



6004-02

2024-03

Processes

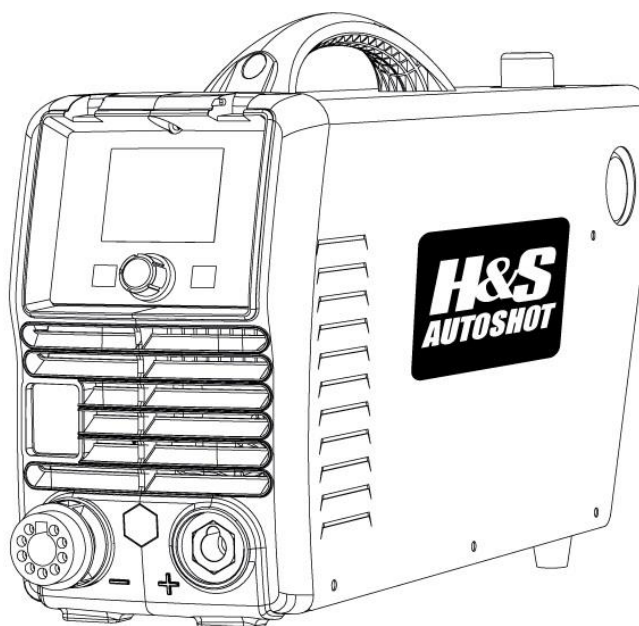


Plasma

110-240VAC

PLASMA CUTTER 40A

HSW-6004



IMPORTANT: Read this Owner's Manual Completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. Contact your distributor if you do not fully understand this manual.

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§1 Safety

Notice: *The manual specifications are for reference only. The manufacturer reserves the right to update and modify the end-product over time.*

Important Safety Precautions: Operation and maintenance of plasma ARC equipment can be dangerous to your health.

- Plasma arc cutting produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near plasma arc cutting applications should consult their medical health qualified technician and the manufacturer of the health equipment to determine whether a hazard exists.
- To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment.



GASES AND FUMES

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

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

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

Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using.

These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.

- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.



ELECTRIC SHOCK

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

- Never touch any parts that are electrically “live” or “hot.”
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the cutting circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.



FIRE AND EXPLOSION

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

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

**NOISE**

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

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.

PLASMA ARC RAYS

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

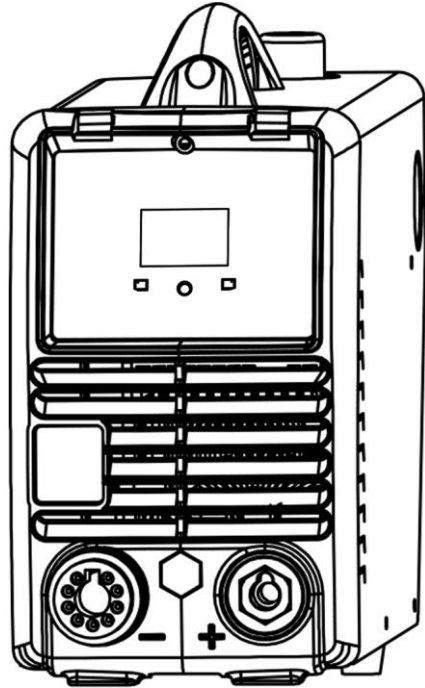


- To protect your eyes, always wear a cutting helmet or shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear cutting gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep helmet and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens or shields.

§2 Overview

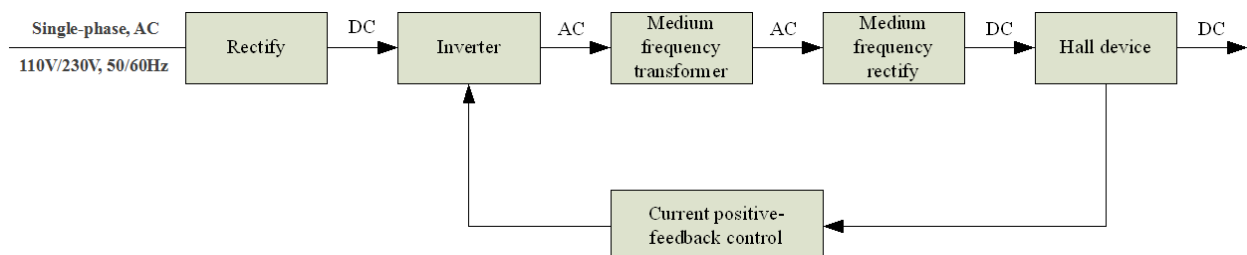
§2.1 Features

1. PFC technology provides dual input voltage allowing operation on 115 & 230 VAC circuits.
2. LCD screen for accurate setting & feedback of welding output.
3. Power factor rating > 0.99 provides high electrical efficiency and energy saving.
4. IGBT parallel balanced current technology and digital control technology.
5. EMI filter restrains the EMI transmission to the LINE power and other shop equipment.
6. Pilot-Arc ignition starts without high-frequency, increases cutting capabilities, speeds and improves tip life. Additionally, it is designed for grid cutting applications without loss of arc.



§2.2 Working Principle

The working principle of HSP40LCD Plasma Cutting Machine is shown as the following figure. Single-phase 110V/240VAC / 50/60Hz is rectified into DC (about 530V), then it is converted to medium frequency AC (about 20 KHz) by inverter device (discrete IGBT), after reducing voltage by medium transformer (the main transformer) and rectified by medium frequency rectifier (fast recovery diode) and is outputted by inductance filtering. The circuit adopts current feedback control technology to insure current output stably.



§2.3 Technical Data

Models Parameters	HSP40LCD	
Rated input voltage (V)	1-110±10%	1-230±10%
Frequency (HZ)	50/60	
Rated input current (A)	28.7	18
Rated input power (KW)	3.2	4.1
Cutting current (A)	20~30	20~40
No-load voltage (V)	329.1	328.8
Duty cycle (40°C 10minutes)	35% 30A 60% 22A 100% 20A	50% 40A 60% 36A 100% 30A
Severance Cut for Carbon Steel (mm)	≤ 18	≤ 20
Carbon steel	≤ 14	≤ 15
Stainless steel	≤ 14	≤ 15
Aluminum	≤ 14	≤ 20
Cuprum	≤ 5	≤ 10
Dimensions (mm)	510*146*278	
Protection class	IP21S	
Circuit breaker	JD03-A1 30A	
Net weight (kg)	7.6	
Cooling method	AF	

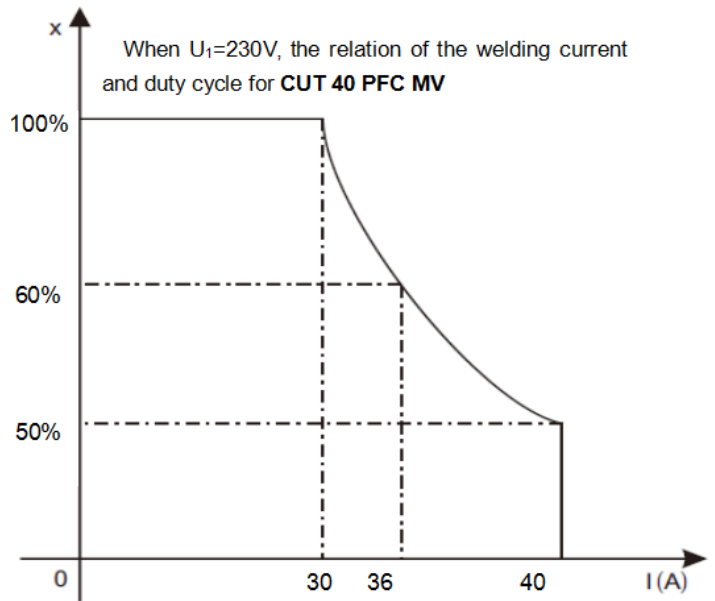
Note: The above parameters are subject to change with the improvement of machines.

§2.4 Duty Cycle and Over-heat

The “X” axis represents Duty Cycle, which is defined as the portion of the time a welding machine can weld at maximum rated output current within a 10-minute cycle. Additionally, this operation must be performed at 104° F ambient temperature in order to pass 3rd party listings.

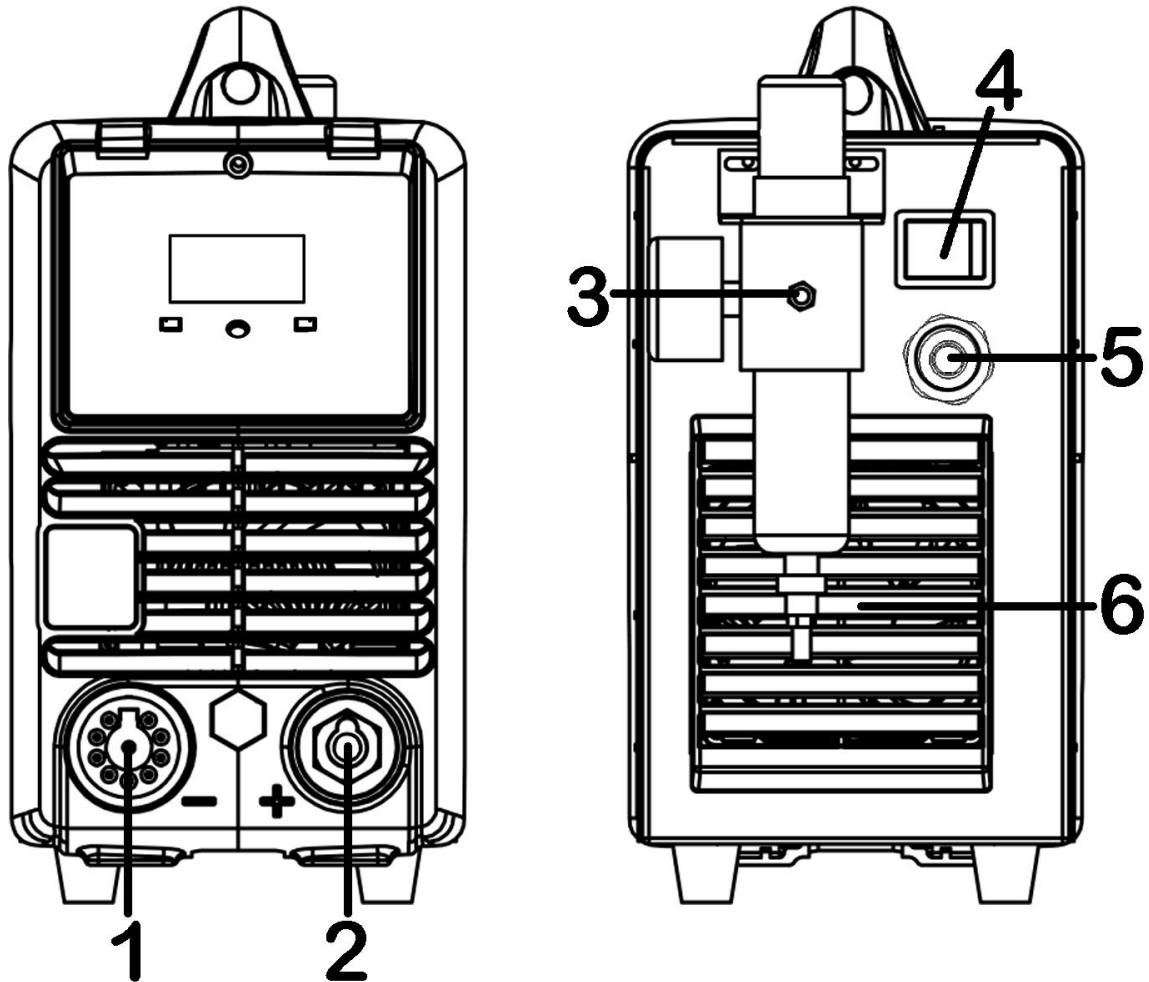
If the plasma machine is operated beyond the rated duty-cycle, the IGBT heat sensor

will send a signal to the machine control unit to switch the output cutting current OFF and illuminate the over-heat LED. The machine should not be operated for 10~15 minutes to allow cool down. When operating the machine again, the cutting output current should be reduced to match the duty cycle.



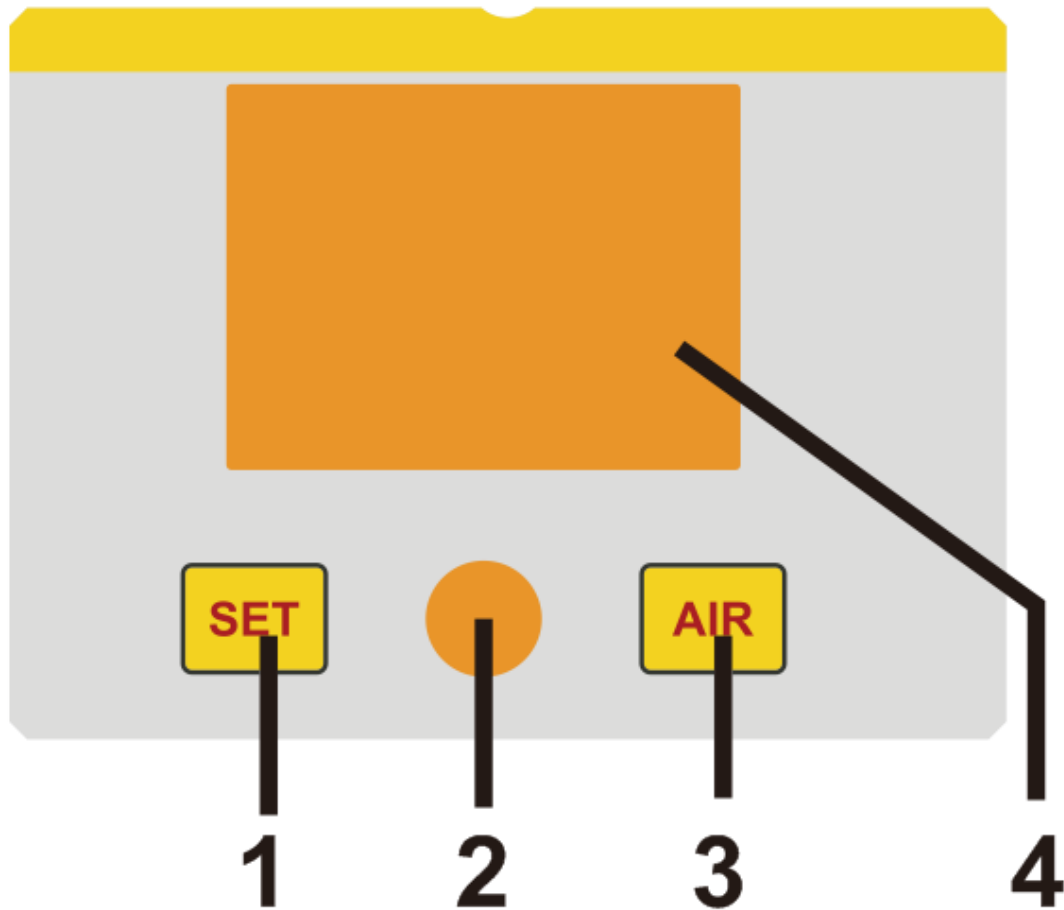
§3 Panel Functions & Descriptions

§3.1 Front and rear panel layout of welding machine



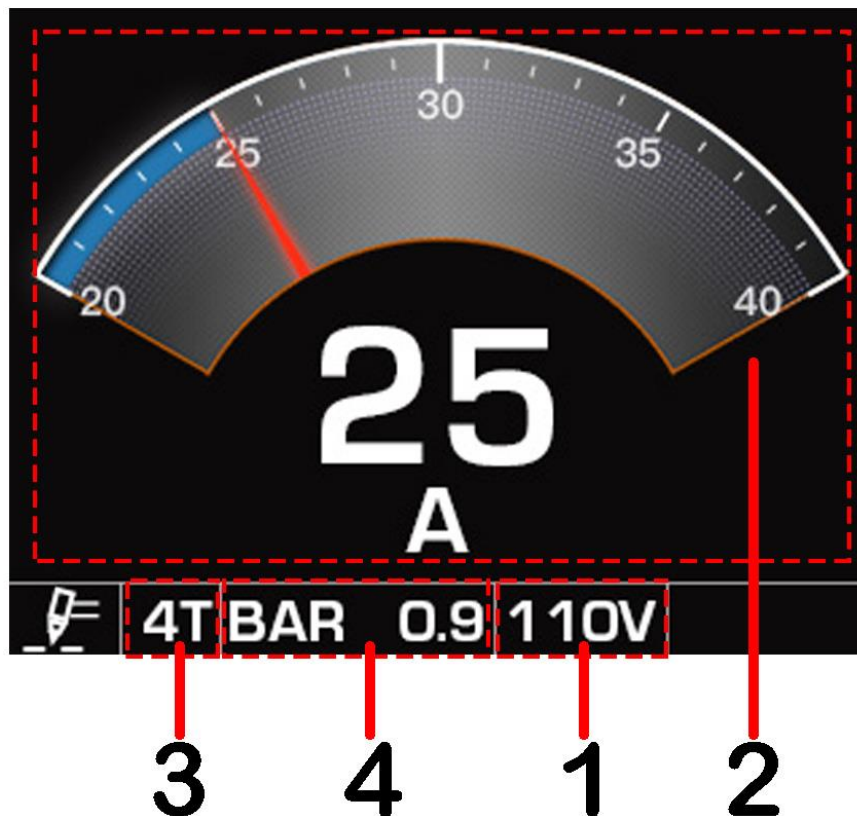
1. **Plasma torch connector:** Central adapter torch plug connects to the cutting machine.
2. **Material cable connector:** Material clamp connected to the workpiece.
3. **Air filter / regulator:** Adjust input pressure and removes contaminants in compressed air.
4. **Power switch:** Turn "ON/OFF" the power to the plasma cutting system.
5. **Power cord:** Connect to the appropriate LINE power with NEMA5-15 or NEMA6-50 plug.
6. **Cooling fan:** Keeps power supply cool and prevents machine overheating.

§3.2.1 Panel introduction



1. **Trigger mode button:** Press it to select 2T or 4T (latching) trigger mode.
2. **Cutting current knob:** counterclockwise rotation reduces the current and clockwise rotation increases the current.
3. **Air purge button:** Press the button to confirm air flow and purge torch cable. Air flow and pressure will be confirmed. If pressure is too low, the screen will display “Undervoltage”.
4. **Screen:** It displays cutting current, trigger mode, air pressure and error codes.

§3.2.2 Display introduction



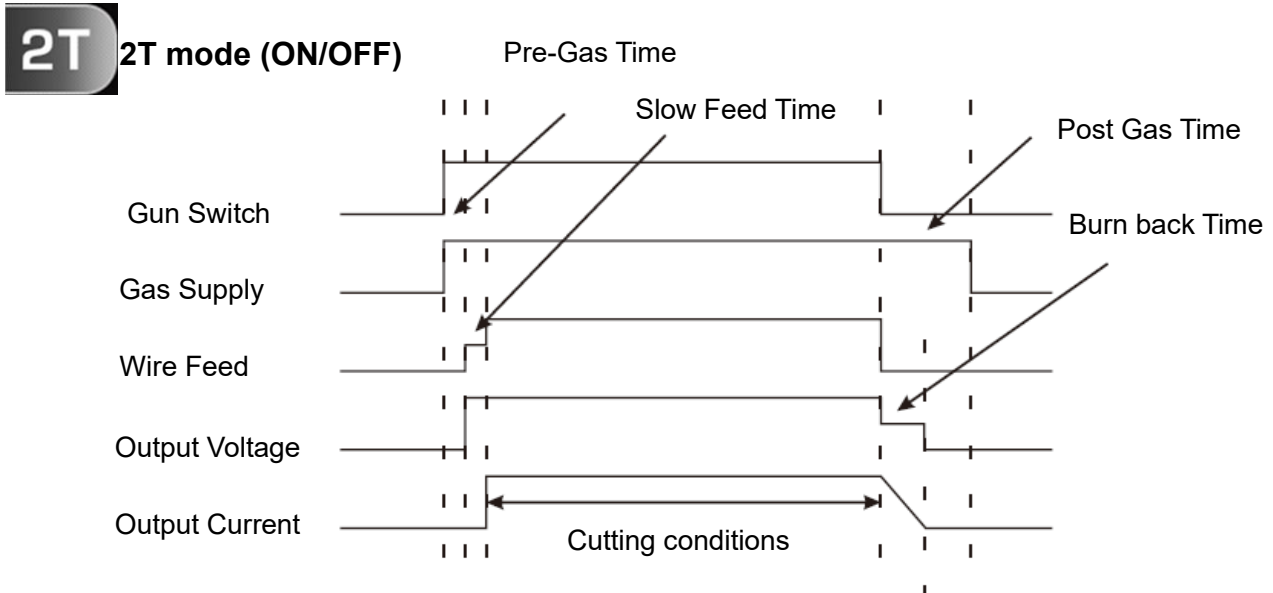
1. **Input voltage:** Here is input voltage value: 110V or 230V.
2. **Output Current:** This is current display. Adjust it by the knob. Unit: A. the range of adjustment is 20~40A.
3. **Trigger mode:** This will display 2T or 4T trigger mode.*
4. **Air pressure:** This will display air pressure, otherwise "Undervoltage" will be displayed.*

* Denotes more detailed explanation of function to follow.

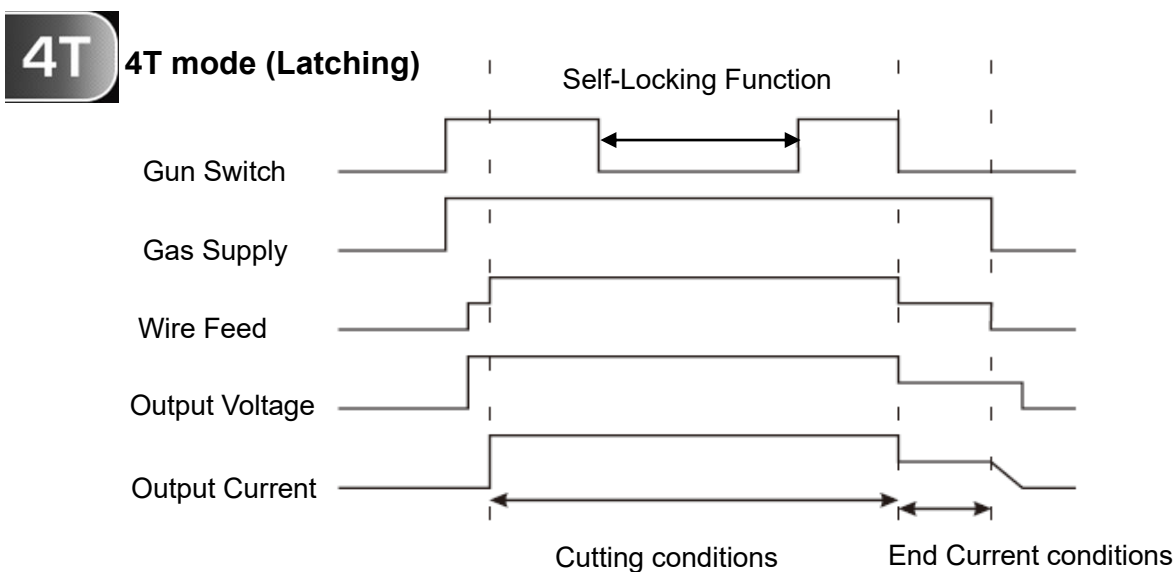
Further Controls Explained

Trigger mode display (3)

- When 2T operation is selected, pressing trigger starts gas and the cutting arc. Release trigger to stop gas and arc.



- When 4T operation is selected, press and release trigger to start gas and arc. Arc will stay on continuously. Press and release trigger again to stop gas and arc.



Air check display (4)

Press the AIR button to confirm air flow to the torch head. If the machine is working properly, the screen will display the air pressure value normally, as shown in the figure below:

A digital display showing the text "BAR 0.9" in white on a black background.

If the compressed air line is not connected, turned on or air pressure is too low, it will cause the machine to alarm and display "E12 Undervoltage", as shown in the figure below:



§4 Installation

§4.1 Unpacking

Use the packing lists to identify and account for each item.

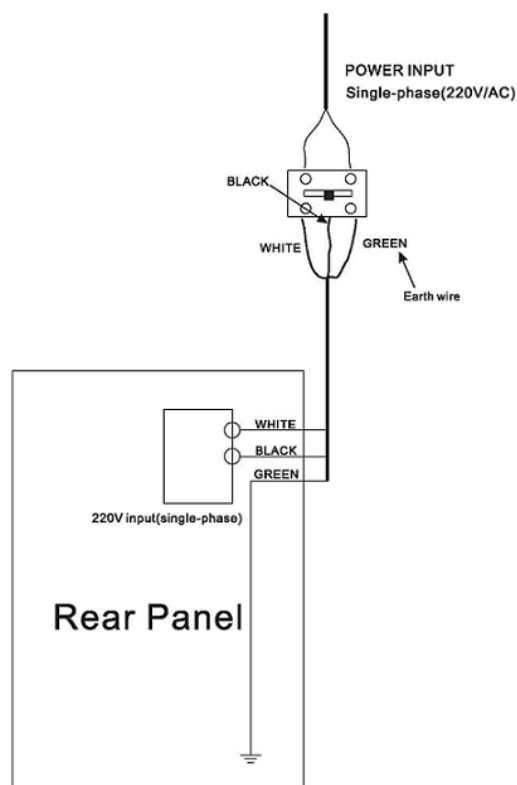
1. Inspect each item for possible shipping damage. If damage is evident, contact your distributor and/or shipping company before proceeding with the installation.
2. The movement may bring the potential danger or substantive hazard, so please make sure that the machine is on the safe position before using.

§4.2 Input Power Connections

1. Check your power receptacle for correct voltage before plugging in unit.
2. Power Cord and Adapter Plug

This power supply includes an input power cord with NEMA 6-50P plug for 230VAC input and a NEMA5-15P adaptor cord for 115VAC input power.

3. If the power supply voltage continually goes beyond the range of safe working voltage (90-270), it will shorten the life of the plasam cutter.



§4.3 Air Connections

1. Connecting Air Supply to Unit

Connect the air hose to the inlet port of the air filter on the rear panel. Turn air ON and adjust pressure to ~70psi.

2. Checking Air Quality

To test air, press AIR button and confirm there is good flow of clean dry air to torch.

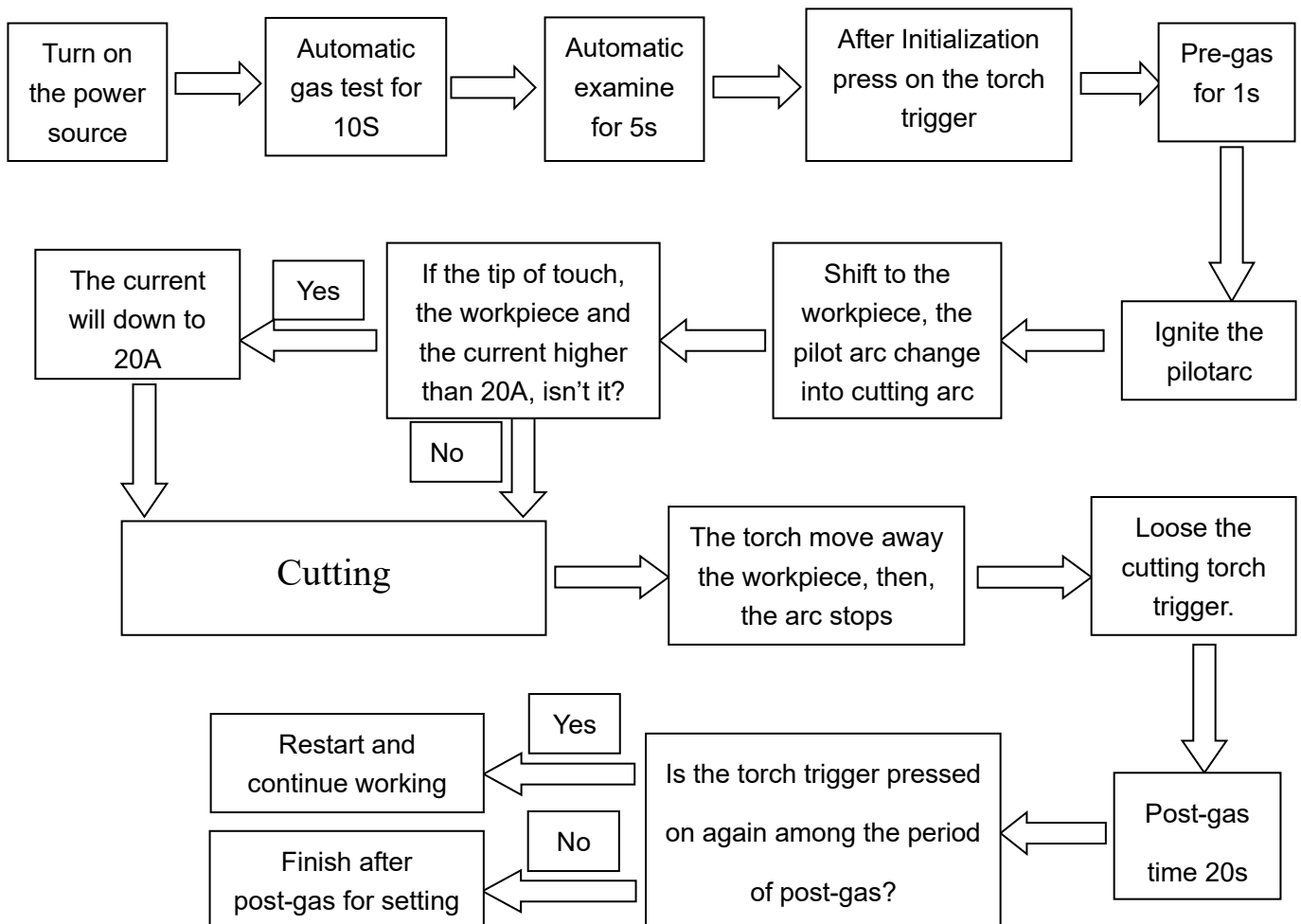
§5 Operation

§5.1 Cutting Preparation

- 1) Insert power cord plug into electrical socket outlet (confirm correct input voltage, refer to the section 2 technology parameters).
- 2) Connect the airline to the regulator and the earth cable to the workpiece.
- 3) Turn power switch “ON” and confirm power indicator LED is continuously illuminated.
- 4) Push AIR button to start the air flow, set regulator air pressure to 50-75 psi (3.5~5 bar).
- 5) Set to Normal Cutting or Grid Cutting and set output current after the flow stops.
- 6) Now all the preparations are complete and unit is ready to cut.

§5.2 Cutting Operation

1. Normal Cut

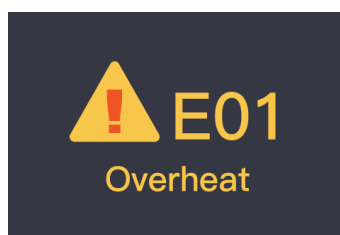


Note:

- 1) If the alarm indicator lights when cutting, release trigger until the alarm resets, then press on the trigger to restart working.
- 2) In the automatic gas test and examine mode, trigger will not function and no arc start.
- 3) Over time, the tip of the electrode and cutting nozzle orifice will have oxidation reaction. Please replace the electrode and cutting nozzle. The alarm indicator will illuminate when the shield cup is removed and the torch will stop working. This is a safety circuit.
- 4) During the period of post gas, if you press the trigger, the arc will restart. if you press and release the trigger quickly, post gas stops. Pressing the trigger again will restart the machine.

2. Alarm indicator:

- 1) When the machine over-heats, the screen will display error code “E01 Overheat”.



The alarm will release after the required cooling period. You can restart the machine.

- 2) When the input voltage or air pressure is too lower, the screen will display error code “E12 Undervoltage”. **Remove power extension cord** to increase voltage to required level.



§5.3 Operation Environment

- ▲ Height above sea level $\leq 3,200$ Ft. (1000 M). Air density will affect cutting performance.
- ▲ Operation temperature range: 14~104°F (-10 ~ +40°C) with humidity below 90%.
- ▲ Preferable set the machine on a **clean** level surface (+/- 15°) above the floor level to insure cooling fan does not intake (suction) dirt, dust or other particles into the power supply.
- ▲ Protect the machine against high moisture, rain, water and against direct sunshine.
- ▲ Take care that there is sufficient ventilation during cutting. There must be at least 1-1/2" (38cm) free distance between the machine and wall.

§5.4 Operation Notices

- ▲ Read Section §1 carefully before starting to use this equipment.
- ▲ Ensure that the input voltage is 110V-240VAC, single-phase: 50/60Hz.
- ▲ Before operation, clear the working area. Do not watch the arc in unprotected eyes.
- ▲ Ensure good ventilation of the machine to improve duty cycle and life.
- ▲ Turn off power supply when the operation finished for energy consumption efficiency.
- ▲ When power switch shuts off protectively because of failure. Do not restart until problem has been resolved. Otherwise, permanent damage could occur.
- ▲ In case of problems, contact your local dealer.

§6 Basic Trouble Shooting

§6.1 Basic Troubleshooting Guide



WARNING

There are extremely dangerous voltage and power levels present inside this unit.

Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

§6.1.1 Basic troubles

A. Machine is ON, the screen is illuminated, but both fan and the air are not functioning.

1. Power line problem: Please check the input power cords, plug and wall receptacle.
2. Main board failure: Please contact your Dealer or qualified technician.

B. Machine ON, the screen display “Undervoltage”.

Air pressure is too low. Adjust to 65 psi (4.5 bar).

Line voltage is too low. Remove any extension cord. Have electrician confirm LINE voltage.

C. Machine ON, the screen display “Overheat”.

1. Air flow blocked, check for blocked air flow around the unit and correct condition.
2. Fan blocked, check fan and correct condition.
3. The machine is over-heated, let it cool down for at least 5 minutes. Make sure the machine has not been operated beyond the Duty Cycle (refer to technology parameters in Section 2).
4. Input voltage over the normal range, choosing the proper voltage (refer to technology parameters in the Section).
5. Faulty components in the machine. Please contact your Dealer or qualified technician.

§6.1.2 Pilot arc troubles

A. Torch failed to ignite the arc when torch is triggered.

1. The system is set in “Air Check” mode, change it to “Cutting” mode.
2. Faulty in torch parts, inspect torch parts and replace it if necessary.
3. Air pressure is too high or too low, adjust it to proper state.

B. Difficult starting

1. The swirl ring (gas distributor) is missing inside shield cap. Replace.
2. Worn torch parts (consumables), shut off input power. Remove and inspect torch shield cup, tip, swirl ring and electrode. Replace electrode or tip if worn; replace swirl ring if burnt or air ports blocked; replace shield cup if excessive spatter adheres to it or blocks air ports.
3. Electrode is “sticking”: Push electrode down with thumb. It must move freely. Replace.

C. Low output arc (pilot arc only)

1. Poor connection between torch and power supply: Check the torch leads are properly connect to power supply.
2. Poor connection earth cable to work piece. Make sure that work cable connect or to machine is tight and clamp has a good electrical connection to a clean and dry area of the workpiece.
3. Faulty Torch: Please contact your Dealer or qualified technician.

D. Arc shuts off during operation, and it will not restart.

1. Power Supply is overheated (OC/OT LED on), let unit cool down for at least 5 minutes. Make sure the unit has not been operated beyond Duty Cycle limit. Refer to Section 2 for duty cycle specifications.
2. Air pressure is too low. Check source for at least 65 psi/4.5 bar; adjust as needed.
3. Torch consumables worn, check torch shield cup, tip, swirl ring and electrode; replace as needed.
4. Faulty components in unit: Please contact your Dealer or qualified technician.

§6.1.3 Cutting troubles**A. No gas flow; power lamp and fan ON**

1. Airline not connected, not turned on at compressor or pressure is too low, check connections. Adjust air pressure to proper setting.
2. Two regulators on airline. Remove wall mounted regulator.
3. Faulty components in the unit: Please contact your Dealer or qualified technician.

B. Low cutting output

1. Incorrect setting of cutting current (A), check and adjust to proper setting.
2. Air pressure too low. Turn pressure higher until torch will not ignite.
3. Swirl ring is missing. Replace missing swirl ring.
4. Input voltage is too low due to extension cord. Remove extension cord.

C. Torch can cut but the cutting quality is poor

1. Current (A) control set too low, increase current setting.
2. The torch move too fast across the workpiece, reduce cutting speed.
3. Swirl ring is missing. Replace missing swirl ring.
4. Air pressure too low. Check the air pressure (65 psi min.) and air flow. Adjust air pressure to highest possible setting (until blows torch out) and turn back $\frac{1}{4}$ turn.
5. Excessive oil or moisture in torch, hold torch $\frac{1}{8}$ inch (3 mm) from clean surface while purging and observe oil or moisture buildup (do not activate torch). If there are contaminants in the gas, additional filtering may be needed.

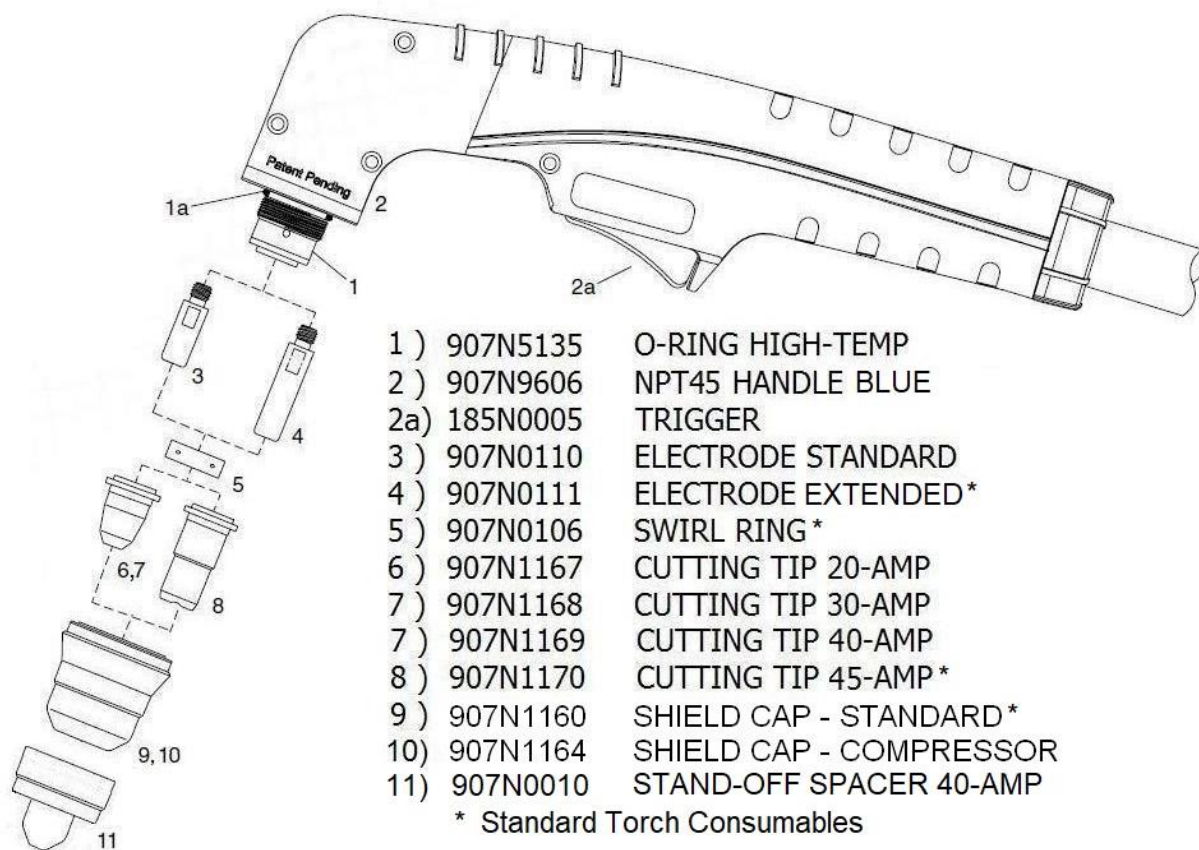
§6.2 Packing list and torch consumables

Chart 5.1 packing list:

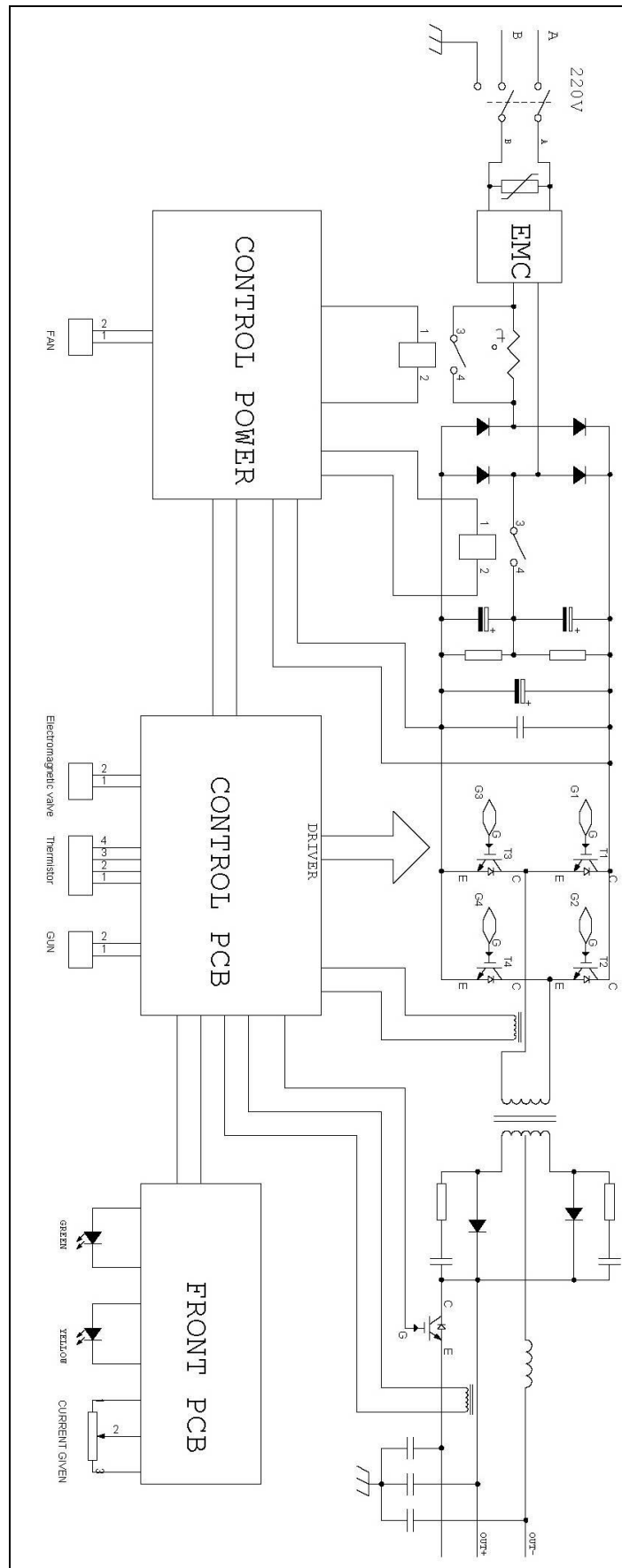
- | | |
|---------------|--|
| 1) HSW-6004 | HSP40LCD Plasma Cutting Power Supply |
| 2) NPT48 | Nu-Tec Plasma Cutting Torch with Central Adaptor (13') |
| 3) Work Clamp | 250 Amp Cable Clamp with Dinse connector (10') |
| 4) 907N0111 | Electrode 40-Amp Extended (3-Pack) |
| 5) 907N1170 | Cutting Nozzle 40-Amp Extended (5-Pack) |
| 6) 40-Man | Operator Manual HSP40LCD Plasma System. |

Chart 5.2 NPT48 consumables:

NPT45/48 TORCH CONSUMABLES



§6.3 Electrical Schematic & Parts Drawing





1	740.0101	HANDLE	15	740.0115	MAIN TRANSFORMER
2	740.1102	CABINET COVER HSP40	16	740.0116	AL HEAT RESISTOR
3	740.0103	CONTROL BOARD HSP40	17	740.0117	VALVE MOUNTING PLATE
4	740.0104	INVERTER BLOCK CUT40	18	740.0118	AIR SOLENOID VALVE
5	740.1106	FRONT PANEL HSP40LCD	19	740.0119	PFC INDUCTOR
6	521.0013	CURRENT KNOB	20	740.0120	CABINET BASE
7	740.1107	CABINET FRAME-F HSP40LCD	21	740.0121	COOLING FAN
8	740.0108	3550F PANEL CONNECTOR	22	740.0122	COOLING FAN COVER
9	740.0109	CENTRAL ADAPTOR SOCKET	23	740.0123	AIR HOSE
10	740.0110	MACHINE FOOT	24	740.0124	STRAIN RELIEF
13	740.0113	SUPPORT COLUMN	25	740.0125	POWER CORD NEMA6-50
14	740.0114	SUPPORT PILLAR	26	740.0126	REGULATOR W/ GAUGE

TECHNICAL SUPPORT LINE: 704-935-5242