LINCOLN ELECTRIC

Operator's Manual

Tomahawk® 1000

For use with machines having Code Numbers:

11581, 12850

GENUINE LINCOLN PARTS™

Register your machine:
www.lincolnelectric.com/register

Authorized Service and Distributor Locator:
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After hours?
Use "Ask the Experts" at lincolnelectric.com
A Lincoln Service Representative will contact you no later than the following business day.

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IM10026-A | Issue Date May-19

THE LINCOLN ELECTRIC COMPANY
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Phone: +1.216.481.8100 • www.lincolnelectric.com

THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

SAFETY DEPENDS ON YOU

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

⚠ WARNING

This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

⚠ CAUTION

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.

KEEP YOUR HEAD OUT OF THE FUMES.

DON'T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.

READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.

IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).

USE NATURAL DRAFTS or fans to keep the fumes away from your face.

If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.

WEAR CORRECT EYE, EAR & BODY PROTECTION

PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).

PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.

PROTECT others from splatter, flash, and glare with protective screens or barriers.

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

Also, wear safety glasses in work area **AT ALL TIMES.**

SPECIAL SITUATIONS

DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.

DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

Additional precautionary measures

PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.

BE SURE cylinders are never grounded or part of an electrical circuit.

REMOVE all potential fire hazards from welding area.

ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.

SECTION A: WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65 warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 *et seq.)*

WARNING: Cancer and Reproductive Harm www.P65warnings.ca.gov

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE POWERED EQUIPMENT.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

ELECTRIC SHOCK CAN KILL.

3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage (Wire) Welder.
- DC Manual (Stick) Welder.
- AC Welder with Reduced Voltage Control.

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS CAN BURN.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

FUMES AND GASES CAN BE DANGEROUS.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required. Additional precautions are also required when welding on galvanized steel.**

5. b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

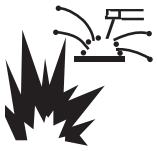
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

6.I. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

CYLINDER MAY EXPLODE IF DAMAGED.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-I, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.

FOR ELECTRICALLY POWERED EQUIPMENT.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Refer to http://www.lincolnelectric.com/safety for additional safety information.

ELECTROMAGNETIC COMPATIBILITY (EMC)

Location:

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated radio-frequency disturbances.

General

The user is responsible for installing and using the equipment according to the manufacturer's instructions.

If electromagnetic disturbances are detected, then it shall be the responsibility of the user of the equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the welding or cutting circuit, (see note). In other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances shall be reduced to the point where they are no longer troublesome.

⚠ **NOTE** The practice for earthing the welding or cutting circuit is dependent on local safety regulations. Changing the earthing arrangements to improve EMC can affect the risk of injury or equipment damage. Further guidance is given in IEC60974-9 or national and local codes.

Assessment of area

Before installing equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

1. other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the equipment;
2. radio and television transmitters and receivers;
3. computer and other control equipment;
4. safety critical equipment, e.g., guarding of industrial equipment;
5. the health of the people around, e.g., the use of pacemakers and hearing aids;
6. equipment used for calibration or measurement;
7. the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;
8. the time of day that welding, cutting or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Assessment of welding and cutting installation

In addition to the assessment of the area, the assessment of installations may be used to evaluate and resolve cases of interference. An emission assessment should include *in situ* measurements as specified in Clause 10 of CISPR11:2009 or national and local codes. *In situ* measurements may also be used to confirm the efficiency of mitigation measures.

Mitigation measures

Public Supply System

Welding and cutting equipment should be connected to the public supply system according to the manufacturer's

recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the system. Consideration should be given to shielding the supply cable of permanently installed equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the power source so that good electrical contact is maintained between the conduit and the power source enclosure.

Maintenance of Equipment

The equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the equipment is in operation. The equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding and cutting cables

The welding and cutting cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

Equipotential bonding

Bonding of all metallic objects in the surrounding area should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, for example, ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.[1]

1. [1]Portions of the preceding text are contained in EN 60974-10: "Electromagnetic Compatibility (EMC) product standard for arc welding equipment."

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d.Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

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PARTS LIST ..... PARTS.LINCOLNELECTRIC.COM
CONTENT/DETAILS MAY BE CHANGED OR UPDATED WITHOUT NOTICE. FOR MOST CURRENT INSTRUCTION MANUALS, GO TO PARTS.LINCOLNELECTRIC.COM.

INSTALLATION

TECHNICAL SPECIFICATIONS - TOMAHAWK® 1000 - CODE 12850

INPUT - SINGLE PHASE/THREE PHASE/ 50 / 60 HERTZ			
INPUT VOLTAGE +/- 10%	INPUT AMPERES @ RATED OUTPUT		CIRCUIT BREAKER (DELAY TYPE)
208V/1/50/60	38	50% Duty Cycle	40 Amps
	25	100% Duty Cycle	
230V/1/50/60	34	50% Duty Cycle	
	23	100% Duty Cycle	
208V/3/50/60	25	50% Duty Cycle	30 Amps
	16	100% Duty Cycle	
230V/3/50/60	21	50% Duty Cycle	
	13	100% Duty Cycle	
460V/3/50/60	9	50% Duty Cycle	15 Amps
	6	100% Duty Cycle	
575V/3/50/60	8	40% Duty Cycle	
	5	100% Duty Cycle	

RATED OUTPUT AT 40° C		
DUTY CYCLE	CURRENT	VOLTAGE
100%	40A	96VDC
50%	60A	104 VDC
40%	60A	104 VDC

PHYSICAL DIMENSIONS			
HEIGHT	WIDTH	DEPTH	WEIGHT INCLUDING TORCH CABLE
15.3 in. 389 mm	9.7 in. 247 m	21.65 in. 550 mm	63.9 lbs. 29 kgs

OUTPUT		
CURRENT RANGE	OPEN CIRCUIT VOLTAGE	PILOT CURRENT
20 - 60 Amps	270 VDC	20 Amps

TEMPERATURE RANGES	
OPERATING TEMPERATURE RANGE	STORAGE TEMPERATURE RANGE
-10°C to +40°C	-25°C to +55°C

REQUIRED GAS FLOW RATE
80.0 PSI @ 275 SCFH (5.5 Bar. @ 130 ±20% LITERS/MIN.)

REQUIRED GAS INLET PRESSURE
87.0 to 109.0 PSI (6.0 Bar. to 7.5 Bar.)

RECOMMEND INPUT WIRE		
For all plasma cutting applications Based on U.S. National Electrical Code Ambient Temperature 30°C or Less		
Input Cord Supplied with Machine	Type S, SO, ST, STO or Extra Hard Usage Cord AWG (IEC) Sizes	
	Input Supply Wires	1 Ground Wire
STO, 600V	#10 (5.3 mm2)	#10 (5.3 mm2)

TECHNICAL SPECIFICATIONS - TOMAHAWK® 1000 - CODE 11581

INPUT - SINGLE PHASE/THREE PHASE/ 50 / 60 HERTZ			
INPUT VOLTAGE +/- 10%	INPUT AMPERES @ RATED OUTPUT		CIRCUIT BREAKER (DELAY TYPE)
208V/1/50/60	38	50% Duty Cycle	40 Amps
	25	100% Duty Cycle	
230V/1/50/60	34	50% Duty Cycle	
	23	100% Duty Cycle	
208V/3/50/60	25	50% Duty Cycle	30 Amps
	16	100% Duty Cycle	
230V/3/50/60	21	50% Duty Cycle	
	13	100% Duty Cycle	
460V/3/50/60	9	50% Duty Cycle	15 Amps
	6	100% Duty Cycle	
575V/3/50/60	8	50% Duty Cycle	
	5	100% Duty Cycle	

RATED OUTPUT AT 40° C		
DUTY CYCLE	CURRENT	VOLTAGE
100%	40A	96VDC
50%	60A	104 VDC

OUTPUT		
CURRENT RANGE	OPEN CIRCUIT VOLTAGE	PILOT CURRENT
20 - 60 Amps	270 VDC	20 Amps

REQUIRED GAS FLOW RATE
80.0 PSI @ 275 SCFH (5.5 Bar. @ 130 ±20% LITERS/MIN.)

REQUIRED GAS INLET PRESSURE
87.0 to 109.0 PSI (6.0 Bar. to 7.5 Bar.)

RECOMMEND INPUT WIRE		
For all plasma cutting applications Based on U.S. National Electrical Code Ambient Temperature 30°C or Less		
Input Cord Supplied with Machine	Type S, SO, ST, STO or Extra Hard Usage Cord AWG (IEC) Sizes	
	Input Supply Wires	1 Ground Wire
STO, 600V	#10 (5.3 mm2)	#10 (5.3 mm2)

PHYSICAL DIMENSIONS			
HEIGHT	WIDTH	DEPTH	WEIGHT INCLUDING TORCH CABLE
15.3 in. 389 mm	9.7 in. 247 m	21.65 in. 550 mm	63.9 lbs. 29 kgs

TEMPERATURE RANGES	
OPERATING TEMPERATURE RANGE	STORAGE TEMPERATURE RANGE
-10°C to +40°C	-25°C to +55°C

SAFETY PRECAUTIONS

Read entire Installation Section before installing the Tomahawk® 1000 .

⚠ WARNING

ELECTRIC SHOCK CAN KILL.

- **Only qualified personnel should install this machine.**
- **Turn the input power OFF at the disconnect switch or fuse box and discharge input capacitors before working inside the equipment.**
- **Do not touch electrically hot parts.**
- **Turn the Tomahawk® 1000 Power Switch OFF when connecting power cord to input power.**

SELECT PROPER LOCATION

Place the Tomahawk® 1000 where clean cool air can freely circulate in and out of the louvers. Dirt, dust or any foreign material that can be drawn into the machine should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdown of the machine.

A source of clean, dry air or nitrogen must be supplied to the Tomahawk® 1000. Oil in the air is a severe problem and must be avoided. The supply pressure must be between 80 and 110 psi. The flow rate is approximately 4.0 cfm (113 l/min.). Failure to observe these precautions could result in excessive operating temperatures or damage to the torch.

STACKING

The Tomahawk® 1000 cannot be stacked.

TILTING

The Tomahawk® 1000 must be placed on a stable, level surface so it will not topple over.

HIGH FREQUENCY INTERFERENCE PROTECTION

The Tomahawk® 1000 employs a touch start mechanism for arc initiation which eliminates high frequency emissions from the machine as compared with spark gap and solid state type high frequency generators. Keep in mind, though, that these machines may be used in an environment where other high frequency generating machines are operating. By taking the following steps, high frequency interference into the Tomahawk® 1000 can be minimized

(1) Make sure the power supply chassis is connected to a good earth ground. The work terminal ground does NOT ground the machine frame.

(2) Keep the work clamp isolated from other work clamps that have high frequency.

(3) If the work clamp cannot be isolated, then keep the clamp as far as possible from other work clamp connections.

(4) When the machine is enclosed in a metal building, several good earth driven electrical grounds around the periphery of the building are recommended.

Failure to observe these recommended installation procedures may cause improper function of the Tomahawk® 1000 or possibly even damage to the control system or power supply components.

INPUT ELECTRICAL CONNECTIONS

The Tomahawk® 1000 is rated for 208VAC through 575VAC input voltages. Before installing the machine, check that input supply voltage, phase, and frequency are the same as the machine's voltage, phase, and frequency as specified on the machine's rating plate.

- Automatically senses and adjusts to input power for a range of 200 up to 600 volts, single or three phase, 50 to 60 hertz. Cutting output remains constant throughout the entire input voltage range.
- The Tomahawk® 1000 should be connected only by a qualified electrician. Installation should be made in accordance with local codes.

INPUT PLUG INSTALLATION

POWER CORD CONNECTION

A power cord is provided and wired into the machine. Follow the power cord connection instructions.

Single Phase Input

Connect green lead to ground per National Electrical Code.

Connect black and red leads to power.

Wrap white lead with tape to provide 600V insulation.

Three Phase Input

Connect green lead to ground per National Electric Code.

Connect black, red and white leads to power.

⚠ WARNING

Failure to wire as instructed may cause personal injury or damage to equipment. To be installed or checked by an electrician or qualified person only.

In all cases, the green or green/yellow grounding wire must be connected to the grounding pin of the plug, usually identified by a green screw.

Attachment plugs must comply with the Standard for Attachment Plugs and Receptacles, UL498.

The product is considered acceptable for use only when an attachment plug as specified is properly attached to the supply cord.

ENGINE DRIVEN GENERATOR

For use on engine drives, keep in mind the above input draw restrictions and the following precaution.

The Tomahawk® 1000 can be operated on engine driven generators as long as the 230 volt auxiliary meets the following conditions:

- The AC waveform peak voltage is below 400 volts.
- The AC waveform frequency is between 45 and 65 Hz.

The following Lincoln engine drives meet these conditions when run in the high idle mode:

Outback 185, Ranger 225, Ranger 250, 250LPG, 305G and 305D engine drives.

Vantage 300, 400, 500 and Air Vantage engine drives.

Operation of the Tomahawk® 1000 is not recommended on engine drives not conforming to these conditions. Such combinations may overvoltage the Tomahawk® 1000 power source.

GAS INPUT CONNECTIONS

(External Air Supply)

Supply the Tomahawk® 1000 with clean compressed air or nitrogen.

- Supply pressure must be between 80 psi and 110 psi.
- Flow rate should be approximately 275 SCFH (130 ±20% LITERS/MIN.).

NOTE: Oil in the air supply to the Tomahawk® 1000 can cause severe problems. Use only a clean air supply.

- Compressed gas can be supplied either through the air fitting supplied with the machine or through the 1/4-19 BSPP thread at the rear of the machine. To use the air fitting supplied with the machine (packaged in the consumable kit), apply teflon tape to the fitting threads and install the fitting in the port at the rear of the machine.
- If compressed air is being used, it is highly recommended that an in line filter be installed in the air supply line ahead of the air connection to the Tomahawk® 1000.
- A standard nominal 5 micron in line filter is recommended; however, for optimum performance, select a prefilter with a 3 micron absolute rating.

If these filter ratings are unavailable, anything with a rating less than, or equal to, 20 micron would be acceptable to use. In line filter elements will generally filter the air with little restriction to the airflow until the element is about 75% contaminated. After this point, there will be a noticeable pressure drop in the line. Filter elements should be replaced when a pressure drop of 8-10 psi is indicated; however, for optimum performance of the Tomahawk® 1000, the filter element should be replaced at or before the pressure drop reaches 8 psi. Be sure to select a filter that will accommodate the necessary flow rating for the Tomahawk® 1000 as specified in the Installation section of this instruction manual under the Gas Input Connections heading.

NOTE: When using nitrogen gas from a cylinder, the cylinder must have a pressure regulator.

- Maximum psi from a nitrogen gas cylinder to the Tomahawk® 1000 regulator should never exceed 110 psi.
- Install a hose between the nitrogen gas cylinder regulator and the Tomahawk® 1000 gas inlet.

⚠ WARNING

CYLINDER could explode if damaged.

- **Keep cylinder upright and chained to a fixed support.**
- **Keep cylinder away from areas where it could be damaged.**
- **Never lift machine with cylinder attached.**
- **Never allow the cutting torch to touch the cylinder.**
- **Keep cylinder away from live electrical parts.**
- **Maximum inlet pressure 110 psi.**

OUTPUT CONNECTIONS

Torch - The Tomahawk® 1000 is sent from the factory with a cutting torch and work clamp included. The work clamp must be securely connected to the work piece. If the work piece is painted or extremely dirty it may be necessary to expose the bare metal in order to make a good electrical connection.

OPERATION

SAFETY PRECAUTIONS

Read and understand this entire section before operating your Tomahawk 1000

⚠ WARNING

- **Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.**

ELECTRIC SHOCK can kill.

- **Do not touch electrically live parts or electrode with skin or wet clothing.**
- **Insulate yourself from work and ground**
- **Always wear dry insulating gloves.**

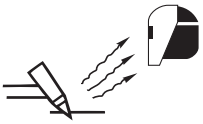
FUMES AND GASES can be dangerous.

- **Keep your head out of fumes.**
- **Use ventilation or exhaust to remove fumes from breathing zone.**

WELDING, CUTTING and GOUGING SPARKS can cause fire or explosion

- **Keep flammable material away.**
- **Do not weld, cut or gouge on containers that have held combustibles.**

ARC RAYS can burn.



- **Wear eye, ear and body protection.**

PLASMA ARC can injure

- **Keep your body away from nozzle and plasma arc.**
- **Operate the pilot arc with caution. The pilot arc is capable of burning the operator, others or even piercing safety clothing.**

- **Only qualified personnel should operate this equipment.**
- **Always operate the welder with the door closed and the side panels in place as these provide maximum protection from moving parts and insure proper cooling air flow.**

GENERAL DESCRIPTION

The Tomahawk® 1000 is a constant current, continuous control plasma cutting power source. It provides superior and reliable starting characteristics, cutting visibility and arc stability. The control system has a safety mechanism to insure that the nozzle and electrode are in place before cutting or gouging. This is extremely important due to the high voltages involved.

The Tomahawk® 1000 comes standard with an air regulator and pressure gauge. The machine also comes with an input power cord and Hand-held torch with a 25 Ft.(7.6m) cable length. Consumables are included with each Tomahawk® 1000 purchase so that cutting can begin right out of the box. Consumables can also be ordered as individual packages.

The Tomahawk® 1000 initiates the plasma arc with a simple, yet reliable, touch start mechanism. This system eliminates many of the failure problems associated with hi-frequency start systems.

PREHEAT TEMPERATURE FOR PLASMA CUTTING

Preheat temperature control is not necessary in most applications when plasma arc cutting or gouging. Preheat temperature control may be necessary on high carbon alloy steels and heat treated aluminum for crack resistance and hardness control. Job conditions, prevailing codes, alloy level, and other considerations may also require preheat temperature control. The following minimum preheat temperature is recommended as a starting point. Higher temperatures may be used as required by the job conditions and/or prevailing codes. If cracking or excessive hardness occurs on the cut face, higher preheat temperature may be required. The recommended minimum preheat temperature for plate thickness up to 1/2" (12.7mm) is 70°F (21.1°C).

DUTY CYCLE

The duty cycle of a plasma machine is the percentage of time in a 10 minute cycle at which the operator can operate the machine at rated cutting current.

Example: 60% duty cycle means that is possible cut for 6 minutes, then the machine stops for 4 minutes.

Refer to the Technical Specification section for more information about the machine rated duty cycles.

USER RESPONSIBILITY

Because design, fabrication, erection and cutting variables affect the results obtained in applying this type of information, the serviceability of a product or structure is the responsibility of the user. Variation such as plate chemistry, plate surface condition (oil, scale), plate thickness, preheat, quench, gas type, gas flow rate and equipment may produce results different than those expected. Some adjustments to procedures may be necessary to compensate for unique individual conditions. Test all procedures duplicating actual field conditions.

DESIGN FEATURES AND ADVANTAGES

The Tomahawk® 1000 design makes plasma cutting uncomplicated. This list of design features and advantages will help you understand the machine's total capabilities so that you can get maximum use from your machine.

- Light weight and portable design for industrial use.
- Continuous control, 20 - 60 amps.
- Reliable touch start mechanism for plasma arc initiation.
- Rapid arc restrike for fast cutting of expanded metal.
- Input over voltage protection.
- Bright 3.0 second timed pilot arc.
- Purge section on output dial.
- Air regulator and pressure gage included.
- Internal water separator included.
- Parts-in-Place mechanism to detect proper installation of consumables and torch.
- Preflow/Postflow timing. Preflow is eliminated if arc is re-initiated in Postflow.
- Thermostatic Protection.
- Solid state over-current protection.
- Unique electrode and nozzle design for optimum cooling and long life.

CUTTING CAPABILITY

The Tomahawk® 1000 is rated at 60 amps, at 50% duty cycle on a 10 minute basis. If the duty cycle is exceeded, a thermal protector will shut off the output of the machine until it cools to the normal operating temperature.

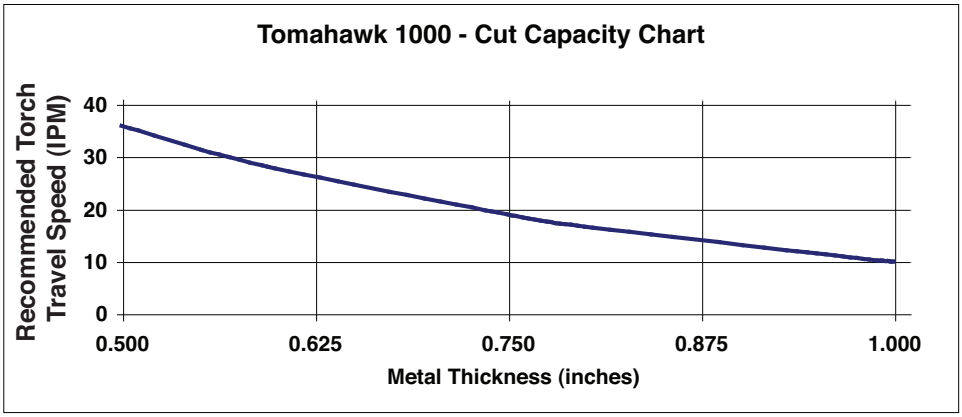
Figure B.1 shows the cut capacity of the Tomahawk® 1000 when cutting mild steel.

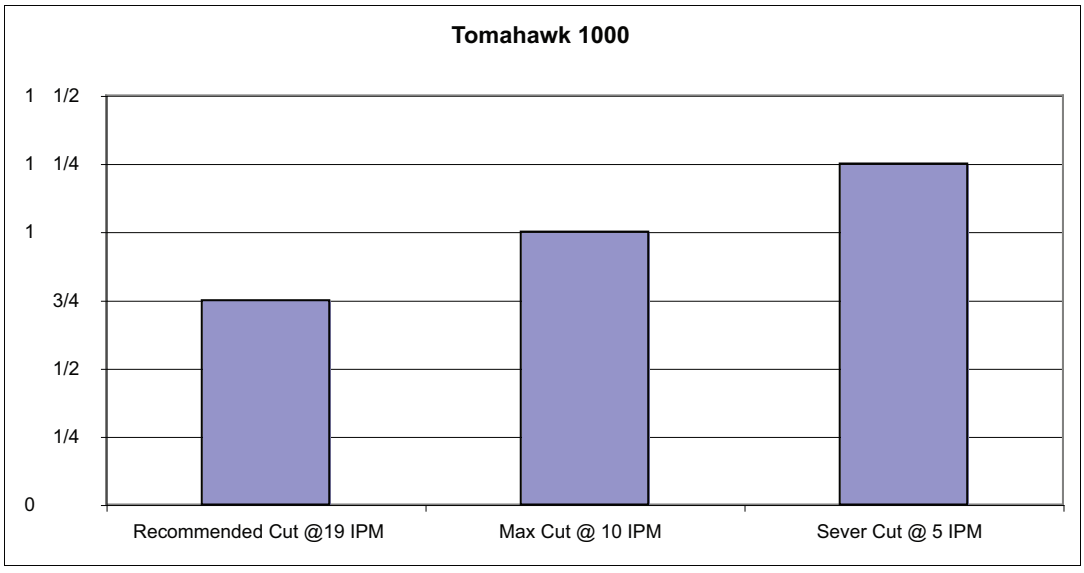
CONSUMABLE LIFE

The expected life for the Tomahawk® 1000 's electrode under normal operating conditions is approximately 1000 starts/cuts. An erosion of .060" is typical for end of electrode life, however, the electrode life may last longer. A green and erratic arc will indicate definite electrode failure and the electrode should be replaced immediately.

It is recommended that consumables be replaced in complete sets. (Example: Electrode and Nozzle). This will maximize the performance of the Tomahawk® 1000 system.

Figure B.1





LIMITATIONS

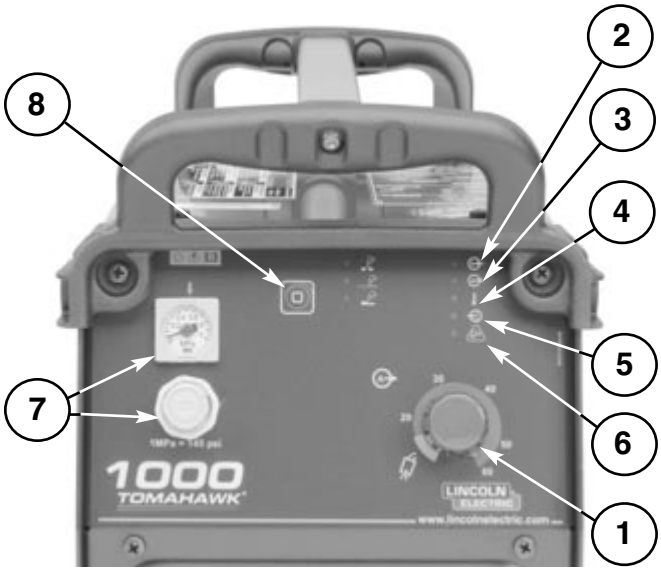
Do not exceed output current and duty cycle rating of machine. Do not use the Tomahawk® 1000 for pipe thawing.

CONTROLS AND SETTINGS

(Figure B.2)

Tomahawk® 1000 front command panel.

FIGURE B.2



When the machine is turned ON, an auto-test is executed; during this test all of the LEDs on the Control Panel light up.

1. **OUTPUT CURRENT KNOB:** For setting the output current used during cutting. Refer to the Technical Specification section for more information about the machine's rated current range.

   AIR, GAS PURGE: The Output Current Knob completely rotated counterclockwise enables the air purge function. A five minute timeout stops the purge function; this will occur only if the Output Current Knob remains in the purge mode for an extended time.

2. **POWER ON/OFF GREEN LED:** Illuminates when the machine is ON.

   Blinking: Input voltage out of range condition. The machine is disabled: When the input voltage returns to the correct range, the machine will restart automatically.

Note: The Fan may automatically turn OFF if the error condition persists for more than 2 seconds.

3. **OUTPUT RED LED:**

   The cutting torch is energized.

   Blinking: Internal auxiliary undervoltage condition. The machine needs to be turned OFF then ON again to restart.

4. **THERMAL YELLOW LED:**

   The machine is overheated and the output has been disabled. This usually occurs when the duty cycle of the machine has been exceeded. Leave the machine ON to allow the internal components to cool. When the thermal LED turns off, normal operation is again possible.

5. **GAS PRESSURE YELLOW LED:**

   The Input Gas pressure is out of range. The machine will restart automatically when a correct gas pressure is detected.

   To check/adjust the primary gas pressure (see recommended values in the Technical Specifications of this manual):

   When this LED illuminates, the machine will automatically enter into Purge mode for 10 seconds.

   During Purge time verify and adjust the gas pressure using the gas pressure regulator knob.

   If necessary, also verify and adjust the inlet gas pressure to the unit.

6. **PARTS IN PLACE (PIP) YELLOW LED:**

   Torch consumables are not attach correctly.

   To reset the machine:

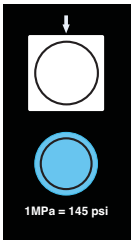
   Firmly attach the torch shielding Cup by hand. Do not over tighten.

   After the torch is restored, the machine will restart after 5 seconds. During this time the PIP LED will blink.

   Note: When the LED is blinking, if another PIP error occurs or if the Torch Trigger pushbutton is pressed the machine will return to the error condition: PIP LED returns to steady ON and the restoring procedure repeats.

   When the PIP LED turns OFF the machine is ready to operate.

7. PRIMARY AIR, GAS PRESSURE GAUGE AND REGULATOR KNOB:



Allows the regulation and monitoring of the primary air/gas pressure.

The inlet primary air/gas pressure is limited by this pressure regulator, set at the factory to 80 PSI (5.5 bar). To adjust the air/gas pressure, place the machine in Purge mode.

8. CUTTING OPERATING MODE SELECTION: Press the pushbutton to select the desired operating mode (the LED indicates the selected mode):

- CUT (Upper LED): for cutting or piercing operations on a solid work piece.
- GRID (Middle LED): for cutting operations on a grid work piece.
- GOUGE (Lower LED): for removing material from a solid work piece (removing a weld).

The Operating Mode can only be changed with the machine at idle or during Purge or Post Flow times.

Pressing the pushbutton during Pilot Arc or Cutting will have no effect.

Items 9 thru 12 on the back of the Tomahawk® 1000 (See Figure B.3)

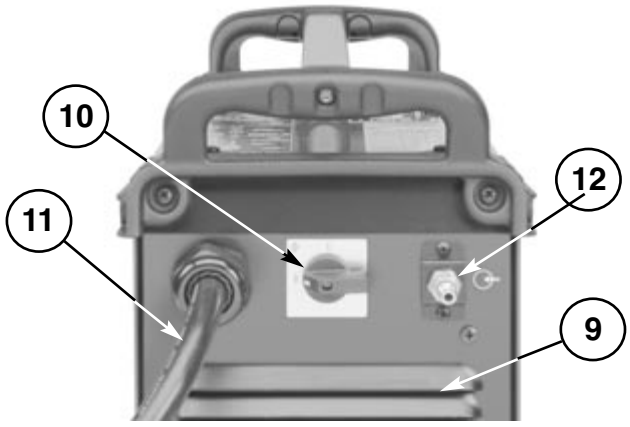
9. FAN: Provides machine cooling. When the machine is switched ON, the fan runs continuously.

10. POWER SWITCH: Turns ON / OFF the input power to the machine.

11. INPUT CABLE: Connects unit to the input power.

12. AIR OR GAS INLET: Compressed Air or Gas Connection.

FIGURE B.3



⚠ WARNING

Clean, dry air or gas must be supplied to the machine. A pressure setting above 110 PSI (7.5 bar) could damage the torch. Failure to observe these precautions could result in excessive operating temperatures or damage to the torch.

CUTTING PROCESS

The air plasma cutting process uses air or nitrogen as a cutting gas and to cool the torch.

The pilot arc is initiated as follows: The torch trigger energizes a solenoid valve. This valve enables the gas to flow during the cutting and post-flow stages.

The Tomahawk® 1000 provides constant current at the set value, independent of the plasma arc length.

When preparing to operate, make sure you have all materials needed to complete the job and have taken all safety precautions. Install the machine as instructed in this manual and remember to attach the work clamp to the work piece.

- With the machine switched OFF, prepare the torch with the consumables adequate to the desired process (CUT / GRID / GOUGE). Refer to the consumable Charts on pages B-9, B-10.
- Connect the Torch and the work cable to the machine.
- Turn ON the Power Switch on the back of the machine; the Input Power LED on the front panel will illuminate. The unit is now ready to operate.
- Verify correct gas pressure using the Gas Purge function.
- Select the desired process using Operating Mode pushbutton.
- Set the desired cutting current using the Output Current knob.

To start the selected process pull the torch trigger, making sure you are not aiming the torch in an unsafe manner.

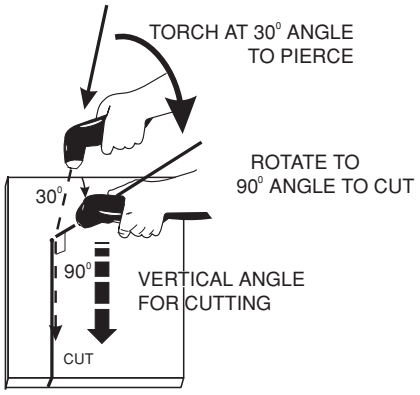
Once the process is completed releasing the torch trigger will cause the plasma arc to turn off. The gas flow will continue, allowing the torch to cool.

- The Post Flow time is proportional to the selected cutting current and it is divided into 4 time ranges:

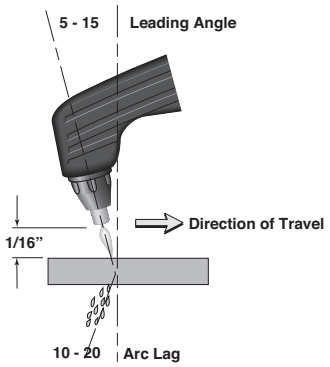
Selected Cutting Current	Post Flow Time
Less than 30A	15 seconds
Between 30A and 40A	20 seconds
Between 40A and 50A	25 seconds
Greater than 50A	30 seconds

- Pilot Arc
  - The air will flow for a preflow time of 2 seconds and the pilot arc will start. (Exceptions: the first time that the trigger is pulled after the machine is turned on, or after a thermal, the initial trigger will be ignored. This is a safety feature to prevent the pilot arc from firing unexpectedly. The other exception is if the machine is in postflow, then the preflow time is skipped and the pilot arc will start immediately.)
  - The pilot arc will run for 3.0 seconds and shut off unless the arc is brought in contact with the work and the arc is transferred. Avoid excessive pilot arc time by transferring the arc to the workpiece quickly. This will extend consumable life.
  - When the arc is brought within 1/8” - 1/4" from the work piece the arc will transfer, the current will ramp to the setting on the control panel, and the cut can last indefinitely (or until the duty cycle of the Tomahawk® 1000 is exceeded).

- Pierce the work piece by slowly lowering the torch onto the metal at a 300 angle away from the operator. This will blow the dross away from the torch tip. Slowly rotate the torch to vertical position as the arc becomes deeper.



- Keep moving while cutting. Cut at a steady speed without pausing. Maintain the cutting speed so that the arc lag is 10° to 20° behind the travel direction.



- Use a 5° - 15° leading angle in the direction of the cut.
- Finish the cut to be made and release the trigger.
- If the dross is difficult to remove, reduce the cutting speed. High speed dross is more difficult to remove than low speed dross.

PROCESS GOUGING

Gouging is a process used to remove material without cutting entirely through the workpiece. The Tomahawk 1000 has the capability of performing plasma gouging with the proper consumables attached to the torch. In general, gouging consumables provide a wider plasma arc compared to a cutting arc. As the material melts, it is blown forward by the pressurized gas coming out of the torch. The dross will land on the surface of the workpiece and can easily be removed after the gouging process is complete.

Technique:

Hold the torch at a 45º angle to the workpiece. Pull the torch trigger to start the gouging arc. As the material is removed move the torch forward to continue removing material. When the desired amount of material has been removed, release the torch trigger to stop the gouging process.

Typically, the larger the angle between the torch and the workpiece, the deeper and slower the gouging. As the torch angle is decreased, less material is removed and the travel speeds can be increased. Keeping the torch fixed while moving forward will remove a straight line of material. Using a side-to-side, weaving motion will remove a wider area of material. The output of the Tomahawk 1000 can also be increased or decreased to control the amount of material being removed. Most users tend to maximize the output in order to remove the most material in a short amount of time.

Applications:

Removing weld imperfections – cracks, porosity, inclusions, etc.

Back gouging for welding preparation

Removal of temporary fit up methods – tack welds, bracketing, etc.

⚠ WARNING

ELECTRIC SHOCK CAN KILL.

- **Turn off machine at the disconnect switch on the rear of the machine before tightening, cleaning or replacing consumables.**

TORCH

- Clean spatter and scale from the nozzle frequently.
- During operation, if the Parts in Place Yellow LED light together:
- Check the assembly of the torch consumables. If they are not properly in place, the machine will not start. Make sure that the shield cup is hand tight. Do not use pliers or over tighten.
- Check the conditions on the inside of the nozzle. If debris has collected, rub the inside of the nozzle to remove any oxide layer that may have built up. Refer to "Suggestions for Extra Utility from the Tomahawk® 1000 system".
- Check the condition of the electrode. If the end has a crater-like appearance, replace it along with the nozzle. The maximum wear depth of the electrode is approximately .062". A green and erratic arc will indicate definite electrode failure and the electrode should be replaced immediately.
- Replace the nozzle when the orifice exit is eroded away or oval shaped.
- After the problem is found, or if there is nothing apparently wrong, the machine may need to be reset by turning the power switch OFF and then ON again. (It is possible for electrical noise to trip the safety circuit on rare occasions. This should not be a regular occurrence.)
- If the machine does not reset or continues to trip, consult the Troubleshooting Section.
- Use the proper cutting procedures referred to in Procedure Recommendations.

PILOT ARC DISCUSSION

The Tomahawk® 1000 has a smooth, continuous pilot arc. The pilot arc is only a means of transferring the arc to the workpiece for cutting. Repeated pilot arc starts, in rapid succession, is not recommended as these starts will generally reduce consumable life. Occasionally, the pilot arc may sputter or start intermittently. This is aggravated when the consumables are worn or the air pressure is too high. Always keep in mind that the pilot arc is designed to transfer the arc to the workpiece and not for numerous starts without cutting.

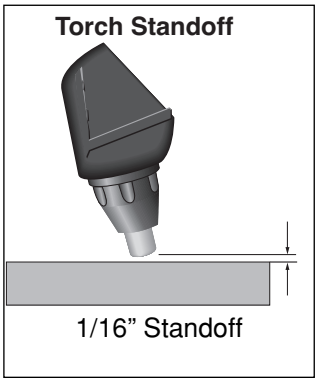
The Tomahawk® 1000 does not utilize high frequency starting. When the pilot arc is started, a slight impulse will be felt in the torch handle. This occurrence is normal and is the mechanism which starts the plasma arc. This impulse can also be used to help troubleshoot a "no start" condition.

PROCEDURE RECOMMENDATIONS

When properly used, plasma arc cutting is a very economical process. Improper use will result in a very high operating cost.

General - In All Cases

- Follow safety precautions as printed throughout this operating manual and on the machine.
- If piercing is required, slowly lower the torch at an angle of about 30° to blow the dross away from the torch tip and slowly rotate the torch to a vertical position as the arc becomes deeper. This process will blow a lot of molten metal and dross. Be careful! Blow the dross away from the torch, the operator and any flammable objects.
- The nozzle should not be dragged on the metal surface. A drag spacer is provided to maintain a consistant touch height. Refer to Touch Parts Configurations in this Section.
- Where possible, start the cut from the edge of the work piece.
- Keep moving! A steady speed is necessary. Do not pause.



SUGGESTIONS FOR EXTRA UTILITY FROM THE TOMAHAWK® 1000 SYSTEM:

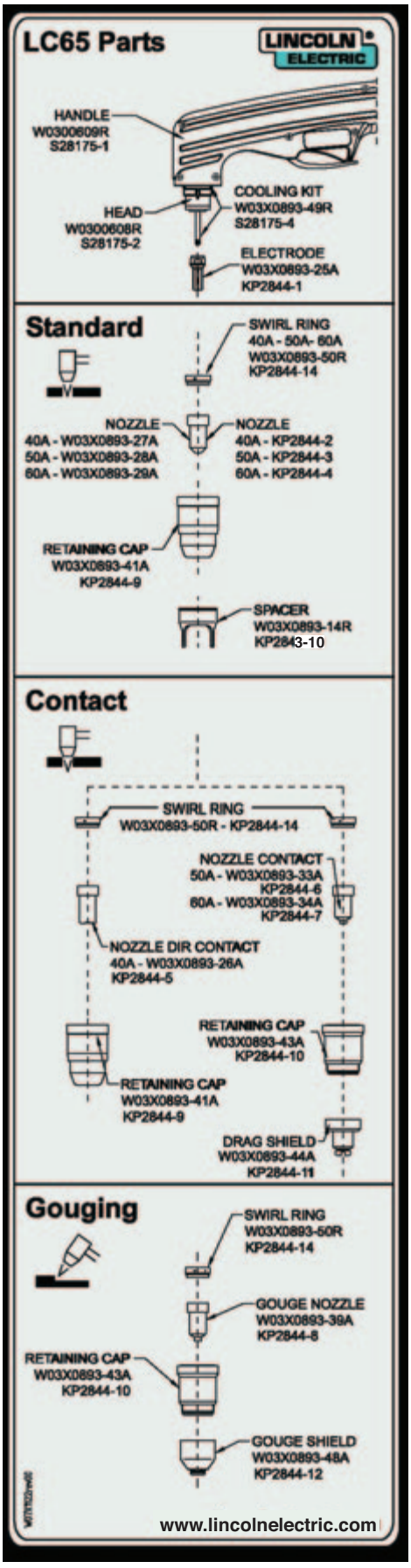
⚠ WARNING

ELECTRIC SHOCK CAN KILL.

- **Turn off machine at the disconnect switch on the rear of the machine before tightening, cleaning or replacing consumables.**

1. Occasionally an oxide layer may form over the tip of the electrode, creating an insulating barrier between the electrode and nozzle. This will result in false starts. When this happens turn the power off, remove the shield cup and nozzle. Rub the inside surface of the nozzle, this will help remove any oxide buildup. Also, clean any oxide build up from the electrode. Replace the shield cup and nozzle, turn on the power and continue cutting. If false starts continue to occur after cleaning the consumables, then replace them with a new set. Do not continue to try and cut with excessively worn consumables as this can cause damage to the torch head and will degrade cut quality. Do not allow torch cable or body to contact hot surfaces.

2. To improve consumable life, here are some suggestions that may be useful:
   - Make sure the air supply to the Tomahawk® 1000 is clean and free of oil. Use several extra in line filters if necessary.
   - Minimize dross buildup on the nozzle tip by starting the cut from the edge of the plate when possible.
   - Pierce cutting should be done only when necessary. If piercing, angle torch about 30° from the plane perpendicular to the work piece, transfer the arc, then bring the torch perpendicular to the work and begin parallel movement.
   - Reduce the number of pilot arc starts without transferring to the work.
   - Reduce the pilot arc time before transferring to the work.
   - Set air pressure to recommended setting. A higher or lower pressure will cause turbulence in the plasma arc, eroding the orifice of the nozzle tip.
   - Use only Lincoln consumable parts. These parts are patented and using any other replacement consumables may cause damage to the torch or reduce cut quality.

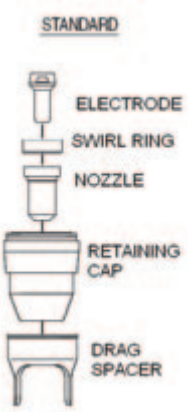


TORCH PART CONFIGURATIONS

Different hand held torch configurations are available depending on the cutting or gouging application.

Standard Cutting Setup:

In the Standard Cutting configuration the nozzle is designed not to touch the work piece. The advantage of this cutting method is good visibility of the arc. However it requires a steady hand to avoid touching the nozzle to the work piece which will cause premature nozzle wear and a jagged cut. An optional drag spacer can be attached to the retaining cap to maintain a consistent arc height.

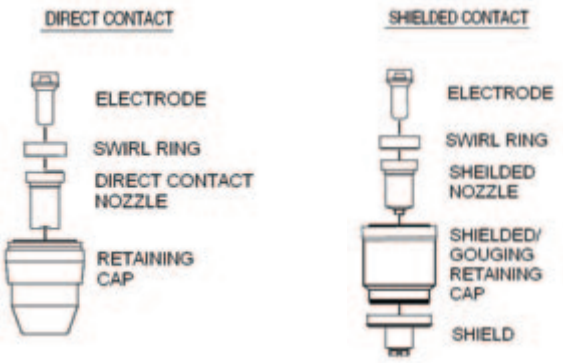


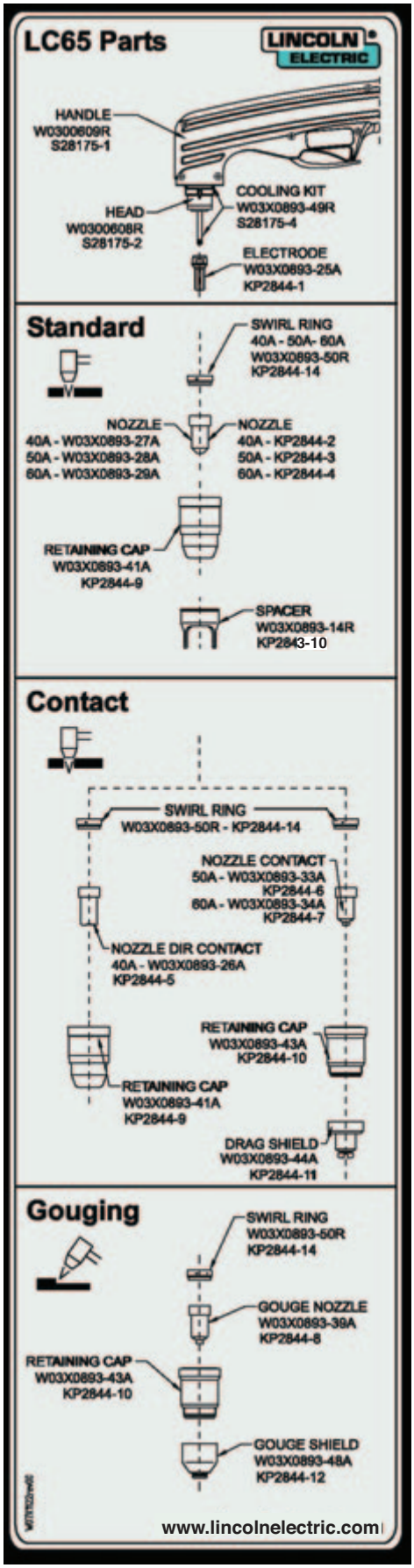
Contact Cutting Setup:

Contact Cutting uses special expendable parts that allow the torch to touch the work piece. The advantage of contact cutting is that the torch can touch the work piece, steadily dragging it across the surface. The disadvantage of contact cutting is the plasma arc is not as visible as with a standard torch set-up.

There are two types of contact cutting:

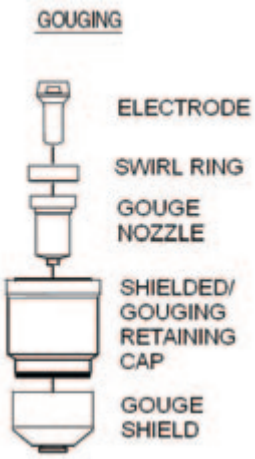
1. Direct contact. A special non-insulated nozzle is used that can touch the work piece directly. This set up is designed for applications below 40 amps.
2. Shielded contact. A special insulated nozzle is used in conjunction with a special drag shield. Shielded contact set-ups are for applications greater than 40 amps.





GOUGING SETUP:

If gouging metal and not cutting completely through the part is required, a special gouging nozzle is used in conjunction with a gouge shield to protect the nozzle from molten metal blow back.



Refer to the torch parts decal located on your machine or the parts pages at the back of this manual for the specific part numbers required for each of these setups.

ALWAYS USE GENUINE LINCOLN ELECTRIC ELECTRODES, NOZZLES, AND EXPENDABLE PARTS FOR THE BEST CUTTING PERFORMANCE.

MACHINE INTERFACE

The TOMAHAWK™ 1000 comes standard with a machine interface. Interface signals provided include: arc start, arc initiated, and arc voltage. These signals are accessible through the 14 pin connector on the case front.

Arc Start:

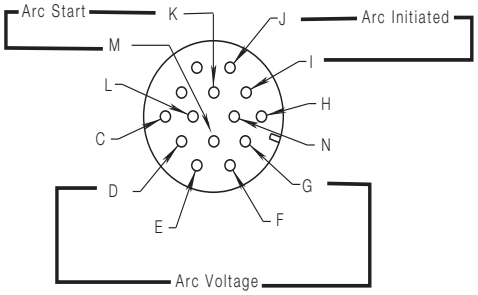
The Arc Start circuit allows for triggering of the power source to commence cutting. This circuit can be accessed through pins K and M of the 14 pin connector. The circuit has a 15 VDC nominal open circuit voltage and requires a dry contact closure to activate.

Arc Initiated:

The Arc Initiated circuit provides information as to when a cutting arc has transferred to the work piece. This circuit can be accessed through pins I and J of the 14 pin connector. The circuit provides a dry contact closure when the arc has transferred. Input to this circuit should be limited to 0.3 A for either 120VAC or 30VDC.

Arc Voltage:

The Arc Voltage circuit can be used for activating a torch height control. This circuit can be accessed through pins D and G of the 14 pin connector. The circuit provides full electrode to work arc voltage (no voltage divider, 270VDC maximum).



14-PIN BOX RECEPTACLE, FRONT VIEW

Users wishing to utilize the Machine Interface can order a K867 Universal Adapter (please adhere to the pin locations stated above) or manufacture a 14 pin connector cable assembly.

ACCESSORIES

The following options/accessories are available for your Tomahawk™ Plasma cutter from your local Lincoln Distributor.

K2886-1 - Plasma Circle Cutting Kit - For cutting circles from 3” to 33” in diameter (77mm to 838mm).

TORCHES

The following replacement or optional torches are available:

K2848-1 LC65 Handheld Plasma Torch 25' (7.5m)

K2848-2 LC65 Handheld Plasma Torch 50' (15m)

K2848-3 LC65M Mechanized Plasma Torch 25' (7.5m)

EXPENDABLE PARTS

Refer to the torch parts decal located on your machine or the parts pages at the back of this manual for the specific part numbers required for each of these setups.

MAINTENANCE

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK CAN KILL.

- **Have an electrician install and service this equipment.**
- **Turn the input power off at the fuse box before working on equipment.**
- **Do not touch electrically hot parts.**

ROUTINE MAINTENANCE

1. Keep the cutting or gouging area and the area around the machine clean and free of combustible materials. No debris should be allowed to collect which could obstruct air flow to the machine.
2. Every 6 months or so, the machine should be cleaned with a low pressure airstream. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean these areas:
   - Printed circuit boards and heat sinks
   - Power switch

⚠ CAUTION

When using a low pressure air stream, wear appropriate eye protection.

3. Examine the sheet metal case for dents or breakage. Repair the case as required. Keep the case in good condition to insure that high voltage parts are protected and correct spacings are maintained. All external sheet metal screws must be in place to insure case strength and electrical ground continuity.
4. Inspect the cable periodically for any slits or puncture marks in the cable jacket. Replace if necessary. Check to make sure that nothing is crushing the cable and blocking the flow of air through the air tube inside. Also, check for kinks in the cable periodically and relieve any so as not to restrict the flow of air to the torch.

PERIODIC MAINTENANCE

⚠ WARNING

ELECTRIC SHOCK CAN KILL.

- **Turn off machine at the disconnect switch on the rear of the machine before tightening, cleaning or replacing consumables.**

Change consumables as required.

Thermal Protection

Thermal Detection Devices protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperatures should occur, the yellow thermal LED will light and the Detection Devices will prevent output voltage or current.

These Detection Devices are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the Power Switch may be left on and the reset should occur within a 15 minute period. If the fan is not turning or the air intake louvers were obstructed, then the power must be switched off and the fan problem or air obstruction must be corrected.

TROUBLESHOOTING

How to Use Troubleshooting Guide

⚠ WARNING

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM).

Look under the column labeled "PROBLEM (SYMPTOMS)." This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting.

Step 2. POSSIBLE CAUSE.

The second column labeled "POSSIBLE CAUSE" lists the obvious external possibilities that may contribute to the machine symptom.

Step 3. RECOMMENDED COURSE OF ACTION

This column provides a course of action for the Possible Cause, generally it states to contact your local Lincoln Authorized Field Service Facility.

If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Lincoln Authorized Field Service Facility.

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Turn off machine at the disconnect switch on the rear of the machine and remove main power supply connections before doing any troubleshooting.**

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
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PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
Input circuit breaker trips repeatedly.	1. Check that the circuit breakers did not trip.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
	2. Install a larger input circuit or turn the output control to a lower amperage.	
No Status indicators light and the fan does not operate 5 seconds after the power switch is turned on.	1. Check the input power to be sure it is on.	
	2. Check the power line fuses or breakers and machine connection.	
	3. Disconnect input power at fuse/breaker panel and check line switch continuity. Replace line switch if bad.	
No Status indicators light 5 seconds after the power switch is turned on, but the fan operates.	1. Possible faulty Control Board.	
The Thermal LED does not go out.	1. Possible faulty Control board.	
The Tomahawk® 1000 powers up properly but there is no response when the trigger is pulled and only the POWER LED is lit.	1. Turn the output knob to purge zone on the front of the Tomahawk® 1000 . If air does not flow, then: • The main gas solenoid assembly/pressure sensor may be faulty. Check or replace. • Possible faulty Control board.	
	2. Remove the handles (or barrel) of the torch and examine all the connections.	
	3. Check for proper trigger switch operation. Replace the trigger switch or torch cable if defective.	
	4. Possible faulty Control board.	
When the trigger is pulled air begins to flow, but there is no pilot arc after at least 3 seconds.	1. Check the torch consumables to be sure they are not dirty or greasy, and are in good shape. Replace the consumables if necessary.	
	2. Make sure the air pressure is set correctly.	
	3. Make sure there are no kinks or restrictions for air flow in the torch cable. Replace cable as needed.	
	4. If a slight thump cannot be felt in the torch when the trigger is pulled, check for loose connection in the torch head.	
	5. Possible faulty Control board.	
The air begins to flow and there is a very brief arc that snaps out consistently with repeated trigger pulls.	1. Check the torch consumables to be sure they are in tight, not dirty or greasy and in good shape. Replace if necessary.	
	2. Make sure the air pressure is set correctly.	
	3. Possible faulty in Control board.	

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.

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PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
The arc starts but sputters badly.	1. Check the torch consumables to be sure they are in tight, not dirty or greasy and in good shape. Replace if necessary.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
	2. Check air supply for oil or a great deal of water. If there is oil or a great deal of water, the air must be filtered or the machine switched to nitrogen or bottled air.	
	3. Make sure the air pressure is set correctly.	
Pilot arc starts but will not transfer when brought near work.	1. Check work lead connection for clean, secure connection.	
	2. Plasma will only cut conductive material. Do not attempt to cut fiberglass, plastic, rubber, PVC or any other non-conductive material.	
	3. Make sure work piece is clean and dry. Remove any scale, rust or dross.	
	4. Check all connections to Control board.	
	5. Possible faulty Control board.	

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.

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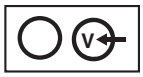
STATUS BOARD INDICATORS

SYMPTOM	CHECK
Yellow Gas Pressure LED is lit and steady.	1. Make sure there is at least 80 psi connected to the gas connection at the back of the machine. 2. Turn the output knob to the purge zone and set the regulator to the correct pressure. The pressure may increase when air stops flowing but this is normal. Do not reset the pressure while the air is OFF. 3. Possible faulty Pressure Switch. 4. Possible faulty Control board.
The Yellow Parts In Place LED is lit and steady.	1. Verify Torch consumables are in good condition and properly installed. If torch and consumables are properly installed, the Yellow LED should turn off. The unit may be required to have the input power turned off then back on. Normal cutting or gouging can resume.
The Thermal LED is lit.	1. The machine's thermostat has tripped due to exceeded duty cycle limits. Do NOT turn the power off. Allow the machine to cool for 15 - 30 minutes and the thermostat will reset itself. 2. The machine's air louvers or fans are obstructed such that air cannot flow to properly cool the machine. Remove any foreign material that may block air flow. Blow the machine out with a clean, dry air stream. 3. Possible faulty Control board.

Error condition list.

At first, try turning the machine OFF, wait for a few seconds, then turn the machine ON again. If the error remains, troubleshooting is required. Please contact the nearest technical service center or Lincoln Electric and report the LED Status found on the machine Front Panel.

	 **On (Green LED)**	 **Blink (Red LED)**	 **Blink (Yellow)**
Head Torch	1. This occurs if after 4 seconds the Pilot Arc isn't transfered to the workpiece. The machine stops the pilot arc to avoid overheating the Torch Head. 2. To restore the machine: • Release the Torch Trigger pushbutton. The blinking LEDs will change to steady ON. • Pull the Torch Trigger and verify correct operation.		

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
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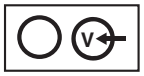
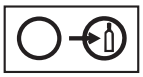
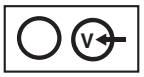
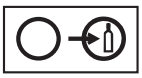
Error condition list

	 **On (Green LED)**	 **On (Yellow LED)**	 **On (Yellow LED)**	
No pilot arc established	1. The Torch Trigger pushbutton is pressed. During this period the machine will attempt to start the pilot arc for 4 times. If the pilot arc does not start, the machine automatically will enter into a safe status condition that will allow troubleshooting as necessary. 2. To restore the machine: • Turn OFF the Power switch. • Check the correct placement of the Torch Head consumables and parts. • Check the Torch electrical connections. • Turn ON the machine.			
	 **On(Green LED)**	 **On (Yellow LED)**	 **On (Yellow LED)**	 **On (Yellow LED)**
Trigger Pushed	1. This occurs if the machine is turned ON (or if it is restarted after Thermal reset) with the Torch Trigger pulled. This condition avoids unsafe operating conditions. The machine is disabled such that manual cutting or gouging processes can ONLY be initiated under the direct control of the operator. 2. To restore the machine: • Release the Torch Trigger. • The LED's will return to normal status and cutting or Gouging may resume. 3. If this error condition persists, check for eventual malfunctions of the Torch Trigger pushbutton.			

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
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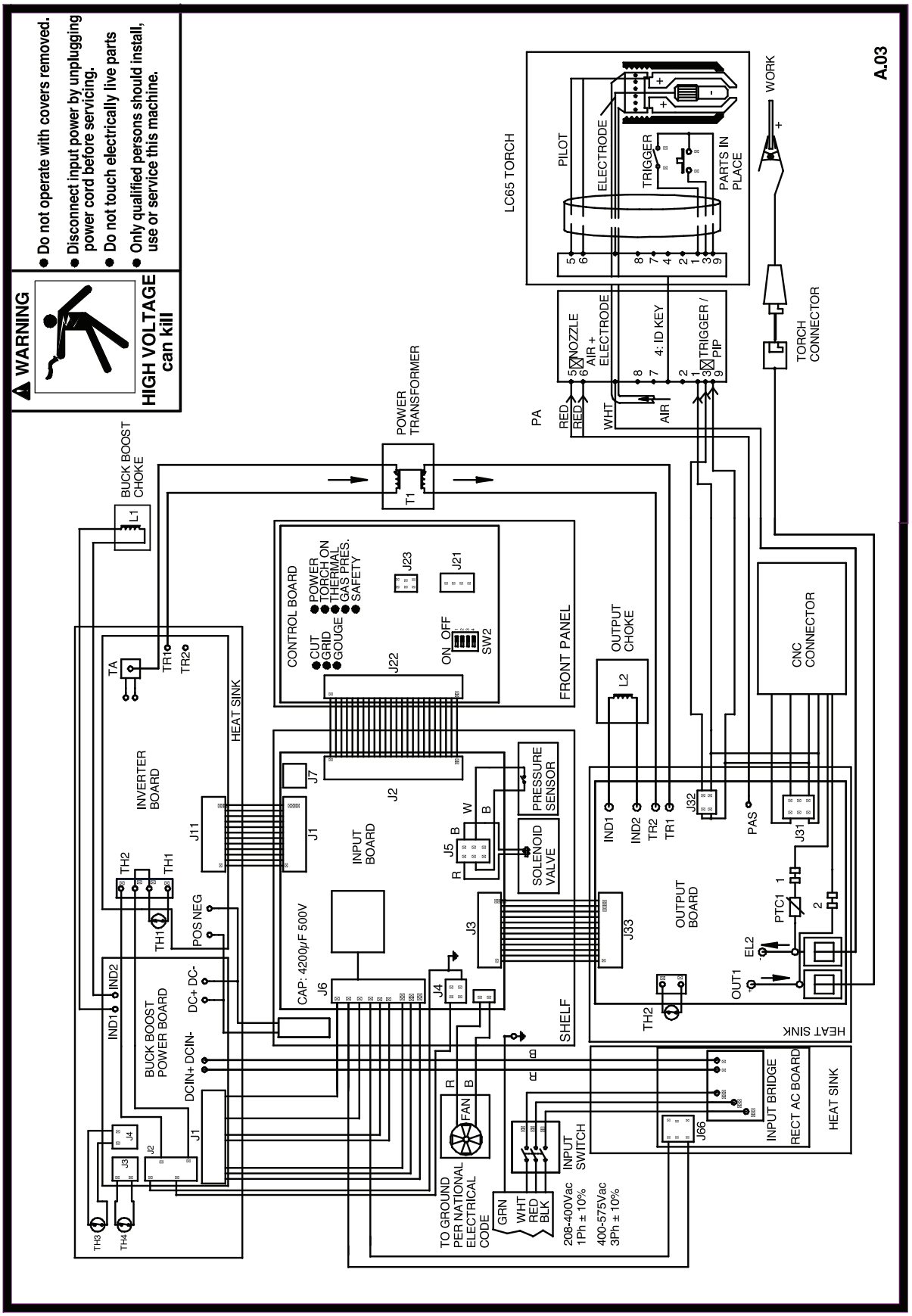
WIRING DIAGRAM



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is included with the machine. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number.

			
WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aislese del trabajo y de la tierra.	● Mantenga el material combustible fuera del área de trabajo.	● Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre.	● Gardez à l'écart de tout matériel inflammable.	● Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden!	● Entfernen Sie brennbarres Material!	● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra.	● Mantenha inflamáveis bem guardados.	● Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。	● 燃えやすいものの側での溶接作業は絶対にしてはなりません。	● 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	● 皮肤或濕衣物切勿接觸帶電部件及銲條。 ● 使你自己與地面和工件絕緣。	● 把一切易燃物品移離工作場所。	● 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	● 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. ● 모재와 접지를 접촉치 마십시요.	● 인화성 물질을 접근 시키지 마시요.	● 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل.	● ضع المواد القابلة للاشتعال في مكان بعيد.	● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			
● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone.	● Turn power off before servicing.	● Do not operate with panel open or guards off.	**WARNING**
● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.	● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	● No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	● Débranchez le courant avant l'entretien.	● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
● Vermeiden Sie das Einatmen von Schweibrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
● Mantenha seu rosto da fumaça. ● Use ventilação e exhaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os paineis abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
●頭部遠離煙霧。 ●在呼吸區使用通風或排風器除煙。	●維修前切斷電源。	●儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的説明以及應該使用的銀捍材料，並請遵守貴方的有関勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.

CUSTOMER ASSISTANCE POLICY

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.

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