



ESP-101

Plasma Arc Cutting System



Instruction Manual

This manual provides installation and operation instructions for the following ESP-101 cutting packages starting with Serial No.: PxxJ943xxx

Consoles:

P/N 0558004880 - ESP-101 460V

P/N 0558005215 - ESP-101 380-400V CE

**BE SURE THIS INFORMATION REACHES THE OPERATOR.
YOU CAN GET EXTRA COPIES THROUGH YOUR SUPPLIER.**

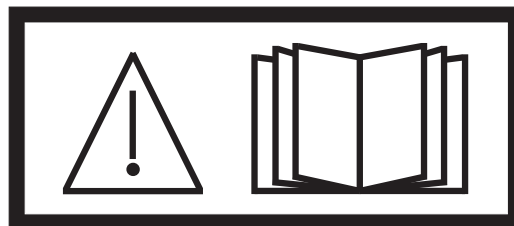


These INSTRUCTIONS are for experienced operators. If you are not fully familiar with the principles of operation and safe practices for arc welding and cutting equipment, we urge you to read our booklet, "Precautions and Safe Practices for Arc Welding, Cutting, and Gouging," Form 52-529. Do NOT permit untrained persons to install, operate, or maintain this equipment. Do NOT attempt to install or operate this equipment until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your supplier for further information. Be sure to read the Safety Precautions before installing or operating this equipment.

USER RESPONSIBILITY

This equipment will perform in conformity with the description thereof contained in this manual and accompanying labels and/or inserts when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Malfunctioning or poorly maintained equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, the manufacturer recommends that a telephone or written request for service advice be made to the Authorized Distributor from whom it was purchased.

This equipment or any of its parts should not be altered without the prior written approval of the manufacturer. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than the manufacturer or a service facility designated by the manufacturer.



READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.

PROTECT YOURSELF AND OTHERS!

TABLE OF CONTENTS

1.0 Safety Precautions.....	5
1.1 Safety - English	5
1.2 Safety - Spanish.....	9
1.3 Safety - French.....	13
2.0 Description.....	17
2.1 General	17
2.2 Scope	17
2.3 ESP-101 Plasma Arc Cutting System:	18
2.4 Package Ordering Information:.....	19
2.5 PT-37 Torch Data.....	19
2.6 System and Optional Accessories.....	20
3.0 Installation	21
3.1 General	21
3.2 Equipment Required.....	21
3.3 Placement and Location	21
3.4 Inspection.....	21
3.5 Primary Input Connections.....	22
3.5.1 TUA2 Auto-Transformer Primary Input Connections	24
3.5.2 Input Air Connection.....	26
3.6 CNC Interface Connection.....	27
3.6 CNC Interface Connection (continued).....	28
3.7 Voltage Divider Adjustment	29
3.7.1 Output Voltage Sample.....	29
3.8 Secondary Output Connections for Mechanized Cutting	30
3.9 PT-37 Torch Installation	31
3.10 Remote Junction Box Installation.....	32
4.0 Operation	37
4.1 ESP-101 Controls	37
4.2 Cutting with the ESP-101	40
4.3 Electrode Wear	40
4.4 Standoff and Cut Quality	41
4.5 Dross Formation.....	42
4.6 Common Cutting Issues.....	43
5.0 Maintenance	45
5.1 General.....	45
5.2 Inspection and Cleaning	45
5.3 IGBT Handling & Replacement	46
5.4 Module Replacement	46

TABLE OF CONTENTS

6.0 Troubleshooting	47
6.1 Troubleshooting	47
6.2 List of Help Codes	48
6.3 Troubleshooting Guide	49
6.4 Troubleshooting Remote Junction Box installation	52
6.5 Reference Voltage Checks	53
6.6 Sequence of Operation	54
7.0 Replacement Parts	55
7.1 General	55
7.2 Ordering	55
7.3 Torque Recommendations	56
7.4 Selecting Air Pressure Units of Measure	57
7.5 Display Board Assembly	57

1.0 Safety Precautions



WARNING: These Safety Precautions are for your protection. They summarize precautionary information from the references listed in Additional Safety Information section. Before performing any installation or operating procedures, be sure to read and follow the safety precautions listed below as well as all other manuals, material safety data sheets, labels, etc. Failure to observe Safety Precautions can result in injury or death.



PROTECT YOURSELF AND OTHERS -- Some welding, cutting, and gouging processes are noisy and require ear protection. The arc, like the sun, emits ultraviolet (UV) and other radiation and can injure skin and eyes. Hot metal can cause burns. Training in the proper use of the processes and equipment is essential to prevent accidents. Therefore:

1. Always wear safety glasses with side shields in any work area, even if welding helmets, face shields, and goggles are also required.
2. Use a face shield fitted with the correct filter and cover plates to protect your eyes, face, neck, and ears from sparks and rays of the arc when operating or observing operations. Warn bystanders not to watch the arc and not to expose themselves to the rays of the electric-arc or hot metal.
3. Wear flameproof gauntlet type gloves, heavy long-sleeve shirt, cuffless trousers, high-topped shoes, and a welding helmet or cap for hair protection, to protect against arc rays and hot sparks or hot metal. A flameproof apron may also be desirable as protection against radiated heat and sparks.
4. Hot sparks or metal can lodge in rolled up sleeves, trouser cuffs, or pockets. Sleeves and collars should be kept buttoned, and open pockets eliminated from the front of clothing.
5. Protect other personnel from arc rays and hot sparks with a suitable non-flammable partition or curtains.
6. Use goggles over safety glasses when chipping slag or grinding. Chipped slag may be hot and can fly far. Bystanders should also wear goggles over safety glasses.

1.1 Safety - English



FIRES AND EXPLOSIONS -- Heat from flames and arcs can start fires. Hot slag or sparks can also cause fires and explosions. Therefore:

1. Remove all combustible materials well away from the work area or cover the materials with a protective non-flammable covering. Combustible materials include wood, cloth, sawdust, liquid and gas fuels, solvents, paints and coatings, paper, etc.
2. Hot sparks or hot metal can fall through cracks or crevices in floors or wall openings and cause a hidden smoldering fire or fires on the floor below. Make certain that such openings are protected from hot sparks and metal."
3. Do not weld, cut or perform other hot work until the work piece has been completely cleaned so that there are no substances on the work piece which might produce flammable or toxic vapors. Do not do hot work on closed containers. They may explode.
4. Have fire extinguishing equipment handy for instant use, such as a garden hose, water pail, sand bucket, or portable fire extinguisher. Be sure you are trained in its use.
5. Do not use equipment beyond its ratings. For example, overloaded welding cable can overheat and create a fire hazard.
6. After completing operations, inspect the work area to make certain there are no hot sparks or hot metal which could cause a later fire. Use fire watchers when necessary.
7. For additional information, refer to NFPA Standard 51B, "Fire Prevention in Use of Cutting and Welding Processes", available from the National Fire Protection Association, Battery march Park, Quincy, MA 02269.



ELECTRICAL SHOCK -- Contact with live electrical parts and ground can cause severe injury or death. **DO NOT** use AC welding current in damp areas, if movement is confined, or if there is danger of falling.

1. Be sure the power source frame (chassis) is connected to the ground system of the input power.
2. Connect the work piece to a good electrical ground.
3. Connect the work cable to the work piece. A poor or missing connection can expose you or others to a fatal shock.
4. Use well-maintained equipment. Replace worn or damaged cables.
5. Keep everything dry, including clothing, work area, cables, torch/electrode holder, and power source.
6. Make sure that all parts of your body are insulated from work and from ground.
7. Do not stand directly on metal or the earth while working in tight quarters or a damp area; stand on dry boards or an insulating platform and wear rubber-soled shoes.
8. Put on dry, hole-free gloves before turning on the power.
9. Turn off the power before removing your gloves.
10. Refer to ANSI/ASC Standard Z49.1 (listed on next page) for specific grounding recommendations. Do not mistake the work lead for a ground cable.



ELECTRIC AND MAGNETIC FIELDS — May be dangerous. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding and cutting current creates EMF around welding cables and welding machines. Therefore:

1. Welders having pacemakers should consult their physician before welding. EMF may interfere with some pacemakers.
2. Exposure to EMF may have other health effects which are unknown.

3. Welders should use the following procedures to minimize exposure to EMF:
 - A. Route the electrode and work cables together. Secure them with tape when possible.
 - B. Never coil the torch or work cable around your body.
 - C. Do not place your body between the torch and work cables. Route cables on the same side of your body.
 - D. Connect the work cable to the work piece as close as possible to the area being welded.
 - E. Keep welding power source and cables as far away from your body as possible.

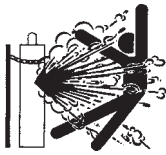


FUMES AND GASES -- Fumes and gases, can cause discomfort or harm, particularly in confined spaces. Do not breathe fumes and gases. Shielding gases can cause asphyxiation.

Therefore:

1. Always provide adequate ventilation in the work area by natural or mechanical means. Do not weld, cut, or gouge on materials such as galvanized steel, stainless steel, copper, zinc, lead, beryllium, or cadmium unless positive mechanical ventilation is provided. Do not breathe fumes from these materials.
2. Do not operate near degreasing and spraying operations. The heat or arc rays can react with chlorinated hydrocarbon vapors to form phosgene, a highly toxic gas, and other irritant gases.
3. If you develop momentary eye, nose, or throat irritation while operating, this is an indication that ventilation is not adequate. Stop work and take necessary steps to improve ventilation in the work area. Do not continue to operate if physical discomfort persists.
4. Refer to ANSI/ASC Standard Z49.1 (see listing below) for specific ventilation recommendations.

5. 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.)



CYLINDER HANDLING -- Cylinders, if mishandled, can rupture and violently release gas. Sudden rupture of cylinder, valve, or relief device can injure or kill. Therefore:

1. Use the proper gas for the process and use the proper pressure reducing regulator designed to operate from the compressed gas cylinder. Do not use adaptors. Maintain hoses and fittings in good condition. Follow manufacturer's operating instructions for mounting regulator to a compressed gas cylinder.
2. Always secure cylinders in an upright position by chain or strap to suitable hand trucks, undercarriages, benches, walls, post, or racks. Never secure cylinders to work tables or fixtures where they may become part of an electrical circuit.
3. When not in use, keep cylinder valves closed. Have valve protection cap in place if regulator is not connected. Secure and move cylinders by using suitable hand trucks. Avoid rough handling of cylinders.
4. Locate cylinders away from heat, sparks, and flames. Never strike an arc on a cylinder.
5. For additional information, refer to CGA Standard P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders", which is available from Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.



EQUIPMENT MAINTENANCE -- Faulty or improperly maintained equipment can cause injury or death. Therefore:

1. Always have qualified personnel perform the installation, troubleshooting, and maintenance work. Do not perform any electrical work unless you are qualified to perform such work.
2. Before performing any maintenance work inside a power source, disconnect the power source from the incoming electrical power.
3. Maintain cables, grounding wire, connections, power cord, and power supply in safe working order. Do not operate any equipment in faulty condition.
4. Do not abuse any equipment or accessories. Keep equipment away from heat sources such as furnaces, wet conditions such as water puddles, oil or grease, corrosive atmospheres and inclement weather.
5. Keep all safety devices and cabinet covers in position and in good repair.
6. Use equipment only for its intended purpose. Do not modify it in any manner.



ADDITIONAL SAFETY INFORMATION -- For more information on safe practices for electric arc welding and cutting equipment, ask your supplier for a copy of "Precautions and Safe Practices for Arc Welding, Cutting and Gouging", Form 52-529.

The following publications, which are available from the American Welding Society, 550 N.W. LeJuene Road, Miami, FL 33126, are recommended to you:

1. ANSI/ASC Z49.1 - "Safety in Welding and Cutting"
2. AWS C5.1 - "Recommended Practices for Plasma Arc Welding"
3. AWS C5.2 - "Recommended Practices for Plasma Arc Cutting"
4. AWS C5.3 - "Recommended Practices for Air Carbon Arc Gouging and Cutting"

- 5. AWS C5.5 - "Recommended Practices for Gas Tungsten Arc Welding"
- 6. AWS C5.6 - "Recommended Practices for Gas Metal Arc Welding"
- 7. AWS SP - "Safe Practices" - Reprint, Welding Handbook.
- 8. ANSI/AWS F4.1, "Recommended Safe Practices for Welding and Cutting of Containers That Have Held Hazardous Substances."



MEANING OF SYMBOLS - As used throughout this manual: Means Attention! Be Alert! Your safety is involved.



Means immediate hazards which, if not avoided, will result in immediate, serious personal injury or loss of life.



Means potential hazards which could result in personal injury or loss of life.



Means hazards which could result in minor personal injury.

Enclosure Class

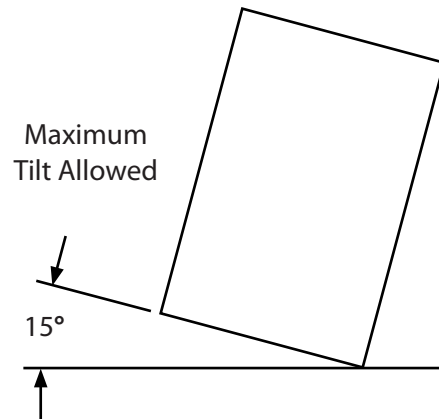
The **IP** code indicates the enclosure class, i.e. the degree of protection against penetration by solid objects or water. Protection is provided against touch with a finger, penetration of solid objects greater than 12mm and against spraying water up to 60 degrees from vertical. Equipment marked **IP23S** may be stored, but is not intended to be used outside during precipitation unless sheltered.



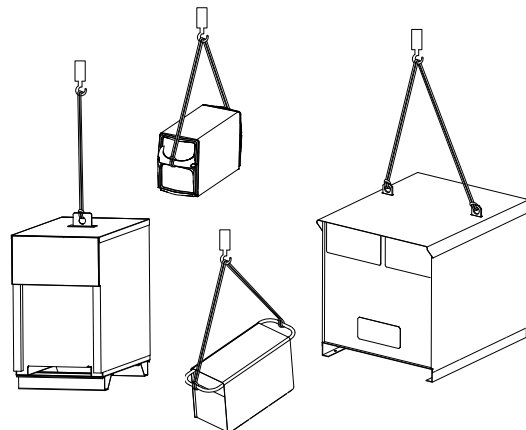
This product is solely intended for plasma cutting. Any other use may result in personal injury and / or equipment damage.



If equipment is placed on a surface that slopes more than 15°, toppling over may occur. Personal injury and / or significant damage to equipment is possible.



To avoid personal injury and/or equipment damage, lift using method and attachment points shown here.



1.2 Safety - Spanish



ADVERTENCIA: Estas Precauciones de Seguridad son para su protección. Ellas hacen resumen de información proveniente de las referencias listadas en la sección "Información Adicional Sobre La Seguridad". Antes de hacer cualquier instalación o procedimiento de operación, asegúrese de leer y seguir las precauciones de seguridad listadas a continuación así como también todo manual, hoja de datos de seguridad del material, calcomanías, etc. El no observar las Precauciones de Seguridad puede resultar en daño a la persona o muerte.



PROTEJASE USTED Y A LOS DEMAS-- Algunos procesos de soldadura, corte y ranurado son ruidosos y requieren protección para los oídos. El arco, como el sol, emite rayos ultravioleta (UV) y otras radiaciones que pueden dañar la piel y los ojos. El metal caliente causa quemaduras. EL entrenamiento en el uso propio de los equipos y sus procesos es esencial para prevenir accidentes. Por lo tanto:

1. Utilice gafas de seguridad con protección a los lados siempre que esté en el área de trabajo, aún cuando esté usando careta de soldar, protector para su cara u otro tipo de protección.
2. Use una careta que tenga el filtro correcto y lente para proteger sus ojos, cara, cuello, y oídos de las chispas y rayos del arco cuando se esté operando y observando las operaciones. Alerta a todas las personas cercanas de no mirar el arco y no exponerse a los rayos del arco eléctrico o el metal fundido.
3. Use guantes de cuero a prueba de fuego, camisa pesada de mangas largas, pantalón de ruedo liso, zapato alto al tobillo, y careta de soldar con capucha para el pelo, para proteger el cuerpo de los rayos y chispas calientes provenientes del metal fundido. En ocasiones un delantal a prueba de fuego es necesario para protegerse del calor radiado y las chispas.
4. Chispas y partículas de metal caliente puede alojarse en las mangas enrolladas de la camisa, el ruedo del pantalón o los bolsillos. Mangas y cuellos deberán mantenerse abotonados, bolsillos al frente de la camisa deberán ser cerrados o eliminados.
5. Proteja a otras personas de los rayos del arco y chispas calientes con una cortina adecuada no-flamable como división.
6. Use careta protectora además de sus gafas de seguridad cuando esté removiendo escoria o puliendo.

La escoria puede estar caliente y desprenderse con velocidad. Personas cercanas deberán usar gafas de seguridad y careta protectora.



FUEGO Y EXPLOSIONES -- El calor de las flamas y el arco pueden ocasionar fuegos. Escoria caliente y las chispas pueden causar fuegos y explosiones. Por lo tanto:

1. Remueva todo material combustible lejos del área de trabajo o cubra los materiales con una cobija a prueba de fuego. Materiales combustibles incluyen madera, ropa, líquidos y gases flamables, solventes, pinturas, papel, etc.
2. Chispas y partículas de metal pueden introducirse en las grietas y agujeros de pisos y paredes causando fuegos escondidos en otros niveles o espacios. Asegúrese de que toda grieta y agujero esté cubierto para proteger lugares adyacentes contra fuegos.
3. No corte, suelde o haga cualquier otro trabajo relacionado hasta que la pieza de trabajo esté totalmente limpia y libre de sustancias que puedan producir gases inflamables o vapores tóxicos. No trabaje dentro o fuera de contenedores o tanques cerrados. Estos pueden explotar si contienen vapores inflamables.
4. Tenga siempre a la mano equipo extintor de fuego para uso instantáneo, como por ejemplo una manguera con agua, cubeta con agua, cubeta con arena, o extintor portátil. Asegúrese que usted esta entrenado para su uso.
5. No use el equipo fuera de su rango de operación. Por ejemplo, el calor causado por cable sobrecarga en los cables de soldar pueden ocasionar un fuego.
6. Después de terminar la operación del equipo, inspeccione el área de trabajo para cerciorarse de que las chispas o metal caliente ocasionen un fuego más tarde. Tenga personal asignado para vigilar si es necesario.
7. Para información adicional, haga referencia a la publicación NFPA Standard 51B, "Fire Prevention in Use of Cutting and Welding Processes", disponible a través de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.



CHOQUE ELECTRICO -- El contacto con las partes eléctricas energizadas y tierra puede causar daño severo o muerte. NO use soldadura de corriente alterna (AC) en áreas húmedas, de movimiento confinado en lugares estrechos o si hay posibilidad de caer al suelo.

1. Asegúrese de que el chasis de la fuente de poder esté conectado a tierra a través del sistema de electricidad primario.
2. Conecte la pieza de trabajo a un buen sistema de tierra física.
3. Conecte el cable de retorno a la pieza de trabajo. Cables y conductores expuestos o con malas conexiones pueden exponer al operador u otras personas a un choque eléctrico fatal.
4. Use el equipo solamente si está en buenas condiciones. Reemplaze cables rotos, dañados o con conductores expuestos.
5. Mantenga todo seco, incluyendo su ropa, el área de trabajo, los cables, antorchas, pinza del electrodo, y la fuente de poder.
6. Asegúrese que todas las partes de su cuerpo están insuladas de ambos, la pieza de trabajo y tierra.
7. No se pare directamente sobre metal o tierra mientras trabaja en lugares estrechos o áreas húmedas; trabaje sobre un pedazo de madera seco o una plataforma insulada y use zapatos con suela de goma.
8. Use guantes secos y sin agujeros antes de energizar el equipo.
9. Apague el equipo antes de quitarse sus guantes.
10. Use como referencia la publicación ANSI/ASC Standard Z49.1 (listado en la próxima página) para recomendaciones específicas de como conectar el equipo a tierra. No confunda el cable de soldar a la pieza de trabajo con el cable a tierra.



CAMPOS ELECTRICOS Y MAGNETICOS - Son peligrosos. La corriente eléctrica fluye a través de cualquier conductor causando a nivel local Campos Eléctricos y Magnéticos (EMF). Las corrientes en el área de corte y soldadura, crean EMF alrededor de los cables de soldar y las maquinas. Por lo tanto:

1. Soldadores u Operadores que use marca-pasos para el corazón deberán consultar a su médico antes de soldar. El Campo Electromagnético (EMF) puede interferir con algunos marca-pasos.
2. Exponerse a campos electromagnéticos (EMF) puede causar otros efectos de salud aún desconocidos.

3. Los soldadores deberán usar los siguientes procedimientos para minimizar exponerse al EMF:

- A. Mantenga el electrodo y el cable a la pieza de trabajo juntos, hasta llegar a la pieza que usted quiere soldar. Asegúrelos uno junto al otro con cinta adhesiva cuando sea posible.
- B. Nunca envuelva los cables de soldar alrededor de su cuerpo.
- C. Nunca ubique su cuerpo entre la antorcha y el cable, a la pieza de trabajo. Mantenga los cables a un sólo lado de su cuerpo.
- D. Conecte el cable de trabajo a la pieza de trabajo lo más cercano posible al área de la soldadura.
- E. Mantenga la fuente de poder y los cables de soldar lo más lejos posible de su cuerpo.



HUMO Y GASES -- El humo y los gases, pueden causar malestar o daño, particularmente en espacios sin ventilación. No inhale el humo o gases. El gas de protección puede causar falta de oxígeno.

Por lo tanto:

1. Siempre provea ventilación adecuada en el área de trabajo por medio natural o mecánico. No solde, corte, o ranure materiales con hierro galvanizado, acero inoxidable, cobre, zinc, plomo, berilio, o cadmio a menos que provea ventilación mecánica positiva. No respire los gases producidos por estos materiales.
2. No opere cerca de lugares donde se aplique sustancias químicas en aerosol. El calor de los rayos del arco pueden reaccionar con los vapores de hidrocarburo clorinado para formar un fosfógeno, o gas tóxico, y otros irritantes.
3. Si momentáneamente desarrolla irritación de ojos, nariz o garganta mientras está operando, es indicación de que la ventilación no es apropiada. Pare de trabajar y tome las medidas necesarias para mejorar la ventilación en el área de trabajo. No continúe operando si el malestar físico persiste.
4. Haga referencia a la publicación ANSI/ASC Standard Z49.1 (Vea la lista a continuación) para recomendaciones específicas en la ventilación.

5. ADVERTENCIA-- Este producto cuando se utiliza para soldaduras o cortes, produce humos o gases, los cuales contienen químicos conocidos por el Estado de California de causar defectos en el nacimiento, o en algunos casos, Cancer. (California Health & Safety Code §25249.5 et seq.)



MANEJO DE CILINDROS-- Los cilindros, si no son manejados correctamente, pueden romperse y liberar violentamente gases. Rotura repentina del cilindro, válvula, o válvula de escape puede causar daño o muerte. Por lo tanto:

1. Utilice el gas apropiado para el proceso y utilice un regulador diseñado para operar y reducir la presión del cilindro de gas. No utilice adaptadores. Mantenga las mangueras y las conexiones en buenas condiciones. Observe las instrucciones de operación del fabricante para montar el regulador en el cilindro de gas comprimido.
2. Asegure siempre los cilindros en posición vertical y amárrelos con una correa o cadena adecuada para asegurar el cilindro al carro, transportes, tablleros, paredes, postes, o armazón. Nunca asegure los cilindros a la mesa de trabajo o las piezas que son parte del circuito de soldadura. Este puede ser parte del circuito eléctrico.
3. Cuando el cilindro no está en uso, mantenga la válvula del cilindro cerrada. Ponga el capote de protección sobre la válvula si el regulador no está conectado. Asegure y mueva los cilindros utilizando un carro o transporte adecuado. Evite el manejo brusco de los



MANTENIMIENTO DEL EQUIPO -- Equipo defectuoso o mal mantenido puede causar daño o muerte. Por lo tanto:

1. Siempre tenga personal cualificado para efectuar la instalación, diagnóstico, y mantenimiento del equipo. No ejecute ningún trabajo eléctrico a menos que usted esté cualificado para hacer el trabajo.
2. Antes de dar mantenimiento en el interior de la fuente de poder, desconecte la fuente de poder del suministro de electricidad primaria.
3. Mantenga los cables, cable a tierra, conexiones, cable primario, y cualquier otra fuente de poder en buen estado operacional. No opere ningún equipo en malas condiciones.
4. No abuse del equipo y sus accesorios. Mantenga el equipo lejos de cosas que generen calor como hornos, también lugares húmedos como charcos de agua, aceite o grasa, atmósferas corrosivas y las inclemencias del tiempo.
5. Mantenga todos los artículos de seguridad y coberturas del equipo en su posición y en buenas condiciones.
6. Use el equipo sólo para el propósito que fue diseñado. No modifique el equipo en ninguna manera.



INFORMACION ADICIONAL DE SEGURIDAD -- Para más información sobre las prácticas de seguridad de los equipos de arco eléctrico para soldar y cortar, pregunte a su proveedor por una copia de "Precautions and Safe Practices for Arc Welding, Cutting and Gouging-Form 52-529."

Las siguientes publicaciones, disponibles a través de la American Welding Society, 550 N.W. LeJuene Road, Miami, FL 33126, son recomendadas para usted:

1. ANSI/ASC Z49.1 - "Safety in Welding and Cutting"
2. AWS C5.1 - "Recommended Practices for Plasma Arc Welding"
3. AWS C5.2 - "Recommended Practices for Plasma Arc Cutting"
4. AWS C5.3 - "Recommended Practices for Air Carbon Arc Gouging and Cutting"



SIGNIFICADO DE LOS SIMBOLOS
--Según usted avanza en la lectura de este folleto: Los Símbolos Significan ¡Atención! ¡Esté Alerta! Se trata de su seguridad.



Significa riesgo inmediato que, de no ser evadido, puede resultar inmediatamente en serio daño personal o la muerte.



Significa el riesgo de un peligro potencial que puede resultar en serio daño personal o la muerte.



Significa el posible riesgo que puede resultar en menores daños a la persona.

Clase de envoltente

El código **IP** indica la clase de envoltente, es decir, el grado de protección contra la penetración de objetos sólidos o agua. Se provee protección contra el toque con un dedo, penetración de objetos sólidos de un tamaño superior a 12 mm y contra rocío de agua de hasta 60 grados de la vertical. El equipo marcado **IP23S** se puede almacenar, pero no se debe usar en el exterior durante periodos de precipitaciones a menos que esté protegido.

PRECAUCIÓN

Este producto sólo se debe usar para corte por plasma. Cualquier otro uso puede causar lesiones físicas y/o daños en los equipos.

PRECAUCIÓN

Si el equipo se coloca sobre una superficie con una inclinación superior a 15°, se puede producir un volcamiento. Es posible que se produzcan lesiones físicas y/o daños importantes en los equipos.

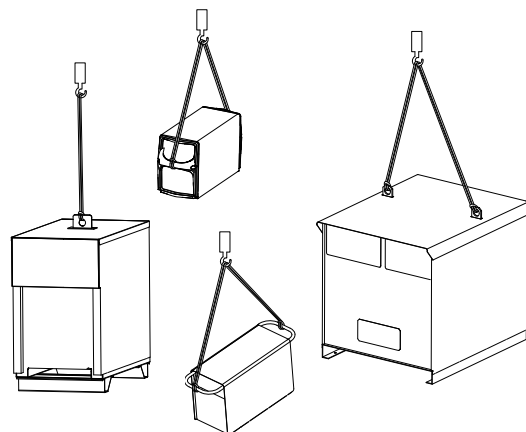
Inclinación
máxima
permitida

15°



PRECAUCIÓN

Para evitar lesiones físicas y/o daños en los equipos, levante mediante el método y los puntos de sujeción que se indican en esta ilustración.



1.3 Safety - French



AVERTISSEMENT : Ces règles de sécurité ont pour but d'assurer votre protection. Ils récapitulent les informations de précaution provenant des références dans la section des Informations de sécurité supplémentaires. Avant de procéder à l'installation ou d'utiliser l'unité, assurez-vous de lire et de suivre les précautions de sécurité ci-dessous, dans les manuels, les fiches d'information sur la sécurité du matériel et sur les étiquettes, etc. Tout défaut d'observer ces précautions de sécurité peut entraîner des blessures graves ou mortelles.



PROTÉGEZ-VOUS -- Les processus de soudage, de coupage et de gougeage produisent un niveau de bruit élevé et exigent l'emploi d'une protection auditive. L'arc, tout comme le soleil, émet des rayons ultraviolets en plus d'autres rayons qui peuvent causer des blessures à la peau et les yeux. Le métal incandescent peut causer des brûlures. Une formation reliée à l'usage des processus et de l'équipement est essentielle pour prévenir les accidents. Par conséquent :

1. Portez des lunettes protectrices munies d'écrans latéraux lorsque vous êtes dans l'aire de travail, même si vous devez porter un casque de soudeur, un écran facial ou des lunettes étanches.
2. Portez un écran facial muni de verres filtrants et de plaques protectrices appropriées afin de protéger vos yeux, votre visage, votre cou et vos oreilles des étincelles et des rayons de l'arc lors d'une opération ou lorsque vous observez une opération. Avertissez les personnes se trouvant à proximité de ne pas regarder l'arc et de ne pas s'exposer aux rayons de l'arc électrique ou le métal incandescent.
3. Portez des gants ignifugés à crispin, une chemise épaisse à manches longues, des pantalons sans rebord et des chaussures montantes afin de vous protéger des rayons de l'arc, des étincelles et du métal incandescent, en plus d'un casque de soudeur ou casquette pour protéger vos cheveux. Il est également recommandé de porter un tablier ininflammable afin de vous protéger des étincelles et de la chaleur par rayonnement.
4. Les étincelles et les projections de métal incandescent risquent de se loger dans les manches retroussées, les rebords de pantalons ou les poches. Il est recommandé de garder boutonnés le col et les manches et de porter des vêtements sans poches en avant.
5. Protégez toute personne se trouvant à proximité des étincelles et des rayons de l'arc à l'aide d'un rideau ou d'une cloison ininflammable.
6. Portez des lunettes étanches par dessus vos lunettes de sécurité lors des opérations d'écaillage ou de meulage du laitier. Les écailles de laitier incandescent peuvent être projetées à des distances considérables. Les personnes se trouvant à proximité doivent également porter des lunettes étanches par dessus leur lunettes de sécurité.



INCENDIES ET EXPLOSIONS -- La chaleur provenant des flammes ou de l'arc peut provoquer un incendie. Le laitier incandescent ou les étincelles peuvent également provoquer un incendie ou une explosion. Par conséquent :

1. Éloignez suffisamment tous les matériaux combustibles de l'aire de travail et recouvrez les matériaux avec un revêtement protecteur ininflammable. Les matériaux combustibles incluent le bois, les vêtements, la sciure, le gaz et les liquides combustibles, les solvants, les peintures et les revêtements, le papier, etc.
2. Les étincelles et les projections de métal incandescent peuvent tomber dans les fissures dans les planchers ou dans les ouvertures des murs et déclencher un incendie couvant à l'étage inférieur. Assurez-vous que ces ouvertures sont bien protégées des étincelles et du métal incandescent.
3. N'exécutez pas de soudure, de coupe ou autre travail à chaud avant d'avoir complètement nettoyé la surface de la pièce à traiter de façon à ce qu'il n'ait aucune substance présente qui pourrait produire des vapeurs inflammables ou toxiques. N'exécutez pas de travail à chaud sur des contenants fermés car ces derniers pourraient exploser.
4. Assurez-vous qu'un équipement d'extinction d'incendie est disponible et prêt à servir, tel qu'un tuyau d'arrosage, un seau d'eau, un seau de sable ou un extincteur portatif. Assurez-vous d'être bien instruit par rapport à l'usage de cet équipement.
5. Assurez-vous de ne pas excéder la capacité de l'équipement. Par exemple, un câble de soudage surchargé peut surchauffer et provoquer un incendie.
6. Une fois les opérations terminées, inspectez l'aire de travail pour assurer qu'aucune étincelle ou projection de métal incandescent ne risque de provoquer un incendie ultérieurement. Employez des guetteurs d'incendie au besoin.
7. Pour obtenir des informations supplémentaires, consultez le NFPA Standard 51B, "Fire Prevention in Use of Cutting and Welding Processes", disponible au National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.



CHOC ÉLECTRIQUE -- Le contact avec des pièces électriques ou les pièces de mise à la terre sous tension peut causer des blessures graves ou mortelles. NE PAS utiliser un courant de soudage c.a. dans un endroit humide, en espace restreint ou si un danger de chute se pose.

1. Assurez-vous que le châssis de la source d'alimentation est branché au système de mise à la terre de l'alimentation d'entrée.
2. Branchez la pièce à traiter à une bonne mise de terre électrique.
3. Branchez le câble de masse à la pièce à traiter et assurez une bonne connexion afin d'éviter le risque de choc électrique mortel.
4. Utilisez toujours un équipement correctement entretenu. Remplacez les câbles usés ou endommagés.
5. Veillez à garder votre environnement sec, incluant les vêtements, l'aire de travail, les câbles, le porte-électrode/torche et la source d'alimentation.
6. Assurez-vous que tout votre corps est bien isolé de la pièce à traiter et des pièces de la mise à la terre.
7. Si vous devez effectuer votre travail dans un espace restreint ou humide, ne tenez vous pas directement sur le métal ou sur la terre; tenez-vous sur des planches sèches ou une plate-forme isolée et portez des chaussures à semelles de caoutchouc.
8. Avant de mettre l'équipement sous tension, isolez vos mains avec des gants secs et sans trous.
9. Mettez l'équipement hors tension avant d'enlever vos gants.
10. Consultez ANSI/ASC Standard Z49.1 (listé à la page suivante) pour des recommandations spécifiques concernant les procédures de mise à la terre. Ne pas confondre le câble de masse avec le câble de mise à la terre.



CHAMPS ÉLECTRIQUES ET MAGNÉTIQUES — comportent un risque de danger. Le courant électrique qui passe dans n'importe quel conducteur produit des champs électriques et magnétiques localisés. Le soudage et le courant de coupage créent des champs électriques et magnétiques autour des câbles de soudage et l'équipement. Par conséquent :

1. Un soudeur ayant un stimulateur cardiaque doit consulter son médecin avant d'entreprendre une opération de soudage. Les champs électriques et magnétiques peuvent causer des ennuis pour certains stimulateurs cardiaques.
2. L'exposition à des champs électriques et magnétiques peut avoir des effets néfastes inconnus pour la santé.

3. Les soudeurs doivent suivre les procédures suivantes pour minimiser l'exposition aux champs électriques et magnétiques :
 - A. Acheminez l'électrode et les câbles de masse ensemble. Fixez-les à l'aide d'une bande adhésive lorsque possible.
 - B. Ne jamais enrouler la torche ou le câble de masse autour de votre corps.
 - C. Ne jamais vous placer entre la torche et les câbles de masse. Acheminez tous les câbles sur le même côté de votre corps.
 - D. Branchez le câble de masse à la pièce à traiter le plus près possible de la section à souder.
 - E. Veillez à garder la source d'alimentation pour le soudage et les câbles à une distance appropriée de votre corps.



LES VAPEURS ET LES GAZ -- peuvent causer un malaise ou des dommages corporels, plus particulièrement dans les espaces restreints. Ne respirez pas les vapeurs et les gaz. Le gaz de protection risque de causer l'asphyxie. Par conséquent :

1. Assurez en permanence une ventilation adéquate dans l'aire de travail en maintenant une ventilation naturelle ou à l'aide de moyens mécanique. N'effectuez jamais de travaux de soudage, de coupage ou de gougeage sur des matériaux tels que l'acier galvanisé, l'acier inoxydable, le cuivre, le zinc, le plomb, le beryllium ou le cadmium en l'absence de moyens mécaniques de ventilation efficaces. Ne respirez pas les vapeurs de ces matériaux.
2. N'effectuez jamais de travaux à proximité d'une opération de dégraissage ou de pulvérisation. Lorsque la chaleur ou le rayonnement de l'arc entre en contact avec les vapeurs d'hydrocarbure chloré, ceci peut déclencher la formation de phosgène ou d'autres gaz irritants, tous extrêmement toxiques.
3. Une irritation momentanée des yeux, du nez ou de la gorge au cours d'une opération indique que la ventilation n'est pas adéquate. Cessez votre travail afin de prendre les mesures nécessaires pour améliorer la ventilation dans l'aire de travail. Ne poursuivez pas l'opération si le malaise persiste.
4. Consultez ANSI/ASC Standard Z49.1 (à la page suivante) pour des recommandations spécifiques concernant la ventilation.

5. AVERTISSEMENT : Ce produit, lorsqu'il est utilisé dans une opération de soudage ou de coupage, dégage des vapeurs ou des gaz contenant des chimiques considérés par l'état de la Californie comme étant une cause des malformations congénitales et dans certains cas, du cancer. (California Health & Safety Code §25249.5 et seq.)



MANIPULATION DES CYLINDRES -- La manipulation d'un cylindre, sans observer les précautions nécessaires, peut produire des fissures et un échappement dangereux des gaz.

Une brisure soudaine du cylindre, de la soupape ou du dispositif de surpression peut causer des blessures graves ou mortelles. Par conséquent :

1. Utilisez toujours le gaz prévu pour une opération et le détendeur approprié conçu pour utilisation sur les cylindres de gaz comprimé. N'utilisez jamais d'adaptateur. Maintenez en bon état les tuyaux et les raccords. Observez les instructions d'opération du fabricant pour assembler le détendeur sur un cylindre de gaz comprimé.
2. Fixez les cylindres dans une position verticale, à l'aide d'une chaîne ou une sangle, sur un chariot manuel, un châssis de roulement, un banc, un mur, une colonne ou un support convenable. Ne fixez jamais un cylindre à un poste de travail ou toute autre dispositif faisant partie d'un circuit électrique.
3. Lorsque les cylindres ne servent pas, gardez les soupapes fermées. Si le détendeur n'est pas branché, assurez-vous que le bouchon de protection de la soupape est bien en place. Fixez et déplacez les cylindres à l'aide d'un chariot manuel approprié. Toujours manipuler les cylindres avec soin.
4. Placez les cylindres à une distance appropriée de toute source de chaleur, des étincelles et des flammes. Ne jamais amorcer l'arc sur un cylindre.
5. Pour de l'information supplémentaire, consultez CGA Standard P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders", mis à votre disposition par le Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.



ENTRETIEN DE L'ÉQUIPEMENT -- Un équipement entretenu de façon défectueuse ou inadéquate peut causer des blessures graves ou mortelles. Par conséquent :

1. Efforcez-vous de toujours confier les tâches d'installation, de dépannage et d'entretien à un personnel qualifié. N'effectuez aucune réparation électrique à moins d'être qualifié à cet effet.
2. Avant de procéder à une tâche d'entretien à l'intérieur de la source d'alimentation, débranchez l'alimentation électrique.
3. Maintenez les câbles, les fils de mise à la terre, les branchements, le cordon d'alimentation et la source d'alimentation en bon état. N'utilisez jamais un équipement s'il présente une défectuosité quelconque.
4. N'utilisez pas l'équipement de façon abusive. Gardez l'équipement à l'écart de toute source de chaleur, notamment des fours, de l'humidité, des flaques d'eau, de l'huile ou de la graisse, des atmosphères corrosives et des intempéries.
5. Laissez en place tous les dispositifs de sécurité et tous les panneaux de la console et maintenez-les en bon état.
6. Utilisez l'équipement conformément à son usage prévu et n'effectuez aucune modification.



INFORMATIONS SUPPLÉMENTAIRES RELATIVES À LA SÉCURITÉ -- Pour obtenir de l'information supplémentaire sur les règles de sécurité à observer pour l'équipement de soudage à l'arc électrique et le coupage, demandez un exemplaire du livret "Precautions and Safe Practices for Arc Welding, Cutting and Gouging", Form 52-529.

Les publications suivantes sont également recommandées et mises à votre disposition par l'American Welding Society, 550 N.W. LeJuene Road, Miami, FL 33126 :

1. ANSI/ASC Z49.1 - "Safety in Welding and Cutting"
2. AWS C5.1 - "Recommended Practices for Plasma Arc Welding"
3. AWS C5.2 - "Recommended Practices for Plasma Arc Cutting"
4. AWS C5.3 - "Recommended Practices for Air Carbon Arc Gouging and Cutting"

**SIGNIFICATION DES SYMBOLES**

Ce symbole, utilisé partout dans ce manuel, signifie "Attention" ! Soyez vigilant ! Votre sécurité est en jeu.

**AVERTISSEMENT**

Signifie un danger potentiel qui peut entraîner des blessures graves ou mortelles.

**DANGER**

Signifie un danger immédiat. La situation peut entraîner des blessures graves ou mortelles.

**ATTENTION**

Signifie un danger qui peut entraîner des blessures corporelles mineures.

Classe de protection de l'enveloppe

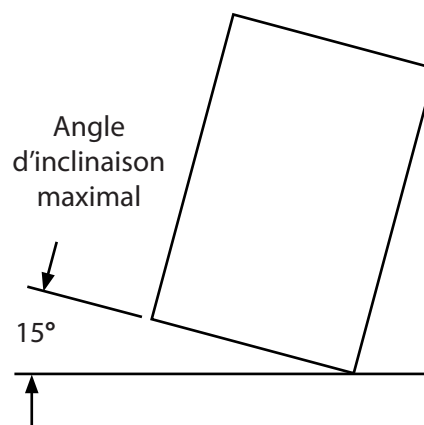
L'indice de protection (codification **IP**) indique la classe de protection de l'enveloppe, c'est-à-dire, le degré de protection contre les corps solides étrangers ou l'eau. L'enveloppe protège contre le toucher, la pénétration d'objets solides dont le diamètre dépasse 12 mm et contre l'eau pulvérisée à un angle de jusqu'à 60 degrés de la verticale. Les équipements portant la marque **IP23S** peuvent être entreposés à l'extérieur, mais ne sont pas conçus pour être utilisés à l'extérieur pendant une précipitation à moins d'être à l'abri.

ATTENTION

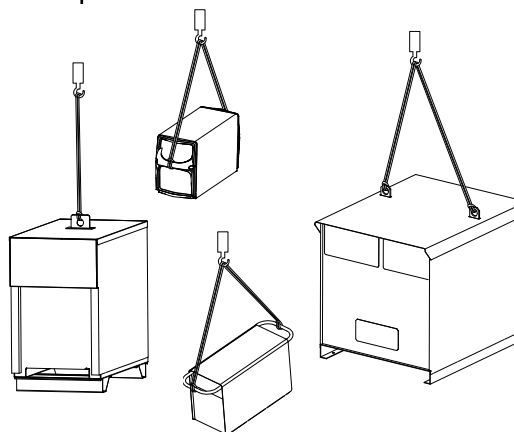
Ce produit a été conçu pour la découpe au plasma seulement. Toute autre utilisation pourrait causer des blessures et/ou endommager l'appareil.

ATTENTION

L'équipement pourrait basculer s'il est placé sur une surface dont la pente dépasse 15°. Vous pourriez vous blesser ou endommager l'équipement de façon importante.

**ATTENTION**

Soulevez à l'aide de la méthode et des points d'attache illustrés afin d'éviter de vous blesser ou d'endommager l'équipement.



**WARNING**

USE THE ESAB PT-37 PLASMARC TORCH WITH MECHANIZED CONSOLES. USE OF TORCHES NOT DESIGNED FOR USE WITH THIS CONSOLE COULD CREATE AN ELECTRIC SHOCK HAZARD.

2.0 Description

2.1 General

As shipped, the ESP-101 is fully assembled and ready to cut after being connected to input power, a source of compressed air, and a PT-37 torch. The ESP-101 system uses the heavy-duty PT-37 (Mechanized Plasma) torch to deliver cutting power for cutting materials up to 1-1/4 inch (32 mm) thick. Refer to the following pages for descriptions of the ESP-101 packages available as well as performance specifications.

2.2 Scope

The purpose of this manual is to provide the operator with all the information required to install and operate the ESP-101 Plasma Arc Cutting System. Technical reference material is also provided to assist in troubleshooting the cutting system.



2.3 ESP-101 Plasma Arc Cutting System:

The ESP-101 plasma cutting system combines the newly redesigned ESP-101 console and PT-37 torch. The PT-37 plasma cutting torch is designed to provide increased performance and longer consumable life resulting in higher production rates at lower costs.

Specifications: ESP-101

Pierces 3/4 inch (19.1 mm); Cuts 1-1/4 inch (32 mm) for Carbon & Stainless Steel
 Pierces 3/4 inch (19.1 mm); Cuts 1 inch (25 mm) for Aluminum

Input.....460 vac, 3 phase 60 Hz, 25 A
 380/400 vac, 3 phase 50/60 Hz, 30/29 A

Output..... 100 amps @ 160v - 100% duty cycle

Voltage requirements Idle 380-400, 460V, +/- 10%
 Cutting 380-400, 460V, +/- 15%

Air Supply Requirements500 cfh @ 90 psig (236 l/min @ 6.2 bars)

Efficiency89%
 Power Factor92%

CE 380-400 vac *S_{sc min} 4 MVA
 *Z_{max} 0.039 Ω

Weight: 125 lb (56.7 kg)



Duty Cycle: The duty cycle refers to the time as a percentage of a ten-minute period that you can cut at a certain load without overheating. The duty cycle is valid for 40 degrees C.

*S_{sc min} : Minimum short circuit power on the network in accordance with IEC61000-3-12.

*Z_{max} : Maximum permissible line on the network impedance in accordance with IEC61000-3-11.

2.4 Package Ordering Information:

Mechanized Package Ordering Information:

The components that are included in the ESP-101 mechanized packages may be purchased separately by using the appropriate P/N when placing orders. Individual part numbers are listed below:

Available Packages:

ESP-101:

460 V CNC PT-37 with rack 25 ft (7.6 m).....	0558009450
460 V CNC PT-37 with rack 50 ft (15.2 m)	0558009451
460 V CNC PT-37 w/o rack 25 ft (7.6 m).....	0558009452
460 V CNC PT-37 w/o rack 50 ft (15.2 m)	0558009453
380-400 V CE CNC PT-37 with rack 25 ft (7.6 m).....	0558009458
380-400 V CE CNC PT-37 with rack 50 ft (15.2 m)	0558009459
380-400 V CE CNC PT-37 w/o rack 17 ft (5.2 m).....	0558009460
380-400 V CE CNC PT-37 w/o rack 25 ft (7.6 m).....	0558009461
380-400 V CE CNC PT-37 w/o rack 50 ft (15.2 m)	0558009462

ESP-101 Multi-Voltage:

The ESP-101 multi-voltage console ships as a ESP-101 460 V console and a separate TUA2 Auto-Transformer.

208-575 V CNC PT-37 with rack 25 ft (7.6 m).....	0558009454
208-575 V CNC PT-37 with rack 50 ft (15.2 m)	0558009455
208-575 V CNC PT-37 w/o rack 25 ft (7.6 m).....	0558009456
208-575 V CNC PT-37 w/o rack 50 ft (15.2 m)	0558009457

ESP-101 Consoles:

460 V Console.....	0558004880
380-400 V CE Console	0558005215

Multi-Voltage Consoles:

The ESP-101 multi-voltage console ships as a ESP-101 460 V console and a separate TUA2 Auto-Transformer.

208, 230, 400, 460, 475, 500, 575 V	0558004881
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 <p>WARNING</p>	<p>DO NOT USE OXYGEN WITH THIS TORCH! A HAZARDOUS FIRE MAY RESULT.</p>
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2.5 PT-37 Torch Data

ESP-101 mechanized console uses the PT-37 torch. For cut data information, breakdown of parts, dimensions and maintenance refer to torch manual.

PT-37 Torches:

PT-37 Torch with rack 4.5' (1.4m).....	0558004860
PT-37 Torch with rack 17' (5.2m).....	0558004861
PT-37 Torch with rack 25' (7.6m).....	0558004862
PT-37 Torch with rack 50' (15.2m).....	0558004863
PT-37 Torch w/o rack 4.5' (1.4m).....	0558004894
PT-37 Torch w/o rack 17' (5.2m).....	0558004895
PT-37 Torch w/o rack 25' (7.6m).....	0558004896
PT-37 Torch w/o rack 50' (15.2m).....	0558004897



2.6 System and Optional Accessories

TUA2 Auto-Transformer0459145880

Converts an input voltage of 208, 230, 400, 475, 500, or 575 V to 460 V for use with an ESP-101 460 V console.



Remote Junction Box0558004887

The Remote Junction Box provides a means to extend the total length of the PT-37 Torch. When used in combination with 50 ft., 75 ft., or 100 ft. extension cables, and any standard length of PT-37 Plasma Torch from 4.5 ft. to 50 ft., a maximum torch length of 150 feet can be achieved.



Extension Cable 50 ft. (15.2 m)..... p/n 0558004888
 75 ft. (22.9 m) p/n 0558009266
 100 ft. (30.5 m)..... p/n 0558004889

Torch Holder Assembly.....p/n 0558005926

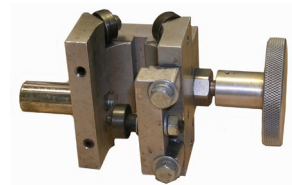


Plate Riderp/n 0560936972

Used to maintain a constant standoff while cutting thin materials or using machines without automatic height control.



CNC Cable 25 ft. (7.6 m)..... p/n 0558008833
 50 ft. (15.2 m) p/n 0558008834

Connects between the CNC interface receptacle on the rear panel and the CNC.



Remote Hand Switch with 25 ft. (7.6 m) lead..... p/n 0558005548
 with 50 ft. (15.2 m) lead p/n 0558005549

Enables non-automated mechanized cutting using the PT-37 or PT-38 torch. Connects to the CNC interface receptacle on the rear panel.



Gas Flow Measuring Kitp/n 19765 ("CE" units - 0558000739)

Valuable troubleshooting tool allows measurement of the actual air flow through the torch.



**WARNING**

INSTALLING OR PLACING ANY TYPE OF FILTERING DEVICE WILL RESTRICT THE VOLUME OF INTAKE AIR, THEREBY SUBJECTING THE POWER SOURCE INTERNAL COMPONENTS TO OVERHEATING. THE WARRANTY IS VOID IF ANY TYPE OF FILTER DEVICE IS USED.

3.0 Installation

3.1 General

Proper installation is important for satisfactory and trouble-free operation of the ESP-101 cutting package. It is suggested that each step in this section be studied carefully and followed closely.

3.2 Equipment Required

A source of clean, dry, oil-free air that supplies 500 cfh (236 l/m) at 90 psig (6.2 bars) is required for the cutting operation. The air supply should not exceed 150 psig (10.3 bars) (the maximum inlet pressure rating of the air filter-regulator supplied with the package).

**CAUTION**

Position the ESP-101 at least 10 feet (3 meters) from the cutting area. Sparks and hot slag from the cutting operation can damage the unit.

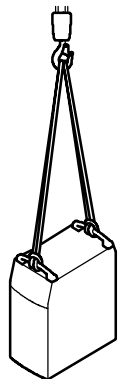
3.3 Placement and Location

After selecting an installation site, place the ESP-101 in the desired location. The unit may be lifted by either an overhead crane or forklift truck. If using forklift truck, be sure that the lift forks are long enough to extend completely under the base. If using straps, use two separate straps as shown in the illustration.

Adequate ventilation is necessary to provide proper cooling of the ESP-101. The amount of dirt, dust, and excessive heat to which the equipment is exposed, should be minimized. There should be at least one foot of clearance between the ESP-101 power source and wall or any other obstruction to allow freedom of air movement through the power source.

3.4 Inspection

1. Remove the shipping container and all packing material and inspect for evidence of concealed damage which may not have been apparent upon receipt of the ESP-101. Notify the carrier of any defects or damage at once.
2. Check container for any loose parts prior to disposing of shipping materials.
3. Check air louvers and any other openings to ensure that any obstruction is removed.



WARNING

ELECTRIC SHOCK CAN KILL! PRECAUTIONARY MEASURES SHOULD BE TAKEN TO PROVIDE MAXIMUM PROTECTION AGAINST ELECTRICAL SHOCK. BE SURE THAT ALL POWER IS OFF BY OPENING THE LINE (WALL) DISCONNECT SWITCH AND BY UNPLUGGING THE POWER CORD TO THE UNIT WHEN CONNECTIONS ARE MADE INSIDE OF THE POWER SOURCE.

3.5 Primary Input Connections

The ESP-101 460V consoles are equipped with approximately 15 ft. of 4-conductor input power cable for 3 phase connection.

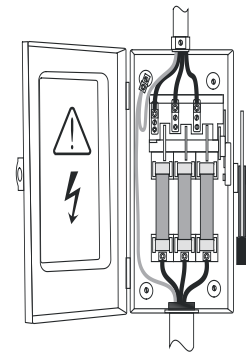
See specification section or rating plate.

STANDARD UNITS (NON-CE)		CE UNITS (EUROPE)	
PHASE	3	PHASE	3
L1	Black	L1	Brown
L2	Red	L2	Black
L3	White	L3	Gray
GND	Green	GND	Green/Yel

A. 460V



PRIMARY INPUT POWER CABLE



CUSTOMER FUSED LINE DISCONNECT SWITCH (See Table 3-1)

B. 380-400V

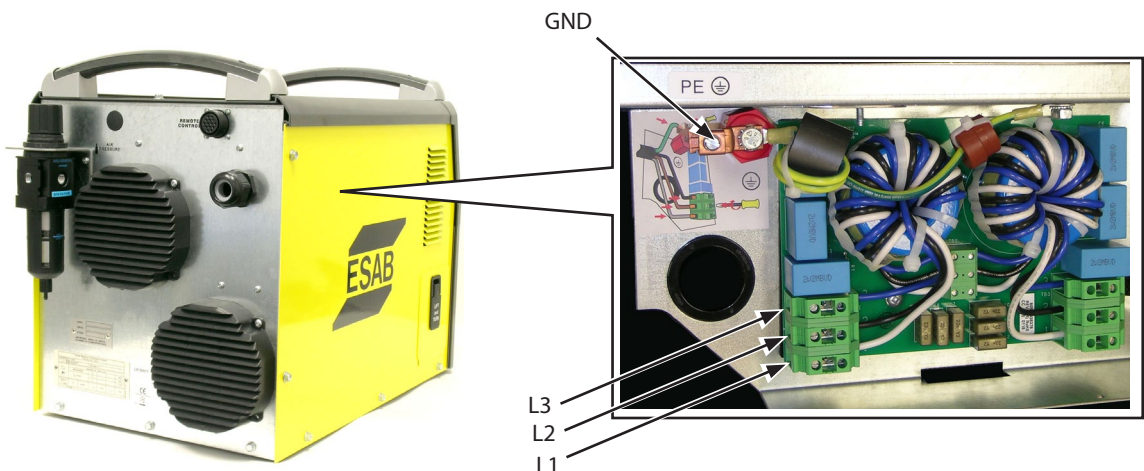




Figure 3-1. Input Connections

 **WARNING** **ELECTRIC SHOCK CAN KILL! BEFORE MAKING ELECTRICAL INPUT CONNECTIONS TO THE POWER SOURCE, "MACHINERY LOCKOUT PROCEDURES" SHOULD BE EMPLOYED. IF THE CONNECTIONS ARE TO BE MADE FROM A LINE DISCONNECT SWITCH, PLACE THE SWITCH IN THE OFF POSITION AND PADLOCK IT TO PREVENT INADVERTENT TRIPPING. IF THE CONNECTION IS MADE FROM A FUSEBOX, REMOVE THE CORRESPONDING FUSES AND PADLOCK THE BOX COVER. IF IT IS NOT POSSIBLE TO USE PADLOCKS, ATTACH A RED TAG TO THE LINE DISCONNECT SWITCH (OR FUSE BOX) WARNING OTHERS THAT THE CIRCUIT IS BEING WORKED ON.**

 **WARNING** **THE CHASSIS MUST BE CONNECTED TO AN APPROVED ELECTRICAL GROUND. FAILURE TO DO SO MAY RESULT IN ELECTRICAL SHOCK, SEVERE BURNS OR DEATH.**

 **WARNING** **BEFORE MAKING ANY CONNECTIONS TO THE POWER SOURCE OUTPUT TERMINALS, MAKE SURE THAT ALL PRIMARY INPUT POWER TO THE POWER SOURCE IS DEENERGIZED (OFF) AT THE MAIN DISCONNECT SWITCH AND THAT THE INPUT POWER CABLE IS UNPLUGGED.**

Before connecting to input power, make sure there is a line (wall) disconnect switch with fuses or circuit breakers at the main power panel. You may either use the factory-installed input power cable 4/c, type SO (90 °C), 15 ft (4.6 m) length or provide your own input power leads. If you choose to provide your own, make sure they are insulated copper conductors. You must have three (3 phase) power leads and one ground wire. The wires may be heavy rubber covered cable or may be run in a solid or flexible conduit. Ensure the ground lead is sufficiently long inside the machine. In an event where the power cord is pulled from the machine, the ground lead **must not** break from the ground connection before the power leads have broken from their connection. Refer to Table 3-1 for recommended input conductors and line fuse sizes.

ESP-101					ESP-101 (With Optional Auto-transformer)				
Input Requirements			Input & Gnd	Fuse	Input Requirements			Input & Gnd	Fuse
Volts	Phase	Amps	Conductor	Size	Volts	Phase	Amps	Conductor	Size
			CU/AWG	Amps				CU/AWG	Amps
380(CE)	3	30	6 mm ²	40	208	3	53	6	70
400(CE)	3	29	6 mm ²	40	230	3	50	6	70
460	3	25	8	35	400	3	29	6 mm ²	40
					460	3	25	8	35
					475	3	24	8	35
					500	3	22	10	30
					575	3	18	10	25

Table 3-1. Recommended Sizes For Input Conductors and Line Fuses

3.5.1 TUA2 Auto-Transformer Primary Input Connections

Connecting a Multi-Voltage Version

The ESP-101 460V version is equipped with an input power cable which may be used to connect to the output of the TUA2 Auto-Transformer. You may either use the factory-installed input power cable (4/c, type SO (90 °C) or provide your own input power leads. If you choose to provide your own, make sure they are insulated copper conductors. You must have three (3 phase) power leads and one ground wire. Refer to Table 3-1 for recommended input conductors.

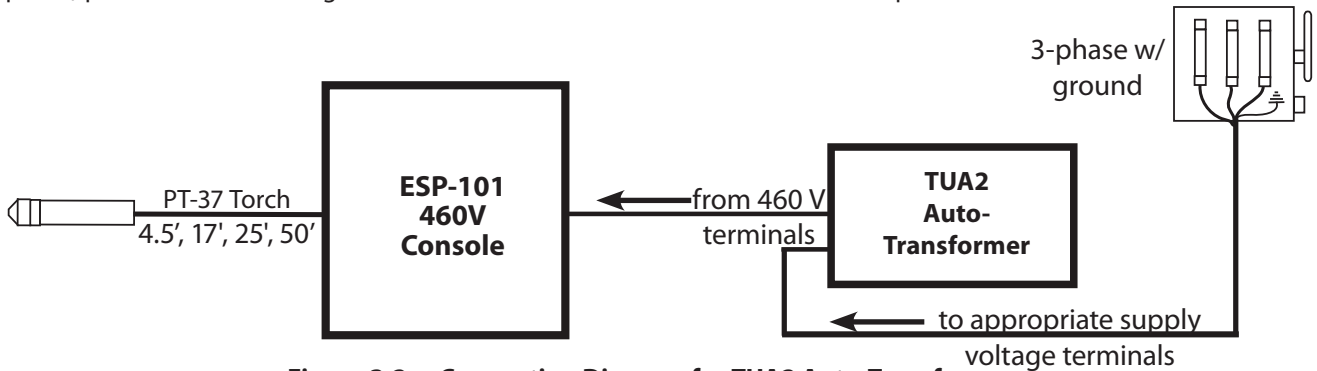


Figure 3-2a. Connection Diagram for TUA2 Auto-Transformer

Primary Power Cable from ESP-101 to TUA2 Auto-Transformer

Step 1: Begin by preparing the power cable, then positioning in the TUA2 as shown.

Note:
L1, L2 & L3 strip wires 3/8" (9.5 mm) .
GND wire strip 1" (25.4 mm) or
5/16" ring terminal.

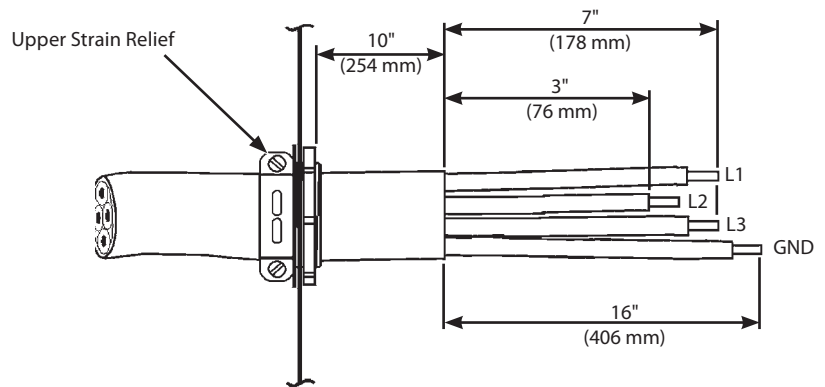


Figure 3-2b. Primary Power Cable from ESP-101 to TUA2 Auto-Transformer

Step 2: Route the power cable through the upper strain relief of the TUA2 Auto-Transformer as shown below. Connect L1, L2, L3 leads to the 460 V terminals. Connect the ground lead to the forward ground stud. Ensure all connections are secure. Do not overtighten the strain relief.

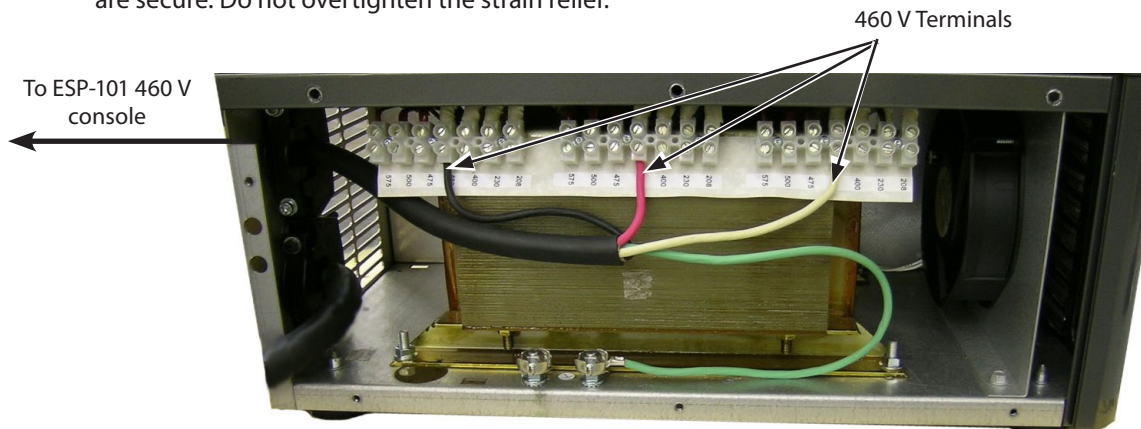


Figure 3-2c. Primary Power Cable from ESP-101 to TUA2 Auto-Transformer 460 V Terminals

CAUTION Ensure three input power jumper cables are connected properly to the Auto-Transformer for your input power.

The TUA2 Auto-Transformer is not equipped with an input power cable. A 4/c, type SO (90 °C) cable or equivalent is recommended. Ensure they are insulated copper conductors. You must have three (3 phase) power leads and one ground wire. Select an input power cable size corresponding to the input supply voltage listed in Table 3.1.

Primary Power Cable from Fused Line Disconnect Switch to TUA2 Auto-Transformer

Step 1: Begin by preparing the power cable, then positioning in the TUA2 as shown:

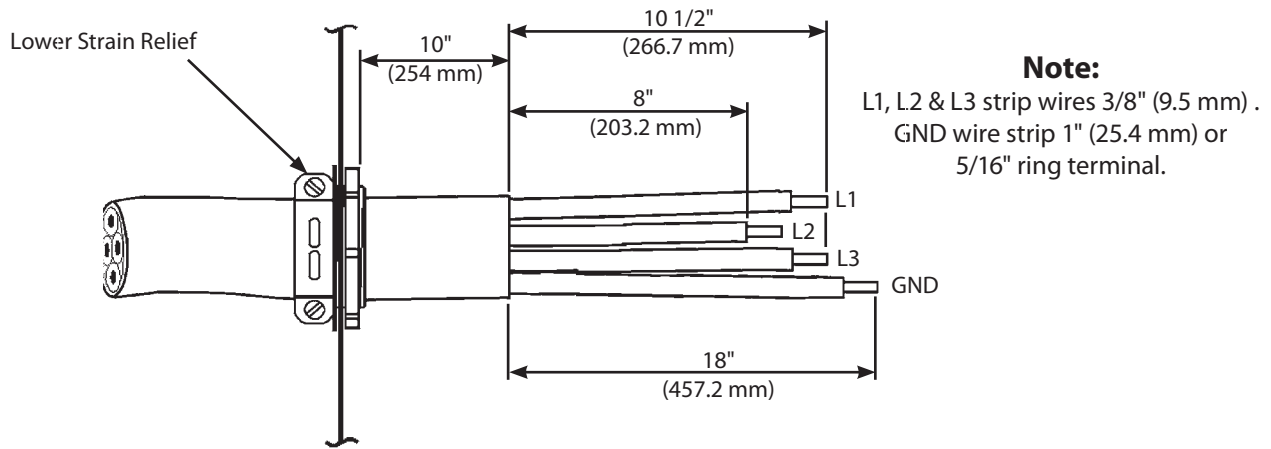


Figure 3-3a. Primary Power Cable from Fused Line Disconnect Switch to TUA2 Auto-Transformer

Step 2: Route the power cable through the lower strain relief of the TUA2 Auto-Transformer as shown below. Connect L1, L2, L3 leads to the voltage terminals that match your input power supply voltage. Connect the ground lead to the rear ground stud. Ensure all connections are secure. Do not overtighten the strain relief.

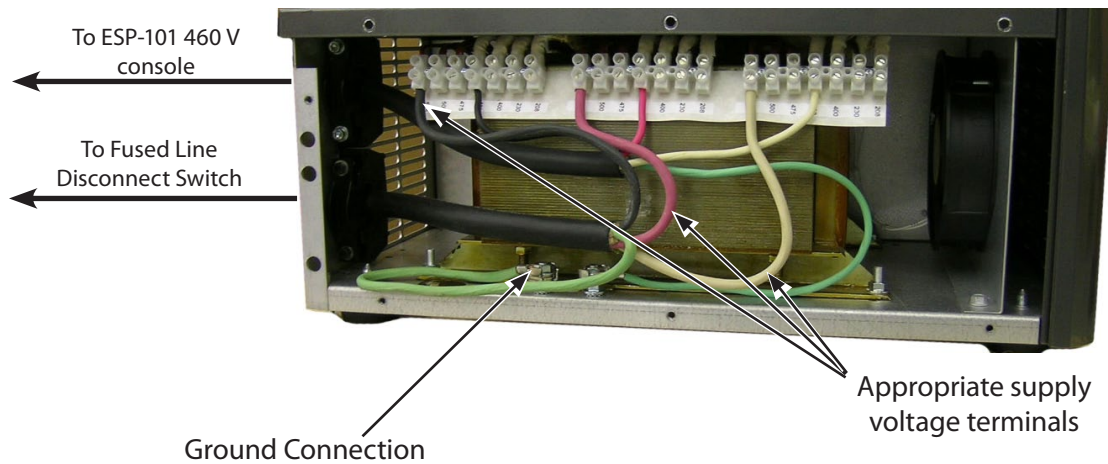


Figure 3-3b. Primary Power Cable from Fused Line Disconnect Switch to TUA2 Auto-Transformer appropriate supply voltage terminals (575 V pictured)

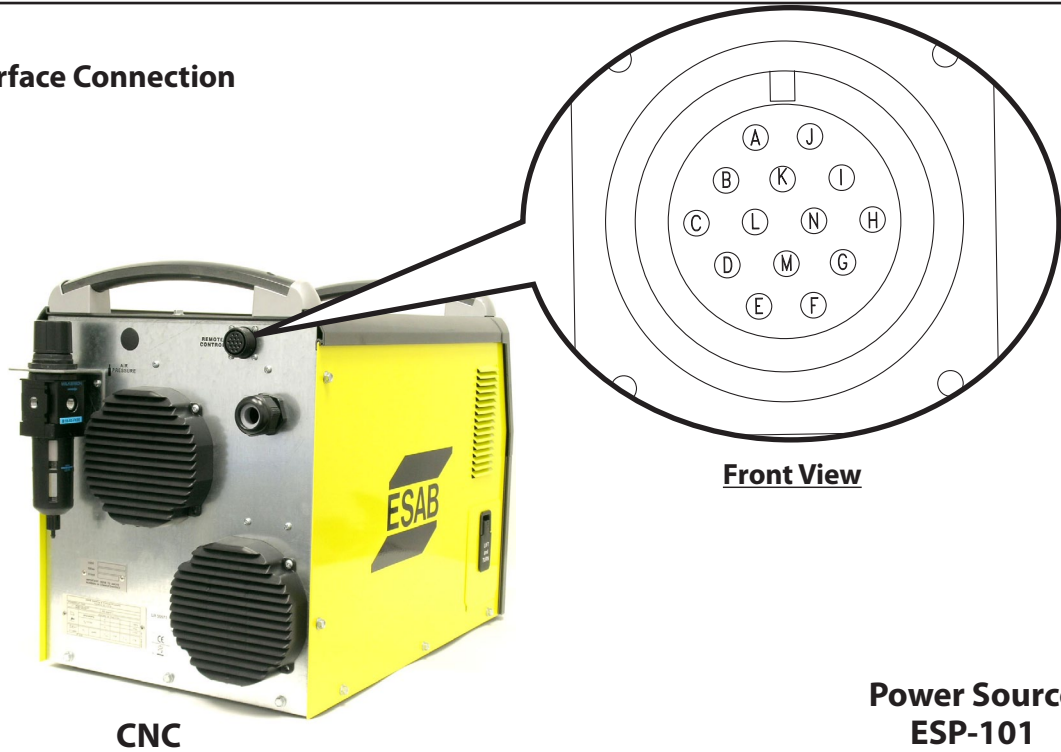
3.5.2 Input Air Connection

Connect your air supply to the inlet connection of the filter/regulator.



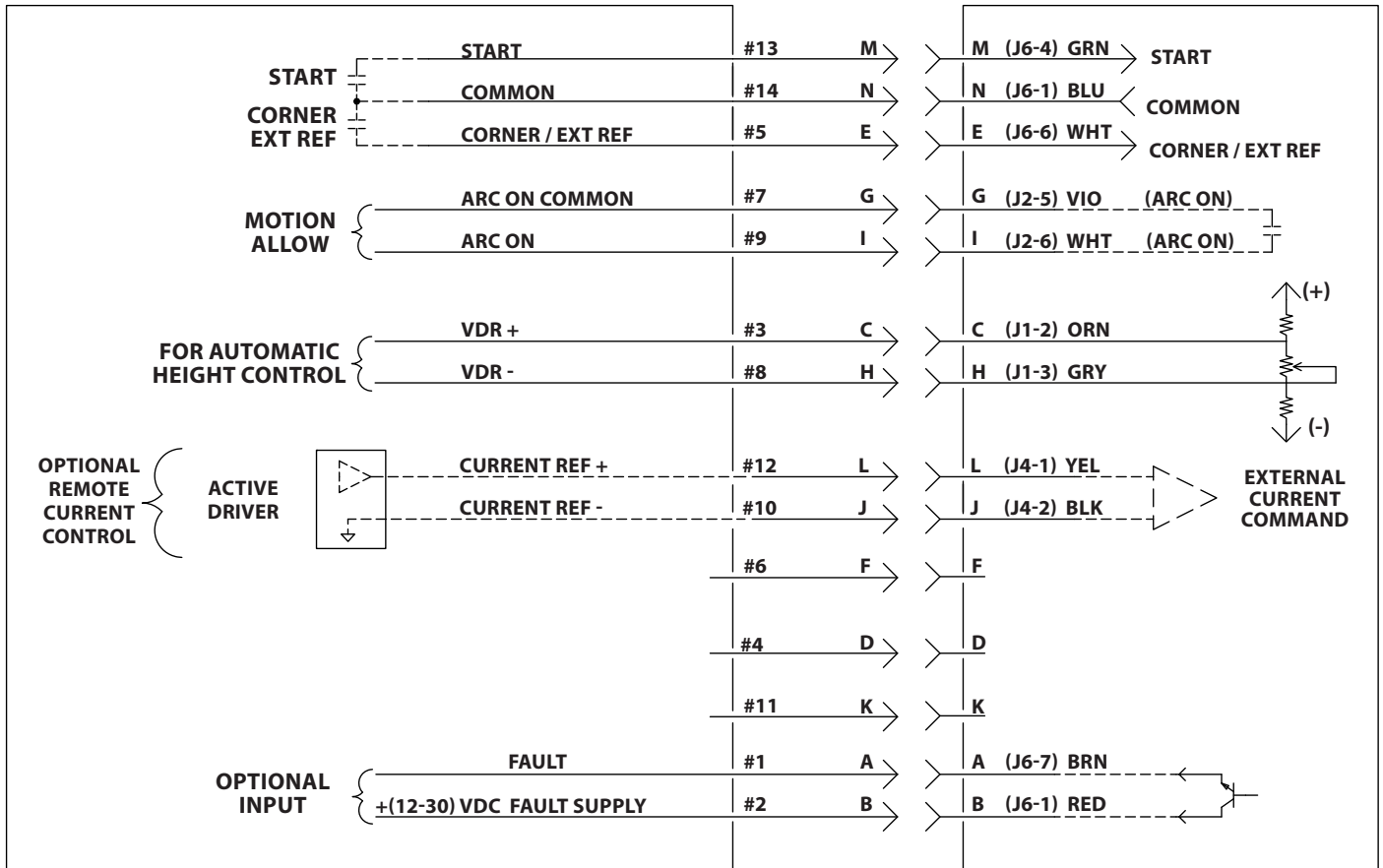
Figure 3-4. Input Connections / Fuse Replacement

3.6 CNC Interface Connection



Front View

Power Source
ESP-101



Note:

If replacing the ESP-100 with an ESP-101, reversing wires 1 and 2 on the CNC cable may be necessary for proper polarity.

Figure 3-5. Mechanical Cutting Interface Diagram CNC Interface Connection

3.6 CNC Interface Connection (continued)

Start signal (pin M)

Use a relay to connect this pin to “Common” (pin N) to start the cutting process.

If a transistor is used for this signal, then the positive potential must be connected to pin M and the common/negative to pin N. This would require a transistor capable of blocking 24 VDC and sinking more than 11 mA.

Corner / External Reference (pin E)

Use a relay to connect this pin to “Common” (pin N) to set the cut current reference signal to the external source- pins L and J. If a transistor is used for this signal, then the positive potential must be connected to pin E and the common/negative to pin N.

Arc On (pins G and I)

These pins will be connected together, via normally open relay contacts that close when the plasma system has established work current. This signal is also referred to as “Motion Allow” or “Arc-Established”.

Voltage Divider (VDR) for Automatic Height Control (pins C and H)

Pin C is the positive connection to the Voltage Divider Network. Pin H is the negative connection.

See section 3.7 for Voltage Divider default values and adjustment instructions.

Current Reference for Optional Remote Current Control (pins L and J)

This signal should be provided by an active driver that is referenced to ground. The signal is received (inside the power source) by a differential amplifier, insuring adequate input impedance for the driver. It is safe to connect output signal directly to pin L and the control common directly to pin J.

The reference signal will be scaled as follows:

- 0 V input, 20 Amps output
- 10 V input, 100 Amps output
- 20 Amps + 8 Amps per Volt input

Optional Input: Fault (pins A and B)

This is a power source fault signal that can be used to signal the external control that the plasma is in a fault condition. It is important to note that this is a transistorized and therefore polarized signal. A source voltage of at least 12 VDC, but no more than 30 VDC, should be applied to pin B. The fault signal will then come out on pin A.

WARNING MAKE SURE POWER SWITCH ON CONSOLE IS IN OFF POSITION AND PRIMARY INPUT POWER IS DE-ENERGIZED.

3.7 Voltage Divider Adjustment

It may be necessary to adjust the Voltage Divider or VDR to match the particular height control system. There are two default settings for the ESP-101 models as shipped from the factory:

- STANDARD UNITS (Non-CE): 750 ohms (21:1)
- CE UNITS (Europe): 789 ohms (20:1)

If the height control system does not match the factory default setting, matching can be accomplished by adjusting the VDR potentiometer on the Current Sensor PCB4 located behind the left side panel.

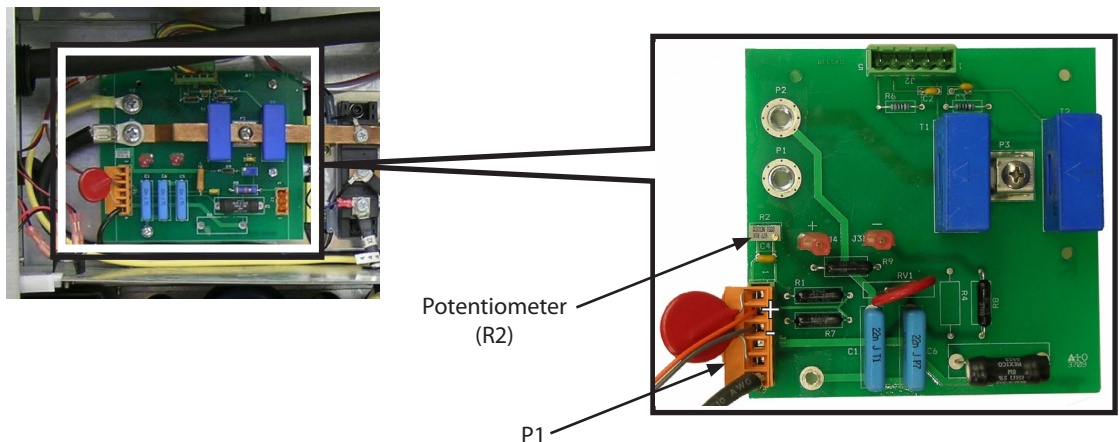
1. Place ohm meter leads between P1-2 (orn) & P1-3 (gry). Adjust R2 to achieve the desired divide ratio for the particular height control system used. For example:

- 16:1 ratio 1000 ohms
- 21:1 ratio 750 ohms
- 18:1 ratio 882 ohms
- 20:1 ratio 789 ohms

Note:

Ohm meter readings can also be taken at the CNC receptacle on the rear panel of the machine, between pins C and H.

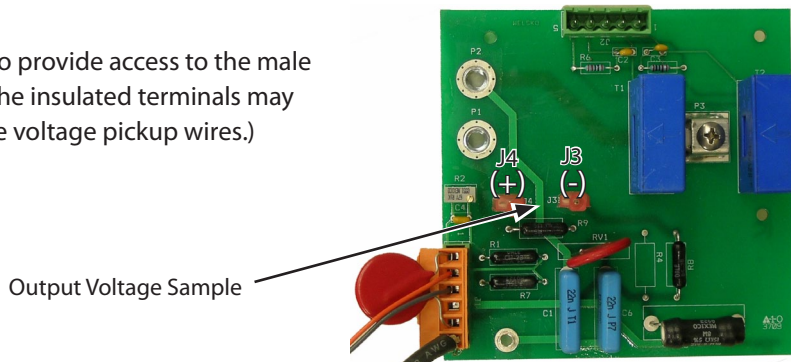
2. If desired, additional minor adjustments of the VDR potentiometer may be made. Any adjustments should be performed by a qualified technician.



3.7.1 Output Voltage Sample

Output Voltage Sample - Some Cutting Machines sample the full output voltage of the plasma system to control the torch height and to determine when to start moving. The full output voltage is available within the machine on a pair of male spade terminals (J3 and J4).

1. Remove insulated terminals to provide access to the male spade terminals. (If needed, the insulated terminals may then be used to terminate the voltage pickup wires.)



**WARNING**

CLAMP THE WORK CABLE TO THE WORK PIECE. BE SURE THE WORK PIECE IS CONNECTED TO AN APPROVED EARTH GROUND WITH A PROPERLY SIZED GROUND CABLE.

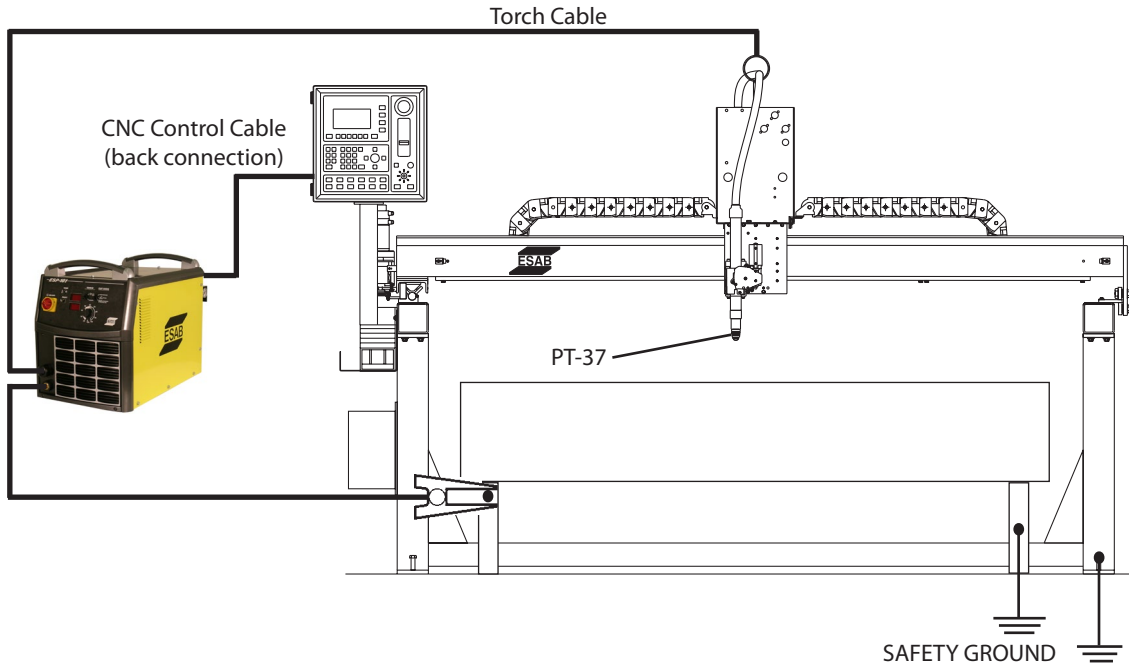
3.8 Secondary Output Connections for Mechanized Cutting

Figure 3-6. ESP-101 Interconnection Diagram

**WARNING**

BEFORE MAKING ANY CONNECTIONS TO THE POWER SOURCE OUTPUT TERMINALS, MAKE SURE THAT ALL PRIMARY INPUT POWER TO THE POWER SOURCE IS DE ENERGIZED (OFF) AT THE MAIN DISCONNECT SWITCH.

3.9 PT-37 Torch Installation

1. Open lead access door on the left side of the ESP-101.

Torch Lead Access Door



2. Route the torch cable through the access opening on the front of the console.
3. Connect the torch cable receptacle to the panel receptacle. Check orientation of the sockets to ensure a correct fit.

Torch Cable Male Receptacle



Torch Lead Access Opening

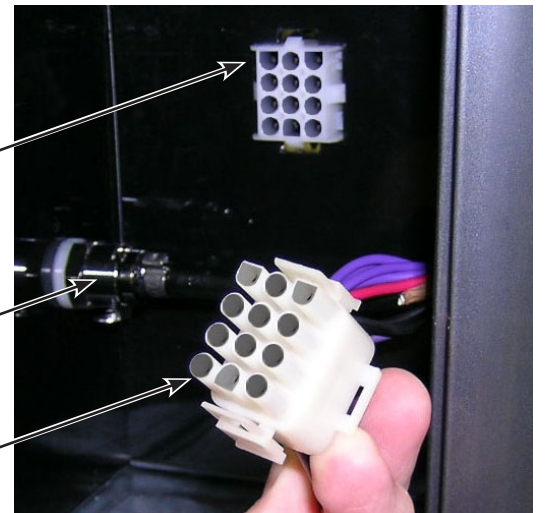
Work Cable Socket

4. Connect the air hose to the quick-connect fitting.
5. Insert work cable plug into work cable socket on the front of the console and turn clockwise until secure.
6. Close the Torch Lead access door.

Panel Receptacle

Air Hose

Torch Cable Male Receptacle



 **WARNING** MAKE SURE POWER SWITCH ON CONSOLE IS IN OFF POSITION AND PRIMARY INPUT POWER IS DE-ENERGIZED.

3.10 Remote Junction Box Installation

The Remote Junction Box (RJB) provides a means to extend the total length of the PT-37 Torch. A Remote Junction Box is used in combination with 50', 75' or 100' extension cable and any standard length of PT-37 Plasma Torch from 4.5' to 50', to create a combined maximum torch length of 150 feet.

Installation of a Remote Junction Box requires minor modifications to the ESP-101 power supply, mounting of the box itself, and connection of the extension cable. Use the diagram and steps below for installation.

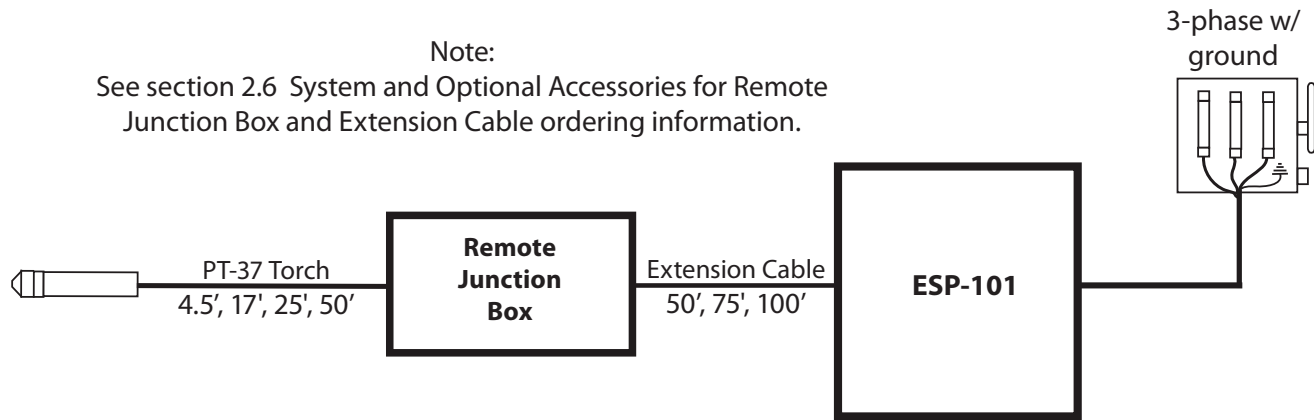


Figure 3-7. Connection Diagram for Remote Junction Box

DESCRIPTION of ESP-101 modification: The wiring modification (interconnect plug reversal) redirects the control signal from the ESP-101 internal solenoid, to the pins within the torch connection panel receptacle. The control signal is then diverted to the solenoid within the Remote Junction Box.

The hose modification (solenoid air bypass) directs the system air supply to the solenoid within the Remote Junction Box. This ensures air at a sufficient pressure is immediately available to the PT-37 torch.

A. ESP-101 Modifications

Remove the top and right side panel of the power supply.

1. Redirection of solenoid control wiring:

- a. Locate, disconnect and move the solenoid interconnect plug as shown.

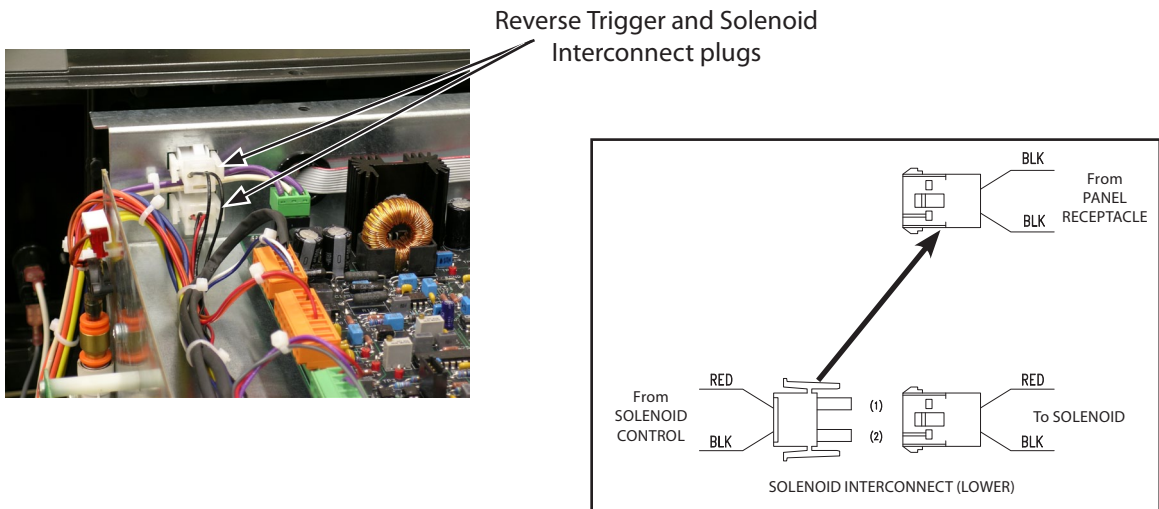
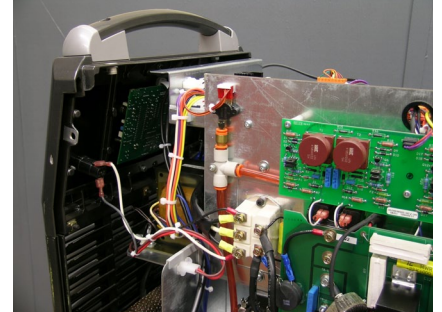
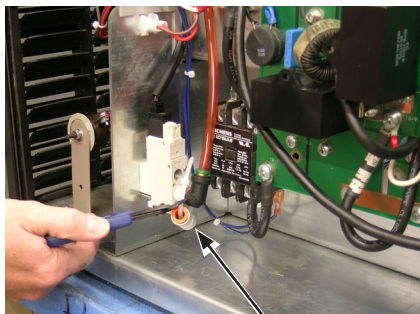


Figure 3-8. Interconnect Move

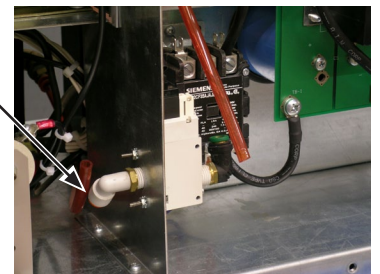
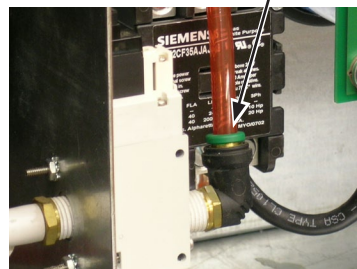
2. Air flow by-pass of internal solenoid:

- a. Locate and remove the included supplied air coupling.
- b. Disconnect both air hoses from the input and output of the solenoid, by pushing ring inward and pulling hose.

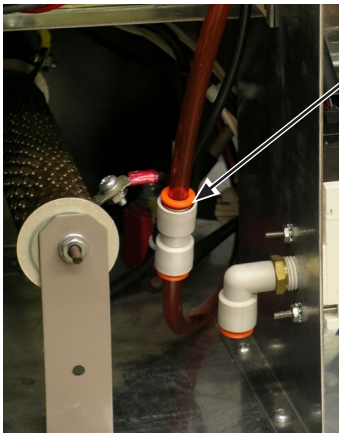


(a) Supplied Air Coupling

(b) Pushing ring inward - pull hose out of connector



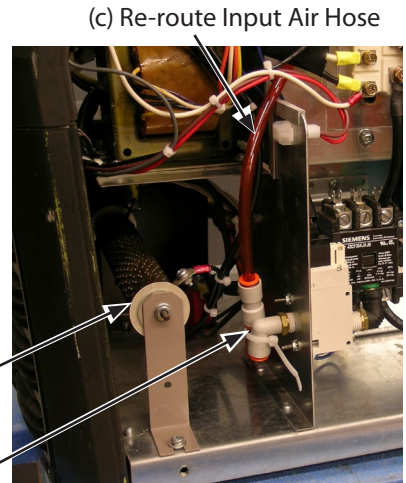
- c. Re-route the Input Air Hose over to the output side.
- d. Couple the free ends of the gas tubes together using the provided union.



(d) Couple the free ends of the gas tubes together

Important Note:

Earlier versions of the ESP-101 (prior to revision G) were equipped with a pilot arc resistor. Ensure tubing is securely fastened at least 1 inch away from pilot arc resistor.



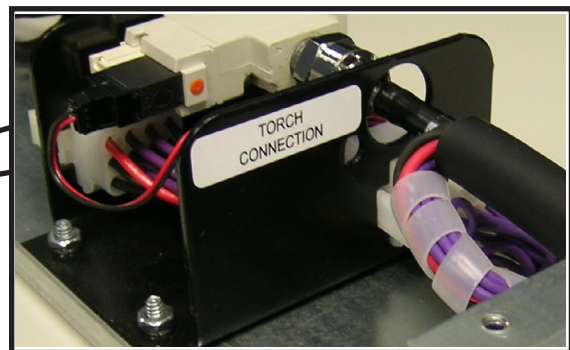
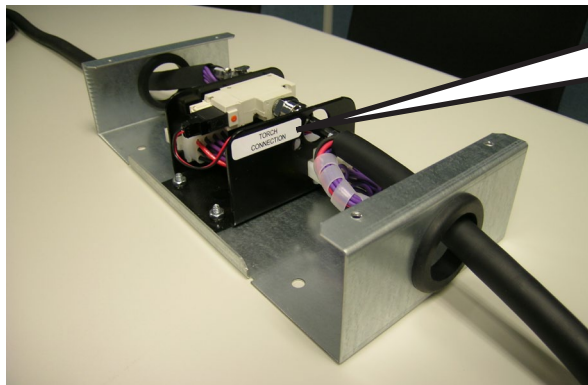
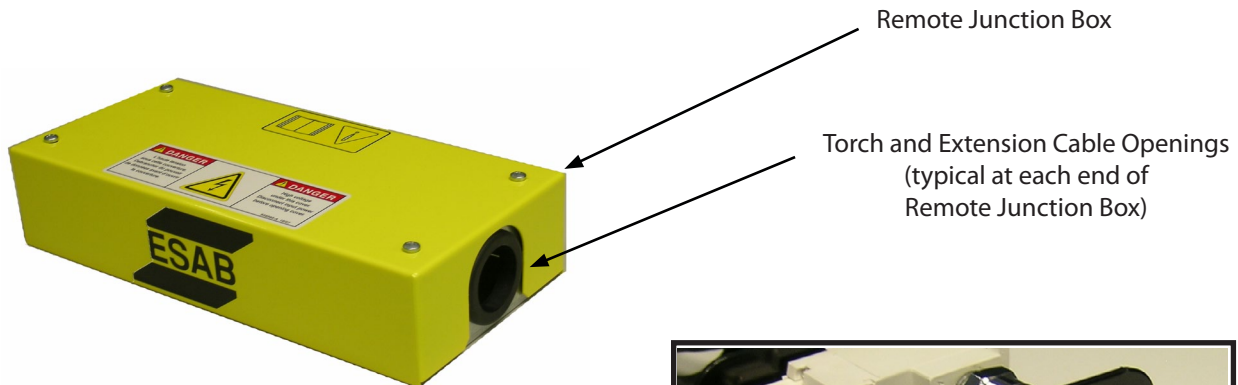
Pilot Arc Resistor (if equipped)

(e) Secure the tubing

- e. If applicable, secure the tubing to prevent contact with pilot arc resistor.
- f. Replace the top and right side panel of the power supply.

B. Mounting the Remote Junction Box (RJB)

1. With the cover removed from the Remote Junction Box, mount the base to a rigid location on the cutting machine, robot, or other suitable object, using at least 2 of the provided mounting holes. Orient the box such that the Extension Cable will enter the end of the RJB **not marked** for torch connection.



2. Insert the free end of the Extension Cable through the grommet on the end of the RJB and make the power and gas connections as shown.
3. Insert the free end of the PT-37 Torch through the grommet on the other end of the RJB and make the power and gas connections as shown.

Note:

Extension Cable connections from the ESP-101 must be connected on the solenoid wiring side of the Remote junction Box. (Torch connection side is labeled.)

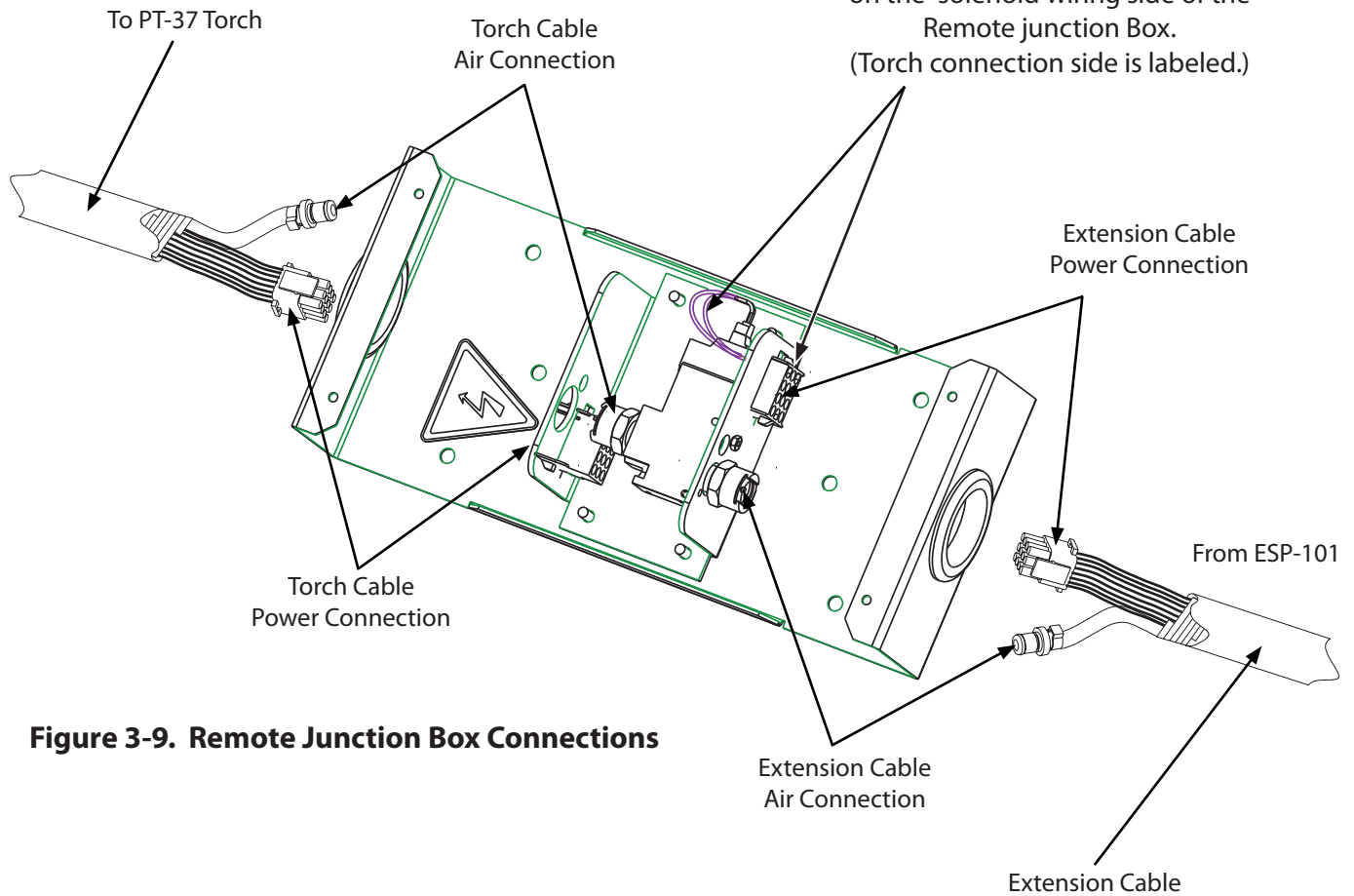


Figure 3-9. Remote Junction Box Connections

4. Replace all covers and hardware.



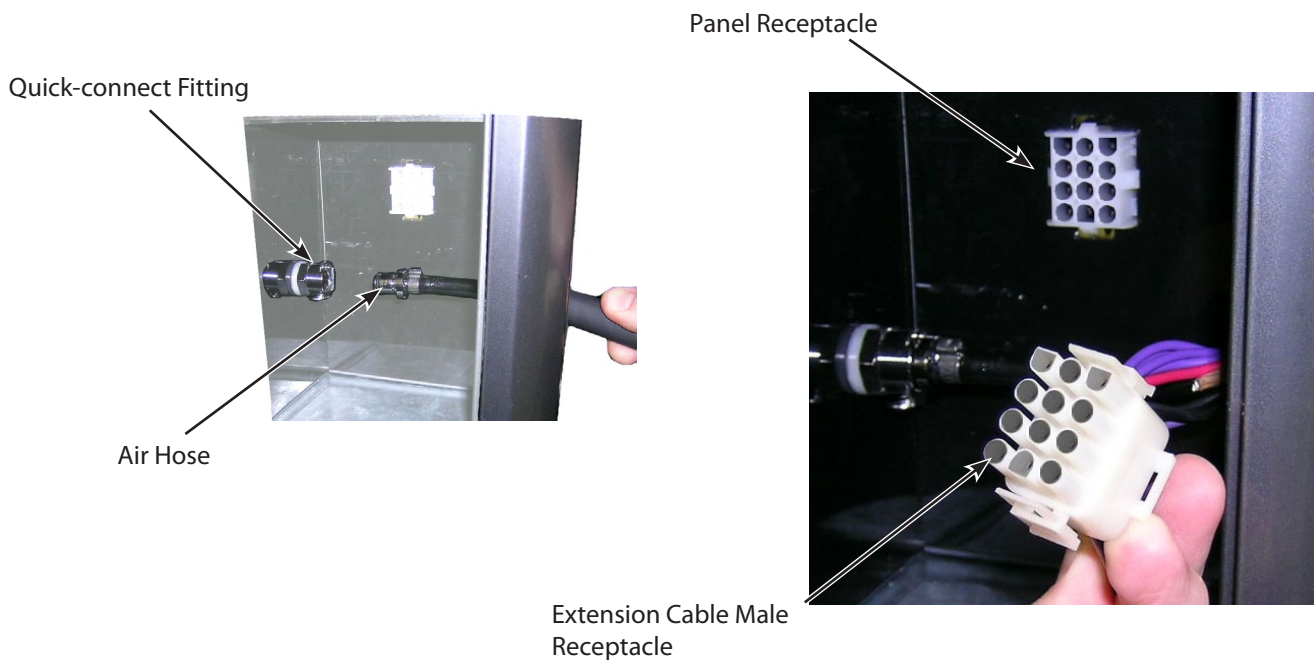
C. Connecting to the ESP-101

The Extension Cable is connected to the ESP-101 in the same manner as the PT-37 Torch.




1. Open extension cable lead access door on the left side of the ESP-101.
2. Insert the extension cable and air hose through the extension cable access opening on the front of the console.



3. Connect the extension cable male receptacle (from Remote Junction Box) to the female receptacle. Check orientation of the sockets so as to ensure a correct fit.
4. Connect the air hose (from Remote Junction Box) to the quick-connect fitting.



5. Close the Extension Cable Lead access door.

 <b style="font-size: 1.2em;">DANGER	<p>ELECTRIC SHOCK CAN KILL.</p> <ul style="list-style-type: none"> • Do NOT operate the unit with the cover removed. • Do NOT apply power to the unit while holding or carrying the unit. • Do NOT touch any torch parts forward of the torch handle (nozzle, heat shield, electrode, etc.) with power switch on.
 <b style="font-size: 1.2em;">WARNING	<p>ARC RAYS CAN BURN EYES AND SKIN; NOISE CAN DAMAGE HEARING.</p> <ul style="list-style-type: none"> • Wear welding helmet with No. 6 or 7 lens shade. • Wear eye, ear, and body protection.
 <b style="font-size: 1.2em;">CAUTION	<p>Position the ESP-101 at least 10 feet (3 meters) from the cutting area. Sparks and hot slag from the cutting operation can damage the unit.</p>

4.0 Operation

4.1 ESP-101 Controls

A. Power Switch (ON-OFF)/(I-O). Turn knob clockwise to "ON" ("I") position for normal operation. Turn knob counterclockwise to switch "OFF" ("O").

Note that with the switch in the "ON" ("I") position, power is provided to the main transformer and the low voltage control circuitry. In the "OFF" ("O") position, the unit is shut down; however, power is still present in the unit. To remove power from the power source, power must be disconnected at the line disconnect switch or the fuse box.

B. Pressure Regulator. Regulates cut gas pressure. Rotate clockwise to increase and counterclockwise to decrease. Pressure reading is indicated on the lower display screen. Pressure unit of measure is indicated on the upper display screen.

Note:

With or without Junction Box installed: When using 4.5' (1.4 m) or 17' (5.2 m) torch assemblies, plasma gas settings should be reduced 5 - 10 psi (.35 - .69 bar) for optimum performance.

Note:

The unit is shipped from the factory with the regulator adjusted to deliver 80 psig (5.5 bar) to the torch from a 95 psig (6.5 bar) supply. If supply pressure to the machine is greater than 95 psig (6.5 bar) up to the maximum recommended 150 psig (10.3 bar), rotate pressure regulator knob counterclockwise to reduce the pressure delivered to the torch back to 80 psig (5.5 bar). Follow GAS TEST instructions, see D.2.

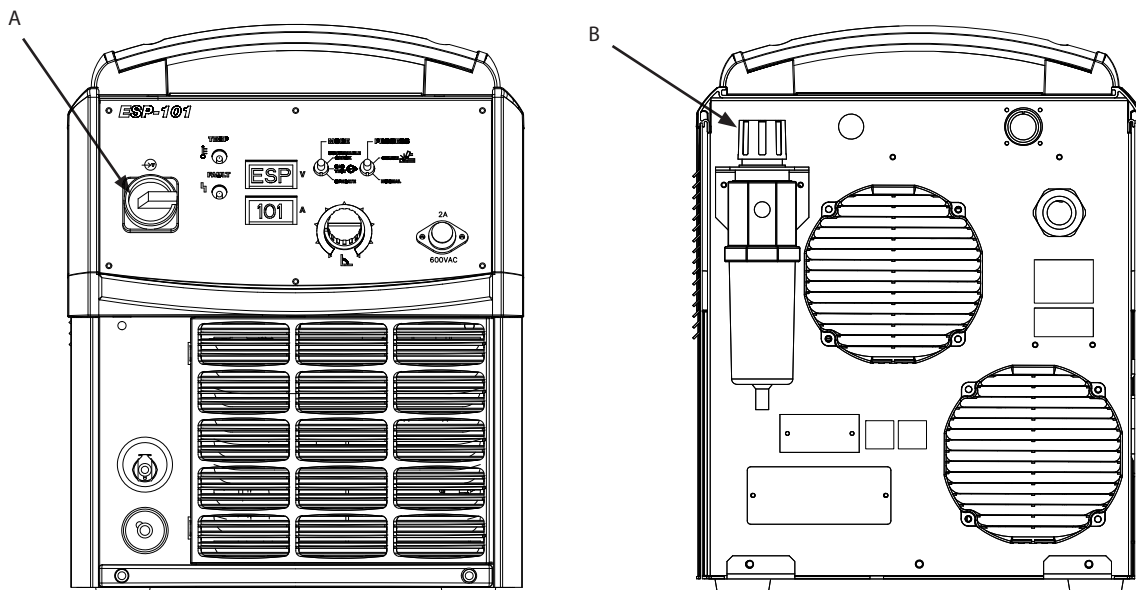


Figure 4-1. ESP-101 Controls

C. Output Current Control. Adjustable from 20 to 100 amperes. Calibration marks are to provide a guide in setting current. For settings refer to cut data charts in the torch manual.

D. MODE Selector Switch.

1. CONSUMABLE CHECK (UP position) - When placed in this position, the proper installation and operation of the consumables are verified by sending a series of gas pulses through the torch. PIP (Parts in Place) is indicated on the upper display screen. An error message will be displayed if improper operation is detected. Err (Error) is indicated on the upper display screen. The Error code is indicated on the lower display screen. Refer to Section 6.2 List of Help Codes. Be sure to place switch in OPERATE position before starting cutting operation.
2. GAS TEST (CENTER position) - The display screen will indicate flowing air pressure. Pressure reading is indicated on the lower display screen. Pressure unit of measure is indicated on the upper display screen (PSI or Bar). See section 7.4 for selecting air pressure units of measure. The air regulator should be adjusted to recommended pressure before cutting operations. Allow air to flow for a few minutes. This should remove any condensation that may have accumulated during shutdown period. Be sure to place switch in OPERATE position before starting cutting operation.
3. OPERATE (DOWN position) - Place switch in this position for cutting and gouging operations.

E. PROCESS Selector Switch. The process switch allows for selection of the output characteristics of the power source depending on the cutting process being used.

1. Normal. Setting for all standard plate cutting operations. (The pilot arc will not re-strike automatically. Requires a new start signal.)
2. Gouge. Optimizes power source for gouging operations. Gouging requires higher arc voltages. In this mode the power source allows higher operating arc voltage limiting the output current to 85 amps.

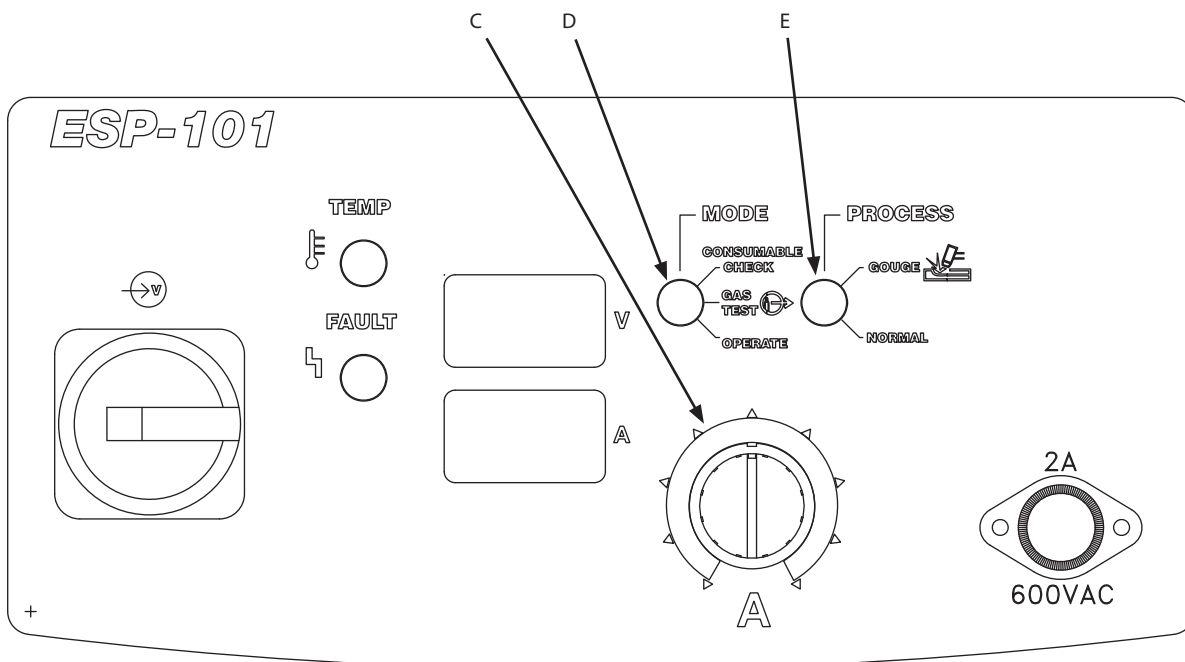


Figure 4-2a. ESP-101 Controls

F. Display Screens.

Voltmeter (UPPER) - Displays DC output voltage.
 Ammeter (LOWER) - Displays output current setting.

The voltmeter and ammeter screens alternately display Model, Test and the Software version along with help code information (see Section 6.2 List of Help Codes).

When unit is initially switched on the Model, PIP (Parts in Place) and Software version will be briefly displayed. Lower display will then show Current Setting.

Important Note:

If after the initial sequence the display does not show the Current Setting but reverts back to displaying the model "ESP-101", the machine has detected a premature torch trigger condition. Disengage the torch trigger and restart the machine. (As a safety precaution, the ESP-101 will not power up with the torch trigger engaged.)

G. TEMP Indicator Lamp.

The amber lamp will illuminate to indicate an internal overheating condition has occurred, one of the thermal switches has opened. User control of the power source will be interrupted and the unit will shut down to protect critical components. **Leave the power on to allow the fan time to cool off the unit.** Once cooled to a safe temperature, the thermal switch will automatically reset and output control will be restored.

H. FAULT Indicator Lamp.

The red lamp will illuminate to indicate an error has occurred, operator attention is required. See item F. Display Screens and refer to Section 6.2 List of Help Codes.

Note:

Most fault signals will remain on for a minimum of 10 seconds.
 Unit will reset automatically after faults are cleared except for over-current protection.

Error Indication:

An error message will be displayed if improper operation is detected. Err (Error) is indicated on the upper display screen. The Error code is indicated on the lower display screen. Refer to Section 6.2 List of Help Codes.

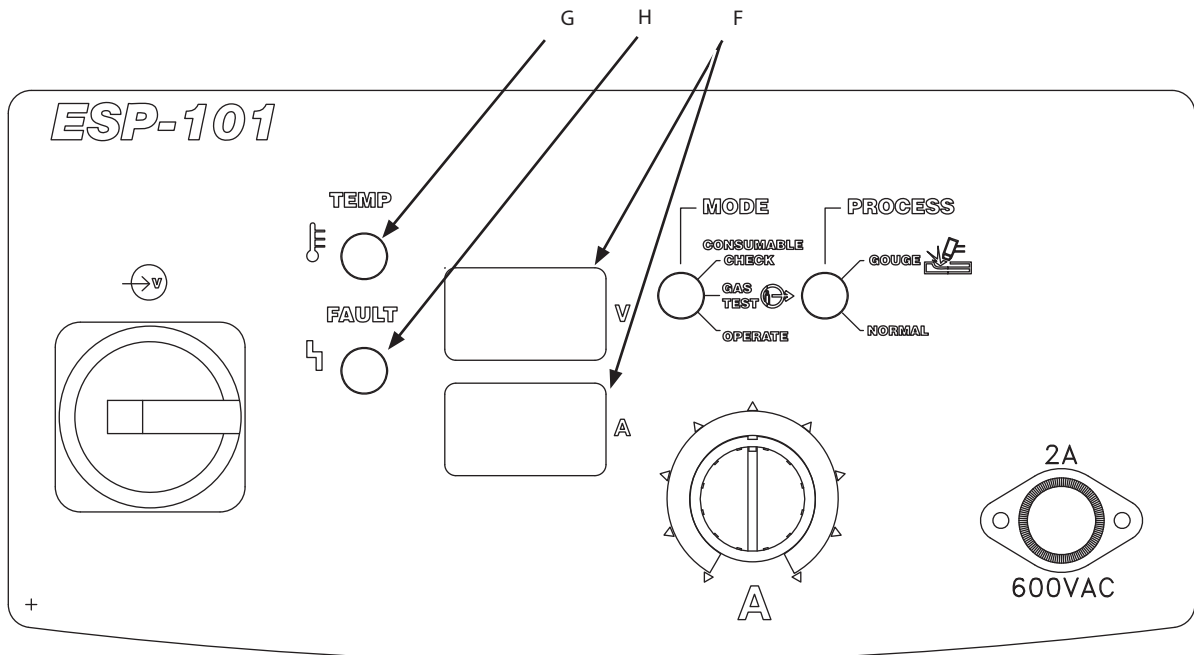


Figure 4-2b. ESP-101 Controls

**WARNING**

MAKE SURE POWER SWITCH ON UNIT IS IN OFF POSITION BEFORE WORKING ON THE TORCH.

**WARNING**

THEPT-37TORCHHEADACTSINCONJUNCTIONWITHTHECIRCUITRY WITHIN THE POWER SOURCE TO PREVENT THE TORCH FROM BEING ENERGIZEDWITHHIGHVOLTAGEIFTHETORCHSWITCHISACCIDENTALLY CLOSED WHEN THE SHIELD IS REMOVED. ALWAYS REPLACE TORCH WITH THE PROPER TORCH MANUFACTURED BY ESAB SINCE IT ALONE CONTAINS ESAB'S SAFETY INTERLOCK.

4.2 Cutting with the ESP-101

- A. Make sure that the wall disconnect switch is on and air is supplied to machine.
- B. Turn on the front panel power switch.
- C. Place MODE selector switch to "GAS TEST". Set Pressure Regulator to 80 psig (5.5 bar).
- D. Place MODE selector switch to "OPERATE".
- E. Place PROCESS selector switch to either "NORMAL" or "GOUGING".
- F. For in depth instructions refer to torch manual for complete operation and maintenance.
- G. Periodically check torch head assembly. Replace if worn or damaged.
- H. Torch cable should be inspected periodically. If there are any cuts through the protective sheath or wire insulation, replace the cable.

**CAUTION**

REPLACE ELECTRODE BEFORE WEAR BECOMES DEEPER THAN .060" INCH (1.5 MM)

4.3 Electrode Wear

If the electrode has a pit which is more than .06" (1.5mm) deep at its center, it must be replaced. This is done by unscrewing the electrode in a counter-clockwise direction from the piston. If the electrode is used beyond this recommended wear limit, damage to the torch and power source may occur. Nozzle life is also greatly reduced when using the electrode below the recommended limit.

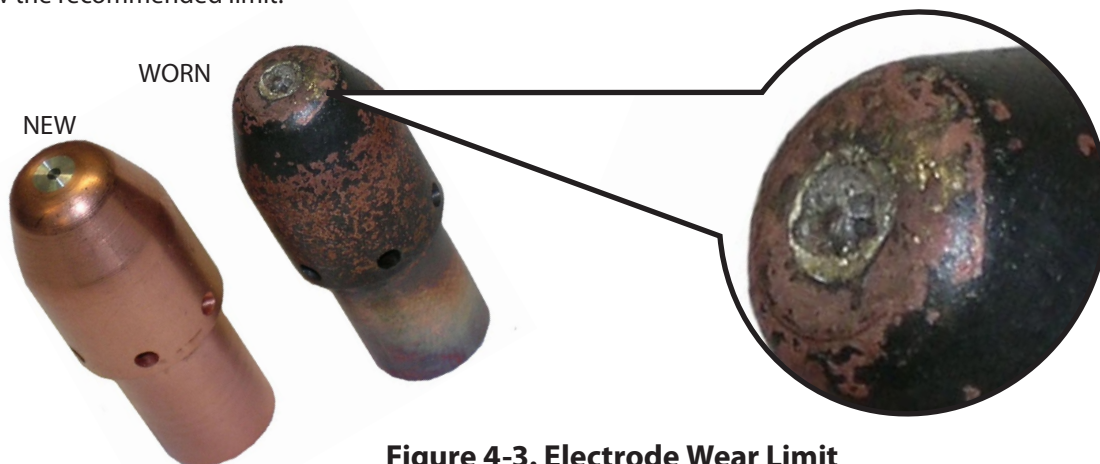


Figure 4-3. Electrode Wear Limit

4.4 Standoff and Cut Quality

Standoff (Arc Voltage) has a direct influence on cut quality and squareness. It is recommended that prior to cutting, that all cutting parameters are set to the manufacturer’s suggested conditions. Refer to the Operation section Process Data in the torch manual for recommendations. A sample cut should be made using actual part material followed by close examination of the part.

If the cut face of the part has excessive bevel or rounded top edge, it may be that the standoff is set too high. When standoff is controlled by an arc voltage height control, reducing the arc voltage setting will reduce the standoff.

Lower the standoff until the excessive bevel or rounded top edge disappears. Note that on material thicknesses of 1/4" (6.4 mm) or greater, a standoff too close may result in a negative cut angle.

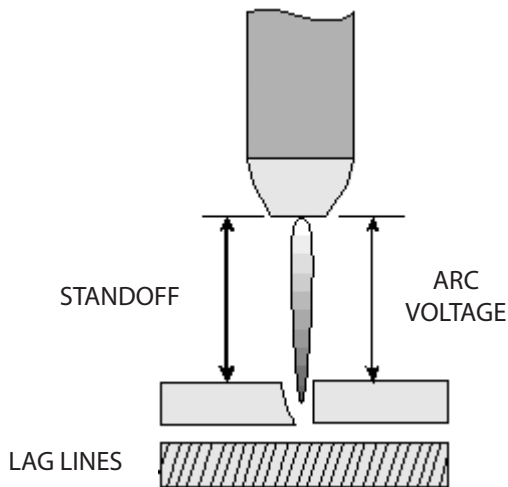
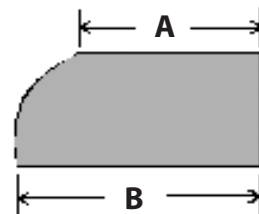


Figure 4-4. Cut Quality

POSITIVE (+) CUT ANGLE

Bottom dimension "B" is greater than dimension "A"



NEGATIVE (-) CUT ANGLE

Bottom dimension "B" is less than dimension "A"

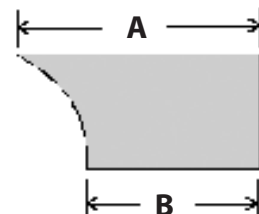


Figure 4-5. Cut Angle

4.5 Dross Formation

Cutting speed, gas selection and variations in metal composition contribute to dross formation. The correct cutting standoff also has an influence on dross formation. If the arc voltage is set too high, the cut angle becomes positive. In addition, dross forms on the bottom edge of the part. This dross can be tenacious and require chipping and grinding for removal. Setting the cutting voltage too low results in undercutting the parts or negative cut angle. Dross formation occurs but in most cases it is easily removed.

Top Dross

Top dross usually appears as splatter near the top edge of the kerf. This is a result of torch standoff (arc voltage) set too high or cutting speed set too fast. Most operators use the parameter charts for recommended speed. The most common problem is torch standoff or arc voltage control. Simply lower the voltage settings in increments of 5 volts until the top dross disappears. If an arc voltage control is not used, the torch can be lowered manually until the dross disappears.

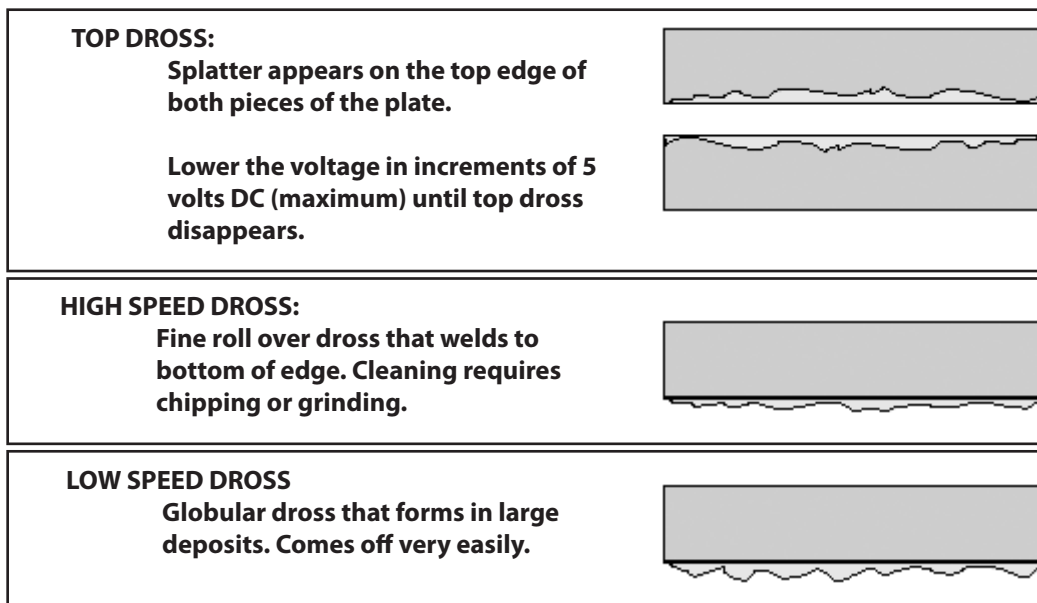


Figure 4-6. Dross Formation

SUMMARY

Arc voltage is a dependent variable. It is dependent upon cutting amperage, nozzle size, torch standoff, cut gas flow rate and cutting speed. An increase in arc voltage can result from a decrease in cutting speed, an increase in cutting amperage, a decrease in nozzle size, an increase in gas flow and an increase in torch standoff. Assuming that all of the variables are set as recommended, torch standoff becomes the most influential variable to the process. Good and accurate height control is a necessity in producing excellent cut quality.

4.6 Common Cutting Issues

Listed below are common cutting problems followed by the probable cause of each. If problems are determined to be caused by the ESP-101, refer to the maintenance and troubleshooting sections of this manual. If the problem is not corrected after referring to the maintenance and troubleshooting sections, contact your ESAB distributor.

A. Insufficient Penetration.

1. Current too low.
2. Cutting speed too fast.
3. Damaged cutting nozzle.
4. Improper air pressure.
5. Low air flow rate.
6. Standoff too high - Nozzle to plate distance.

B. Main Arc Extinguishes.

1. Cutting speed too slow.
2. Worn electrode.
3. Standoff too high - Nozzle to plate distance.

C. Dross Formation. (In some materials and thicknesses, it may be impossible to get dross-free cuts.)

1. Current too low.
2. Cutting speed too fast or too slow.
3. Improper air pressure.
4. Faulty nozzle or electrode.
5. Low air flow rate.

D. Double Arcing. (Damaged Nozzle Orifice.)

1. Low air pressure.
2. Damaged cutting nozzle.
3. Loose cutting nozzle.
4. Heavy spatter accumulation on nozzle.
5. Nozzle contact with workpiece during starting or cutting operation.

E. Uneven Arc.

1. Damaged cutting nozzle or worn electrode.
2. Heavy spatter accumulation on nozzle or torch heat shield.

F. Unstable Cutting Conditions.

1. Incorrect cutting speed.
2. Loose cable or hose connections.
3. Electrode and/or cutting nozzle in poor condition.

G. Main Arc Does Not Strike.

1. Worn electrode.
2. Loose connections.
3. Work cable not attached.

H. Poor Consumable Life.

1. Improper air pressure.
2. Contaminated air supply.
3. Low air flow rate.
4. Incorrect current setting for consumable set installed in torch.

**WARNING**

BE SURE THAT THE WALL DISCONNECT SWITCH OR WALL CIRCUIT BREAKER IS OPEN BEFORE ATTEMPTING ANY INSPECTION OR WORK INSIDE OF THE UNIT.

5.0 Maintenance

5.1 General

If this equipment does not operate properly, stop work immediately and investigate the cause of the malfunction. Maintenance work must be performed by an experienced person and electrical work by a trained electrician. Do not permit untrained persons to inspect, clean, or repair this equipment. Use only recommended replacement parts.

5.2 Inspection and Cleaning

Frequent inspection and cleaning of the ESP-101 is recommended for safety and proper operation. Some suggestions for inspecting and cleaning are as follows:

- A. Check work cable for secured connection to workpiece.
- B. Check safety earth ground at workpiece and at power source chassis.
- C. Check heat shield on torch. It should be replaced if damaged.
- D. Check the torch electrode and cutting nozzle for wear on a daily basis. Remove spatter or replace if necessary.
- E. Make sure cable and hoses are not damaged or kinked.
- F. Make sure all plugs, fittings, and ground connections are tight.
- G. With all input power disconnected, and wearing proper eye and face protection, blow out the inside of the unit using low-pressure dry compressed air.

**WARNING**

WATER OR OIL OCCASIONALLY ACCUMULATES IN COMPRESSED AIR LINES. BE SURE TO DIRECT THE FIRST BLAST OF AIR AWAY FROM THE EQUIPMENT TO AVOID DAMAGE TO THE UNIT.

- H. Occasionally, bleed all water from the filter beneath the air regulator.

5.3 IGBT Handling & Replacement

Since IGBT gates are insulated from any other conducting region, care should be taken to prevent static build up, which could possibly damage gate oxides. All IGBT modules are shipped from the factory with conductive foam contacting the gate and emitter sense pins.

Always ground parts touching gate pins during installation. In general, standard ESD precautions application to FETs should be followed.

Other handling precautions that should also be observed are as follows:

- Use grounded work station with grounded floors and grounded wrist straps when handling devices.
- Use a 100Ω resistor in series with the gate when performing curve tracer tests.
- Never install devices into systems with power connected to the system.

5.4 Module Replacement

When mounting modules on a heatsink, certain precautions should be taken to prevent any damage against a sudden torque. If a sudden torque (“one-sided tightening”) is applied at only one mounting terminal the ceramic insulation plate or silicon chip inside the module may get damaged.

The mounting screws are to be fastened in the order shown below. Also, care must be taken to achieve maximum contact (i.e. minimum contact thermal resistance) for the best heat dissipation.

A torque wrench should be used. Tighten mounting and terminal screws per Torque Requirements shown in Subsection 7.3. If device is over-torqued, the device can be damaged like the above “one-sided tightening”.

Application of a Thermal Compound or Thermal Pad on the contact surface is required to properly remove heat from the device. It is recommended that a unit manufactured with thermal compound use thermal compound for replacement, even if replacement module was shipped with a thermal pad. Thermal compound may always be used as a replacement for a pad. Never use both compound and a pad.

Thoroughly remove any residual material from the mating surfaces. Use Dow-340 Heat Sink Compound or equivalent. Apply a thin layer (.005” nominal) between mating surfaces. If a thermal pad is used, ensure there are no folds or creases.

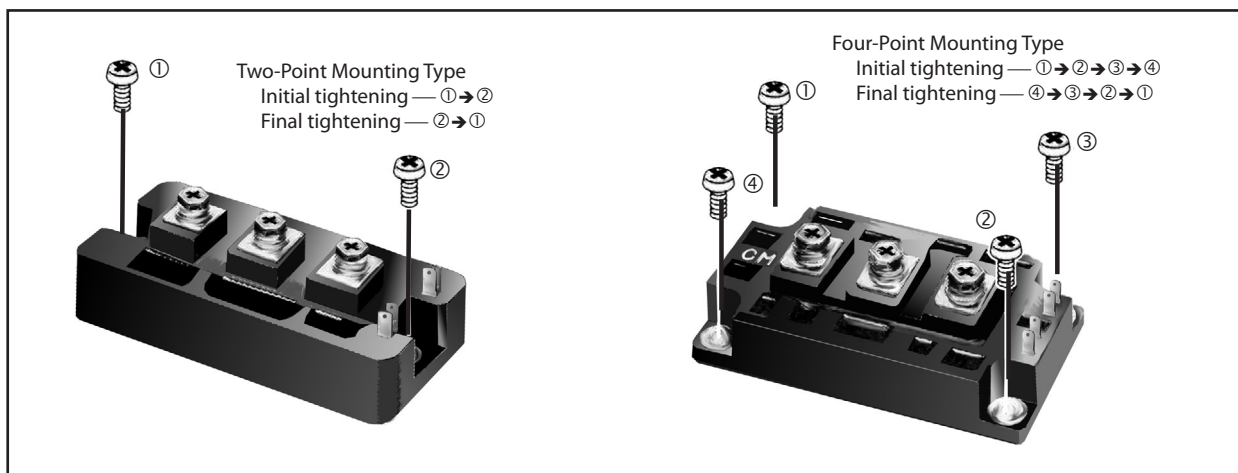


Figure 5-5. Screw Fastening Order

**DANGER**

ELECTRIC SHOCK CAN KILL! BE SURE THAT ALL PRIMARY POWER TO THE MACHINE HAS BEEN EXTERNALLY DISCONNECTED. OPEN THE LINE (WALL) DISCONNECT SWITCH OR CIRCUIT BREAKER BEFORE ATTEMPTING INSPECTION OR WORK INSIDE OF THE POWER SOURCE.

**DANGER**

VOLTAGES IN PLASMA CUTTING EQUIPMENT ARE HIGH ENOUGH TO CAUSE SERIOUS INJURY OR POSSIBLY DEATH. BE PARTICULARLY CAREFUL AROUND EQUIPMENT WHEN THE COVERS ARE REMOVED.

6.0 Troubleshooting

6.1 Troubleshooting

Check the problem against the symptoms in the following troubleshooting guide. The remedy may be quite simple. If the cause cannot be quickly located, shut off the input power, open up the unit, and perform a simple visual inspection of all the components and wiring. Check for secure terminal connections, loose or burned wiring or components, bulged or leaking capacitors, or any other sign of damage or discoloration.

The cause of control malfunctions can be found by referring to the sequence of operations, electrical schematics and checking the various components. A volt-ohmmeter will be necessary for some of these checks.

6.2 List of Help Codes

Code	Error	Cause	Solution
1	Line voltage, idle +/- 15 %	Supply line voltage either dropped or exceeded nominal input setting.	Check voltage supply.
2	Line voltage, cutting +/- 20 %	Supply line voltage either dropped or exceeded nominal input setting during a cut.	Check voltage supply.
3	Control bias, +/- 15 V bias split	Control transformer not supplying the proper voltage to the control circuit	Check transformer and control board.
4	Thermal switch	Switch open - unit overheated.	Allow unit to cool down, check for adequate ventilation.
5	Pressure	Air pressure is outside of proper range.	Check air supply and pressure setting.
6	Fail to fire	Arc did not transfer.	Check ground cable.
7	Pilot Arc timeout (~ 5 seconds)	Pilot arc exceeded 5 second limit .	Start within 5 second limit.
8	Torch error	Electrode in contact with nozzle (failed to separate).	Check/replace consumables.
9			
10	Feedback improper	Primarily seen if Hall sensor is unplugged. Check torch - possible nozzle to work short. Remove debris from front end of torch.	Check cable and connection between current sensor board and control board.
11	Primary over-current	Converter failure.	Send unit to an Authorized Repair Station for repair.
12	Single phase operation, shutdown	Lost (dropped) phase on the primary supply.	Check line wall disconnect fuses.
13	OCV (open circuit voltage) failure	Voltage or current not detected when test (parts in place, PIP) is performed.	Send unit to an Authorized Repair Station for repair.
14	Cabinet temperature	Too high, outside of operating limits.	Check ventilation around unit. Check air louvers and any other openings to ensure that any obstruction is removed.
15	Bus charger failure	Primary bus not up to voltage.	Check bus charger.
16			
17			
18			
19			
20	PIP (Parts in place) no retract	Piston did not retract when air applied.	Check/clean consumables. Check air supply.
21	PIP (Parts in place) no continuity	Piston did not drop back in place when air was removed.	Check/clean consumables.

6.3 Troubleshooting Guide

A. Power (LED display) does not come on.

1. Visually inspect the machine for any damage.
2. Check if the cooling fan is running. If not, then check the following :
 - a. Check if the machine power cord is plugged to the input power receptacle.
 - b. Measure the input power at the receptacle. If not present, then check the wall disconnect switch and it's fuses.
 - c. Check Fuse (F1). If fuse is ok, then check the input switch (S1) for proper operation. Replace if defective.
3. If above items check OK , the problem is internal. **Send unit to an Authorized Repair Station for repair.**
 - a. If the cooling fan is running, then measure voltage between the following:
 - between P1-1 and P3-1 for 28 vac (if no voltage replace T1)
 - between TP-1 and TP-2 for 24 vdc
 - between P2-1 and P2-10 for 24 vdc
 - between P2-3 and P2-10 for 24 vdc
 - between TB1-1 (black) and TB1-2 (red) for 24 vdc.
 - b. If the voltage is present, then the pilot light may be burnt out.

B. Fault light remains on at power-up.

1. Verify start signal is not present. If so, clear start signal, fault should reset.
2. Switch power to OFF, verify consumables are installed correctly.

C. No Air Flow

1. Check air inlet supply. Unit requires 500 cfh (14.2 cmh) at 70 to 80 psig (4.8 to 5.5 bars) with 100 amp consumable set.
2. Check air hose and connections. Tighten if leaking.
3. Does air flow when "air test" switch is in test position?
 - a. If not, check torch consumables, replace if necessary.
 - b. If above items check OK , the problem is internal. **Send unit to an Authorized Repair Station for repair.**

D. The power is on, display does not show current setting but shows "ESP-101".

The machine has detected a premature torch trigger condition. Disengage the torch trigger and restart the machine. (As a safety precaution, the ESP-101 will not power up with the torch trigger engaged.)

E. The power is on, but nothing happens when torch switch is operated.

1. Ensure that torch is securely connected to the power source.
2. Torch should be checked for switch function.
3. If torch switch is functional, machine will need servicing.

F. Air is on, but nothing happens when torch switch is operated.

1. Error 21 will appear if the pilot arc path is not completed.
 - a. Check consumables, replace them if necessary.
 - b. Check torch for good connection to power source.
 - c. If it still gives this error, the machine may need to be serviced.
2. Error 20 will appear if the torch piston does not retract.
 - a. Check and clean torch consumables.
 - b. Check that source pressure is greater than 80 psi (5.5 bar).
 - c. Check that air flows out of the torch.
 - d. If it still gives this error, the machine may need to be serviced.
3. Error 13 will appear if the machine does not provide OCV.
 - a. Send unit to an Authorized Repair Station for repair.

G. Pilot Arc is on but Main Arc does not transfer.

1. Make sure work clamp is connected to work table.
 - a. Measure continuity between work terminal and the work piece or table.
 - b. Make work clamp connection to clean bare metal of work piece or table.
 - c. If clamping to a work table, ensure good contact between work piece and the table.
2. Check the torch. Replace consumables if necessary.

H. Poor Cutting Performance.

1. Check air supply regulator . It should be adjusted to 70 - 80 psig (4.8 - 5.5 bars).
2. The air supplied to the torch should be free of oil and water.
3. Make sure the consumables in the torch are acceptable.
4. Check the output. Use a calibrated current probe capable of measuring 200 amps.

I. Air does not shut off.

1. Check air test, the gas solenoid valve is energized when the switch is in the "on" position.
 - a. Check voltage to solenoid coil, if present when CNC cable is unplugged, replace PCB2.
 - b. Turn off primary power to the power source. If gas continues to flow, replace the gas solenoid.
 - 1) Turn on primary power and check the status of the Fault light. If the Fault light is on continuously and gas is on continuously, turn off primary power and inspect the torch for proper assembly of the electrode and nozzle. Press firmly on the electrode and verify that it retracts when pressed, and returns forward when released.
 - 2) Reassemble the electrode and nozzle and turn on primary power. After approximately two seconds the gas should come on briefly then go off. If the Fault light comes on continuously and gas remains off, check for defective torch trigger or shorted torch trigger leads.

J. Main arc is difficult to start.

1. The most common reason is worn or missing consumables. Check and replace if necessary.
2. Input air must be clean and dry.
3. Input air pressure must be between 70 - 80 psig (4.8 - 5.5 bars).
4. Torch connections must be tight.
5. Work cable and clamp must be in good condition and must make a good electrical connection to the material to be cut.
6. If above items check OK, the problem may be internal. **Send unit to an Authorized Repair Station for repair.**

K. No pilot arc or main arc established if you depress torch switch or send start signal.

1. Check Help Code display.

6.4 Troubleshooting Remote Junction Box installation

Issue	Resolution
Continuous flow of gas from Remote Junction Box.	Extension Cable and Torch Cable are connected to wrong sides of RJB. Disconnect air supply and cables and reverse RJB mounting.
No gas flow from torch in Gas Test or Operate Mode and Low Air Pressure code is not present on Power Supply.	Place Power Supply in Gas Test Mode, verify 24VDC is supplied at gas solenoid in RJB.
	If 24VDC (polarity not required) is present, verify pins are properly installed in 12-pin plug, verify plug is mated completely until tabs are engaged and/or replace solenoid.
	If 24VDC is not present, verify wiring connections made in Installation step A.2.

6.5 Reference Voltage Checks

A. Control Board Assembly (PCB1)

1. Voltage Test Points - Tests are made with power on - no arc.

- TP-15 - Ground
- TP-12 - +15 vdc
- TP-13 - +5 vdc
- TP-14 - -15 vdc

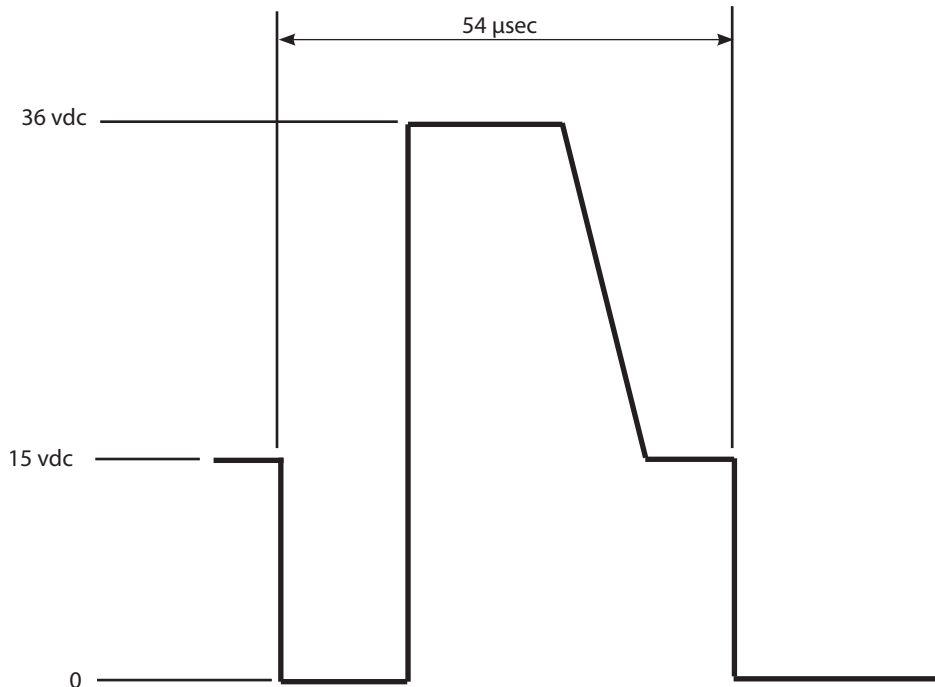
B. Interface Board (PCB2)

1. Voltage Test Points

- TP-1 - +24 vdc
- TP-2 - +24 vdc com

2. LED's

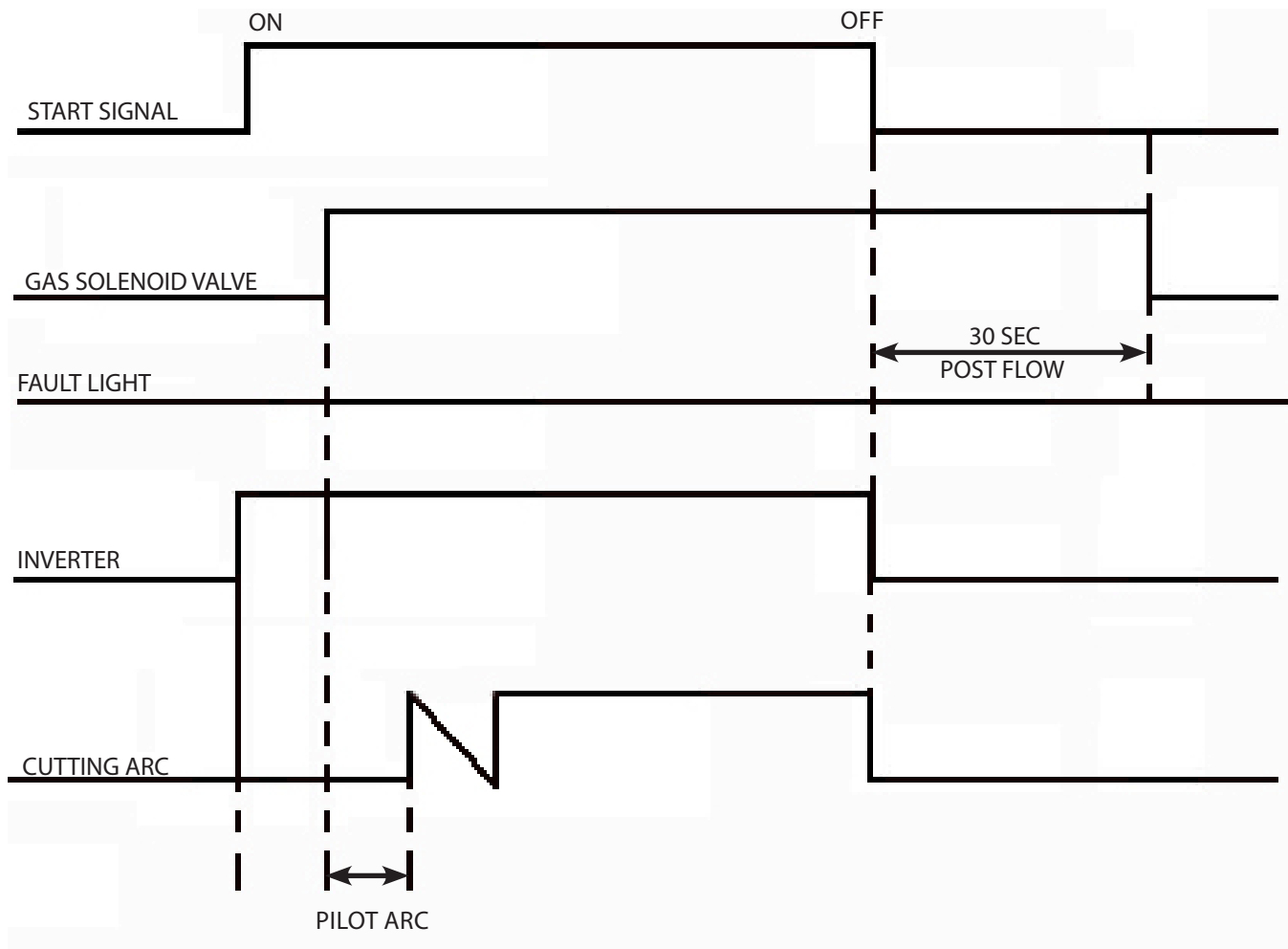
- D18 - Torch Trigger



For 208/230 VAC input, the IGBT off time is 3μsec.
For 400/460 VAC input, the IGBT off time is 3μsec.

Figure 6.1 IGBT Gating Signal

6.6 Sequence of Operation

**NOTES:**

1. When the start signal is turned "on" during post flow period, the machine will start the process without a preflow period.
2. If the amber fault light comes on, cutting operation will be terminated. The post flow time starts from the moment the start signal is removed.

7.0 Replacement Parts

7.1 General

Always provide the serial number of the unit on which the parts will be used. The serial number is stamped on the unit nameplate.

7.2 Ordering

To ensure proper operation, it is recommended that only genuine ESAB parts and products be used with this equipment. The use of non-ESAB parts may void your warranty.

Replacement parts may be ordered from your ESAB Distributor.

Be sure to indicate any special shipping instructions when ordering replacement parts.

Refer to the Communications Guide located on the back page of this manual for a list of customer service phone numbers.

Note

Bill of material items that have blank part numbers are provided for customer information only.
Hardware items should be available through local sources.

	Model # P/N	DESCRIPTION	SCHEMATIC DIAGRAM	WIRING DIAGRAM
1	0558004880	ESP-101 460v	0558006578	0558004831
2	0558005215	ESP-101 380-400v CE	0558006606	0558006607

NOTE:

Schematics and Wiring Diagrams on 279.4mm x 431.8mm (11" x 17") paper are included inside the back cover of this manual.

7.3 Torque Recommendations

RECOMMENDED TORQUES (IN/LBS ±10%)		
SYMBOL / DESCRIPTION	MOUNT	TERMINAL
BR101	36	36
Q2,3	32	32
D4,5	28	22
C5,6	-	25
C11,12,13,14	-	18
R1,2,3,4,5,6,7	6	-
R14	Hand	-
SW1	22	35
K1	18	40
K2	18	18
F1 , TB1	14	-
TS1 , J1 , TEE	12	-
SOL1	10	-
HEATSINK	28	-
M1,2	18	-
JP1	36	36
WORK , GND1	44	44
GND2	12	-
PCB1,2	10	
PCB1 - J12	-	12
PCB3 - POTENTIOMETERS	14	-
PCB4	14	-
PCB4 - P1,2	-	44
PCB4 - P3	-	25
PCB5 - TB1,2,3,4,9,10	-	44
PCB5 - TB6,8	-	25
PCB6	10	-
PCB7	18	14
P7,8	-	2.5
P1,2,3,4,6,7,9,13,16	-	4.5
STANDOFFS	7	-
HANDLES	44	-
SHEETMETAL #8	18	-
SHEETMETAL #10	28	-
SHEETMETAL 1/4"	Impact	-

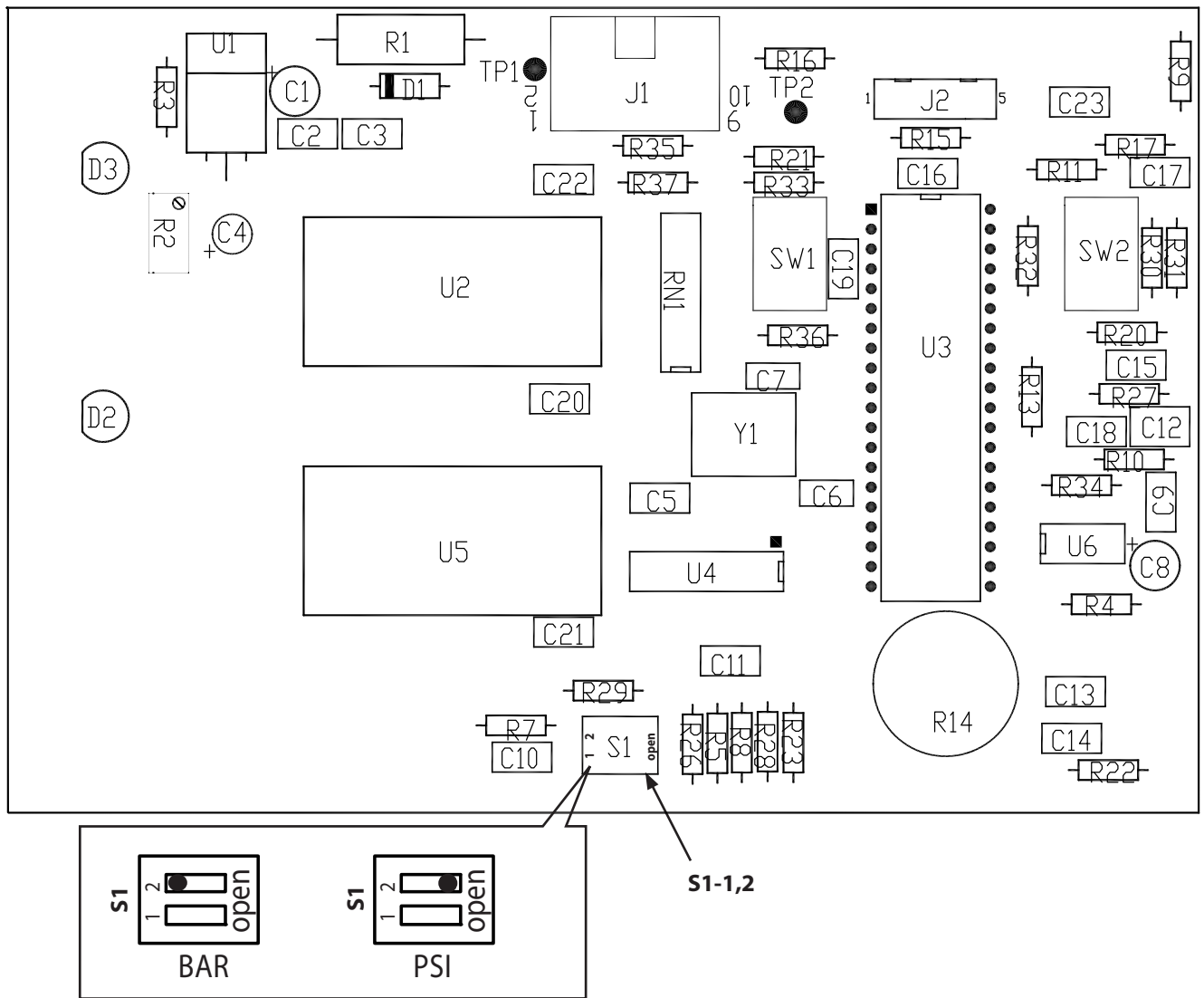
7.4 Selecting Air Pressure Units of Measure

1. Set S1-2 dip switch for desired air pressure units of measure.
 - PSI - "OPEN"
 - BAR - Not Open
2. S1-1 is not used.

7.5 Display Board Assembly

DISPLAY BOARD ASSEMBLY

P/N 0558038297



REVISION HISTORY

1. Original release for BETA use only: 04/2007.
2. Preliminary release - 08/2007.
3. Official release - 01/2008.
4. Added info and made changes per CN-083154 - 09/2008.
5. Revision 10/09 - completely re-work manual.
6. Revision 04/2010 - added 3.6 CNC Interface Connection (continued) for CCARES issue.
7. Revision 08/2010 - updated primary input requirements.
8. Revision 03/2011 - updated page 33, Interconnect Move diagram.
9. Revision 03/2013 - updated replacement parts and schematic pages.

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