FPT 120V NC	SV6	1	9-23
006057	Solenoid Valve: 3-way 120VAC 1/8NPT	SV7	1	9-23

PARTS LIST

RECOMMENDED SPARE PARTS (CONT.)

Gas Console

Part Number	Description	Designation	Qty.	Pg. Ref.
005042	Tgl Switch: SP, Mom. ON/OFF/ON	S3	1	9-27
005093	Pressure Switch:0-90psi	PS1,PS2	1	9-27
005149	Bulb, 120VAC	LT1	1	9-27
006057	Solenoied Valve: 150# 1/8FPT 120V 3W	SV1-3	1	9-27
006064	Needle Valve: 1/8 FPT .125 Orifice	MV2,MV3,MV4	1	9-27
011053	Flowmeter: 7.8 GPM/44CFH	FM1,FM2	1	9-27
011055	Float: Glass 1/4" Diameter for 011053		2	
011058	Tube: SK 1/4"-33-G5-2FS for 011053		2	
011008	Shield: Plastic, for 011053 or 011056		2	
022020	Gauge: Pressure, 160 psi/bar, Panel Mnt	PG1-3	1	9-27

Motor Valve Console

Part Number	Description	Designation	Qty.	Pg. Ref.
006057	Solenoid Valve: 150# 1/8FPT 120V 3W	SV4	1	9-29
006063	Motor Valve: Electric 1/8FPT .125 Orifice	MV2	1	9-29

Section 10 WIRING DIAGRAMS

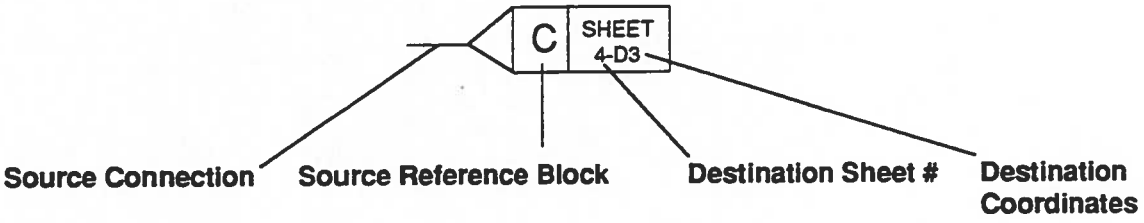
In this section:

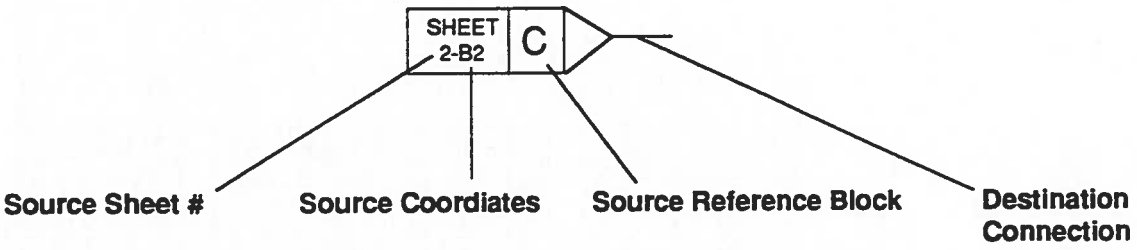
WIRING DIAGRAMS

INTRODUCTION

This section contains the wiring diagrams for the HT2000 system. When tracing a signal path or referencing with the **Parts List** or **Troubleshooting** sections, please be aware of the following format to assist you in understanding the wiring diagrams' organization:

- Sheet numbers are located in the lower right-hand corner.
- Page-to-page referencing is done in the following manner:



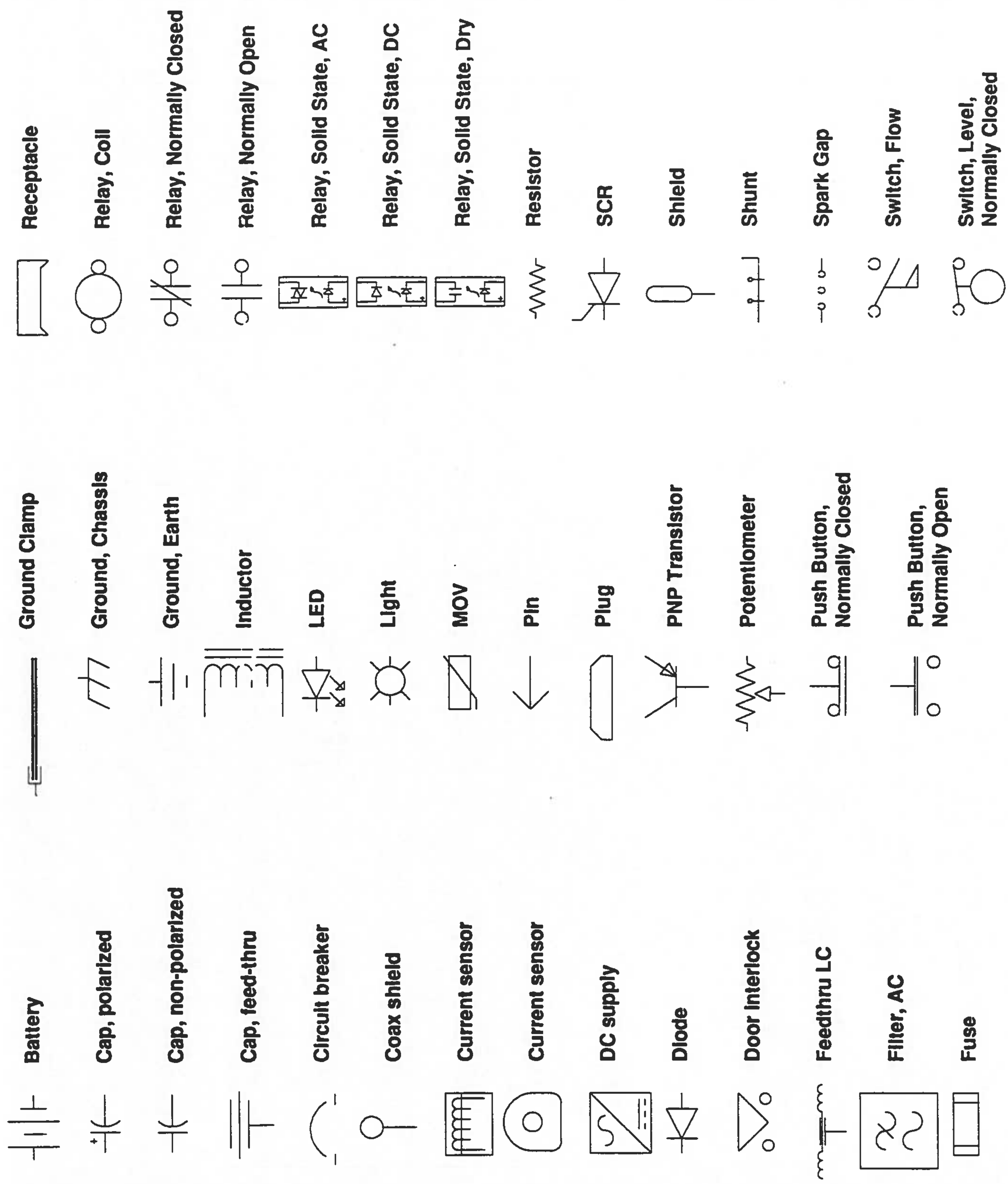


Destination and **Source Coordinates** refer to letters A-D on the Y-axis of each sheet and numbers 1-4 on the X-axis of each sheet. Lining up the coordinates will bring you to the source or destination blocks (similar to a road map).

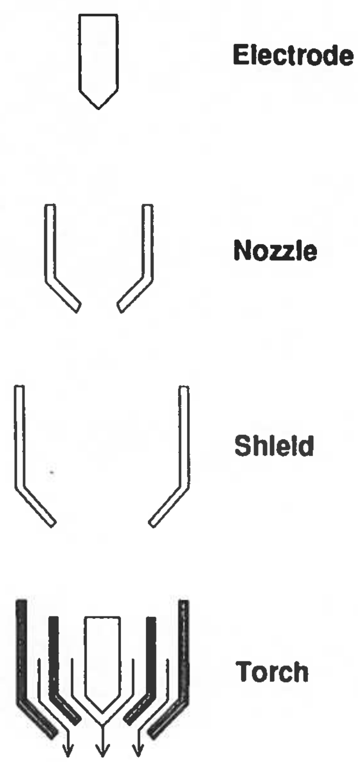
- When referencing components to the wiring diagrams, designations may appear to be repeated. Ex. C1 appears on sheet 2 of 9 in the wiring diagrams in five separate locations. Sections of the power supply on that page are outlined with a dotted box and a label. Within different sections, the same designation may appear. Be certain to check the dotted box label when looking for or cross-referencing HT2000 parts.

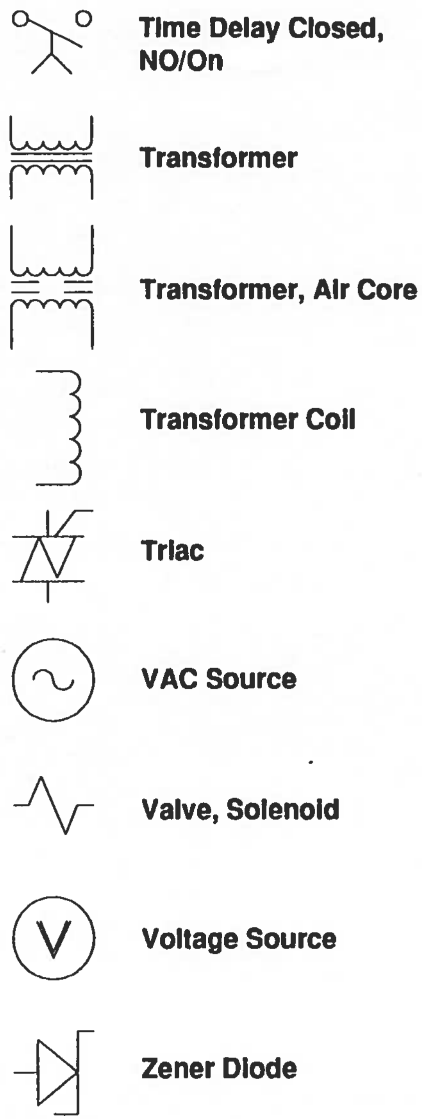
WIRING DIAGRAM SYMBOLS

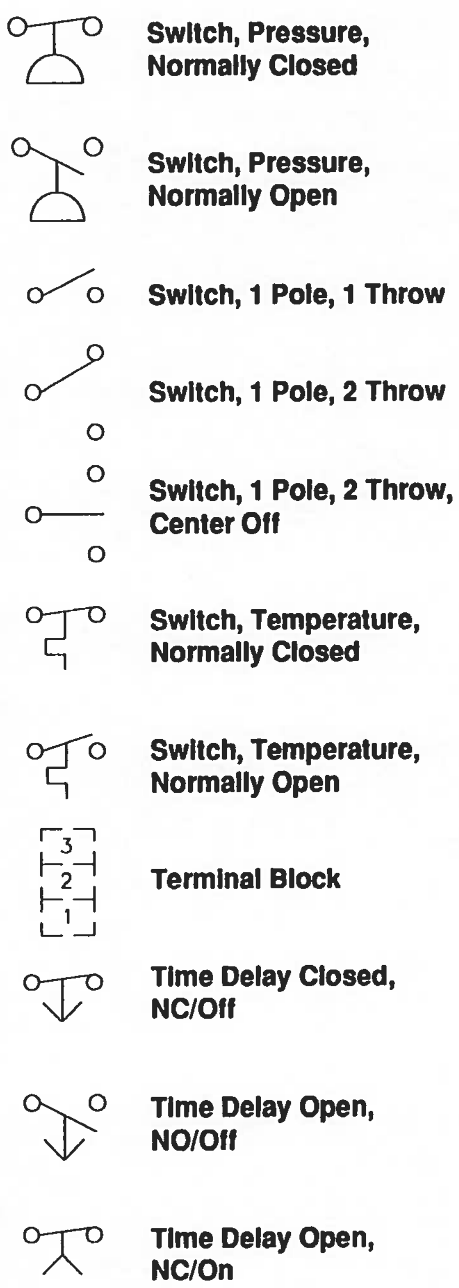
Wiring diagram symbols and their identification precede the system wiring diagrams in this section.

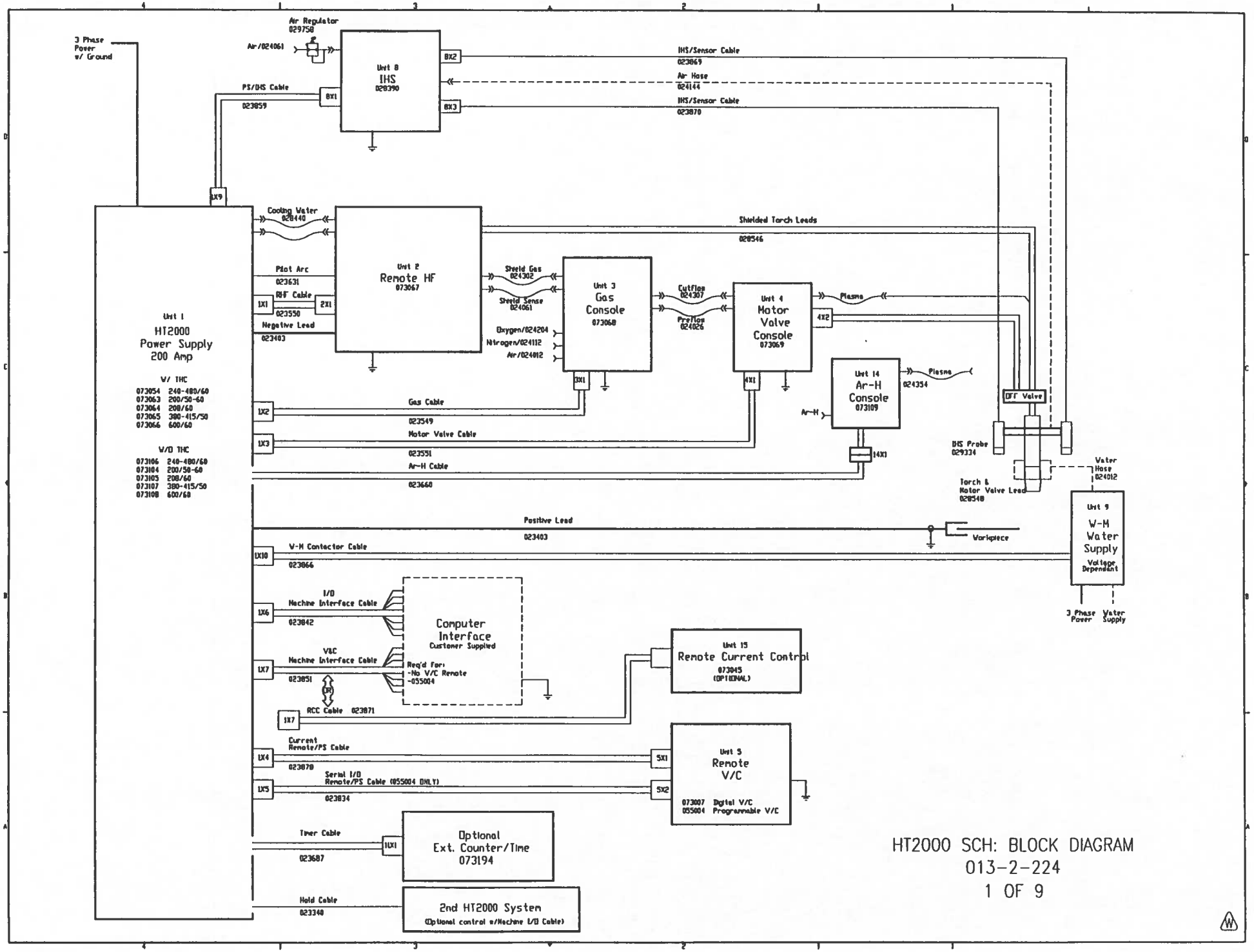

Receptacle
Relay, Coil
Relay, Normally Closed
Relay, Normally Open
Relay, Solid State, AC
Relay, Solid State, DC
Relay, Solid State, Dry
Resistor
SCR
Shield
Shunt
Spark Gap
Switch, Flow
Switch, Level, Normally Closed
Ground Clamp
Ground, Chassis
Ground, Earth
Inductor
LED
Light
MOV
Pin
Plug
PNP Transistor
Potentiometer
Push Button, Normally Closed
Push Button, Normally Open
Battery
Cap, polarized
Cap, non-polarized
Cap, feed-thru
Circuit breaker
Coax shield
Current sensor
Current sensor
DC supply
Diode
Door Interlock
Feedthru LC
Filter, AC
Fuse

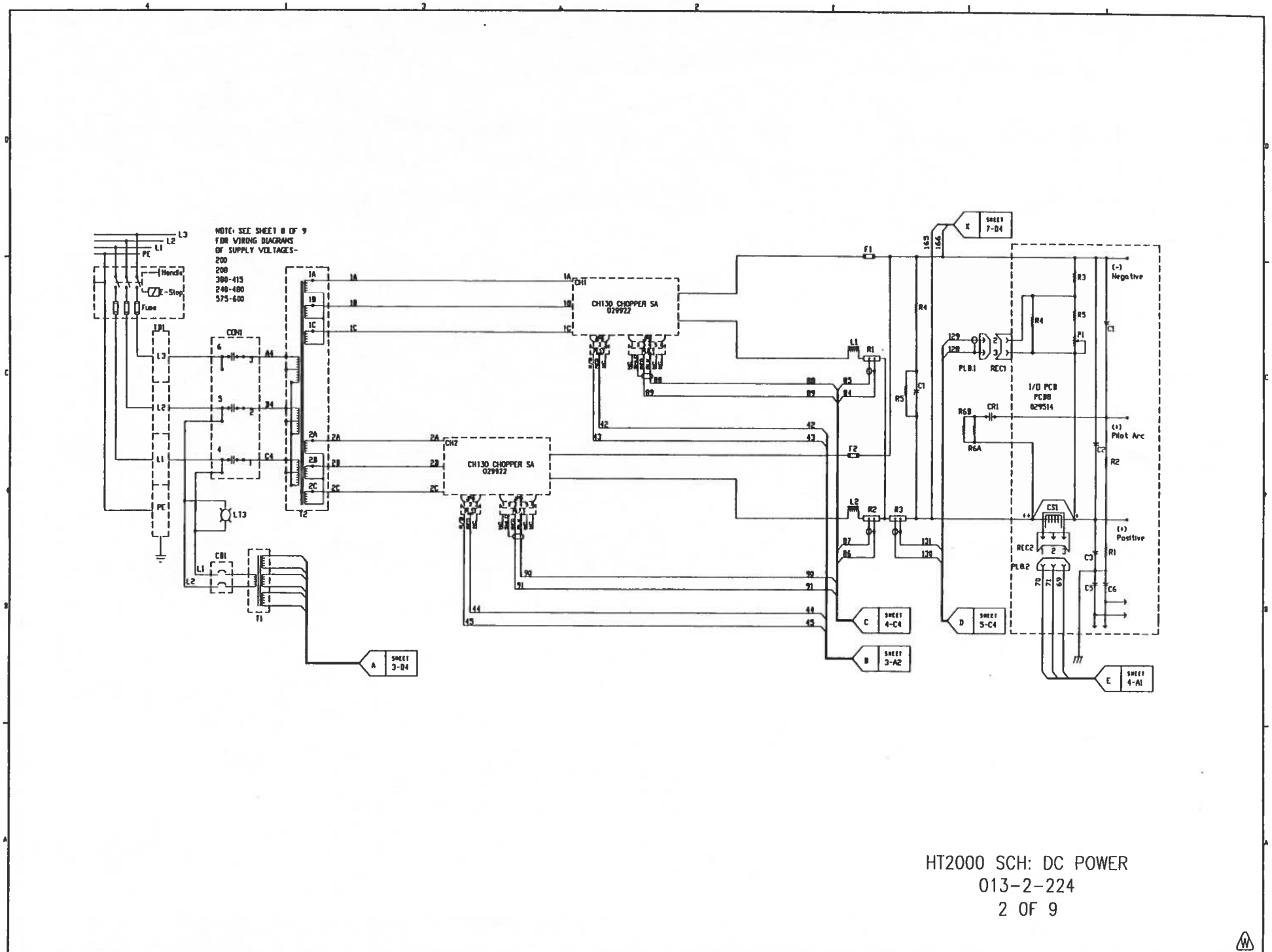
Torch Symbols



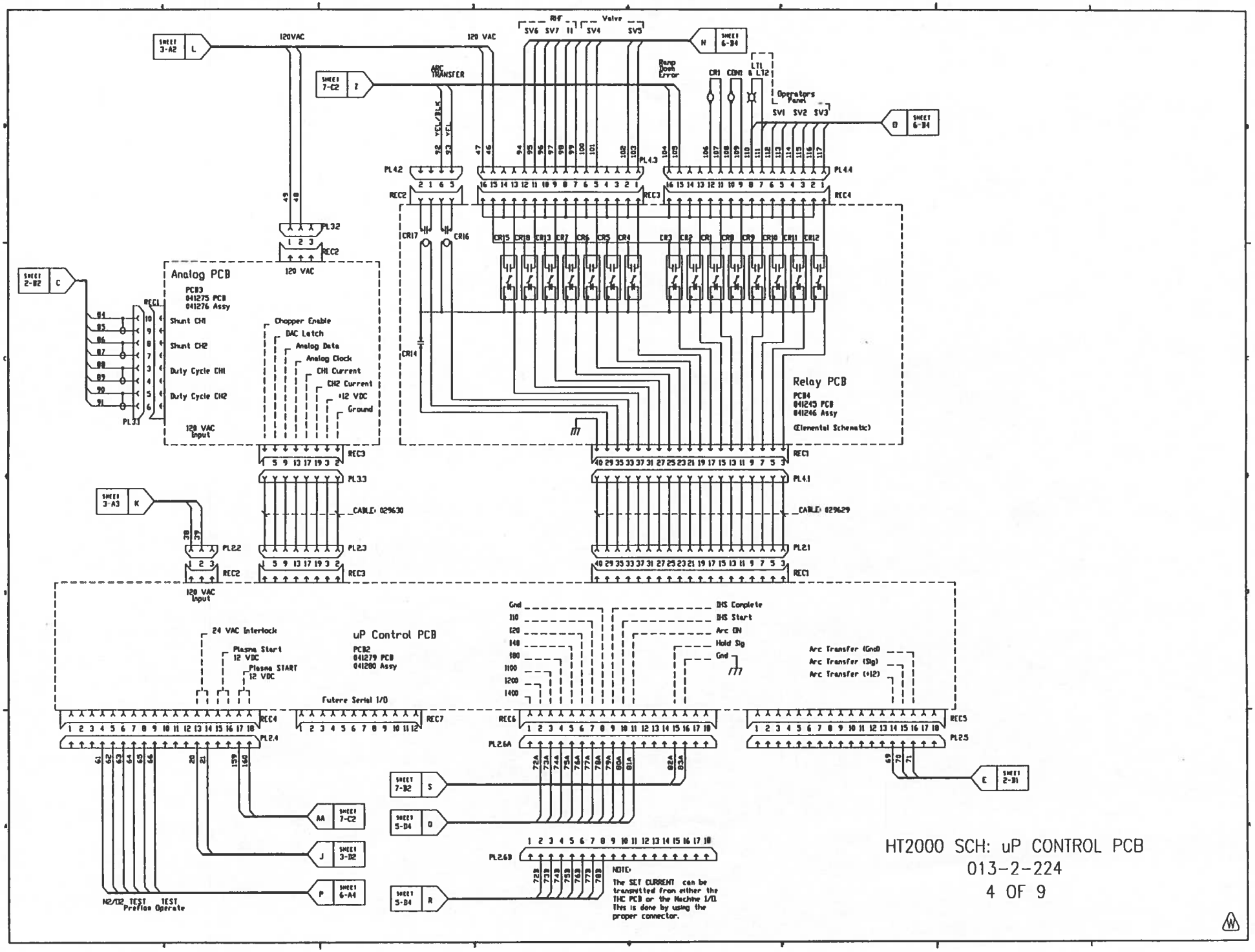




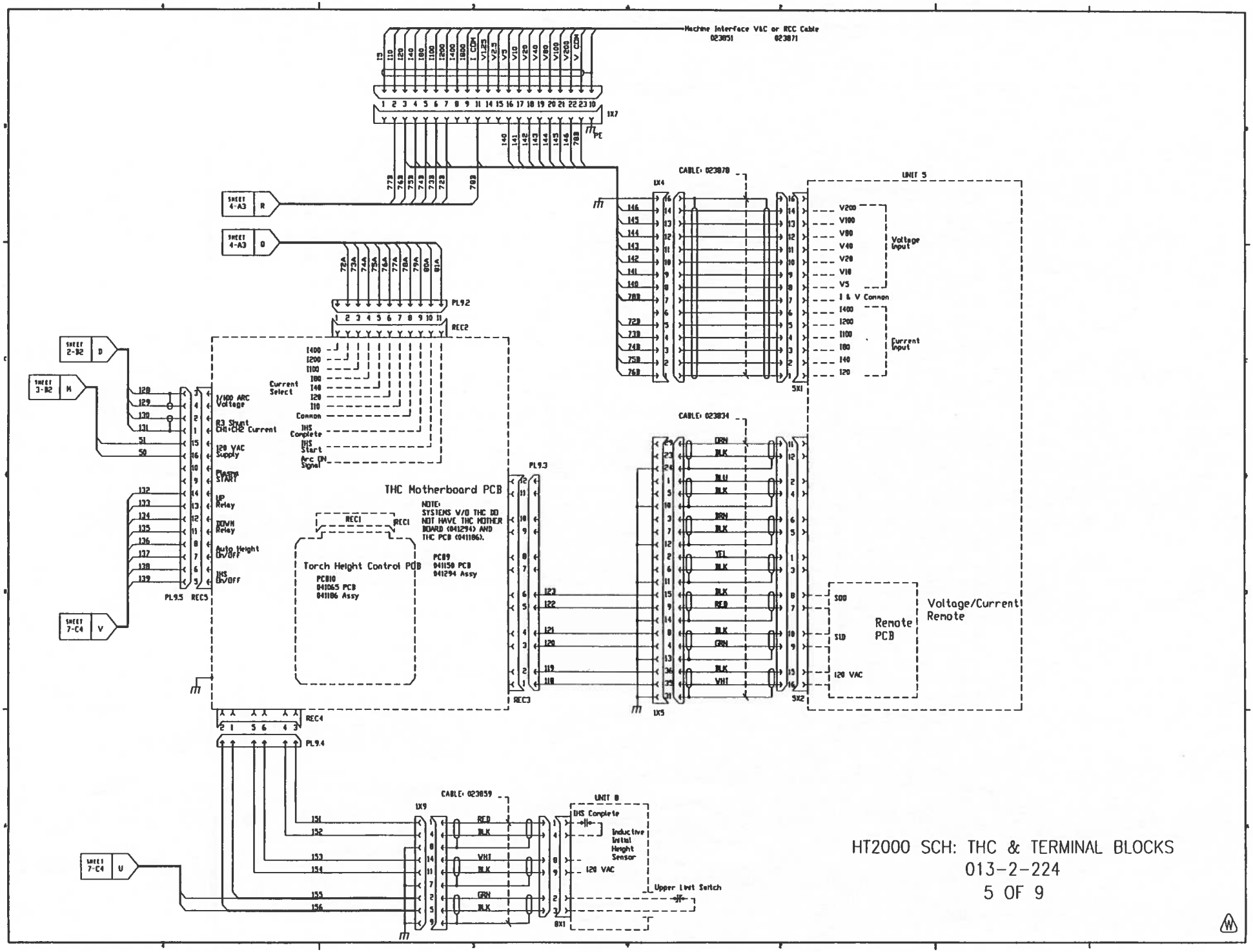

3 Phase Power w/ Ground
Air Regulator 029758
Air/024061
Unit 8 IHS 028390
8X2
8X1
8X3
PS/IHS Cable 023859
IHS/Sensor Cable 023869
Air Hose 024144
IHS/Sensor Cable 023870
1X9
Unit 1 HT2000 Power Supply 200 Amp
W/ THC
073054 240-480/60
073063 200/50-60
073064 208/60
073065 380-415/50
073066 600/60
W/O THC
073106 240-480/60
073104 200/50-60
073105 208/60
073107 380-415/50
073108 600/60
Cooling Water 028440
Unit 2 Remote HF 073067
Shielded Torch Leads 028546
Pilot Arc 023631
1X1
HF Cable 023550
2X1
Negative Lead 023403
Shield Gas 024302
Shield Sense 024061
Unit 3 Gas Console 073068
Oxygen/024204
Nitrogen/024112
Air/024012
3X1
Cutflow 024307
Preflow 024026
Unit 4 Motor Valve Console 073069
4X1
4X2
Plasma
Unit 14 Ar-H Console 073109
Ar-H
14X1
Plasma 024354
OFF Valve
IHS Probe 029334
Torch & Motor Valve Lead 028548
Water Hose 024012
1X2
Gas Cable 023549
1X3
Motor Valve Cable 023551
Ar-H Cable 023660
Positive Lead 023403
Workpiece
Unit 9 W-M Water Supply Voltage Dependant
3 Phase Power
Water Supply
1X10
W-H Contactor Cable 023866
1X6
I/O Machine Interface Cable 023842
Computer Interface Customer Supplied
Req'd for:
-No V/C Remote
-055004
1X7
V&C Machine Interface Cable 023851
RCC Cable 023871
Unit 15 Remote Current Control 073045 (OPTIONAL)
1X4
Current Remote/PS Cable 023870
1X5
Serial I/O Remote/PS Cable (055004 ONLY) 023834
5X1
5X2
Unit 5 Remote V/C
073007 Digital V/C
055004 Programmable V/C
Timer Cable 023687
1UX1
Optional Ext. Counter/Time 073194
Hold Cable 023340
2nd HT2000 System
(Optional control w/Machine I/O Cable)
HT2000 SCH: BLOCK DIAGRAM
013-2-224
1 OF 9



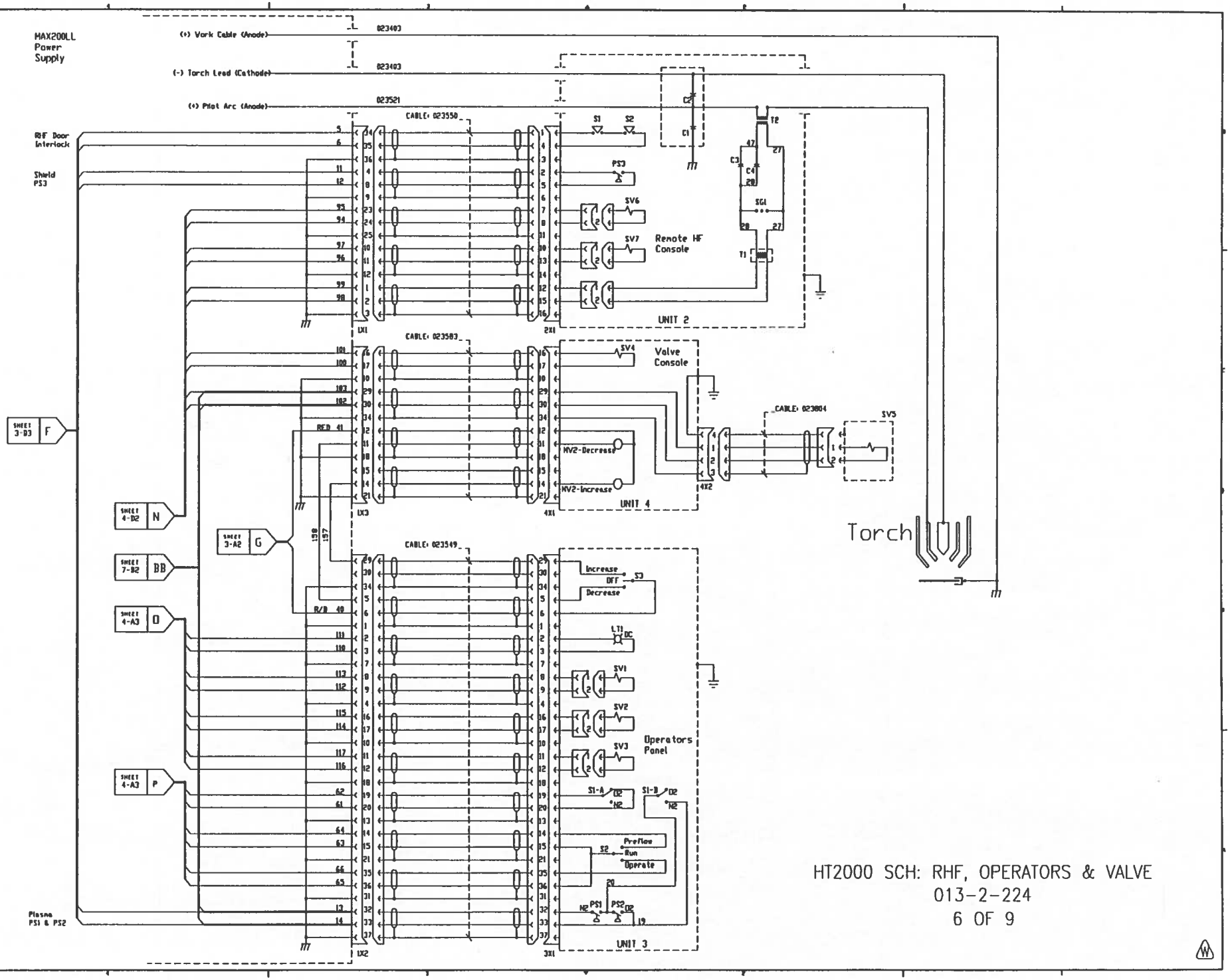
HT2000 SCH: DC POWER
013-2-224
2 OF 9

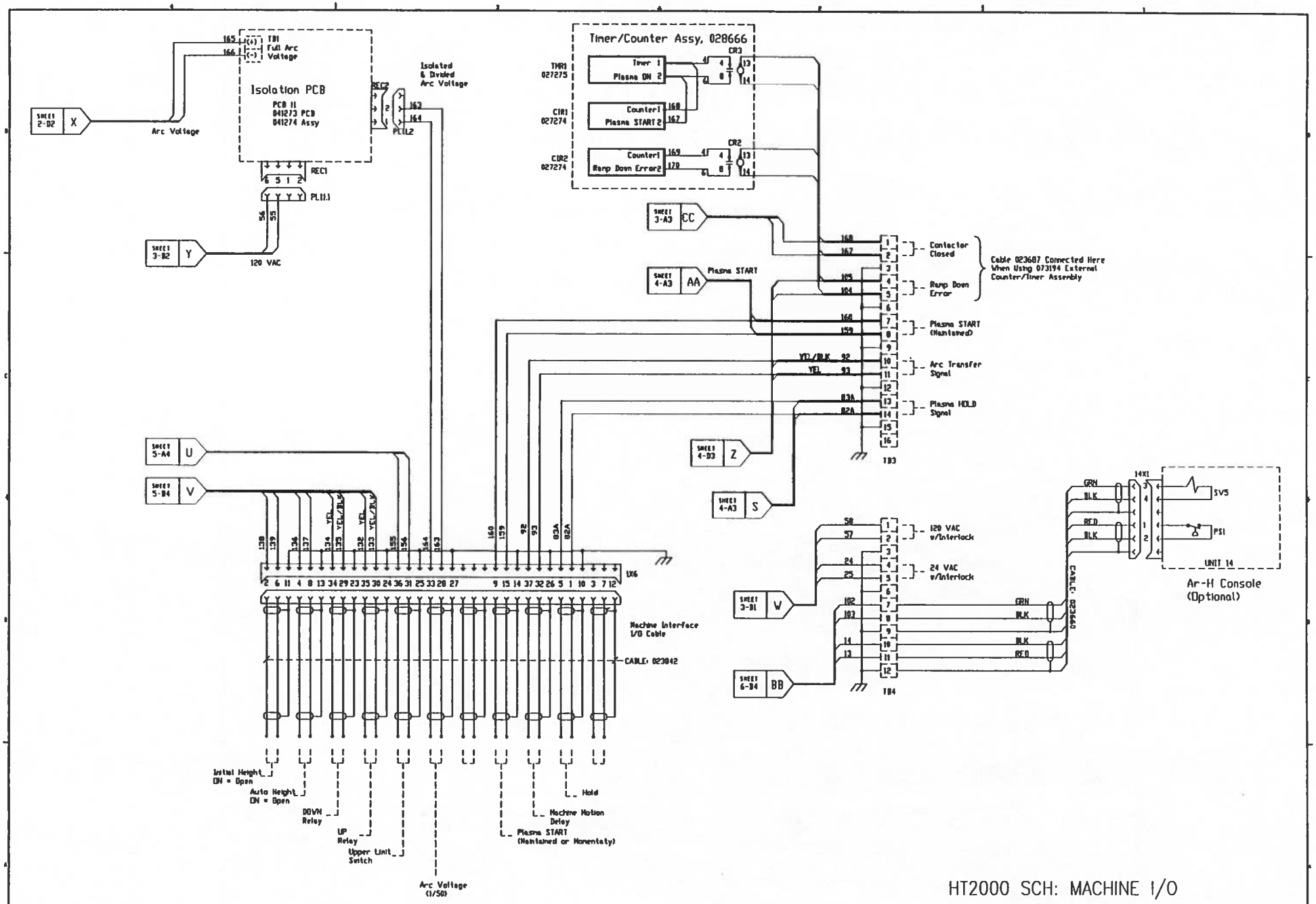


HT2000 SCH: uP CONTROL PCB
013-2-224
4 OF 9



HT2000 SCH: THC & TERMINAL BLOCKS
013-2-224
5 OF 9


MAX200LL
Power
Supply
(+) Work Cable (Anode)
023403
(-) Torch Lead (Cathode)
023403
(+) Pilot Arc (Anode)
023521
CABLE: 023550
CABLE: 023583
CABLE: 023549
CABLE: 023804
RHF Door
Interlock
Shield
PS3
Remote HF
Console
Valve
Console
Operators
Panel
UNIT 2
UNIT 4
UNIT 3
Torch
HV2-Decrease
HV2-Increase
Increase
Decrease
Preflow
Run
Operate
Plasma
PS1 & PS2
SHEET 3-D3 F
SHEET 4-D2 N
SHEET 3-A2 G
SHEET 7-B2 BB
SHEET 4-A3 O
SHEET 4-A3 P
RED 41
R/B 40
HT2000 SCH: RHF, OPERATORS & VALVE
013-2-224
6 OF 9


Timer/Counter Assy, 028666
Isolation PCB
PCB II
041273 PCB
041274 Assy
TB1
Full Arc Voltage
Isolated & Divided Arc Voltage
Arc Voltage
120 VAC
Contactor Closed
Ramp Down Error
Plasma START (Maintained)
Arc Transfer Signal
Plasma HOLD Signal
Cable 023687 Connected Here When Using 073194 External Counter/Timer Assembly
120 VAC w/Interlock
24 VAC w/Interlock
Machine Interface I/O Cable
CABLE: 023842
Initial Height ON = Open
Auto Height ON = Open
DOWN Relay
UP Relay
Upper Limit Switch
Arc Voltage (1/50)
Plasma START (Maintained or Momentary)
Machine Motion Delay
Hold
Ar-H Console (Optional)
SVS
PSI
UNIT 14
CABLE: 023660
HT2000 SCH: MACHINE I/O
013-2-224
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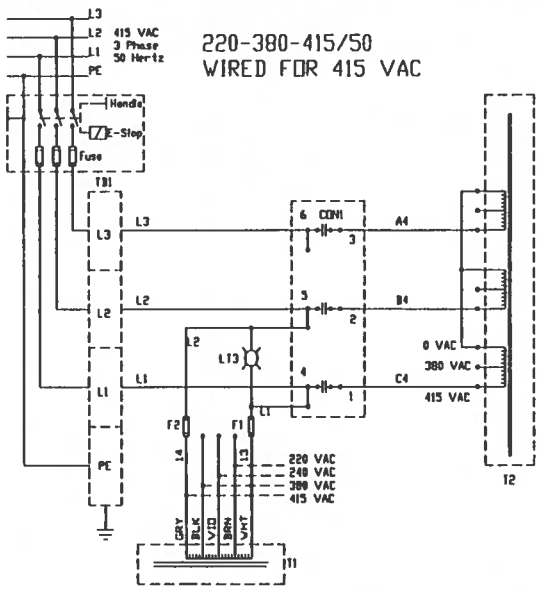
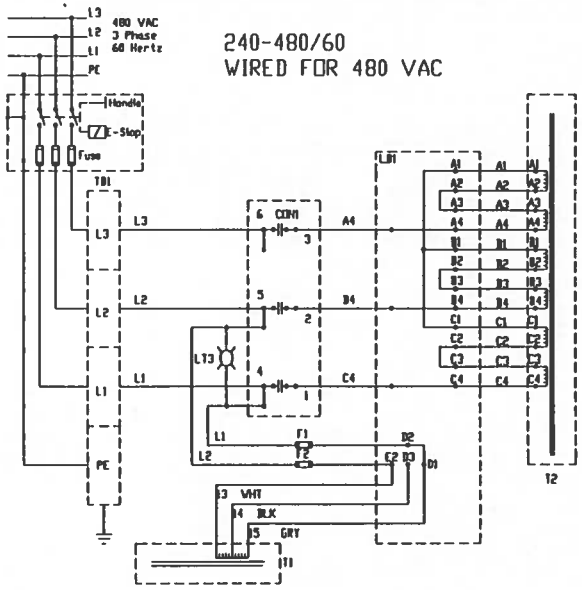
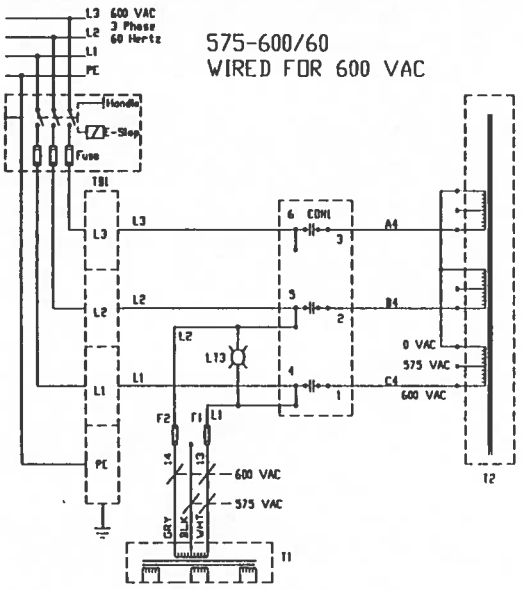
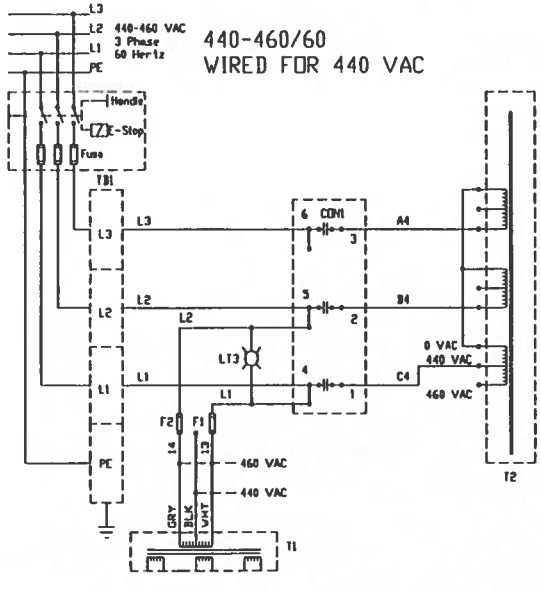
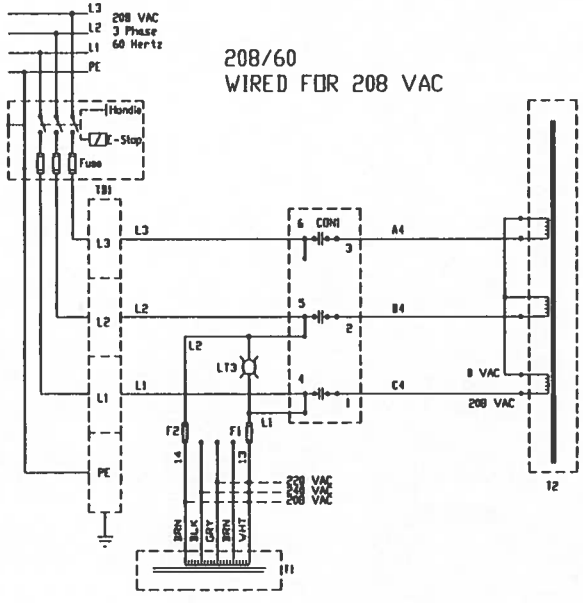
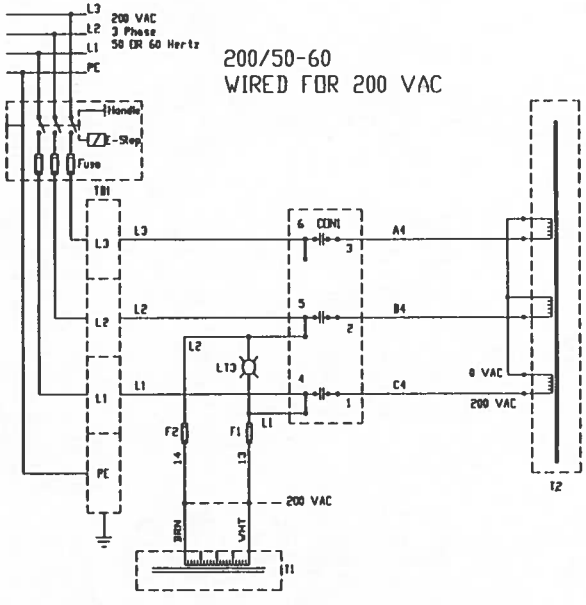




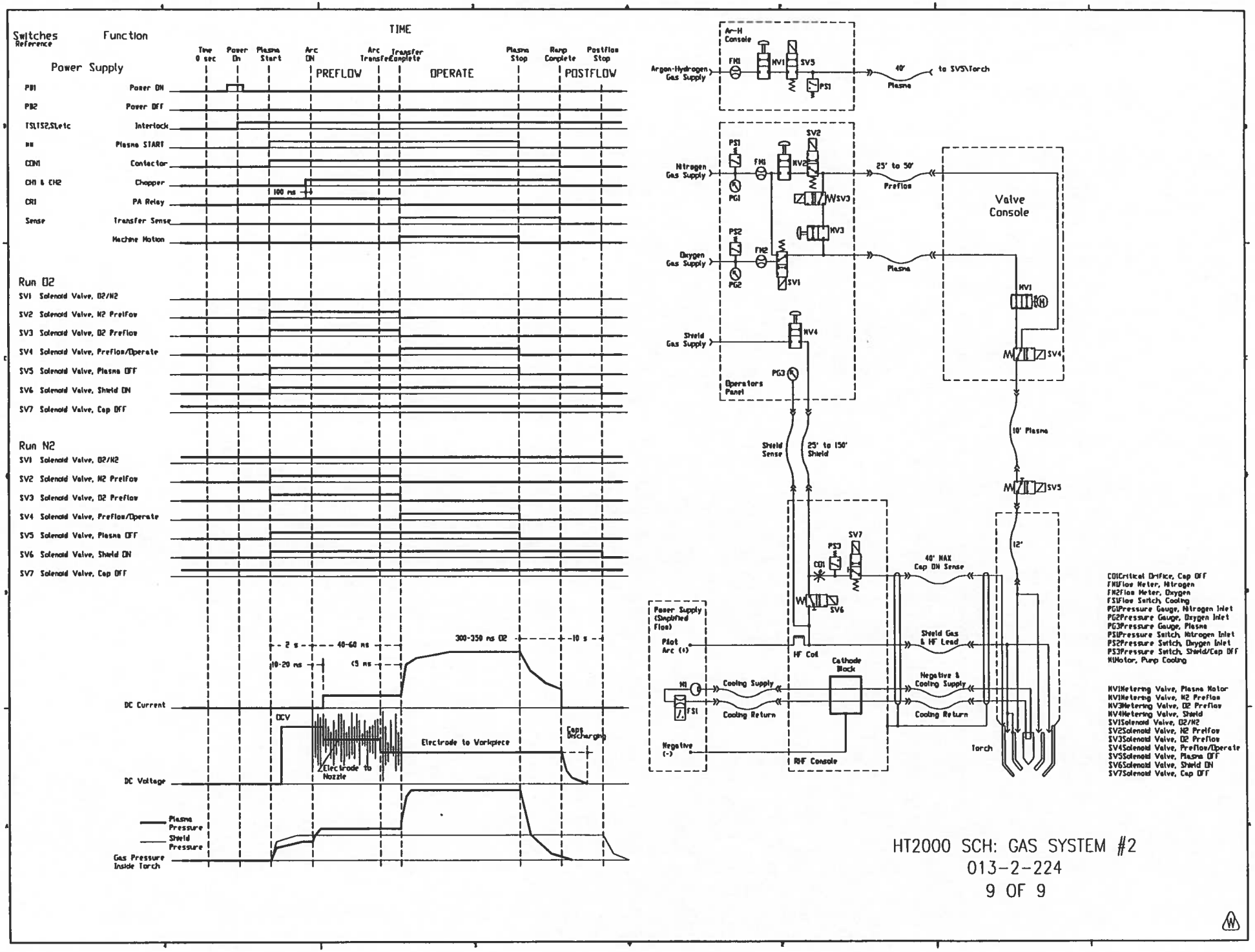








HT2000 SCH: PWR SPLY ALL VOLTAGES
013-2-224
8 OF 9



HT2000 SCH: GAS SYSTEM #2
013-2-224
9 OF 9

APPENDIX A IEC SYMBOLS

APPENDIX A

IEC SYMBOLS USED

Direct Current (DC).

Alternating current (AC).

Plasma cutting torch.

AC input power connection.

The terminal for the external protective (earthed) conductor.

A chopper-based power source.

Anode (+) work clamp.

Temperature switch.

Pressure switch.

Plasma torch in the TEST position (cooling and cutting gas exiting nozzle).

The power is on.

The power is off.

Volt/amp curve.

Appendix B ETHYLENE GLYCOL SAFETY DATA

In this section:

Material Safety Data Sheet

Manufacturer
HYPERTHERM INC.
Address
Box A-10, Etna Road
Hanover, New Hampshire 03755
603-643-3441
Phone Number (for information)
1-800424-9300 CHEMTREC
Telex*
943 541

Identity (Trade Name As Used On Label)
HYPERTHERM TORCH COOLANT
MSDS Number*
910820
CAS Number*
N/A
Date Prepared
8/20/91
Prepared By*
N/A

Section 1 - MATERIAL IDENTIFICATION AND INFORMATION

Components — Chemical Name & Common Names (Hazardous Components 1% or greater: Carcinogens 0.1% or greater)		%*	OSHA PEL	ACGIH TLV	Other Limits Recommended
Ethylene Glycol	CAS # 107-21-1	25	N/A	50 ppm	N/A
Non-Hazardous Ingredients	Deionized water	75			
TOTAL		100			

Section 2 - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	320°F	**Specific Gravity (H20=1)**	1.12
Vapor Pressure (mm Hg and Temperature)	<0.1	**Melting Point**	N/A
Vapor Density (Air = 1)	2.1	**Evaporation Rate**	(Butyl Acetate=1) Less than 1
Solubility in Water	Complete	**Water Reactive**	N/A
Appearance and Odor	Clear or very light green, Mild odor		

Section 3 - FIRE AND EXPLOSION HAZARD DATA

Flash Point and Method Used	TAG open cup 250°F	**Auto-ignition Temperature**	N/A
Flammability Limits in Air % by Volume	**LEL** 3.0	**UEL**	16 calc
Extinguisher Media	Water, Fog, Alcohol foam, Chemical or $C0_2$ for small fires		
Special Fire Fighting Procedures	A solid stream of water directed into hot burning liquid can cause frothing.		
Unusual Fire and Explosion Hazards	None		

Section 4 - REACTIVITY HAZARD DATA

Stability ☒ Stable ☐ Unstable		**Conditions to Avoid**	N/A
Incompatability (Materials to Avoid)	Keep away from strong oxidizing agents		
Hazardous Decomposition Products	Burning can produce carbon dioxide or carbon monoxide		
HAZARDOUS POLYMERIZATION ☐ May Occur ☒ Will Not Occur		**Conditions to Avoid**	N/A

Section 5 - HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY	☒ Inhalation ☒ Skin Absorption	☒ Ingestion ☐ Not Hazardous	Carcinogen Listed In N/A	☐ NTP ☐ 0SHA ☐ IARC ☐ Not Listed Monograph	
HEALTH HAZARDS	**Acute** High vapor concentrations cause nausea. vomiting, headaches.				
	Chronic Irritating to eyes and skin. Inhalation irritates nose and throat.				
Signs and Symptoms of Exposure	Slight irritation to skin. Swallowing causes drunkenness, rapidly passing to coma				
Medical Conditions Generally Aggravated by Exposure	Pre-existing skin, eye & respiratory disorders may be aggravated.				

EMERGENCY FIRST AID PROCEDURES -	Seek medical assistance for further treatment, observation and support if necessary.
Eye Contact	Flush with plenty of water
Skin Contact	Flush and clean with soap and water.
Inhalation	Remove to fresh air and give artificial respiration. If breathing has stopped. Call a physician or take immediately to a hospital.
Ingestion	If conscious, give large amounts of water or milk. Induce vomiting and seek medical attention immediately.

Section 6 - CONTROL AND PROTECTIVE MEASURES

Respiratory Protection (Specify Type)	Air-supplied mask if in high concentration with poor ventilation.		
Protective Gloves	Chemical resistant gloves	**Eye Protection** Splash protection goggles	
VENTILATION TO BE USED	Local Exhaust	Mechanical (general)	Special
	Other (specify)		
Other Protective Clothing and Equipment	Chemical resistant pants and jacket.		
Hygienic Work Practices	Safety shower and eyewash. Wash with soap & water before eating, smoking or using contaminated clothing before reuse.		

Section 7 - PRECAUTIONS FOR SAFE HANDLING AND USE / LEAK PROCEDURES

Steps to be Taken If Material is Spilled or Released	Small spills, flush with large amounts of water. Major spill, notify authorities and collect with absorbent materials for disposal.
Waste Disposal Methods	Consult with local sewer, municipal, state and/or federal agencies to determine appropriate current disposal options.
Precautions to be Taken in Handling and Storage	Avoid skin and eye contact. Harmful or fatal if swallowed. Avoid prolonged breathing of vapors.
Other Precautions and/or Special Hazards	Do not store in open, unlabeled or mislabeled containers.

NFPA Rating*	Health 2	Reactivity 0	Special 0	
HMIS Rating*	Health 3	Flammability 1	Reactivity 0	Personal Protection H

*Optional

Reorder No. 2217-2

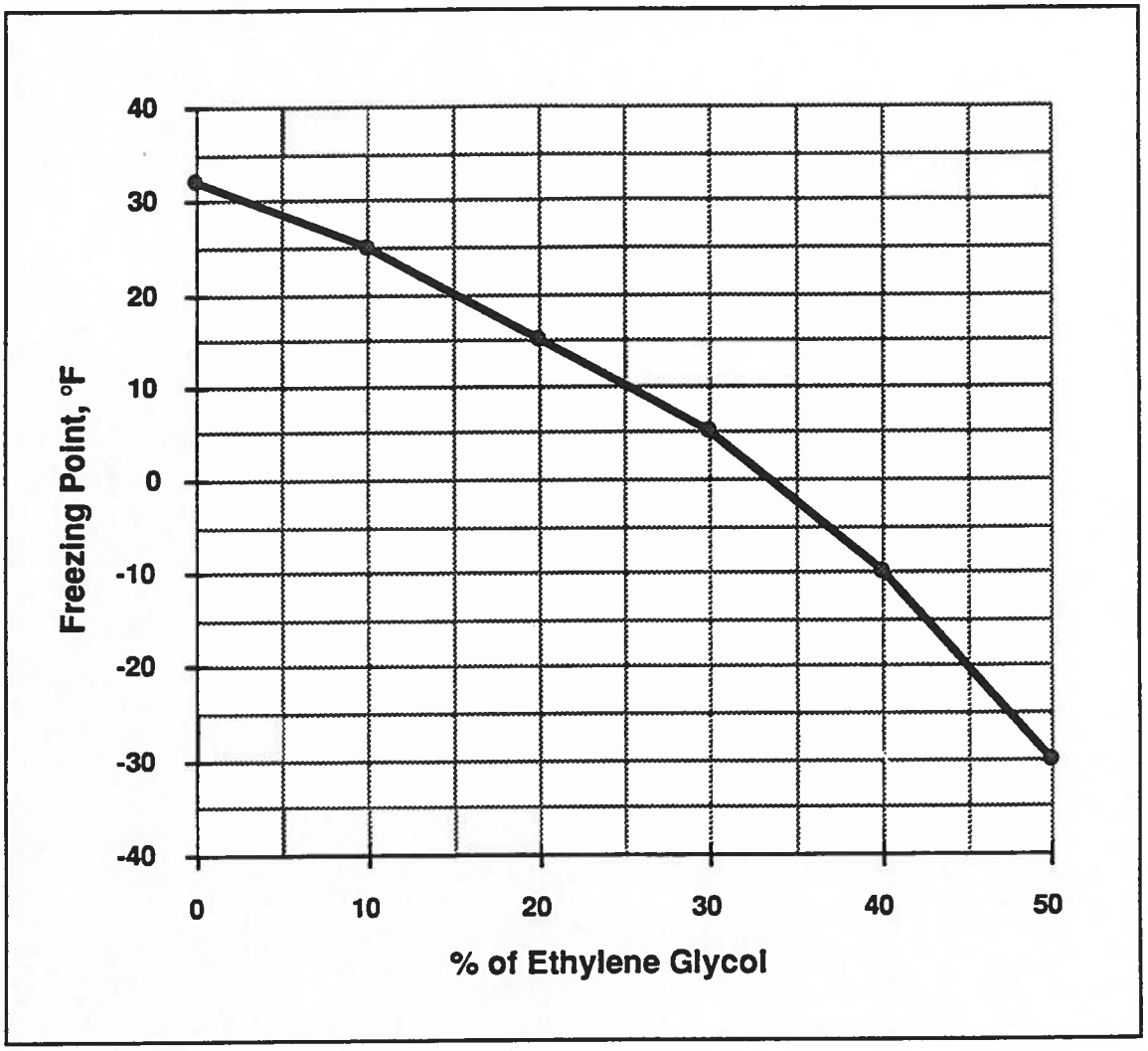


Figure b-1 Freezing Point of Ethylene Glycol Solution

APPENDIX C AERATION MANIFOLD

APPENDIX C

AERATION MANIFOLD FOR PLASMA CUTTING ALUMINUM

Introduction

When plasma arc cutting aluminum, free hydrogen gas may be generated by the cutting process. The high temperature of the plasma process causes disassociation of oxygen and hydrogen from the water in the water table. The hot aluminum, which has a high affinity for oxygen, then combines with the oxygen leaving free hydrogen.

An effective means of avoiding free hydrogen buildup is to install an aeration manifold on the floor of the water table to replenish the oxygen content of the water.

Making an Aeration Manifold - Figure c-1

Make an **Aeration Manifold** with two-inch (50 mm) PVC tubing with one-inch (25 mm) **Distribution Lines** connected to it. Drill 1/8 inch (3 mm) holes every six inches (150 mm) in the distribution lines. Cap the ends of the distribution lines and install the lines so that oxygen is delivered to all parts of the cutting area.

Connect the manifold to a shop air line. Set a pressure regulator to obtain a steady stream of bubbles.

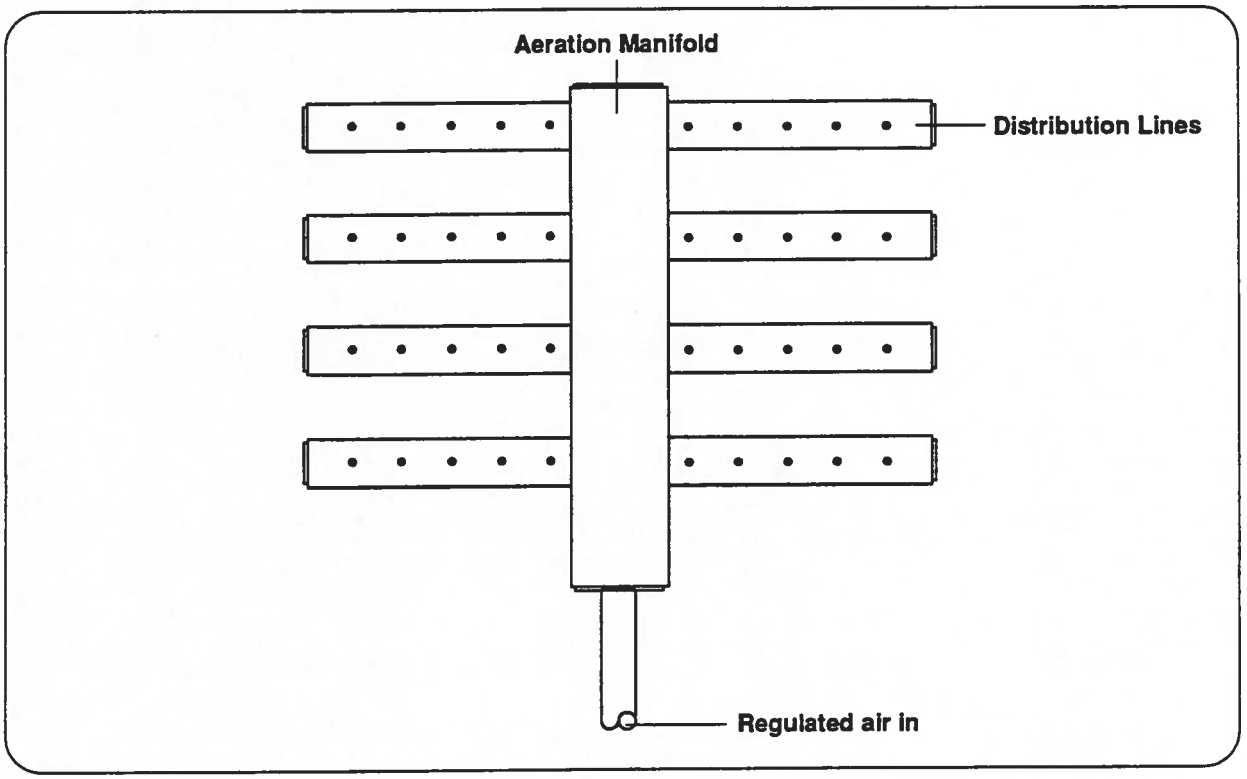


Figure c-1 Aeration Manifold

Appendix D AIR FILTRATION INFORMATION

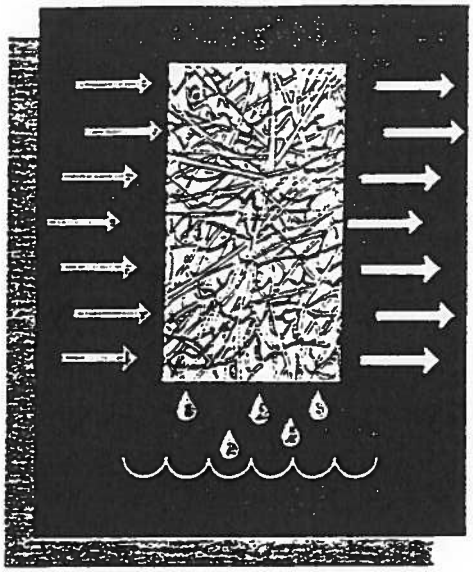
HANKISON

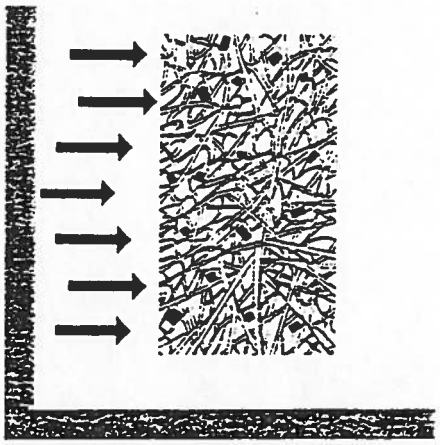
Compressed air contaminants are costing you money

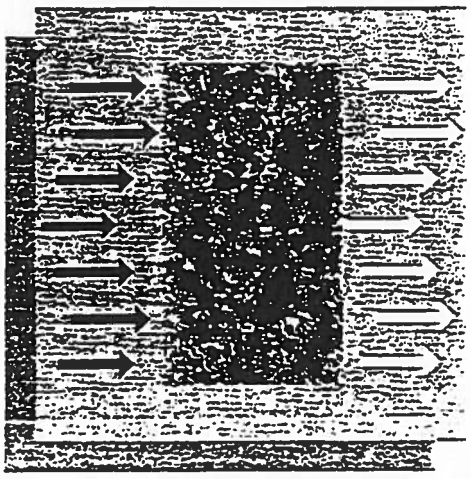
Air entering the compressor intake carries with it solid particles (dust and dirt), gaseous hydrocarbons, and water vapor. Inside the compressor, oil aerosols and vapors, and solid wear particles are added to the compressed air stream. As air passes through aftercoolers and air lines downstream, oil and water vapors condense into liquid aerosols and droplets.

The result is solid, liquid, and vaporous contaminants in your compressed air system, which, if not removed: reduce pneumatic equipment service life; cause air tools, motors and cylinders to operate inefficiently; contaminate products and processes; and foul instruments and control valves.

Using Hankison filters to remove these contaminants reduces operating expenses, improves the efficiency of your compressed air system, and ensures product quality.







Hankison Filters designed for performance and built to last

Liquids removed by coalescing action

- Unlike filters using cartridges made of paper, cotton, wool, or clay which "soak-up" liquids and require frequent replacement—coalescing filters continuously capture, coalesce, and remove liquid droplets from the compressed air stream—cartridge life is actually indefinite when removing liquids.
- Unlike mechanical separators and screening type filters, high efficiency coalescing filters are designed to remove very small particles including submicronic oil aerosols (also called oil mist or smoke).
- Unlike mechanical separators, coalescing filters maintain high efficiencies across a wide range of flows.

Solids collected in an in-depth filter bed

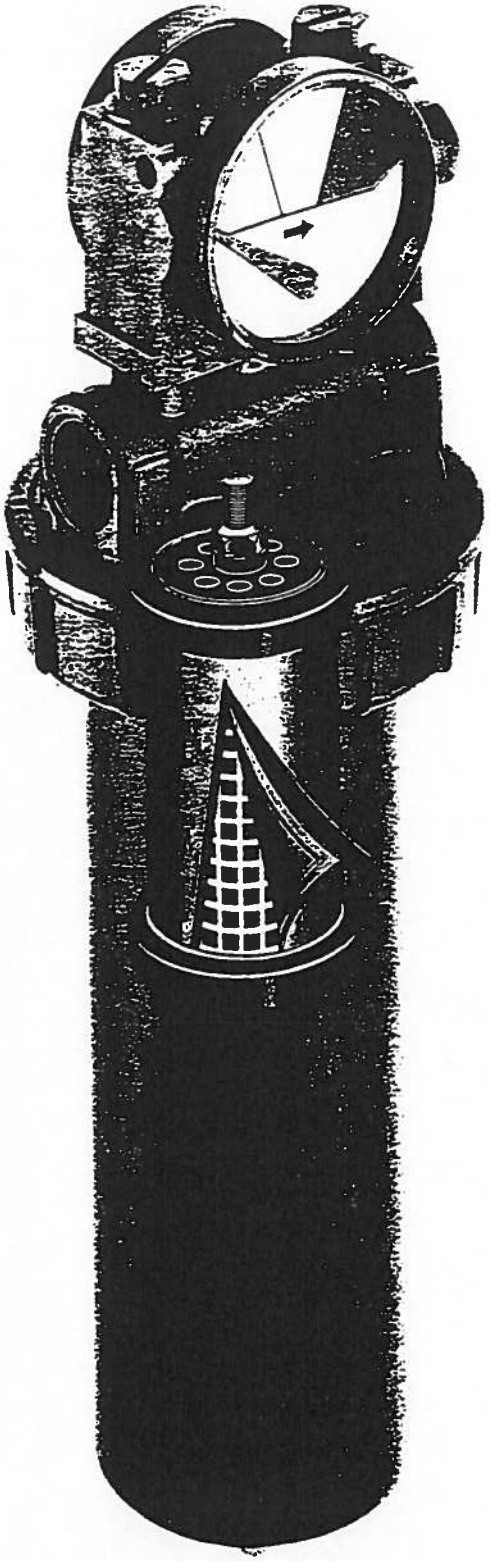
- Unlike surface type filters (sintered metals, porous ceramics or plastics), in-depth filters capture particles throughout the depth of the filter media. Because of this, and because the media contains 90% void space, in-depth filters are able to collect two to three times more particles than surface type filters—increasing cartridge life.

Vapors adsorbed by activated carbon

- Activated carbon is used to remove oil vapor because of its selective preference for oil rather than water vapor. The activated carbon used by Hankison possesses an enormous internal pore area. In addition, the carbon is finely divided, exposing the greatest amount of surface area and maximizing cartridge life.

HANKISON

Look inside a Hankison filter



▶ **Designed for performance—High efficiency**

Filter media designed with lightly epoxy coated glass fibers

Optimum amount of epoxy coating maintains bed stability without compromising high efficiencies

Light epoxy coating allows media to flex—keeps liquids (particularly viscous oils) flowing evenly through the media—without channeling or clogging

Proper choice of fiber size allows collection of submicronic particles

Inside to outside flow pattern allows coalesced liquids to drain without re-entrainment

Multiple stages (not just graded densities) permit effective draining

Filter designed to prevent by-passing of unfiltered air

Elastomeric seal between cartridge end cap and housing

Media sealed to end caps

▶ **Low pressure drop**

Light epoxy coating maintains large void space within media

Deep beds provide space to collect large amounts of solids

▶ **Long life**

Media fibers are non-wetting—won't soak up liquids

Coalescing action—continuously collects and drains liquids

In-depth media is able to collect two to three times more particulates than surface type filters

Staged filtration—a combination of stages within the cartridge allows removal of large liquid loads while prefiltering solids

▶ **Built to last**

Inner core—protects media if flow is reversed through filter

Thru-bolt—maintains cartridge integrity—even when filter is subjected to vibration

Chemically resistant media—compatible with synthetic lubricants

▶ **Housing features**

Ample annular clearance—minimizes velocity, eliminates carryover

Large sump and quiet zone for liquid storage without re-entrainment

In-line inlet/outlet connections

HANKISON

HANKISON® C Series separator/filter (Centriflex®)

Mechanical separator and 3 micron coalescing filter

Two filters in one housing

- Handles large liquid loads
- Removes 99+% of liquid water
- Removes all solid particles 3 microns and larger

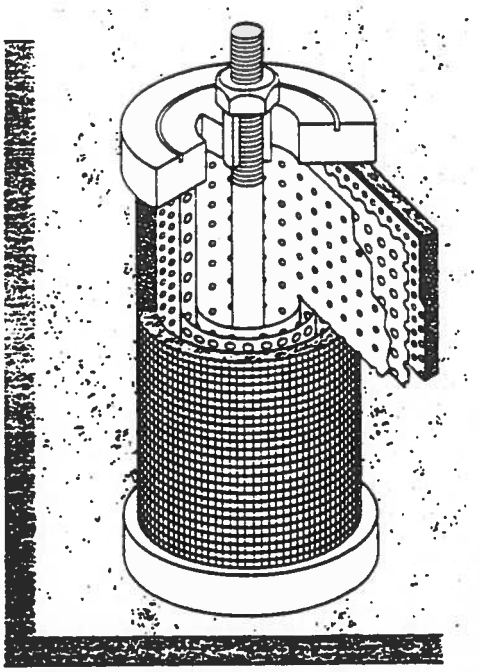
Applications

- Use as a separator downstream of an aftercooler
- Use as a point-of-use filter where heavy liquid loads are expected (air systems without aftercoolers or dryers)

Operation

Air enters the inside of the cartridge and flows outwardly through the separator core, a pair of permanent, cleanable, stainless steel perforated tubes. Here large liquid loads are removed by centrifugal action and inertial impaction. The air then passes through a filter sleeve, composed of an in-depth bed of glass fibers, where all solids 3 microns and larger are captured and all liquid droplets 3 microns and larger are captured, coalesced and drained.

The addition of the second stage allows superior performance when compared to a purely mechanical separator. The filter sleeve is able to capture the smaller droplets that pass through the separator core and maintains high efficiency separation when operating at reduced flows.



	Model	Rated Flow (scfm) @ 100 psig (1)	Maximum Working Pressure (psig) (2)		Accessories (5)			Inlet/ Outlet Conn. (6)	Dimensions (inches)		Weight (lbs.)	Housing Type	Replacement Sleeve (7)	
			Std.	with Internal Auto Drain	Internal Auto Drain -D	DPG -G	-S		H	W			Part No.	Qty. Req.
POLY BOWL	C18-03-8P*	18	150	NA	NA	NA	0	⅜"	6	3	2	8 oz.	0734-1	1
	C18-03-16P*			150	O	O		½"	10		3	16 oz.		
	C18-04-16P*							⅜"					0734-2	
	C35-03-16P*	35						½"						
	C35-04-16P*													
METAL BOWL	C18-03-16	18	300	175 (3)	O	O	0	⅜"	10	3	3	16 oz.	0734-1	1
	C18-04-16							½"					0734-2	
	C35-03-16	35						⅜"						
	C35-04-16							½"						
	C55-06-48-G	55				S		¾"	16	4	6	48 oz.	0734-3	
	C55-08-48-G							1"						
	C110-06-48-G	110						¾"						
	C110-08-48-G							1"						
	C165-12-100-G	165		(4)	NA			1½"	25	5	13	100 oz.	0734-4	
	C220-12-205-G	220							33		21	205 oz.	0734-5	
	C330-12-205-G	330											0734-6	
PRESSURE VESSEL	C400-16-5L-G	400	300	300	O	S	0	2"	41	10	37	5"	0734-7	1
	C660-24-5L-G	660						3"	48	16	86	8"		2
	C1320-24-8L-G	1320	225	(4)	NA				49		131	10"		3
	C1980-24-10L-G	1980						4" Flg	52	20	179	12"		4
	C2640-4-12L-G	2640									182			5
	C3300-4-12L-G	3300						6" Flg	55	24	271	16"		8
	C5280-6-16L-G	5280							63	28	518	20"		11
	C7260-6-20L-G	7260									527			14
	C9240-6-20L-G	9240						8" Flg	69	33	709	24"		19
	C12540-8-24L-G	12540							68	39	762	30"		26
	C17160-8-30L-G	17160						10" Flg	71	46	914	36"		34
	C22440-10-36L-G	22440												

O—Optional S—Standard NA—Not available

*Note: Polycarbonate bowls furnished with bowl guards. Do not use polycarbonate bowls with synthetic lubricants

(1) See Sizing, page 9, for capacity at other pressures.

(2) In many cases, models with higher MWPs available. Models C1320 and larger are ASME code constructed and stamped.

(3) Optional auto drain for 300 MWP available

(4) Drain port provided. For auto drain use externally mounted Hankison electric or pneumatically operated drains. For pneumatically operated drain use 505 Series Trap-L-Trap® with models C165 thru C660 and 506 Series Trap-L-Trap® with models C1320 and larger. C400 and C660 are also available with internal auto drain.

(5) For optional equipment, add -O to model number to add internal drain, -G to add differential pressure gauge (DPG), -S to convert cartridge to all stainless steel materials. See page 10 for further details

(6) Models C18 thru C330 are NPT female, female BSP available. models C400 thru C1980 are NPT male, female BSP or DIN flange available. models C2640 and larger are ANSI flanges, optional flange sizes and DIN flanges available.

(7) Normal maintenance requires replacement of sleeve only. Complete replacement cartridges are also available

HANKISON

HANKISON® T Series air line filter (3100 Series)

micron coalescing filter

Superior performance in a general usage filter

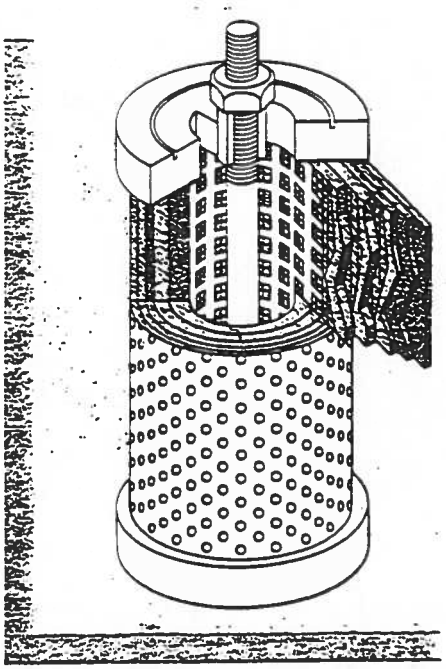
- Two in-depth filter beds offer superior performance and extended cartridge life
- Removes 100% of liquid water
- Removes all solid particles 1 micron and larger

Applications

- General filter for shop air
- Prefilter for high efficiency filters
- Afterfilter for pressure-swing desiccant dryers
- Point-of-use filter on systems utilizing aftercoolers or dryers

Operation

Air enters the inside of the cartridge and flows outwardly through two in-depth beds of glass fibers. Larger particles are collected in the first bed while all remaining particles one micron and larger are collected in the second bed. A combination of large void areas and stabilized media allows heavy particulate loading and low pressure drop...resulting in a long service life for the cartridge. Throughout both stages, liquid aerosols are captured and coalesced. The coalesced liquids then drain to the bottom of the cartridge and into the quiet zone in the bottom of the housing.



	Model	Rated Flow (scfm) @ 100 psig (1)	Maximum Working Pressure (psig) (2)		Accessories (5)			Inlet/ Outlet Conn. (6)	Dimensions (inches)		Weight (lbs.)	Housing Type	Replacement Cartridge	
			Std.	with Internal Auto Drain	Internal Auto Drain -D	DPG -G	-S		H	W			Part No.	Qty. Req.
POLY BOWL	T20-03-8P*	20	150	NA	NA	NA	0	⅜"	6	3	2	8 oz.	0731-3	1
	T20-03-16P*			150	0	0		½"	10		3	16 oz.		
	T20-04-16P*							⅜"					0731-4	
	T40-03-16P*	40						½"						
	T40-04-16P*													
METAL BOWL	T20-03-16	20	300	175 (3)	0	0	0	⅜"	10	3	3	16 oz.	0731-3	1
	T20-04-16							½"						
	T40-03-16	40						⅜"					0731-4	
	T40-04-16							½"						
	T110-06-48-G	110				S		¾"	16	4	6	48 oz.	0731-5	
	T110-08-48-G							1"						
	T220-12-100-G	220						1½"	25	5	13	100 oz.	0731-6	
	T330-12-205-G	330							33		21	205 oz.	0731-7	
PRESSURE VESSEL	T400-16-5L-G	400	300	300	0	S	0	2"	41	10	37	5"	0731-8	1
	T850-24-5L-G	850						3"	48	16	86	8"	0731-9	2
	T1700-24-8L-G	1700	225	(4)	NA				49		131	10"		3
	T2550-24-10L-G	2550						4" Flg	52	20	179	12"		4
	T3400-4-12L-G	3400									182			5
	T4250-4-12L-G	4250						6" Flg	55	24	271	16"		8
	T6800-6-16L-G	6800							63	28	518	20"		11
	T9350-6-20L-G	9350									527			14
	T11900-6-20L-G	11900						8" Flg	69	33	709	24"		19
	T16150-8-24L-G	16150							68	39	762	30"		26
	T22100-8-30L-G	22100						10" Flg	71	46	914	36"		34
	T28900-10-36L-G	28900												

O—Optional S—Standard NA—Not available

*Note: Polycarbonate bowls furnished with bowl guards. Do not use polycarbonate bowls with synthetic lubricants

(1) See Sizing, page 9, for capacity at other pressures.

(2) In many cases, models with higher MWPs available. Models T1700 and larger are ASME code constructed and stamped.

(3) Optional auto drain for 300 MWP available.

(4) Drain port provided. For auto drain use externally mounted Hankison electric or pneumatically operated drains. For pneumatically operated drain use 505 Series Trap-L-Trap® with models T400 thru T2550 and 506 Series Trap-L-Trap® with models T3400 and larger. T400 and 850 are also available with internal auto drain.

(5) For optional equipment, add -D to model number to add internal drain, -G to add differential pressure gauge (DPG), -S to convert cartridge to all stainless steel materials. See page 10 for further details

(6) Models T20 thru T300 are NPT female, female BSP available. models T400 thru T2550 are NPT male, female BSP or DIN flange available; models T3400 and larger are ANSI flanges, optional flange sizes and DIN flanges available.

HANKISON

HANKISON® A Series oil removal filter (Aerolescer®)

0.01 micron coalescing filter

High efficiency coalescing filter for virtually oil free air

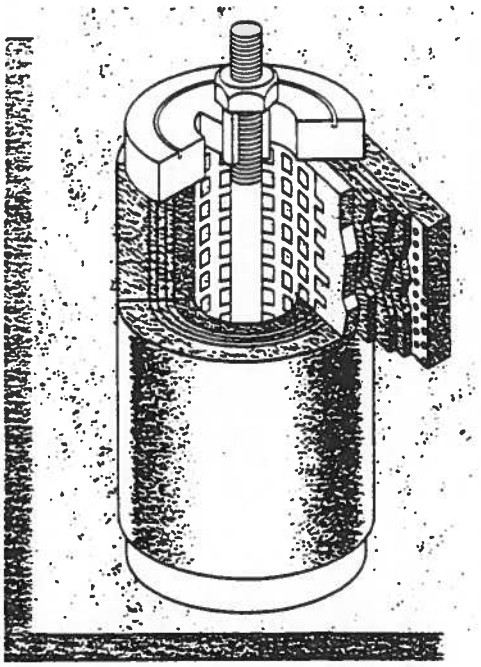
- Patented design maintains high oil removal efficiency for the life of the cartridge
- Removes 99.999+% of oil aerosols (remaining oil is in a vapor state)
- Removes solid particles 0.01 microns and larger

Applications

- Use with oil-lubricated compressors to produce oil free air for: spray painting, powder coating, blow molding, pneumatic instrumentation, fluid logic, air bearings, pneumatic conveying, food and drug packaging, and electronics manufacturing

Operation

Air enters the inside of the cartridge and flows outwardly through an inner foam sleeve which acts as a prefilter and flow disperser, and then through the filter media, a bed of submicronic glass fibers. During operation the inner sleeve expands against the media, ironing out any voids or liquid pockets. This maintains high efficiencies over a wide range of flow rates and liquid loads. Air then flows through a large non-wicking outer foam sleeve where coalesced droplets collect and drain into the filter sump. The extra large, non-wetting foam sleeve prevents any re-entrainment of liquid droplets.



	Model	Rated Flow (scfm) @ 100 psig (1)	Maximum Working Pressure (psig) (2)		Accessories (5)			Inlet/ Outlet Conn. (6)	Dimensions (inches)		Weight (lbs.)	Housing Type	Replacement Cartridge	
			Std.	with Internal Auto Drain	Internal Auto Drain -D	DPG -G	-S		H	W			Part No.	Qty. Req.
POLY BOWL	A18-03-8P*	18	150	NA	NA	NA	0	⅜"	6	3	3	8 oz.	0713-2	1
	A18-03-16P*			150	0	0			10			16 oz.		
	A18-04-16P*							½"						
	A35-03-16P*	35						⅜"					0713-3	
	A35-04-16P*							½"						
METAL BOWL	A18-03-16	18	300	175 (3)	0	0	0	⅜"	10	3	3	16 oz.	0713-2	1
	A18-04-16							½"						
	A35-03-16	35						⅜"					0713-3	
	A35-04-16							½"						
	A55-06-48-G	55				S		¾"	16	4	6	48 oz.	0713-4	
	A55-08-48-G							1"						
	A110-06-100-G	110						¾"	25		13	100 oz.	0713-5	
	A110-08-100-G							1"						
	A220-12-205-G	220						1½"	33	5	21	205 oz.	0713-6	
	A330-12-381-G	330							38		30	381 oz.	0713-7	
PRESSURE VESSEL	A275-16-5L-G	275	300	300	0	S	0	2"	41	10	36	5"	0713-12	1
	A350-16-5L-G	350											0713-11	
	A550-24-8L-G	550	225	(4)	NA			3"	48	16	85	8"	0713-12	2
	A700-24-8L-G	700									86		0713-11	
	A1050-24-10L-G	1050							49		131	10"		3
	A1400-4-12L-G	1400						4" Flg	52	20	179	12"		4
	A1750-4-12L-G	1750									182			5
	A2800-6-16L-G	2800						6" Flg	55	24	271	16"		8
	A3850-6-20L-G	3850							63	28	518	20"		11
	A4900-6-20L-G	4900									527			14
	A6650-8-24L-G	6650						8" Flg	69	33	709	24"		19
	A9100-8-30L-G	9100							68	39	762	30"		26
	A11900-10-36L-G	11900						10" Flg	71	46	914	36"		34

O—Optional S—Standard NA—Not available

*Note: Polycarbonate bowls furnished with bowl guards. Do not use polycarbonate bowls with synthetic lubricants.

(1) See Sizing, page 9, for capacity at other pressures.

(2) In many cases, models with higher MWPs available. Models A550 and larger are ASME code constructed and stamped.

(3) Optional auto drain for 300 MWP available.

(4) Drain port provided. For auto drain use externally mounted Hankison electric or pneumatically operated drains. For pneumatically operated drain use model 504 Snap-Trap® (175 psig MWP) or 505 Series Trip-L-Trap® (300 psig MWP) with models A275 thru A1750 and 505 Series Trip-L-Trap® with models A2800 and larger. A275 and 350 also available with internal auto drain.

(5) For optional equipment, add -D to model number to add internal drain, -G to add differential pressure gauge (DPG), -S to convert cartridge to all stainless steel materials. See page 10 for further details.

(6) Models A18 thru A330 are NPT female, female BSP available; models A275 and A350 thru A1050 are NPT male, female BSP or DIN flange available; models A1400 and larger are ANSI flanges, optional flange sizes and DIN flanges available.

HANKISON

HANKISON® H Series oil vapor removal filter (Hypersorb®)

Activated carbon adsorbent filter

Removes oil vapor, eliminates odors

- Two beds of carbon give 1500 hours of life at rated conditions
- Removes oil vapor and other hydrocarbons normally adsorbable by activated carbon—eliminates oily smell and taste
- Removes solid particles 0.01 microns and larger

Applications

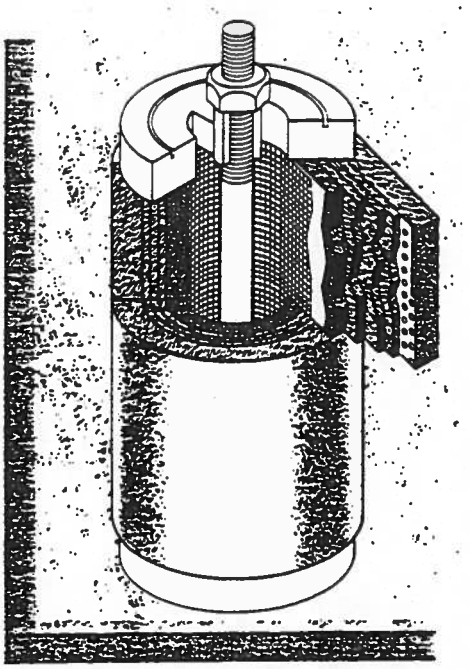
- Food and drug industries where compressed air contacts products
- For deodorizing compressed air exhausted into confined worker environments
- Conditioning gas samples ahead of analytical instruments

Operation

Air enters the inside of the cartridge and flows outwardly through a bed of finely divided activated carbon where 95% of the oil vapor is removed, then through a second bed of microfine activated carbon bonded to fibers where the remaining oil vapor is adsorbed. Outlet oil vapor concentration is 0.01 ppm by weight. This is well below the concentrations that could be detected by smell or taste and below the level where a normal drop in temperature downstream could cause vapor to condense.

To prevent any solid contaminants from entering the downstream air, the exiting air flows through layers of microglass fibers and an outer foam sleeve.

NOTE: Liquids must be removed from the air stream prior to the oil vapor removal filter. This filter should only be used after a 0.01 micron coalescing filter.



	Model	Rated Flow (scfm) @ 100 psig (1)	Maximum Working Pressure (psig) (2)	Accessories (3) -S	Inlet/ Outlet Connections (4)	Dimensions (inches) H	Dimensions (inches) W	Weight (lbs.)	Housing Type	Replacement Cartridge Part No.	Replacement Cartridge Qty. Req.
POLY-BOWL	H18-03-8P*	18	150	O	⅜"	6	3	3	8 oz.	0715-2	1
POLY-BOWL	H18-03-16P*	18	150	O	½"	10	3	3	16 oz.	0715-2	1
POLY-BOWL	H18-04-16P*	18	150	O	⅜"	10	3	3	16 oz.	0715-2	1
POLY-BOWL	H35-03-16P*	35	150	O	½"	10	3	3	16 oz.	0715-3	1
POLY-BOWL	H35-04-16P*	35	150	O	½"	10	3	3	16 oz.	0715-3	1
METAL BOWL	H18-03-16	18	300	O	⅜"	10	3	3	16 oz.	0715-2	1
METAL BOWL	H18-04-16	18	300	O	½"	10	3	3	16 oz.	0715-2	1
METAL BOWL	H35-03-16	35	300	O	⅜"	10	3	3	16 oz.	0715-3	1
METAL BOWL	H35-04-16	35	300	O	½"	10	3	3	16 oz.	0715-3	1
METAL BOWL	H55-06-48	55	300	O	¾"	14	4	6	48 oz.	0715-4	1
METAL BOWL	H55-08-48	55	300	O	1"	14	4	6	48 oz.	0715-4	1
METAL BOWL	H110-06-100	110	300	O	¾"	23	4	13	100 oz.	0715-5	1
METAL BOWL	H110-08-100	110	300	O	1"	23	4	13	100 oz.	0715-5	1
METAL BOWL	H220-12-205	220	300	O	1½"	31	5	21	205 oz.	0715-6	1
METAL BOWL	H330-12-381	330	300	O	1½"	36	5	30	381 oz.	0715-7	1
PRESSURE VESSEL	H275-16-5L	275	300	O	2"	41	10	37	5"	0715-12	1
PRESSURE VESSEL	H350-16-5L	350	300	O	2"	41	10	37	5"	0715-11	1
PRESSURE VESSEL	H550-24-8L	550	225	O	3"	48	16	85	8"	0715-12	2
PRESSURE VESSEL	H700-24-8L	700	225	O	3"	48	16	86	8"	0715-11	2
PRESSURE VESSEL	H1050-24-10L	1050	225	O	3"	49	16	131	10"	0715-11	3
PRESSURE VESSEL	H1400-4-12L	1400	225	O	4" Flg	52	20	179	12"	0715-11	4
PRESSURE VESSEL	H1750-4-12L	1750	225	O	4" Flg	52	20	182	12"	0715-11	5
PRESSURE VESSEL	H2800-6-16L	2800	225	O	6" Flg	55	24	271	16"	0715-11	8
PRESSURE VESSEL	H3850-6-20L	3850	225	O	6" Flg	63	28	518	20"	0715-11	11
PRESSURE VESSEL	H4900-6-20L	4900	225	O	6" Flg	63	28	527	20"	0715-11	14
PRESSURE VESSEL	H6650-8-24L	6650	225	O	8" Flg	69	33	709	24"	0715-11	19
PRESSURE VESSEL	H9100-8-30L	9100	225	O	8" Flg	68	39	762	30"	0715-11	26
PRESSURE VESSEL	H11900-10-36L	11900	225	O	10" Flg	71	46	914	36"	0715-11	34

O—Optional

*Note: Polycarbonate bowls furnished with bowl guards. Do not use polycarbonate bowls with synthetic lubricants.

(1) See Sizing, page 9, for capacity at other pressures.

(2) In many cases, models with higher MWPs available. Models H550 and larger are ASME code constructed and stamped.

(3) Add -S to convert cartridge to all stainless steel materials. See page 10 for further details.

(4) Models H18 thru H330 are NPT female, female BSP available; models H275 and H350 thru H1050 are NPT male, female BSP or DIN flange available; models H1400 and larger are ANSI flanges, optional flange sizes and DIN flanges available.

HANKISON

HANKISON® HTA Series high temperature afterfilter (Accumax®)

Three stage, 1 micron particulate removal filter

High dirt loading capacity for maximum cartridge life

- High dust loading capacity—utilizes gravitational settling and both surface and depth filtration to maximize dirt holding capacity and cartridge life
- Maximum operating temperature of 450°F

Applications

- Afterfilter for regenerative desiccant dryers
- Any dry application where loading of conventional filters leads to frequent cartridge changeout

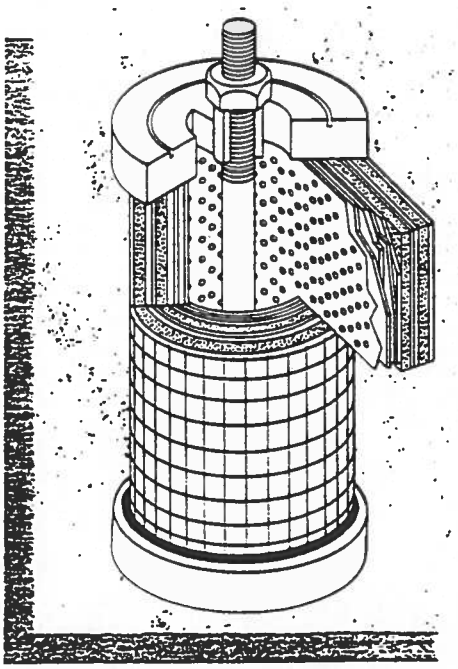
Operation

Stage 1—Gravitational Settling Air enters the filter housing and, because of velocity reduction and change of direction, large particles (20 microns and above) drop to the bottom of the filter housing. This results in a 30% reduction in loading on the cartridge.

Stage 2—Surface Filtration Air then enters the outside of the cartridge and flows through a layer of glass fabric filter cloth where dust particles are captured by a web of small diameter fibers. The particles captured on the surface of the filter act as a filter itself, capturing other particles. Eventually the dust builds up to the point where outside dust layers shed and fall into the bottom of the housing.

Stage 3—In-depth Filtration Finally the air travels through a bed of multi-layer in-depth filter media where all remaining solid particles one micron and larger are retained.

A final wrap of media prevents fiber migration into the exiting air stream.



	Model	Rated Flow (scfm) @ 100 psig (1)	Maximum Working Pressure @ 450°F (psig) (2)	Inlet/ Outlet Connections	Dimensions (inches)		Weight (lbs.)	Housing Type	Replacement Cartridge	
					H	W			Part No.	Qty. Req.
METAL BOWL	HTA100	100	250	1" NPT	15	4	13	48 oz.	0740-1	1
	HTA200	200			24		19	100 oz.	0740-2	
PRESSURE VESSEL	HTA400	400	165	3" NPT	40	10	95	5"	0740-3	1
	HTA600	600							0740-4	
	HTA1200	1200			41	16	159	8"		2
	HTA1800	1800			43		219	10"		3
	HTA2400	2400		4" Flg	55	20	236	12"		4
	HTA3000	3000					239			5
	HTA4800	4800		6" Flg	53	24	319	16"		8
	HTA6600	6600			62	28	548	20"		11
	HTA8400	8400					558			14
	HTA11400	11400			68	33	772	24"		19

(1) See Sizing, page 9, for capacities at other pressures.
(2) Models HTA1200 and larger are ASME code constructed and stamped.

HANKISON

Operating Information

	Maximum Liquid Loading (by weight)	Maximum Operating Temperature	Pressure Drop At Rated Conditions		When To Replace Cartridge
			Dry	Wet	
C Series (Centriflex®) Separator/Filter	25,000 ppm	120°F	1 psi	1 psi	When pressure drop exceeds 10 psi
T Series (3100 Series) Air Line Filter	2,000 ppm			3 to 5 psi	
A Series (Aerolescer®) Oil Removal Filter	100 ppm				
H Series (Hypersorb®) Oil Vapor Removal Filter	No liquid should be present at inlet			—	When odor is detected downstream*
HTA Series (Accumax®) High Temperature Afterfilter		450°F			When pressure drop exceeds 10 psi

*The Oil Vapor Removal Filter is designed to have a minimum life of 1500 hours of operation at rated conditions.

Sizing

Maximum air flow at 100 psig is indicated in Table 1. To determine maximum air flow at pressures other than 100 psig, multiply flow in Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

Example: Choose an Oil Removal Filter to handle 705 scfm at 150 psig. From Table 1 pick an A550 with an air flow of 550 scfm at 100 psig.

Multiply 550 scfm by the correction factor 1.43 from Table 2 (550 x 1.43=787 scfm). An A550 has ample capacity for this requirement.

Caution:

Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

TABLE 1. Maximum Air Flow (scfm*) @ 100 psig

FILTER TYPE									
C Series		T Series		A Series		H Series		HTA Series	
Size	Flow	Size	Flow	Size	Flow	Size	Flow	Size	Flow
C18	18	T20	20	A18	18	H18	18	HTA100	100
C35	35	T40	40	A35	35	H35	35	HTA200	200
C55	55	T110	110	A55	55	H55	55	HTA400	400
C110	110	T220	220	A110	110	H110	110	HTA600	600
C165	165	T330	330	A220	220	H220	220	HTA1200	1200
C220	220	T400	400	A330	330	H330	330	HTA1800	1800
C330	330	T850	850	A275	275	H275	275	HTA2400	2400
C400	400	T1700	1700	A350	350	H350	350	HTA3000	3000
C660	660	T2550	2550	A550	550	H550	550	HTA4800	4800
C1320	1320	T3400	3400	A700	700	H700	700	HTA6600	6600
C1980	1980	T4250	4250	A1050	1050	H1050	1050	HTA8400	8400
C2640	2640	T6800	6800	A1400	1400	H1400	1400	HTA11400	11400
C3300	3300	T9350	9350	A1750	1750	H1750	1750		
C5280	5280	T11900	11900	A2800	2800	H2800	2800		
C7260	7260	T16150	16150	A3850	3850	H3850	3850		
C9240	9240	T22100	22100	A4900	4900	H4900	4900		
C12540	12540	T28900	28900	A6650	6650	H6650	6650		
C17160	17160			A9100	9100	H9100	9100		
C22440	22440			A11900	11900	H11900	11900		

*Convert scfm to metric units as follows: 1 scfm=1.717 Nm³/h

TABLE 2. Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	60	80	100	120	150	200	250	300
Multiplier	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

Filter Housings

HANKISON

Accessories

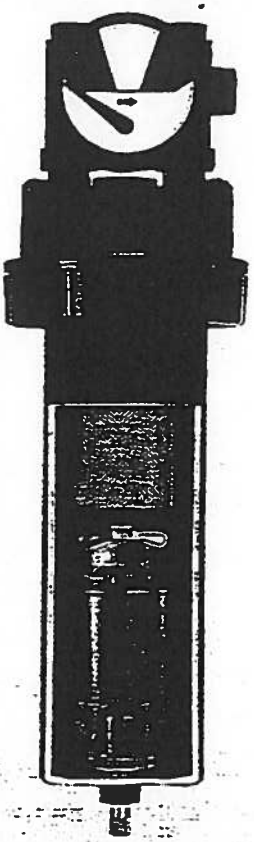
Differential Pressure Gauge

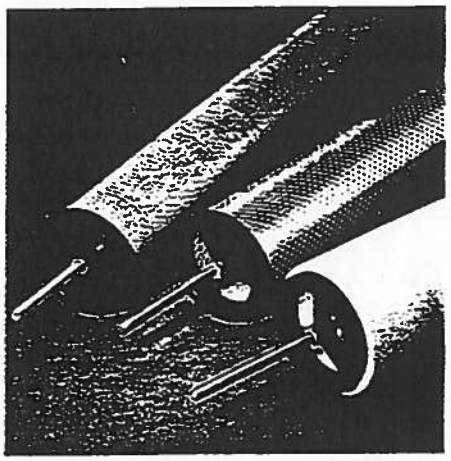
Standard on Separator/Filters, Air Line Filters, and Oil Removal Filters with ¾" connections and larger (optional on smaller sizes), Hankison's differential pressure gauge indicates the optimum time for cartridge changeout, maximizing your cartridge investment without adding excessive pressure drop to your system.

Automatic Condensate Drains

Hankison condensate drains automatically discharge liquids collected in the filter sump. They eliminate man hours spent manually draining filters and minimize the danger of flooding the system when filters are left unattended.

Hankison has a complete selection of both pneumatically and electrically operated automatic condensate drains for use with your filters.





Stainless Steel Cartridge Construction

This option converts all metal parts of a standard cartridge to stainless steel. Primary applications include paper mills where chemicals ingested by the compressor may cause corrosion of standard materials. Note: Separator core of C Series is stainless steel as standard. SS option converts materials in the sleeve only.

Filters for special applications

	Series	Model	Rated Flow (scfm) (1)	Maximum Working Pressure (psig)	Inlet/Outlet Connections	Dimensions (inches) H	Dimensions (inches) W	Weight (lbs.)	Replacement Cartridge Part No.	Replacement Cartridge Qty. Req.
MINI FILTERS	T	T5-02-1	5 @ 100 psig	300	¼" NPTF	4	2	½	0731-11	1
	A	A3-02-1	3 @ 100 psig						0713-20	
HIGH-PRESSURE FILTERS	C	HPC-08F-48-900	800 @ 900 psig	900	1" NPTF	15	5	14	0734-3	1
	T	HPT-08F-48-900							0731-5	
	A	HPA-08F-48-900	400 @ 900 psig						0713-4	
	H	HPH-08F-48-900							0715-4	
	C	HPC-24M-5H-700	4000 @ 700 psig	700	3" NPTM	41	10	40	0734-7	
	T	HPT-24M-5H-700							0731-9	
	A	HPA-24M-5H-700	2000 @ 700 psig						0713-11	
	H	HPH-24M-5H-700							0715-11	

(1) For flows at other pressures, contact factory.

Corrosion Resistant and Stainless Steel Housings

Corrosion resistant housings—These housings are available with ⅜, ½, ¾, 1, & 1½ inch heads. Filter heads are zinc, bowls are stainless steel. Housings can be supplied with C, T, A, or H Series cartridges.

Stainless steel housings—5 inch and larger pressure vessels are available in all stainless steel construction. These housings are available with C, T, A, or H Series cartridges.

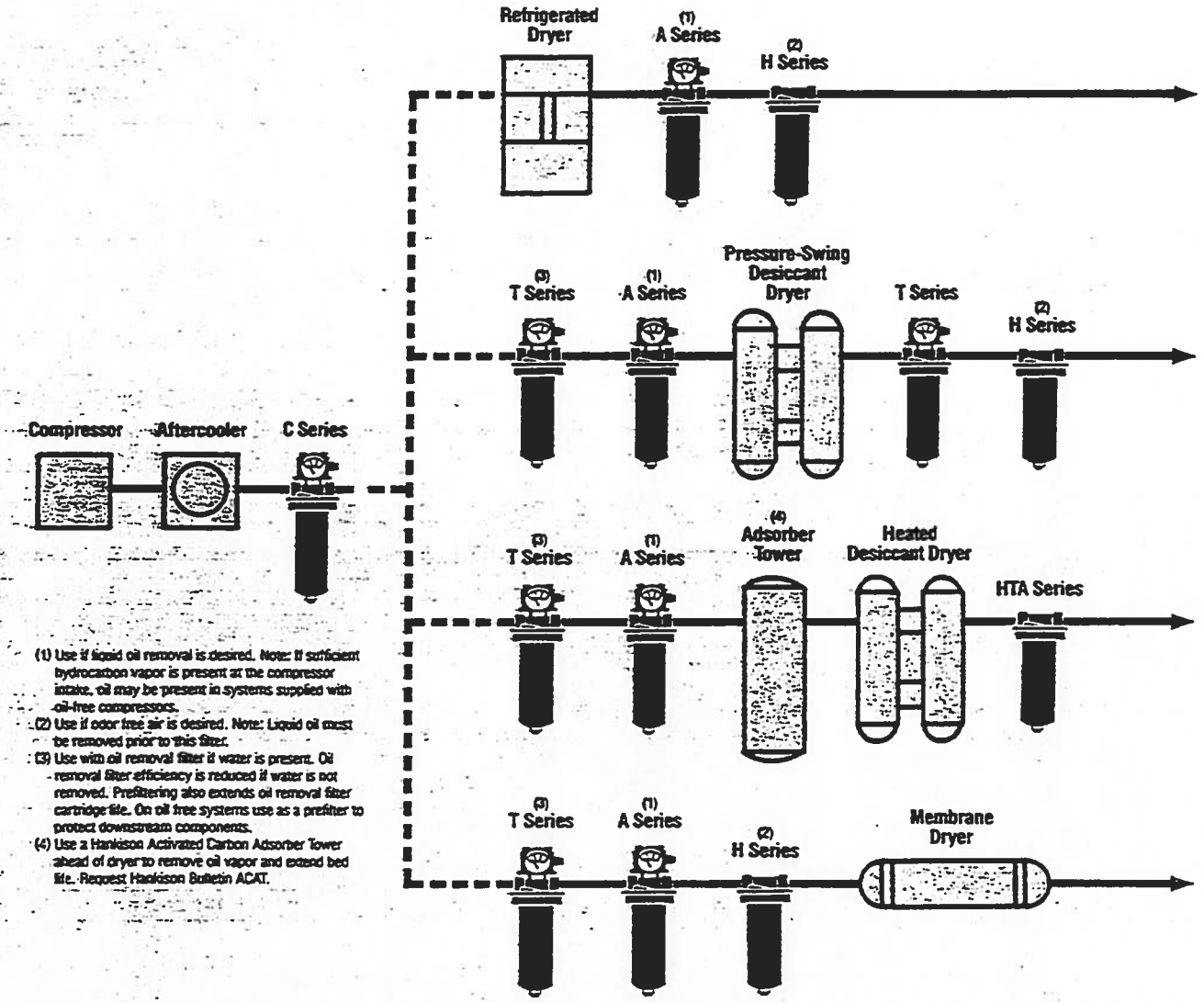
Carbon Black Filters

Available in all sizes. Enables systems where carbon black is present to operate until compressor maintenance is performed. Hankison's specially designed SMP cartridge allows coalesced oil to wash fine carbon particles out of the cartridge preventing rapid loading and frequent cartridge change out.

HANKISON

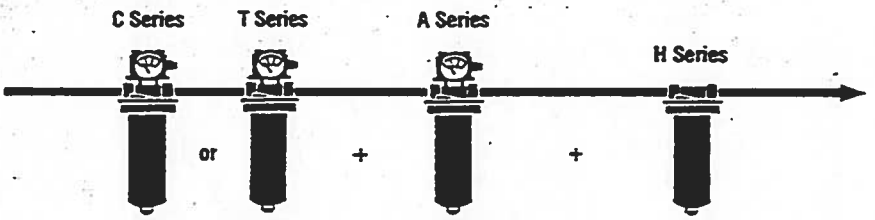
Recommended installation of Hankison filters in a typical compressed air system

Mainline installations



(1) Use if liquid oil removal is desired. Note: If sufficient hydrocarbon vapor is present at the compressor intake, oil may be present in systems supplied with oil-free compressors.
(2) Use if odor free air is desired. Note: Liquid oil must be removed prior to this filter.
(3) Use with oil removal filter if water is present. Oil removal filter efficiency is reduced if water is not removed. Prefiltering also extends oil removal filter cartridge life. On oil free systems use as a prefilter to protect downstream components.
(4) Use a Hankison Activated Carbon Adsorber Tower ahead of dryer to remove oil vapor and extend bed life. Request Hankison Bulletin ACAT.

Point-of-use installations



Use C Series if air lines contain bulk liquid or T Series if air has been treated by an aftercooler/separator

Add an A Series if oil aerosol removal is desired

Add an H Series if oil vapor removal is desired

GLOSSARY

AC	**A**lternating **C**urrent. Motion of current alternately in one direction, then the other. The number of times per second the direction changes (the "frequency") is measured in hertz.
amp	**Amp**eres. Measurement of the electron flow (the number of electrons per second) in an electrical circuit.
anode	The "positive" (+) side of a DC power source. Electrons leave the cathode and move toward the anode; ions move in the opposite direction. Plasma cutting requires the work and the nozzle to be the anode, and the electrode to be the cathode.
arc	Motion of electricity in a gas.
AWG	**A**merican **W**ire **G**auge. Defines the diameter of wires.
bar	A unit of pressure equal to one million dynes per square centimeter.
breaker	A device which interrupts an electrical current if the current exceeds a preset amperage setting. Breakers can be returned to their conducting (non-interrupting) state by some mechanical action, such as flipping a switch.
cap	Nozzle retaining cap. Holds the swirl ring, electrode and nozzle inside the torch.
capacitor	A device that stores electric energy in the form of voltage.
cathode	The "negative" (-) side of a DC power source. (See anode)
consumable	Electrode, O-ring, nozzle, swirl ring and retaining cap.
CSA	**C**anadian **S**tandards **A**ssociation. A product standards and testing agency.
current	Movement of electricity, measured in amperes. Current is said to move in a direction opposite that of electron flow.
DC	**D**irect **C**urrent. Motion of current in one direction only, from anode (+) to cathode (-).
dross	Globs of metal hanging around the kerf, usually on the bottom side.
duty cycle	Percentage of on-time (measured in minutes) in a 10 minute period in which the MAX100 can be operated.
electricity	Fundamental property of atoms that atoms can have their electrons pulled away ("ionized") and then the electrons can move about in metals or gases. An atom missing one or more electrons is called an ion. Both electrons and ions can move about in gases.
electrode	A part inside the torch connected to the cathode (-) of the power supply. Electrons come out of the electrode.
ferrule	A ring of metal surrounding the end of a cable or wire to strengthen a connection.
fuse	A protective device which melts when the current running through it exceeds the usage rating.
ground	An electrical connection buried in the earth to establish a voltage of zero (0) volts.

GLOSSARY

Hertz (Hz)	Measurement of "frequency" of an AC voltage or current in cycles per second.
IEC	International Electrotechnical Commission. An international standards organization.
interlock	A safety device which must be activated before another device can be activated.
ion	An atom which has an excess or surplus of electrons.
IP	International Protection. An IEC designator, describing the degree of protection an enclosure offers against entry of objects and water.
I_1	Rated supply current. The supply current to the power source at a rated cutting condition (given U_1, U_2 and I_2).
I_2	Rated output cutting current.
kerf	Slit made in a workpiece by a cutting torch.
kilowatt	Thousand (kilo) watts. Measurement of electrical power.
LED	Light Emitting Diode. An electronic indicator lamp.
line	As in "line voltage." Utility voltage from a branch circuit (wall outlet).
liters/minute	A measure of gas flow.
nozzle	Tip of the plasma torch, made from copper, from which the plasma arc comes. The nozzle pinches the plasma arc. It is usually an anode (+).
OCV	Open Circuit Voltage. The highest voltage from a electrical power supply. It occurs when the power supply is on and active but not producing a plasma arc.
pilot arc	A plasma arc that attaches to the torch nozzle rather than the work.
plasma	An electrically charged gas is said to be "ionized". A cloud of ionized gas together with its electrons is called "plasma".
plasma arc	Movement of electric current in a plasma (ionized gas). An intensely hot and bright arc which exists between the cathode (-) (electrode) and the anode (+) (either the nozzle or the work).
pressure	Force per unit area.
psi	Pounds per Square Inch. Measurement of gas pressure.
quench	Put in water to cool.
regulator	A mechanical device to control the outlet pressure of a gas supply.
ripple	Unwanted variations in current or voltage from an electrical power supply.
scfm	Standard cubic feet per minute. A measurement of gas flow.

single phase An alternating current carried by only two wires. In the U.S. the "hot" carries the AC voltage and the "neutral" is at approximately "ground" voltage. The "ground" wire carries current only in fault conditions.

swirl ring An insulating ring that separates the electrode from the nozzle and causes the air inside the plasma torch to swirl and aid in squeezing the arc.

transfer A pilot arc *transfers* to the work when the plasma arc leaves the surface of the nozzle and attaches to the work.

U_0 Rated Open Circuit Voltage occuring at the rated input voltage (U_1).

U_1 Rated Supply Voltage. The supply voltage for which the power source is constructed.

U_2 Conventional load voltage. The output load voltage at which rated input current (I_1), rated output current (I_2) and duty cycle (X) are measured.

VAC Volts Alternating Current.

VDC Volts Direct Current.

volt Measurement of electrical force required to move an electric current through an electrical circuit.

watt Measurement of electrical power. The ability to heat the work equivalent to a current of one ampere times an electrical force of one volt.

work(piece) The object to be cut.

X Duty cycle at a given U_1, U_2 and I_2.

GLOSSARY

STANDARDS INDEX

For further information concerning safety practices to be exercised with plasma arc cutting equipment, please refer to the following publications:

1. ANSI Standard Z49.1, *Safety in Welding and Cutting*, obtainable from the American Welding Society, 550 LeJeune Road, P.O. Box 351020, Miami, FL 33135.

2. 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.

3. OSHA, *Safety and Health Standards*, 29FR 1910, obtainable from the 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 the 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 the 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 the American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135.

8. NFPA Standard 51, *Oxygen — Fuel Gas Systems for Welding and Cutting*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

9. NFPA Standard 70-1978, *National Electrical Code*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

10. NFPA Standard 51B, *Cutting and Welding Processes*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

11. CGA Pamphlet P-1, *Safe Handling of Compressed Gases in Cylinders*, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.

12. CSA Standard W117.2, *Code for Safety in Welding and Cutting*, obtainable from the Canadian Standards Association Standard Sales, 178 Rexdale Boulevard, Rexdale, Ontario M9W 1R3, Canada.

13. NWSA booklet, *Welding Safety Bibliography*, obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103.

STANDARDS INDEX

14. American Welding Society Standard AWS F4.1, *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 LeJeune Road, P.O. Box 351040, Miami, FL 33135.

15. ANSI Standard Z88.2, *Practices for Respiratory Protection*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

16. Canadian Electrical Code Part 1, *Safety Standards for Electrical Installations*, obtainable from the Canadian Standards Association, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W1R3.

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