INVERTEC® DC TIG STARTER

IM465-B

October, 1999

This manual for use with DC TIG Starter Codes 9926, 9990 & 10368

This manual covers equipment which is no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

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.

OPERATOR'S MANUAL

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •

• Sales and Service through Subsidiaries and Distributors Worldwide •

Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

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

The Above For Diesel Engines

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

The Above For Gasoline Engines

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.

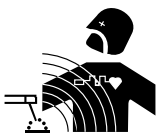
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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.

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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 with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

5.b. 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.c. 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.d. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer’s safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.e. Also see item 1.b.

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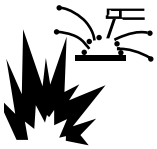


WELDING SPARKS can cause fire or explosion.

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.

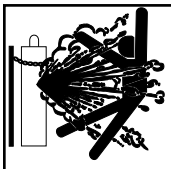
6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe 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.



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-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

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.

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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

Thank You —— for selecting a **QUALITY** product by Lincoln Electric. We want you to take pride in operating this Lincoln Electric Company product ••• as much pride as we have in bringing this product to you!

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.

Please record your equipment identification information below for future reference. This information can be found on your machine nameplate.

Model Name & Number _____

Code & Serial Number _____

Date of Purchase _____

Whenever you request replacement parts for or information on this equipment always supply the information you have recorded above.

Read this Operators Manual completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. The level of seriousness to be applied to each is explained below:

⚠ 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**.

TABLE OF CONTENTS

NOTES

TECHNICAL SPECIFICATIONS – DC TIG STARTER

INPUT	
Standard Voltage/Frequency	**Input Current**
42 VAC ±15% / 50/60 Hz.	2.0 Amps - Rated Output

CURRENT LIMIT	
Duty Cycle	**Amps**
60% Duty Cycle	300
100% Duty Cycle	250

PHYSICAL DIMENSIONS			
Height	**Width**	**Depth**	**Weight**
6.44 in	10.72 in	21.01 in	23 lbs
164 mm	272 mm	523 mm	10.4 kg

PRODUCT DESCRIPTION

The purpose of the DC TIG Starter is to provide a high frequency, high voltage pulse for arc starting in DC TIG welding applications. It is intended to be used with the Invertec™ power sources which have a 5.5 amp, 42 VAC auxiliary supply. The DC TIG Starter's output rating matches the Invertec V300's (300 amperes DC at a 60% duty cycle and 250 amperes DC at a 100% duty cycle). The input requirements are 42 VAC, 2.0 amps.

The DC TIG Starter is designed for non-contact starting of DC TIG welding arcs. It can select between 2-step and 4-step trigger functioning to control the Invertec's energizing of the torch. The DC TIG Starter has a water solenoid to control the on/off flow of coolant and a gas solenoid to control a preset preflow and allow a variable postflow. Maximum current limit can be adjusted for amptrol™ or arc start switch use. The DC TIG Starter comes with a preset upslope and an adjustable downslope. An Amphenol and control switch are provided for simultaneous wire feeder connection to Invertec power sources.

RECOMMENDED PROCESSES AND EQUIPMENT

The DC TIG Starter is to be used with DC TIG welding processes. A work cable, TIG torch, gas supply, and an arc start switch are required. An optional amptrol may be used. A water supply is required if using water- cooled torches.

For best results, use of Thoriated Tungsten electrodes is recommended.

COMPATIBLE LINCOLN ELECTRIC EQUIPMENT.

- V300's with 5.5 amp 42 VAC auxiliary supply.
- V200's with 5.5 amp 42 VAC auxiliary supply.
- Field installed options and accessories. See ACCESSORIES section.
- Compatible with all Magnum™ one and two piece water-cooled torches with 7/8 left-hand threads and gas-cooled torches with 3/8, 5/8, and 7/8 right-hand threads.
- Compatible with Magnum water coolers. The solenoid controlled coolant flow will help yield longer Magnum cooler life.

INSTALLATION

⚠ WARNING

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

Location

The DC TIG Starter kit has been designed with many features to protect it from harsh environments. Even so, it is important that simple preventative measures are followed in order to assure long life and reliable operation.

a. The machine must be located where there is free circulation of clean air such that air movement in the back and out the bottom will not be restricted. Dirt and dust that can be drawn into the machine should be kept to a minimum.

b. Keep machine dry. Shelter from rain and snow. Do not place on wet ground or in puddles.

High Frequency Interference Protection

The DC TIG Starter employs a solid state non-contact torch starting circuit which drastically reduces high frequency emissions from the machine as compared with spark gap type high frequency generators.

Radiated interference can develop, however, in the following four ways:

a. Direct interference radiated from the machine;

b. Direct interference radiated from the welding leads;

c. Direct interference radiated from feedback into the power lines;

or

d. Interference from reradiation or "pickup" by ungrounded metallic objects.

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

a. Keep the machine power supply lines as short as possible.

b. Keep the work and torch leads as short as possible and as close together as possible. Lengths should not exceed 25 ft. (7.6m). Tape the leads together when practical.

c. Be sure the torch and work cable rubber coverings are free of cuts and cracks that allow high frequency leakage.

d. Keep the torch in good repair and all connections tight to reduce high frequency leakage.

NOTE: The DC TIG Starter's frame is grounded to the Invertec's frame by the input cable assembly. The input cable assembly must be kept in good repair and all connections kept tight. The Invertec frame must be grounded per the Invertec's instruction manual.

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

f. When the machine is in operation, keep all covers securely fastened in place to minimize interference radiation.

Failure to observe these recommended installation procedures may cause radio or TV interference problems and may result in unsatisfactory performance.

Securing to Invertec

To secure the DC TIG Starter kit to the bottom of the Invertec, refer to page F-4 at the back of this manual, and :

a. Remove the bottom 4 wraparound screws from the Invertec;

b. Place the Invertec on top of and inside the starter kit's case;

c. Align holes and reinsert the 4 screws.

Input Connection

An input cable assembly is supplied with the kit to connect the DC TIG Starter to an Invertec. The cable makes the connection between the 14-pin Amphenols on the back of both the DC TIG Starter kit and the Invertec. Refer to S20405 connection diagram at the back of this manual.

Output Connection

An output cable assembly is supplied with the kit to connect the DC TIG Starter with the Invertec's negative or positive output quick connect terminals. (For electrode negative or positive connections, with the Invertec mounted on top of the DC TIG Starter). Refer to S20405 connection diagram at the back of this manual.

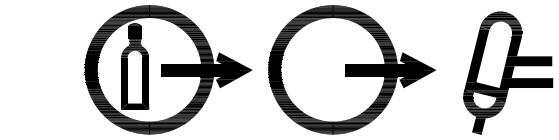
Torch Connection

All Magnum one and two piece gas-cooled or water-cooled torches can be connected to the starter kit.

Figure 1 below shows connection of air-cooled torches with the required adapters. One piece torches with 7/8-RH threads do not require an adapter, while one piece torches with 3/8-RH threads require the 7/8-RH to 3/8-RH adapter. The use of the 7/8-LH to 1/2" stud adapter with one piece torches is recommended to keep debris out of the water connection. Two piece torches with 5/8-RH threads and a separate electrical stud connector require the 5/8-RH to 7/8-RH adapter and the 7/8-LH to 1/2" stud adapter.

FIGURE 1

Connection Diagram for Air-Cooled Torches.



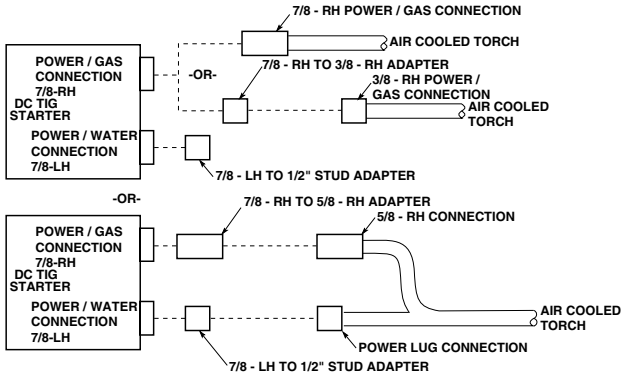
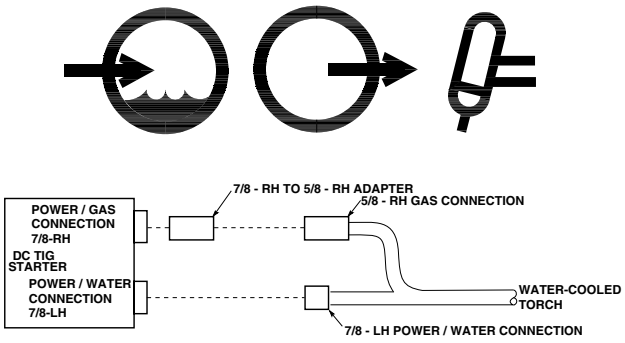


Figure 2 below shows connection of water-cooled torches with the required 7/8-RH to 5/8-RH adapter for the gas fitting. The water/coolant inlet connection for the torch should be connected directly to the 7/8-LH water/coolant connection.

FIGURE 2

Connection Diagram for Water-Cooled Torches.



NOTE: All required adapters are included with the DC TIG Starter kit.

Torch Connection Cover Installation

A torch connection cover has been provided with the DC TIG Starter. The cover should be installed using the 4 screws on the case front.

Gas Connection

The inlet gas connection is made at the back of the starter kit.

Water/Coolant Return Connection

Solenoid Controlled Water/Coolant Return Connection

The DC TIG Starter is shipped with a solenoid in the coolant path for fluid control. The water/coolant inlet connection is made at the 5/8-LH connector at the back of the DC TIG Starter.

Non-Solenoid Controlled Water/Coolant Return Connection

Use of water coolers which need non-interrupted fluid flow require the replacement of the DC TIG Starter's water solenoid with the fluid connector supplied with the kit.

Water Solenoid Removal

a. Turn power off to the V300.

b. Disconnect all items connected to the DC TIG Starter from the V300 (input cable, V300 output cable, torch connection and gas and coolant lines).

c. Uncouple Invertec from DC TIG Starter by removing 4 connecting fasteners.

d. Detach DC TIG Starter's wraparound by removing 6 fasteners.

e. Loosen clamp on coolant line then remove line from solenoid.

f. Remove exterior 5/8-LH connector from solenoid.

g. Disconnect 4 pin mini-molex (P4) from J4 on control board and cut any tie wraps to free the water solenoid input leads.

h. Detach water solenoid from center panel by removing 2 fastening screws.

Coolant Feed Through Connector Installation

a. Insert fitting through vacated hole in case back and secure with supplied lock washer and hex nut. Slight clearing of the center panel and case back may be necessary.

b. Slide coolant hose over fitting and secure with hose clamp.

c. Secure any loose wires by replacing removed tie wraps.

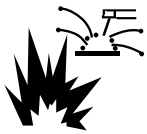
NOTE: All water/coolant threads are left-hand threads.

OPERATING 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 closed containers.

ARC RAYS can burn eyes and skin.
• Wear eye, ear and body protection.

See additional warning information at front of this operator's manual.

Limitations

a. The DC TIG Starter is not recommended for processes where procedures are not within its current and/or duty cycle ratings.

b. The DC TIG Starter is not intended for use with AC welding.

c. The DC TIG Starter is not intended for use where the input voltage will vary more than 15% from 42 VAC.

d. The DC TIG Starter is not intended for use where the open circuit voltage of the power source is less than 35 volts or greater than 90 volts.

Additional Safety Precautions

⚠ WARNING

HIGH FREQUENCY SHOCK can cause injury or fall.
• Keep the torch and cables in good condition.
• Secure yourself in position to avoid a fall.
• Do not operate machine if it is wet or sitting in water.

Power Source and Starter Kit Operation

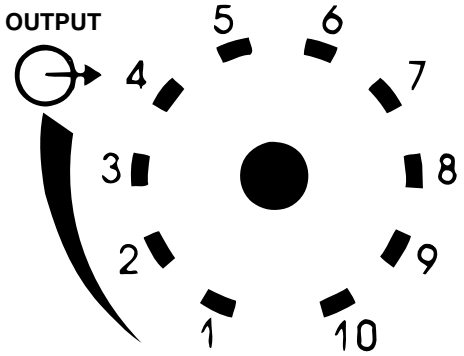
Duty Cycle

The DC TIG Starter kit is rated to match the V300 Invertec's duty cycle of 300 amps, 60% duty cycle, and 250 amps, 100% duty cycle.

Invertec Control Function/Operation

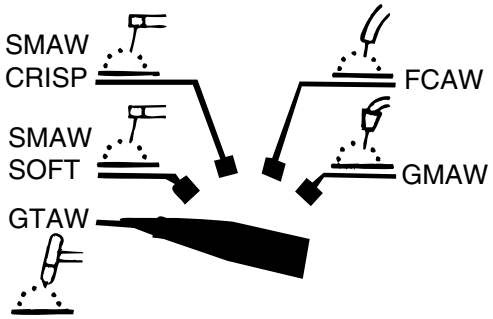
Power Switch: Placing the Invertec's power switch in the "ON" position will energize the Invertec and the DC TIG Starter kit. When the power is on, the digital meter in the Invertec will activate and the fans in the Invertec and the DC TIG Starter kit will operate.

Output Control: The welding current level is set by adjusting this knob on the Invertec if the Local/Remote Control Switch is set to the "Local" position. If the Local/Remote Control Switch is set to the "REMOTE" position, output current is set by use of optional remote controls and/or current limit control.

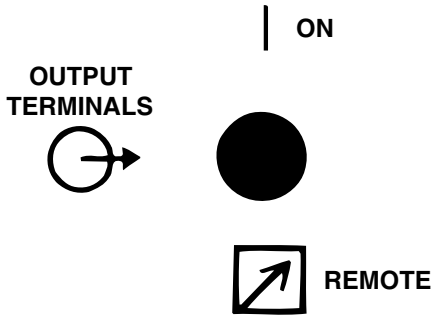


NOTE: The digital meter in the Invertec will indicate the current limit level when no current is flowing. When current is flowing, the digital meter will display the output current level.

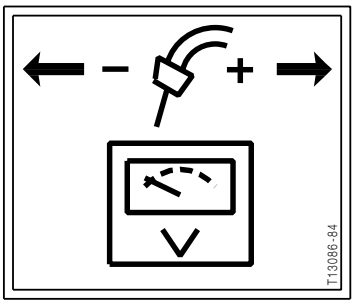
Mode: This switch on the Invertec should be set to the GTAW position for both scratch start and non-contact, high frequency starting use.



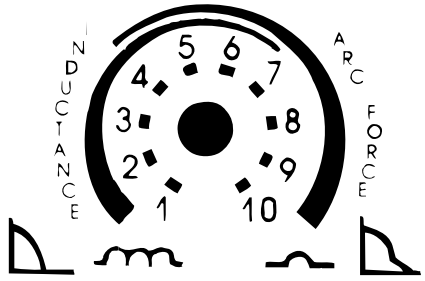
Output Terminals Switch: To allow the DC TIG Starter kit to control the Invertec's power to the welding terminals, set this switch on the Invertec to the "REMOTE" position. Set this switch to the "ON" position for a continuously energized torch.



Meter Polarity Switch: Located at the rear of the Invertec, this switch must be placed in the negative ("-") position for electrode negative welding and in the positive ("+") for electrode positive welding.

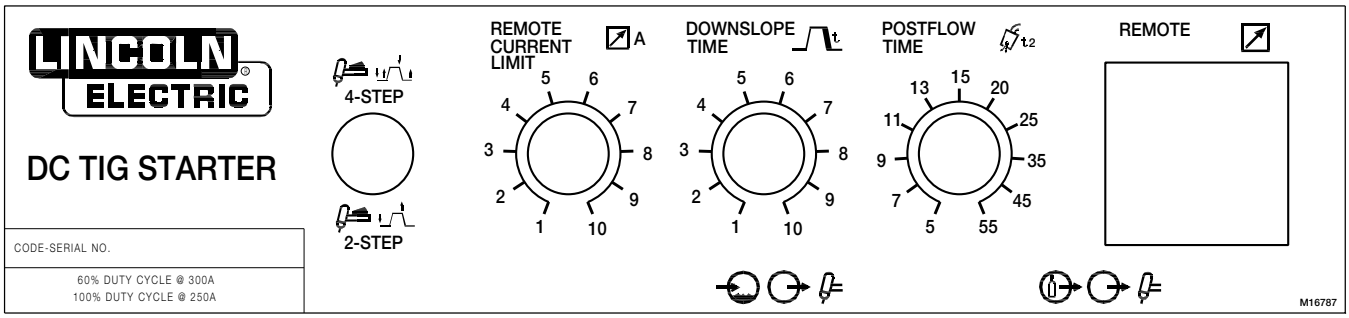


Arc Force/Inductance: This control on the Invertec is disabled in the GTAW mode.



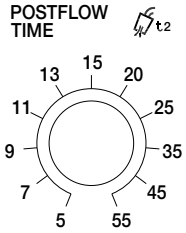
Has no effect when DC TIG Starter is used.

DC TIG Starter Front Panel

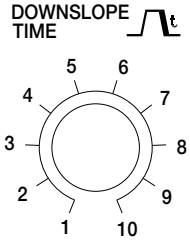


DC TIG Starter Control Function/Operation

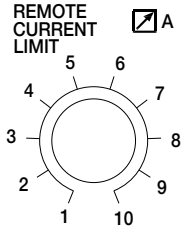
Postflow Time: An infinite range of postflow times between 5 and 55 seconds can be set by adjusting this knob on the front panel.



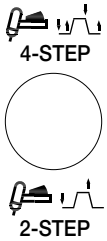
Downslope: Current downslope "fade-out" can be regulated from fast (0 seconds) to slow (30 seconds) by adjusting this knob on the front panel. The current downslope starts at the level set by the current limit "CL" knob and reduces to a crater fill level of 25% of CL. This switch should be placed in the fast (downslope off) position when the DC TIG Starter is used with an amptrol.



Remote Current Limit: This feature limits the maximum current obtainable when the DC TIG Starter is used with a remote amptrol or sets the welding current when the DC TIG Starter is used with an arc start switch. Current limit can be controlled by adjusting this knob on the front panel.



Trigger Function Switch: This switch selects a 2-step or 4-step trigger function when used with an arc start switch. This switch should be placed in the 2-step position when the DC TIG Starter is used with an amptrol. For best utility, the output terminals switch on the Invertec should be placed in the "REMOTE" position.

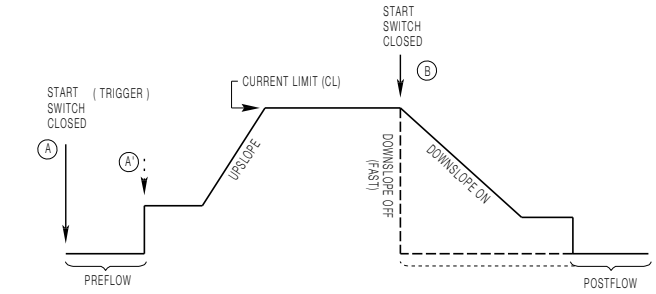


Operation with an Arc Start Switch

2-STEP: In this mode, closing the trigger (or arc start switch) will start the welding process with a 0.5 second gas preflow. The Invertec's welding terminals will energize and the solid state starting circuit is enabled. The starting circuit will continue operation until the arc has been established or 2 minutes elapse. Once the welding arc is established, an optimized upslope takes the welding current up to the desired current limit and the arc will be maintained as long as the trigger is closed. Releasing the trigger initiates the downslope/crater fill sequence and then starts the postflow timing. Reclosing the trigger during the downslope/crater fill sequence begins the upslope sequence starting at the current level reached in the downslope sequence. Reclosing the trigger during postflow skips the preflow stage and immediately restrikes the arc. If the arc is lost during welding, the starting circuit will resume operation for up to two minutes to re-establish the arc. If the arc is not re-established, the DC TIG Starter kit will shut off the starting circuit, shut off the Invertec's trigger, begin postflow timing, and await the release of the arc start switch. See FIGURE 3.

FIGURE 3

2-Step Trigger Control Using Arc Start Switch

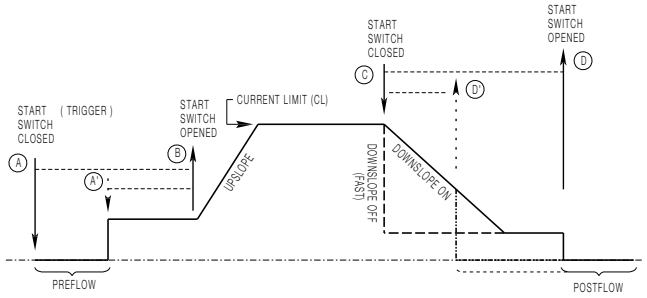


(A) TRIGGER PULLED WITHOUT GAS FLOWING.
(A) TRIGGER PULLED DURING POSTFLOW.
(B) TRIGGER RELEASED TO INITIATE FINISHING SEQUENCE.

4-STEP: In this mode, closing the trigger (or arc start switch) will start the welding process with a 0.5 second gas preflow. The Invertec's welding terminals will energize and the solid state starting circuit will operate until the trigger is opened regardless if the arc has been established or not. When the welding arc is initiated and the trigger is released, the optimized upslope will ramp the current up to the desired current limit. Closing the trigger the second time initiates the selected downslope which ramps the current down to 25% of current limit. Releasing the trigger stops the crater fill current level and starts postflow. Reclosing the trigger during postflow skips the preflow stage and immediately restrikes the arc. If the arc is lost during welding, the solid state starting circuit will resume operation for up to two seconds to re-establish the arc. If the arc is not re-established, the DC TIG Starter kit will shut off the high frequency, shut off the Invertec's trigger, and begin postflow timing. See FIGURE 4.

FIGURE 4

4-Step Trigger Control Using Arc Start Switch



(A) TRIGGER PULLED WITHOUT GAS FLOWING.
(A) TRIGGER PULLED DURING POSTFLOW.
(B) TRIGGER RELEASED TO START WELDING PROCEDURE. IF ARC HAD STARTED. POSTFLOW STARTS IF ARC DID NOT START .
(C) TRIGGER PULLED TO INITIATE FINISHING SEQUENCE.
(D) TRIGGER RELEASED TO STOP CURRENT.
(D') TRIGGER RELEASED DURING DOWNSLOPE STOPS CURRENT AND STARTS POSTFLOW.

Operation with an Amptrol

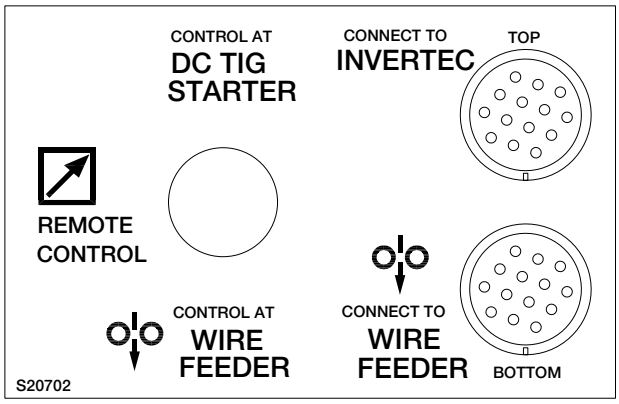
For best use of the DC TIG Starter with an optional hand or foot amptrol, the Trigger Function Switch should be placed in the 2-step position and the downslope control should be placed in the FAST (or OFF) position.

Remote Control Switch

Located at the rear of the DC TIG Starter, this switch gives output control of the Invertec to the DC TIG Starter or to a wire feeder. Use of this switch and connecting a wire feeder to the lower 14-pin Amphenol or the back of the DC TIG Starter allows for simultaneous connection of the DC TIG Starter and a wire feeder to the Invertec. Changing between GTAW and GMAW processes, or vise versa, then requires changing the Invertec's switches as needed, changing the DC TIG Starter's remote control switch to the "WIRE FEEDER" position and changing connections to the Invertec's output terminals as needed.

FIGURE 5

Remote Control Switch



There are no factory installed options. The DC TIG Starter comes complete with cables, torch adapters, and hardware for installation.

Field Installed Options/Accessories:

Cable Plugs: Cable Plug Kit for 1/0-2/0- cable (K852-70): Attaches to welding cable to provide quick disconnect from machine. NOTE: A 17” 1/0 cable with two K852-70 plugs installed is included with the DC TIG Starter kit for use in installing the kit beneath the Invertec.

Remote Control:

K963 Hand Amptrol or K870 Foot Amptrol can be used with the DC TIG Starter kit for full-range remote current control and arc starting/stopping control.

K814 Arc Start Switch can be used with the DC TIG Starter kit for arc starting/stopping control.

MAINTENANCE

⚠ WARNING

ELECTRIC SHOCK can kill.

- Only qualified persons should install, use or service this equipment.
- Turn off the input power to the Welding Power Source using the disconnect switch at the fuse box before connecting the DC Tig Starter to the power source, or the Remote Control, Amptrol or adapter to the DC Tig Starter.
- Welding cable must be sized for current and duty cycle of application.

Routine Maintenance

1. Every 6 months or so the machine should be cleaned with a low pressure airstream. Keeping the machine clean will result in cooler operation and higher reliability.

2. Examine the sheet metal case for dents or breakage. Repair the case as required. Keep the case in good condition to ensure that high voltage parts are protected and correct spacings are maintained. All external sheet metal screws must be in place to ensure case strength and electrical ground continuity.

Periodic Maintenance

No scheduled periodic maintenance is required for the DC Tig Starter Kit.

HOW TO USE TROUBLESHOOTING GUIDE AND GENERAL INFORMATION ON TROUBLE SHOOTING

⚠ 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 repair possible machine misadjustments. Simply follow the 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 RECOMMENDED PROCEDURES

The second column labeled "RECOMMENDED COURSE OF ACTION" lists the possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed.

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.

Visual Inspection

Clean interior of machine with a low pressure airstream. Make a thorough inspection of all components. Look for signs of overheating, broken leads or other obvious problems. Inspect all wiring, lugs, and connections to ensure that electrical connections are tight and free of debris. All connectors should make complete contact with their mating components. All leads and lugs should be fully inserted into their respective connector cavities. Many problems can be uncovered with a good visual inspection.

Open Circuit Voltage

The DC TIG Starter does not alter the open circuit voltage of the Invertec. Consult the Invertec's manual for applicable open circuit voltages. With the Invertec's Output Terminals Switch in the "ON" position, the open circuit voltage should appear between the Invertec's positive output terminal and both of the torch connection terminals of the DC TIG Starter (for electrode negative connections).

Test Conditions

Perform all powered tests with an isolated 42 VAC input supply such as from an Invertec V300. Make ohmmeter checks only after power has been disconnected from machine.

Certain high voltage connections have been insulated with RTV sealant. It is necessary to break through the sealant with a sharp probe in order to make voltage or resistance checks on these connections. After the completion of all measurements and repair work, all RTV punctures should be resealed with RTV.

Refer to the DC TIG Starter's wiring diagram at the back of this manual for lead and connector references listed.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the necessary tests/repairs safely, contact your **local authorized field service facility** before you proceed.

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	RECOMMENDED COURSE OF ACTION
No output; fan does not operate.	1. Check that the input cable assembly is tightly connected. 2. Check the wiring at the 14-pin and 6-pin Amphenols. All connections should be insulated and free of debris. 3. Check that there is 42 VAC present between cavities “I” and “K”, (leads 42 and 41), of the 14-pin Amphenol. If 42 VAC is present between these cavities at the Invertec but not at the DC TIG Starter, replace or repair the input cable assembly. If 42 VAC is not present at the Invertec’s cavities, see the Instruction Manual for the Invertec. 4. Check that 115 VAC is present between leads 41B and 215A. If it is present, replace the fan and check that the outputs of the auxiliary transformer are within 15% of nominal values: 380 VAC between the U leads and 24 VAC between the Y leads. 5. Check that the GREEN LED on the control board is illuminated. If it is not illuminated, perform the following: Check that 24 VAC is present between leads 101A and 102A and between leads Y and Y. If 24 VAC is present between the Y leads and not between leads 101A and 102A, check that all connections on these wires are tight and have continuity. If all connections are acceptable, replace the HIGH FREQ FIRING BOARD. If 24 VAC is not present between the Y leads with plug J7 disconnected and 115 VAC present between 41B and 215A, replace the auxiliary transformer, T1. If 24 VAC is present between leads 101A and 102A, replace the control board. 6. Replace the auxiliary transformer, T1.

⚠ CAUTION

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

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	RECOMMENDED COURSE OF ACTION
No output; fan operates.	1. Perform steps 1 and 2 under heading on previous page of "No output; fan does not operate". 2. Check that the Invertec's Meter Polarity Switch is in the correct position for the electrode polarity being used. 3. Check that the RED LED on the control board is not illuminated. If it is illuminated, replace the control board. 4. If solenoids engage when the arc start switch is closed, check that the Invertec produces OCV: a. If OCV is not present, check that the arc start switch has continuity when closed and repair or replace to correct, or replace the control board if the arc start switch is correct. b. If OCV is present, see the heading below of "No HF arcing; OCV present".
No HF arcing; OCV present.	1. If a welding arc can be started using the scratch start method: a. Check leads 107 and 108 for proper connections and continuity. b. Replace the HIGH FREQ FIRING BOARD. c. Replace the CONTROL BOARD. d. Replace the HIGH FREQ TRANSFORMER, T2. 2. If a welding arc cannot be started using the scratch start method, check continuity of the work lead and torch and repair or replace as needed. Check the continuity between both of the DC TIG Starter's torch connectors and the Invertec's negative output terminal: repair or replace the input cable assembly, the HF transformer lead connections, or the HF transformer, T2, as needed.

⚠ CAUTION

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

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	RECOMMENDED COURSE OF ACTION
No HF arcing; OCV not present.	1. Check that the Invertec's Meter Polarity Switch is in the position for the electrode connection being used. 2. Check that the RED LED on the control board is not illuminated. If it is illuminated, replace the control board. 3. If solenoids engage when the arc start switch is closed, check that 24 VAC is present between leads 2 and 4 with the arc start switch open and <3 VAC with the arc start switch closed: a. 24 VAC not present with arc start switch open: check continuity of input cable assembly and consult the Invertec's Instruction Manual. b. Voltage is not <3 VAC with arc start switch closed; replace control board. 4. If solenoids do not engage when the arc start switch is closed: a. Check that the arc start switch has continuity when closed. b. Check that there is 28-40 VDC between leads D and E. If voltage is not present between D and E, replace the control board.
Solenoid(s) does (do) turn on but OCV is present.	1. With the kit timing postflow, check that 115 VAC is present between leads B and B to the gas and water solenoids. Replace the control board if voltage is not present. Replace the solenoid(s) if voltage present.
Arc does not start consistently; HF present.	1. Use Thoriated tungsten electrodes. Pure tungsten electrodes may exhibit starting difficulty. 2. Check continuity of work lead, torch and HF transformer secondary, T2. Check for tight, clean connections between all output connectors.

⚠ CAUTION

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

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	RECOMMENDED COURSE OF ACTION
Postflow Time does not vary with knob; 15 seconds always.	1. Check leads and connections for the postflow adjustment potentiometer, R1. 2. Check that there is approximately 15 VDC between leads 13 and 15 and that the voltage between leads 16 and 15 varies from 0.1 to approximately 15 VDC when the postflow knob is rotated throughout its full range. Repair or replace R1 and/or the associated leads as needed. 3. Replace the control board. **NOTE:** If the postflow adjustment becomes disabled, the control board will use a preset of 15 seconds for postflow timing.
Downslope does not vary with knob.	1. Check leads and connections for the downslope adjustment potentiometer, R2. 2. Check that there is approximately 15 VDC between leads 13 and 17 and that the voltage between leads 8 and 17 varies from 0.1 to approximately 15 VDC when the downslope knob is rated throughout its full range. Repair or replace R2 and/or the associated leads as needed. 3. Replace the control board.
Current Limit does not vary with knob.	1. Check leads and connections for the current limit vary adjustment potentiometer, R3. 2. Check that there is approximately 15 VDC between leads F and 19 and that the voltage between leads A and 19 varies from 0.1 to approximately 15 VDC when the current limit knob is rotated throughout its full range. Repair or replace R3 and/or the associated leads as needed. 3. Replace the control board.

⚠ CAUTION

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

Environmental Protection

High voltage connections are covered with an RTV sealant to prevent malfunction in severe environments. Sealant must be applied to connections which have been opened or otherwise lost their protection. A noncorrosive electronic grade sealant such as Dow Corning 3140, 3145, 738, Columbus Adhesives 0172 or GE RTV-162 is recommended. Sealant may also be purchased from Lincoln Electric (order E2519 Silicone Rubber RTV Coating).

Printed Circuit Board Replacement

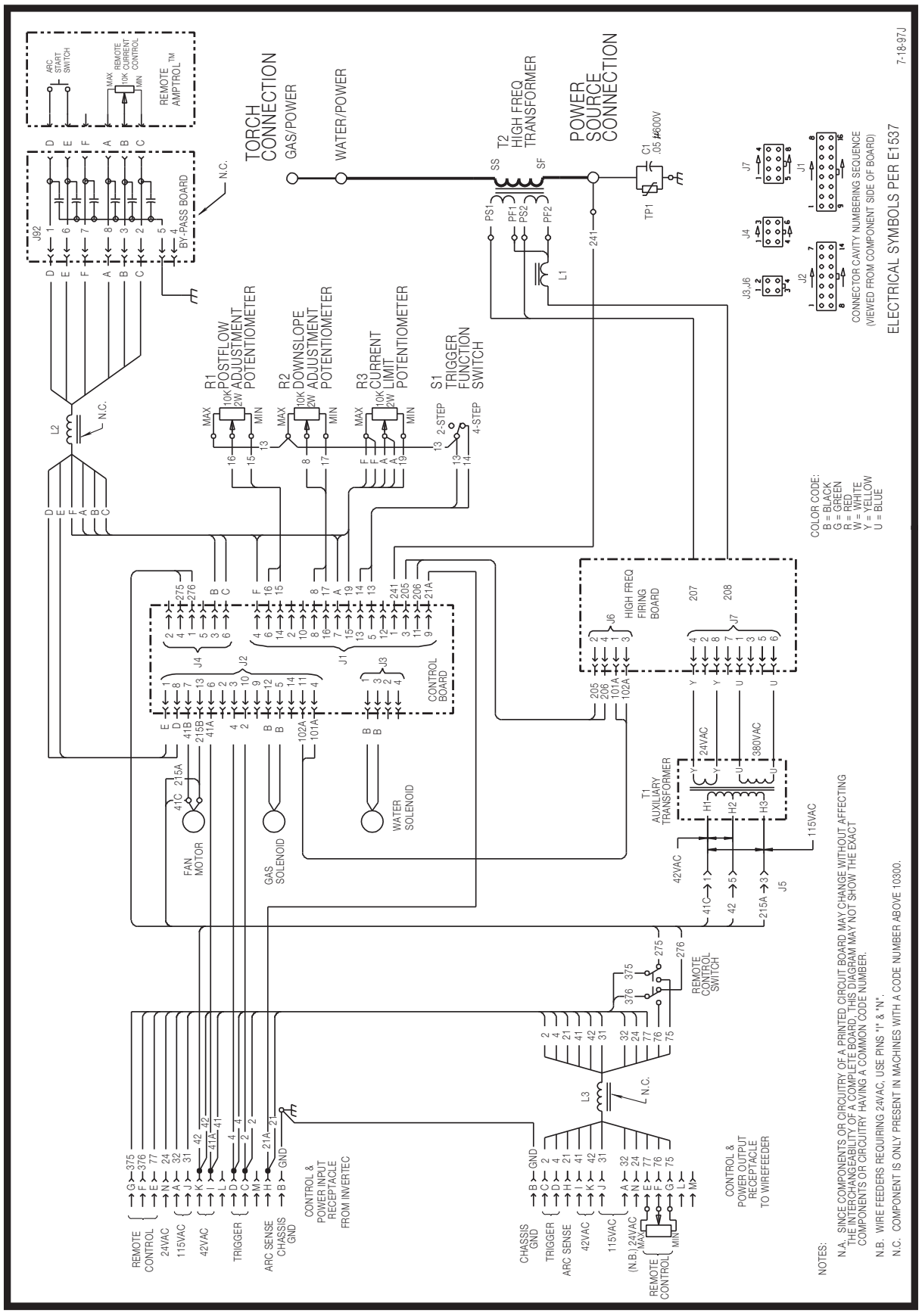
1. Handle PC boards by edges only.

2. Store PC boards only in the bags that they are shipped in. Some PC boards require special bags that disperse static charges.

3. Inspect malfunctioning PC boards for burned conductors or components. If damage is visible, inspect the machine wiring for grounds or shorts to avoid damaging a new PC board.

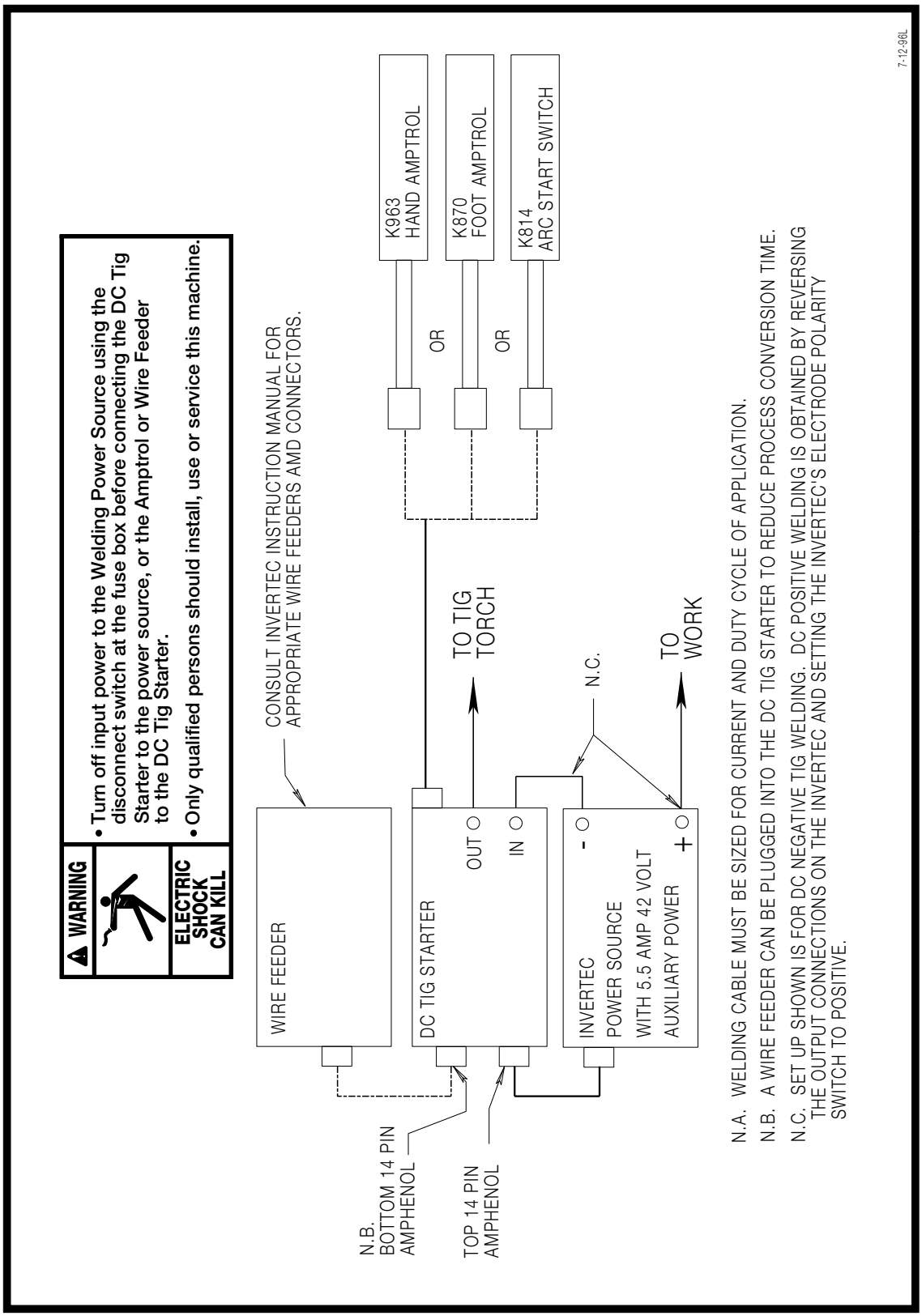
4. If there is no visible damage to the PC board, install a new PC board and see if the problem is fixed. If the problem is fixed by the new board, reinstall the old board and see if the problem reoccurs. If the problem does not reoccur, check the wiring harness and plugs for loose connections or faults.

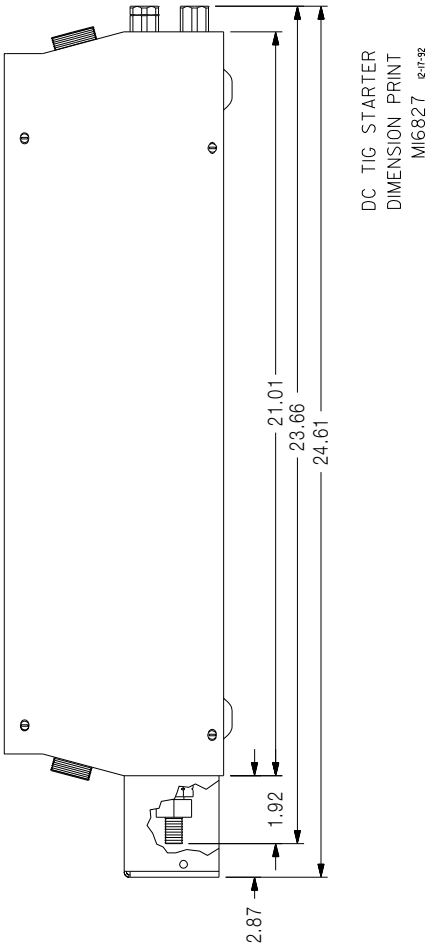
WIRING DIAGRAM - DC TIG STARTER

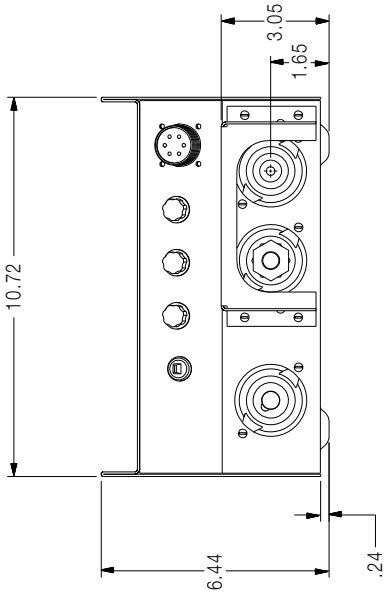


NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment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

DC TIG STARTER CONNECTION DIAGRAM




DC TIG STARTER
DIMENSION PRINT
MI6827 12-17-92
21.01
23.66
24.61
1.92
2.87


3.05
1.65
10.72
6.44
.24

INVERTEC DC TIG STARTER

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NOTES

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Titles:	Price	Code	Quantity	Cost
New Lessons in Arc Welding	$5.00	L		
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		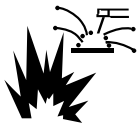	
WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aislese del trabajo y de la tierra.	● Mantenga el material combustible fuera del área de trabajo.	● Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre.	● Gardez à l'écart de tout matériel inflammable.	● Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden!	● Entfernen Sie brennbarres Material!	● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra.	● Mantenha inflamáveis bem guardados.	● Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。	● 燃えやすいものの側での溶接作業は絶対にしてはなりません。	● 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	● 皮肤或濕衣物切勿接觸帶電部件及銲條。 ● 使你自己與地面和工件絕緣。	● 把一切易燃物品移離工作場所。	● 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	● 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. ● 모재와 접지를 접촉치 마십시요.	● 인화성 물질을 접근 시키지 마시요.	● 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل.	● ضع المواد القابلة للاشتعال في مكان بعيد.	● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

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

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

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

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

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

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

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

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

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