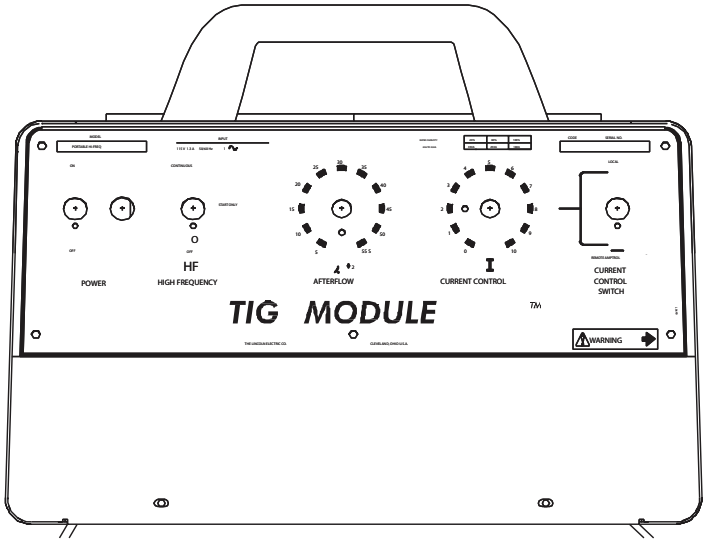
Operator's Manual

TIG MODULE



For use with machines having Code Numbers:

10135, 10203, 10284, 11010

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IM528-B | Issue Date 7-Feb

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THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

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

SAFETY DEPENDS ON YOU

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

⚠ WARNING

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

⚠ CAUTION

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

KEEP YOUR HEAD OUT OF THE FUMES.

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

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

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

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

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

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

WEAR CORRECT EYE, EAR & BODY PROTECTION

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

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

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

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

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

SPECIAL SITUATIONS

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

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

Additional precautionary measures

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

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

REMOVE all potential fire hazards from welding area.

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

SECTION A: WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

Diesel Engines

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Gasoline Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

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

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

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

FOR ENGINE POWERED EQUIPMENT.

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

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

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

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

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

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

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

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

ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS

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

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

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

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

- 2.d.1. Route the electrode and work cables together - Secure them with tape when possible.
- 2.d.2. Never coil the electrode lead around your body.
- 2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
- 2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.
- 2.d.5. Do not work next to welding power source.

ELECTRIC SHOCK CAN KILL.

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

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

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

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

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

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

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

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

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

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

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

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

ARC RAYS CAN BURN.

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

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

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

FUMES AND GASES CAN BE DANGEROUS.

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

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

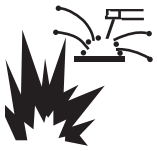
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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

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

5.f. Also see item 1.b.

WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



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

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

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

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

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

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

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

6.h. Also see item 1.c.

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

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

CYLINDER MAY EXPLODE IF DAMAGED.

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

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

7.c. Cylinders should be located:

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

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

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

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

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

FOR ELECTRICALLY POWERED EQUIPMENT.

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

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

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

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

PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Mar. '93

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INSTALLATION

TECHNICAL SPECIFICATIONS - TIG MODULE

INPUT - SINGLE PHASE ONLY		
Standard Voltage	**Input Current**	**Code Number**
115 VAC 50/60 (60VAC TO 130 VAC) 50/60 HZ. (MIN. TO MAX.)	1.3 amperes	10135 10203 10284 11010

RATED CAPACITIES		
Duty Cycle	**Amps**	**Total Capacity Range**
100%	200 amps AC/DC	15 - 400 amps AC/DC
60%	300 amps AC/DC	
20%	400 amps AC/DC	

RECOMMENDED WELDING CABLES		
Duty Cycle	**Amps**	**Cable sizes* (mm^2)**
100%	200 amps AC/DC	#2 AWG (30)
60%	300 amps AC/DC	#1 AWG (35)
20%	400 amps AC/DC	#1/0 AWG (50)

(*) Correct Cable size if the cable length is 150 feet (45.7 meters) or less.

PHYSICAL DIMENSIONS			
Height	**Width**	**Depth**	**Weight**
12.0 in.	15.0 in.	10.5 in.	33 lbs
305 mm	381 mm	267 mm	(15 kg)

Insulation Class 155(F)

Read entire installation section before starting installation.

Safety Precautions

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this installation.**
- **Turn the Power Source input power OFF at the disconnect switch or stop the engine before attempting to connect the TIG Module**
- **Do not touch electrically hot parts.**

Users should familiarize themselves with Figure 8, Rear Connections, in the Operating Section of this manual before proceeding.

LOCATION

The TIG Module can be mounted in or carried to any convenient location. It is designed to be portable. If placed on the roof of engine welders, it must be mounted securely. A Docking Kit option is available for this purpose. See the Accessories section.

ENVIRONMENTAL PROTECTION

This accessory qualifies for an IP23 rating. It is suited for use in damp, dirty and dusty locations. (In locations where there are large amounts of conductive metal or salt particles in the air, additional maintenance may be required.) It is protected against rainfall. Excessive moisture can, however, cause short term operational difficulties. Difficulties can occur with the spark gap; it may not "spark" when the unit is first turned on after prolonged exposure to moisture. Usually, allowing the unit to operate for 5 to 15 minutes will allow the spark gap to dry out, and return to normal operation.

HIGH FREQUENCY INTERFERENCE PROTECTION

Since the spark gap oscillator in the TIG Module is similar to a radio transmitter, improper installation can result in radio and TV interference or problems with nearby electronic equipment.

Radiated interference can develop in the following four ways:

1. Direct interference radiated from the welder and the TIG Module.
2. Direct interference radiated from the welding leads.
3. Direct interference radiated from feedback into the power lines.
4. Interference from reradiation of "pickup" by ungrounded metallic objects.

Keeping these contributing factors in mind, installing equipment per the following instructions should minimize problems.

1. Keep the power source input supply lines as short as possible and completely enclose them in rigid metallic conduit or equivalent shielding for a minimum distance of 50 feet (15.2 m). There should be good electrical contact between this conduit and the welder. Both ends of the conduit should be connected to a driven ground and the entire length should be continuous.
2. Keep the work and electrode leads as short as possible and as close together as possible. Lengths should not exceed 25 feet (7.6 m). Tape the leads together when practical.
3. Be sure the torch and work cable rubber coverings are free of cuts and cracks that allow high frequency leakage. Cables with high natural rubber content, such as Lincoln Stable-Arc® better resist high frequency leakage than neoprene and other synthetic rubber insulated cables.
4. Keep the torch in good repair and all connections tight to reduce high frequency leakage.
5. The work terminal must be connected to a ground within ten feet of the welder, using one of the following methods:

    a) A metal underground water pipe in direct contact with the earth for ten feet or more.

    b) A 3/4" (19 mm) galvanized pipe or conduit or a 5/8" (16 mm) solid galvanized iron or steel or copper rod driven at least eight feet into the ground.

The ground should be securely made and the grounding cable should be as short as possible using cable of the same size as the work cable, or larger. Grounding to the building frame electrical conduit or a long pipe system can result in reradiation, effectively making these members radiating antennas.

NOTE: The welder frame MUST also be grounded. The work terminal ground does not ground the welder frame.

6. Keep all access panels and covers securely in place.

7. All electrical conductors within 50 feet (15.2 m) of the welder should be enclosed in grounded rigid metallic conduit or equivalent shielding. Flexible helically-wrapped metallic conduit is generally not suitable.

8. When the welder is enclosed in a metal building, several good earth driven electrical grounds (as in 5 (b)) around the periphery of the building are recommended.

SUPPLY CONNECTIONS

Control cables are needed to connect the TIG Module's 9-pin Input Receptacle to the power source. Four different cables are available. The proper choice of cable depends on the power source being used. Included in this report are charts which specify which cable is used with a particular power source. The cables come in standard 5 ft.(1.5m) lengths. 22(6.7m) and 45(13.7) ft. extensions are available.

Input power should be nominally 115 volts AC, but the TIG Module will operate properly on any AC voltage from 60 to 130 volts, 50 or 60 Hz. Input current draw is 1.3 amps at 115 volts.

INPUT AND OUTPUT CONNECTIONS

Input Connections

The user must provide welding cables for the connections between the work and electrode terminals of the power source, and the "FROM POWER SOURCE WORK" and "FROM POWER SOURCE ELECTRODE" terminals of the TIG Module. All connections are made with 1/2-13 threaded stud output terminals. Choose cables according to the output currents and duty cycles listed below.

200 Amps 100% Duty Cycle #2 AWG(30mm²) (minimum) Cable

300 Amps 60% Duty Cycle #1 AWG(35mm²) (minimum) Cable

400 Amps 20% Duty Cycle #1/0 AWG(50mm²) (minimum) Cable

These ratings are for cables lengths of 150 ft.(46.0m) or less.

Note that two of the studs are labeled "FROM POWER SOURCE"; these are to be connected to the power source work and electrode terminals. If the power source output terminals are not labeled "WORK" and "ELECTRODE", the TIG Module "FROM POWER SOURCE ELECTRODE" terminal should go to the power source output terminal which matches the desired welding polarity. This is the negative (-) terminal when welding DC-. The choice of power source terminal will have no effect when welding AC.

TIG Torch and Workpiece Connections

One terminal is labeled "TO TIG TORCH". Use that terminal for the TIG torch connection. TIG torches come in 12.5ft.(3.8m) and 25ft.(7.6m) lengths; use the shorter size whenever possible to minimize the possibility of high frequency interference.

The last terminal is labeled "TO WORKPIECE". Use short lengths whenever possible to minimize the possibility of high frequency interference.

Shielding Gas Connections

The gas valve connections are labeled "GAS INPUT" and "GAS OUTPUT". Any torch and gas supply conforming to Compressed Gas Association (CGA) standards can be connected via the 5/8-18 right hand threaded fittings. The cylinder of shielding gas must be equipped with a regulator and flowmeter. Install a hose between the flowmeter and the input fitting.

Water Valve Connection

The optional K844-1 Water Valve Kit can be installed in the TIG Module to provide on/off flow control for cooling water. The water valve opens and closes at the same time as the gas valve, so cooling water flows during the afterflow period. Connections are made via the two 5/8-18 left hand threaded connections. If using a water-cooled torch with a free running water supply, install a water line between the water supply and the "WATER INPUT" fitting on the TIG Module. Include a strainer in the supply line to prevent dirt particles from obstructing the water flow in the valve and cooling chamber of the TIG torch. Failure to do so could result in overheating of the water-cooled torch. Connect the torch water line to the "WATER OUTPUT" fitting. Use a nonmetallic drain line from the TIG torch power block to the drain.

If using a water cooled torch with a water cooler, do not install the water valve. It will block the water flow, possibly damaging the pump. Magnum water coolers are an exception to this rule. Refer to the manufacturer's instructions provided with the cooler.

INSTALLATION OF FIELD INSTALLED ACCESSORIES

Installation of the K963 Hand Amptrol, K870 Foot Amptrol, and K814 Arc Start Switch is as follows:

Connect the 6-pin MS-type circular connector to the Remote Receptacle on the TIG Module. Secure with the threaded collar.

Installation of the K936-[ ] Input Cables and K937-[ ] Extension Cables is as follows:

Connect the 9-socket MS-type circular connector on the Input Cable to the Input Receptacle on the TIG Module. Secure with the threaded collar. If one or more K937-[ ] Extension Cables are used, connect them between the TIG Module and the K936-[ ] Input cable.

Installation instructions for the K938-1 Contactor Kit, K844-1 Water Valve Kit and the K939-1 Docking Kit are included with those kits.

INSTALLATION WITH A POWER SOURCE

Ranger 8 Installation

Tables 1 and 2 list the required and optional equipment for installing and operating the TIG Module with a Ranger 8. Table 1 is for the Ranger 8, and table 2 is for the Ranger 8 with the K892-1 Remote Kit installed. The Remote Kit installation is identified by the presence of a 6-pin remote connector located between the output studs.

Refer to the Connection Diagrams Figures 1 and 2. Figure 1 is for the Ranger 8, and figure 2, for the Ranger 8 with the K892-1 Remote Kit installed. Make sure all connections are tight before proceeding.

RANGER 8 (WITH NO K892-1 REMOTE KIT) AND THE TIG MODULE REQUIRED EQUIPMENT

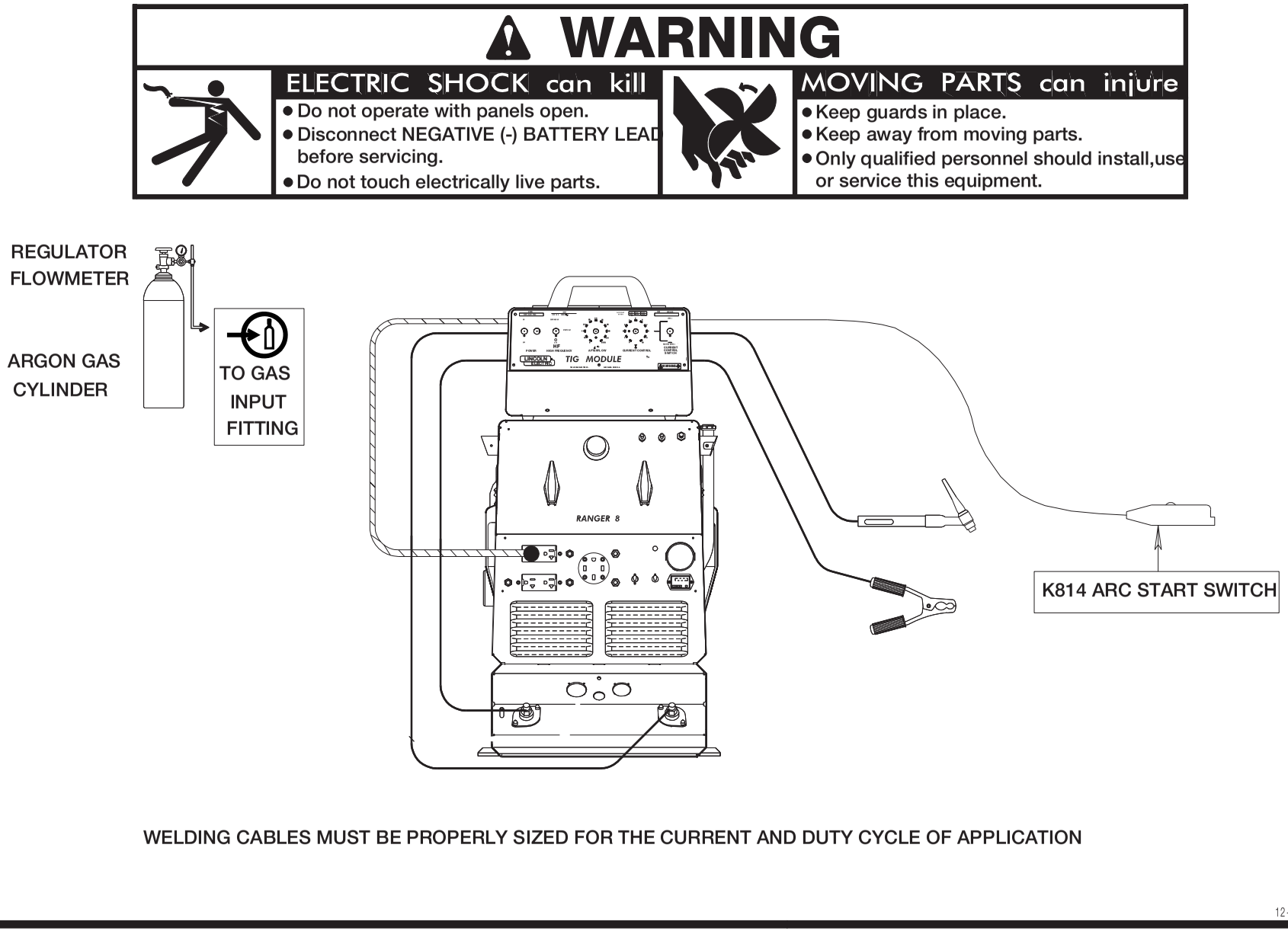
Control Cable	Contactor Kit	Work and Electrode Leads from Ranger 8 to TIG Module	TIG Torch	Work Lead	Shielding Gas, Regulator, Flowmeter	Arc Start Switch
K936-4 9-pin to 115V Plug	K938-1 Field Installed	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	K814

RANGER 8 (WITH NO K892-1 REMOTE KIT) AND THE TIG MODULE OPTIONAL EQUIPMENT

Control Cable Extension	Water Valve	Docking Kit				
K937 - [ ] Extension 9-pin to 9-pin	K844-1	K939-1 Mounts to Ranger 8 Roof				

TABLE 1

FIGURE 1: RANGER 8 / TIG MODULE CONNECTION DIAGRAM



NOTE: This diagram is for reference only. It was accurate at the time of printing , however Lincoln Electric reserves the right to make improvements and modifications as necessary, if you supect this information to be inaccurate, write to the Service Department for a replacement. Give the equipment code number..

RANGER 8 (WITH THE OPTIONAL K892-1 REMOTE KIT INSTALLED) AND THE TIG MODULE REQUIRED EQUIPMENT						
Control Cable	Contactor Kit	Work and Electrode Leads from Ranger 8 to TIG Module	TIG Torch	Work Lead	Shielding Gas, Regulator, Flowmeter	Arc Start Switch
K936-3 9-pin to 6-pin plus 115V Plug	K938-1 Field Installed	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	See Optional Equipment Below

RANGER 8 (WITH THE OPTIONAL REMOTE KIT INSTALLED) AND THE TIG MODULE OPTIONAL EQUIPMENT						
Control Cable Extension	Water Valve	Arc Start Switch	Hand Amptrol	Foot Amptrol	Docking Kit	
K937 - [ ] Extension 9-pin to 9-pin	K844-1	K814	K963	K870	K939-1 Mounts to Ranger 8 Roof	

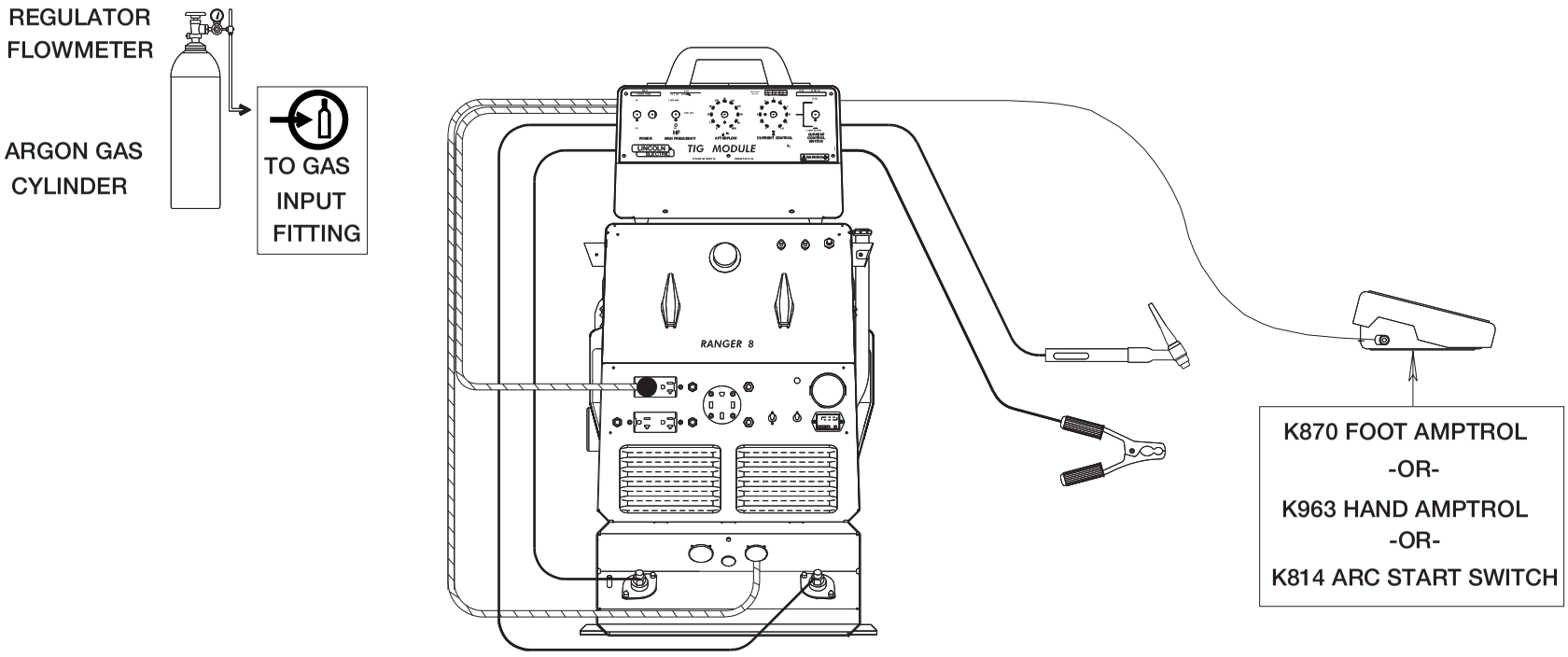
TABLE 2

FIGURE 2: RANGER 8 / K892-1 REMOTE KIT / TIG MODULE CONNECTION DIAGRAM

⚠ WARNING

ELECTRIC SHOCK can kill
- Do not operate with panels open.
- Disconnect NEGATIVE (-) BATTERY LEAD before servicing.
- Do not touch electrically live parts.

MOVING PARTS can injure
- Keep guards in place.
- Keep away from moving parts.
- Only qualified personnel should install,use or service this equipment.



WELDING CABLES MUST BE PROPERLY SIZED FOR THE CURRENT AND DUTY CYCLE OF APPLICATION

4-19-96D

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Ranger 9 Installation

Table 3 lists the required and optional equipment for installing and operating the TIG Module with a Ranger 9.

Refer to Figure 3 for the TIG Module/Ranger 9 connection diagram. Make sure all connections are tight before proceeding.

RANGER 9 AND THE TIG MODULE REQUIRED EQUIPMENT

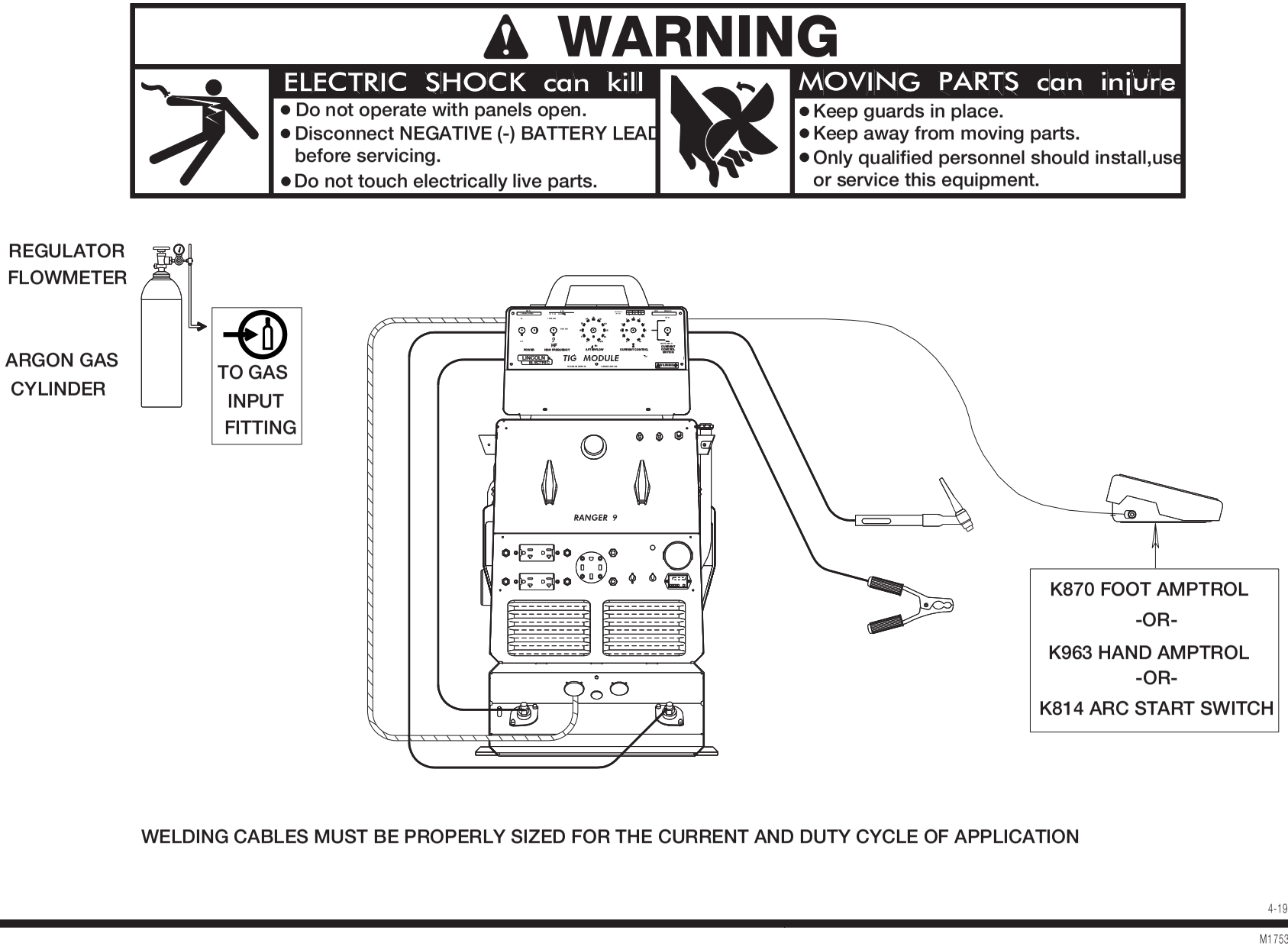
Control Cable	Work and Electrode Leads from Ranger 9 to TIG Module	TIG Torch	Work Lead	Shielding Gas, Regulator, Flowmeter	Arc Start Switch - OR - Amptrol
K936-1 9-pin to 14-pin	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	See Optional Equipment Below

RANGER 9 AND THE TIG MODULE OPTIONAL EQUIPMENT

Control Cable Extension	Water Valve	Arc Start Switch	Hand Amptrol	Foot Amptrol	Docking Kit
K937 - [ ] Extension 9-pin to 9-pin	K844-1 Field Installed	K814	K963	K870	K939-1 Mounts to Ranger 9 Roof

TABLE 3

FIGURE 3: RANGER 9 / TIG MODULE CONNECTION DIAGRAM



NOTE: This diagram is for reference only. It was accurate at the time of printing , however Lincoln Electric reserves the right to make improvements and modifications as necessary, if you supect this information to be inaccurate, write to the Service Department for a replacement. Give the equipment code number..

Ranger 10 and Ranger 300 D Installation

Table 4 lists the required and optional equipment for installing and operating the TIG Module with a Ranger 10 or Ranger 300 D.

Refer to Figure 4 for the TIG Module/Ranger 10 connection diagram and to Figure 4A for the TIG Module/Ranger 300 D connection diagram. Make sure all connections are tight before proceeding.

RANGER 10 / RANGER 300 D AND THE TIG MODULE REQUIRED EQUIPMENT

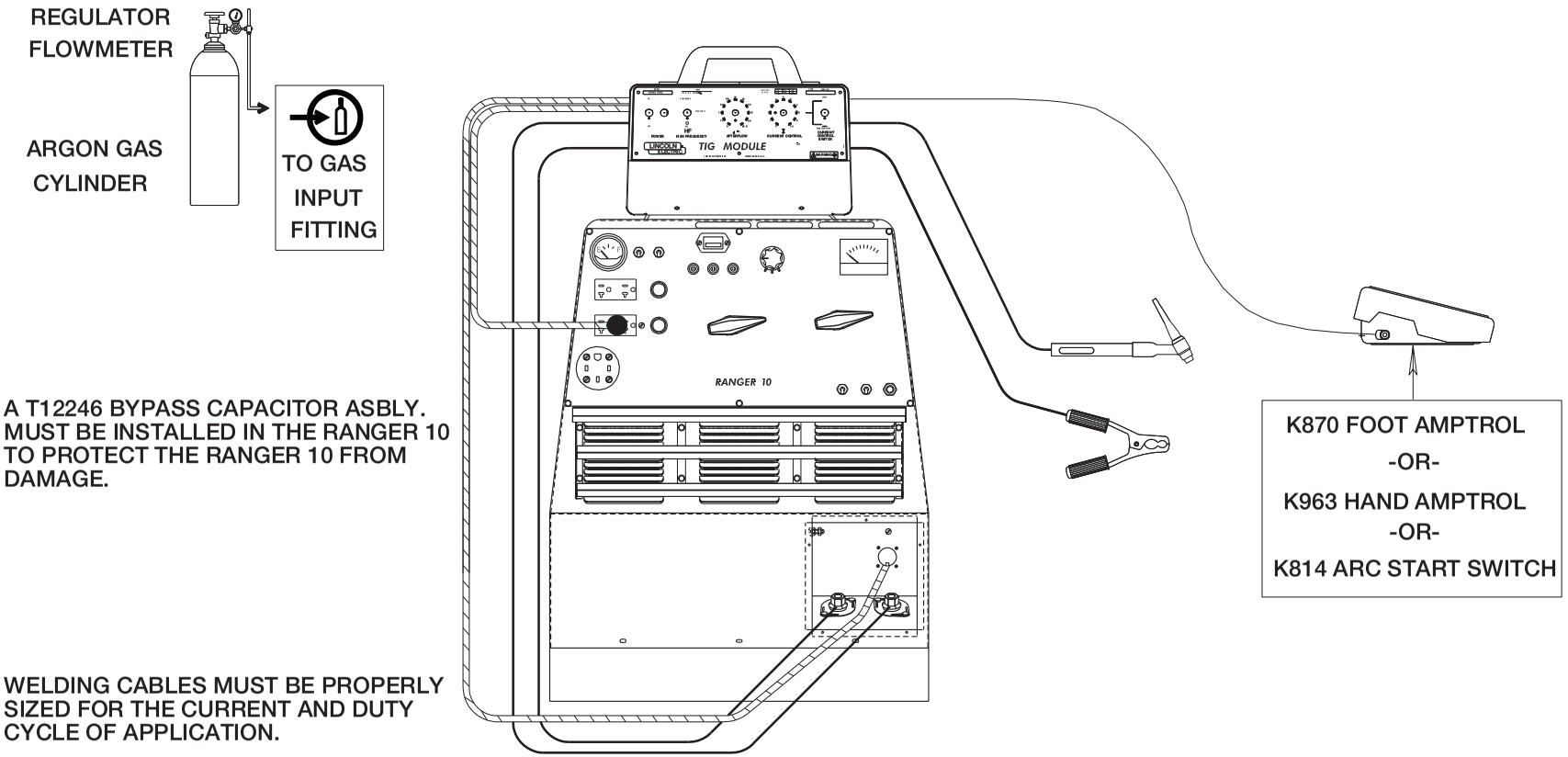
Control Cable	Contactor Kit	Work and Electrode Leads from Ranger 10 to TIG Module	TIG Torch	Work Lead	Shielding Gas, Regulator, Flowmeter	Arc Start Switch - OR - Amptrol
K936-3 9-pin to 6-pin plus 115V Plug	K938-1 Field Installed	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	See Optional Equipment Below

RANGER 10 / RANGER 300 D AND THE TIG MODULE OPTIONAL EQUIPMENT

Control Cable Extension	Water Valve	Arc Start Switch	Hand Amptrol	Foot Amptrol	Docking Kit	
K937 - [ ] Extension 9-pin to 9-pin	K844-1	K814	K963	K870	K939-1 Mounts to Ranger 10 Roof	

TABLE 4

FIGURE 4: RANGER 10 / TIG MODULE CONNECTION DIAGRAM



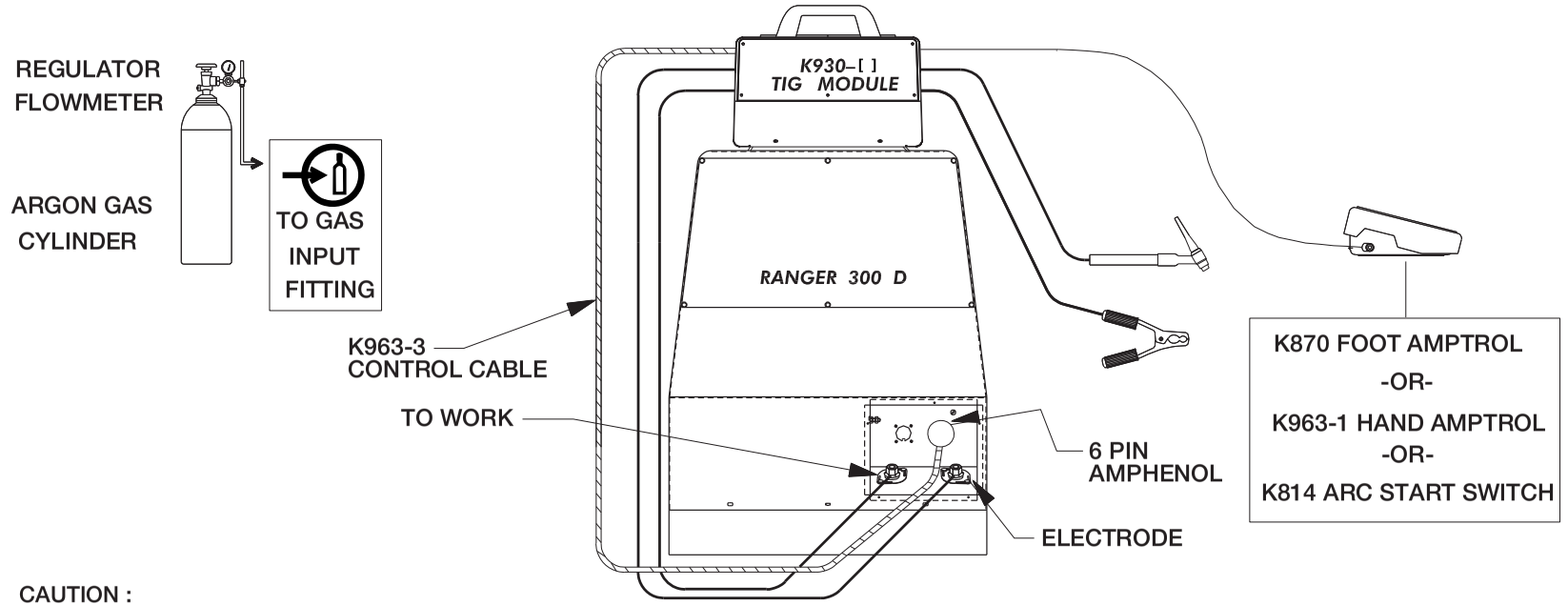
NOTE: This diagram is for reference only. It was accurate at the time of printing , however Lincoln Electric reserves the right to make improvements and modifications as necessary, if you supect this information to be inaccurate, write to the Service Department for a replacement. Give the equipment code number..

FIGURE 4A: RANGER 300 D / TIG MODULE CONNECTION DIAGRAM

WARNING

ELECTRIC SHOCK can kill
- Do not operate with panels open.
- Disconnect NEGATIVE (-) BATTERY LEAD before servicing.
- Do not touch electrically live parts.

MOVING PARTS can injure
- Keep guards in place.
- Keep away from moving parts.
- Only qualified personnel should install,use or service this equipment.



CAUTION :

ANY INCREASE OF THE HIGH IDLE ENGINE RPM BY CHANGING THE GOVERNOR SETTING OR OVERRIDING THE THROTTLE LINKAGE WILL CAUSE AN INCREASE IN THE THE AC AUXILIARY VOLTAGE. IF THIS VOLTAGE GOES OVER 140 VOLTS, WIRE FEEDER CONTROL CIRCUITS MAY BE DAMAGED. THE ENGINE GOVERNOR SETTING IS PRE-SET AT THE FACTORY - DO NOT ADJUST ABOVE RPM SPECIFICATIONS LISTED IN THE ENGINE WELDER OPERATING MANUAL.

N.A. WELDING CABLES MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE AND FUTURE APPLICATIONS. SEE OPERATING MANUAL.
N.B. USE POLARITY SWITCH TO SELECT DESIRED ELECTRODE POLARITY. POSITION THE RANGE SWITCH TO A "STICK/WELD" POSITION.
N.C. PLACE WELDER TERMINALS SWITCH TO " REMOTELY CONTROLLED" POSITION.
N.D. PLACE OUTPUT CONTROL SWITCH IN "REMOTE CONTROL" POSITION.
N.E. PLACE IDLER SWITCH IN "HIGH" IDLE POSITION.

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NOTE: This diagram is for reference only. It was accurate at the time of printing , however Lincoln Electric reserves the right to make improvements and modifications as necessary, if you supect this information to be inaccurate, write to the Service Department for a replacement. Give the equipment code number..

NOTES

Ranger 10-LX and Ranger 300D-LX Installation

Table 5 lists the required and optional equipment for installing and operating the TIG Module with a Ranger 10-LX or Ranger 300D-LX.

Refer to Figure 5 for the TIG Module/Ranger 10-LX connection diagram and Figure 5A for the TIG Module/Ranger 300D-LX connection diagram. Make sure all connections are tight before proceeding.

RANGER 10LX / RANGER 300D-LX AND THE TIG MODULE REQUIRED EQUIPMENT

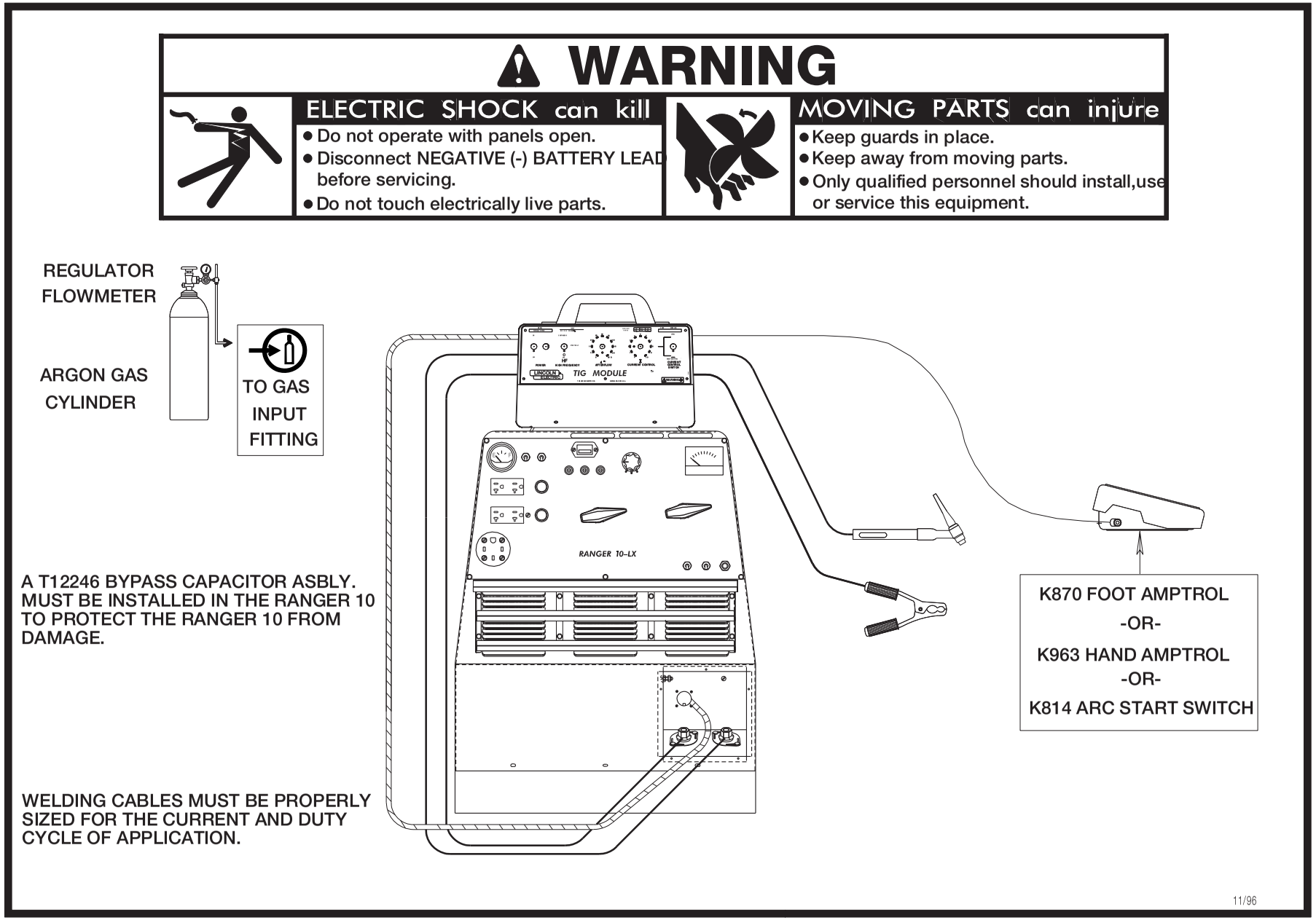
Control Cable	Contactor Kit	Work and Electrode Leads from Ranger 10LX to TIG Module	TIG Torch	Work Lead	Shielding Gas, Regulator, Flowmeter	Arc Start Switch - OR - Amptrol
K936-1 9-pin to 14-pin Plug	K938-1 Field Installed	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	User Supplied; Length as Req'd. Cable Sized to Match Current and Duty Cycle	User Supplied	See Optional Equipment Below

RANGER 10LX / RANGER 300D-LX AND THE TIG MODULE OPTIONAL EQUIPMENT

Control Cable Extension	Water Valve	Arc Start Switch	Hand Amptrol	Foot Amptrol	Docking Kit	
K937 - [ ] Extension 9-pin to 9-pin	K844-1	K814	K963	K870	K939-1 Mounts to Ranger 10LX Roof	

TABLE 5

FIGURE 5: RANGER 10-LX / TIG MODULE CONNECTION DIAGRAM



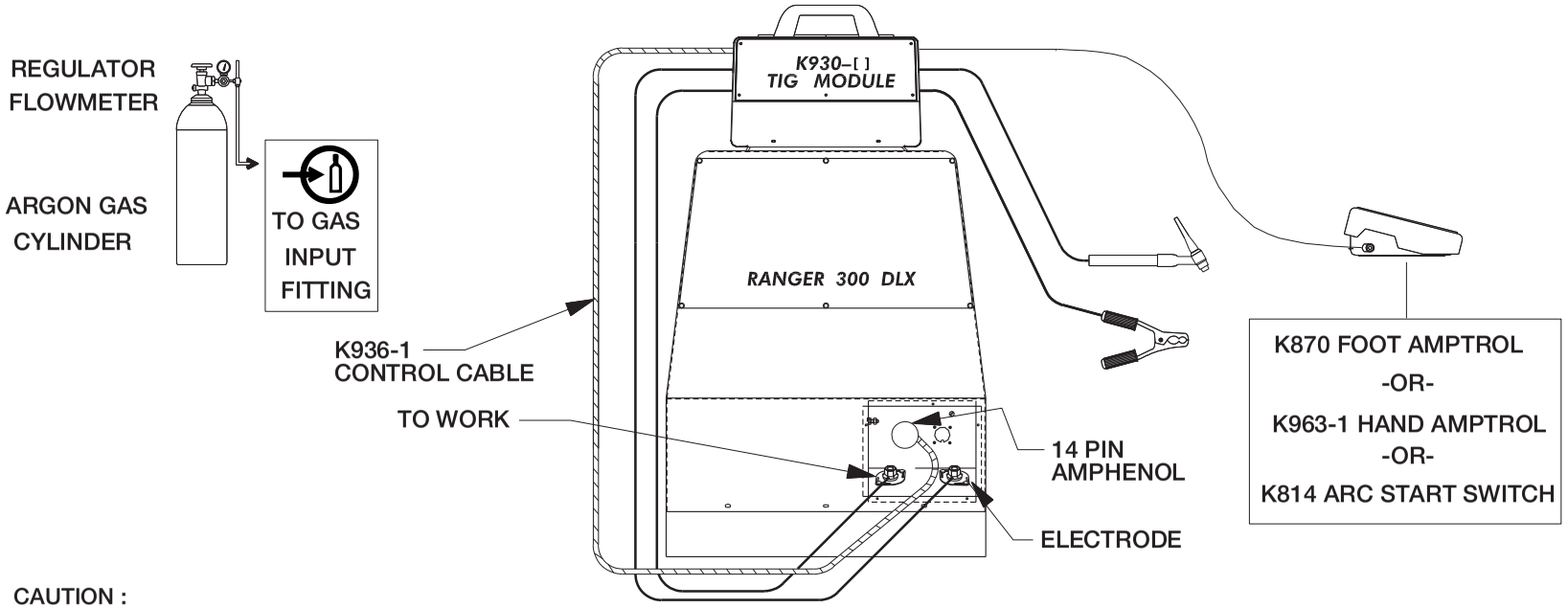
NOTE: This diagram is for reference only. It was accurate at the time of printing , however Lincoln Electric reserves the right to make improvements and modifications as necessary, if you supect this information to be inaccurate, write to the Service Department for a replacement. Give the equipment code number..

FIGURE 5A: RANGER 300D-LX / TIG MODULE CONNECTION DIAGRAM

WARNING

ELECTRIC SHOCK can kill
- Do not operate with panels open.
- Disconnect NEGATIVE (-) BATTERY LEAD before servicing.
- Do not touch electrically live parts.

MOVING PARTS can injure
- Keep guards in place.
- Keep away from moving parts.
- Only qualified personnel should install,use or service this equipment.



CAUTION :

ANY INCREASE OF THE HIGH IDLE ENGINE RPM BY CHANGING THE GOVERNOR SETTING OR OVERRIDING THE THROTTLE LINKAGE WILL CAUSE AN INCREASE IN THE THE AC AUXILIARY VOLTAGE. IF THIS VOLTAGE GOES OVER 140 VOLTS, WIRE FEEDER CONTROL CIRCUITS MAY BE DAMAGED. THE ENGINE GOVERNOR SETTING IS PRE-SET AT THE FACTORY - DO NOT ADJUST ABOVE RPM SPECIFICATIONS LISTED IN THE ENGINE WELDER OPERATING MANUAL.

N.A. WELDING CABLES MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE AND FUTURE APPLICATIONS. SEE OPERATING MANUAL.
N.B. USE POLARITY SWITCH TO SELECT DESIRED ELECTRODE POLARITY. POSITION THE RANGE SWITCH TO A "STICK/WELD" POSITION.
N.C. PLACE WELDER TERMINALS SWITCH TO " REMOTELY CONTROLLED" POSITION.
N.D. PLACE OUTPUT CONTROL SWITCH IN "REMOTE CONTROL" POSITION.
N.E. PLACE IDLER SWITCH IN "HIGH" IDLE POSITION.

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NOTE: This diagram is for reference only. It was accurate at the time of printing , however Lincoln Electric reserves the right to make improvements and modifications as necessary, if you supect this information to be inaccurate, write to the Service Department for a replacement. Give the equipment code number..

NOTES

Installation with other Lincoln Power Sources

Installation consists of connecting the input work and electrode cables, TIG torch, work lead, the proper control cable, and an Arc Start Switch or Amptrol. Tables 6 and 7 list the equipment required for installing and operating the TIG Module on various Lincoln power sources.

If the TIG Module is being used for AC TIG welding, the TIG Module's input power must be properly phased with respect to the welder output current. This would be a front panel 115VAC receptacle for engine welders. For transformer welders, the TIG Module must be connected to the same phase as the welding supply. The best way to assure this is to connect the TIG Module input cord, properly fused, to a source of 115VAC inside the power source. In Lincoln transformer welders rated 250 amps and higher, this would be the supply leads to the fan motor. Although the TIG Module will operate on a different phase, the AC TIG arc will be less stable.

For DC TIG welding, the TIG module's input may be connected to any convenient source of 115VAC; the input phasing is unimportant.

Refer to Figure 6 for the connection diagram for the TIG Module when used with various Lincoln power sources. Make sure all connections are tight before proceeding.

If using the K936-2 Input Cable (9-socket to 8 lugged leads), connect the leads at the power source end of the cable to the matching terminals on the power source (2 to 2, 4 to 4, etc.).

For other installations, connect the plugs on the end of the Input Cable to the mating receptacles on the power source.

LINCOLN POWER SOURCES AND THE TIG MODULE REQUIRED EQUIPMENT TABLE

Power Sources	Control Cable	Contactor Kit	Work and Electrode Leads from Power Source to the TIG Module	TIG Torch	Work Lead	Shielding Gas, Regulator, Flowmeter	Arc Start Switch - or- Amptrol
R3R-All	K936-3	K938-1	User Supplied; Length as required Cable sized to match current and duty cycle	User Supplied	User Supplied; Length as required Cable sized to match current and duty cycle	User Supplied	Amptrol*
DC-250 DC-400 DC-600 DC-650 PRO/DC-750	K936-1	------					Amptrol*
G8000 (w/oK892 Remote Kit)	K936-4	K938-1					Arc Start Switch
G8000 (w/ K892 Remote Kit)	K936-3						Amptrol*
Weldanpower 150 Weldanpower 150 AC/DC SA-250 Perkins SAE-350 Deutz Classic II Classic III & IIID Idealarc 250 AC/DC	K936-4						Arc Start Switch

* An Amptrol is recommended. If remote current control is not required, a K814 Arc Start Switch may be used.

TABLE 6

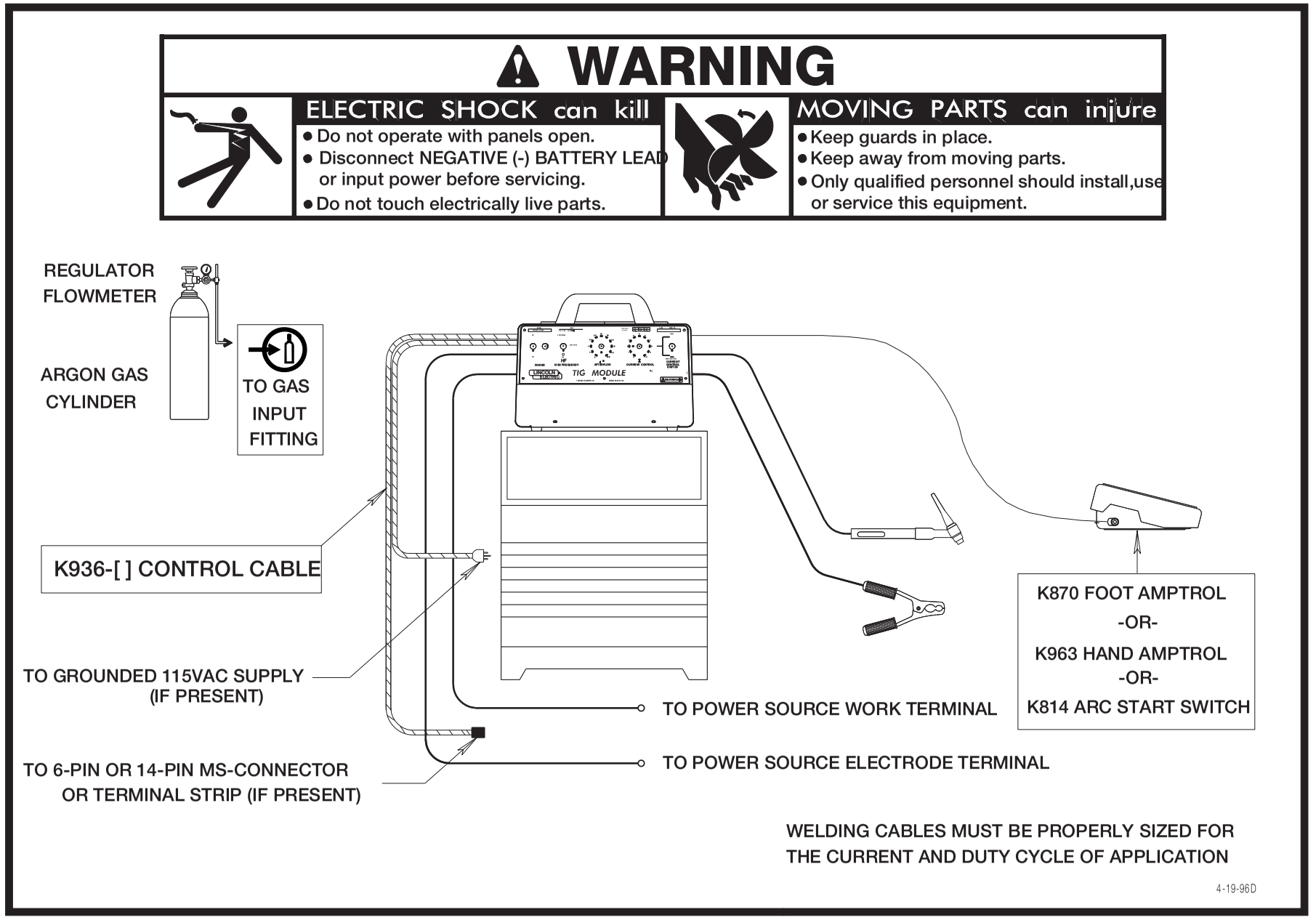
LINCOLN POWER SOURCES AND THE TIG MODULE OPTIONAL EQUIPMENT TABLE

Power Sources	Control Cable Extension	Water Valve	Arc Start Switch	Hand Amptrol	Foot Amptrol	Docking Kit
DC-250	K937-[ ]	K844-1	K814	K963	K870	----------
R3R-All DC-400 DC-600 DC-650 PRO/DC-750						K939-1
G8000 (w/oK892 Remote Kit)	K937-[ ]*			----------	----------	
G8000 (w/ K892 Remote Kit)	K937- [ ]			K963	K870	
Weldanpower 150 Weldanpower 150 AC/DC SA-250 Perkins SAE-350 Deutz Classic II Classic III & IIID Idealarc 250 AC/DC	K937-[ ]*			----------	----------	----------

* A standard 3-wire, grounding type extension cord (16 ga. minimum) may be used instead of the K937-[ ].

TABLE 7

FIGURE 6: TIG MODULE ON A LINCOLN POWER SOURCE - CONNECTION DIAGRAM



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NOTE: This diagram is for reference only. It was accurate at the time of printing , however Lincoln Electric reserves the right to make improvements and modifications as necessary, if you supect this information to be inaccurate, write to the Service Department for a replacement. Give the equipment code number..

OPERATING INSTRUCTIONS

General Warnings

SAFETY INSTRUCTIONS

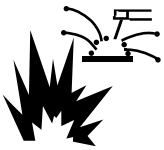
⚠ WARNING

ELECTRIC SHOCK can kill.

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

FUMES AND GASES can be dangerous.

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



WELDING SPARKS can cause fire or explosion

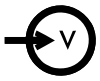
- Keep flammable material away.
- Do not weld on containers that have held combustibles.

ARC RAYS can burn.

- Wear eye, ear and body protection.

Observe additional Safety Guidelines detailed throughout this manual.

GRAPHIC SYMBOLS USED ON THIS EQUIPMENT OR IN THIS MANUAL

	ON		GAS INPUT
	OFF		GAS OUTPUT
	INPUT		WATER INPUT
	HIGH FREQUENCY CONTINUOUS		WATER OUTPUT
	HIGH FREQUENCY START ONLY		INPUT
	AFTERFLOW		TIG TORCH CONNECTION
	CURRENT CONTROL (OUTPUT)		WORK CONNECTION
	LOCAL CURRENT CONTROL		REMOTE CONTROL CONNECTION
	REMOTE CURRENT CONTROL		INSTRUCTION MANUAL

PRODUCT DESCRIPTION

The TIG Module is an accessory for constant current power sources. It provides high frequency and shielding gas control for AC and DC GTAW (TIG) welding applications, and easy connection of Amptrol remote controls to power sources having remote control capability. It also provides contactor control of the welding current, always allowing the operator to make and break the arc with an Arc Start Switch or Amptrol remote control. A contactor option must be used for power sources which do not have a built-in contactor in the constant current mode.

The K930-[ ] TIG Module is supplied without accessories. Arc start switches, Amptrols, cables, torches and mounting brackets must be purchased separately.

RECOMMENDED PROCESSES AND EQUIPMENT

Recommended for TIG welding with AC or AC/DC constant current welding power sources rated 250 amps or higher. This includes transformer, transformer/rectifier and engine driven power sources with constant current output. For a listing of machines that the TIG Module can be used with, see Installation Section.

DESIGN SUMMARY

Operational Features and Controls

Wide input voltage range of 60 to 130 volts AC allows operation on Ranger power sources.

Power On/Off switch with Pilot Light.

High Frequency switch allows selection of Continuous, Start Only, or Off.

Contactor control by an Arc Start Switch or Amptrol (optional Contactor Kit required with certain power sources).

Afterflow Timer allows adjustable cooling period for gas and water (optional) flow after the weld is stopped.

Current Control functions as an adjustable limit control when using a remotely controllable power source. Allows operator to adjust welding current at the TIG module, instead of at the power source. Also allows Hand or Foot Amptrol control range to be narrowed, for better current control capability.

Fixed preflow timer for purging the weld area before an arc is struck. Preflow timer is automatically bypassed if a new weld is started during the Afterflow time; this allows quick tacking or spot welding, without the need to wait for the preflow time.

Design Features

Compact case is designed for easy carrying, complete with handle.

Case has rubber feet which provide cushioning and skid resistance when used as a portable unit.

Input studs, output studs, valve fittings and cable receptacles are located under a protective door. Door has a stainless steel hinge to resist corrosion.

Modular construction makes for easy servicing. All control and timer functions are contained on one printed circuit board.

The case was designed to complement the Ranger power source line, particularly the Ranger 8 and Ranger 9.

High frequency bypass is built into the TIG Module.

No work sense lead is required (as it was on the K799 Hi-Freq).

No power source matching switch is required.

Welding Capability

The TIG Module is designed for arc starting in manual GTAW (TIG) applications. Application to automated GTAW equipment may be satisfactory also. It is the user's responsibility to investigate and resolve issues regarding interfacing and operating with automated GTAW equipment.

OPERATION

Users should familiarize themselves with Figure 7, Control Panel, before proceeding.

CONTROL PANEL

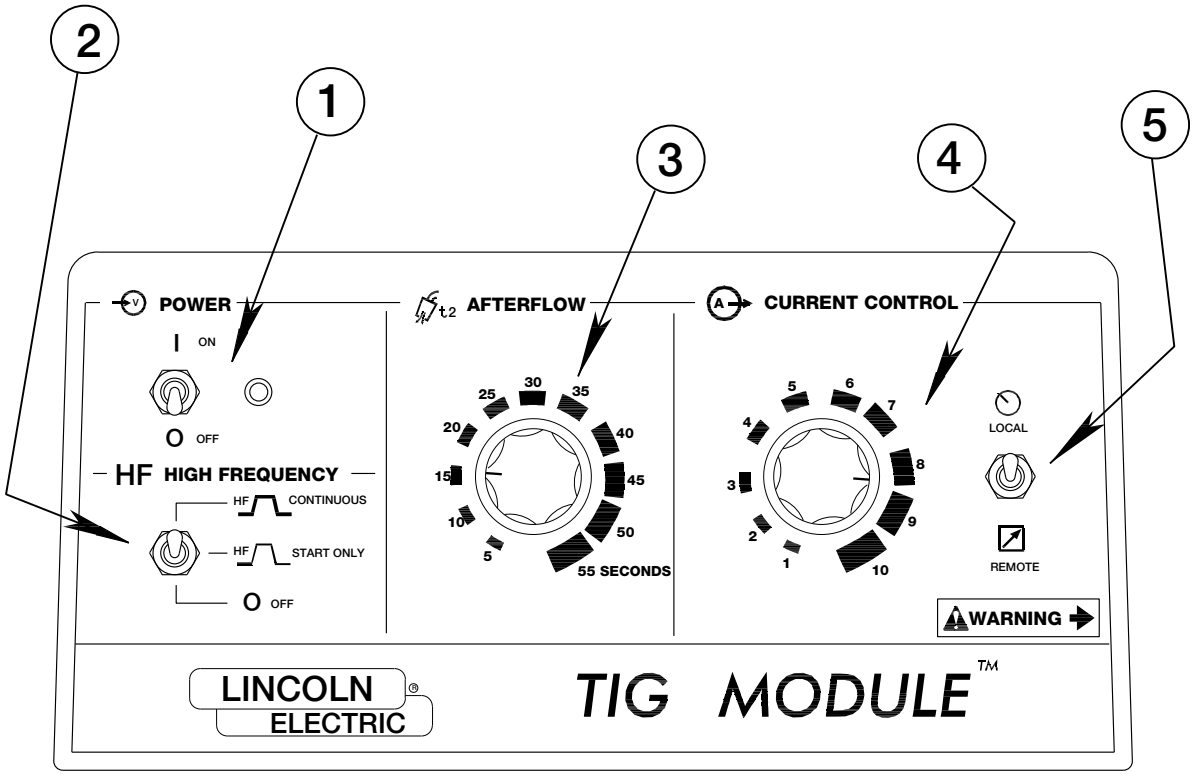


FIGURE 7

1 INPUT POWER SWITCH AND PILOT LIGHT - Turns the input power to the TIG Module on and off. Red pilot light indicates that input power is "on".

2 HIGH FREQUENCY SWITCH - Used to select Continuous High Frequency, Start Only High Frequency, or High Frequency Off.

3 AFTERFLOW CONTROL - Adjust the afterflow time from 5 to 55 seconds. This is the time the shielding gas (and, if equipped, cooling water) flows after the weld is completed. This extra gas flow cools the TIG torch and the tungsten electrode.

4 CURRENT CONTROL - This control functions only when the TIG module is used with a power source having remote control capability. It controls the welding current, and is used in conjunction with the Local/Remote Switch.

5 LOCAL/REMOTE SWITCH - This switch functions only when the TIG module is used with a power source having remote control capability. When in the Local position, all output current control is done by the Current Control on the TIG Module. When in the Remote position, the Current Control on the TIG Module sets the maximum available welding current, and an Amptrol, plugged into the Amptrol Receptacle, can adjust the welding current. See the Chart labeled "Use of the Current Control, Arc Start Switch and Amptrol on Ranger Welders with Remote Control.

REAR CONNECTIONS

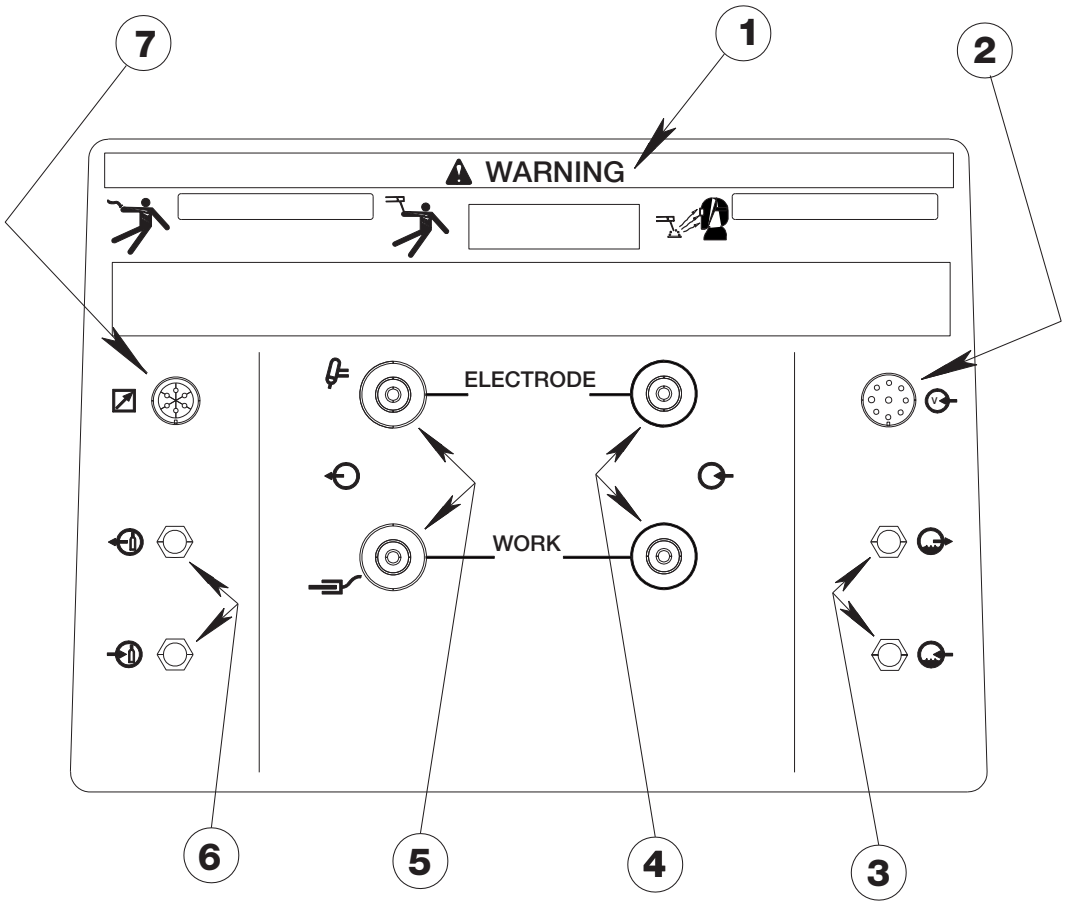


FIGURE 8

1 WARNING INFORMATION - Important information regarding the safe installation, operation, and servicing of the TIG Module.

2 INPUT RECEPTACLE - For connecting the Control Cable from the power source. This receptacle contains the following circuits: Input power, power source contactor control (where applicable) and power source remote control (where applicable). This is a 9-pin receptacle.

3 WATER VALVE FITTINGS (OPTIONAL) - Water valve inlet and outlet fittings, 5/8-18 left-hand threads. For connection of cooling water to and from the TIG torch. Supplied as part of the optional K844-1 Water Valve Kit.

4 POWER INPUT CONNECTIONS - Connections for the work (bottom) and electrode (top) cables from the Ranger power source. 1/2-13 threaded stud connections.

5 POWER OUTPUT CONNECTIONS - Connections for the work lead (bottom) and TIG torch (top). 1/2-13 threaded stud connections.

6 GAS VALVE FITTINGS - Gas valve inlet and outlet fittings, 5/8-18 right hand threads. For connection of the shielding gas supply and the TIG torch gas fitting.

7 ARC START SWITCH / AMPTROL RECEPTACLE - 6-socket receptacle for connecting an arc start switch or an Amptrol remote current control.

RANGER 8 OPERATION

The tables (Table 8 & 9) list the recommended switch and control settings for the TIG Module/Ranger 8 combination. The first table is for the Ranger 8, and the second for the Ranger 8 with the K892-1 Remote Kit installed.

Operate the Ranger 8 in accordance with the Ranger 8 Manual.

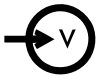
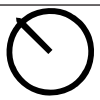
Note: For AC TIG welding, the maximum TIG welding output currents on each range setting will be approximately 50% higher that those marked on the nameplate. This is due to the special nature of the AC TIG welding arc. Do not AC TIG weld on the 225AC range setting. The output current may exceed the rating of the Ranger 8.

TABLE 8: K930-[ ] / RANGER 8 (WITHOUT THE K892-1) SETTINGS

K930-[ ] SETTINGS				
 POWER	 HIGH FREQUENCY	 AFTERFLOW	 CURRENT CONTROL	 CURRENT CONTROL SWITCH
ON 	 START - OR -  CONTINUOUS	ADJUST TO SUIT, 5 - 55 SECONDS	SETTING HAS NO EFFECT ON OUTPUT	SETTING HAS NO EFFECT ON OUTPUT

RANGER 8 (WITHOUT THE K892-1 REMOTE KIT) SETTINGS			
IDLER SWITCH	 STICK/TIG POLARITY	RANGE 	CONTROL 
HIGH	DC-	SELECT TO SUIT, 50 - 210	SET FOR DESIRED OUTPUT CURRENT
	AC	SELECT TO SUIT, 50-175	

TABLE 9: K930-[ ] / RANGER 8 (WITH THE K892-1) SETTINGS

K930-[ ] SETTINGS				
 POWER	HF HIGH FREQUENCY	 AFTERFLOW	 CURRENT CONTROL	 CURRENT CONTROL SWITCH
ON 	 START - OR -  CONTINUOUS	ADJUST TO SUIT, 5 - 55 SECONDS	ADJUST TO SUIT 0-10	 REMOTE (WITH AN AMPTROL)  LOCAL (WITH AN ARC START SWITCH)

RANGER 8 (WITH THE K892-1 REMOTE KIT INSTALLED) SETTINGS			
IDLER SWITCH	 STICK/TIG POLARITY	RANGE 	CONTROL AT WELDER / REMOTE CONTROL 
HIGH	DC-	SELECT TO SUIT, 50 - 210	 REMOTE CONTROL
	AC	SELECT TO SUIT, 50-175	

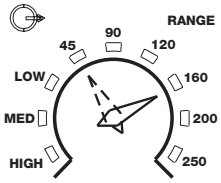
If your Ranger 8 has the optional K892-1 Remote Receptacle installed, refer to Figure 9, which covers the proper use of the TIG Module Current Control, Arc Start Switch, and Amptrols.

Once the TIG Module and Ranger 8 are properly set up, TIG welding is very easy. Position the torch in place, lower your helmet, and press the Arc Start Switch or Amptrol. The power source contactor (or the optional TIG Module contactor) will close, gas will flow for a one-half second preflow time, and the high frequency will come on. The arc should strike and welding should begin. At the end of the weld, simply release the Arc Start Switch or Amptrol, and the contactor will open, shutting off the arc. The Afterflow time will begin, cooling the torch, protecting the weld and the tungsten.

If another weld is started during the Afterflow time, there will be no preflow time delay. The contactor will close and the high frequency will come on immediately when the Arc Start Switch or Amptrol is pressed.

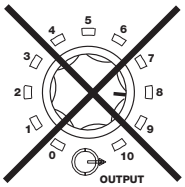
USE OF THE CURRENT LIMIT CONTROL, ARC START SWITCH, AND AMPTROL ON WELDERS EQUIPPED WITH REMOTE CONTROL CAPABILITY.

WELDER SETTINGS



CHOOSE THE RANGE SETTING. (IF APPROPRIATE)

CHOOSE REMOTE OUTPUT CONTROL.



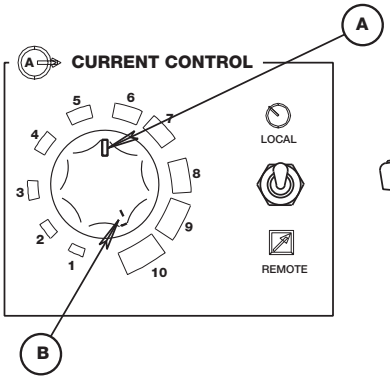
THE OUTPUT DIAL HAS NO EFFECT ON THE OUTPUT.

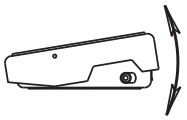
TIG MODULE SETTINGS

EXAMPLE 1: AN ARC START SWITCH OR AN AMPTROL IS USED TO START THE ARC. THE CURRENT CONTROL SETS THE WELDING CURRENT.

(A) HALF THE RANGER SETTING IS AVAILABLE BECAUSE THE CURRENT CONTROL IS SET TO THE HALF-WAY POINT.

(B) FULL OUTPUT IS AVAILABLE BECAUSE THE CURRENT CONTROL IS SET TO MAXIMUM.



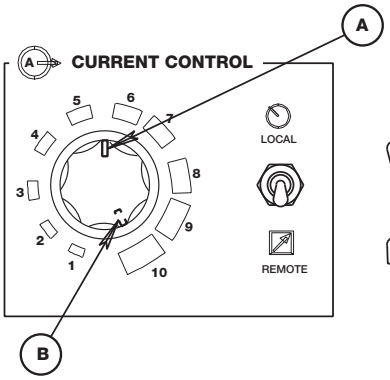


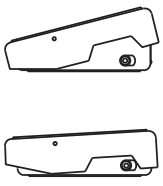
AMPTROL POSITION HAS NO EFFECT ON THE OUTPUT CURRENT.

EXAMPLE 2: AN AMPTROL IS USED FOR REMOTE CURRENT CONTROL. THE CURRENT CONTROL SETS THE MAXIMUM AVAILABLE WELDING CURRENT.

(A) THE CURRENT CAN BE VARIED FROM MINIMUM TO HALF OF THE RANGER SETTING BECAUSE THE CURRENT CONTROL IS SET TO THE HALF-WAY POINT.

(B) THE CURRENT CAN BE VARIED FROM MINIMUM TO MAXIMUM OF THE RANGER SETTING BECAUSE THE CURRENT CONTROL KNOB IS SET TO MAXIMUM.





LIGHT PRESSURE - LOW OUTPUT CURRENT

HEAVY PRESSURE - UP TO THE SETTING OF THE CURRENT. CONTROL.

FIGURE 9

RANGER 9 OPERATION

The table (Table 10) lists the recommended switch and control settings for the TIG Module/Ranger 9 combination.

Operate the Ranger 9 in accordance with the Ranger 9 Manual.

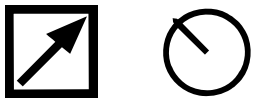
Note that for AC TIG welding, the maximum TIG welding output currents on each range setting will be approximately 50% higher that those marked on the nameplate. This is due to the special nature of the AC TIG welding arc. Do not AC TIG weld on the 200 or 250 amp range settings. The output current may exceed the rating of the Ranger 9.

Because your Ranger 9 has remote control capability, refer to Figure 9, which covers the proper use of the TIG Module Current Control, Arc Start Switch, and Amptrols.

Once the TIG Module and Ranger 9 are properly set up, TIG welding is very easy. Position the torch in place, lower your helmet, and press the Arc Start Switch or Amptrol. The Ranger 9's output contactor will close, the engine will go to high idle, gas will flow, and after a one-half second preflow time, the high frequency will come on. The arc should strike and welding should begin. At the end of the weld, simply release the Arc Start Switch or Amptrol, and the contactor will open, shutting off the arc. The Afterflow time will begin, cooling the torch, protecting the weld and the tungsten.

If another weld is started during the Afterflow time, there will be no preflow time delay. The contactor will close and the high frequency will come on immediately when the Arc Start Switch or Amptrol is pressed.

TABLE 10: K930-[ ] / RANGER 9 SETTINGS

K930-[ ] SETTINGS				
 POWER	HF HIGH FREQUENCY	 AFTERFLOW	 CURRENT CONTROL	 CURRENT CONTROL SWITCH
ON	 START - OR -  CONTINUOUS	ADJUST TO SUIT, 5 - 55 SECONDS	ADJUST TO SUIT 0-10	 REMOTE (WITH AN AMPTROL)  LOCAL (WITH AN ARC START SWITCH)

RANGER 9 SETTINGS				
IDLER SWITCH	 STICK/TIG POLARITY	 RANGE	 CONTROL AT WELDER / REMOTE CONTROL	WELDING TERMINALS ALWAYS ON / REMOTELY CONTROLLED
AUTO	DC-	SELECT TO SUIT, 45 - 250	 REMOTE CONTROL	REMOTELY CONTROLLED
	AC	SELECT TO SUIT, 45-160		

RANGER 10 / RANGER 300 D OPERATION

The table (Table 11) lists the recommended switch and control settings for the TIG Module/Ranger 10 or TIG Module/Ranger 300 D combination. Make sure all connections are tight before proceeding.

Operate the Ranger 10 or Ranger 300 D in accordance with the proper Operator's Manual.

Note that for AC TIG welding, the maximum TIG welding output currents on each range setting will be approximately 50% higher that those marked on the nameplate. This is due to the special nature of the AC TIG welding arc. Do not AC TIG weld on the 200 or 250 amp range settings. The output current may exceed the rating of the Ranger 10 or Ranger 300 D.

Because your Ranger 10 / Ranger 300 D has remote control capability, refer to the diagram Figure 9 which covers the proper use of the Tig Module Current Control, Arc Start Switches, and Amptrols.

Once the TIG Module and Ranger 10 or Ranger 300 D are properly set up, TIG welding is very easy. Position the torch in place, lower your helmet, and press the Arc Start Switch or Amptrol. The TIG Module's optional contactor will close, gas will flow for a one-half second preflow time, and the high frequency will come on. The arc should strike and welding should begin. At the end of the weld, simply release the Arc Start Switch or Amptrol, and the contactor will open, shutting off the arc. The Afterflow time will begin, cooling the torch, protecting the weld and the tungsten.

If another weld is started during the Afterflow time, there will be no preflow time delay. The contactor will close and the high frequency will come on immediately when the Arc Start Switch or Amptrol is pressed.

TABLE 11: K930-[ ] / RANGER 10 or RANGER 300 D SETTINGS

K930-[ ] SETTINGS

POWER	HIGH FREQUENCY	AFTERFLOW	CURRENT CONTROL	CURRENT CONTROL SWITCH
ON	START - OR - CONTINUOUS	ADJUST TO SUIT, 5 - 55 SECONDS	ADJUST TO SUIT 0-10	REMOTE (WITH AN AMPTROL) LOCAL (WITH AN ARC START SWITCH)

RANGER 10 SETTINGS

IDLER SWITCH	STICK/TIG POLARITY	RANGE	OUTPUT CONTROL SWITCH
HIGH	DC-	SELECT TO SUIT, 45 - 250	OUTPUT CONTROL REMOTE
	AC	SELECT TO SUIT, 45-160	

RANGER 10-LX / RANGER 300 DLX OPERATION

The table (Table 12) lists the recommended switch and control settings for the TIG Module/Ranger 10-LX or TIG Module/Ranger 300 DLX combination. Make sure all connections are tight before proceeding.

Operate the Ranger 10-LX or Ranger 300 DLX in accordance with the proper Operator's Manual.

Note that for AC TIG welding, the maximum TIG welding output currents on each range setting will be approximately 50% higher that those marked on the nameplate. This is due to the special nature of the AC TIG welding arc. Do not AC TIG weld on the 200 or 250 amp range settings. The output current may exceed the rating of the Ranger 10-LX or Ranger 300 DLX.

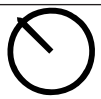
Because your Ranger 10-LX or Ranger 300 DLX has remote control capability, refer to the diagram Figure 9 which covers the proper use of the TIG Module Current Control, Arc Start Switches, and Amptrols.

Once the TIG Module and Ranger 10-LX or Ranger 300 DLX are properly set up, TIG welding is very easy. Position the torch in place, lower your helmet, and press the Arc Start Switch or Amptrol. The TIG Module's optional contactor will close, gas will flow for a one-half second preflow time, and the high frequency will come on. The arc should strike and welding should begin. At the end of the weld, simply release the Arc Start Switch or Amptrol, and the contactor will open, shutting off the arc. The Afterflow time will begin, cooling the torch, protecting the weld and the tungsten.

If another weld is started during the Afterflow time, there will be no preflow time delay. The contactor will close and the high frequency will come on immediately when the Arc Start Switch or Amptrol is pressed.

TABLE 12: K930-[ ] / RANGER 10-LX or RANGER 300 DLX SETTINGS

K930-[ ] SETTINGS

 POWER	 HIGH FREQUENCY	 AFTERFLOW	 CURRENT CONTROL	 CURRENT CONTROL SWITCH
ON 	 START - OR -  CONTINUOUS	ADJUST TO SUIT, 5 - 55 SECONDS	ADJUST TO SUIT 0-10	 REMOTE (WITH AN AMPTROL)  LOCAL (WITH AN ARC START SWITCH)

RANGER 10-LX SETTINGS

IDLER SWITCH	 STICK/TIG POLARITY	RANGE 	OUTPUT CONTROL SWITCH
 HIGH	DC-	SELECT TO SUIT, 45 - 250	OUTPUT CONTROL REMOTE
	AC	SELECT TO SUIT, 45-160	

OPERATION ON OTHER LINCOLN POWER SOURCES

The table (Table 13) lists the recommended switch and control settings for the TIG Module when used with various Lincoln power sources.

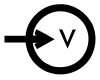
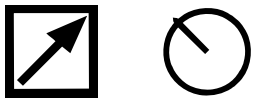
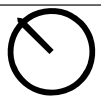
Operate the power source in accordance with its Manual.

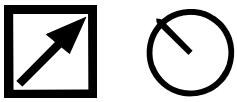
Note that AC power sources must be derated approximately 50% when used for AC TIG welding. This is due to the special nature of the TIG welding arc. Input currents will also be higher when AC TIG welding. Be sure the power source is properly fused to handle this situation.

If your power source has remote control capability, refer to the second half of the diagram Figure 9 which covers the proper use of the TIG Module Current Control with Hand and Foot Amptrols.

Once the TIG Module and the power source are properly set up, TIG welding is very easy. Position the torch in place, lower your helmet, and press the Arc Start Switch or Amptrol. The power source contactor (or the optional TIG Module contactor) will close, gas will flow for a one-half second preflow time, and the high frequency will come on. The arc should strike and welding should begin. At the end of the weld, simply release the Arc Start Switch or Amptrol, and the contactor will open, shutting off the arc. The Afterflow time will begin, cooling the torch, protecting the weld and the tungsten. If another weld is started during the Afterflow time, there will be no preflow time delay. The contactor will close immediately when the Arc Start Switch or Amptrol is pressed.

TABLE 13: K930-[ ] / LINCOLN POWER SOURCE SETTINGS

K930-[ ] SETTINGS				
 POWER	HF HIGH FREQUENCY	 AFTERFLOW	 CURRENT CONTROL	 CURRENT CONTROL SWITCH
ON 	 START - OR -  CONTINUOUS	ADJUST TO SUIT, 5 - 55 SECONDS	ADJUST TO SUIT 0-10	 REMOTE (WITH AN AMPTROL)  LOCAL (WITH AN ARC START SWITCH)

LINCOLN POWER SOURCE SETTINGS			
 WELD MODE POLARITY	 OUTPUT CONTROL	 CURRENT CONTROL SWITCH	CONSULT YOUR POWER SOURCE INSTRUCTION OR OPERATOR'S MANUAL FOR COMPLETE INFORMATION
CHOOSE CONSTANT CURRENT (STICK) OUTPUT, AC OR DC AS REQUIRED	IF POWER SOURCE HAS REMOTE CONTROL CAPABILITY, THIS CONTROL WILL HAVE NO EFFECT FOR OTHER POWER SOURCES, SET TO OUTPUT CURRENT DESIRED	SET TO REMOTE IF THIS SWITCH APPEARS ON THE POWER SOURCE 	

TIG WELDING INFORMATION

TABLE 14
TYPICAL CURRENT RANGES [1] FOR TUNGSTEN ELECTRODES [2]

Tungsten Electrode Diameter in. (mm)	DCEN (-)	DCEP (+)	AC				Approximate Argon Gas Flow Rate C.F.H. (1/min.)		TIG Torch Nozzle Size [4], [5]
			Unbalanced Wave		Balanced Wave				
	1%, 2% Thoriated Tungsten	1%, 2% Thoriated Tungsten	Pure Tungsten	1%, 2% Thoriated Tungsten Zirconiated	Pure Tungsten	1%, 2% Thoriated Tungsten Zirconiated	Aluminum	Stainless Steel	
.010 (.25)	2-15	[3]	2-15	2-15	2-15	---	3-8 (2-4)	3-8 (2-4)	#4, #5, #6
0.020 (.50)	5-20	[3]	5-15	5-20	10-20	5-20	5-10 (3-5)	5-10 (3-5)	
0.040 (1.0)	15-80	[3]	10-60	15-80	20-30	20-60	5-10 (3-5)	5-10 (3-5)	
1/16 (1.6)	70-150	10-20	50-100	70-150	30-80	60-120	5-10 (3-5)	9-13 (4-6)	#5, #6
3/32 (2.4)	150-250	15-30	100-160	140-235	60-130	100-180	13-17 (6-8)	11-15 (5-7)	#6, #7, #8
1/8 (3.2)	250-400	25-40	150-210	225-325	100-180	160-250	15-23 (7-11)	11-15 (5-7)	
5/32 (4.0)	400-500	40-55	200-275	300-400	100-240	200-320	21-25 (10-12)	13-17 (6-8)	#8, #10
3/16 (4.8)	500-750	55-80	250-350	400-500	190-300	290-390	23-27 (11-13)	18-22 (8-10)	
1/4 (6.4)	750-1000	80-125	325-450	500-630	250-400	340-525	28-32 (13-15)	23-27(11-13)	

(1) When used with argon gas. The current ranges shown must be reduced when using argon/helium or pure helium shielding gasses.

(2) Tungsten electrodes are classified as follows by the American Welding Society (AWS):
Pure . . . . . EWP
1% Thoriated EWTh-1
2% Thoriated EWTh-2
Though not yet recognized by the AWS, Ceriated Tungsten is now widely accepted as a substitute for 2% Thoriated Tungsten in AC and DC applications.

(3) DCEP is not commonly used in these sizes.

(4) TIG torch nozzle “sizes” are in multiples of 1/16ths of an inch:
#4 = 1/4 in. (6 mm)
#5 = 5/16 in. (8 mm)
#6 = 3/8 in. (10 mm)
#7 = 7/16 in. (11 mm)
#8 = 1/2 in. (12.5 mm)
#10 = 5/8 in. (16 mm)

(5) TIG torch nozzles are typically made from alumina ceramic. Special applications may require lava nozzles, which are less prone to breakage, but cannot withstand high temperatures and high duty cycles.

OPTIONS / ACCESSORIES

The following field installed Kits and accessories may be used dependingon the application:

K936 Control Cables

At least one of the following control cables is needed to connect the TIG Module to the power source. Four different cables are available. The proper choice of cable depends on the power source being used. See the installation section to choose the proper control cable. The control cable carries one or more of the following circuits between the TIG Module and the power source: Input power, remote control signals, contactor control signals, and ground.

K936-1 9-Socket (at the TIG Module) to 14-pin (at the power source) (Contains circuits 2, 4, 31, 32, 75, 76, 77 and ground)

K936-3 9-Socket to a grounded 115V plug and a 6-pin MS-connector (Contains circuits 31, 32, 75, 76, 77 and ground)

K936-4 9-Socket to a grounded 115V plug (Contains circuits 31, 32 and ground.)

K937 Control Cables Extensions

Control cable extensions are available in 22 and 45 foot engths. These allow the TIG Module to be operated at distances up to 200 feet from the power source. The extensions connect between the standard control cable and the TIG Module.

K937-22 22 foot extension cable, 9-Socket to 9-pin

K937-45 45 foot extension cable, 9-Socket to 9-pin

K938-1 Contactor Kit

This field installed kit must be installed in the TIG Module whenever it is used with a power source which does not have a built-in contactor for constant current (stick/TIG) welding. See the list of compatible power sources to see which applications require the Contactor Kit.

K939-1 Docking Kit

The Docking Kit provides a means to “dock” the TIG Module on top of a flat-roofed power source, or any other flat surface measuring at least 10 X 15 inches (255 X 381 mm). It includes a latch and provisions for a user-supplied padlock to lock the TIG Module in place.

K844-1 Water Valve Kit

A field installed kit which contains one water valve for mounting inside the TIG Module. The water valve is controlled by the same preflow and afterflow timers as the gas valve.

Other Compatible Lincoln Accessories:

K963 Hand Amptrol
K870 Foot Amptrol
K814 Arc Start Switch
All Magnum TIG torches and accessories

Compatible Equipment

The TIG Module can be used with the following Lincoln power sources:

Ranger 8[1]
Ranger 9
Ranger 10[1]
Ranger 10-LX[1]
DC-250
DC-400
DC-600
DC-650Pro/DC-750
R3R-300/400/500,
including “I” versions[1]
Idealarc 250 AC/DC[1]
Weldanpower 150[1]
Weldanpower 150 AC/DC[1]
Weldanpower G8000[1]
SA 250 Perkins[1]
SAE 350 Deutz[1]
SAE 400[1]
Classic I[1,2]
Classic II[1]
Classic III & IIID[1]

[1]Requires the K938-1 Contactor Kit in the TIG Module
[2]Requires a source of 115VAC power

For installation of field installed accessories see the INSTALLATION SECTION.

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this maintenance.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

⚠ WARNING

To avoid receiving a high frequency shock, keep the TIG torch and cables in good condition.

PERIODIC MAINTENANCE

Very little maintenance is required to keep your TIG Module in top operating condition. No specific schedule can be set for performing the following items; factors such as hours of usage and the machine environment should be considered when establishing a maintenance schedule.

1. Periodically blow off dust and dirt which may accumulate on the outside of the TIG Module.

2. Inspect the welding and control cables for fraying, cuts and bare spots.

3. Inspect the spark gap at regular intervals to maintain the recommended spark gap setting. Use the following procedure:

   The spark gap is set at the factory for a gap of 0.015(.38mm) inches. This setting is proper for most applications.

   To adjust the spark, first be sure that the Ranger welder is off, and that the input cable is disconnected from the Input Receptacle on the back of the TIG Module. Remove the outer case wraparound, and find the spark gap assembly located at the top right hand side of the internal compartment. Check the spark gap setting with a feeler gauge. If adjustment is required, loosen one of the Allen head screws which secure the spark gap electrodes in place. Set the gap, and tighten the screw. Reinstall the case wraparound.

4. If the TIG Module is used in locations where there are large amounts of conductive metal or salt particles in the air, it is recommended that the inside rear assembly of the TIG Module be cleaned out with clean, dry, low pressure compressed air on a regular basis (monthly, for example). To do so, first be sure that the input power has been removed from the TIG Module. Remove the case wraparound. This exposes the spark gap, high voltage transformer, high frequency transformer, and other components. Clean this area with compressed air.

How To Use Troubleshooting Guide

⚠ WARNING

This Troubleshooting Guide is designed to be used by the machine Owner/Operator. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety, please observe all safety notes and precautions detailed in the Safety Section of this manual to avoid electrical shock or danger while troubleshooting this equipment.

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

Step 1. LOCATE PROBLEM (SYMPTOM)

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

Step 2. PERFORM EXTERNAL RECOMMENDED TESTS

The second column labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)" lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case wrap-around cover.

Step 3. CONSULT LOCAL AUTHORIZED FIELD SERVICE FACILITY

If you have exhausted all of the recommended tests in step 2, consult your local Authorized Field Service Facility.

⚠ CAUTION

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

Troubleshooting Guide

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major Physical or Electrical Damage is Evident.	1. Contact your local Lincoln Authorized Field Service Facility	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
High frequency “jumps” from the electrode to work but welding arc does not establish	1. Make certain that the welder power source has weld output- Check for open circuit voltage at welding power source 2. Make certain that the tungsten type and size is correct for the process 3. The tungsten may be contaminated - clean or replace	

⚠ CAUTION

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

Observe Safety Guidelines
detailed in the beginning of this manual.

Troubleshooting Guide

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No weld output, no gas flow and no high frequency at spark gap	1. Check arc start switch or remote control unit 2. Make certain both the TIG Module and the welding power source are powered up	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
Low weld output current when operating in remote control	1. Make certain the welder power source is in the remote control mode 2. The current control (R4) may be set too low for the process	

⚠ CAUTION

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

Troubleshooting Guide

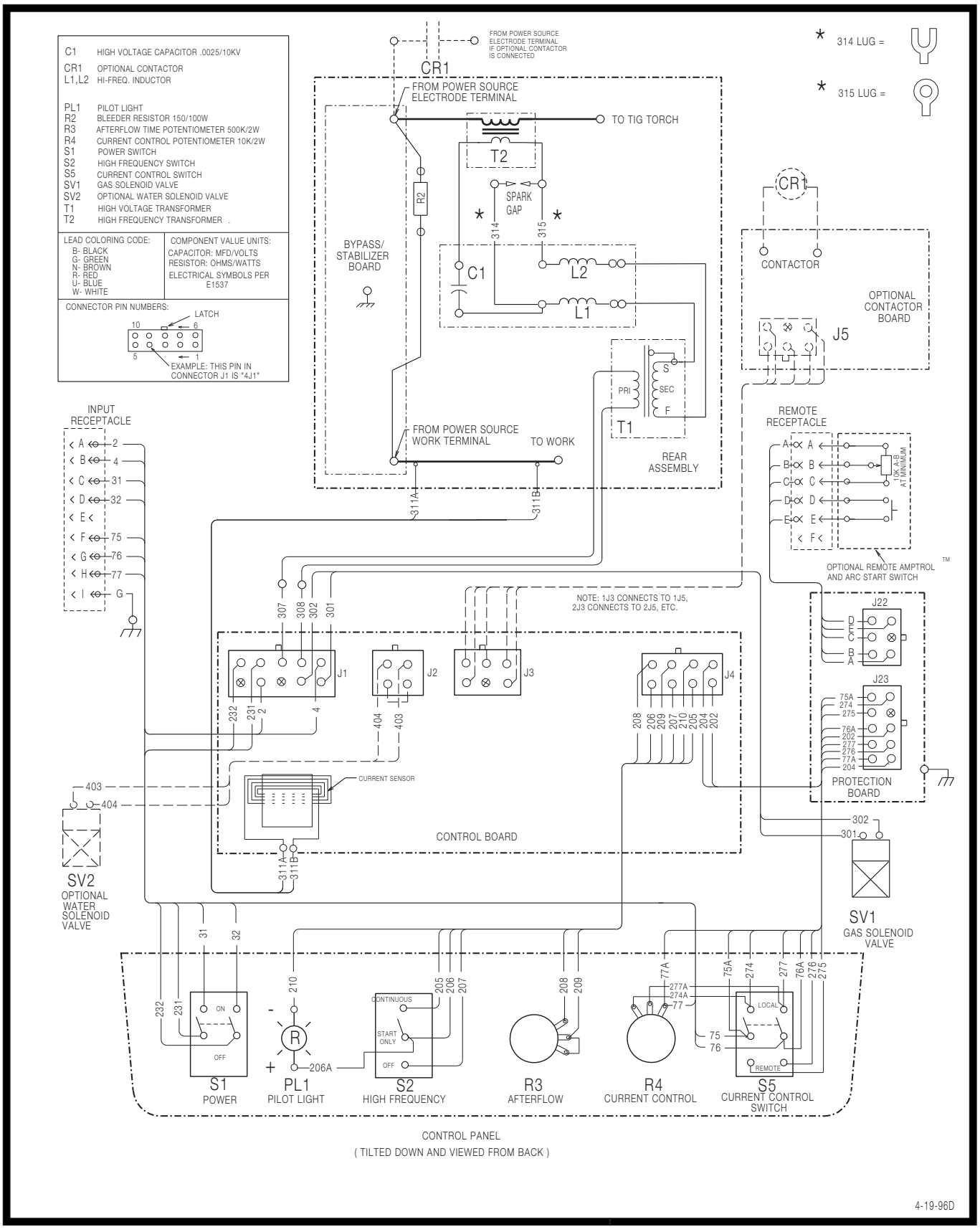
Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	iRECOMMENDED COURSE OF ACTION
HIGH FREQUENCY PROBLEMS		
High frequency not present or intermittent at torch electrode	1. Check for correct gas and gas flow 2. Check torch and work cables for breaks and leaks 3. Check spark gap for correct setting 0.015in. (.25mm)	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
High frequency not present at spark gap	1. Make certain that the High Frequency switch (S2) is NOT in the OFF position 2. Check spark gap for correct setting 0.015in (.25mm)	
High Frequency stays on after the arc is established	1. High frequency switch (S2) is in the continuous position	

⚠ CAUTION

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

WIRING DIAGRAM FOR CODES 10135, 10203 and 10284

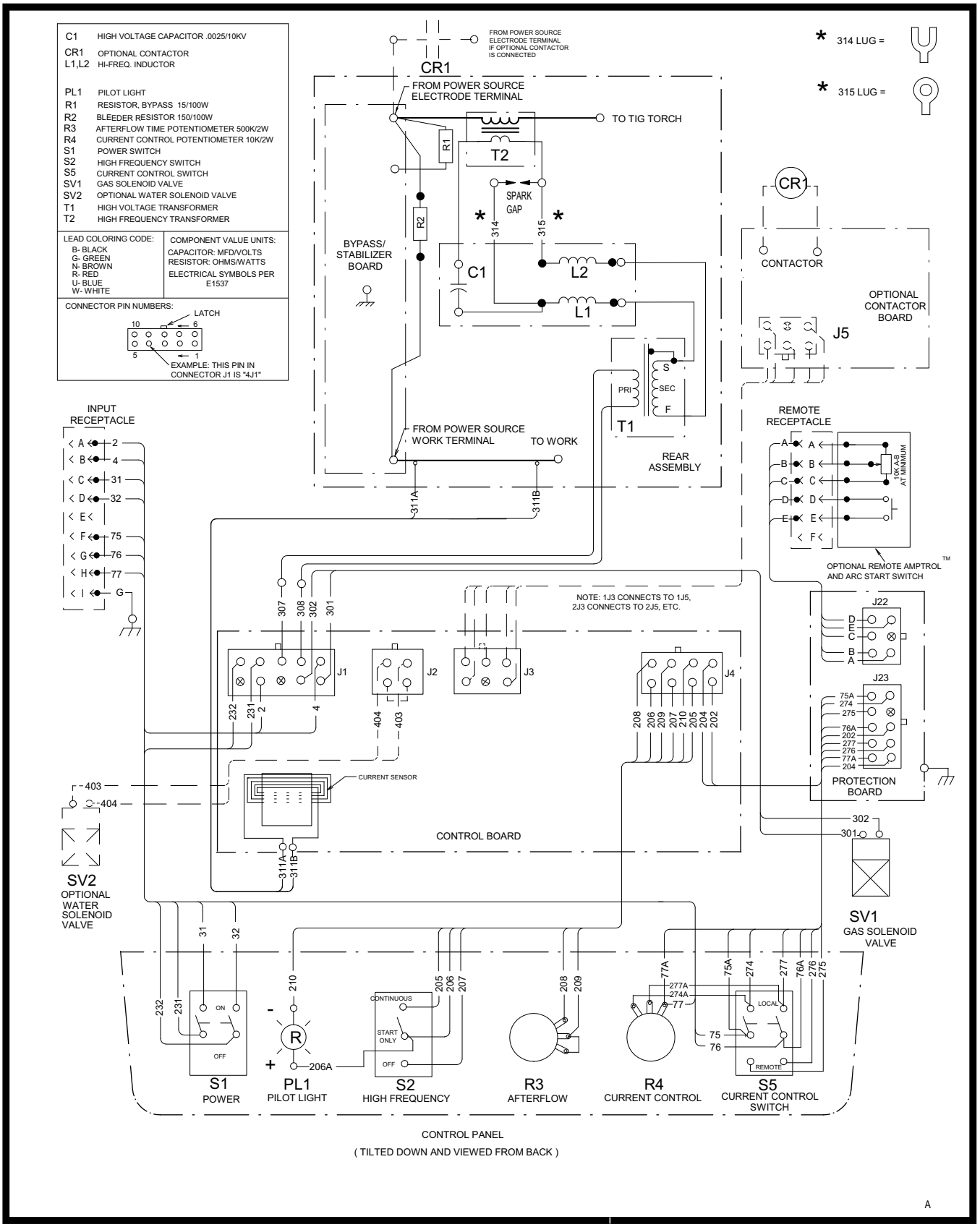


L9580

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

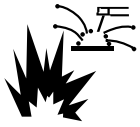
TIG MODULE

WIRING DIAGRAM FOR CODE 11010



L12065

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

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

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

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

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

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

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

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

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

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

이 제폼에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

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

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