



IGBT INVERTER
TIG160PDCHF **DC TIG/PULSE TIG**
WELDING MACHINE

(Suitable for 1x110V or 1x220V)

Operators's Manual
Safety, Setup and General Use Guide



REV.2 0 00134-16
Issue Date: May.10,2016
Manual No.: 0-1524

EMPRESAS CARBONE S.A.
Calle 5ta. Rio Abajo, Panamá, Panamá
Telefonos: (507) 3916309 / 3916313
www.empresascarbone.com

Dear Customer,

Thank you for selecting the our machine. We appreciate you as a customer and hope that you will enjoy years of use from your welder.

Please go directly to the our website to register your unit and receive your warranty information. Your unit registration is important should any information such as product updates or re-calls be issued. It is also important so that we may track your satisfaction with our products and services. If you are unable to register by website, contact our directly through the sales department through the main customer service number in your country. Your unit will be registered and warranty will be issued and in full effect. Keep all information regarding your purchase. **In the event of a problem you must contact technical support before your welder can be a candidate for warranty service and returned.**

Please review the current online warranty statement and information found on the website of the our division located in or nearest to your country. Print it for your records and become familiar of its terms and conditions.

We offers full technical support, in several different forms. We have online support available through email, and a welding support forum designed for customers and noncustomer interaction. Technical advisors are active on the forum daily. We also divide our support into two divisions: technical and welding performance. Should you have an issue or question concerning your unit, please contact performance/technical support available through the main company headquarters available in your country. For best service call the appropriate support line and follow up with an email, particularly if off hours, or you cannot reach a live person. In the event you do not reach a live person, particularly during heavy call volume times, holidays, and off hours, leave a message and your call will normally be returned within 24 hours. Also for quick answers to your basic questions, join the company owned forum available through the website.

Should you need to call or write, always know your model name, purchase date and welder manufacturing inspection date. This will assure the quick and accurate customer service. **REMEMBER: Be as specific and informed as possible. Technical and performance advisors rely upon you to carefully describe the conditions and circumstances of your problem or question. Take notes of any issues as best you can. You may be asked many questions by the advisors to clarify problems or issues that may seem very basic. However, diagnosis procedures MUST be followed to begin the warranty process. Advisors can't assume anything, even with experienced users, and must cover all aspects to properly diagnose the problem. Depending upon your issue, it is advisable to have basic tools handy such as screwdrivers, wrenches, pliers, and even an inexpensive test meter with volt/ohm functions before you call.**

Let us know how we may be of service to you should you have any questions.

We want you to take pride in operating our machine as much pride as we have taken in making this product for you. Please read all information in this manual before operation

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt from the courier. Consequently all claims for material damaged in shipment must be made by purchaser against the transportation company used.

Please record your equipment identification below for future reference. This information can be found on data plate at rear of machine.

Product : TIG160PDCHF

Serial No. _____

Date of Purchase _____

Where Purchased _____

Whenever you request replacement parts or information on this equipment please always supply information you have recorded above

This product is covered by 1 years parts and labour warranty, you are responsible for costs of shipping unit to us, we will cover cost of returning item to you. External items, torch, earth lead etc are covered by 3 months warranty. Any faults/damage found caused by customer will be charged prorata.

Pay particular attention to the safety instructions we have provided you for your protection The level of seriousness to be applied to each section is explained below

WARNING



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

CAUTION

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

SAFETY PRECAUTIONS

We are dedicated to providing you with the best possible equipment and service to meet the demanding jobs that you have. We want to go beyond delivering a satisfactory product to you. That is the reason we offer technical support to assist you with your needs should an occasion occur. With proper use and care your product should deliver years of trouble free service.



Safe operation and proper maintenance is your responsibility.

We have compiled this operator's manual, to instruct you in basic safety, operation and maintenance of our product to give you the best possible experience. Much of welding and cutting is based upon experience and common sense. As thorough as this welding manual may be, it is no substitute for either. Exercise extreme caution and care in all activities related to welding or cutting. Your safety, health and even life depends upon it. While accidents are never planned, preventing an accident requires careful planning.

Please carefully read this manual before you operate machine. This manual is not only for the use of the machine, but to assist in obtaining the best performance out of your unit. Do not operate the unit until you have read this manual and you are thoroughly familiar with the safe operation of the unit. If you feel you need more information please contact our Support.

The warranty does not cover improper use, maintenance or consumables. **Do not attempt to alter or defeat any piece or part of your unit, particularly any safety device.** Keep all shields and covers in place during unit operation should an unlikely failure of internal components result in the possible presence of sparks and explosions. If a failure occurs, discontinue further use until mal-functioning parts or accessories have been repaired or replaced by qualified personnel.

Note on High Frequency electromagnetic disturbances:



Certain welding and cutting processes generate High Frequency (HF) waves. These waves may disturb sensitive electronic equipment such as televisions, radios, computers, cell phones, and related equipment. High Frequency may also interfere with fluorescent lights. Consult with an electrician if disturbance is noted. Sometimes, improper wire routing or poor shielding may be the cause.



HF can interfere with pacemakers. See EMF warnings in following safety section for further information. Always consult your physician before entering an area known to have welding or cutting equipment if you have a pacemaker.

MOVING PARTS can cause injury.



Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

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.

SAFETY PRECAUTIONS



These safety precautions are for protection of safety and health. Failure to follow these guidelines may result in serious injury or death. Be careful to read and follow all cautions and warnings. Protect yourself and others.



Welding and cutting processes produce high levels of ultraviolet (UV) radiation that can cause severe skin burn and damage. There are other potential hazards involved with welding such as severe burns and respiratory related illnesses. Therefore observe the following to minimize potential accidents and injury:



Use appropriate safety glasses with wrap around shields while in the work area, even under welding helmets to protect your eyes from flying sparks and debris. When chipping slag or grinding, goggles and face shields may be required.



When welding or cutting, always use an approved shielding device, with the correct shade of filter installed. Always use a welding helmet in good condition. Discard any broken or cracked filters or helmets. Using broken or cracked filters or helmets can cause severe eye injury and burn. Filter shades of no less than shade 5 for cutting and no less than shade 9 for welding are highly recommended. Shades greater than 9 may be required for high amperage welds. Keep filter lenses clean and clear for maximum visibility. It is also advisable to consult with your eye doctor should you wear contacts for corrective vision before you wear them while welding.



Do not allow personnel to watch or observe the welding or cutting operation unless fully protected by a filter screen, protective curtains or equivalent protective equipment. If no protection is available, exclude them from the work area. Even brief exposure to the rays from the welding arc can damage unprotected eyes.



Always wear hearing protection because welding and cutting can be extremely noisy. Ear protection is necessary to prevent hearing loss. Even prolonged low levels of noise has been known to create long term hearing damage. Hearing protection also further protects against hot sparks and debris from entering the ear canal and doing harm.



Always wear personal protective clothing. Flame proof clothing is required at all times. Sparks and hot metal can lodge in pockets, hems and cuffs. Make sure loose clothing is tucked in neatly. Leather aprons and jackets are recommended. Suitable welding jackets and coats may be purchased made from fire proof material from welding supply stores. Discard any burned or frayed clothing. Keep clothing away from oil, grease and flammable liquids.



Leather boots or steel toed leather boots with rubber bottoms are required for adequate foot protection. Canvas, polyester and other man made materials often found in shoes will either burn or melt. Rubber or other non conductive soles are necessary to help protect from electrical shock.



Flame proof and insulated gauntlet gloves are required whether welding or cutting or handling metal. Simple work gloves for the garden or chore work are not sufficient. Gauntlet type welding gloves are available from your local welding supply companies. Never attempt to weld with out gloves. Welding with out gloves can result in serious burns and electrical shock. If your hand or body parts comes into contact with the arc of a plasma cutter or welder, instant and serious burns will occur. **Proper hand protection is required at all times when working with welding or cutting machines!**

SAFETY PRECAUTIONS



WARNING! Persons with pacemakers should not weld, cut or be in the welding area until they consult with their physician. Some pacemakers are sensitive to EMF radiation and could severely malfunction while welding or while being in the vicinity of someone welding. Serious injury or death may occur!



Welding and plasma cutting processes generate electro-magnetic fields and radiation. While the effects of EMF radiation are not known, it is suspected that there may be some harm from long term exposure to electromagnetic fields. Therefore, certain pre-cautions should be taken to minimize exposure:

- * Lay welding leads and lines neatly away from the body.
- * Never coil cables around the body.
- * Secure cables with tape if necessary to keep from the body.
- * Keep all cables and leads on the same side the body.
- * Never stand between cables or leads.
- * Keep as far away from the power source (welder) as possible while welding.
- * Never stand between the ground clamp and the torch.
- * Keep the ground clamp grounded as close to the weld or cut as possible.



Welding and cutting processes pose certain inhalation risks. Be sure to follow any guidelines from your chosen consumable and electrode suppliers regarding possible need for respiratory equipment while welding or cutting. Always weld with adequate ventilation. Never weld in closed rooms or confined spaces. Fumes and gases re-released while welding or cutting may be poisonous. Take precautions at all times.

Any burning of the eyes, nose or throat are signs that you need to increase ventilation.

- * Stop immediately and relocate work if necessary until adequate ventilation is obtained.
- * Stop work completely and seek medical help if irritation and discomfort persists.



WARNING! Do not weld on galvanized steel, stainless steel, beryllium, titanium, copper, cadmium, lead or zinc without proper respiratory equipment and or ventilation.



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



WARNING! Do not weld or cut around Chlorinated solvents or degreasing areas. Release of Phosgene gas can be deadly. Consider all chemicals to have potential deadly results if welded on or near metal containing residual amounts of chemicals.



Keep all cylinders upright and chained to a wall or appropriate holding pen. Certain regulations regarding high pressure cylinders can be obtained from OSHA or local regulatory agency. Consult also with your welding supply company in your area for further recommendations. The regulatory changes are frequent so keep informed.



All cylinders have a potential explosion hazard. When not in use, keep capped and closed. Store chained so that overturn is not likely. Transporting cylinders incorrectly can lead to an explosion. Do not attempt to adapt regulators to fit cylinders. Do not use faulty regulators. Do not allow cylinders to come into contact with work piece or work. Do not weld or strike arcs on cylinders. Keep cylinders away from direct heat, flame and sparks.

SAFETY PRECAUTIONS



WARNING! Electrical shock can kill. Make sure all electrical equipment is properly grounded. Do not use frayed, cut or otherwise damaged cables and leads. Do not stand, lean or rest on ground clamp. Do not stand in water or damp areas while welding or cutting. Keep work surface dry. Do not use welder or plasma cutter in the rain or in extremely humid conditions. Use dry rubber soled shoes and dry gloves when welding or cutting to insulate against electrical shock. Turn machine on or off only with gloved hand. Keep all parts of the body insulated from work, and work tables. Keep away from direct contact with skin against work. If tight or close quarters necessitates standing or resting on work piece, insulate with dry boards and rubber mats designed to insulate the body from direct contact.



All work cables, leads, and hoses pose trip hazards. Be aware of their location and make sure all personnel in area are advised of their location. Taping or securing cables with appropriate restraints can help reduce trips and falls.



WARNING! Fire and explosions are real risks while welding or cutting. Always keep fire extinguishers close by and additionally a water hose or bucket of sand. Periodically check work area for smoldering embers or smoke. It is a good idea to have someone help watch for possible fires while you are welding. Sparks and hot metal may travel a long distance. They may go into cracks in walls and floors and start a fire that would not be immediately visible. Here are some things you can do to reduce the possibility of fire or explosion:

- * Keep all combustible materials including rags and spare clothing away from area.
- * Keep all flammable fuels and liquids stored separately from work area.
- * Visually inspect work area when job is completed for the slightest traces of smoke or embers.
- * If welding or cutting outside, make sure you are in a cleared off area, free from dry tender and debris that might start a forest or grass fire.

* Do not weld on tanks, drums or barrels that are closed, pressurized or anything that held flammable liquid or material.



Metal is hot after welding or cutting! Always use gloves and or tongs when handling hot pieces of metal. Remember to place hot metal on fire-proof surfaces after handling. Serious burns and injury can result if material is improperly handled.



WARNING! Faulty or poorly maintained equipment can cause injury or death. Proper maintenance is your responsibility. Make sure all equipment is properly maintained and serviced by qualified personnel. Do not abuse or misuse equipment.



Keep all covers in place. A faulty machine may shoot sparks or may have exploding parts. Touching uncovered parts inside machine can cause discharge of high amounts of electricity.



Do not allow employees to operate poorly serviced equipment. Always check condition of equipment thoroughly before start up. Disconnect unit from power source before any service attempt is made and for long term storage or electrical storms.



Further information can be obtained from The American Welding Society (AWS) that relates directly to safe welding and plasma cutting. Additionally, your local welding supply company may have additional pamphlets available concerning their products. Do not operate machinery until you are comfortable with proper operation and are able to assume inherent risks of cutting or welding.

TABLE OF CONTENTS

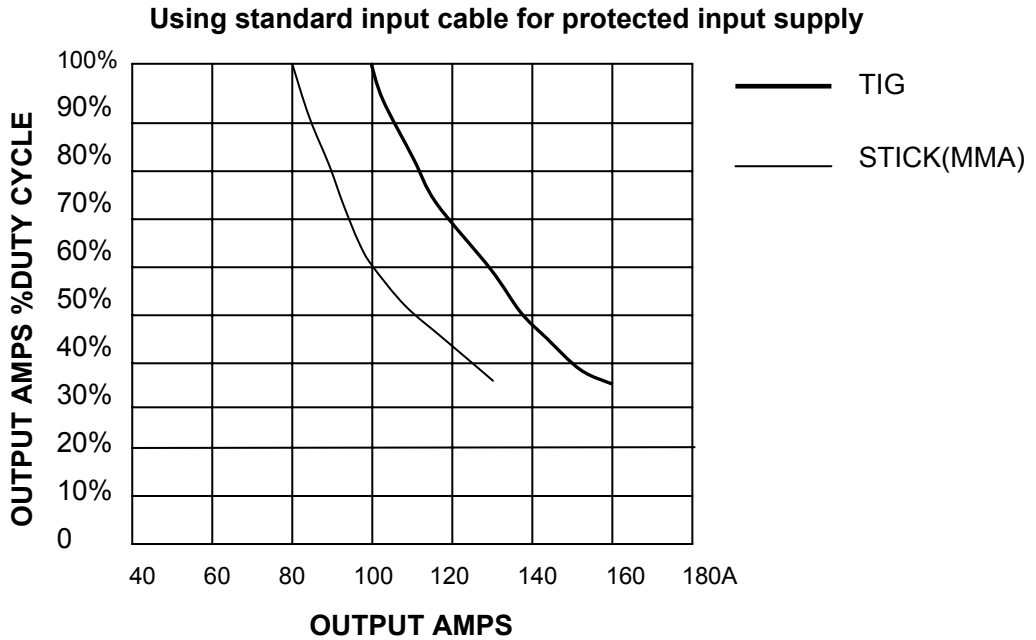
	Page
SAFETY PRECAUTIONS	
Installation	Section A
Technical Specifications.....	A-1
Output Amps %duty cycle	A-2
Select Suitable Location.....	A-3
Stacking	A-3
TRANSPORT - UNLOADING	A-3
Tilting.....	A-3
Environmental Area	A-3
Machine Grounding and High Frequency Interference Protection	A-4
Input Connections	A-4
Reconnect Procedure.....	A-5
220/230/240V Input.....	A-5
110/115/120V Input.....	A-5
Attachment Plug Installation, Engine Driven Generator.....	A-5
Output Connections.....	A-6
Output and Gas Connection for Tig Welding.....	A-6
Work Cable Connection	A-6
Output Connection for Stick Welding	A-6
Quick Disconnect Plug	A-6
Shielding Gas Connection.....	A-6
Remote Control Connection.....	A-6
Operation	Section B
Safety precautions.....	B-1
Product Description.....	B-2
Welding Capability.....	B-2
Limitations	B-2
Control Panel	B-3
Controls and Settings, 2 Step and 4 Step Tig Sequence	B-3, B-5
Operating steps.....	B-6
Welding in Tig mode.....	B-6
Welding Polarity	B-6
DC Electrode Negative Polarity.....	B-6
DC Electrode Positive Polarity	B-6
D.C. -Pulsed TIG	B-6
Steel Tig Welding	B-7
Copper Tig Welding.....	B-7
GTAW Process.....	B-8
Protective Gas	B-8
DC Tig Welding Quick Start Up	B-9
Remote Control operation	B-9
Welding in Stick mode	B-13
Maintenance	Section C
Safety Precautions	C-1
Routine and periodic Maintenance.....	C-1
Troubleshooting	Section D
How to Use Troubleshooting Guide	D-1
Input Filter Capacitor Discharge Procedure	D-1
Troubleshooting Guide.....	D-2 thru D-7
Wiring Diagram	Section E
Main circuit wiring Diagram	E-1
Accessories	Section F
Parts Lists (COMPONENT LISTS).....	Appendix

TECHNICAL SPECIFICATIONS -

max. rated Output Amps @% Duty Cycle (Based on a 10 minute cycle) (Example; 130A@35% for DC Stick and 160A@35% for DC TIG)

Model	TIG 160PDCHF	
Power Supply Voltage	1x110V 50/60Hz	1x220V 50/60Hz
Fuse rating	27A	24A
No-load Voltage	70V	70V
Rated Output Current	100A(TIG) 80A(MMA)	160A(TIG) 130A(MMA)
Rated Duty Cycle	35%	35%
Welding Cur. Adjusting Range	5-100A(TIG) 10-80A(MMA)	5-160A(TIG) 10-130A(MMA)
base Current	5A	
Initial current(fixed)	15A	
crater-fill current(fixed)	15A	
Pulse Width Ratio	0.5	
Pulse Frequency	0.5 - 25Hz	
TIG Arc starting mode	high frequency arc striking	
Up-slope,Down-slope time	0-5 Sec	
After Flow Time	1 - 10 Sec	
Mass	9kg	
Protection Class of enclosure	I P21S	
outline Dimensions (mm ³)	310×155×290	

Chart gives max. rated Output Amps @% Duty Cycle (Based on a 10 minute cycle) (Example; 130A@35% for DC Stick and 160A@35% for DC TIG)



(1)

Wiring and protection based on the IEC60974.1 National Electric Code: Use a Super Lag type fuse or circuit breaker with a delay in tripping action. Models with NEMA 6-50P plug may be used with a 50 amp protected 6-50R receptacle, or with a maximum 70 amp protected 6-50R receptacle if dedicated for the welder.

SAFETY PRECAUTIONS

Read entire installation section before starting installation.

⚠ WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF at the disconnect switch or fuse box

before working on this equipment.

- Do not touch electrically hot parts.
- Always connect the MACHINE to a power supply grounded per the National Electrical Code and any local codes.

SELECT SUITABLE LOCATION

Place the welder where clean cooling air can freely circulate in and out through the rear louvers. Dirt, dust or any foreign material that can be drawn into the welder should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shut-downs.

GRINDING

Do not direct grinding particles towards the welder. An abundance of conductive material can cause maintenance problems.

STACKING

The machine cannot be stacked.

TRANSPORT - UNLOADING



Never underestimate the weight of the equipment.



Never make the cargo pass or leave it suspended over people or things.

Neither let the equipment or the single unit fall, nor put it down with force.

Once it has been removed from the packing, the power source can be used to move it in the hand or on the shoulder.

⚠ WARNING



FALLING EQUIPMENT cause injury

- Never lift welder with gas cylinder attached.
- Never lift welder above personnel.

TILTING

Each machine must be placed on a secure, level surface, either directly or on a recommended undercarriage. The machine may topple over if this procedure is not followed. 10°

ENVIRONMENTAL RATING

The welding machine power source carries an IP21s environmental rating. It may be used in normal industrial and commercial environments. Avoid using it in environments which have falling water such as rain.

Read and follow "Electric Shock Warnings" in the Safety section if welding must be performed under electrically hazardous conditions such as welding in wet areas or on or in the workpiece.

MACHINE GROUNDING AND HIGH FREQUENCY INTERFERENCE PROTECTION

This welder must be grounded! See your local and national electrical codes for proper grounding methods.

The high frequency generator, being similar to a radio transmitter, may cause radio, TV and electronic equipment interference problems. These problems may be the result of radiated interference. Proper grounding methods can reduce or eliminate radiated interference.

Radiated interference can develop in the following four ways:

- 1 Direct interference radiated from the welder.
- 2 Direct interference radiated from the welding leads.
- 3 Direct interference radiated from feedback into the power lines.
- 4 Interference from re-radiation of "pickup" by ungrounded metallic objects.

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

1 Keep the welder power supply lines as short as possible and enclose as much of them as possible in rigid metallic conduit or equivalent shielding for a distance of 50 feet (15.2m). There should be good electrical contact between this conduit and the welder case ground. 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 ft (7.6m). 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.

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

5 The work piece must be connected to an earth ground close to the work clamp, 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" (19mm) galvanized pipe or a 5/8" (16mm) solid galvanized iron, 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 along pipe system can result in reradiation, effectively making these members radiating antennas.

6 Keep cover and all screws securely in place.

7 Electrical conductors within 50 ft (15.2m) of the welder should be enclosed in grounded rigid metallic conduit or equivalent shielding, wherever possible. Flexible metallic conduit is generally not suitable.

8 When the welder is enclosed in a metal building, the metal building should be connected to several good earth driven electrical grounds (as in 5 (b) above) around the periphery of the building.

Failure to observe these recommended installation procedures can cause radio or TV and electronic equipment interference problems and result in unsatisfactory welding performance resulting from lost high frequency power.

INPUT CONNECTIONS

Be sure the voltage, phase, and frequency of the input power is as specified on the rating plate, located on the rear of the machine.

Have a qualified electrician provide input power supply to the receptacle or cord in accordance with all local and national electrical codes. Use a single phase line or one phase of a two or three phase line.

Choose an input and grounding wire size according to local or national codes. Refer to **the Technical Specifications** page at the beginning of this section. Fuse the input circuit with the recommended super lag fuses or delay type circuit breakers.

Using fuses or circuit breakers smaller than recommended may result in "nuisance" shut-off from welder inrush currents even if not welding at high currents.

¹Also called "inverse time" or "thermal/magnetic" circuit breakers; circuit breakers which have a delay in tripping action that decreases as the magnitude of the current increases.

INPUT RECONNECT PROCEDURE

On multiple input voltage welders, be sure the machine is connected per the following instructions for the voltage being supplied to the welder.

Failure to follow these instructions can cause immediate failure of components within the welder and void machine's warranty.

Multiple voltage models are shipped connected for the highest voltage. To change this connection refer to the following instructions.

WARNING

ELECTRIC SHOCK can kill.



Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.

. Have a qualified electrician install and service this

equipment.

. Turn the input power OFF and unplug the machine from the receptacle before working on this equipment.

. Allow machine to sit for 5 minutes minimum to allow the power capacitors to discharge before working inside this equipment.

. Do not touch electrically hot parts.

. Machine must be plugged into a receptacle that is grounded according to the National Electrical Code and local codes.

. Do not remove or defeat the purpose of the power cord ground pin.

RECONNECT PROCEDURE

The Inverter machine auto reconnects to either 115V or 230V supply.

Fuse the input circuit with time delay fuses or delay type¹ circuit breakers. Using fuses or circuit breakers smaller than recommended may result in "nuisance" shut-offs from welder inrush currents even if not welding at high currents.

The Inverter machine is recommended for use on

an individual branch circuit.

¹Also called "inverse time" or "thermal/magnetic" circuit breakers.

These circuit breakers have a delay in tripping action that decreases as the magnitude of the current increases.

220/230/240V INPUT

The equipment is provided with a 230/115V cable, 6.6ft.(2m) in length with a 230V 6-50P attachment plug.

The Inverter machine performs best when connected to 230VAC inputs. This input allows full output of the machine (160 amps).

110/115/120V INPUT

A suitable 115V attachment plug must be installed on the power cord to use the inverter machine with a 115V input supply. The rated output of the inverter machine is available when connected to a 30A branch circuit. When connected to a branch circuit with lower amp rating, lower welding current and duty cycle must be used. An output guide is provided below. The values are approximate and must be adjusted downward if the fuse or circuit breaker trips off. Other loads on the circuit and fuse/circuit breaker characteristics will affect the available output. Do not exceed these welding conditions:

ATTACHMENT PLUG INSTALLATION

Connect the white (neutral) wire under terminal clamp with silver screw, and black (hot) wire under terminal clamp with brass screw. Connect green wire under terminal clamp with green screw.

WARNING

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

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

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

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

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

ENGINE DRIVEN GENERATOR

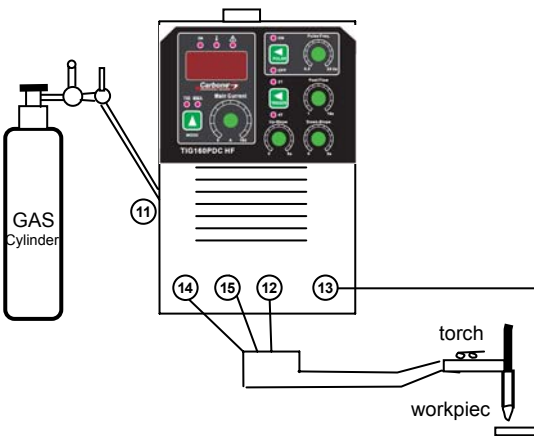
The Inverter machine can be operated on engine driven generators as long as the 220/230/240 volt auxiliary meets the following conditions:

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

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

● Ranger 250,305 ● Commander 300, 400, & 500
 Some engine drives do not meet these conditions (e.g. Miller Bobcats, etc). Operation of the Inverter machine is not recommended on engine drives not conforming to these conditions. Such drives may deliver unacceptably high voltage levels to the Inverter machine power source.

CONNECTIONS FOR TIG (GTAW) WELDING



TIG TORCH CONNECTION

Refer to Included Equipment in the Operation Section of this manual for TIG welding equipment which is included with the machine

The TIG Torch Twist-Mate and work cable Twist-Mate Connectors are supplied with the welder. To connect the cables, turn the Power Switch "OFF". Connect the torch cable Twist-Mate plug into the DC(-)

Electrode Receptacle on the front of the welder and turn it clockwise until snug,(Do not Over tighten). This is a quick connect terminal

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

WORK CABLE CONNECTION

Next, connect the work cable to the "+" output terminal in the same way.

To minimize high frequency interference, refer to Machine Grounding and High Frequency Interference Protection section of this manual for the proper procedure on grounding the work clamp and work piece.

SHIELDING GAS CONNECTION

Obtain the necessary inert shielding gas (usually argon). Connect the cylinder of gas with the pressure regulator and flow gage. Install the gas hose between the regulator and gas inlet (located on the rear of the welder).



CYLINDER could explode if damaged.

Keep cylinder upright and chained to a support.

Keep cylinder away from areas where it could be damaged.

Never allow the torch to touch the cylinder.

Keep cylinder away from live electrical circuits.

Maximum inlet pressure 150 psi.

A cylinder is loaded by leaning it slightly sideways and rocking it up on the platform, being careful not to allow the Under-Storage Cart to roll. Secure the cylinder in place with the provided chain. Unload by following these steps in reverse.

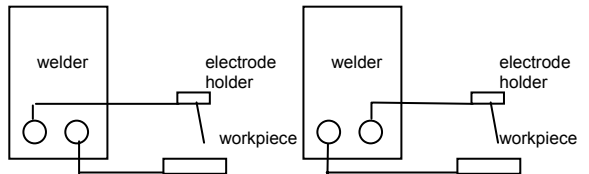
ADJUSTABLE FOOT CONTROL CONNECTION

A Adjustable foot control receptacle is provided on the case front of the welder for connecting a remote control to the machine.

CONNECTIONS FOR STICK (SMAW) WELDING

A. POSITIVE CONNECTION

B. NEGATIVE CONNECTION



STICK ELECTRODE CABLE AND WORK CABLE CONNECTION

Refer to Field Installed Options in Accessories Section of this manual for STICK welding equipment which is available for use with the inverter machine. An electrode holder with Twist-Mate cable and Twist-Mate connector are available separately for use with the inverter machine.. Turn the Power Switch "OFF". Connect the Twist-Mate quick connect plug into the Electrode and turn it clockwise until it is tight. The work cable and work clamp are factory connected.

Read and understand this entire section before operating the machine.

SAFETY PRECAUTIONS

⚠ 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.

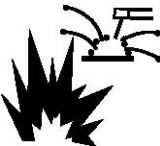
Read and follow "Electric Shock Warnings" in the Safety section if welding must be performed under electrically hazardous conditions such as welding in wet areas or on or in the workpiece.

FUMES AND GASES can be dangerous.



- Keep your head out of fumes.
- Use ventilation or exhaust at the arc, or both, to remove fumes and gases from breathing zone and general area.

WELDING SPARKS can cause fire or explosion



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

RC RAYS can burn.



Wear eye, ear and body protection.

Only qualified personnel should operate this equipment. Observe additional Safety Guidelines detailed in the beginning of this manual.

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL



INPUT POWER



POSITIVE OUTPUT



NEGATIVE OUTPUT



DIRECT CURRENT



PROTECTIVE GROUND



WARNING OR CAUTION



DO NOT SWITCH WHILE WELDING

PRODUCT DESCRIPTION

The Precision TIG is a member of our field acclaimed Precision TIG family of industrial arc welding power sources. Premium features include:

- 1 Precise constant current output.
- 2 Enhanced version of the patented Micro-Start Technology for its lower Minimum (5 amps at DC) to higher Maximum output control range.
- 4 Built-in high frequency stabilization for DC TIG starting
- 5 DC Stick (SMAW capability.)

The Precision TIG patented convenient built-in storage provisions for welding components and cable management.

The TIG machine also provides advanced features such as:

- Digital Meter
- Timers for fixed Preflow and variable Postflow shielding gas.
- Tool-less Twist-Mate electrode cable connection.

RECOMMENDED PROCESSES AND EQUIPMENT

RECOMMENDED PROCESSES

The Precision TIG is recommended for the TIG (GTAW) and Stick (SMAW) welding processes within its output capacity range of 5 amps DC, to MAX amps. It is compatible with most Magnum TIG accessories, as well as many industry standard items, such as TIG torches (adapted for Twist-Mate), hoses.

PROCESS LIMITATIONS

The Precision TIG machines are not recommended for arc gouging due to its limited output capacity, and are also not recommended for pipe thawing.

RECOMMENDED EQUIPMENT/INTERFACE

(See Installed Options in Accessories Section for more details)

The Precision TIG will be available as a basic Machine (Only) and in Factory Basic module will also be available as with Domestic,.

(SEE PACKING LIST, PLEASE)

EQUIPMENT LIMITATIONS

The Precision TIG machines are protected from over loads beyond the output ratings and duty cycles, per the Specifications in the Installation Section, with Thermostat protection of the output power coils and rectifiers.

If a Precision Tig is powered from an engine generator which doesn't have sufficient capacity, the AC Balance control and the Output control will not provide full range of control.

WELDING CAPABILITY (Duty Cycle)

The PRECISION TIG is rated at 160 amps, 16.4 volts, at 35% duty cycle on a ten minute basis. It is capable of higher duty cycles at lower output currents. See rated output graph, on specification sheet located in the Installation Section. If the duty cycle is exceeded, a thermal protector will shut off the output until the machine cools.

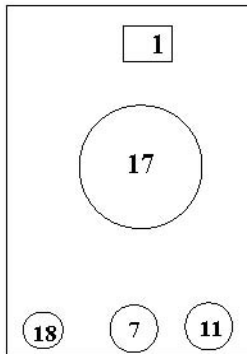
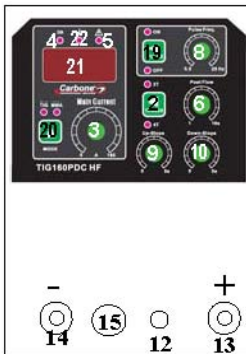
CONTROLS AND SETTINGS

All operator controls and adjustments are located on the case front of the TIG machine. Refer to Figure B.1 and the corresponding explanations.

FIGURE B.1 CONTROL PANEL

1. FRONT PANEL

2. BACK PANEL



- 1. power switch
- 2.steps/4steps switch .
- 3. current regulator
- 4. indicating light of power
- 5. warning indicating light
- 6. (Gas)post flow
- 7. safety earthing column
- 8. pulse Freq. regulator
- 9. Up-slope regulator
- 10.Down slope regulator
- 11. gas inlet
- 12. torch control I (or connect remote control box)
- 13. output"+"14.output"-"
- 15. gas outlet
- 17. fan
- 18.incoming line of the power
- 19.Pulse ON/OFF switch
- 20.MMA/TIG switch
- 21.indication of welding current
- 22.over heat indicating light

CONTROL FUNCTIONALITY

1 POWER SWITCH - Input line switch turns input power ON or OFF, as indicated by the on or off status of the front panel digital display (See Item 21).

2 steps/ 4 steps switch

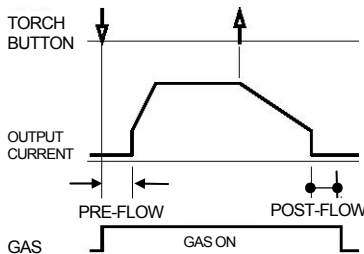
Tig Trigger Sequences -

For the TIG machine AC/DC, TIG welding can be done in either the 2-step or 4-step mode which is selected with the Trigger Mode Push Button.

2-Step Sequence

With the Trigger Mode switch in the 2-step position, the following welding sequence will occur. This sequence is shown in (2-step diagram 1)

2 STEP DIAGRAM 1



1. Press and hold the Arc Start Switch to start the sequence.

The machine will open the gas valve to start the flow of the shielding gas. After a 0.5 second preflow time, to purge air from the torch hose, the output of the machine is turned ON. At this time the arc is started.

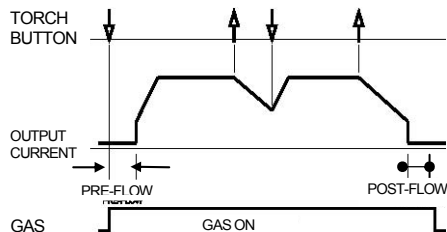
After the arc is started the output current will be

increased from the start current to the welding current. Both the start current and increase, or upslope time are presettable. The default start current is 15 amps and the default upslope time is 0.2 seconds.

2. Release the Arc Start Switch to stop welding. The machine will now decrease the output current at a controlled rate, or down slope time, until the Finish Current, (also commonly referred to as Crater Current) is reached and the output of the machine is turned OFF. Both the Down slope Time and the Finish Current are can be preset.

After the arc is turned OFF, the gas valve will remain open to continue the flow of the shielding gas to the hot electrode and work piece. The duration of this postflow shielding gas is adjusted by the Postflow Parameter.

Possible variations of this standard sequence is shown in (2 step diagram 2). It is possible to press and hold the TIG torch trigger a second time during downslope to restart. After the trigger is pressed the output current will increase to the welding current. This operation is shown in (2 step diagram 2).



2 STEP DIAGRAM 2

4-Step Sequence

With the 4-step Selected, the following welding sequence will occur.

1. Press and hold the Arc Start Switch to start the sequence.

The machine will open the gas valve to start the flow of the shielding gas. After a 0.5 second preflow time, to purge air from the torch hose, the output of the machine is turned ON. At this time the arc is started.

After the arc is started the output current will be at the Start current. This condition can be maintained as long or as short as necessary.

If the Start current is not necessary, do not hold the TIG torch trigger as described at the beginning of this step. Instead, quickly press and release the trigger. In this condition, the machine will automatically pass from Step 1 to Step 2 when the arc is started.

2. Release the TIG torch trigger to start the main part of the weld.

The output current will be increased from the start current to the welding current. Both the start current and increase, or upslope time are presettable. The default start current is 15 amps and the default upslope time is 0.2 seconds.

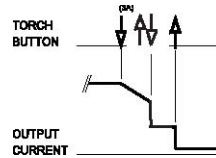
3. Press and hold the TIG torch trigger when the main part of the weld is complete.

The machine will now decrease the output current at a controlled rate, or down slope time, until the Finish current is reached. Both the Down slope Time and the Finish Current are presettable. This Finish current can be maintained as long or as short as necessary.

4. Release the TIG torch trigger.

The output current of the machine will turn OFF and the gas valve will remain open to continue the flow of the shielding gas. The duration of this postflow time is adjusted by the Postflow parameter. This operation is shown in (4 step diagram 1).

will immediately drop to and hold at the Finish Current. Releasing the trigger will turn off the output and begin postflow. This operation shown in (4 step diagram 2)



3. welding current regulator

Regulating the knob, It can be selected between 5A TO 160A.

4.indicating light of power

Turn power on, it will illuminate indicating.

5. indicating light of over heat

-If the welder overheats due to blocked air flow, high ambient air temperature, or exceeded duty cycle, an internal thermostat will open disabling the welding output and this yellow light will illuminate. The cooling fans will continue to run to cool the unit during this time. The light will go out when the unit cools and the thermostat resets. Once the light goes out, the machine will again become available to weld.

6.post flow time regulator

Sets the TIG mode shielding gas post flow time over the range of about 1 to 10 seconds after the arc is shut off.

7.safety earthing column

The earthing must be made according to the national regulations. Make sure that the supply mains and the earthing are sufficient and adequate

8.pulse Freq. regulator

Regulating the knob, It can be selected between 0.5Hz TO 25Hz.

9.current up-slope time regulator

Regulating the knob, It can be selected between 0s TO 5s

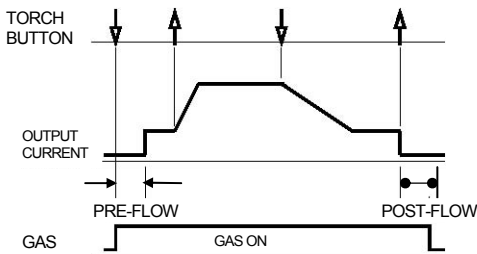
10.current down-slope time regulator

Regulating the knob, It can be selected between 0s TO 5s.

11.argon inlet

connected gas pipe of flow meter

4 STEP DIAGRAM 1



Possible variations of this standard sequence are shown below. By releasing and re-pressing the TIG torch trigger during the downslope step, the output

12.REMOTE RECEPTACLE ^{*note} (OR argon arc control)

Provides for connection of remote control and/or arc start switch in TIG Mode: Plugging a remote current control (Adjustable foot control) into this receptacle automatically switches the output control from the panel Max Output Control (See Item 3) to the remote control.

The connected remote control will then control the output current between the Min. range of the machine and the setting of the panel Max Output Control.

13. output"+" (Electrode Connection (Positive))

For quick disconnect system using Twist-Mate cable plugs

14.output"-" (Electrode Connection (Negative))

This quick connect Twist-Mate receptacle provides electrical connection to the electrode holder and cable for Stick welding and connection for the TIG torch when TIG welding.

15. argon out

connected gas pipe of torch

17.fan

when power switch on, the cooling fan runs

18. power supply

connected main supply

19.Pulse On/Off.

Press the touch-pad button to select the desired pulse mode.

20.MMA/TIG switch (MODE SWITCH)

Select the mode of output

21. DIGITAL METER - A 3 digit LED meter is

used to display the preset output current level before welding, and actual output level while welding: A lit display indicates input power is turned on. (See Item 1.)

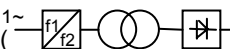
22.indicating light of over heat

-If the welder overheats due to blocked air flow, high ambient air temperature, or exceeded duty cycle, an internal thermostat will open disabling the welding output and this yellow light will illuminate. The cooling fans will continue to run to cool the unit during this time. The light will go out when the unit cools and the thermostat resets. Once the light goes out, the machine will again become available to weld.


nameplate

The data plate stamped on the metal structure complies with the EN 60974-1, EN50199(EN60974-10) international standards and contains the following information:

- * (a) Manufacturer's name and address
- * (b) Trademark
- * (c) Model ~
- * (No) Serial number

* () The welding power source comprises a frequency converter followed by an transformer and rectifier that transforms input voltage into direct current.

* (EN 60974-1/EN 50199) Standards applied.


* () Direct current.


* (x) Utilisation factor expressed as a percentage of useful work over a cycle of 10 minutes at an ambient temperature of 40°C.

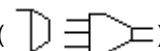
* (I₂) Rated weld current.

* (U₂) Conventional load voltage.

* (U₀) Rated no-load voltage.

* () TIG welding.

* () MMA welding.

* () 1input phases.

* (IP21S) Casing protection degree in compliance with the EN 60529 Standard:

IP2XX Casing protected against access to dangerous components with fingers and against the introduction of foreign matters with diameter 12.5 mm.


IPX3X Casing protected against rain failing at 60°-on the vertical line.

IPXXC Casing protected against contact of a test gauge ϕ 2.5 mm length 100 mm with live dangerous parts,

* (U₁) Rated power supply voltage.

* (50/60 Hz) Power supply rated frequency.

* (I_{lmax}) Maximum supply current.

(I_{1 eff}) Effective supply current.* () Generator suitable for installation in places where major risks of electric shocks are preset

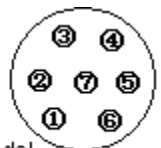
* (CE) In compliance with the European regulations in force.

***note:**

① ② connect torch switch

③ ④ ⑤ connect potentiometer(2K2 to 47K)

⑥ ⑦ if shorted, the "5. panel/pedal switch" is no use.the F unctionalism of '5' is Pedal



OPERATING STEPS

WELDING IN TIG MODE

1 Connect the TIG torch and cable Twist-Mate quick connect plug to the Electrode/Gas output receptacle. This receptacle also contains an integral gas connection for the torch. Connect the work clamp to the work piece.

2 Set the Pulse on /pulse off/MMA selector to "Pulse on /off".

3 Connect the arc start switch (or Adjustable foot control)to the Remote Control Connector.

4 Turn on the cylinder gas valve and adjust the flow regulator to obtain desired flow.

5 Turn the power switch to "ON".

6 Preset the Output Control on the control panel to the maximum desired amps, as read on the digital meter.

7 Depress the Adjustable foot control to energize the torch and establish an arc with the work piece.

The digital meter reads the actual amps while welding.

NOTE: When the Pulse on /pulse off/MMA is set to "on/off", depressing the remote control will start a 0.5 second gas pre-flow before energizing the TIG torch. When the remote control is released the TIG torch is de-energized and gas flow will continue for the time set by the Post Flow Time control.

When the polarity switch is set to DC, the TIG Arc Starter will turn on and off automatically to start and stabilize the arc. In AC the TIG Arc Starter will turn on with the output and remain on continuously until the remote control is released.

WELDING POLARITY

DC Electrode Negative Polarity (Direct Current Straight Polarity) (see FIGURE B.4)

While Welding, there is a continuous flow of electrons from the electrode to the workpiece. This is the most used polarity, ensuring limited wear of the electrode, since the majority of the heat concentrates on the anode (workpiece). Narrow and deep welds are obtained with high travel speeds. Most materials, with the exception of aluminum and magnesium, are welded with this polarity.

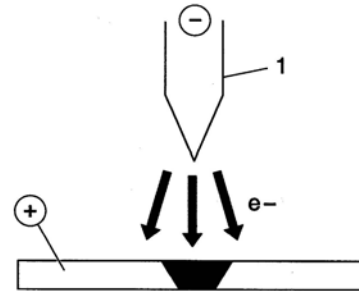


FIGURE B.4

DC Electrode Positive Polarity. (Direct Current Reverse Polarity) (see Figure B.5)

In this case, there is a continuous flow of electrons from the workpiece to the electrode. The reverse polarity is used for welding alloys covered with a layer of refractory oxide.

With this polarity the electrode functions as anode and is subjected to a high degree of heat; the workpiece is bombardment by positive ions sent from the electrode which break the surface oxide.

In Electrode Positive Polarity, high currents cannot be used, since they would cause an excessive wear of the electrode.

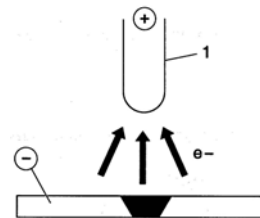


FIGURE B.5

D.C.-Pulsed TIG (see Figure B-6)

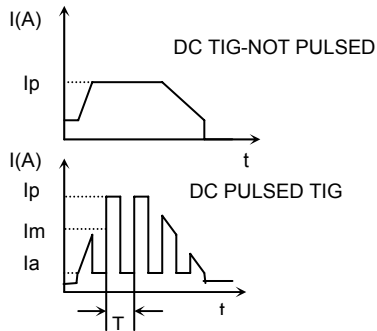
The use of pulsed direct current allows better control of the weld pool during certain operating conditions.

When compared with traditional TIG welding

performed at the same average current, pulsed welding results in a smaller heat affected zone which results in fewer deformations and reduced chance of cracking and gas entrapment.

Increasing the frequency constricts the arc, increases stability and improves weld quality.

FIGURE B.6



STEEL TIG WELDING

The TIG process is very effective for welding both carbon steel and alloy steel, especially in applications requiring precision results. DC Electrode Negative Polarity is required. Since this process does not include the removal of impurities, proper cleaning and preparation of the edges is required.

FILLER MATERIAL:

The filler rods must deposit welds with mechanical characteristics appropriate for the application.

COPPER TIG WELDING

Since the TIG welding is a process characterized by high heat concentration, it is particularly suitable for welding materials with high thermal conductivity, like copper. As with steel, the DC Electrode Negative

Polarity is employed, with argon as protective gas. Considering the fluidity of molten copper, the use of backup support may prove useful.

FILLER MATERIAL:

In order to avoid the oxidation of the molten material, filler materials containing phosphorus, silicon or other deoxidating materials are typically used. The mechanical properties can also be improved through the use of silver.



DC welding requires a sharpened point with a flattened end. AC welding requires a balled end. Grind with the grain along the length of the electrode. **Get the right point!**



Tungsten Preparation Sharpening Procedure



*2 1/2 Times
Electrode Diameter*



*Ideal Tungsten
Preparation-Stable Arc*



*Wrong Tungsten
Preparation-Stable Arc*

GTAW Process

Electrode Polarity	DC	Approximate Argon	
Electrode Tip Preparation	Sharpened	Gas Flow Rate	
Electrode Type	EWTh-1, EWLa-1 EWTh-2, EWCE-2 EWG	C.F.H. (l/min.)	
Electrode Size-in. (mm)		Aluminum	Stainless Steel
.010 (0.25)	Up to 15 A.	3-8 (2-4)	3-8 (2-4)
.020 (0.50)	Up to 15 A.	5-10 (3-5)	5-10 (3-5)
040 (1.0)	Up to 80 A.	5-10 (3-5)	5-10 (3-5)
1/16 (1.6)	Up to 150 A.	5-10 (3-5)	9-13 (4-6)
3/32 (2.4)	Up to MAX. A.	13-17 (6-8)	11-15 (5-7)
1/8 (3.2)	X	15-23 (7-11)	11-15 (5-7)

Tungsten electrodes are classified as follows by the American Welding Society (AWS):

- Pure.....EWP.....green
- +1% Thoria.....EWTh-1...yellow
- +2% Thoria.....EWTh-2...red
- +2% CeriaEWCE-2...orange
- +1.5% LanthanaEWLa-1 ...black
- +0.5% to 0.40% Zirconia...EWZr.....brown
- TRI-MIX of elements.....EWG.....gray

Ceriated Tungsten is now widely accepted as a substitute for 2% Thoriated Tungsten in AC and DC applications.

PROTECTIVE GAS

Both argon and helium work when welding aluminum. Argon is preferred, due to its lower cost and consumption rate. This gas also tends to stabilize the arc, thus making it easy to operate. For some applications, however, the use of helium, or argon-helium blends, is recommended due to better weld penetration and faster travel speed. Helium is especially suitable for welding thick workpieces. The recommended gas flow rates are shown in table 5.

TABLE 5

Current (A)	Helium cfh-(l/min)
50	29 - (14)
100	29 - (14)
150	42 - (20)
200	42 - (20)
250	53 - (25)
300	53 - (25)

DC TIG WELDING QUICK START UP

WARNING



ELECTRIC SHOCK can kill.

. Have an electrician install and service this equipment.

. Turn the input power off at the fuse box, disconnect or

unplug supply lines and allow machine to sit for five minutes minimum to allow the power capacitors to discharge before working inside this equipment.

. Do not touch electrically hot parts.

Connect up the shielding gas – typically argon – using an appropriate regulator. Connect Adjustable foot control, torch and work lead to power source. With the Work cable connected to a properly grounded work piece, turn the power source on.

To change to DC TIG Welding:

. Press Mode button to select "DC TIG."

. Press Local / Remote Mode button and set for Remote.

Set the maximum output current desired using the Output Control.

Initiate the arc by closing the Adjustable foot control's arc start switch. The Adjustable foot control will control the output current from 10 amps to current level set by output control.

To change the Post Flow time, repeatedly push the Parameter button until the Post Flow indicator light is on. Adjust the Output control to the desired Post Flow time as indicated on digital display.

REMOTE CONTROL OPERATION

A Adjustable foot control (optional) is included with the PRECISION TIG models and available for other models (See Accessories Section) for remote current control while TIG welding. An Arc Start Switch may be used to start and stop the welding if no remote control of the current is desired. Refer to the Accessories Section of this manual.

Both the Hand and Adjustable foot control work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models. The term "minimum" refers to a foot pedal in the "up" position, as it would be with no foot pressure, or a Hand Ampcontrol in

the relaxed position, with no thumb pressure.

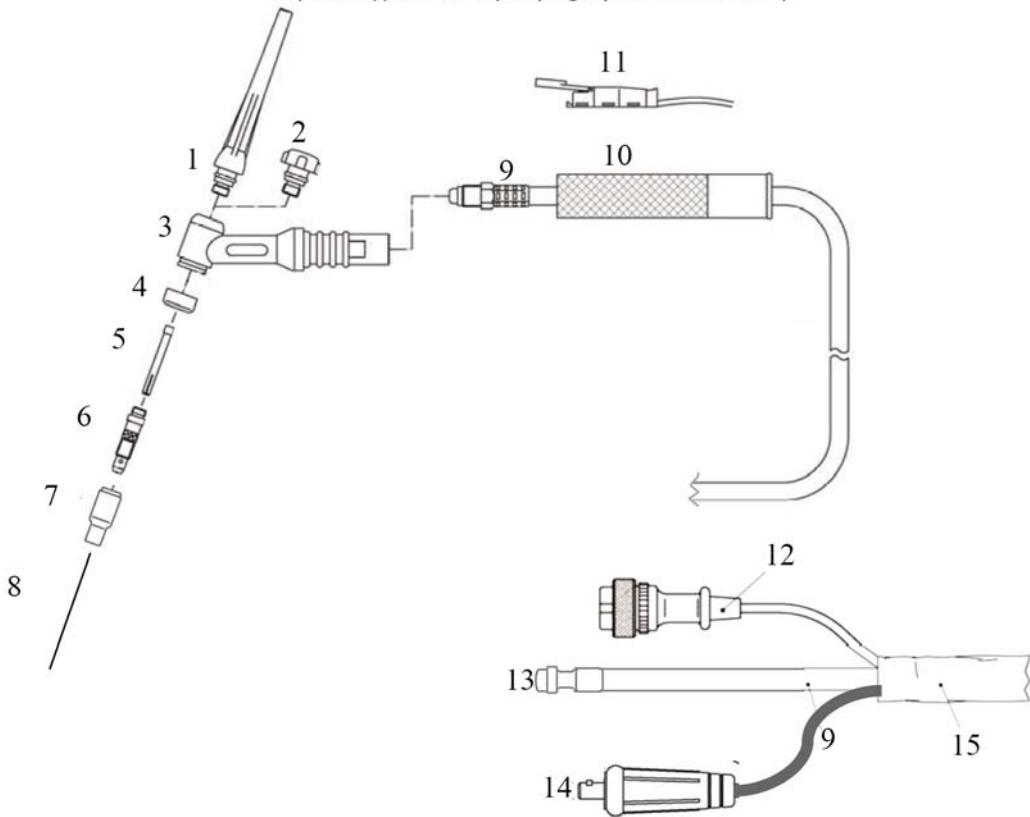
"Maximum" refers to a fully depressed Foot Ampcontrol, or a fully extended Hand Ampcontrol. When the welder is in TIG modes activating the Ampcontrol energizes the electrode terminal and varies the output welding current from its minimum value of 5 Amp (DC) , to the maximum value set by the Current Control on the control panel. This helps eliminate accidental high current damage to the work piece and/or tungsten, and provides a fine control of the current. When the welder is in the stick mode a remote control has no effect and is not used.

It is important to note that, in some cases, the tungsten will not start an arc at the minimum current because the tungsten may be too large or cold. To start an arc reliably, it is important to depress the Ampcontrol far enough so that the machine output current is near the tungsten operating range. For example, a 3/32" tungsten may be used on DC- to weld over the full range of the machine.

To start the arc, the operator may have to turn the current control up and depress the Ampcontrol approximately 1/4 of the way down. Depressing the Ampcontrol to its minimum position may not start the arc. Also if the current control is set too low, the arc may not start. In most cases, a large or cold tungsten will not readily establish an arc at low currents. This is normal. In Direct Current mode the PRECISION TIG will start a 3/32", 2% thoriated tungsten electrode at 20 amperes provided the electrode tip is properly grounded and not contaminated.

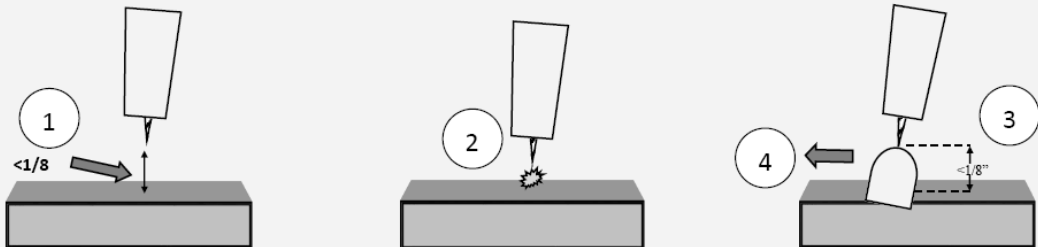
EXPANDED VIEW OF TIG TORCH

(Actual appearance may vary slightly from what is listed.)



NO.	PARTS FOR 17 Series Torch (STYLE MAY VARY)	QTY.
1	Long Back Cap with O-Ring	1
2	Short Back Cap	Opt.
3	Torch Head	1
4	Insulator	1
5	Collet 1/16 or 3/32	1
6	Collet Holder	1
7	Ceramic Cup #5,6, or 7	1
8	Tungsten (customer supplied)	0
9	Torch Cable	1
10	Torch Handle (Blue ergo handle std, not pictured)	1
11	Torch Switch (Built into ergo handle, separate on straight handle)	1
12	Torch Switch Connector	1
13	9mm (1/8") b quick connect coupling (male)	1
14	Power Connector	1
15	Protective Synthetic Rubber Cover	1

HIGH FREQUENCY START TIG OPERATION



1. Position the point of the sharpened tungsten about $1/8''$ or less above the metal.
2. Press the torch trigger or press the foot pedal to initiate the arc. The HF arc will be initiated. It may appear briefly as a blue spark.
3. An arc should form, almost immediately after the pre-flow cycle is completed. HF arc initiation will be delayed by the amount of pre-flow time used. If arc does not start after the pre-flow interval, and the HF is creating a spark, then check the work clamp contact with the work piece. Move the tungsten closer to the work. Repeat steps 1 and 2.
4. Leave $1/8''$ or less gap between the tungsten tip and the metal and proceed with welding, leaving the torch inclined at a 15° angle.

General TIG Arc Starting Steps

1. Turn unit on, allow time for power up cycle to complete its start up process.
2. Select either HF or Lift Start TIG with the HF/Lift Start/Stick selector switch. Select DC mode with the AC/DC torch switch.
3. Plug in Torch and select 4T or 2T mode with the selector switch **OR** plug in foot pedal and select 2T.
4. If using the torch switch, select up/ down slope time by rotating the knob to increase/decrease the ramp up or ramp down time of the amperage.
5. Adjust amps with amp control knob.
7. Start arc as depicted above.
7. If using 2T, continue to hold the torch switch until you are ready to stop welding. Release the switch. The Arc will then cease.
If using pedal raise foot fully off the pedal and arc will stop automatically.
8. If using 4T, release the switch, after arc initiates. Continue to weld without holding the switch down. To stop, press and release the switch again.

WELDING IN STICK MODE

- 1 Put the electrode holder and cable quick connect plug into the electrode output receptacle. Turn clockwise until tight. Connect the work clamp to the work piece.
- 2 Set the Pulse on /pulse off/MMA switch to "MMA".
- 3 Set the Pulse on /pulse off/MMA Switch to the MMA mode desired for the type of electrode being used (most commonly DC+).
- 4 Place the electrode in the electrode holder.

will be electrically hot whenever the power switch is turned on.

- 5 Turn the power switch to "ON".
- 6 Adjust the Current Control to the desired amps.
- 7 Strike an arc and weld.

NOTE: When the Pulse on /pulse off/MMA switch is set to "MMA" the output is always on when the power switch is on. A remote control has no effect on the welding current and the gas flow and high frequency TIG arc starter are disabled.

In Stick Mode the output terminal and electrode

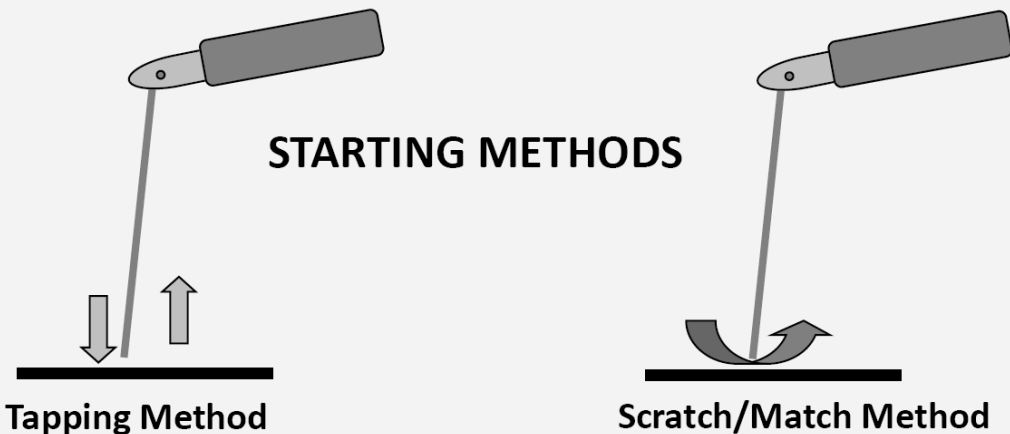
RECOMMENDED ELECTRODE AMPERAGE RANGES

SMAW Process

ELECTRODE TYPE	Welding Amp Range for Stick Electrode Size			
	POLARITY	3/32"	1/8"	5/32"
E6010	DC+	40 -70	75 - 130	90 - 175
E6011	DC+	40 - 80	55 - 110	105 - 135
E6013	DC+	70 - 95	100 - 135	145 - 180
E7014	DC-	75 - 95	100 - 145	135 - 200
E7018	DC+	85 - 110	110 - 160	130 - 200
Stainless	DC+	40 - 80	75 - 110	95 - 150

STICK OPERATION

STARTING METHODS



1. Turn on the power switch on the rear of the unit. Allow unit to cycle through its start up program.
2. Select the Stick mode with the Pulse on /pulse off/MMA selector switch.
3. Make sure electrode holder is connected to the positive terminal and the work clamp is connected to the negative connector. Make sure the connectors are twisted until light resistance is met.

4. Select the amps desired. Use the electrode diameter selection chart in this manual to determine the approximate range of amps suitable for the rod size selected. Consult the welding electrode manufacturer's recommendation for proper amperage range. Each manufacturer has specific recommendations for its electrodes. Usually these can be found on the packaging or on the respective manufacturer's website.
5. Use the arc force control to select the desired arc characteristics, creating the desired arc characteristic and automatic amp response needed to maintain the arc when voltage falls below the threshold. 6011 Cellulose electrodes may require more arc force control than other rods, but each brand and size will weld a little differently. The arc force control setting will vary from person to person as well, with different rod angles, positions, and arc lengths all factoring into the arc force control performance. Set the arc start intensity by adjusting the "start amps" knob to increase the hot start action and reduce rod sticking at the start of the weld.
6. Strike the arc with either the tapping method or the match strike method. Beginners usually find that the match strike method yields best results. Professionals tend to gravitate toward the tapping method because of its placement accuracy which helps prevent arc striking outside of the weld zone.
7. Terminate the arc by flipping the tip of the electrode up quickly with a quick flick of the wrist. Alternately, pull directly back on the rod with a brisk, smooth motion.

IMPORTANT: Do not attempt to stick weld with the electrode holder while in the TIG Mode.

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.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

⚠ WARNING

The machine has internal capacitors which are charged to a high voltage during power-on conditions. This voltage is dangerous and must be discharged before the machine can be serviced. Discharging is done automatically by the machine each time the power is switched off. However, you must allow the machine to sit for at least 5 minutes to allow time for the process to take place.

⚠ WARNING

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

ROUTINE AND PERIODIC MAINTENANCE

- 1 Disconnect power supply lines to machine before performing periodic maintenance.
2. Periodically clean the inside of the machine with a low pressure air system. Be sure to clean the following components thoroughly.

- Main Transformer
- Electrode/Gas Output Receptacle
- Polarity Switch
- Rectifier Assembly
- Arc Starter/Spark Gap Assembly
- PC Boards
- Fan Blades

- 3 Inspect welder output and control cables for fraying, cuts, and bare spots.
- 4 Keep TIG torch and cables in good condition.
- 5 Clean air louvers to ensure proper air flow and cooling.
- 6 The fan motor has sealed ball bearings which require no maintenance.

7 SPARK GAP ADJUSTMENT

The spark gap .020(.5mm) is set at the factory to a gap of 0.015 inches (0.4mm) See Figure D.1. This setting is adequate for most applications. Where less high frequency is desired, the setting can be reduced to 0.015 inches (0.4mm).

⚠ WARNING

Use extreme caution when working with circuit of the high frequency. The high voltages developed can be lethal. Turn the input power off using the disconnect switch or fuse box before working inside machine. This is particularly important when working on the secondary circuit of the high voltage transformer (T3) because the output voltage is dangerously high.

Refer to figure D.1. Note in highly dirty environments where there is an abundance of conductive contaminants, use a low pressure air stream or a firm piece of paper to clean the spark gap. Do not disturb the factory setting.

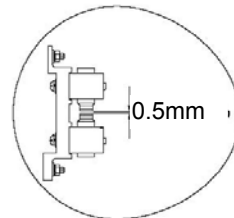
To check the spark gap:

- Turn off input power as specified above.
- Remove the right side panel from the machine, the spark gap box is located on the lower right side.
- Check the spark gap with a feeler gauge. If adjustment is needed:
- Adjust the gap by loosening the head screw in one of the aluminum blocks, near the front of the unit and tighten the screw in the new position.

If the gap is correct:

- Replace the wraparound.
- 8 Inspect gas hose and inlet fitting for cracks or leaks.
- 9 Replace any unreadable labels or decals.
- 10 Verify that the machine and welding circuit is properly grounded.

FIGURE D.1 SPARK GAP



FAN MOTOR OR FAN BLADE REPLACEMENT
When installing a new fan blade or fan motor be sure to maintain proper shaft spacing.

HOW TO USE TROUBLESHOOTING GUIDE **WARNING**

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).

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

Step 2. POSSIBLE CAUSE.

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

Step 3. RECOMMENDED COURSE OF ACTION This column provides a course of action for the Possible Cause, generally it states to contact your local Authorized Field Service Facility. If you do not understand or are unable to perform the Recommended Course of Action safely, contact 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.

Observe all Safety Guidelines detailed throughout this manual

OUTPUT PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS	RECOMMENDED COURSE OF ACTION
Machine is Dead -No Output - No Fan	<ol style="list-style-type: none"> 1. Make certain that the input power switch is in the "ON" position and machine is plugged in. 2. Check the input voltage at the machine. Input voltage must match the rating plate and voltage connection. Refer to Reconnect Procedure in the Installation section of this manual. 3. Blown or missing fuses in input line. 	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.</p>
Fan runs normally at power up - No output from machine in either Stick or TIG modes.	<ol style="list-style-type: none"> 1. Check for proper input voltages per nameplate and voltage reconnection. 2. Check to make sure polarity switch is not in between two positions. 	
Fan runs - No output from machine in either Stick or TIG modes and the yellow light on the control panel is on.	<ol style="list-style-type: none"> 1. Welding application may have exceed the recommended duty cycle. Allow the unit to run until the fan cools the unit and the yellow light goes out. 	
Machine does not respond (no gas flow, no high frequency and no open circuit voltage) when arc start switch or Ampcontrol is activated - fan is working.	<ol style="list-style-type: none"> 1. Machine MUST be in the TIG Mode. 2. The Ampcontrol may be defective. Check for continuity between pins "D" and "E" on cable connector when Ampcontrol is depressed. 	
Welding stops, and warning light is on	<p>Self-protection has engaged</p> <ol style="list-style-type: none"> 1.Display "E01" -over-temperature 2.Display "E02" -over-current, 3.Display "E05"- torch switch always close 	

Note:Both the Hand and Adjustable foot control work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models

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 all Safety Guidelines detailed throughout this manual

TIG MODE PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
<p>Machine output is intermittently lost. Gas flow and high frequency are also interrupted.</p>	<ol style="list-style-type: none"> 1. Problem may be caused by high frequency interference. Make sure that the machine is grounded properly according to the installation instructions. If there are other high frequency sources in the area, make certain that they are grounded properly. 2. Check Ampcontrol for proper operation and loose connections. 3. Check for proper input voltage and proper voltage reconnection. 	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.</p>
<p>Arc "Flutters" when TIG welding.</p>	<ol style="list-style-type: none"> 1. Tungsten electrode may be too large in diameter for the current setting. 2. Tungsten not "sharp" when welding in DC - mode. 3. Gas shielding may be insufficient. Increase gas flow; reduce tungsten stick out beyond gas cup. 4. Check for contaminated gas or leaks in the gas line, torch, or connections. 5. If a helium blend is used as a shielding gas, then reduce the percentage of helium. 	

Note:Both the Hand and Adjustable foot control work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models

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 all Safety Guidelines detailed throughout this manual

TIG MODE PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
Black areas along weld bead	<ol style="list-style-type: none"> 1. Clean any oily or organic contamination from the work piece. 2. Tungsten electrode may be contaminated. Replace or sharpen. 3. Check for contaminated gas or leaks in the gas line, torch, or connections. 4. Gas shielding may be insufficient. Increase gas flow; reduce tungsten stick out beyond gas cup. 	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.</p>
Weak high frequency - machine has normal welding output.	<ol style="list-style-type: none"> 1. Check for poor connections in the welding circuit. 2. Gas shielding may be insufficient. Increase gas flow; reduce tungsten stick out beyond gas cup. 3. Check for work and electrode cables in poor condition allowing high frequency to "Leak Off". 4. Keep cables as short as possible. 5. Check Spark Gap operation and setting (0.5mm). 	
High frequency "spark" is present at tungsten electrode, but operator is unable to establish a welding arc. Machine has normal open circuit voltage (refer to Technical Specifications in the Installation Chapter).	<ol style="list-style-type: none"> 1. The tungsten electrode may be contaminated. Replace or sharpen. 2. The current control may be set too low. 3. The tungsten electrode may be too large for the process. 4. If a helium blend is used as a shielding gas, then reduce the percentage of helium. 	

Note: Both the Hand and Adjustable foot control work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models
 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 all Safety Guidelines detailed throughout this manual

TIG WELD PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
No high frequency. Machine is in the TIG Mode and has normal output.	1. If the machine location is in a highly dirty environment with conductive contaminants, check and clean the spark gap with a low pressure air stream per the maintenance instructions.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.
No gas flow when Ampcontrol is activated in the TIG Mode. Machine has output - fan runs. A "Click" can be heard indicating that the gas solenoid valve is operating.	1. Gas supply is empty or not turned on. 2. Flow regulator may be set too low. 3. Gas hose may be pinched. 4. Gas flow may be blocked with dirt. Check filter screen inside gas inlet fitting to solenoid valve. Use filters to prevent reoccurrence. 5. Consult your local welder/gas distributor.	
The end of the tungsten electrode melts away.	1. The welding current is too high for the electrode type and/or size. See Electrode Amperage Ranges in the Operation Section of this manual.	

Note:Both the Hand and Adjustable foot control work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models

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.

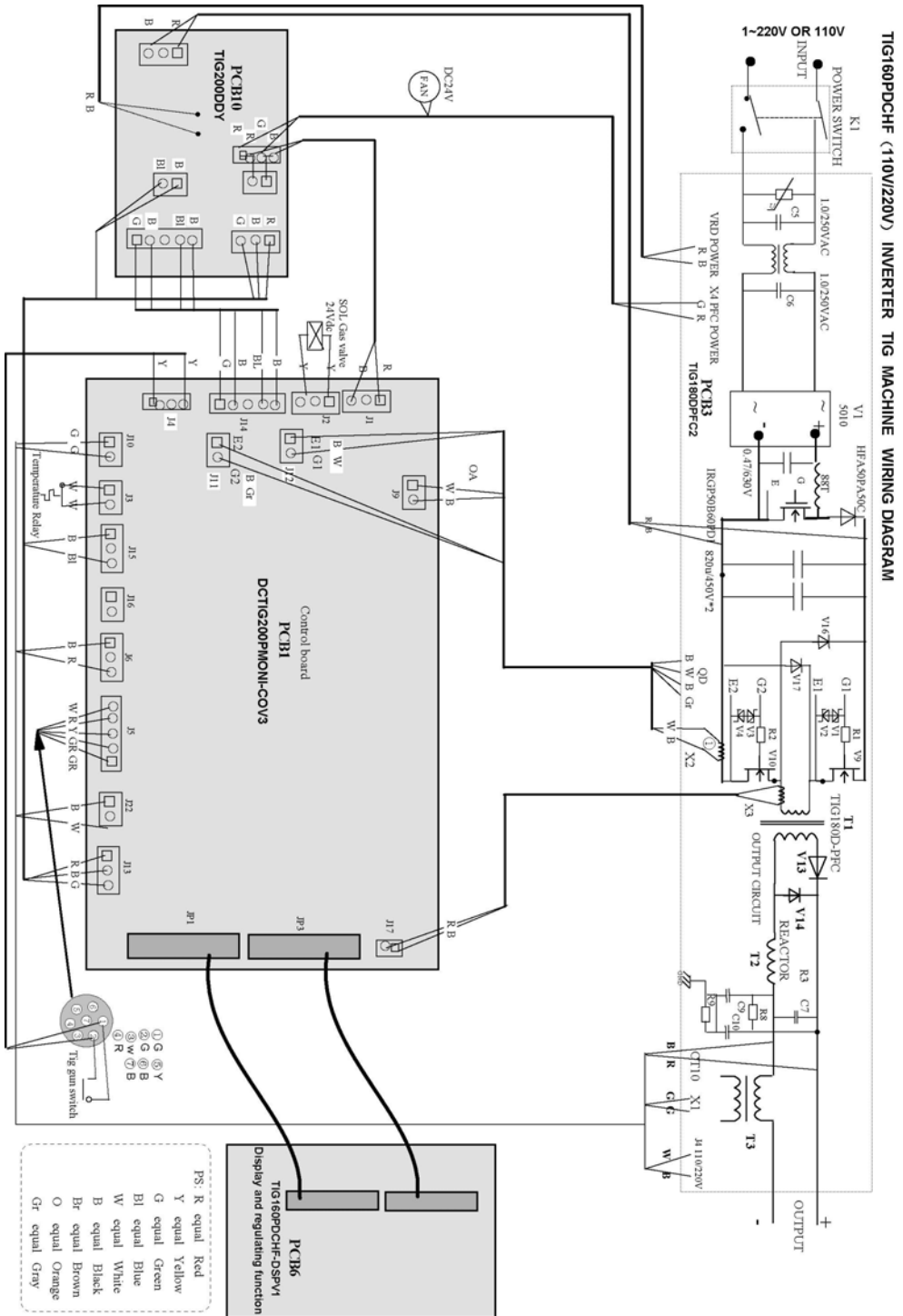
Observe all Safety Guidelines detailed throughout this manual

STICK WELDING PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
Stick electrode "Blasts Off" when arc is struck.	<ol style="list-style-type: none"> 1. Weld current may be set too high for electrode size. Reduce current control setting, or use a larger diameter electrode. 2. Dirty materials 3. Hydrogen in weld (present on electrode coating). 	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.
Stick electrode "sticks" in the weld puddle.	<ol style="list-style-type: none"> 1. The weld current may be set too low. Increase the current control setting or use a smaller diameter electrode. 2. Arc too short. 	
Excessive spatter	<ol style="list-style-type: none"> 1. Long arc 2. High current 	
Craters	<ol style="list-style-type: none"> 1. Fast movement of the electrode away from piece. 	
Inclusions	<ol style="list-style-type: none"> 1. Poor cleanliness or distribution of the Welding passes. 2. Improper movement of the electrode. 	
Insufficient penetration	<ol style="list-style-type: none"> 1. High progression speed. 2. Welding current too low. 3. Narrow chamfering. 	
Porosity	<ol style="list-style-type: none"> 1. Humidity in electrode. 2. Long arc. 	

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.

Diagram for the machine working elements.



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

Appendix

FACTORY INSTALLED OPTIONS

PACKING LIST

TIG160PDCHF MACHINE	1		
Ground clamp	1		
TIG welding torch	1		
Welding holder	1		
gas inlet pipe	1		
flow meter	1		
Adjustable foot control	1		
Operation instructions	1		
Certificate of quality	1		

No. _____

Certificate of quality

Name of product: PULSE TIG WELDING

Type of product: TIG160PDCHF

Packing No: _____

Test results of this welder fulfils _____

_____ technical requirements and its release

from the works is granted.

Inspector _____ Date _____

WARNING	<ul style="list-style-type: none"> ● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground. 	<ul style="list-style-type: none"> ● Keep flammable materials away. 	<ul style="list-style-type: none"> ● Wear eye, ear and body protection.
Spanish AVISO DE PRECAUCION	<ul style="list-style-type: none"> ● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aíslese del trabajo y de la tierra. 	<ul style="list-style-type: none"> ● Mantenga el material combustible fuera del área de trabajo. 	<ul style="list-style-type: none"> ● Protéjase los ojos, los oídos y el cuerpo.
French ATTENTION	<ul style="list-style-type: none"> ● 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. 	<ul style="list-style-type: none"> ● Gardez à l'écart de tout matériel inflammable. 	<ul style="list-style-type: none"> ● Protégez vos yeux, vos oreilles et votre corps.
German WARNUNG	<ul style="list-style-type: none"> ● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden! 	<ul style="list-style-type: none"> ● Entfernen Sie brennbares Material! 	<ul style="list-style-type: none"> ● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese ATENÇÃO	<ul style="list-style-type: none"> ● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra. 	<ul style="list-style-type: none"> ● Mantenha inflamáveis bem guardados. 	<ul style="list-style-type: none"> ● Use proteção para a vista, ouvido e corpo.
Japanese 注意事項	<ul style="list-style-type: none"> ● 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。 	<ul style="list-style-type: none"> ● 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。 	<ul style="list-style-type: none"> ● 目、耳及び身体に保護具をして下さい。
Chinese 警告	<ul style="list-style-type: none"> ● 皮肤或湿衣物切勿接触带电部件及焊条。 ● 使你自已与地面和工件绝缘。 	<ul style="list-style-type: none"> ● 把一切易燃物品移离工作场所。 	<ul style="list-style-type: none"> ● 佩戴眼、耳及身体劳动保护用具。
Korean 위험	<ul style="list-style-type: none"> ● 전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오. ● 모재와 접지를 접촉치 마십시오. 	<ul style="list-style-type: none"> ● 인화성 물질을 접근시키지 마십시오. 	<ul style="list-style-type: none"> ● 눈, 귀와 몸에 보호장구를 착용하십시오.
Arabic تحذير	<ul style="list-style-type: none"> ● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجسد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل. 	<ul style="list-style-type: none"> ● ضع المواد القابلة للاشتعال في مكان بعيد. 	<ul style="list-style-type: none"> ● 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.

<ul style="list-style-type: none"> ● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone. 	<ul style="list-style-type: none"> ● Turn power off before servicing. 	<ul style="list-style-type: none"> ● Do not operate with panel open or guards off. 	WARNING
<ul style="list-style-type: none"> ● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases. 	<ul style="list-style-type: none"> ● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio. 	<ul style="list-style-type: none"> ● No operar con panel abierto o guardas quitadas. 	Spanish AVISO DE PRECAUCION
<ul style="list-style-type: none"> ● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail. 	<ul style="list-style-type: none"> ● Débranchez le courant avant l'entretien. 	<ul style="list-style-type: none"> ● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés. 	French ATTENTION
<ul style="list-style-type: none"> ● Vermeiden Sie das Einatmen von Schweißrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes! 	<ul style="list-style-type: none"> ● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!) 	<ul style="list-style-type: none"> ● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen! 	German WARNUNG
<ul style="list-style-type: none"> ● Mantenha seu rosto da fumaça. ● Use ventilação e exaustão para remover fumo da zona respiratória. 	<ul style="list-style-type: none"> ● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas. 	<ul style="list-style-type: none"> ● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas. 	Portuguese ATENÇÃO
<ul style="list-style-type: none"> ● 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。 	<ul style="list-style-type: none"> ● 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ください。 	<ul style="list-style-type: none"> ● パネルやカバーを取り外したまま機械操作をしないで下さい。 	Japanese 注意事項
<ul style="list-style-type: none"> ● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。 	<ul style="list-style-type: none"> ● 維修前切斷電源。 	<ul style="list-style-type: none"> ● 儀表板打開或沒有安全罩時不準作業。 	Chinese 警告
<ul style="list-style-type: none"> ● 얼굴로부터 용접가스를 멀리하십시오. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오. 	<ul style="list-style-type: none"> ● 보수전에 전원을 차단하십시오. 	<ul style="list-style-type: none"> ● 판넬이 열린 상태로 작동치 마십시오. 	Korean 위험
<ul style="list-style-type: none"> ● ابعـد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها. 	<ul style="list-style-type: none"> ● أقطع التيار الكهربائي قبل القيام بأية صيانة. 	<ul style="list-style-type: none"> ● لا تشغيل 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說明以及應該使用的銀焊材料，並請遵守貴方的有閣勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

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