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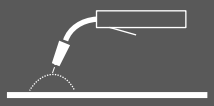

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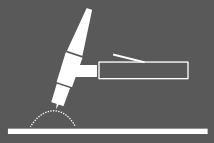

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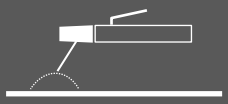

DC
120/220A

EVERLAST
WELDING AND CUTTING SYSTEMS

Lightning 275 MTS
Lightning 275 MTS-P

Safety, Setup and General Use Guide

FUNCTION: Lightning 275 MTS and Lightning 275P MTS **275:** MIG/AC-DC Pulse TIG/ DC Stick **275P:** Pulse MIG/ AC- DC Pulse TIG / DC Stick
PURCHASE DATE:
WELDER SERIAL NUMBER:
OPTIONAL ACCESSORY SERIAL NUMBER:

120/240V
1 Phase

Operator's Manual

EVERLAST
WELDING AND CUTTING SYSTEMS
Welders, Plasma Cutters, Multi-Process

www.everlastwelders.com
Need Parts? Need Technical Help? Call: 1-877-755-9353
380 Swift Ave. Unit 12 South San Francisco, CA 94080, USA

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IMPORTANT!

Before operating the welder, read this manual from beginning to end. A thorough read-through of this manual is important to help guide you in the safe and competent operation of the welder. This welder is designed and intended for professional use. This welderhas many features that new owners or users may not understand or be familiar with. The manual is written in a way that builds knowledge upon previous information presented in the manual. If sections are randomly read through, details of important information will be missed. In certain sections, where details of operation may overlap, some information may be repeated from previous sections to highlight continuity between different functions and settings. *Though some general welding information is given to illustrate the parameters and functions of the welder, the manual is not meant to train or instruct in welding. The manual's scope and intent is to guide the professional user in safe use of the basic parameters and functions of the welder.* Any explicit setting or detail offered in this manual is intended as a general guide, or a starting point, and should not be construed to be a final setting to be applied in any or all circumstances.

NOTICE:

Product Specifications and features are subject to change without notice. While every attempt has been made to provide the most accurate and current information possible at the time of publication, this manual is intended to be a general guide and not intended to be exhaustive in its content regarding safety, welding, or the operation/maintenance of this unit. Due to multiple variables that exist in the welding field and the changing nature of it and of the Everlast product line itself, Everlast Power Equipment INC. does not guarantee the accuracy, completeness, authority or authenticity of the information contained within this manual or of any information offered during the course of conversation or business by any Everlast employee or subsidiary. The owner of this product assumes all liability for its use and maintenance. Everlast Power Equipment INC. does not warrant this product or this document for fitness for any particular purpose, for performance/accuracy or for suitability of application. Furthermore, Everlast Power Equipment INC. does not accept liability for injury or damages, consequential or incidental, resulting from the use of or installation of this product or damages resulting from the content found in this document. Nor does it accept claims by a third party of such liability.

⚠ WARNING!

California Proposition 65 Warning:

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

⚠ Warning: Cancer and/or Reproductive Harm

www.P65warnings.ca.gov

NOTICE:

The Lightning Series of welders are designed for use by professional welders in commercial settings. Commercial settings are equipped with industrial wiring and power supply. This welder requires a dedicated circuit and special welder outlets that are not typically found in home garages. The higher Amperage outlets and breakers required by this welder may not allow connection to a standard home panel box with out significant modification to meet national electric codes and the input requirements of the welder. (See specifications page of inrush and rated current.) Additionally, use in home settings may cause interference with electronics. **Besides a required dedicated circuit, this welder may also require additional grounding of all metal items and the welder by a commercial electrician to prevent undesirable operation if interference is observed.**

THANK YOU! We appreciate you as a valued customer and hope that you will enjoy years of use from your welder. We work to please the customer by providing a well supported, quality product. *To make sure that you receive the best quality ownership experience, please see below for important information and time sensitive details.*

What to do right now:

1. Print your receipt from your confirmation email that should have been sent to you after your purchase and put it up for safe keeping. If you do not have one, contact us at 1-877-755-9353 (US customers) or 1-905-570-1818 (Canadian Customers). You will need this if anything should ever happen for original owner verification (if bought as a gift, original receipt will still be needed, or explanation sent to Everlast).
2. Read this manual! A large number of tech and service calls are a result of not reading the manual from start to finish. Do not just scan or casually peruse this manual. There are different features and functions that you may not be familiar with, or that may operate differently than you expect. Even if you have expertise in the field of welding, you should not assume this unit operates like other brands or models you have used.
3. Carefully unpack and inspect all items immediately. Look for missing or damaged items. Please report any issues within 48 hours (72 hours on weekend or holidays) of receiving your product,. Take pictures if you are able and contact us at 1-877-755-9353, ext. 207 if any issue is discovered between 9 am and 5 pm Eastern Time M-F (US customers) or at 1-905-570-1818 (Canadian Customers) between 9am and 4 pm weekdays except on Fridays when hours are from 9 am to 12pm Eastern. If outside of the US or Canada, contact your in-country/or regional distributor direct at their service number.

What to do within the next 2-3 days:

1. Make sure your electrical system is up to date and capable of handling the inrush and rated current of the unit. Consult and use a licensed and knowledgeable electrician. If you have downloaded this manual in expectation of delivery, get started now.
2. Make sure this machine is plugged in, turned on, and tested with every process and major feature, checking for proper function. You have a 30 day period to test and thoroughly check out the operation of this unit under our 30 day satisfaction period. If something is wrong, this policy covers shipping on the unit (30 day satisfaction policy applies to the USA only for the 48 lower states and D.C., territories and provinces are excluded) or any incidental parts that may be needed to resolve any issue. After this 30 day period, if you find something wrong with the unit, you will not receive the benefit of free shipping back and forth to resolve this issue. Your unit is still covered under the 5 year parts/labor warranty, but shipping is covered by the customer after the 30 day period is over. The first 30 days of operation with any electronic item is the most critical and if any issue will happen, it will often happen during this time. This is why it is very important that you put this unit to work as soon as possible. Any issue should be reported within 48 hours (72 if on the weekend or holiday). Everlast will not be liable for any shipping after that time.

What to do within the next 30 days:

Visit our website (US customers). Go to www.everlastwelders.com. Navigate to the resources tab and to the "product registration" page to register your product. While keeping your receipt/proof of purpose is still required for verification of ownership, registering will help us keep your details straight and establish a chain of ownership. Don't worry, though, your warranty is still valid if you can't do this. Remember: Always keep your receipt even if you register. You may want to staple a copy to your manual.

What to do if you have a warranty issue or problem with the unit:

1. Unplug the unit. (Also do this before any maintenance or cleaning is done.)
2. Do not attempt a self-repair until authorized by an Everlast representative. This does not include performing routine maintenance such as point gap adjustments or regular internal cleaning. Any third party repairs are not covered under warranty, and can further damage your unit.
3. Within 24-48hours, (or by the next working business day) you must contact U.S. tech support at 1-877-755-9353 ext 207(U.S. hours are 9 am to 5pm Eastern for tech support and 9 am to 5 pm Pacific for the business/sales office). If you are in Canada contact 1-905-570-1818 (Canada hours are 9am to 4pm M-Th, 9am to 12pm Fri). Although phone contact is preferred to establish a warranty claim, you may send an email to tech@everlastwelders.com (US) or mike@everlastwelders.ca (Canada) along with your contact information and brief explanation of the issue and ask for a follow up call. If you contact us via phone, and you do not reach a live person, please leave a brief message with the nature of your problem and your contact information. You should expect a call back within 24 hours. It is also a good idea to follow up the message with an email.

4. Be prepared with as much information as possible when you talk with a tech advisor, including a details of the failure, settings, and application of the unit. *NOTE: A Proof-Of-Purchase (receipt) is required before returning the unit for warranty or before warranty parts can be sent to you.*

5. Keep in mind that, you may be asked to check a few basic things. Before you call, having a screwdriver and volt/ohm meter at hand is a good idea and will save time. Many issues can be resolved over the phone. If the issue cannot be resolved over the phone/email, you may be given an option to return the unit, or have a part shipped to you, at Everlast's discretion. Keep in mind, you may be asked questions that seem basic, or elementary to your knowledge base. These are not meant to question your knowledge, but rather to make sure nothing is overlooked. However the tech chooses to proceed, please cooperate with the process, even if you think you know what the cause or issue is. You may be asked to check something or open the unit during the diagnosis. This does not void the warranty! Opening the unit is a part of routine maintenance and cleaning. This is an important step. The willingness of the customer to work with tech support can save lots of time and accelerate the warranty process. For

warranty to be honored, you will need to make sure that you follow these guidelines. ***Units that are returned without an RMA (issued by the tech support department) may not be repaired under the warranty agreement and you may be charged for the repair and can result in a delayed repair as well.***

What to do if you need setup help, guidance, weld issue diagnosis or have general product compatibility questions.

Call us at 877-755-9353 ext. 204 for welding guidance and general welding issue diagnosis. Or email performance@everlastwelders.com with the basic issue you are having, along with your specific settings, and welding application.

Hey...wait, what is my warranty?

Warranties and service policies and procedures vary from country to country and are maintained and supported by the regional or in country distributor of Everlast welding equipment.

USA Customers Only: For full details on the 5 year parts and labor warranty, 30 day satisfaction policy, terms of sale, and how to proceed with a warranty claim, please visit: https://www.everlastgenerators.com/standard-warranty. Accessories are covered by a separate warranty and detailed information can also be found at the link above.

Canada Customers Only: For full details on the 3 year parts and labor warranty, terms of sale, and related policies and procedures, please visit: https://www.everlastwelders.ca/terms.php.

Who do I contact?

USA Technical Support:

Email: tech@everlastwelders.com
1-877-755-9353 ext. 207
9am-5pm Eastern (Closed holidays)
Monday-Friday

USA Welding Support and General Product Information:

Email: performance@everlastwelders.com
1-877-755-9353 ext 204
9am-6:30 pm Eastern (Closed holidays)
Monday-Friday

USA Sales and Main Office:

Email: sales@everlastwelders.com
1-877-755-9353 ext 201
9am-5pm Pacific (Closed holidays)
Monday-Friday

Canada Technical Support:

Email: mike@everlastwelders.ca
905-570-1818
9am-4pm Eastern Monday-Thursday
9am-12pm Eastern Friday

Canada Sales and Main Office:

Email: sales@everlastwelders.ca
905-570-1818
9am-4pm Eastern Monday-Thursday
9am-12pm Eastern Friday

Other Countries and Regions:

Visit the U.S. Website @ www.everlastwelders.com and click on the flag of the country or region represented that is closest to you. If your country or region is not found, call the U.S. office at 1-650-588-8588 between the hours of 9am to 5pm Pacific, Monday through Friday.

Safe operation and proper maintenance is your responsibility.

Everlast is dedicated to keeping safety a top priority. While we have compiled this operator's manual to instruct you in basic safe operation and maintenance of your Everlast product, it is no substitute for observing safe welding practices and behavior. Safe welding and related cutting operations require basic knowledge, experience and ultimately the exercise of common sense. **Welding does significant hazards to your health and life! Exercise extreme caution and care in all activities related to welding or cutting. Your safety, health and even life depends upon it.**

WARNING! If you do not have proper knowledge or capability to safely operate this machine, do not use this machine until proper training has been received!

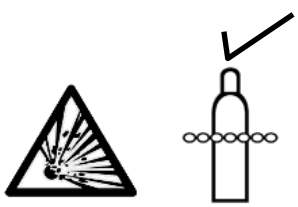
While accidents are never planned, preventing an accident requires careful planning. Stay alert!

Please carefully read this manual before you operate your Everlast unit.

The warranty does not cover damage or harm created by improper use. neglect of the machine or failure to follow safe operating practices.

NOTICE:	
	Welding and cutting operations may generate undesirable High Frequency (HF) and EMF energy. This can interfere with surrounding electronic equipment such as computers, routers, CNC equipment, televisions, radios, fluorescent lighting etc. If disturbance in surrounding electrical and electronic equipment is noted, consult a licensed electrician to help properly ground surrounding equipment to limit the interference. This machine may cause GCFI and ground fault outlets to malfunction. This unit is designed to be operated on a dedicated, properly grounded circuit.

Safety Warnings, Dangers, Cautions and Instructions

	**NOTICE.** This unit manual is intended for users with basic knowledge and skillset in welding. It is your responsibility to make certain that the use of this welder is restricted to persons who have read, understand and follow the warnings and instructions in this manual. If you or the operator needs further instruction, contact Everlast welding support at 1-877 755-9353 ext. 204 or seek qualified professional advice and training.
	**WARNING!** High Frequency (HF) energy can interfere with the operation of pacemakers and can damage pacemakers. Consult with your physician and pacemaker manufacturer *before* entering an area where welding and cutting equipment is in operation and *before* using this welder. Some pacemakers have limited shielding. Alert any users or customers of this potential problem.
	**WARNING!** Use approved safety glasses with wrap around shields and sides while welding and working in the weld area or serious eye damage or loss of vision may result. Use a grinding shield in addition to the safety glasses during chipping and grinding operations.
	**WARNING!** When welding always use an approved welding helmet or shielding device equipped with at least an equivalent of a shade 9 or greater. Increase the shade number rating as amperage increase over 100 amps. Inspect helmet for cracks in lenses and in the helmet. Keep lens covers in good condition and replace as necessary.
	**WARNING!** Welding/cutting operations carry inherent risks which include but not limited to possible cuts burns, electrical shocks, lung damage, eye damage and even death. Take all appropriate measures to use proper Personal Protective Equipment (PPE). Always use leather welding gloves, closed toe (preferably reinforced or steel toe leather shoes, and long-sleeved flame resistant clothing (i.e. denim). Do not wear Poly/Nylon blend materials.
	**DANGER!** Welding poses shock and electrocution risks. Keep this welding equipment dry. **Do not weld in the rain or where moisture accumulates.** Use dry, rubber soled shoes, gloves and clothing when welding. Do not rest or contact work clamp (ground) when welding. Keep all parts of the body insulated from the part being welded when possible. Do not touch both terminals or connections at the same time. Consider all welder parts to be "live" at all times even if no welding is being performed. Do not use frayed welding cables.
	**CAUTION!** Fires are possible but also preventable while welding. Always remove flammable rags, papers, and other materials from the weld area. Keep rags stored in an approved flame proof canister. Keep a fully charged fire extinguisher at hand. Remove any fuels, oils, paint, pressurized spray cans, and chemicals from the weld area. Make sure any smoke/fire detectors are function properly. Do not weld on tanks, drums or barrels, especially if pressurized or sealed. Do not weld on any container that previously held fuel or chemicals. Make sure the weld area is clear of flammable materials such as grass or wood shavings solvents and fuels. Do not wear frayed or loose clothing. Visually inspect and recheck the work area after welding looking for smoldering debris or flames.
	**WARNING!** Welding gas cylinders are under high pressure. Keep all gas cylinders upright and chained to a cart or held safely in a safety holding pen. Never transport gas cylinders in an enclosed car van or other vehicle. Transport gas cylinders securely. Keep all cylinders capped while not in use or during transport. Replace the cap on the cylinder when it is going to be more than 24 hours before use. Do not use or attempt to repair faulty regulators. Never weld on gas cylinders. Keep gas cylinders away from direct sparks.

Safety Warnings, Dangers, Cautions and Instructions

	**DANGER!** Welding and cutting operations pose serious inhalation hazards. Some of these hazards are immediate while others are cumulative in their effect. **Do not weld in enclosed spaces or in areas without adequate ventilation.** Fumes and gases released in the welding and cutting operations can be toxic. Use fans or respiration equipment to insure adequate ventilation if you are welding in a shop or garage area. **Do not weld on galvanized metal under any circumstance. You may develop metal fume fever. Symptoms are similar to lu-like symptoms. Seek medical advice and treatment if you are exposed to galvanized welding fumes.** **If you experience any eye burning, nose or throat irritation while welding, these are signs that you need more ventilation.** If you feel these symptoms: • Stop work immediately and relocate work area with better ventilation. • Wash and clean your face and hands. • Stop work completely and seek medical help if irritation persists.
	**DANGER! Never use brake cleaner or any chlorinated solvent to clean or degrease metal scheduled to be welded or other related equipment in the area being welded.** The heating of this cleaner and its residue will create highly toxic phosgene gas. Small amounts of this vapor are harmful and can lead to organ failure and death. If degreasing of a part is necessary, use Acetone or an approved pre-weld cleaner. Use the proper personal protective equipment (PPE) when handling any cleaners/solvents.
	**DANGER! People with pacemakers should consult a physician and pacemaker manufacturer before welding. There is a potential for damage or serious malfunction resulting in death. High Frequency energy (HF)/Electromagnetic Fields generated during welding can interfere with pacemaker signals, even permanently damaging it. Some pacemakers offer some shielding, but restrictions regarding amperage and HF/HV starting of TIG arcs may be placed upon the individual. Warn all potential bystanders that they should exit the work area if they have a pacemaker or similar medical equipment before welding. Consult with a Physician if a pacemaker is expected to be implanted.**
	**DANGER!** Never defeat or modify any safety guards or shields. Keep all safety covers and shields in place. Never place your fingers in or near a fan shroud or insert any object into the fan(s).
	**WARNING**! The intense flashing and strobing effects that are common with welding processes, particularly when using the Pulse function may cause seizures in people with a history of photo-sensitive Epilepsy. Be mindful of others in the welding area who may have such sensitivities. Keep them clear of the area.

Safety Warnings, Dangers, Cautions and Instructions

	**CAUTION!** Trip Hazards exist around welders. Cords, cables, welding leads and hoses pose a trip hazard. Be aware of their location and inform others of their location. Tape and secure them so they will stay out of high traffic areas.
	**CAUTION!** Welded metal can stay hot long after welding is completed. Burns may occur. Always wear gloves or use tongs/pliers when handling welded or cut metal. Remember the heat from the metal may catch other material on fire. Always have a fire-proof area ready to place welded components until they fully cool. Use soap stone or a metal marking marker to label the metal as "HOT" to serve as a reminder to all present in the area.
	**CAUTION!** Welding and cutting operations generate high levels of ultraviolet (UV) radiation which can burn and damage skin and eyes. The intensity is so high that exposed skin and eyes can burn in a few minutes of exposure. Minimize direct skin and eye exposure to this intense form of radiation by using proper PPE and sun screen where appropriate.
	**CAUTION!** Do not allow bystanders. Do not allow others without proper Personal Protection Equipment (PPE) suitable for welding to stand in the welding area or to observe welding and welding related activities. If protection is not readily available, use a welding screen to separate the welding area from the rest of the area. If no protection or screen is available, physically exclude them from the welding area by a wall or other solid divider. Keep all pets and young children away from the welding area.
	**CAUTION!** Electromagnetic Fields can be generated by this welder and radiate into the work place. The effect of EMF is not fully known. Exercise caution when welding by: NOT draping welding leads (guns/cables) over your shoulders or arms, NOT coiling them around your body, NOT inserting yourself directly between the cables, and by NOT contacting the unit while welding. DO keep the work clamp connected as close as possible to the area of the weld and directly to the object being welded whenever possible.

**NOTICE:
If any electrical disturbance is noticed as a result of the High Frequency operation of this unit during arc starting, the HF service bolt located on the rear of this unit should be connected directly to a 12 gauge wire that is bonded directly to an outside copper ground rod driven into moist soil. (see location on rear panel page) Additionally, all metal items including any metal frame or sheeting of the building should be connected and grounded to separate copper ground rods driven into the ground at 10 foot intervals around the perimeter of the building. This includes items such as tables, carts, rack material, metal surrounds, etc. that may act as "antenna" to radiate/absorb HF energy. Additionally, all cords and welding leads should be twisted together and run directly to the work without coils or excess cabling.

Specifications

Important Information: Operating this unit with a generator or other off-grid service.

This welder should only be operated on a generator certified by its manufacturer to produce clean power. Clean power is equivalent to the quality of household or shop/garage type power. This means the generator must have 5% or less total harmonic distortion (THD) of the Sine wave. If you are unsure of the power output type of the generator, contact the manufacturer of the generator for verification. *Do not operate on square wave or modified square wave generators or converters/inverters or damage or malfunction may occur. Damage caused by running this welder off of "dirty" power or modified sine waves may not be readily apparent and is usually cumulative in nature. However, damage may present itself immediately. The damage caused by running this welder on "dirty" power usually leaves specific signs internally of specific parts damages.*

When operating on 240V 1 phase generator power, you will need a minimum size of 12,000 Surge Watts. Ideally, it is recommended for use with 13,000 Surge Watt generators or larger. Operating the unit on under-powered generators and/or on generators not rated with 5% or less THD can damage your unit. *The generator manufacturer determines this rating, not Everlast.* Do not assume that a name brand generator, or a "new" generator provides clean power. Price paid does not guarantee a clean power output either. There are multiple brands at various price points capable of producing clean power. Investigate this before purchasing a generator. The manufacturer will usually state that a unit is clean power in the advertising information and will state actual THD. If the manufacturer does not state it, contact the manufacturer directly for actual THD.

NOTICE! Operation of this unit with a generator not stated to provide clean power (5% or less THD) by the manufacturer of the generator is prohibited and will void the warranty. Use only with generators/inverters/converters that produce an equivalent type of sine wave used in shops, homes and "shore" type systems. **Do not use with any off-grid power delivery system that produces more than 5% Total Harmonic Distortion (THD).**

WARNING! Do not start or stop the generator with the welder switched on. Never use the generator in ECO mode or an auto-idle mode. Even with a clean power rated generator, this action can damage the unit. *Turn on the welder only after full generator R.P.M. has been achieved and the engine is sufficiently warmed up.* Closely monitor generator fuel level so that the engine R.P.M doesn't drop or completely shut down with the welder plugged in. **For best practice: do not start or stop the generator with this welder plugged in, even if it is turned off. Unplug the welder before shutting down the generator.**

If using with a welder generator, make sure the manufacturer has determined that the generator portion produces a clean sine wave. Many older models do not. Some newer models use "divided" power between welding and generating and cannot supply the full power to the welder unless the fine current control knob is turned to maximum. Do not use this unit with such welder/generators unless the Power/fine current control is turned to 100%. Some welder generators do have a separate alternator for generating power. If this is the case, do not weld or load the generator on other circuits while this welder is in use.

WARNING! Always make sure any generator or welder generator is properly grounded, according to local code and manufacturer's instructions. Ground the machine per the generator manufacturers instructions to meet code. Improperly grounded generators may damage the machine and more importantly may cause severe injury or death. Damage resulting from improperly grounded generators is not covered under warranty.

Precautions for operating the unit on 120V or 240V input power.

This unit is rated and intended for use with single phase 120V or 240V input. However, due varying output by local utilities, the unit may be used with voltages ranging from 208V up to 250V. If this unit is operated on 208V, duty cycle and wire feed speed and PowerSet accuracy will be affected. I1max/ I1eff Amp draw ratings will be increased proportionately from the stated factory specs and duty cycle will decrease. If you decide to use this machine on 208V, before installing permanently, have an licensed electrician monitor voltage fluctuations, particularly under load and during peak use times. If the voltage remains constant, and steady without dropping below the 206V threshold, the unit may be installed. Using voltage below 208V can cause excess heat and damage the IGBT components and related circuitry. Damage caused by operating the welder on undervoltage power sources is not covered by the warranty. Always be aware of the voltage output and the quality of the power source being used. Never operate the watercooler with the welder when operating on 120V input power. If 208V is present and the voltage may fluctuate, contact Everlast for other machine voltage input options. Never use the rear plug for the cooler for any other use that for the Everlast brand water cooler. The 120V operation of this unit is designed for convenience and maximum portability for various jobs where 240V 1 phase power is not always an option. However, it should not be installed for dedicated 120V use. 120V output will limit the maximum output of the welder. Also the unit requires a large 120V breaker and heavy gauge wiring to achieve the maximum output. Otherwise, overheating of the welder circuit (and welder) and constant breaker tripping is to be expected. The material cost to install a large breaker and the heavy gauge 120V wiring on a dedicated circuit is close to having a standard 240V breaker and wiring installed.

Specifications

Duty Cycle Information and Explanation

Duty Cycle is defined per North American Specifications as the amount of time out of a 10 minute period in which the unit can operate when tested at 40° C (104° F). For example, this unit has a stated duty cycle of 60% at maximum output. That means that the unit can be actively welding for at total of 6 minutes out of a 10 minute time period at the maximum output of the welder (275A MIG/TIG and 225A Stick output operating on 240V). For Stick and Plasma, the duty cycle is at 60%. This means that the unit can be actively welding or cutting for 6 minutes out of 10. Everlast uses a maximum output rating to figure duty cycle on this unit. A duty cycle of 60% is considered to be an industrial duty cycle which makes this unit suitable for daily commercial use for commercial manufacturing and repair. Reducing the output of the machine will increase the duty cycle if all environmental factors are equal. Lowering the ambient air temperature and relative humidity will also help to increase duty cycle somewhat. While operating on 120V, the unit still provides a high duty cycle but at a reduced maximum output.

The duty cycle rating of this welder is tested at an ambient temperature of 40°C (104° F) to ensure conformance to the North American Standards. Operating the welder above this temperature point, or in extremely humid conditions, or while obstructing free flow of air in and around the unit may reduce the duty cycle of the welder. Additionally dirty units may suffer loss of duty cycle. As indicated previously, under normal conditions, the duty cycle will increase somewhat as ambient air temperature drops so long as the unit has access to clean, dry air. Free flow of air around the unit is critical to maintain duty cycle. Additionally, operating on lower voltages than rated may also affect the stated duty cycle.

The welder's duty cycle is not actually limited or controlled by a timer. Nor is it required to manually tabulate use time while welding. Rather than a timer, the welder is equipped with a heat sensor located on a heat sink near the critical power components of the welder. The sensor circuit is designed to interrupt the welding output of the welder if the unit overheats and exceeds the factory-set maximum operating temperature. If the operating temperature of the unit is exceeded, welding output will stop and an over-temperature warning light/error code will be displayed on the panel. The unit will continue to run the fans and act normally except no welding output will be allowed until it cools below the trigger threshold. **If a duty cycle event is registered, do not switch the unit off! Allow the welder to continue to run at idle for at least 10-15 minutes until the temperature has fallen enough to reset the sensor and over-temperature warning light**. *Even if the unit resets, allow the unit to cool for a full 15 minutes, or the duty cycle will be quickly triggered again since the unit resets just below the set temperature threshold.* After 15 minutes of cooling, you may switch the unit off if you are finished welding. If the unit does not automatically reset after 15 minutes, turn the unit off. Wait for 15 seconds before turning the machine back on. If the unit does not reset, contact technical support for further advice and assistance. As a best practice, when you have completed all welding activity and have been welding continuously for extended periods of time at moderate to high Amperages, keep the welder switched on for an additional 10 minutes without actively welding to allow it to cool.

The intentional and/or repeated triggering of the duty cycle protection feature on this unit will shorten the lifespan of the unit's electronics and can weaken internal components. The effect of overheating your unit repeatedly takes a cumulative toll on the welder. and can lead to early failure of internal components, guns and torches.

WARNING!

This unit is not designed for Air Carbon Arc Gouging or Cutting. Do not this unit for this application. The high arc voltage and extended use times that are up to 100% duty cycle will over heat the unit and cause component failures due to voltage spikes.

WARNING: Any Carbon-Arc use will instantly void the warranty! Do not be tempted to use Carbon-Arc Gouging or Cutting under any circumstances, regardless of the size or diameter of the gouging electrode.

Specifications

Welder updates and information in this manual:

This manual has been written to guide the user in safe operation of the "Lightning" series MIG/TIG/Stick welder. Due to Everlast's continual effort to improve and advance the design of the Lightning series, units currently in production may have updated designs and programming improvements not found in earlier production models. Older models may not always be updateable without returning the units for major service (at customer's expense). Additionally, if an update is ruled to be possible, this is not considered to be a part of warranty work and is not eligible for return/exchange, unless it is an update designed to address and to correct a critical function of the welder. *Some functions and specifications, not significantly affecting overall appearance or operation of the welder, may change from time to time without notice. Everlast holds no obligation and offers no promise, guaranty or any form of assurance to the customer/user to update older units to newer programming, features, accessories or styles found on subsequent model updates and releases, except those deemed by Everlast to be warrantable items related to welder malfunction or inadequate performance.*

AC and DC output of this welder:

This unit supplies AC and DC output for TIG. DC TIG is suitable for welding most metals except Aluminum and Magnesium. AC TIG is used for Aluminum and Magnesium. Output for MIG and Stick is DC only. In MIG mode (DC) a spool gun or push pull gun or stock gun with a polymer liner and U- groove drive rolls can be used to weld aluminum quickly with on materials 1/8" or greater. Under 1/8", use AC TIG to weld aluminum. DC Stick can be used to weld Aluminum with special electrodes, but weld quality will not as good and is designed for thicker materials only. AC is only available in TIG on this unit.

Factory default settings:

This unit is not shipped with any default settings or saved programs, with the exception of the preset PowerSet programming which extends only the Volts and Wire Feed Speed settings. Any saved programs or settings entered into the machine on initial startup should not be construed to be "factory settings". If there is an adjustment available, it should not be ignored and will require some input from the user for best function for the application. The settings that are entered into the unit when you receive it are because of saved last use setting memory that were used during factory testing and programming. These units are both live and stand tested for quality control and are run through the range of settings. Any final settings left in the machine from testing will be stored in the machine upon start up. The last test configurations performed may not allow the welder to create a useable weld. **Other than PowerSet Volts and Amp functions, there are no factory presets and no ability to reset the machine to an default settings.**

Calibrating the settings by inputting the correct wire type/size:

The programmed wire sizes and types (where applicable) are used to calibrate and improve machine performance in both the manual and PowerSet modes. You must know and input the correct wire size and type to ensure best welding performance. Notice that all wire diameters and types provided in the MIG/ Flux-Cored Menus are commonly found in local stores. This machine is designed to operate in many regions of the world and will have extra wire diameter and type selections that may not be readily available at some local welding supply stores. However, more difficult-to-find wire sizes and types are still usually available online from specialty suppliers. To utilize different wire types and sizes, additional drive rolls, guns and liners must be purchased. The stock drive rolls are .035 and .045" solid steel/stainless wire.

Gasless (Self-Shielded) flux-cored wire use:

Although the unit has a Gasless Flux-Cored setting for MIG welding. the MIG gun supplied with this welder is not suitable for use with gasless/self-shielded use. For use with flux-cored wire, a separate dedicated Flux-Cored gun should be used. There are several aftermarket sources of dedicated flux-cored guns. If you intend to use gasless flux-cored wire, you will need to source one separate from your welder purchase. Contact Everlast for sources of flux-cored guns if needed. Gas type MIG guns and gas-less flux-cored guns are not interchangeable. (Some small welders may have a flux-cored conversion kit for their guns but these are usually for 140 up to 180A light-duty use). Commercial Flux-cored welding runs the guns at a much hotter temperature and they have heavier cables, gun necks and connections to withstand those higher temperatures. The MIG gun supplied with this unit is heavy-duty, it depends upon the flowing of the shielding gas to help cool the gun. Using the supplied gun without gas and with self-shielded wire, will not only damage consumables, but it can overheat and melt the torch cable and connections. Gasless Flux-Cored operation also requires a very short contact tip-to-work distance which runs the contact fully exposed. The contact tip on the supplied gun is recessed and results in poor arc performance with gasless/self-shielded wire.

Specifications

Product Specifications Lightning 275 MTS/275 MTS-P	
Welder Base Construction Type	Digital IGBT Inverter-Based Design with 5" HD Screen. (Full Diagonal Measurement)
Welding Processes	**Lightning 275 MTS:** GMAW, FCAW, AC-DC GTAW-P, SMAW (MIG, Gasless Flux-Cored, AC-DC Pulse TIG, DC Stick) **Lightning 275 MTS-P:** GMAW-P, FCAW, AC-DC GTAW-P, SMAW (Syn. Pulse MIG, Gasless Flux-Cored, AC-DC Pulse TIG, DC Stick)
Input Voltage/ Hertz/ Phase	Dual Voltage 120/240V (± 10%) 50/60 Hz 1 phase
$I1_{MAX}$ Current Rating (Inrush Amps)	**Lightning 275 MTS** **120V:** 43A **240V:** 48A **Lightning 275 MTS-P** **120V:** 43A **240V**: 53A
$I1_{EFF}$ Current Rating (Effective Rated Amps)	**Lightning 275 MTS** **120V:** 34A **240V:** 38A **Lightning 275 MTS-P** **120V:** 34A **240V:** 41A
OCV/ OCV with Voltage Reduction Device Selected	**MIG:** 80V **Stick:** 80V (With VRD Selected <24V) **AC-DC TIG**: 80V
MIG Duty Cycle @ Rated Output (Rated a 40°C/104°F)	**120V:** 60% @ 150A/21.5V 100% @ 120A/20V **240V:** 60% @ 275A/ 27.8V 100% @ 220A/ 25V
TIG Duty Cycle @ Rated Output (Rated at 40°C/104°F)	**120V:** 100% @ 150A/16V **240V:** 60% @ 275A/ 21V 100% @ 200A/18V
Stick Duty Cycle @ Rated Output (Rated at 40°C/104°F)	**120V:** 60% @ 120A/24.8V 100% @ 90A/23.6V **240V:** 60% @ 220A/ 28V 100% @ 175A/ 27V
MIG Wire Feed Speed Range (WFS)	60-600 IPM /.5-15 M/M
Installed MIG Drive Roll Sizes/ Types	Stock: .035"-.045" (.9-1.2mm) V groove (solid steel and stainless wire)
Programmed Wire Sizes *See Notice at end of Product Specification for more details.	**Steel/Stainless:** .024'',.030'',.035'',.040',.045"'(0.6,0.8,0.9,1.0,1.2mm) **Aluminum:** .030'',.035'',.040",.045'' (0.8,0.9,1.0,1.2mm) **Flux-Cored:** 030'',.035'',.040',.045"'(0.6,0.8,0.9,1.0,1.2mm)
MIG Output Range V/A (DC)	**120V:** 30– 150A/ 15.5-21.5V **240V:** 30-275A/ 15.5-27.8V
TIG Output Range V/A (DC)	**120V:** 10-150A/ 10.4-16V **240V:** 10-275A/ 10.4-275A/21V
TIG Output Range V/A (AC)	**120V:** 15-150A/10.6-16V **240V:** 15-275A/10.6-21V
Stick Output Range V/A (DC)	**120V:** 10-120A/ 20.4V-24.8V **240V:** 10-220A/ 20.4-28V
TIG Start Type	Solid State HV (Simulated HF, No point gap), Lift with Remote, Live Lift
Pre Flow / Post Flow Gas Time	**MIG:** PREFLOW: 0-10 S; POSTFLOW: 0-30 S **TIG:** PREFLOW: 0-10 S; POSTFLOW: 0-30 S
MIG Start/End Wire Feed Speed (WFS)	60-600 IPM/ .5-15 M/M
TIG Start Amps (Initial); End Amps, (Crater Fill) DC(AC)	**120/240V:** 10(15)- 150/250A;10 (15)-/150/250A
TIG Remote Functions	Pedal, 2T, 4T, 2T+A, 4T+A (+A denotes operation with special torch with separate switch and amp control)
MIG Remote Functions	**Standard MIG Mode (Lightning 275MTS and 275MTS-P):** 2T, 4T **Synergic Pulse MIG Mode (Lightning 275 MTS-P Only):** 2T, 4T, 2TSP, 4TSP
MIG Upslope/ Downslope (Ramp up/Ramp Down WFS)	UPSLOPE: 0-1.0 S DOWNSLOPE: 0-1.0 S
TIG Upslope/ Downslope (Ramp up/Ramp Down Amp)	UPSLOPE: 0-15.0 S DOWNSLOPE: 0-15.0 S
TIG AC Frequency	20-250Hz (Typically use 90 to 120Hz for best all around performance.)
TIG AC Balance	10-70% of Electrode Positive Cleaning Action (Typically use 25 to 35% for best results.)
TIG AC Wave Form Shapes	Advanced Square, Soft Square, Triangular, and Sine Wave
TIG AC/DC Pulse Frequency Hz	**AC:** 0-250Hz **DC:** 0-250Hz **Advanced AC Pulse:** 0-10 Hz
DC TIG Pulse Wave Form Shape	Square, Sine and Triangular Pulse Wave Shapes (**NOTE:** These are not related to AC wave form control.)
TIG Pulse Time On (Pulse Duty Cycle)	5-95% of total pulse stage duration during one cycle (also called pulse "peak")
TIG Pulse Amps (Background Current)	10-90% of welding amperage
TIG/MIG Spot Timer (Arc on time for Spot welding)	.1-10.0 S (adjustable in Tenths) Notice: User must turn on Spot function to utilize Stitch function.
TIG/MIG Stitch Timer (Arc off time between Spot welds)	0-10.0 S (adjustable in Tenths) Notice: User must set to 0 to turn off activity of the Stitch function.
Stick Arc Force Control	0-100% over set Amperage. Limited to the maximum available overhead current.
Stick Hot Start Amps (Intensity)	0-100% over set Amperage. Limited to the maximum available overhead current.

Specifications

Product Specifications 275 MTS /275MTS-P Continued	
Stick Hot Start Time (Duration)	0-2.0 S (adjustable in Tenths)
Ant Stick Function (Stuck Rod)	Yes. Lowers current output when rod is stuck for easy removal.
Stick E6010 or EXX10 Capable (Cellulose Type)	Yes, with E6010 selected. (6011, 6013, 7018 rod selections also available for selection)
Memory Function	Save up to 30 Programs with lockable settings. Each program can be individually named.
Spool Gun/ Push Pull Gun Options	Spool Gun: Parker DSP360 Push/Pull Gun: North MPG 300A
Wire Jog function	Yes
Gas Purge Function	Yes
Work Clamp with Cable Length	300A, 9.5 ft. (2m) DINSE 35/50mm^2 (1/2" nominal lug diameter)
Stick Electrode Holder Length	300A, 9.5 ft. (3m) DINSE 35/50mm^2 (1/2" nominal lug diameter)
Power Cable Length	6.5 ft. (2m)
Power Plug Type for Single Phase Operation	NEMA 6-50P (Standard 240V Welder Type, 3 Wire in North American Markets Only.) with NEMA 6-50 to NEMA 5-15 Plug 240V to 120V adapter for 120V operation.
Cooling Method and Type	Fan with full-time operation.
PowerSet Mode (Synergic Assist for User Setup)	For MIG,, Pulse MIG, Flux-Cored, AC-DC TIG and Stick modes.
Rapid Adjustment Function	During parameter adjustment, press in on the adjustment knob responsible for adjusting/controlling the parameter value and the parameter will be adjusted in larger increments. (Amps x 10, Seconds x 1.0, % x 10 etc.)
On-Screen/In Menu Unit System Selector	Display outputs all measurements in either the Metric (SI) system or in the Imperial System (English/US). **Select from the on screen menu MET (METRIC) or IMP (Imperial) to change units of measure.** All speed measurements, diameters and thicknesses will be changed and displayed in the user selected unit system.
Dimensions with Handles installed (installation optional)	20.1" H X 11.9" W X 28" L (510mm H X 300mm W X 710mm L) Includes handles and fittings stick-out.
Display Dimensions and Type	5" (127mm) Diagonal Measurement. 1280 x 720 (720P) High Definition TFT Full Color LCD.
Weight (Bare Unit)	82 lbs.
Standard MIG Gun Type/Length/Connector Type	North 36 series MIG Gun 10 ft (3m) with Euro Quick Connect.
Standard TIG Torch Type/Length/ Connector Type	NOVA Rigid-Neck 18 Series 350A Water-Cooled, 12.5 ft. (4m) DINSE 35/50mm^2 (1/2" nominal lug diameter). **NOTICE:** The water cooled gun supplied with this unit must always be used with the optional water -cooler. To use this unit with TIG without a water-cooler, you must purchase an optional Air-Cooled Gun. The largest Air-Cooled Gun is the 26 series and reaches a maximum rating of 200A DC and 175A AC at 60% Duty Cycle.
Optional Standard MIG Guns and Liners Information. (IMPORTANT: For best results, always use the smallest liner available for the wire you select).	*To accommodate the maximum 275A capability and general heavy-duty design of the welder, the North 36 series is included with the welder as the standard MIG gun. It is designed for heavy-duty spray arc transfer with .045" and .062" (1/16")Steel wires. It comes with a yellow liner for .045-.062" liner. For wires .045" or smaller, especially for short circuit operation up to 250A, the 24 series MIG gun is recommended. The 24 series gun comes standard with a .040 to .045" red liner. For wires smaller than .040" in diameter, a blue liner (.023-.035") must be purchased in addition to the stock liner that comes in either gun. For spray-arc of steel and stainless steel .035" wire is the smallest diameter wire recommended. For aluminum, if not using a push-pull or spool gun, the 24 series 10 Ft. standard gun can be used with a polymer liner for .047" (3/64"/1.2mm) wires to weld. In fact, .047"/3/64" Aluminum wire is recommended for all MIG welding of aluminum. For Pulse MIG, even though smaller wires are supported in the programming, .040 or .047" wire can be used for the entire range of adjustment with better results on thin materials than smaller diameter wires. (This may seem counter-intuitive, but it is the industry practice with pulse-mig welding of thin materials.) The polymer liners for Aluminum use the same color coding as the steel liners. Without pulse, the thinnest material to get satisfactory results is generally considered to be 14 gauge to 1/8". Welding Aluminum with a regular MIG gun and polymer liner or with a push-pull gun will require U-groove drive rolls to be purchased and installed.*
Ingress Protection Rating	IP21S
Operating Temperature Range	14-104°F/ -10-40°C (If operated higher than 104°F/40°C then duty cycle will be lowered significantly.
Recommended Welding Cart (Optional)	PowerCart 400 (MTS Version) or PowerCart 375
Recommended Push Pull Guns	Parker DSP360A (Pistol Grip) or North MPG 300A (Inline-style grip)
Recommended Spool Gun	Parker SGP360A

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Getting Started

UNPACK THE UNIT.

Upon arrival, you will need to completely unpack your unit, and check things over. This is a time sensitive matter. Do not delay or hold the welder unopened in the box. First, make sure the unit is opened from the top. Be careful with using knives and sharp objects so you won't cut cords and cables inside the boxes. Lay all items out and inspect them.

You should have the following in your box:

1. Lightning 275/275P Multi-Process MIG/DC TIG/Stick welder.
2. Wired NOVA Foot pedal 25 ft. (NOVA wireless pedal optional).
3. NOVA 18 Series water-cooled rigid neck torch 12.5 ft. (4m).

3a. 2T/4T Remote torch switch (maybe loose or attached to torch)

3b. 18 Series TIG Torch consumable starter kit (no tungsten).

4. North 36 series MIG gun 10 ft. (3m).
5. 300A Stick electrode holder (approx. 9.5 ft with cable).
6. 300A Work clamp (approx. 9.5 ft with cable).
7. Argon regulator, floating ball type with hose.
8. *Installed, not pictured:* 6.5 foot power cord with NEMA 6-50 Plug.
9. *Packed separately, not installed:* Front, rear and middle handles.
10. 240V to 120V Pig Tail Adapter.

NOTICE:

The foot pedal may arrive with the top separated from the bottom. This is not damage. The top can easily be installed on the bottom, by aligning the pivot pins with the corresponding holes for the pins located in the top. The pins are spring loaded and can be squeezed so that the top slides down onto the pins. The pins will pop out into the holes and allow the top to pivot once the pins and holes are properly aligned. You may need to make sure the pressure return spring is flipped so that it pushes back against the pedal as it is assembled. Similarly, the foot pedal may be easily disassembled by pressing in on the ends of the pins on both sides to remove the top.

Upon receipt of the package, immediately open the box to inspect the welder for damage. Check the general condition of the accessories. Some slight rubbing or chaffing of some of the accessories may be present. This is considered normal. Make sure everything is present and accounted for from the list above. If any item is damaged or missing, please inform Everlast within 72 hours of product receipt. See pages 4 and 5 for more details. Check all packaging, box corners and flaps for small items.

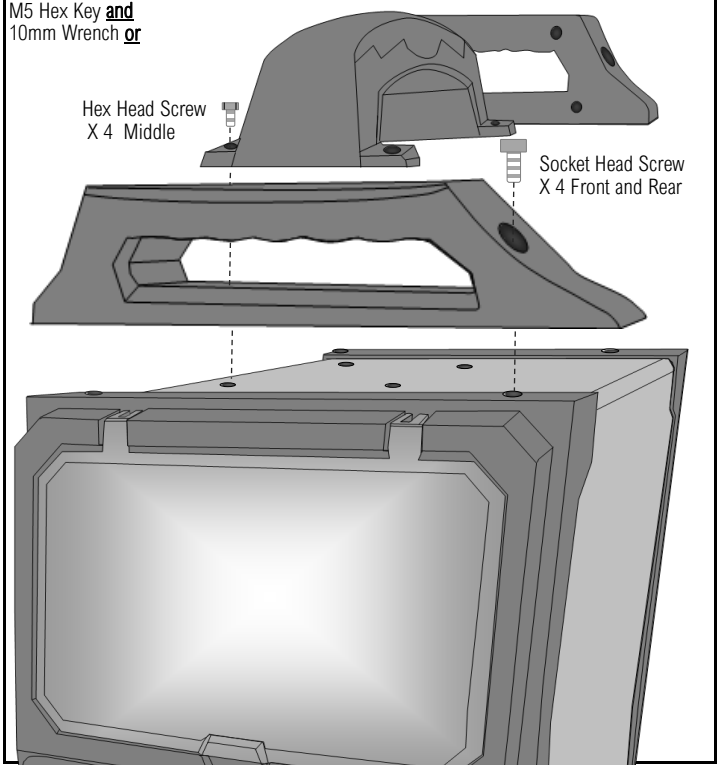
ASSEMBLE AND MAKE THE UNIT READY FOR USE.

Assemble the front, middle, and rear handles with the supplied screws. Do not overtighten. Handle assembly is optional for some non-portable and space limited applications, but all handle screws must be installed in the panel even if handles are not used. Carry the unit only by the handles. *Screws are usually found pre-mounted in the case.* Remove the factory shipped plastic sheeting covering the LCD Color screen. For maximum screen protection, install a cut-to-fit screen protector (customer supplied) on the screen before use.

Assemble the Handles

Screws may already be mounted in the machine. If not, they are in the accessory packaging.

Tools Needed:
M5 Hex Key **and**
10mm Wrench **or**



POWER UP AND TEST THE UNIT.

You will need to fully test the unit as soon as possible. Within 72 hours after delivery of the unit, be sure to have every thing you need at hand to test the unit. Make sure the correct input power, wiring, and receptacle configuration is used. Then, power up your machine without any accessories installed. Allow the unit to initially idle for 15 minutes. Check and observe operation of knobs, controls and keys, cycling through each as required. *Make sure the fan is operating via the control panel menu setting.* After the test is completed, turn the unit off, connect the accessories and recommended shielding gas(es) to conduct live testing. Test all of the functions and features of the machine. For testing and welding, make sure the work clamp is connected directly to the work (part being welded). Check for arc starting and stability. If problems are observed, contact Everlast for further guidance. See page 5 for more information.

NOTICE: *Cosmetic damage claims made after 30 days will not be accepted. Unless Everlast is contacted and informed of such delay with legitimate reason for such a required for a delay (i.e. Overseas deployment or sudden disability) cosmetic claims will not be considered. Everlast determines*

Getting Started

what is considered to be a legitimate delay. Keeping the product in a box it is needed is not considered a legitimate delay.

CHECK FOR GAS LEAKS.

This unit has two gas connections on the rear. Each connection should be tested. Be sure to check for gas leaks before attempting to weld. You can best test this by first installing each torch separately.

For TIG: Install both back caps into the TIG torch head (from both sides). Next, remove the gas plug on the rear (save for storage use) and install the regulator. Tighten fittings on both cylinder and unit (see section on regulator installation). After the regulator is secured, press the "purge gas" button on the front of the machine so that post flow can flow. Observe the ball on the regulator. It will float up while "purge gas" is active. The gas flow rate can now be adjusted with the knob on the regulator. If, after the purge has been discontinued, the ball continues to float, or if you hear or suspect leaks, use warm, soapy water (or a dedicated leak testing solution available from welding suppliers) to spray all connections, including the TIG torch connections at the head, and back cap. Don't forget to check the connections underneath the torch handle. If any leaks are present, bubbles will form around the area of the leak. Tighten any clamps or fittings found to be leaking. If the problem cannot be remedied, contact Everlast. Over-tightening the brass gas fitting at the rear of the unit can lead to cracking the gas inlet fitting on the welder Use one wrench to hold the fitting on the welder while tightening the regulator-side fitting.

For MIG: The process of testing MIG is similar except the MIG gun should be installed securely into the Euro-Quick connect base on the unit. The hand nut on the gun connector should be tightened and the gun connector should be gently wiggled and pushed in at the same time to check for secure seating. Retighten the hand nut on the connector. Do not use tools. Hand tighten the Euro– Quiok connection only. Check all connections and use the same technique used to check for TIG leaks.

DISTANCE YOUR WELDER FROM YOUR WORK.

As a best practice technique, be sure to locate the welder away from the immediate welding area. The fan found in your unit is powerful enough to create strong air turbulence in the weld area. When the fan cycles on, it can disrupt the smooth, even flow of shielding gas around your weld creating unstable arcs and porous welds, resulting in dull finished weld. If possible, the welder should be located at least 6 feet away from the weld area and should be placed on a different level to prevent weld porosity and defects being created by the welder's fan system. Keep in mind that air flow exits from both the front and the sides of the welder.

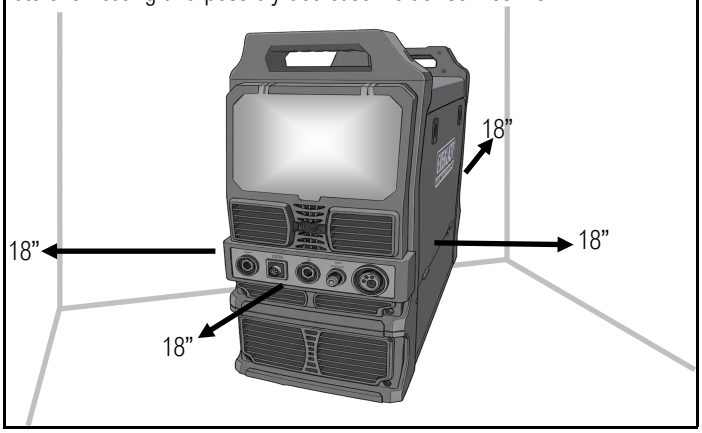
GIVE YOUR WELDER SPACE TO COOL.

Maintain enough unobstructed space around the welder to allow free flow of air so that it can cool itself. Position the welder in a way that will allow 18" from the front, back and sides to allow for proper air flow for optimum cooling. The welder pulls air in from the rear. It then pushes air through the unit's heat sinks to cool the electronics. The air is then exhausted through the front panel and side louvers of the unit. If any side is blocked or restricted, the duty cycle will be reduced, leading to possible damage from chronic overheating.

The recommended Everlast/ NOVA Cart 375 LF has ample room for cooling built into the design of the cart. Never attempt to restrict air flow by attaching filters to the vents or altering the vents in any way. *Home-built carts need to allow free flow of air on all sides. Dividers and blocking plates should be avoided. Never place multiple machines side by side unless the proper air space is observed.*

Allow Air Flow Space of at least 18"

Keep a distance of 18" from all sides of the welder to promote cooling and preserve duty cycle. Less air space will reduce duty cycle, accelerate overheating and possibly decrease welder service life.



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CONNECT THE WELDER TO THE OUTLET.

NOTICE:

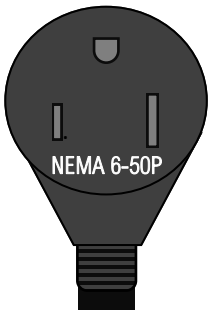
The National Electric Code (NEC) under Article 630 has developed specific regulations for wiring electrical service for welding equipment. These rules are different than for other types of service such as a stove or dryer in a household or even in a commercial application. You need to consult and/or employ a locally licensed electrician before installing this unit to make sure all national and local codes are followed. If you are not qualified, do not attempt to wire any outlet or make any electrical power connections or related determinations of electrical code. Everlast is in no way liable for any damages caused by improper connection of this welder. As a rule, your welder should be on a dedicated branch circuit not far from an electrical disconnect box. It is very important that the welder not share circuits with other shop or household items. Do not attempt to adapt existing household circuits because conductor wire colors are different for welders. Additionally, only 3 wires are used for single phase welders. No neutral is used in a welder circuit. The white and black wires are used as conductors in a single phase welder service. A red wire is not used. *The input power cable and plug conforms to North American standards for size, length, with consideration given to inrush amperage, rated amperage and duty cycle. Do not modify, or attempt to rewire your unit. This will void your warranty.*

Your unit has been shipped with a NEMA 6-50P plug and 6.5 ft. (2m) cable installed on the unit. This is the standard type plug used for 240V 1 phase welders in North America. For single phase 240V connection, select a NEMA 6-50 Receptacle for operation with this unit. (Other regions/ countries vary). A neutral is not used. In a dedicated circuit, the wire wires supplying power (the conductors and ground) are black, white and green. A red wire, which is traditionally used as a "hot" leg (power conducting wire) of power is not present in a three-wire 240V wire circuit of a welder. From the panel box, the Black wire serves as L1(Hot), White serves as L2 (Hot) and Green serves as G (Ground). No neutral wire is needed, so white is often used as a "hot" conductor wire in this instance. It is recommended to either install a receptacle as close to the main panel as possible or install a subpanel cutoff as close to the outlet and welder as possible. Always follow local codes when making these connections. **Do not share or piggyback another device anywhere on the circuit.**

DUAL VOLTAGE OPERATION.

This unit is a dual voltage unit, which means it can operate on 120V or 240V power. To operate the unit on 120V, connect the NEMA 6-50 to NEMA 5-15 pigtail adapter supplied with the welder. Plug the unit in and turn the welder on. The welder will automatically sense the voltage and the adapt the output when it is switched on. Be aware that 120V operation reduces the power output of the unit. When the unit is switched on the 120V indicator will be displayed in a yellow box located in the top information bar on the screen. When the pigtail plug is uninstalled and the NEMA 6-50 plug is reconnected direct to 240V, the screen should again display 240V in a green box when switched on. If you are operating on 240V, but the display continues to display the 120V yellow box in the information bar, stop using immediately. The power supply may have a lose wire or a damaged breaker, or the outlet may be mis-wired.

Standard Plug Configuration 1 Phase 240V



Selecting A Breaker and Wire Size

Select a breaker based off of the I_{1MAX} rating of this unit. This is the maximum inrush current of the unit. The inrush is not a sustained current. The I_{1EFF} rating of the unit is the maximum "rated" current of the machine. When combined with the length of the run from the main panel, this determines the conductor size needed to supply the welder, Refer your electrician to Article 630 and the specification page of this manual (or the specification grid printed on your unit) when selecting the correct breaker and wire size. Use a delayed trip breaker, or slow blow fuse.

Using with 208V 1 Phase

This unit may be operated with 208V service 1 phase service in some circumstances. However voltage should be checked under load before allowing permanent installation. Voltage should not fall below 206V or damage may occur to the unit. Most modern 208V service runs several volts above 208V and is not usually a concern. Older installations where service wiring may be degraded or not up to code may produce sub standard or low voltage not suitable for use with this unit. As a best safeguard, check with Everlast Tech support before use.

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Breaker Sizing and Wiring Requirements

Before installation of this unit in any facility, always consult a licensed local electrician familiar with the requirements of properly wiring a welder into the electrical supply. Refer to the National Electric Code (NEC) and local codes. If needed, refer the electrician to Article 630 of the NEC during consultation to determine proper application and wiring needs. Use the $I1_{MAX}$ and the $I1_{EFF}$ ratings listed above to determine the proper breaker and conductor (wire) sizing required. Everlast welders are designed around use in industrial wiring applications and are intended to be used with modern electrical systems. Household wiring may need to be upgraded before this welder may be installed.

NOTICE: The ratings and methods in the NEC for wiring single phase 240V welders are different from wiring common household 240V equipment/appliances. Please see information in this manual or use the data/specification information found printed on the side of the welder for official values.

WARNING! Do not modify the welder wiring. This unit meets the standards for conductor sizing on the power cable and takes

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CONNECT YOUR UNIT TO SHIELDING GAS.

Always wear safety glasses when installing a gas cylinder to the welder. Before installing the regulator, stand to the side of the cylinder valve, out of the way of the path of gas discharge. Make sure no one is in line with the valve discharge or near the valve outlet. Then, give a quick blast of gas from the cylinder by rapidly opening and closing the valve approximately 1/2 to 3/4 turn as seamlessly as possible. This will dislodge any dirt or particles stuck in the valve or the threads. This will help reduce the chance of dirt particles getting into the solenoid valve, causing future sticking and failure issues.

This unit is equipped with two 5/8" CGA rear gas connections, one for the MIG shielding gas and one for the TIG shielding gas. This allows both cylinders to be connected at the same time. These connectors are clearly marked on the rear of the welder. When connecting, be sure to match the gas to the correct gas connector.

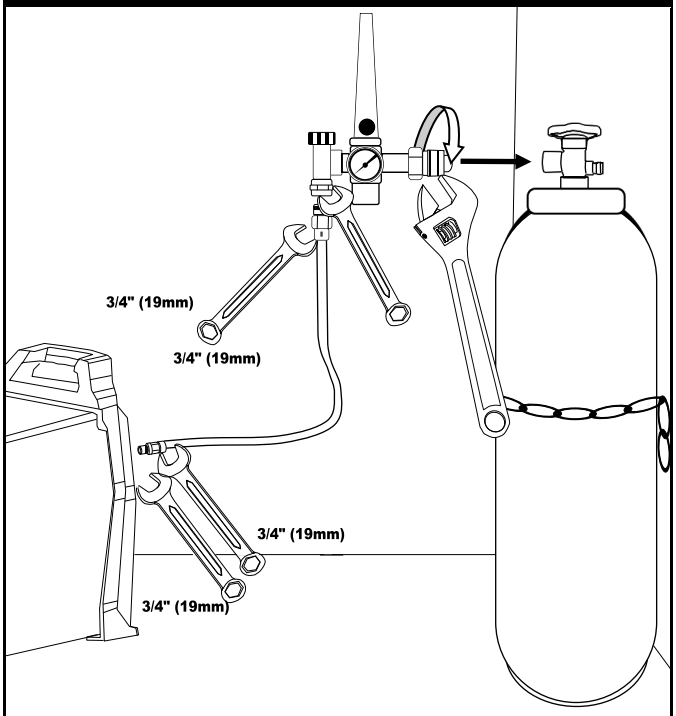
The welder is supplied with one regulator, which means the regulator be swapped from one cylinder to the other when changing from MIG to TIG or vice versa. However, if both MIG and TIG gas need to be connected at the same time, purchase an additional regulator. The unit will automatically switch between the two gases if both are connected and turned on. If only one connecter is connected, be sure to keep one of the red plastic plugs (supplied during shipping) inserted into the vacant gas inlet fitting. To reduce solenoid and operating issues, both plugs should be kept inserted into the gas inlets when the machine is disconnected from the regulators or stored to prevent debris and insects from entering the connectors and contaminating the system.

To connect a North American Cylinders= with a CGA 580 valve to the regulator a cylinder wrench or 1 $^{1/16}$" wrench will be required. If you do not have a cylinder wrench or properly sized wrench, an similarly-sized adjustable wrench will work. However, make sure it is properly adjusted to prevent rounding of the shoulders of the fitting. Do not use pliers, or any wrench with a serrated jaw such as a pipe wrench to tighten the fitting.

Connect the regulator tubing to the regulator. The regulator tubing may have either a hose barb connection (Non-North American Markets) or a threaded connection (North American markets). If the regulator supplied has a hose barb, make sure the hose barb fitting is tight on the regulator. Tighten with a 3/4" (19mm) wrench. **If it is a threaded connection, use two 3/4" (19mm) wrenches to hold both the regulator and the tubing connection at the same time.** Hold counter pressure on the regulator connector while tightening the hose fitting to prevent damage to the regulator and to ensure maximum sealing. After connecting the tubing to the regulator, connect the other end of the tubing to the 5/8" CGA fitting on the unit. **Hold the fitting on the unit with one 3/4" (19mm) wrench firmly while tightening the regulator hose fitting with another 3/4"(19mm) wrench.** Other markets outside of North America may feature a hose barb connection in the rear.

IMPORTANT: This is a compression fitting! Do not use thread tape or pipe sealant on any cylinder, regulator or other unit connection. The residue and debris may get into the gas solenoid and cause operational issues. It is recommended that NPT 90° elbow fittings not be used in conjunction with these fittings to reroute the angle of the connection. Use only CGA 5/8" elbow fittings if rerouting of gas line is required.

Connect Regulator To Cylinder And Unit.



Note: In some regions, regulators may have a hose barb connection fitting on the regulator.

CAUTION!

Do not tighten the rear unit connection without holding the female 5/8 CGA fitting located on the unit with a wrench, or damage may occur to the bezel and the fitting as the fitting may turn in the housing while the hose fitting is being turned.

REMEMBER: *Do not tighten the rear unit connection without holding the female fitting on the unit side with another wrench. If you fail to do so, damage is likely occur to the bezel and the female fitting as the fitting may turn in the plastic housing. Overtightening will cause the fitting to snap-off in the solenoid housing or crack down the threads.*

Setup Guide

Getting Started

What Shielding Gas Should Be Used?

The Lightning 275 models are synergic welders which incorporates on screen recommendations for the type of gas needed for each process. The MIG gas recommended may change due to the settings of the unit. This change occurs when the wire settings cross over into the spray arc range when C25 (Steel) is selected on the panel. Keep in mind this is not an absolute guide, but is based off of generally accepted industry accepted thresholds. When the gas change recommendation occurs, the main display numbers will change to yellow to reflect the process limit has been reached. *If the gas is not changed, arc performance will begin to become increasingly erratic as the spray threshold is reached or surpassed.*

The following gases should be used with this unit:

MIG

Steel:

- 75/25 Ar/CO_2 (C25) for Short Circuit, Globular Transfer or Gas Shielded Flux Cored. (80/20 Ar/CO_2 is permissible in lieu of 75/25.)
- 100% CO_2 (C100) for Short Circuit or Gas Shielded Flux-Cored.
- 90/10 Ar/CO_2 (C10) for Spray Arc and Pulsed MIG. (92/8 Ar/CO_2 is permissible in lieu of 90/10 if not available but will slightly affect accuracy of settings. 98/2 Ar/O_2 is NOT recommended.)

Stainless (Inox):

- 98/2 Ar/CO_2 for Short Circuit, Spray and Pulse. (**Do not use 98/2 Ar/O_2 or the settings will not be accurate).**
- 75/25 Ar/CO_2 for Gas Shielded Flux-Cored (Consult wire mfgr.)
- Tri-Part Gas Mix is permissible for only short circuit transfer. However, it is not recommended due to extreme cost. (**NEVER use with Pulse or use for Spray Arc**)

Aluminum:

- 100% Ar (Argon) for all applications.

DC TIG

Steel/Stainless (Inox):

- 100% Ar for all applications.

For short circuit MIG welding steel, C100 setting is more economical, but will produce more spatter while welding. Never use for Spray transfer or Pulse.

While "Tri-mix" (Tri-Part gas mixes with Helium) are permissible for Stainless welding with MIG, 98/2 Ar/CO_2 is typically the most widely available and most economical shielding gas for Stainless Steel MIG. Do not use pure Argon (100% Ar).

Aluminum always requires the use of pure Argon (100% Ar) shielding gas while welding in MIG mode. This is a widely available and a standard gas throughout the world. Aluminum is designed to only be welded in a spray transfer setting. Short circuit should only be used for thin, non structural applications. Regardless, only pure Argon should be used.

For TIG, only one gas is used for all metals. 100% pure Argon.

What Size Cylinder Do I Need?

Gas cylinders come in a wide ranges of sizes. Cylinders range from about 20 Cu. Ft. to over 300 Cu. Ft. capacity. For this unit, there are at least two different gas types that will be used for MIG and TIG operation. This will necessitate either exchanging each cylinder at the store when a different process is used or you will need to have at least two cylinders on hand (possibly more, depending upon the metal you are welding). The size you use will depend upon how much of each process you expect to do. Average gas consumption is around 25 to 35 CFH for MIG and 15 to 25 CFH for TIG. To figure the actual amount of solid welding time cylinder will last use this basic formula:

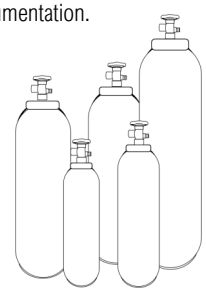
Cylinder Volume Size ÷ Gas Flow Rate = Hours of Approx. Operating Time.

Divide Total Operating Time again by 60% to add time for stopping to fit, cut, grind, measure and to allow for miscellaneous time not spent welding.

This should give you a rough idea how long the cylinder will last and what size you will need based off typical shop use patterns.

Gas supply companies have several confusing ways to rate their cylinder sizes. One way (the best) is to rate them by volume. Another way is by letter designation, which relates generally to a volume size (some may be slightly more or less volume than others with the same letter). Yet another way to rate them is to size them by height. The most common (nominal) cubic foot sizes (Cu. Ft.) are 20 , 40, 80, 125, 150, 200, 250, and 300/330 for most MIG and TIG gases. Assigned lettering and actual volume may vary from each supplier, so be sure to compare only volume when shopping. Larger cylinders do exist but these are not typically used in most small shops (except for CO_2). Not all gas companies carry the full range of gas cylinders that are manufactured.

When considering whether to buy, rent or lease a cylinder, many chain store gas suppliers will not sell any cylinder larger than 125 Cu. Ft. and some will not sell larger than an 80 Cu. Ft. due to a case law ruling. Some independent shops will sell the larger sizes. however. Shop around and compare as prices will often vary greatly, especially when selling to new customers. *Be careful when buying larger cylinders second hand since they often are labelled with a gas company's name on the round, flat metal ring on top of the cylinder at the neck. Depending upon the gas supply company, these cylinders could be considered stolen and can be confiscated. If so, another gas company cannot legally fill them.* A blank ring on the neck or a "customer owned" embossed ring or similar marking helps to ensure that the cylinder is customer owned. Some companies will offer to "sell" you a cylinder but will have the gas company name on them. In reality, these are often considered to be the company's cylinder and what they are selling you is considered a "lifetime" lease. Be certain if you buy a cylinder that you have the paperwork stating you own it outright and you have the original records or you could be out of money. Even if you have full ownership, there are some gas companies that will not fill a cylinder if another name is on the label without proper paperwork and documentation.



Setup Guide

Getting Started

SELECT THE CORRECT MIG AND FLUX-CORED POLARITY.

NOTICE: The Lightning 275 MTS and the Lightning 275 MTS-P vary from each other in the procedure involved to select wire feed polarity.

The Lightning 275 has an auto-select polarity feature, which automatically selects the correct polarity for you. Of course, this is provided that the correct work clamp polarity is selected at the outset because the Lightning 275 MTS cannot sense if the work clamp is in the correct location to begin with. However, the auto-select feature does automatically switch both the torch and the work clamp polarity between MIG and Gasless Flux Cored. The same is true when switching between Gas Shielded Flux-Cored wire and Gasless Flux-cored wire. It also automatically chooses the polarity for any other MIG related process when going back and forth between Gasless Flux Cored-Wire and any standard type MIG wire.

The unit's default or starting point polarity for all wire feed processes is electrode positive, which means the work clamp will be connected to the negative terminal. From there, whether it is MIG or Gasless Flux-Cored process that is selected the unit will automatically change polarity for you without further concern for polarity. The display screen on the welder will still remind you of the proper polarity, just as with the Lightning 275 MTS-P. Use this reminder to make sure that the work clamp is connected to the correct terminal, especially when switching from TIG to MIG or MIG to TIG.

<u>The Lightning 275 MTS-P does not auto switch the wire-feed polarity and must be manually changed when switching from one wire process with one polarity to another wire feed process with the other polarity or vice versa.</u>

Even though both welders operate similarly, the process switching is a key difference that separates the two that the user should remember. Selecting the right polarity is still key for both units, but once the correct polarity has been established, the Lightning 275 MTS takes care of the rest while using a wire feed process.

With the Lightning 275 MTS-P, when you desire to change wire feed welding processes, from MIG to Gasless Flux cored welding, you must physically change torch polarity inside the wire cabinet and the location of the work clamp when transitioning between the two. The welder provides an on-screen reminder of torch (electrode) polarity. However, despite this reminder, polarity is commonly overlooked or forgotten when changing back and forth between MIG welding processes and gasless flux-cored welding. Failure to change polarity will result in erratic operation, bird's nesting of the wire, poor fusion and excess spatter. MIG polarity will always require that the torch be positive. Gasless Flux-cored welding almost always requires a negative polarity.

Don't confuse the gasless Flux-cored welding process with the gas-shielded Flux-cored welding (dual-shield) process. Gas-shielded Flux-cored (dual shielded) welding uses both a specially formulated flux-cored wires and a typical MIG shielding gas, usually 75/25 Ar/CO_2 or 100% CO_2. Gas-shieled Flux-cored welding uses the same positive torch polarity as MIG.

It's important to note that gasless Flux-cored welding is a dirty, more spatter prone welding process and cannot be used with thin metal gauges. The standard MIG gun cannot be used. On the other hand, gas-shielded Flux-cored welding is much cleaner process. While there is still a thin layer of slag that must be removed, it is spatter free, smoother and has a faster deposition rate.

The gasless Flux-cored welding setting is not meant for gas shielded flux cored wire. **NOTE:** <u>Adding a gas to self-shielded Flux-cored wire does not mean that it is "dual shielded" wire.</u>

With the Lightning 275 MTS-P, regardless of the polarity required for the wire feeding process chosen, both the torch and the work clamp must be moved. If only one is moved, there will be no output because both torch polarity will result in either both torch and work clamp being the same polarity.

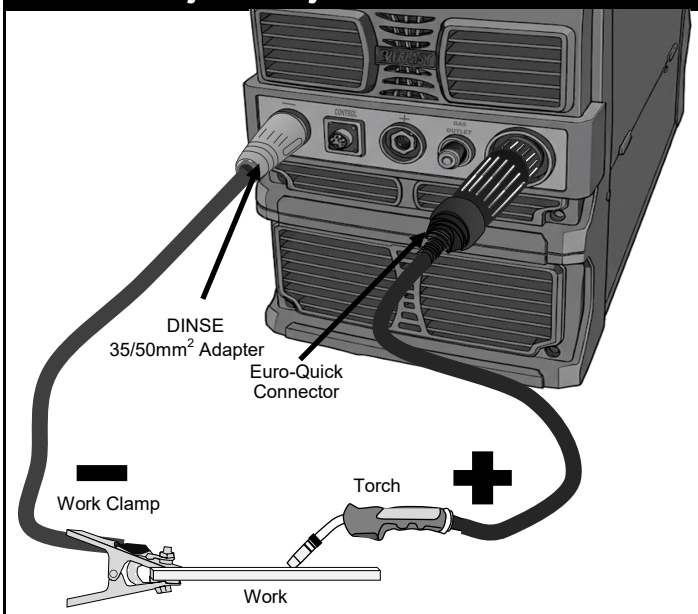
Setup Guide

Getting Started

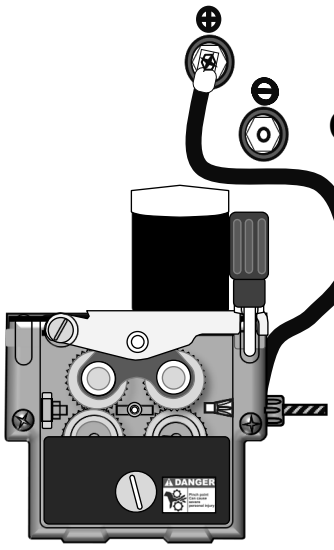
LIGHTNING 275 MTS-P POLARITY FOR WIRE FEEDING PROCESSES.

The following wire feed process diagrams specifically refer to the Lightning 275 MTS-P. Notice that both the work clamp and the torch polarity must be changed or the unit will not work.

What Is My Polarity For MIG/Gas Shielded?

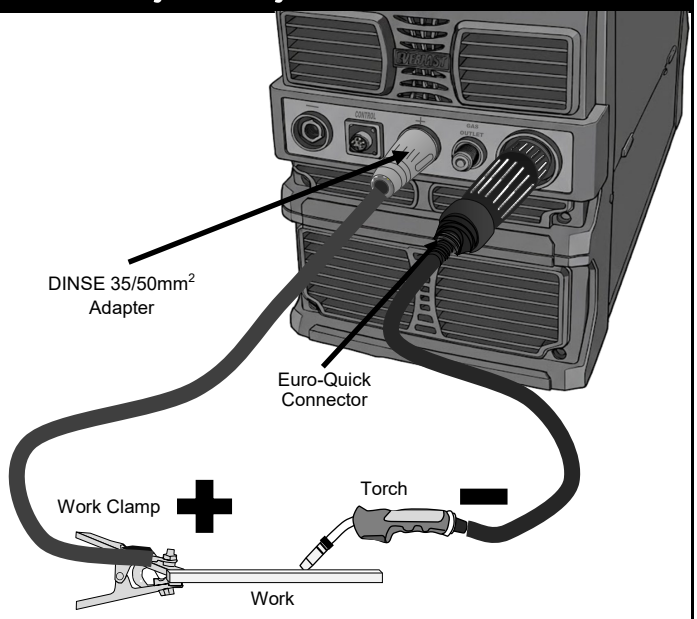


The MIG gun must also be correct in polarity for proper performance. Drop open the cover on the right side of the unit to access the wire spool and feeder. Just above the feeder, there are two terminal lugs. The upper is Positive, and the lower is negative. If there are no positive (+) or negative (-) symbols, there may also be a label that says "Gas MIG" and "Gasless". Regardless, the top terminal is positive and the bottom terminal is negative. For all MIG and most Gas-Shielded Flux Cored Wire, the wire feeder cable should be connected to the top, positive (+) terminal with via the provided screw. See below.

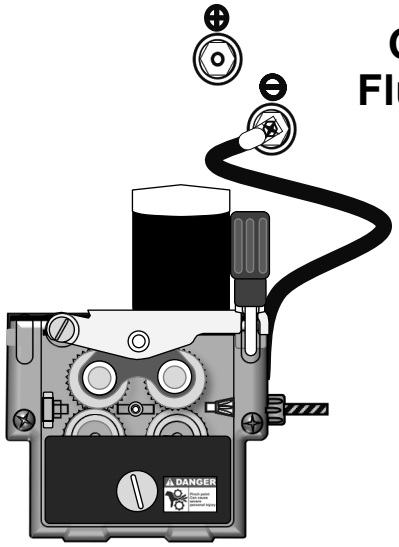


MIG/MAG & Gas Shielded Flux-Cored Polarity

What Is My Polarity for Gasless Flux-Cored?



When welding most all Self-Shielded (Gasless) flux-cored wires, polarity will be negative. There are a small number of exceptions. However, if the manufacturer doesn't state the polarity, assume it is negative. Drop open the cover on the left side of the MIG to access the wire spool and feeder. Just above the feeder, there are two terminal lugs. The upper terminal is Positive polarity, and the lower terminal is Negative polarity. If there are no positive (+) or negative (-) symbols, there will be a label that says "Gas MIG" and "Gasless" or similar terminology. Connect the wire feeder cable to the bottom terminal lug via the provided screw.

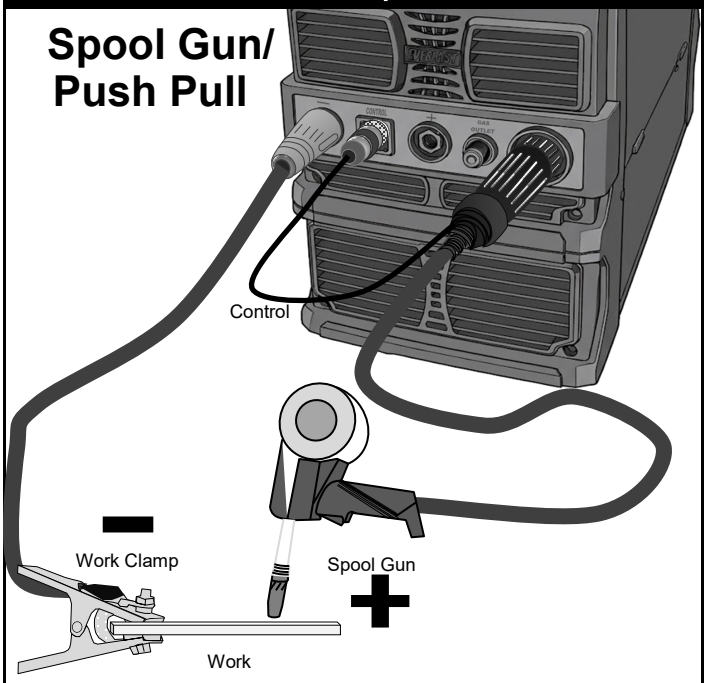


Gasless Flux-Cored Polarity

Setup Guide

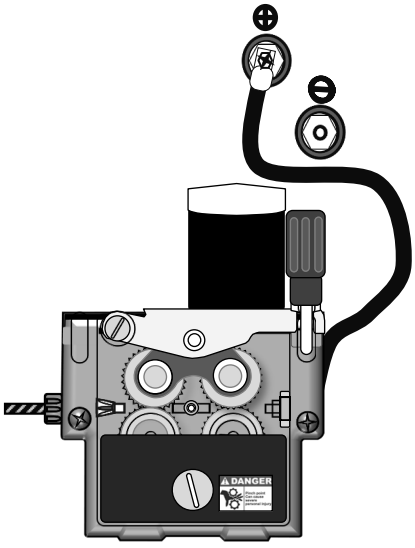
Getting Started

Where Do I Install The Spool/Push Pull Gun?



Spool/Push-Pull Gun Polarity

NOTICE: Spool guns and push-pull guns connect in the same manner and are installed using the same connections and polarity. Both versions of push-pull guns, while different in appearance, connect the same way to the unit as the spool gun does. The torch polarity for aluminum will always be positive (+).



INSTALLING AND USING THE OPTIONAL SPOOL GUN AND PUSH-PULL GUN ON THE LIGHTNING 275 MTS-P

Although the Lightning 275P can be used with U-groove drive rolls and a polymer PTFE liner installed in the standard 10 ft (3m) gun for welding aluminum and achieve excellent results, this unit can also be used with both a spool gun and a push-pull gun for softer alloyed aluminum wires and longer distance aluminum welding requirements.

For spool-gun applications, the optional Parker DSP 360 gun is recommended for this unit. Spool guns are typically for lighter work or for occasional MIG welding of aluminum. It is not the most economical way to weld aluminum. Using the standard gun, PTFE (aluminum) liner and U-groove drive rolls, or the Push Pull gun are much more economical to use, reducing price-per-pound cost by as much 2/3 or more.

The Everlast/North MPG300A Push-Pull gun recommended for this unit is the "snake-head" type which is an "inline" gun style. Although slightly heavier than a conventional MIG gun, this gun looks and feels more like conventional type MIG gun. The "Pistol Grip" Style Parker SGP 360 Push -Pull can also be used for those that prefer the weight and balance of this Heavy Dut Design.

Both spool and push pull units feature "on-the-gun" control of the Amps/ WFS. At purchase, be sure to specify that you need this newer style of control for the units. Do not attempt to adapt other brands or types of spool guns or push pull guns to the welder or the welder circuit may become damaged. There may also be problems for calibration. Use with other brand guns not approved by Everlast will void the warranty. If a "will fit" brand is being considered, call Everlast for evaluation and approval. Do not rely upon claims of other companies assuring compatibility.

Make sure to use electrode positive polarity for the spool and push-pull guns, which is the same for standard MIG welding for typical solid wire welding with a spool gun.

NOTICE: It is possible that some specialty wires may vary from these recommendations. Always consider the wire manufacturer's recommendations as the final authority on polarity. Adjust the polarity to match the manufacturer's recommendations. This should be rare. However, if this is the case, ignore the polarity reminder on screen. Operating contrary to the wire feed recommendation will not harm the welder. (This does not apply to TIG!) Most gasless flux-cored wires are electrode negative polarity. Use with gasless flux-cored wire with the stock gun is not recommended because there is no shielding gas to assist in cooling the gun, and the gun nozzle may become plugged or damaged due to the excessive amounts of spatter produced in gasless flux-cored welding. Source a dedicated Flux-Cored gun from an after-market supplier or if you cannot find a unit on your own, call Everlast for recommendations and options

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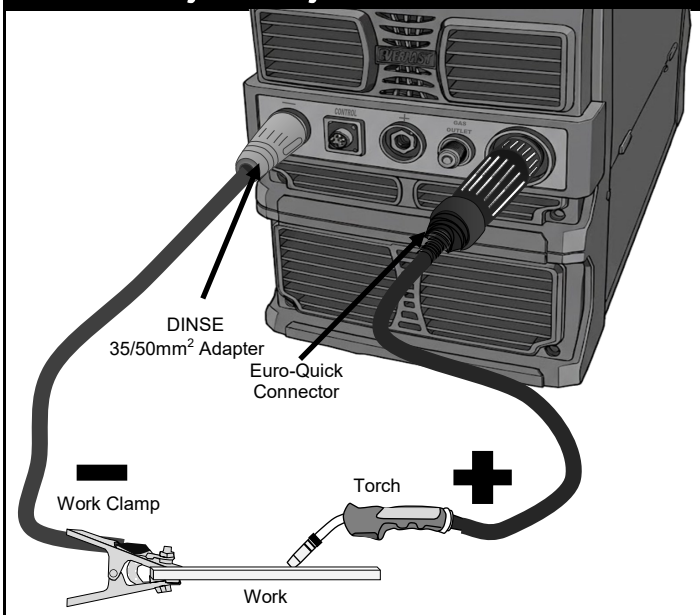
LIGHTNING 275 MTS POLARITY FOR WIRE FEEDING PROCESSES.

The following wire feed process diagrams specifically refer to the Lightning 275 MTS. Notice in the illustrations that polarity remains unchanged = the wire feed processes with this model. When welding with a Spool gun or push pull gun, the connections are similar to any wire fprocess.

What Is My Polarity For MIG/Gas Shielded?



MIG/MAG
Gasless Flux-Cored
Gas Shielded Flux-Cored
Polarity

INSTALLING THE OPTIONAL SPOOL AND PUSH-PULL GUN ON THE LIGHTNING 275 MTS

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For spool-gun applications, the optional Parker DSP 360 gun is recommended for this unit. Spool guns are typically for lighter work or for occasional MIG welding of aluminum. It is not the most economical way to weld aluminum. Using the standard gun, PTFE (aluminum) liner and U-groove drive rolls, or the Push Pull gun are much more economical to use, reducing price-per-pound cost by as much 2/3 or more.

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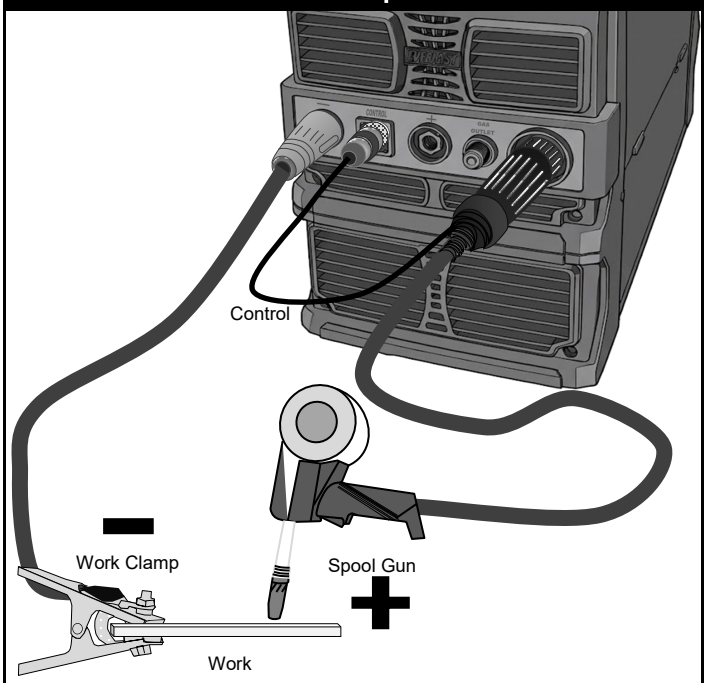
NOTICE: *It is possible that some specialty wires from certain manufacturers may indicate a polarity which is different from the one the machine has chosen. This should be a rare occurrence. But in these limited instances, the machine cannot be made to change the programmed polarity and poor welding performance will be experienced.. It is recommended that you source a wire that agrees with the polarity of the welder recommendations.*

Most gasless flux-cored wires are electrode negative polarity. Using the stock gun with gasless flux-cored wire is not recommended because there is no shielding gas to assist in cooling the gun, and the gun nozzle may become plugged or damaged due to the excessive amounts of spatter produced in gasless flux-cored welding. Source a dedicated flux-cored gun from an aftermarket supplier if using the unit for gasless flux-cored work. Contact Everlast for additional sources and recommendations on a flux-cored gun purchase.

Where Do I Install The Spool/Push Pull Gun?



Spool/Push-Pull Gun
Polarity

Setup Guide

Getting Started

NOTICE: For Both TIG and Stick processes, both the Lightning 275 MTS and Lightning 275 MTS-P are setup the same for polarity. There is no need to swap the torch and clamp location for AC use to weld aluminum. Once installed, torch polarity and work clamp location are never moved.

SELECT THE PROPER TIG POLARITY AND CONNECTIONS.

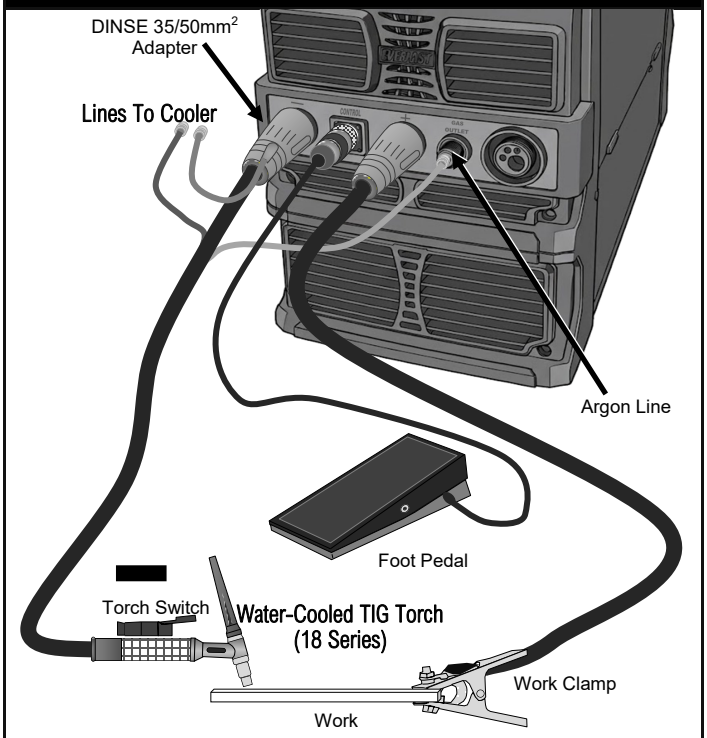
Selecting the correct polarity for TIG is quite simple. To TIG weld any metal, the TIG torch will always be connected to the negative (-) output terminal located on the right side of the welder. Polarity will never change as long as you are TIG welding. If you select the wrong TIG polarity (Positive +), the Tungsten will be rapidly consumed. It will ball up and draw back to the collet body after only a few seconds after the arc is struck. Also, because the HV/HF connection is connected to the negative terminal, the arc will typically be hard to start, since the HV/HF starting energy would be flowing the wrong way through the work clamp and torch. Of course, if the TIG torch is correctly connected, the work clamp will be connected to the positive (+) terminal located on the left side of the welder. ***NOTE:*** *The interior MIG polarity connection for the Lightning 275 MTS-P under the cover is irrelevant during TIG operation. It does not carry current to the TIG torch.*

The TIG torch switch or the Foot Pedal is connected to the 7 pin control connector. This allows you to select 2T or 4T control with the torch switch OR foot pedal control on the panel. A torch switch or foot pedal must be connected *unless* live lift is selected in the screen menu to be able to start the arc. If live lift is selected, no switch or pedal will be required.

SELECT THE PROPER STICK POLARITY.

The electrode holder, or stick torch (also commonly called a "Stinger") will almost always be connected to the left positive terminal of the machine when welding in DC Mode. The work clamp will then be connected to the negative terminal on the right side. This is known as DCEP (Direct Current, Electrode Positive) or "reverse polarity", Although "reverse polarity" is an older term, this is still used to refer to Stick torch polarity as is DCEP. Most all welding electrodes (rods) weld primarily in DCEP. There are a few rods like E6011 which can operate well with either polarity. Even so, the preferred polarity is DCEP. Reasons for welding with DCEN are usually to provide a softer arc or to reduce burn through with aggressive rods which produce a driving, harsh arc. Switching to straight polarity (DCEN) in stick mode will not harm the welder, but it may not produce reliable or sound welds.

Where Do I Connect The TIG Torch?

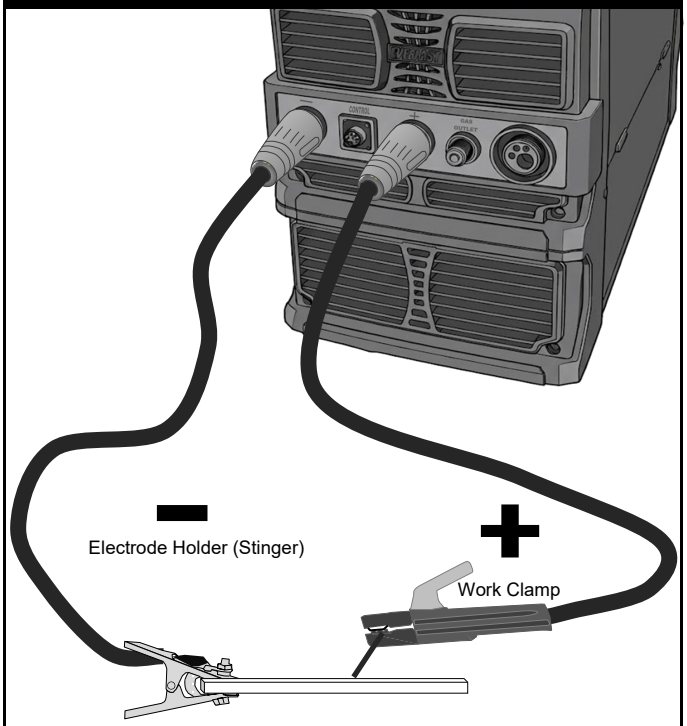


NOTICE: Choose between the torch switch operation (2T/4T) or the foot pedal operation. Only one can be connected at the same time.

Polarity for AC and DC TIG

Polarity does not change between AC and DC.

Where Do I Connect the Stinger for DC?



Polarity for DC Stick

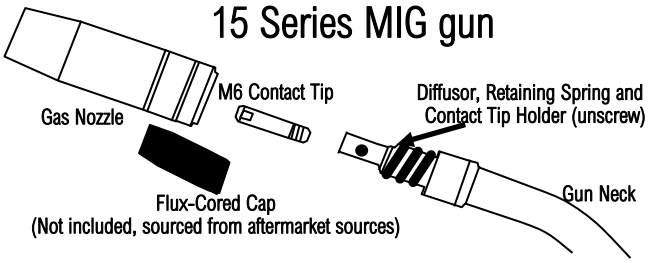
This unit does not feature AC Stick welding.

Setup Guide

Getting Started

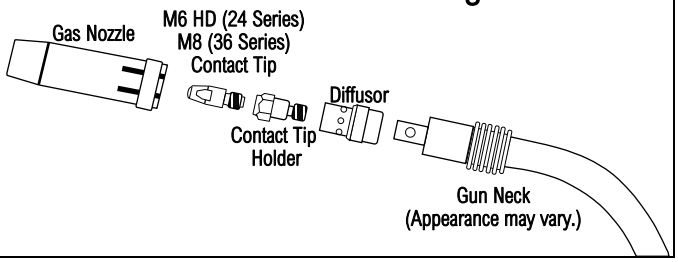
How Do I Disassemble the MIG Gun?

15 Series MIG gun



Always remove and install the 15 series gas nozzle by twisting clockwise.

24 and 36 Series MIG gun



USE THE CORRECT GUN AND LINER.

This unit is delivered with a 36 series gun which is rated for the maximum output of this welder. It is designed for use with Spray and Pulse operation with wires .045" and greater in diameter. This gun may be too big or bulky for more delicate operation and is not designed for short circuit operation. The supplied yellow liner may also be too big as it is designed for .045/.047" and .062" steel wires. The liners are color coded and are designed to operate best with the correct sized wires. Blue liners are for .023" (.025"/ .6mm) to .035" (.9mm) diameter wire. Red Liners are for .040" (1.0mm) to .045" (3/64/.047"/1.2mm) diameter wire. This color coding system also applies to the polymer PTFE liners as well. If short circuit and non pulse welding below 250A is expected, purchase a 24 series gun. If light duty short circuit is used, and maximum flexibility is needed, the 15 series gun can be purchased. These guns are to be purchased in addition to the supplied 36 and are not exchangeable after the sale. These are optional optional purchases you may make in addition to the standard gun at the time of or after the sale. You may also need to purchase the correct liner as well. The 36 is delivered with a yellow liner, the 24 with a red liner and the 15 with a blue liner installed. The liners, including the PTFE liners for aluminum, are interchangeable with these guns.

CHECK AND CHANGE YOUR DRIVE ROLL.

The unit comes with a pair of .035" and .045" drive rolls installed. Remember, if you change wire size or type, you will need to either flip both of the lower drive rolls over for the opposing size or completely change both of the drive rolls out with the ones of correct size and type found in the consumable bag. When not in use, keep these "spares" put up where moisture and dust cannot get to them. They will rust if not stored properly.

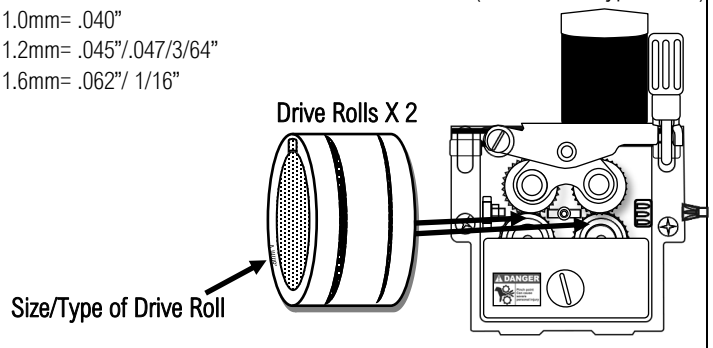
The top drive rolls are actually idler rolls used to hold tension and keep the wire in the groove. These should not ever be removed or changed unless damaged. Only the bottom drive rolls needs to be changed for proper sizing. Each of the bottom drive rolls have two small grooves that are sized for .035" (.9mm) and .045" (1.2 mm) solid wire. **NOTICE: .045" is nominally the same wire as .047" and 3/64" sizes. The small discrepancy (.002") in wire size will not matter.** Additional sizes and types of drive rolls are available as options. The standard installed drive roll is meant to feed hard (solid) steel wire. The groove on this drive roll has a "V" shape designed for the solid wire. A Flux-Cored drive roll has a serrated edge to the groove, which grips the softer, cored wire. Viewing a flux-core drive roll from the top, you will see a "zipper" like pattern. This should never be used to feed hard steel, stainless or aluminum wire. This will result in damage to the wire, metal flaking and possible plugging of the MIG gun liner. To determine the exact size of wire and type you have, look at the side of the drive roll. The size of the drive roll groove is stamped on the side of the drive roll closest to the corresponding groove. The type of the drive roll will also be stamped with a V if it is for solid (hard) wire. If it is stamped with an "U", this is a special drive roll for feeding aluminum wire. Aluminum wire is best fed with the push pull gun or the standard gun with a PTFE liner and U groove drive rolls..

The drive rolls are held in place by a screw. Use a flat head screw driver to gently remove the screws to expose and change the drive roll. The drive rolls are mounted on a bushing. To prevent the bushing from being removed along with the drive roll, use the index finger of one of your hands to hold the bushing while the other hand removes the drive roll. When removing make sure that the square locating key is not dismounted. If the key falls out of the keyway, replace it before replacing the drive roll. When

Drive Roll Size and Location Info

.6mm =.023"/.025"/.027"
.8mm= .030"
.9mm= .035"
1.0mm= .040"
1.2mm= .045"/.047/3/64"
1.6mm= .062"/ 1/16"

V= V-Groove (Solid Steel/Stainless Wire)
U= U-Groove (Aluminum/Bronze)
K or X= Serrated Groove (Flux-Cored Type Wires)



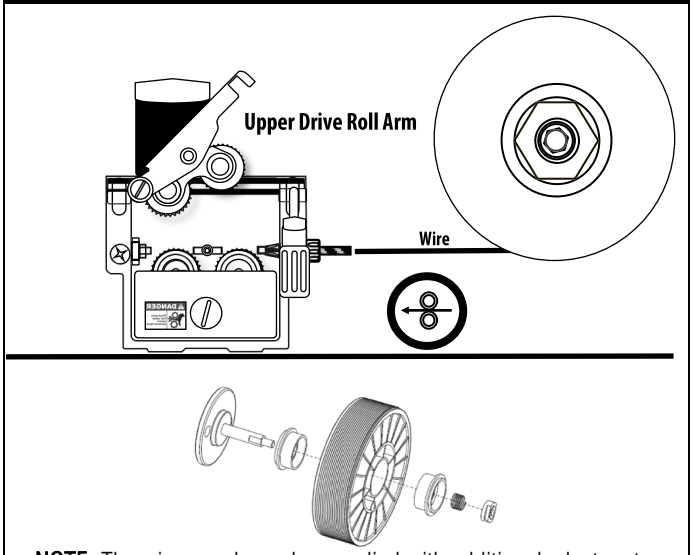
The side of the drive roll is stamped with the groove size and type. Inspect the drive roll and find the size and type of drive roll etched/stamped on the side. Orient the drive roll and install it so that the side with the desired stamped wire size is physically facing toward the inside wall of the welder. The groove and stamp are on the same side of the roll and are not opposite facing as with some brands. Each drive roll has two different sizes.

Getting Started

the drive roll is reinstalled, just lightly snug the screws with the screw driver. Do not over tighten.

INSTALLING THE MIG WIRE SPOOL

Installing the MIG Wire Spool



NOTE: The wire spool may be supplied with additional adapters to accommodate both 8" and 12" diameter spools (10 to 12 lbs. and 30 to 44 lbs.). These are used to hold the spool in place.

The spacers may be flipped to the short edge side facing the spool or one of them removed or any combination to accommodate different spools so that the spool stays centered on the carrier axle. The outside spacer will always be used. When properly centered, the door will shut. If the door does not shut, rearrange the spacers. Not all spacers will be used on larger spools. Do not use more than 44 lbs. spools or the spool carrier assembly may be damaged.

Install the wire spool as shown above. Once the wire spool has been installed, flip the tensioner lever down and raise the top drive roll to the upper position. Gently guide the wire from the spool over through the wire feeder and into the front section of the gun at least 6 inches. Make sure the wire lays neatly in the groove. Hold it with your finger if necessary as you lower the top drive roll down and raise the tensioning lever with your other hand. When complete the wire should look like the illustration on the previous page. *Hint: The wire on the spool is usually bent and threaded through a small hole in the side of the spool to lock it in place and prevent de-spooling of the wire. Keep one hand on the wire spool to prevent despoiling and cut the wire loose with a pair of wire cutters. Trim the wire to make sure the end of the wire is straight and able to be threaded through the wire feeder mechanism and gun.* After the tensioner is raised back to the vertical position, confirm the wire is still in the groove and is not riding up on the shoulders of the drive roll.

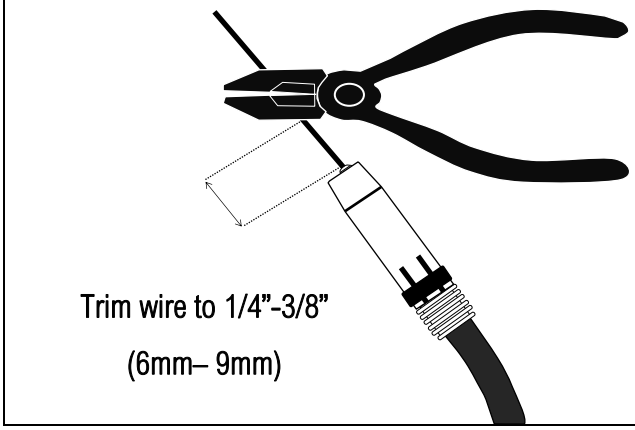
Next, turn the welder on and set to a desired MIG or Flux-Cored mode.

NOTE: This unit is equipped with the 36 Series MIG Gun. However it can also be used with the 24 series MIG gun or 15 series MIG gun (optional purchase. If using the 15 series gun, remove the gas nozzle by twisting it *clockwise* and pull. Never turn the nozzle counter clockwise! Unscrew the contact tip as shown in the illustration "How Do I Disassemble the MIG Gun?." All guns are illustrated. Hold the gun cable and gun straight as possible. Press and hold the wire jog button. The wire should slowly begin feed through the gun cable and on through to the gun tip. As the wire exits the gun, allow 3 to 4 extra inches of wire to be fed out past the diffusor. Release the wire jog button. Re-install the contact tip over the wire and screw it in clockwise until it is tight, but not to the point of stripping. Install the gas nozzle.

When using the 36 or 24 series gun, make sure that the ceramic diffusor is carefully handled. Tipping the gun with the contact tip holder removed so the gun points down may cause the diffusor to drop out and break on the floor. To change the tip, hold the gun so the contact tip faces up. *Ordinarily, the diffusor has a long life and is durable. But dropping the gun while hot or while the gun is nozzle is removed, may cause the diffusor to crack or shatter.* The diffusor design provides superior gas coverage over the weld and allows a cleaner weld to be produced, and will last a long time if these precautions are observed. (A minor chip will not require a new diffusor unless the diffusor is cracked.)

TRIM THE WIRE AFTER INSTALLATION.

Trim Wire Before Starting a Weld



Trim the wire sticking out of the nozzle to 1/4" to 3/8" (6mm to 9mm) in length with wire cutters. See the illustration above. The gun is now ready for welding. *Hint: Always make sure that you re-trim the wire before beginning a new weld if the wire is not already trimmed to this length. This will help to improve restarts.*

PROPERLY TENSION THE WIRE FEEDER.

To feed properly, the wire needs to be tensioned before you begin welding. The tensioning lever has numbers on the dial. To increase tension, rotate the tension lever clock-wise. Different types of wires require differ-

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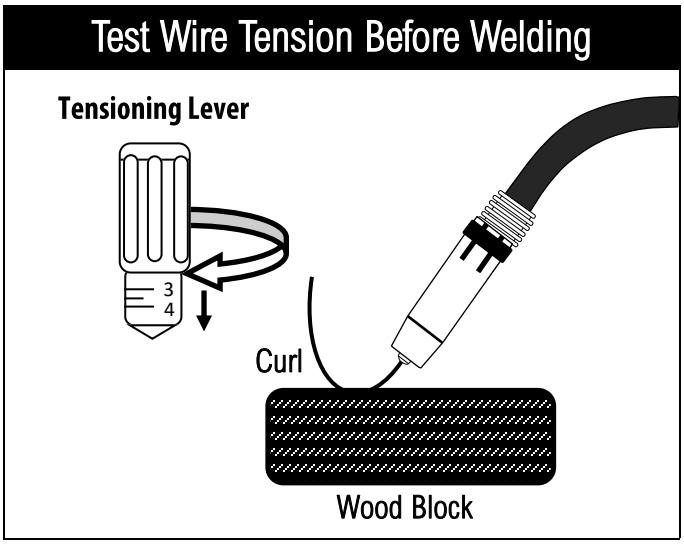
ent tensions. There is no exact tension that works for all wire types. However, for steel wire, you will generally tension to at least 3 to 3.5 on the dial. For flux-cored wire, use 2 to 3. For Aluminum use 2 to 2.5. Wire diameter also plays a small part in the amount of required tension that is needed. Regardless of the wire type or wire diameter, follow the process below and refer to the following illustration. Turn the unit on and use the wire jog to feed the wire until the wire extends approximately 1" beyond the gas nozzle.

- Find a small block of wood, such as a two by four, and secure it to the welding table or other solid object. **Do not perform this on metal or arcing may occur!**
- Hold the gun approximately 2 inches off the wood. Aim the gun at the block of wood so that the nozzle is at a 30 degree angle.
- Pull the trigger and allow the wire to contact the block.
- Increase wire tension so that the wire contacts the block of wood and is forced to curl up. Continue holding the trigger so that two or three full spirals are made.
- If the wire stops, or stutters during this process, let go of the trigger immediately and increase tension.
- Adjust the wire until the stuttering or jerking disappears.
- Do not over-tighten the tensioner or use more tension than necessary. When the wire begins to curl without any stoppage, the tension is enough.



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SELECTING A PROPER MIG WIRE SIZE AND TYPE.

As previously covered, this unit has been equipped with a 4 roll MIG wire feeder. While the welder's programming and design offers more than these two sizes and metals, this unit has shipped with a V groove drive roll that accommodates the two most common sizes of solid steel wires for this class of welder: .035 and .045" (.9mm and 1.2mm). Smaller or larger drive rolls can be purchased as optional items.

To cover the entire range of wire sizes and metal types that the unit supports, the purchase of additional drive rolls, guns and or gun liners will be required. This unit provides a wide range of voltage and wire feed speed. That does not necessarily mean that the smallest wire can be forced to weld the thickest materials or that the largest gun and wire supplied is best for welding the thinnest metals with the thinnest wires. The following general recommendations are intended to help guide the user through the thought process of wire type and size selection. However, user knowledge and skill will ultimately determine what wire size choice is best to use and the appropriate settings to use.

For Steel/Stainless Wire (V-groove):

045" (1.2mm) is the largest wire size recommended for this machine and is the largest size for steel allowed. This is because the maximum wire speed of this unit will not support the amperage output of the machine with larger wires. Keep in mind that .023-.025" (.6mm) wire is used for lighter gauge material but only offers about a 7 Amp advantage on the low end of settings over .030". It will also reach a useful service limit of about 90A. Feeding and results will become erratic at higher settings. .030" wire can service up to about 150A in short circuit transfer before it begins to enter globular transfer range. .035" reaches spray transfer around 200A. However, with Syngergic Pulse MIG, these thresholds are not valid.

Even though .023" Stainless wire is supported, it may not be available in all markets and will experience feeding difficulty in the standard gun. In this case the spool gun is the best option. Also even with .030" stainless wire there may also some difficulty feeding wire with longer guns.

For Aluminum Wire (U-groove drive roll required with polymer liner installed or use spool/push pull gun):

Even though smaller drive rolls exist, to achieve best results, .035" wire should be the smallest wire used with this unit (not to be used with 4043 due to the softness of the wire) in the main gun, although the wire speed will be nearly maxed out for most applications. .035" aluminum wire also provides a very narrow range of welding of 1/8" to 3/16".

For best results, .040" or .045" is recommended is used since it can weld a broader range of material from 1/8 to 1/4" and can also be used with the softer 4043 wire. The optional spool and push pull guns are also equipped with either a .040" (1.0) or .045"/.047"/3/64" drive rolls, but smaller sized drive rolls are available as an option. Unless you are using the synergic pulse, MIG welding aluminum is not considered to be a delicate process and is typically recommended for use on 1/8" materials and thicker, though some success can be achieved in skilled hands down to 14 gauge with .030" wires used in a spool gun. With Pulse, .045" wire can weld down to .040" with practice and a correctly setup machine.

For Self-Shielded and Gas Shielded Flux-Cored Wire (Zippered, or serrated drive roll):

This unit supports both self-shielded and gas shielded (dual-shielded) flux -cored operation In general, Flux-cored wires smaller than .035" flux-cored wire should not be used, even if programming allows. (Some versions may allow settings with flux-cored wire sizes that are not practical). Flux-Cored wire in general is a heavier penetrating wire and is not meant for lighter gauge work. Typically Flux-Cored wire is used on 14 gauge and heavier materials. Since the nature of Flux-Cored wire carries less amperage per inch of wire delivered to the weld puddle, a larger wire may be used to deliver lower amperage at higher wire speeds However, even though available, smaller flux cored wires than recommended above suffer from weakness and the column strength of the wire is low and cannot feed longer distances. Pay attention to the size limits designated on-screen in the welder programming.

NOTICE: Although the maximum selectable size offered in the welder's programming for solid steel wires is .045" (1.2mm, .047" and 3/64" wires are viewed to be the same size .045" on this machine) for the US and North American market, it is recommended to use .045" (1.2 mm) as the maximum wire size for this unit for use solid steel wires. This is because .045" (1.2mm) is the largest steel size commonly available for up to 275A welding range. Although technically available in North America, .040" (1.0mm) wire is more common in other regions of the world. For Aluminum, .040" is often recommended for North American Auto-Body applications.

GUN AND LINER SELECTION.

This welder uses a common Euro Style Connection for the MIG gun. This allows any Everlast gun or any after market gun with the same connection to be connected to this unit. To match the 275A maximum output of this welder at the 60% duty cycle specified, this unit is equipped with a 36 series MIG gun. This gun is a larger gun suitable for conventional MIG welding up to 320A and up to 275A for Pulse MIG welding. This gun is a large sized gun suitable for industrial and commercial fabrication and maintenance. However, if lighter work is required, such as welding body panels, the smaller 24 series gun is recommended as an optional purchase. It is smaller and is a good choice for welding up to 240A for extended periods of time and up to 250A for brief periods of time.

Because of the range of output of this welder, no single gun is ideal for every situation. Additionally each gun can be equipped with different sized liners to match the wire size used. The liners, both steel liners and polymer liners for aluminum, are color coded for wire diameter sizes.

NOTICE: Push-Pull Guns typically use special graphene type black/gray graphene liners are sized for .045" and larger for Aluminum use. Also, even though the stock liner of the 36 can support up to .062", the maxi-

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mum size of wire that should be used with this unit is .045".

The wire sizes and liner color codes are as follows:
Blue Liner: .023"-.035" (.6-.9mm)
Red Liner: .040"-.045/ .047/ 3/64" (1.0-1.2mm)
Yellow Liner: .045"-.062"/ 1/16" (1.2mm– 1.6mm)

Notice .062"/1/16/1.6mm wire is not supported on this unit in the programming/calibration of this unit and should not be used, even in manual mode. This will help to prevent over loading/ over amping of the unit by allowing excessive wire speed which creates higher Amperage output than the welder is rated for. Using .062" wire can easily exceed the maximum amp output rating of the machine at even lower wire feed speed rates.

It is also important to check and change the contact tips as well to match the wire diameter. In the case of Aluminum, order one size larger regular tips, or order special Aluminum tips that are slightly oversized. These tips will use the standard size, but typically are followed by an "A" to designate these are designed for use with Aluminum.

INSTALLING / REPLACING THE MIG LINER.

The liner of the gun is critical to proper wire feeding and welding performance. A liner is responsible for securely carrying the wire into the gun head from the machine connection. An undersized liner may be difficult to load or feed without bird nesting in the cabinet. An over sized liner will cause spatter and irregular behavior. While burn-back control can eliminate some of this excess wire , the best solution is to use the correct sized liner for the wire.

A steel liner should only be used with steel or stainless wire. If steel wire is used with a polymer liner, the liner will wear extremely fast. A polymer PTFE type liner or graphene type liner (or other similar smooth plastic type liner) should be used with Aluminum or soft natured wires. Liners designed for Steel use and Aluminum use look different but install the same way. Each must be cut to fit because they are always slightly longer than needed. This is done to custom fit liners in guns that may have stretched from use over time.

Liners do wear and are sometimes kinked from rolling or wrapping the gun cable too tight during storage or bending the gun in too tight of a radius at the base of the handle. More commonly, it can be caused running over or stepping on the gun cable. This will necessitate liner replacement. Also with an oversized liner, the wire may appear to jump or feed out extra wire after wire feeding is terminated. It can even cause bird nesting in the liner, making wire removal almost impossible. In this case, the liner will almost always need to be replaced due to the damage it causes as the wire is removed.

If a liner needs to be removed and it is difficult to remove this is almost always an indication of a damaged liner. Sometimes a damaged liner may also cause damage to the gun head or outer conduit when it is removed. If so, the whole gun may need to be replaced if the damage is severe enough. Usually this is not the case and a worn liner or a damaged liner can be replaced fairly quickly.

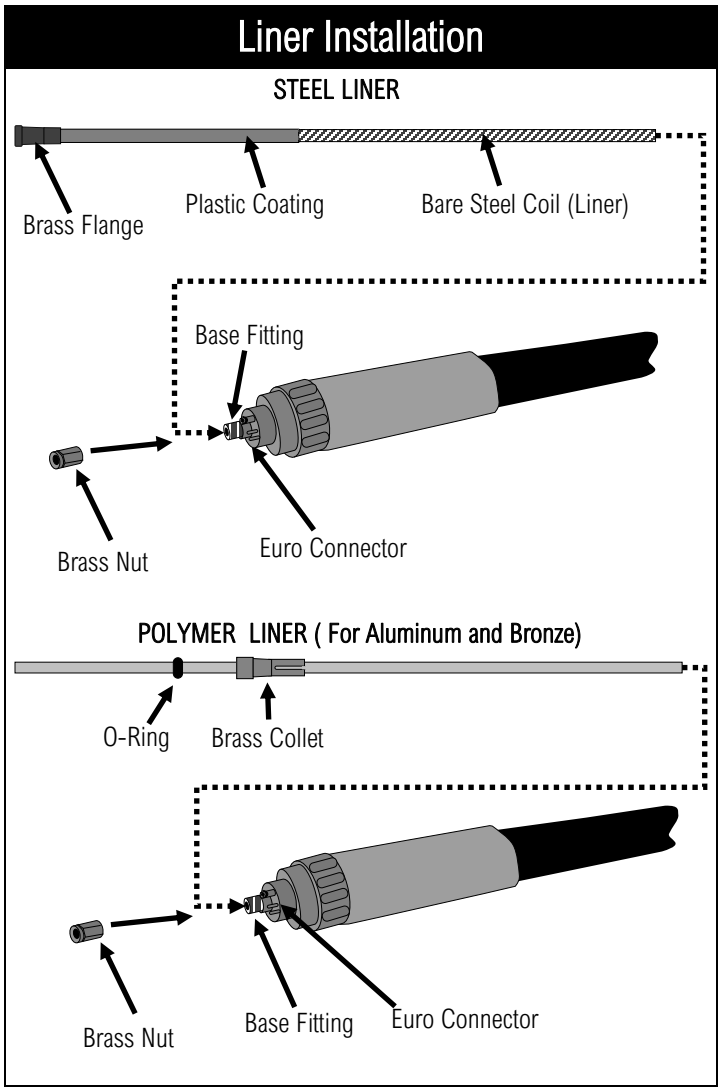
A damaged liner should be checked and replaced as soon as any damage is suspected.

A steel liner is a tightly coiled hardened wire similar to a lawn mower or automobile choke cable. The bottom half of the liner will be plasticized and color coded. The top part of the liner will typically be bare steel. The bottom of the liner will have a brass flange crimped to the liner.

The Aluminum liner will be smooth and will be composed of three pieces, the liner tube, brass collet and o-ring.

Both liners are installed from the rear of the gun and not from the top of the gun. See the information below.

IMPORTANT! Read these instructions carefully before attempting to remove the old liner or before trimming the new one. It is better to have to retrim a new liner than to cut too much off.



Steel Liner Removal and Installation.

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1. Remove the brass nut from the base fitting on Euro Connector. Hold the base fitting while using a wrench to do this. Do not allow the base fitting to unscrew. If the fitting unscrews, it must be reinstalled before proceeding.
2. Grab the brass flange of the liner that was originally held in place by the brass nut. Pull on the flange to remove the old liner completely. Once removed, set aside. (If the liner is stuck, carefully work it back and forth, and twist slightly to remove. The liner can break or stretch if the liner is badly damaged inside the outer cable conduit.
3. Make sure the gun and gun cable is held straight. Install the new liner as far as it will go. (Do not cut the liner yet.) Make sure the liner isinserted into the base of contact tip holder. Typically the liner will be visible with the contact tip holder installed. If the liner is not visible, remove the contact tip hold to check for visibility (some guns the contact tip hold is part of the gun neck and cannot be removed). If the liner is still not visible and/or does not appear to be inserted into the end of the contact tip holder manipulate the liner gently until it is visible and in position to mate with the contact tip holder once it is re -inserted. It may be necessary to move the gun handle around gently until the liner slides home.
4. With the liner inserted fully home, measure and record the distance from the top of the threaded base fitting to the flange (measure to the base fitting side of the flange). <u>This is the amount that will need to be cut off.</u> Double check that the liner is still seating and that the gun is held perfectly straight. **IMPORTANT: Do not cut the liner on the flange side. This is only for measuring the amount needing to be cut off the other end (Gun side of the liner).**
5. Remove the new liner.
6. From the gun end of the liner (the end that contacts the contact tip), measure and mark the length to be removed. Mark it with a metal marking pen or small file. Carefully cut the steel liner to length with pair of lineman's pliers or a similar sharp cutting tool. Make a clean flat cut. A small cut off wheel may also be used if a suitable cutter cannot be found. Carefully dress the end of the liner and chamber end with a small file removing any burrs. Do not use dull cutters or the liner may collapse.
7. Reinsert the new liner and test fit. The brass flange should fit flush against the base fitting and it should fit fully home in the contact tip.
8. Reinstall the brass nut to hold the liner in place.
9. Reassemble the gun if it has not already been reassembled.

Polymer/PTFE (For Aluminum and Bronze) Liner Removal and Installation.

1. Remove the brass nut from the base fitting on Euro Connector. Hold the base fitting while using a wrench to do this. Do not allow the base fitting to unscrew. If the fitting unscrews, it must be reinstalled before proceeding.
2. Grab the brass flange of the liner that was originally held in place by the brass nut. Pull on the flange to remove the old liner completely. Once removed, set aside. (If the liner is stuck, carefully work it back and forth, and twist slightly to remove. The liner can break or stretch if the liner is badly damaged inside the outer cable conduit.
3. Make sure the gun and gun cable is held straight. Install the new liner as far as it will go. (Do not cut the liner yet.) Make sure the liner isinserted into the base of contact tip holder. Typically the liner will be visible with the contact tip holder installed. If the liner is not visible, remove the contact tip hold to check for visibility (some guns the contact tip hold is part of the gun neck and cannot be removed). If the liner is still not visible and/or does not appear to be inserted into the end of the contact tip holder manipulate the liner gently until it is visible and in position to mate with the contact tip holder once it is re -inserted. It may be necessary to move the gun handle around gently until the liner slides home.
4. Once the liner is fully inserted, install the collet over the liner and slide the collet down the liner until it is fully seated into the base fitting. (Depending upon the manufacturer, the collet may be more like a ferrule)
5. Slide the O-ring down until it contacts the collet.
6. Slide the brass retaining nut down over the liner and screw the nut down until the collet slightly compresses the liner and holds it in place.
7. Trim excess liner flush with the end of the brass nut.

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SELECT THE PROPER TUNGSTEN TYPE FOR TIG.

What Type of Tungsten Do I Use?

Selecting the correct tungsten for your welder is important. Modern inverters no longer use pure (green band) Tungsten for welding AC. In fact pure Tungsten used with an inverter can create problems with arc stability, arc starting and excessive balling. While Thoriated 2% Tungsten can be used in an inverter for DC welding, it is falling out of favor in the industry due to the slightly radioactive nature of it.

For TIG welding consider the following types.

- Lanthanated 2% (blue band). Overall this is one of the best choices for TIG welding. It has great arc starting characteristics, with excellent point holding capability.
- Ceriated 2% (gray band or orange band, depending upon brand and country of origin). This is a good choice for welding with this unit. However, it doesn't hold up as well and starts to erode faster than Lanthanated at higher amperages. Arc start quality is excellent.
- Lanthanated 1.5% (gold band). Holds up nearly as well as Lanthanated 2% and can be used with this unit. In some tests it has rivaled the performance of Lanthanated 2%.
- Tri-Mix/Rare Earth (purple, turquois or other color band). While still relatively new, it is being marketed as a replacement for Thoriated 2%. Overall, it does perform fairly well and even excels in many circumstances. But some problems have been seen with quality control and inconsistency in performance. The primary metal oxide used is lanthanum 1.5%. Usually it also includes a small percent of Zirconium and Cerium to complete the mix. Some use Yttrium. But the balance of the components in the blend are usually stated to be around .06 to .08%, but can be allowed to vary up or down from .04% to .9%, making the blend prone to inconsistency in quality control.
- Thoriated 2% (red band) Still considered the best for DC TIG power like this unit provides but has been banned in many markets outside the US due to a small radiation risk posed as an alpha emitter.

Do not use the following types of Tungsten.

- Pure Tungsten (green band). This will create arc instability. The tungsten will not stand up well to the more intense arc created by an inverter welder. This is only for AC transformer welders.
- Zirconiated Tungsten (white band). This was created as an alternative for pure Tungsten for transformer welders. Similar issues welding issues are presented as with pure Tungsten.

Purchasing Tungsten can be difficult. Local suppliers tend to put a premium price on Tungsten, and may be three times an online price direct from a distributor. In many areas, the choice of tungsten may be limited. However, many local welding suppliers are stepping up and offering competitive prices and range of selection, so don't rule them out until you have checked. Also, there are some companies that may send you free samples to test, so be sure to investigate their product, and give them a chance as well.

GRIND THE TUNGSTEN CORRECTLY.

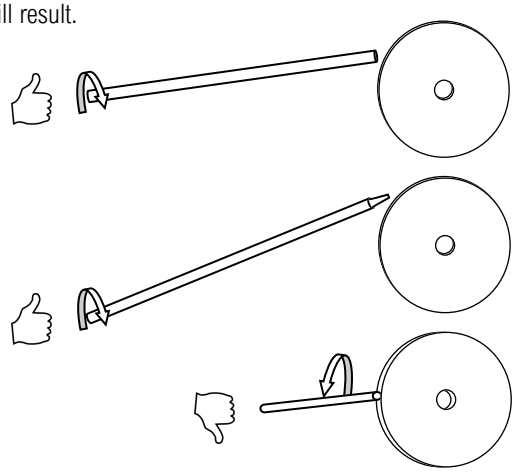
An improperly ground point on tungsten is a cause of many issues with arc stability, arc directability, and penetration. A bench grinder and a fine-grit stone dedicated for tungsten sharpening is all you need to sharpen Tungsten and is the age old standard. There are special hand held grinders that feature diamond stones with slotted guides, designed to hold the tungsten at the exact desired angles. A dry chemical sharpener "dip" is available and is inexpensive. When properly swirled, it does an excellent job in seconds. With practice, it can deliver a superior result. As a bonus feature, chemical sharpening can be done without getting up from the bench-top and without removing the tungsten from the cup. Please note: the Tungsten has to be red hot before being dipped and swirled in the chemical.

⚠ WARNING!

Wear safety glasses and leather gloves while grinding tungsten or serious injury may occur. On occasion tungsten may split or shatter. Do not breathe or inhale tungsten dust. **Do not use a angle grinder to grind!**

How Do I Grind My Tungsten On a Wheel?

- Grip the Tungsten firmly. Grind with the Tungsten secured.
- Grind the Tungsten perpendicular to the wheel face. Allow tungsten to grind slowly without much pressure.
- Rotate the Tungsten quickly as it is being ground to keep the point even and symmetrical.
- Do not grind the Tungsten parallel to the wheel face or an unstable arc will result.



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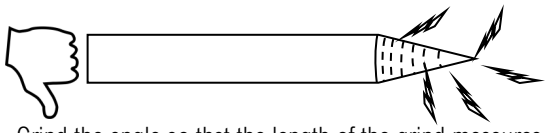
Choosing the proper grind angle is important to achieving the weld penetration, bead appearance, and arc-cone width that you desire. While there is no true one-size-fits-all angle, there are some general rules of thumb to observe and follow:

- Always grind in-line with the length of the tungsten. Never make a radial grind that leaves marks on the tungsten in the direction of the grind. Radial marks will cause arc instability. Never grind with the tungsten held parallel to the stone edge face.
- For most applications, grind a point that is 2 –2.5 times greater in length than the tungsten is wide. This will create an angle of about 30° to 35°.
- For higher amperages, you will want to put a slightly truncated tip on the tungsten. This prevents the tip from dropping into the metal.
- Grip the tungsten firmly. Slowly rotate it while grinding.

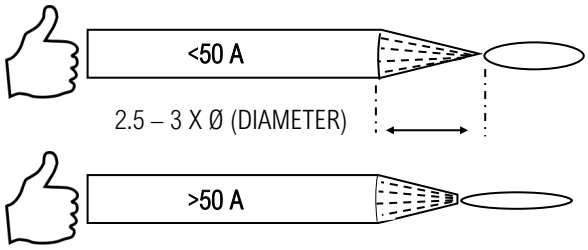
Depending upon what arc properties you are looking for, you may periodically want to regrind your tungsten to maintain optimal arc characteristics.

What Type of Tungsten Grind Works Best?

- Never use a radial grind pattern. This can be caused by grinding at the wrong angle, or spinning the tungsten too fast while grinding at the proper angle. The arc will be unstable.



- Grind the angle so that the length of the grind measures 2 to 2.5 times the wide of the tungsten (For general purpose use this should form about a 30° to 35° angle.) A slightly blunted end (truncated) may be used if the amperage is over 50A to prevent the tungsten from breaking off into the metal while welding.



What Size Tungsten Do I Use?

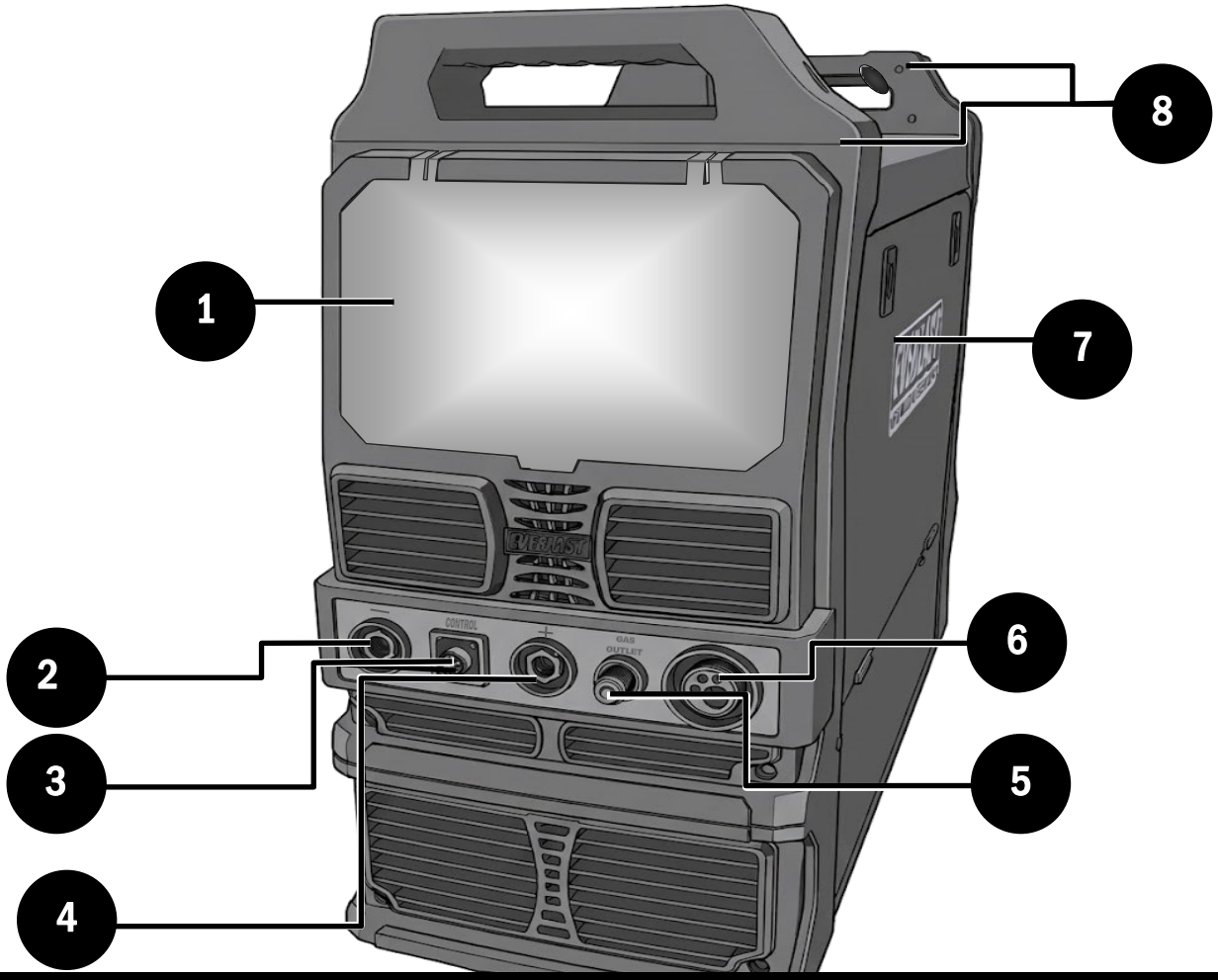
Everlast uses a HV start system on this unit. This system is able to handle several different sizes of Tungsten. Clean arc starts are related to the size of Tungsten. But clean arc starts are not solely dependent upon the size of the Tungsten. The tungsten type, tip angle and grind preparation will ultimately affect the arc starting capability of the tungsten. Amperage carrying capability is also size dependent. Each type of Tungsten blend will slightly vary in amperage handling capability and range of Amperage that is best for use. However, overall, the ranges will greatly overlap between different types of Tungsten. The differences will be seen on the extreme edges of the range.

In general, consider the information below for selecting tungsten diameter. The list below is not the absolute maximum range of the Tungsten, but a reliable recommended range. It is a good practice when you approach the maximum limit of the Tungsten's capability in terms of amperage, that you switch to the next size up for best point retention and arc characteristics.

- 2-15A: .020" (.5mm)
- 10-70A: 1/16" (1.6mm)
- 15-200A: 3/32" (2.4mm)
- 30-250+ A 1/8" (3.2mm)

Component Identification and Explanation

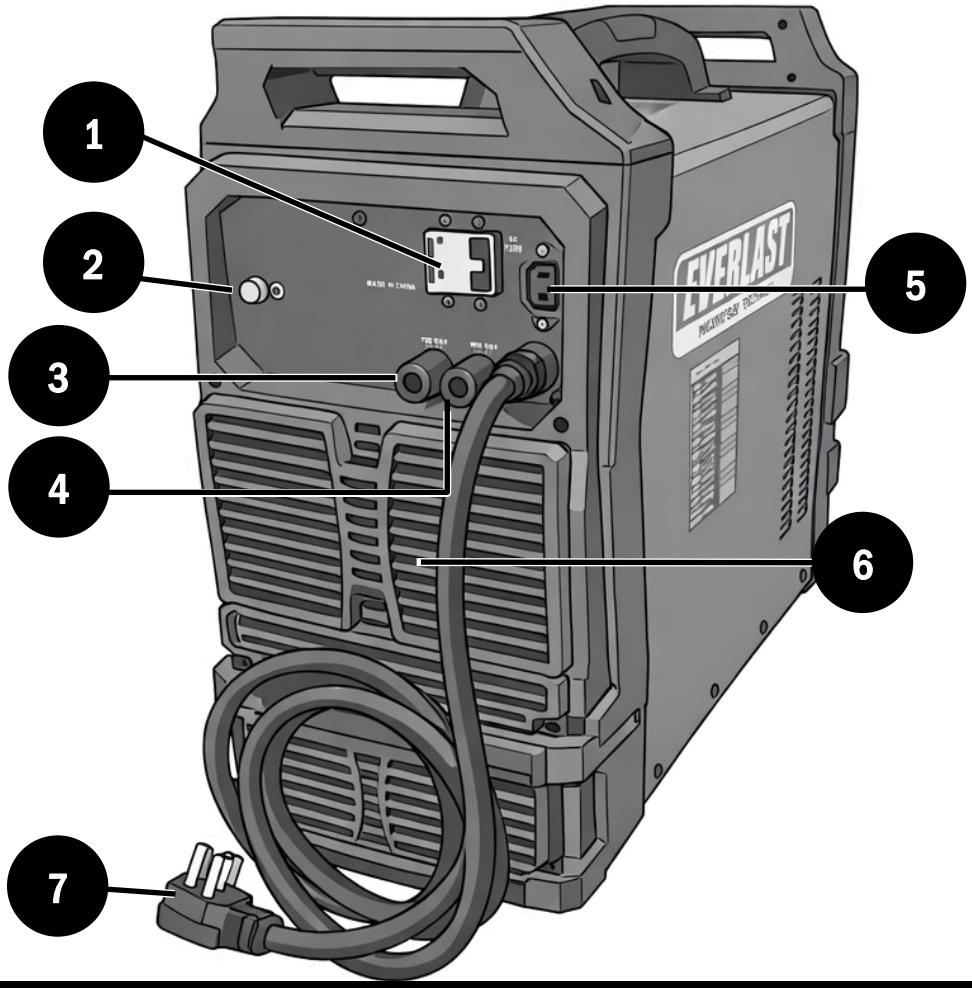
Front Panel View



#	Component Identification	Function/Component Note
1.	Protective Clear Plastic Cover	Keep cover down and in place during welding activities and while in storage. Do not use harsh chemicals to clean. Use only a soft cloth and soap and water for clean up to prevent scratches.
2.	Negative Terminal (-) (DINSE 35/50mm^2 Type, 1/2" nominal dia.)	Connect the work clamp to this terminal for MIG operation. (Not for Gasless Flux-Cored use.) Connect the TIG torch to this terminal for all TIG welding applications including AC. Connect the work clamp to this terminal for most DC Stick welding applications.
3.	7 Pin Control Connector (5/8" Type GX16-7)	All torch switch and foot pedal connections attach at this point. (One at a time.) **Ref. EV-PANA7-625-PLUG**
4.	Positive Terminal (+) (DINSE 35/50mm^2 Type, 1/2" nominal dia.)	Connect the work clamp to this terminal for all TIG welding applications, including AC. Connect the work clamp to this terminal for Gasless Flux-Cored Welding. Connect the Stick electrode holder to this terminal for most DC Stick Welding.
5.	TIG Torch Shielding Gas Connection (Quick Connect, 9mm Type B)	The gas line from the TIG torch is connected to the quick coupler. The sleeve/collar of the coupler is normally held back until the male torch fitting is inserted until it clicks in place. The coupler should slide forward to capture and hold the connector. To release the torch fitting, manually slide the outer collar/sleeve back. **Ref. EV-9MM-B-QUICK CONNECT-STDSET or 21KATS09MPX**
6.	Euro-Style Quick MIG Connector (Only one gun may be connected at a time.)	Connect the MIG gun to this connector. Connect the Spool Gun to this connector. Connect the Push-Pull Gun to this connector.
7.	Wire Feeder Access Door	The access door is located on the right hand side of the machine. Press in on the latch buttons and fold the door down. Do not let the door fall as it can damage the paint or edges of the panel.
8.	Handles	The handles are packed separately in the box and are not installed. Installation is recommended, but the handles are designed to be removeable for low clearance or for some permanent mount applications. Be sure to reinstall screws in the cover and panel if the handles are to be removed or not installed.

Component Identification and Explanation

Rear Panel View



#	Component Identification	Function/Component Note
1.	Breaker/Power Switch	This switch doubles as the main power switch and disconnect switch. If this switch trips and the welder power turns off, a significant internal event or failure of the switch *may* have occurred. If this occurs, immediately remove from service. Mark and tag the unit as out-of-service according to required work regulations and contact Everlast Tech Support for further diagnosis and/or repair options.
2.	HF Ground Service Bolt **NOTICE:** *Always consult national codes and employ a locally licensed electrician before connecting this welder to any new or old service.*	This connection is only to be used, if required, to mitigate any electrical interference that may be caused by the HF start or general operation of this unit. If disturbance in nearby electrical items such as lights and electronics is observed, this may be required. A 12 gauge copper wire should be connected to this terminal, and routed direct via the shortest route possible to a dedicated copper rod driven into moist ground outside the weld area. All metal items in the shop must be grounded to the outside at regular, multiple intervals, including any metal building panels. Consult a local licensed electrician to perform this connection if needed. If interference persists, after professional connection, or if your electrician has questions, contact Everlast Technical Support for further help.
3.	TIG Shielding Gas Inflow Connector	*North America:* 5/8" CGA R.H. connector. Standard Argon/Inert gas type. *Other Markets:* Hose barb connection.
4.	MIG Shielding Gas Inflow Connector	*North America:* 5/8" CGA R.H. connector. Standard Argon/Inert gas type. *Other Markets:* Hose barb connection.
5.	Input Cable 6.5 ft. with NEMA 6-50P Plug	***North America only:*** The unit operates on 120 or 240V 1 phase power. The unit is equipped with a 3-wire NEMA 6-50P plug. This is the standard welder plug used by all companies for 240V 1 phase welder applications. The plug should not be removed, changed or modified in any form. No adapter or alternate plug should be used with this welder, except the pigtail adapter provided. North American codes and standards dictate that only 3 wires (two Hot conductors and one ground) are used for 240V 1 phase operation of welders. A neutral wire is not used or needed. Do not attempt to use both a neutral and ground with this unit. The ground should be properly grounded according to code and should not share a neutral buss bar in the panel.
6.	Fans	Periodically check the fans for proper function and cleanliness. These can be viewed through the rear grill section on the left side of the rear panel. From time to time, remove the rear panel and carefully inspect fan blades and remove all debris accumulated on blades to prevent unbalanced running and failure. Fans run full time to provide high duty cycle performance. If an increase in in the fan noise is noticed, this can be from build up on the fan blades, bad bearing or damaged fan blade.
7.	Water-Cooler Outlet (240V 1Ph, 4A max)	This outlet is a low amperage outlet. It is intended only to be used with Everlast 240V water-coolers while operating on 240V. **Do not use this outlet with any other application.** Do not operate with 120V Everlast coolers. Do not use this outlet when operating on 120V.

Component Identification and Explanation

Control Panel Layout

#	Component Identification	Function/Component Note
1.	Welding Process Selector	Press left or right arrow key connected to the process selector LEDs to navigate back and forth to select the desired weld process. The LED will light to indicate which weld process has been selected. See Quick Setup Section.
2.	5" 720HD TFT Color Display	This display is designed to be clear and bright. It will provide long life if proper care is taken. Keep the flip down cover in place when welding and when not in use. Remove temporary, original protective film on the screen surface upon delivery. Use cut-to-fit screen protectors as a replacement for future use. Do not use harsh cleaners. Use only screen type cleaners sprayed onto a damp, lint free rag to clean. Remove dust with short bursts of dry compressed air. Notice: The operation of the screen is divided into left half and right half sides. The left and right half are divided by a green line running down the middle of the screen on all adjustable pages of the menu. The left and right half are also highlighted further by the black extended line in the middle of the green surrounded area of the screen that groups right and left side controls.
3.	Left Adjustment Knob	This control knob controls all the parameter values found on left-half side of the LCD screen. It is used to increase and decrease the value. *Helpful Hint: Press in and turn to increase the parameter value in larger increments to save time.*
4.	Purge Gas Key	When selected, the Purge Gas function is designed to allow shielding gas to flow rate from the cylinder without having to use the torch trigger. Gas will flow when the button is pressed. The LED will illuminate until the button is pressed again to shut off gas flow. Be sure to turn the purge function after use or the gas will continue to flow and waste gas.
5.	Wire Jog Key	The wire jog function is designed to feed wire without pressing the trigger. This speeds up wire delivery when changing the wire spools out or loading the gun with wire. It prevents waste of gas while wire is feeding during this change process.
6.	Left-Half Side Navigation Keys	The left side down and left arrow keys are used to navigate and select the left side parameters for adjustment.
7.	Program Save Key	Use this key to both access the program save menu, lock/unlock a program recall a program. See Quick Setup Section. A short press will bring up the recall menu. A long 3 second press will bring up the save menu.
8.	Right-Half Side Navigation Keys	The right side down and right arrow keys are used to navigate and select the right side parameters for adjustment.
9.	PowerSet Key	The PowerSet key is used to activate the synergic programming of any welding mode. The LED will light to both confirm and remind the user that the PowerSet Mode is activated. Also used to lock or unlock a program in the save mode
10.	E-Z Wire Run-In	This is a "Soft-Start" feature which feeds wire slowly in the beginning to improve arc starting. When the LED is illuminated, this function will be on. The wire will feed slowly initially with the trigger pulled. It will ramp up speed as soon as the arc is established. In effect, this acts as a type of hot start by allowing more voltage to wire feed ratio to help reduce porosity at the start. While activated, the Wire Jog button can be used to feed wire quickly during installation or for wire run off. Normally, this should be on unless heavy tacking is being performed. Keep in mind with this turned off arc starts will be more violent and spattery. This also precludes the ability to manually calibrate and check wire feed speed since adjusting the wire feed speed will not affect the wire run-in rate. **For best arc starting, leave this feature turned on.**
11	Right Adjustment Knob	This control knob controls all the parameter values found on the right side of the LCD screen. It is used to increase and decrease the value. It is also used to select and navigate the pop up on-screen keyboard when naming the program or selecting a program in the recall mode.

Component Identification and Explanation

PowerSet MIG vs. Synergic Pulse MIG

The term "synergic" is applied by many manufacturers to a MIG welder which requires input of basic welding information to "automatically" provide the user with settings good enough to make a competent weld. The differences in industry in terminology, levels of input, and programming has led to confusion over what constitutes true synergic operation. The confusion is further complicated through the proprietary marketing of trade names.

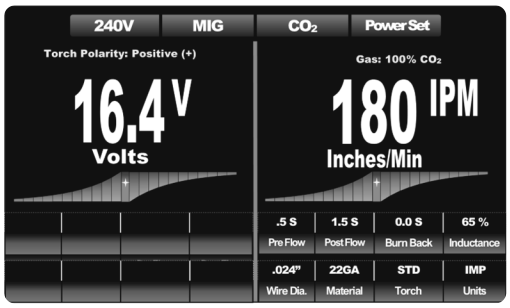
As early as the 1980's, the term "Synergic" was applied to early, more advanced pulse MIG welders to help distinguish them from manually set pulse MIG welders. In its original form, synergic operation incorporated a basic logarithmic formula to determine an appropriate ratio of volts to amps based off of certain inputs of wire diameter and type which allows a single knob control of simultaneously, reducing the need for trial and error. This helped the user to maintain good weld performance throughout the range of adjustment. As technology developed, synergic systems began to incorporate other user input variables such as plate thickness, joint design, travel speed and shielding gas. *Any welder that requires these or similar types of input variables to achieve a pre-programmed setting qualifies as being "Synergic." With new advances in programming and digitalized control, the term "Synergic" can be applied to all welding and cutting processes.*

The Everlast Synergic Pulse MIG design provides easy adjustment of all pulse-related parameters through the Amp control knob. When the user inputs the correct wire type, diameter and combined with the correct shielding gas, the program can determine the best wire speed rate, frequency, average pulsed voltage and pulse balance, while keeping the pulse operating smoothly at any Amp setting. *While Synergic Pulse MIG offers unlimited fine tuning and an easy setup experience for Amps (WFS) and Volts, the user must still manually set many other functions not related to the pulse itself and must still be able to evaluate metal thickness to determine the amount of Amps required to complete the weldment.*

Everlast PowerSet is a "next-level" form of Synergic programming which incorporates color coded graphics and a limited adjustment range. Overall, it simplifies setup, reducing knowledge and training needed for accurate setup. The programming determines targeted settings by requiring the user to input wire diameter, type, and the thickness of the metal being welded. Many functions are preset or have graphics to assist in adjustment. Some functions that require a parameter to be precisely set in synergic or manual mode actually change format in PowerSet mode. *For example, the hot start pulse MIG function in PowerSet mode no longer requires the user to input a precise Amp value. Instead, it changes to require the user to input a percent (%) value of the welding Amps*. However, some functions that may be desirable, such as Spot/Stitch may also be eliminated.

Both PowerSet and full manual control modes have their own merits and which is best depends upon operator expectations and application. But they also both present their own set of requirements. Neither form of control eliminates a certain basic level of user responsibility. The user is still required to know the basic parameters of the weld, such as wire diameter, metal type, and thickness. Both require at least a base-line set of skills, knowledge, and to some extent, experience to properly set up the welder. In reality, there is no "auto sensing" welder that just allows the user to pick up the MIG gun or TIG torch that will determine all this for the user. *This welder is considered an advanced, professional level machine suitable for commercial use and should be treated as such by the user. Additional training and instruction may be required.*

PowerSet Control



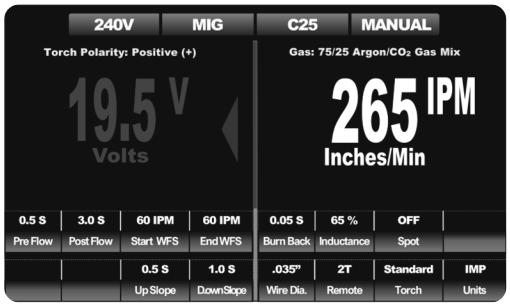
Pros:

- Easy, Fast Setup with presets and reduced operator input effort.
- Easier to train new users with shorter adjustment period.
- *Usually* gives the operator a useable setting of volts to Amps.
- Can be used by amateurs or professionals.
- Reduces operator error.
- Offers a limited but favorable amount of fine-tune adjustment.

Cons:

- Settings may not be perfect for all positions/applications/users.
- Presets may takes away from Pro user's ability to tailor the settings to individual needs or worksite applications.
- Need to know and enter exact specifics of wire type, diameter and metal thickness.
- Adjustments do not allow for all variations in position and joint design.
- Some functions eliminated such as the Spot/Stitch timer function.

Manual Control



Pros:

- Allows full, unlimited range of control of all process functions.
- Offers Pro-level of control and complete customization of program settings.
- Usually provides best results for experienced, knowledgeable users.
- All functions allowed to be programmed and can be saved.
- All functions and settings can be viewed at one time.

Cons:

- Higher risk of operator induced error.
- More knowledge and skill required to operate competently.
- More extensive setup process.
- Must know proper volt/amp ratios for setup that are customary, or must be able to fine tune programming on the fly by ear/sight.

Component Identification and Explanation

Starting-up the Welder

WHAT TO EXPECT ON START UP.

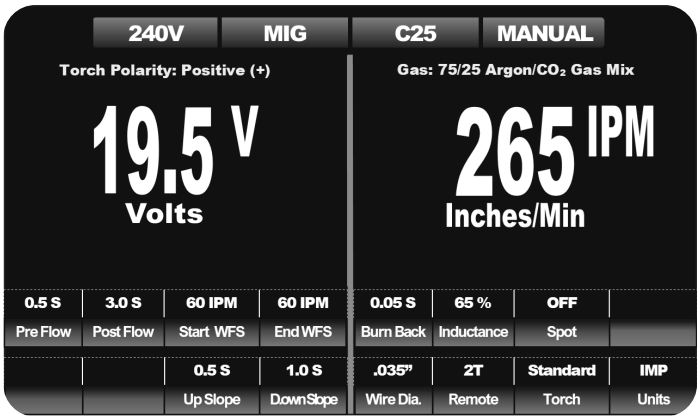
Before the first start and use of the machine, check all your connections. Make sure all fittings are tight and that your gas cylinder valve is fully open. Put on proper safety equipment (PPE) and fire resistant clothing. Make sure all accessories are uncoiled and properly connected. Inspect the accessories and ensure that they are in good working order.

WARNING! *Accidental arc flashes and burns could be possible if the foot pedal or torch switch is depressed at the time of start up. Uncoiling accessories and dismounting them from the cart is important to prevent accidental triggering, arc flashing, welder damage and possible injury.*

When the welder is switched on at the rear of the unit and the start-up process begins, the welder will greet you with the start-up screen while it is booting up. All LED lights on the front panel will light up on the front to allow you to inspect their functionality. The boot-up will take up to 5 or 6 seconds as the machine re-adjusts for the voltage input and recalls the last settings used. *The boot up screen will look similar to this:*

During the boot-up process you may hear a series of slight clicks, thuds, or thumps as the machine switches relays and solenoids. This is normal. IIt is important to note that similar thuds or clicks that are heard on start up can also be heard as the machine swaps processes or when certain functions are selected. This is normal and should not be of concern.

When fully booted up, the screen arrangement should look similar to this, depending upon the actual process and functions selected:



It is recommended that all functions be checked for proper operation every few months so that any malfunction can be noted and reported before it is needed. If any malfunction of the control screen or the welder is observed, contact Everlast Tech Support.

TAKE CARE OF THE LCD SCREEN.

The screen is a high resolution 5" TFT color LCD screen. It is important to take care of it. Keep the cover shut when welding or when not in use. *Additionally, cut-to-fit screen protectors can be used with the screen (and it is recommended to do so) to offer a second layer of protection and keep the screen in like new conditions. These are customer-supplied and available at local stores that sell electronic items such as computers or mobile phones.* These should be periodically removed and replaced. Lightly clean the screen only when needed with standard screen cleaning solution and lint free cloth designed for cleaning screens or lenses. Do not use harsh detergents, solvents or alcohol. The front protective cover is plastic and may get scratched if it is wiped dry. If heavy dust has accumulated, use dry compressed air to blow off the screen. Do not try to dry wipe with dirty rags, sleeves or gloves or the screen may become damaged.

Functions vs. Parameters vs. Status

This manual makes frequent use of the words "mode", "settings" "functions", "parameters", "values" and "status". In some cases it may seem that some words are interchangeable. And in a number of cases, there may be indeed some limited interchangeability in the terms since a function may also double (when turned on) as an adjustable parameter or could indicate a mode. To clear up the confusion between the terms, here is a brief explanation of Settings, Functions, Parameters, Values and Status and the general intended use of these words in this manual.

A **mode** can refer to the selection of a particular function, or a welding process. The welder has several different processes. Each process can also be considered a mode. For example, you may select "DC TIG Mode" to weld. But you can also select the Spool Gun mode from the torch function on the screen. The term mode is broadly used.

Settings is a broad term inclusive of both functions and parameters. When the term settings is used it is meant to refer to both generally and can also refer to status or value.

Functions are features and modes of the machine. Functions will dictate the way the welder behaves and what parameters are offered for adjustment to the user. A function can indicate a mode of operation, such as 2T torch switch operation as opposed to Foot Pedal operation. A function will typically be associated with words like On or OFF, or even indicate a gun type or mode.

A **parameter** is an adjustable feature of the machine. Pre-Flow, Post-Flow, Up-Slope, Down-Slope, Welding Amps, Pulse Time On, etc. are all examples of parameters.

A parameter is defined by its **value**. The value can be expressed in Seconds, Amps, Wire Feed Speed, or Percent. Values are expressed in numbers. Each parameter has a range of values.

Status indicates the *condition* of a function (On, Off, etc.). It can also indicate the static operating condition or welding mode of the welder on the status bar at the top of the menu screen.

Component Identification and Explanation

GENERAL INFORMATION ON SETUP AND USE.

Selecting the Process.

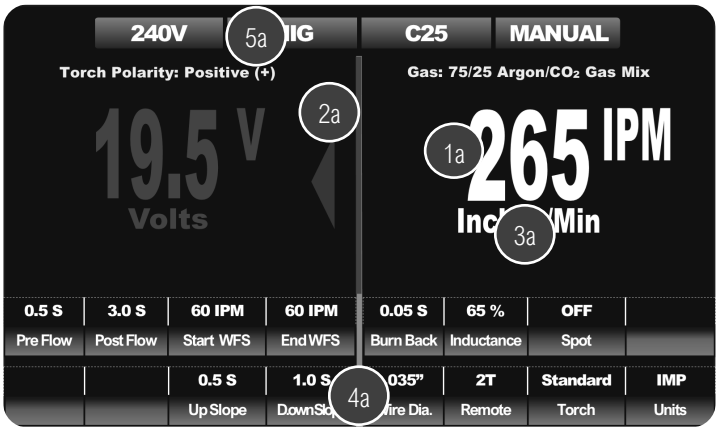
At the top of the panel **(1)** use the process selector buttons to select the desired welding or cutting process. Use either the right or left arrow directional (◄ ►) buttons to advance to the next process. Pressing the left or right arrow button too quickly multiple times in succession may cause the LED to appear to skip a process. Advance through the processes at a moderate, deliberate pace. If desired welding process is accidentally passed or skipped over, instead of cycling back through all the processes, use the opposite directional arrow button to scroll back to the desired process rather than scrolling all the way through again.

Navigating the On-Screen Menu.

The LCD screen is divided visually into a right and left half **(2)** by a vertical green bar on screen and black line above and below the screen. The left half side is controlled by the left side panel controls. The right half is controlled by the right side panel controls. The left side left **(3)** left pointing and down pointing arrows (◄ ▼) are used to navigate the left half of the screen and the right side **(4)** right pointing and down pointing arrows (► ▼) are used to navigate the right half of the screen. The left and right control knobs **(5,6)** are used to increase or decrease the selected parameter value of that side or to change the status of a function of the related side. The menu is also divided horizontally into 2 functional areas. 1) The top tier, or main display/default parameter display area, and the two lower tiered rows of parameters and functions.

There are two types of information located on-screen in the two lower tiered rows **(7,8)** of the on-screen menu: Parameters and Functions. *Functions are menu items that may change in status, such as ON/OFF, or Gun Selection. Parameters are menu items that change in value throughout a range such as pre-flow time or inductance percent.* Some selectable items on the menu screen serve both as functions and parameters. For example, the Spot weld function can be set to "OFF". That indicates the status of the function. But when selected and the control knob is rotated, and the status is changed to "ON", the function automatically changes to represent the parameter value and displays the seconds.

Understanding the Anatomy of the Menu Screen.



Quick Steps to Setting-Up the Welder.

1. The main display in the upper area serves to display the status, or value of a function or parameter. (1a)

- After startup, while welding or when the unit is not in the adjustment mode, Voltage is displayed on the left side of the menu screen and the Wire Feed Speed (IPM or M/M) or Amps on the right side of the menu screen. These are the default parameters displayed unless the unit is in adjustment mode and other parameters or functions are selected for adjustment. These default parameters can be adjusted simply by turning the relevant side control knob. The display will turn red to indicate adjustment

- After adjustment is finished and no further adjustment or changes are made, the unit will re-enter the default mode within approximately 5 seconds and display the Voltage and Wire Feed Speed/Amps.

2. Entering adjustment mode allows the user to make changes to all functions statuses and parameter values.

- To enter the adjustment mode, press once on the down arrow key (▼) on either the right or left side, depending upon which side the desired function or parameter is located on. This will turn the main display on that side red in color, the middle vertical line will turn red and either a left or right red arrow (◄ or ►)will appear to indicate which side is ready for adjustment. (2a) *Alternatively, to enter the adjustment mode, a slight turn of the control knob will enter the welder into the adjustment mode unless the default displayed is non adjustable and displayed in green (TIG/Stick modes).*

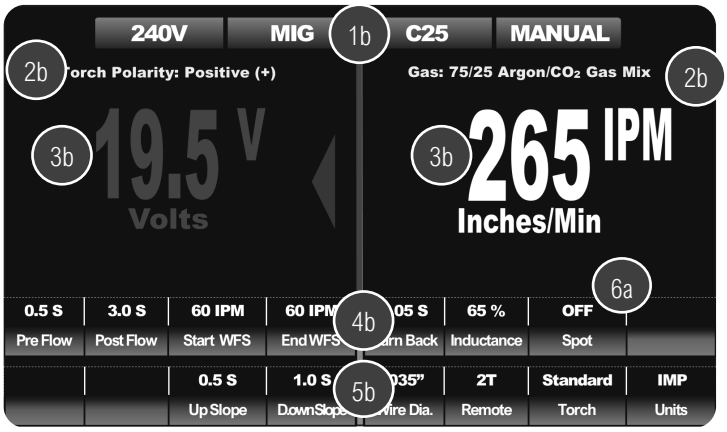
- Continue to use the down arrow key (▼) to navigate vertically down to the desired row.

- In TIG and Stick modes, a single press on the down arrow on the left side will automatically navigate to the first lower row.

- Use the left or right arrow button (◄ or ►) to navigate over to the desired parameter or function to highlight for adjustment.

- The middle red line will extend to the row and over to the desired parameter and the selected parameter will be highlighted in red.

Component Identification and Explanation



3. The control knobs are used to increase or decrease a selected parameter value, or make a status change in a selected function.

- Use the control knob on the side closest to the desired function or parameter to make changes to status or value.
- When making large changes in value to a parameter, press in on the control knob while continuing to turn it to make larger increment changes in value. This will speed up the adjustment process.

Detailed Menu Information and What to Expect During Adjustment

The menu screen utilizes a combination of symbols, words, numbers, colors and graphical indicators to assist the user in making adjustments. It is designed to create a fluid, intuitive and easy to understand interface for the user.

The menu is divided into several basic areas and conveys useful information to the user.

1. Top Information Bar. (1B) This area conveys information to the user about basic process selection, operating mode, and input voltage.
2. Torch Polarity and Gas Selection Information (2b). This row is in yellow lettering for contrast. This is area is designed to serve as a important reminder to the user to check and confirm both gas type and torch/gun polarity. The gas selection information may change in Steel MIG mode (C25) depending upon the settings of the unit. At higher volts and wire speed settings the gas recommendation may change from 75/25 Ar/CO_2 (C25) to 90/10 Ar/CO_2 (C10).
3. The main display area, or top tiered row (3b). This area on both left and right sides of the machine will display default Volt and Wire Feed Speed/ Amp settings unless the adjustment mode is entered into. During active welding, it will also display the actual measured Volt and Amp output of the machine. During adjustment, the display will reflect the chosen parameters and values of the parameters. During adjustment, the main display area values and parameters will change color to red. Appoximately 5 seconds after adjustments are completed the main display area will revert to the default setting and colors.
4. The lower parameter rows/tiers. (4b and 5b) This area displays all the information related to adjustable parameters and selectable functions of the unit. *In the PowerSet mode, only one line may be displayed due to the simplified input design.*

When a parameter or a function is selected, the screen will display the value or status of the function in two places:

1) At the top of the screen in the main display area.
2) Just above the selected parameter in the lower rows

The value-based parameters are also accompanied at the top of screen by the parameter's unit of measure in an abbreviated exponent form such as V, S, or % to as a reminder of the value being adjusted. Underneath the parameter value or function status, the actual name of the selected function or parameter appears. This redundant arrangement makes the display easier to read during adjustment and helps to eliminate bottle necks in navigation.

After adjusting is completed, the machine will default back to the main adjustment value (Volts, Amps or Inches per Minute) after approximately 5 seconds if no further input is made. The purpose of displaying the value or status of the lower tiered rows and the upper default value is to provide an at-a-glance view of all parameters simultaneously on the single screen at any time during operation. This eliminates the need for pop up menus and bottle necks in setup while promoting operator awareness of settings.

The screen makes use of colors to indicate condition, mode and status and serves to aid the user in general in interpreting the on screen information.

1. Green:

- The green color (4b, 5b) of the two lower rows/tiers of boxes indicates normal operation or that the unit is ready for use. The two lower tiered rows of boxes are normally green, unless the parameter of the box has been selected for adjustment by the user. Green is used to indicate a set function status or relay a parameter value to the user.
- Green is used at the top information bar to communicate basic status information. It is used to confirm the mode and basic operating information. *If the Voltage box in the information bar turns yellow, this indicates the unit is operating on 120V. This is to serve as a reminder that output is limited in 120V and some settings may not have a full range of adjustment or selection.*
- When the large numbers turn green in the top, main display area, this indicates the value cannot be adjusted. However, it is communicating an important measured value, such as TIG or Stick welding Voltage and OCV.

2. Gray:

- Gray, blank areas in the lower rows of boxes are non-selectable areas. These emptied boxes can be ignored and no function is assigned to them in the current menu configuration or process.
- In some cases a gray area will become an adjustable area if certain functions like Spot weld is selected for use. If so, the area(s) will turn

from gray to green and will display additional parameters related to the function. When the items are green and the blank areas filled by additional parameter information, they are then adjustable. The grayed -out areas help eliminate confusion over what needs to be adjusted. Some gray areas have no func tion and may only be a place holder and will not change status or offer adjustment. Due to the nature of each process, some areas will have more gray areas than others. In a couple of instances where a function is selected that limits the ability of other necessary functions, and the restricted function remains active, the area will remain green, but will not be adjustable.

3. Red.

- Red indicates the machine has entered the adjustment mode. The numbers/words at top of the screen, the middle vertical line, middle line extension and any parameter box on a row that turns red indicates that the machine is in adjustment mode.
- If a parameter box is highlighted in red, the main display area will display of the chosen function status or parameter value.

4. White.

- White letters or numbers in the main display area indicates that the unit is displaying the default setting and is not being adjusted.
- In any wire feed process, when both upper numbers are in white the unit is displaying welding volts (left side) and welding wire speed feed rate (right side).
- When the main display area is white this indicates the unit is not in adjustment mode and is ready to weld.
- In TIG and Stick modes, only the right Amp box will be displayed in white. The other box will be in green to indicate a non adjustable voltage value. When the white appears in only the Amp box, and the other side is in green, the unit has exited the adjustment mode.

5. Yellow.

- Yellow is used to convey important basic information.
- Yellow can also be used to alert the user to a change in status or warn of an unwise setting (PowerSet mode).
- In manual mode for steel the colors of the numbers may change when a wire begins to reach its short circuit limit and transitions to globular transfer and into axial spray transfer. The on screen recommendations for shielding gas will also change from 75/25 to 90/10. The information just above the main display area reminds the user to observe the indicated polarity and the gas type to use.

Why Are Some Settings Limited or Blank?

There are two basic reasons some settings are limited in adjustment or completely blank. The first reason is that the unit is being used on 120V and output is limited. With limited output, the machine must limit certain range of adjustments to protect itself from malfunction. In PowerSet mode this is obvious by the limit on selecting electrode /wire or thickness sizes. The second reason is that a function is not active or has been set to "OFF". When functions such as spot weld or pulse are set to "ON", the unit will add additional settings and allow adjustment of those functions or parameters.

Component Identification and Explanation

USING THE PROGRAM MENUS AND MEMORY FUNCTION.

The memory function on this machine allows the user to save and name up to 30 different programs. (There are 30 programs but only 10 programs per page.) Not only can the programs be saved, they can also be locked to prevent unwanted or accidental tampering for WPS work requirements. The process to save and recall the memory is relatively simple. However, there are some differences in the way the machine is controlled from the main menu screens. There are no longer any left or right division of control in this mode. Only the right side control knob and Save/Recall Program button will be used for navigation and selecting. The PowerSet button is used for selecting or deselecting the lock function. Most programs will say "Empty" until they are filled by a program. But if there are some form of program stored, these were stored during factory testing and not intended to be functional settings. These programs can be saved over, after being unlocked. Any recalled program can be fine tuned or adjusted, but the new settings or changes made to the machine will not be kept.

NOTICE: There are no useful pre-stored programs on this machine except for the suggested settings in the PowerSet programming. Individual parameters, if they are present, are entered during the manufacturing process to serve as place holders and for testing the programming. Actual values entered may not be useable .

Navigating and Using the Recall Screen.

The program function consists of two screens: the recall screen and the save screen. Both look alike except at the top information bar location, the words "Recall" or "Save" are used. Be sure to notice which word is at the top so that the unit is in the correct screen to perform the action desired. The recall screen is used to "recall" or bring up a desired program for use.

The recall mode does not allow any saving or any permanent modification of the programming. A recalled program will allow adjustments to be made, but the base program cannot be modified unless it is unlocked in the save mode and completely resaved or saved over. Recall mode will always be a safe mode to use for any user since programming cannot be saved over in this mode.

1. To recall any program, quickly press and release the save program button (1). This may be done from any process, even if the desired process is not selected at the top of the selector. (The selected program will override the process selector and display the saved program and process.)
2. The Recall menu screen will appear and will be confirmed by the green "Recall" bar (2) at the top of the screen.
3. Navigate to the desired program by rotating the right side adjustment knob (3). A green bar will highlight the line chosen.
4. Press the left side adjustment knob (3a) to select and enter and open the program. The screen will display the program and settings like a normal screen, but it will not allow it to be overwritten. The programming will allow the user to make adjustments, but these will not be permanent to the program.

NOTICE: If the recall mode is not being actively used, and no choice has been selected/entered by pressing the right adjustment knob, the machine will return back to the previous setting. It will not recall (bring up on screen) the program, even if it has been highlighted.

Navigating and Using the Save Screen.

The Recall and Save screen are similar but the Save screen allows programs to be stored and features the lock/unlock ( ) function which will allow a new program to be saved in the old memory slot.

1. To save, complete all normal setup for the process desiring to be saved. Make sure all settings are correct before proceeding to step 2.
2. To access the save menu screen, press and hold the save/recall button (1) for at least three seconds before releasing.
3. When the button is released the Save screen will appear and the green "Save" bar at the top of the screen will confirm the selection.
4. Navigate to the desired line by rotating the right side adjustment knob (3). Each line will highlight in green as the adjustment knob is rotated.
5. Each line will have either a lock symbol or unlock symbol ( ) located on each line on the right side (4). This indicates whether or not the selected line is available for a new program to be saved. If the

Component Identification and Explanation

unlock symbol is displayed, this line will allow a new program to be saved. If a locked symbol is displayed, this line must be unlocked before saving. To unlock a line, quickly press and release the PowerSet button (5). The symbol will change to the unlocked status. **WARNING! If a line is purposefully unlocked, or left unlocked after saving a new program, this program will be subject to permanent change or over-writing without an extra layer of protection.** If available, always save in an "Empty" space. If a new program must be saved over an old one, make sure that it has no value or future use or write down the settings so that the values can be re-entered in the future.

6. Press the left side adjustment knob (3a) to select the line and access the 'QWERTY" Popup key pad (6). Rotate the adjustment knob (3) to highlight a letter or a command (save or cancel). Press the adjustment knob (3a) to enter the letter or number desired. Continue until the

program name is complete or until the maximum character limit has been reached. *The maximum number of letters, numbers and other characters that can be entered to name a program is a total of 15 in any combination. The keypad will not hold more than a 15 total character program and will block more from being entered once the maximum is reached. To eliminate future confusion over which programs are which, be sure that program names are carefully chosen to be distinctive without exceeding the character limit.*

7. Once the program has been entered, rotate the adjustment knob (3)to save selection or press cancel to exit the screen. *If cancel is selected the program will not be saved on that line and the name or status of the line will not be changed.*

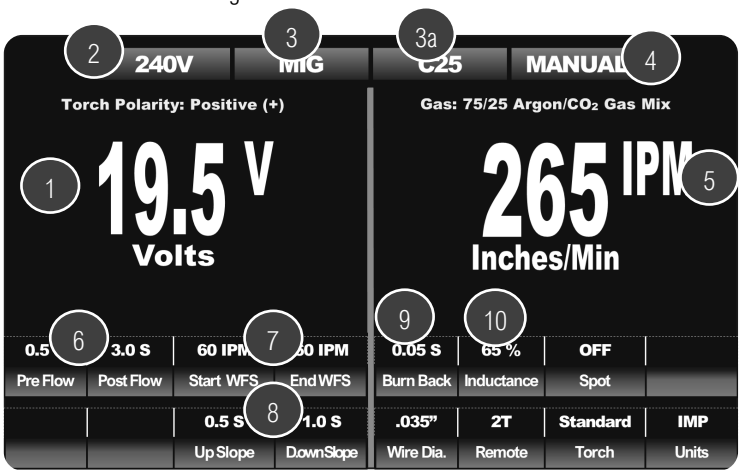
8. After selecting "save" on the popup key pad, the program screen will reappear with the newly named program. As an extra layer of security, and to prevent unwanted or otherwise accidentally tampering with the program, press the PowerSet button (5) to lock the program as soon as the program returns from the keypad menu screen*. It is always a good idea to keep all programs locked for program integrity.*

9. If no further input is made (i.e. locking or selecting another line) after saving the program, the menu will default back to the welding mode after approximately 5 seconds. Instead of waiting for the 5 seconds to expire, quickly press and release the "Save/Recall" button (1) once all programming is complete and saved. This will quickly exit and return to the menu normal welding/adjustment mode.

Component Identification and Explanation

USING THE MANUAL MENUS.

Each process menu operates in the basic same way. Navigation is similar between all the functions. See below for menus and notes about navigation of each of the following menus.



MIG/Flux-Cored Manual Menus (Except Synergic Pulse MIG Function on the Lightning MTS 275P):

The MIG manual menu is essentially the same between all MIG process selections, whether selecting C25, C100, Aluminum, or Stainless Steel. However, see the next section for detailed information on Synergic Pulse MIG operation. The functions and operation of the parameters in Pulse MIG mode varies significantly in some areas.

1. **Main Left Display, Default Voltage Display.** Adjust the voltage with left adjustment knob. To adjust other parameters or functions, enter the adjustment mode with left down arrow key to navigate to the desired parameter to highlight and enable adjustment. When a parameter or function is selected for adjustment, the numbers will turn from white to red. Voltage is the default setting of the left side. After 5 seconds of no input or adjustment of other parameters or functions, the selected setting will default back to the Voltage setting and exit adjustment mode.

2. **Voltage Input Confirmation. Voltage Input Confirmation.** This confirms the correct voltage to be supplied to the machine. The correct Voltage is 240V. If 220, 230 or 208V is supplied, the Voltage will still read 240V.

3. **Process and Gas Reminders.** When viewed together, both 3 and 3a reminds the user which process has been selected. Except for Synergic Pulse MIG, a selected MIG process will always display with either C25 (75/25 Ar/CO_2 for Steel), C100 (100% CO_2 for Steel), Mix Gas (98/2 Ar CO_2 for Stainless/Inox), Ar Gas (100% Argon for Aluminum), or No Gas (For Flux-Cored on Steel) in wire feeding modes.

4. **Manual/PowerSet Mode**. This indicates which mode the machine is operating in, whether in full manual mode or in PowerSet mode which is a synergic, more automated mode. In PowerSet mode, many functions may not be available for adjustment and will be preset. (See the MIG PowerSet section).

5. **Main Right Display, Default Wire Feed Speed Display.** Adjust the wire feed speed (WFS) with right adjustment knob. This display can indicate the wire feed speed in either Inches Per Minute (IPM), Meters Per Minute) M/Min or Amps. This is the default setting of the right side. Other parameters and functions will be represented in the display when in adjustment mode. When the Wire Feed Speed or other parameter is selected for adjustment the display will turn red in color. After 5 seconds of no input or adjustment of any parameter or function, the selected setting will default back to the Wire Speed setting and return to white. *While actively welding, the display function will change to read actual measured amperage output.*

6. **Pre-Flow/Post Flow Timers.** Pre and Post Flow provide adjustable shielding gas flow time before and after the weld. This is important to reducing contamination in the weld. The arc start and wire feed will be delayed slightly by the amount of pre-flow time used but helps provide a gas envelope around the weld. Post flow helps cool the torch and provides shielding around the weld after the arc is terminated. This helps prevent oxidation of the weld. **NOTICE: In gasless Flux -Cored mode, Pre and Post Flow will be unavailable for adjustment and the space will be blank.** Typically a setting of about 0.5 seconds for Pre-flow and 3-5 seconds for Post Flow are used.

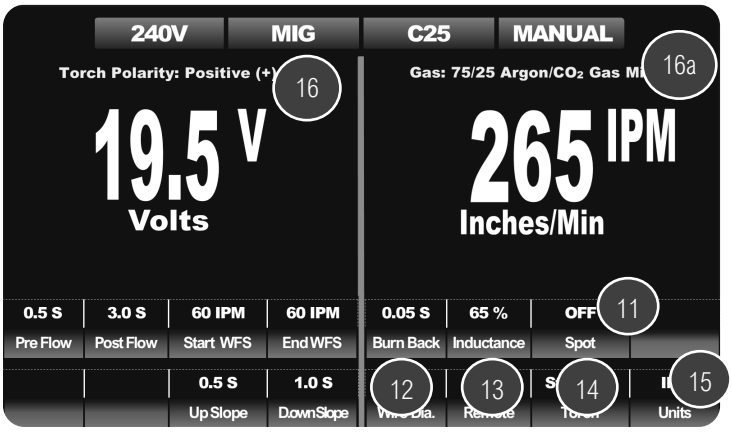
7. **Start/End WFS.** The starting wire feed speed helps the unit start cleanly and smoothly. It can be used with up-slope to helps to improve the quality of the start and transition into the welding amperage. This provides a type of "soft start" which is similar to a hot start setting. The end wire feed speed is used as finishing wire speed feed, and is used to fill the crater left at the end of the weld at arc termination. To reduce the impact of this function, set to 60 IPM (.5 M/M) and set up and down-slope to 0.0 Seconds.

8. **Up/Downslope Timers.** The slope is used to ramp wire speed up or down, at the start of the weld or at weld termination. Up-slope is used with Start Amps to increase wire speed (or decrease it, depending upon the setting desired) from the starting wire feed speed. Down-slope is used to decrease wire speed from welding wire feed speed to the end wire speed. This provides the time necessary to complete the crater fill process at the end of the weld. Either Up or Down Slope can be set to "0.0" if the function is not desired.

9. **Burn-back.** This is the amount of time the arc stays on after the wire stops feeding. It is used to help prevent the wire from sticking in the weld and to reduce the need for constant trimming of the wire before restarting. Use a setting of .02 to .2 seconds to begin with for most applications. Smaller diameter wires need less burn-back time

10. **Inductance. IMPORTANT NOTICE FOR EXISTING EVERLAST MIG OWNERS AND USERS:** *Due to the nature of the Pulse MIG design, the Inductance values used for setting inductance on this model vary from other non-pulse capable units in the Everlast lineup. These settings use a reciprocal value of the other Everlast models (i.e. 70% on*

Component Identification and Explanation



other units = 30% on this model). However, the effect and result, when properly adjusted is the same. This improves the wet-in of the weld. A high setting will result in a very poor arc, with a high pitch. The result will be a raised ridge in the middle and poor wet-in. Excess spatter may be observed. The result of too low of a setting will result in a very fluid, flat puddle. The pitch will be raspy and rough sounding. Starts will not be as smooth. Generally, a setting of 25 to 35% is a good starting point on Steel with C25. With Steel and C100, 10 to 20% is a good starting point. Generally, pure CO2 is not very smooth on many welders, but with inductance control, high quality welds can be achieved. Stainless requires the lowest inductance with 10% or less. Aluminum can range depending upon the wire from 40 to 60% or so. Flux-Cored behaves a little differently with a 35 to 60% starting point. Of course, different weld positions, joint designs and thicknesses of metal can affect the inductance requirement slightly. *Setting inductance is crucial. It is as important as setting proper Voltage and Wire Feed Speed. Inductance will not typically change very much but may change between users if different styles are preferred. In laymen's terms Inductance should be thought of as the third leg of a three legged stool, with the other legs being Volts and Wire Feed Speed/Amps. All three equally contribute to making a weld but without anyone component, the weld cannot be made.* **NOTICE: The unit will ship with the last settings used in performance testing. Often Inductance will be set to 0% or 100% after testing the range of function. If the unit is used at extremes for Inductance, bad arc quality will result.**

11. **Spot and Stitch Timers.** *The Spot timer must be turned on for the Stitch function to appear. When Spot is turned on, the empty box to the right of Spot will be enabled and will be labelled as "Stitch." When Spot is turned off as shown in the picture above, the Stitch function is no longer selectable.* The Spot function is a timer that sets a defined "Arc on" time. The timer allows the arc to stay energized for the period set. After the time has expired the arc will automatically stop, if the trigger is still held down. While it can be used with 4T, the spot function is best used in 2T mode, especially for relatively short tack welds. **NOTE:** Keep in mind that If the spot timer is turned on accidently, the wire feed will stop suddenly soon after the trigger is pressed. In fact it may barely feed and just seem to quit if the time is set low. This is normal, but often a source of tech support calls. If your wire feeder stops feeding unexpectedly after the trigger is pressed, check this function first. Stitch is defined as "Arc-off" time. This function is dependent upon the use of the Spot weld function. While the Spot function may be used independently with the Stitch timer set to "0.0", the use of the Stitch is predicated on the use of the Spot Timer. Using the spot timer together with the stitch timer creates an endless "On and Off" cycle of the arc for as long as the trigger is held. The Spot Timer sets an "arc-off" interval between a series of spot welds as the trigger is continued to be held down. This is useful for tacking up long seams on thin sheet metal such as body panels. It helps to provide regular spacing between the weld as long as the forward travel speed provided by the user remains fairly consistent. **IMPORTANT: If the spot is accidentally engaged, the user will experience a short cycle of the arc. This typically happens with new or inexperienced users or after another user has made adjustments. If the arc suddenly dies after the arc is started or starts/stops starts, check and make sure the Spot timer is set to "OFF".**

12. **Wire Diameter.** The input of the wire diameter helps to put guide limits around output for the wire and make suggestions in gas selection when the wire approaches the short-circuit limits and begins to transition to globular/spray transfer. It also calibrates the welder programming so that it can properly read Amps if Amps is selected in the unit menu.

13. **Remote/Torch Trigger Function.** This controls how the welder reacts to the torch trigger in MIG mode. The functions, while similar will vary slightly from the TIG process. In 2T, the trigger is pressed and held to weld. In 4T, the trigger is pressed briefly to start the arc, then released to continue to weld. The weld is continued without the torch trigger being held down. The trigger is once again pressed, held and then released to terminate the arc. See more detailed 2T/4T Remote information and explanation found later in this manual.

14. **Torch Type**. Select between the main MIG gun, Push Pull and Spool Gun function. **NOTICE: Operation with Spool and Push-Pull Guns yields control of WFS/Amps to the control knob on the gun.**

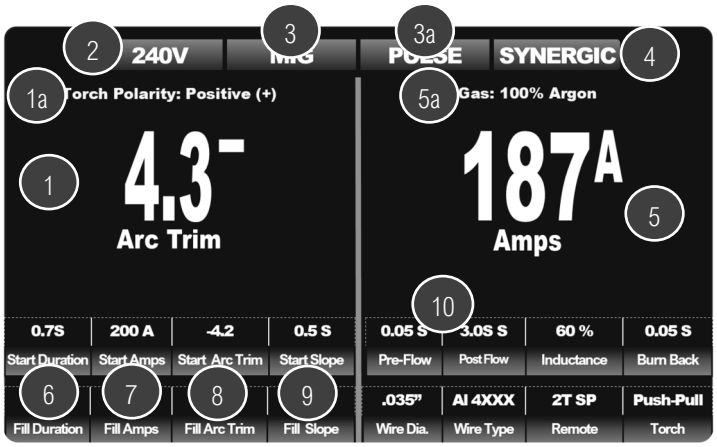
15. **Units.** Everlast recognizes that there is a need to provide different units of measures to different industries and regions of the world. This unit is equipped to read in Standard Imperial (US or English) units such as inches per minute or decimal inch equivalents. The unit is also equipped to read in Metric (SI) units such as Meters/ Minute and millimeters. Choose between MET (Metric) or IMP (Imperial) on the screen to convert all relevant measurements to the desired or required units. This can also read in Amps.

16. **Reminder/ Information Areas.** This informs the user about which torch polarity (16) to use and which gas to use (16a). Both the Torch polarity and gas recommendations are subject to change according to the process used and the actual output of the machine. If improper operation is observed, check this area and the information it is displaying and confirm the polarity and gas mix being used. These areas are not selectable or adjustable.

Component Identification and Explanation

SYNERGIC PULSE MIG. (LIGHTNING 275 MTS-P ONLY)

When the welder is switched to Synergic Pulse MIG mode, many parameters are the same as they are in standard MIG welding modes. However due to the complexity of the process, it requires several parameters and functions not used with standard MIG transfer processes. Pay close attention to these differences as the order, the way a parameter is adjusted or what is being controlled may differ from standard MIG modes. The location of many of the parameters vary somewhat from the standard MIG mode. However this is done logically as possible to accommodate the special requirements needed to operate the welder in pulse MIG mode.



1. **Main Left Display, Arc Trim Display.** Use the left adjustment knob to modify the Arc Trim setting. The Arc Trim is a relative setting (-5 to +5) which replaces the Voltage setting used in the other MIG modes. Use the Arc Trim to adjust the average pulsed voltage to control the arc length. (Arc length is the observed distance from the end of the wire to the puddle surface while welding.) To adjust other parameters or functions, enter the adjustment mode with left down arrow key to navigate to the desired parameter to highlight and enable adjustment. When a parameter or function is selected for adjustment, the numbers will turn from white to red. Arc Trim is the default setting of the left side display. After 5 seconds of no input or adjustment of other parameters or functions on this side, the selected setting will default back to the Arc Trim setting and exit adjustment mode. **Notice: Polarity will always indicate Positive (+) in Pulse MIG mode (1a).**

2. **Voltage Input Confirmation.** This confirms the correct voltage to be supplied to the machine. The correct Voltage is 240V. If 220, 230 or 208V is supplied the Voltage will still read 240V. 208V may affect the machines performance in relation to calibration of WFS.

3. **Process and Gas Reminders.** When viewed together, both 3 and 3a reminds the user which process has been selected. In this mode gas is not displayed except above the right hand section of the screen.

4. **Manual/PowerSet Mode**. This indicates which mode the machine is operating in, whether in full Synergic mode or in PowerSet mode which is a synergic, more automated mode. In PowerSet mode, many functions may not be available for adjustment and will be preset. (See the MIG Pulse PowerSet section).

5. **Main Right Display, Amp Display.** This side displays selected welding Amps by default and is adjusted with the right adjustment knob. Due to the way Amps are controlled in a MIG welder by wire speed, adjusting Amperage simultaneously adjusts WFS, even though the value is shown in Amperage. Using Amperage as the adjustment reference allows the user to transfer and use the same settings between different wire diameters. If Amperage were not used as an adjustment, each wire size will require a different wire speed for the same amperage. This creates difficulty for users in determining the actual wire feed needed to achieve the same Amperage setting since Amperage is often prescribed for a weldment and required Amperage is directly related to thickness of the plate. **The programming automatically takes wire diameter and type of wire input by the user and calculates the Amperage based off of these variables, which eliminates the need for a less accurate Wire Feed Speed (WFS) adjustment.** Other parameters and functions will be represented in the display when in adjustment mode. When the Amps, or other parameter is selected for adjustment the display will turn red in color. After 5 seconds of no input or adjustment of any parameter or function, the selected setting will default back to the Wire Speed setting and return to white. *While actively welding, the display function will change to read actual measured amperage output*. **Notice: Changes in wire type will change gas recommendation (5a).**

6. **Start/Fill Duration.** Start/Fill duration provides a timed Hot Start and a Crater (End) Fill duration when used with the 2TSP/4TSP settings.

7. **Start/Fill Amps.** The Start/Fill Amps settings provide a starting and ending point for Amperage over/under the welding amperage. Start Amperage is typically set higher than the welding Amperage by 15-30% to allow a fast wet in at the beginning. Fill Amperage, which is typically set lower by 15-30% is used to complete the weld by filling the weld puddle (crater) to help prevent cracking at the end of the weld.

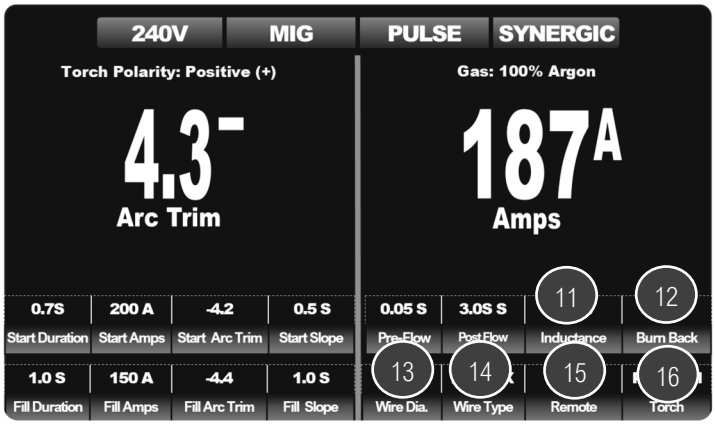
8. **Start/Fill Arc Trim.** These trim settings set the arc length (measured from the end of the wire to the puddle) during the hot start and fill amp portion of the weld cycle. **Typically, this will be set the same as or within .1 to .3 points of the welding arc trim (#1).**

9. **Start/Fill Slope.** This controls the transition time from the Starting Amperage to the Welding Amperage to the Fill Amperage. The slope gradually ramps the amperage according to the time set by the user to ensure a smooth transition between the different weld stages.

10. **Pre-Flow/Post Flow Timers.** Pre and Post Flow provide adjustable shielding gas flow time before and after the weld. This is important to reducing contamination in the weld. The arc start and wire feed will be delayed slightly by the amount of pre-flow time used but helps provide a gas envelope around the weld. Post flow helps cool the torch and provides shielding around the weld after the arc is terminated. This helps prevent oxidation of the weld. Typically, a setting of

Component Identification and Explanation

about 0.5 seconds for Pre-flow and 3-5 seconds for Post Flow are used under 200A. Over 200A, use at least 5-10 seconds of Post Flow for best results.



11. Inductance. IMPORTANT NOTICE FOR EVERLAST MIG OWNERS AND USERS: *Due to the nature of this welder's Pulse MIG design, the Inductance values used for setting inductance on this model differ from other non-pulse capable units in the Everlast lineup. These settings use a reciprocal value of the other Everlast models.* Inductance improves the wet-in of the weld. A high setting will result in a very poor arc, with a high pitch. The result will be a raised ridge in the middle and poor wet-in. Excess spatter may be observed. The result of too low of a setting will result in a very fluid, flat puddle. The pitch will be raspy. Starts may not be as smooth. Generally, a setting of 25 to 35% is a good starting point for Steel. Stainless typically requires 0 to 20% or less. Aluminum, depending upon the wire chemistry, ranges from 35 to 50% or so. Weld position, joint design and metal thickness can slightly affect the inductance requirement. NOTICE: The units will ship with the last settings used in performance testing. Inductance may be set to 0% or 100% after testing the range of function and will need to be reset.

12. Burn-Back. This is the amount of time the arc stays on after the wire stops feeding. It is used to help prevent the wire from sticking in the weld and to reduce the need for constant trimming of the wire before restarting. Use a setting of .02 to .2 seconds to begin with for most applications. Smaller diameter wires need less burn-back time. Too much burn-back time will cause wire to burn-back to the tip after the weld is terminated. Burn-back has no effect during active welding.

13. Wire Diameter. IMPORTANT: The input of the wire diameter helps calibrates the machine so that proper Amperage can be displayed. Minimum allowed wire size is .030" in Pulse MIG. This is sufficient to allow the unit to weld the full range. For this welder, .045" wire is the most versatile diameter, making it able to weld with virtually with any gauge and type of material in Synergic Pulse MIG mode.

14. Wire Type. Select wire type using to calibrate the unit and determine the programming needed to weld the metal. NOTICE: *Instead of having separate Synergic Pulse MIG process selections for Steel, Stainless, Aluminum and Bronze at the top of the panel inline with other process selections, the selection is made with this setting. Scroll through the possible selections and select the wire and metal type you need. If an exact match is not found, select the metal and wire type that is nearest in properties to what is being used.*

15. Remote. This controls how the welder reacts to the torch trigger in MIG mode. The functions, while similar will vary slightly from the TIG process. In 2T, the trigger is pressed and held to weld. In 4T, the trigger is pressed briefly to start the arc, then released to continue to weld. The weld is continued without the torch trigger being held down. The trigger is once again pressed, held and then released to terminate the arc. See more detailed 2T/4T Remote information and explanation found later in this manual. The Synergic Pulse MIG mode additionally offers two more settings: 2TSP (Special) mode and 4TSP (Special) mode which allows additional programmable settings when selected not available in non pulse MIG modes. These programmable settings are all visible in the screen sample above. If 2T or 4T is selected, many of these function and parameter options will disappear. For example, 2T mode only allows selection of trim settings.

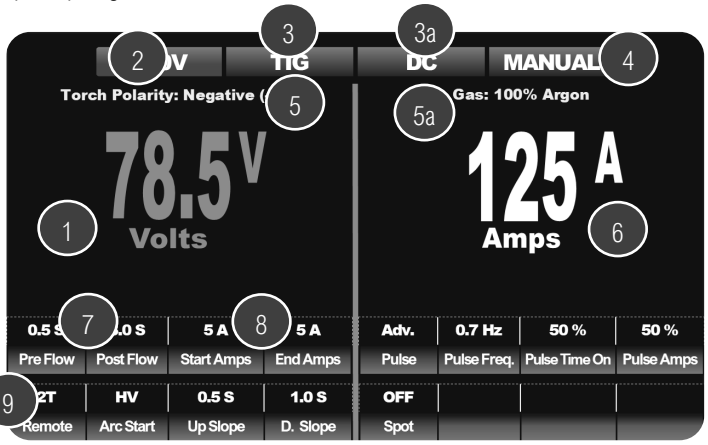
16. Torch. Select between the main MIG gun, Push-Pull and Spool Gun function. NOTICE: Operation with Spool and Push-Pull Guns yields control of Amps to the control knob on the gun.

Component Identification and Explanation

Control Panel Operation and Navigation

DC TIG MANUAL MENU

The TIG manual menu is arranged similarly to the MIG menu and some of the features and parameters overlap. But the information below deals completely within the context of TIG operation. This unit is a DC TIG. It should not be used for welding aluminum. For aluminum welding a spool gun or push pull gun should be used.



1. **Main Left Display, Default Voltage Display.** The voltage displayed in the Main display in TIG mode is a measured reading of actual output. It is not adjustable. The voltage will always be displayed in the color green to remind the user that the voltage is non-adjustable. The left control knob will not allow adjustment of voltage. While adjusting other parameters, the display will change function and display the selected parameter. It will also turn red in color to indicate that the welder has entered into the adjustment mode.

2. **Voltage Input Confirmation. Voltage Input Confirmation.** This confirms the correct voltage to be supplied to the machine. The correct Voltage is 240V. If 220, 230, or 208V is supplied at the outlet, the Voltage will still display 240V unless the voltage is too high or low.

3. **Process Reminders.** When viewed together, both 3 and 3a reminds the user which process has been selected. For TIG, DC will also be highlighted on this machine to remind the user that this unit is DC, and not AC mode. (This TIG supplies DC output only for TIG. It is not suitable for welding Aluminum or Magnesium.)

4. **Manual/PowerSet Mode**. This indicates which mode the machine is operating in, whether in full manual mode or in PowerSet mode which is a synergic, more automated mode. In PowerSet mode, many functions may not be available for adjustment and will be preset. (See the TIG PowerSet section).

5. **Reminder/Information Area.** The area in yellow is designed to inform or remind the user to check or change polarity and to confirm which shielding gas (5a) should be used. For TIG, this area will remain unchanged. Torch polarity in TIG mode will always be negative (-). The recommended shielding gas will always be 100% Argon.

6. **Main Right Display, Default Amp Display.** Adjust with right adjustment knob. By default this display area indicates the Amperage. In adjustment mode, the function or parameter selected will display and the display numbers/letters will turn red to indicate adjustment mode. After 5 seconds of no input or adjustment of any parameter or function, the selected setting will default back to the amperage reading and return to the default white color. *While actively welding, the display function will change to read actual measured amperage output.*

7. **Pre/Post Flow Timers.** The setting provides shielding gas flow before and after the weld. While only a small amount is needed, pre-flow is important to the TIG process. This provides a gas envelope around the weld area so the arc can be cleanly started and oxidation of the metal and consumption of tungsten will be eliminated. Post flow aids in weld cooling and protection to help prevent oxidation of the weld and consumption of the electrode. Always use around .3 to 1.0 seconds of preflow (more is needed for longer torches). Post flow should be set according to the amperage being used. Always use a minimum of 3 seconds for welding. Ideally, use 1 second for every 10 to 20 Amps used, with 3 seconds being the minimum setting regardless of the amperage.

8. **Start/End Amps.** This controls be beginning and ending amperage of the weld cycle. The Start Amp setting provides a starting amperage for the welding arc. The minimum used should be adjusted according to the tungsten size used. This setting is adjustable with all remote modes. While typically used at a relatively low setting (<40A) the Start Amps can be used to provide a "Hot Start" as well. However, if the Tungsten is blasted with too much starting amperage during the start, the Tungsten tip may deteriorate rapidly. End Amps provide a crater fill amperage and assists the user in terminating the arc cleanly. It provide the user an opportunity to fill the crater at a lower amperage and to cool the weld puddle slightly before terminating the arc. Typically, with the foot pedal, this is set less than 20A for a clean tail-out of the arc. With the torch switch, this is typically less than 40A, however it can be higher depending upon the desired effect.

9. **Remote/Torch Trigger/Pedal Function.** The Remote function settings that are offered vary depending upon whether you are in MIG, Pulse MIG, or TIG modes. For TIG you will have: 2T, 4T, Pedal, 2T+A, or 4T+A. These settings dictate how the welder's amperage and screen programming are set and controlled. Depending upon the remote selection choice, the Remote function also controls which other functions and parameters are available for adjustment. For example, in TIG, the pedal eliminates Up and Down Slope functions because they are not needed since slope is controlled through the pedal manually. 2T and 4T are used with the torch switch only. The amperage, slope and all functions related to the weld cycle are available. The torch switch does not control welding amperage or increase or decrease of amperage directly. The programming on the panel controls this. Bu the cycling of the torch switch does affect when this happens. The 2T+A and 4T+A, though similar to standard 2T and 4T and work with

Component Identification and Explanation

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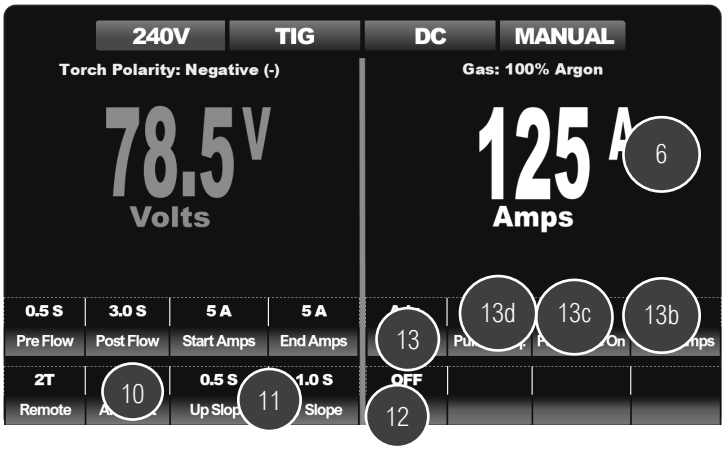

a type of TIG torch equipped with a separate amp control and switch. This allows the user to use the welder programming for start and end amperage, up and down slope but still be able to fine tune the max amperage on the torch while welding without a foot pedal. See more detailed 2T/4T Remote information and explanation found later in this manual for illustrated examples.

10. Arc Start. The TIG welding arc can be initiated in two basic ways. The arc can be started without contacting the metal or can be touched to the metal and lifted up to create the arc.

- *HV Start.* For contactless starting, which is usually preferred for most applications, the unit features an electronic form of HF starting called HV. This type start is very similar to the old HF contactless start, but is now generated electronically without the use of adjustable points. HV/HF starting may be restricted in some environments where this may cause electronic interference such as hospitals.

- *Lift Start.* The other method of starting is called Lift Start. This is where the tungsten is briefly touched to the metal and lifted up to start the arc. There are two types of Lift start. The first is the Live lift. This lift start means the tungsten is always live. Touching down to the metal, the contact is sensed and the output is reduced until the tungsten is lifted up and the arc is started. This is preferred by pipe welders and job site fabricators because it eliminates pedals and wires. This type start also disallows all adjustment except Post Flow. Gas automatically starts flowing when the tungsten is touched. The second type of lift start is activated by the switch or foot pedal. The tungsten stays "dead" until the switch is activated. In this mode, the torch is touched to the work and the switch or pedal is pressed and held and the torch is then lifted up and the arc is struck. This method is safer and is often used where HF/HV use is restricted.

11. Up/Down Slope Timers. Up slope is used to ramp the amperage up from the starting amperage up to the pre-set welding amperage by setting a defined ramp up time. Down slope is used to ramp the amperage up from the pre-set welding amperage down to the end (crater fill) amperage by setting a defined ramp up time.

12. Spot/Stitch Timer. *The Spot timer must be turned on for the Stitch function to appear to the right of the Spot Timer function. When Spot is turned off as shown in the picture above, the Stitch function is no longer selectable and the space will turn gray and will remain blank.* The Spot function is a timer that sets a defined "Arc on" time. The timer allows the arc to stay energized for the period set. After the time has expired the arc will automatically stop, if the trigger is still held down. The spot function is best used in 2T mode, especially for relatively short tack welds. NOTICE: While the Spot function may be used independently with the Stitch timer set to "0.0", the use of the Stitch is predicated on the use of the Spot Timer. Using the spot timer together with the stitch timer creates an endless "On and Off" cycle of the arc for as long as the trigger is held. The Spot Timer sets an "arc-off" interval between a series of spot welds as the trigger is continued to be held down. This is useful for tacking up long seams on thin sheet metal such as body panels. It helps to provide regular spacing between the weld as long as the forward travel speed provided by the user remains fairly consistent. **IMPORTANT: If the Spot function is accidentally engaged, the user will experience a short cycle of the arc. This typically happens with new or inexperienced users or after another user has made adjustments. If the arc suddenly dies after the arc is started or starts/stops starts, check and make sure the Spot timer is set to "OFF". The use of spot eliminates the use of Pulse. However, it should not be confused with Pulse. In Pulse mode the arc never extinguishes and there are more adjustments.**

13. Pulse. The pulse is used to help control heat input and warping by creating a lower average Amperage by cycling between levels of amperage. It can also be used at slower pulse frequency settings to improve the weld appearance and the "stacking" of the weld. When turned on, the Pulse selection will be expanded with three additional selections on the line that are pulse functions. When the pulse is turned off, the three boxes to the right of the function will be gray. Additionally, when the Spot timer is turned on, Pulse will not be available. Even though on the line, there are three additional settings, in total the Pulse has four adjustable components on this welder:

- (6) The *Peak stage*, or the Welding Amp stage represents the maximum set amperage of the pulse. This is represented on the machine by the default Amp setting.
- (13b) The *Base stage* represents the minimum set amperage of the pulse. This is represented on the machine by the Pulse Amp setting. The represents a drop in the amperage, not a rise in amperage.
- (13c) The *Pulse Time-On*, or the pulse duty cycle of represents the adjustable balance of the pulse between the Peak and Base pulse
- (13d) The *Frequency* is the number of times per second the pulse cycles. It is represented in Hz, but Hertz can also be thought of a Pulses per second (PPS). Frequency determines how fast or slow the pulse is cycling every second.

NOTICE: Pulse is not available when using the Spot Timer.

DC Stick Manual Menu:

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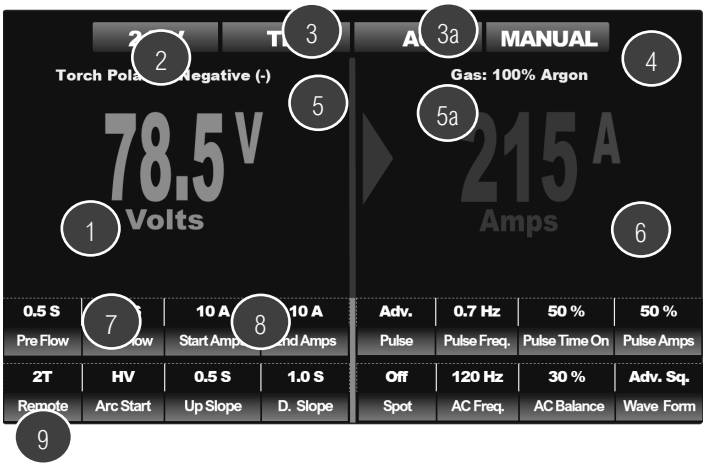
AC TIG MANUAL MENU

The TIG manual menu is arranged similarly to the MIG menu and some of the features and parameters overlap. But the information below deals completely within the context of TIG operation. This unit provides both AC and DC TIG Output, which is suitable for welding almost all weldable metals.



1. **Main Left Display, Default Voltage Display.** The voltage displayed in the Main display in TIG mode is a measured reading of actual output. It is not adjustable. The voltage will always be displayed in the color green to remind the user that the voltage is non-adjustable. The left control knob will not allow adjustment of voltage. While adjusting other parameters, the display will change function and display the selected parameter. It will also turn red in color to indicate that the welder has entered into the adjustment mode.

2. **Voltage Input Confirmation. Voltage Input Confirmation.** This confirms the voltage to be supplied to the machine. The correct Voltage is 120V or 240V. If 220, 230, or 208V is supplied at the outlet, the Voltage will still display 240V unless the voltage is too high or low. When operating on 120V, the box will be yellow to remind the user. Output will be limited on 120V.

3. **Process Reminders.** When viewed together, both 3 and 3a reminds the user which process has been selected. For TIG, AC will also be highlighted on this machine to remind the user that this unit is AC, and not DC mode. (This TIG supplies AC or DC output for TIG. AC should be used for for welding Aluminum or Magnesium.)

4. **Manual/PowerSet Mode**. This indicates which mode the machine is operating in, whether in full manual mode or in PowerSet mode which is a synergic, more automated mode. In PowerSet mode, many functions may not be available for adjustment and will be preset. (See the TIG PowerSet section).

5. **Reminder/Information Area.** The area in yellow is designed to inform or remind the user to check or change polarity and to confirm which shielding gas (5a) should be used. For TIG, this area will remain unchanged. Torch polarity in TIG mode will always be negative (-). The recommended shielding gas will always be 100% Argon.

6. **Main Right Display, Default Amp Display.** Adjust with right adjustment knob. By default this display area indicates the Amperage. In adjustment mode, the function or parameter selected will display and the display numbers/letters will turn red to indicate adjustment mode. After 5 seconds of no input or adjustment of any parameter or function, the selected setting will default back to the amperage reading and return to the default white color. *While actively welding, the display function will change to read actual measured amperage output.*

7. **Pre/Post Flow Timers.** The setting provides shielding gas flow before and after the weld. While only a small amount is needed, pre-flow is important to the TIG process. This provides a gas envelope around the weld area so the arc can be cleanly started and oxidation of the metal and consumption of tungsten will be eliminated. Post flow aids in weld cooling and protection to help prevent oxidation of the weld and consumption of the electrode. Always use around .3 to 1.0 seconds of preflow (more is needed for longer torches). Post flow should be set according to the amperage being used. Always use a minimum of 3 seconds for welding. Ideally, use 1 second for every 10 to 20 Amps used, with 3 seconds being the minimum setting regardless of the amperage.

8. **Start/End Amps.** This controls be beginning and ending amperage of the weld cycle. The Start Amp setting provides a starting amperage for the welding arc. The minimum used should be adjusted according to the tungsten size used. This setting is adjustable with all remote modes. While typically used at a relatively low setting (<40A) the Start Amps can be used to provide a "Hot Start" as well. However, if the Tungsten is blasted with too much starting amperage during the start, the Tungsten tip may deteriorate rapidly. End Amps provide a crater fill amperage and assists the user in terminating the arc cleanly. It provide the user an opportunity to fill the crater at a lower amperage and to cool the weld puddle slightly before terminating the arc. Typically, with the foot pedal, this is set less than 20A for a clean tail-out of the arc. With the torch switch, this is typically less than 40A, however it can be higher depending upon the desired effect.

9. **Remote/Torch Trigger/Pedal Function.** The Remote function settings that are offered vary depending upon whether you are in MIG, or TIG modes. For TIG you will have: 2T, 4T, Pedal, 2T+A, or 4T+A. These settings dictate how the welder's amperage and screen programming are set and controlled. Depending upon the remote selection choice, the Remote function also controls which other functions and parameters are available for adjustment. For example, in TIG, the pedal eliminates Up and Down Slope functions because they are not needed since slope is controlled through the pedal manually. 2T and 4T are used with the torch switch only. The amperage, slope and all functions related to the weld cycle are available. The torch switch does not control welding amperage or increase or decrease of amperage directly. The programming on the panel controls this. But the cycling

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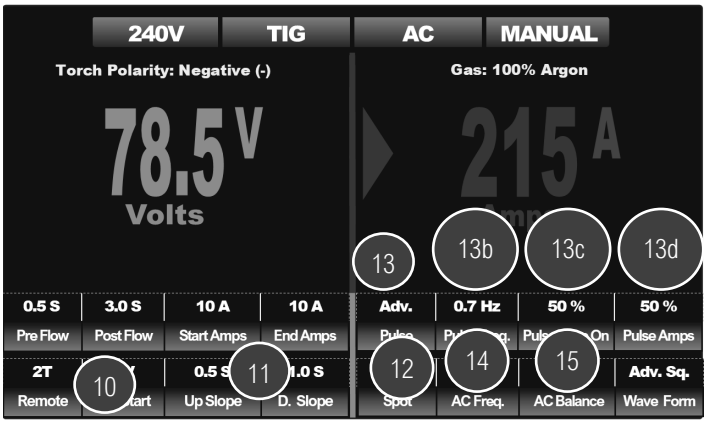
of the torch switch does affect when this happens. The 2T+A and 4T+A, though similar to standard 2T and 4T and work with a type of TIG torch equipped with a separate amp control and switch. This allows



10. the torch while welding without a foot pedal. See more detailed 2T/4T Remote information and explanation found later in this manual for illustrated examples.

11. Arc Start. The TIG welding arc can be initiated in two basic ways. The arc can be started without contacting the metal or can be touched to the metal and lifted up to create the arc.

- *HV Start.* For contactless starting, which is usually preferred for most applications, the unit features an electronic form of HF starting called HV. This type start is very similar to the old HF contactless start, but is now generated electronically without the use of adjustable points. HV/HF starting may be restricted in some environments where this may cause electronic interference such as hospitals.

- *Lift Start.* The other method of starting is called Lift Start. This is where the tungsten is briefly touched to the metal and lifted up to start the arc. There are two types of Lift start. The first is the Live lift. This lift start means the tungsten is always live. Touching down to the metal, the contact is sensed and the output is reduced until the tungsten is lifted up and the arc is started. This is preferred by pipe welders and job site fabricators because it eliminates pedals and wires. This type start also disallows all adjustment except Post Flow. Gas automatically starts flowing when the tungsten is touched. The second type of lift start is activated by the switch or foot pedal. The tungsten stays "dead" until the switch is activated. In this mode, the torch is touched to the work and the switch or pedal is pressed and held and the torch is then lifted up and the arc is struck. This method is safer and is often used where HF/HV use is restricted.

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12. Spot Timer. The Spot function is a timer that sets a defined "Arc on" time. The timer allows the arc to stay energized for the period set. After the time has expired the arc will automatically stop, if the trigger is still held down. The spot function is best used in 2T mode, especially for relatively short tack welds.

13. Pulse. The pulse is used to help control heat input and warping by creating a lower average Amperage by cycling between levels of amperage. It can also be used at slower pulse frequency settings to improve the weld appearance and the "stacking" of the weld. When turned on, the Pulse selection will be expanded with three additional selections on the line that are pulse functions. When the pulse is turned off, the three boxes to the right of the function will be gray. Additionally, when the Spot timer is turned on, Pulse will not be available. Even though on the line, there are three additional settings, in total the Pulse has four adjustable components on this welder*: Do not confuse Pulse functions with AC functions. These are completely different functions, even if they use both % and Hz.*

- (6) The *Peak stage*, or the Welding Amp stage represents the maximum set amperage of the pulse. This is represented on the machine by the default Amp setting.

- (13b) The *Base stage* represents the minimum set amperage of the pulse. This is represented on the machine by the Pulse Amp setting. The represents a drop in the amperage, not a rise in amperage.

- (13c) The *Pulse Time-On*, or the pulse duty cycle of represents the adjustable balance of the pulse between the Peak and Base pulse

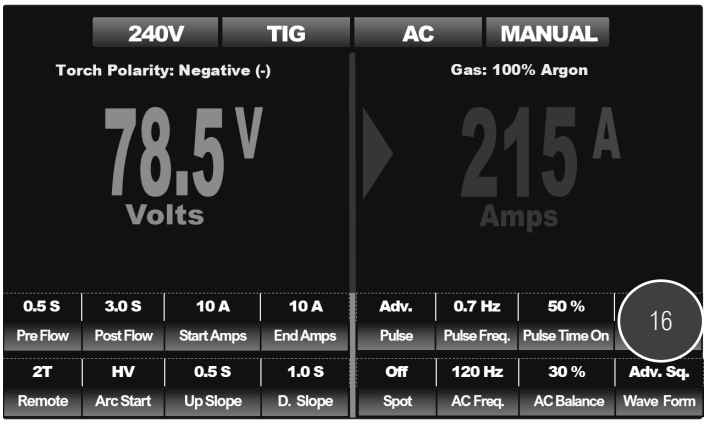
- (13d) The *Frequency* is the number of times per second the pulse cycles. It is represented in Hz, but Hertz can also be thought of a Pulses per second (PPS). Frequency determines how fast or slow the pulse is cycling every second. NOTICE: Pulse is not available when using the Spot Timer.

14. AC Frequency. This is the number of times per second the AC cycle oscillates between DC negative polarity and DC positive. Represented in Hertz (Hz), AC Frequency controls arc focus and gives a higher measure of control. Turning Frequency higher gives a tighter, more focused weld. Typically, for day-to-day welding use between 90 and 120Hz. Turning frequency higher also lowers the heat that goes into the weld. The higher frequency, the less wet-in and slower travel speed. Lower frequencies from 50-80Hz can be used to increase the maximum capability of the welder.

15. AC Balance. Expressed as a percentage of positive polarity, AC Balance adjusts the amount of Positive (+) polarity and Negative (-) polarity in each complete AC cycle. The Positive polarity portion of the AC cycle serves to deoxidize, or clean, Aluminum in the weld area as

Control Panel Operation and Navigation

the weld progresses. The Negative polarity portion of the AC cycle serves to provide penetration. A true balanced "AC balance" would be 50% negative and 50% positive polarity. However, this creates problems with Tungsten longevity and creates balling and rapid consumption of the Tungsten point. To much Positive percentage also reduces heat going into the weld and focuses it too much on the tungsten, which will require more amperage to create a good weld puddle. Additionally, at 50% Positive polarity the etched area created by the cleaning effect that Positive polarity creates, will be unacceptably wide. In reality, only about 20% to 40% Positive polarity is needed. Typically, an AC Balance setting of 25% to 35% is more than sufficient to provide good cleaning action with minimal cleaning lines. **NOTE: AC Balance is not the only way to control cleaning (etching) lines on the Aluminum metal. Slow weld speed can also create undesirably wide cleaning lines. Too little Amperage or poor manipulation resulting in slow forward travel increase the amount of time the cleaning action has time to act on a small area. Always use sufficient Amperage to maintain fast forward travel to help combat over-etching in AC.**



16. AC Wave Form Control. AC output creates a wave like shape (viewable on an oscilloscope) as it cycles between Positive and Negative polarities. Normal AC wave shape (the kind a power company provides) is in the form of a Sine wave. This is similar to regular waves in an ocean. The rise and fall of the voltage as it switches defines the wave form. A sine wave offers a smooth rise and fall, with a rounded peak that offers a more gradual transition. But in this welder, this wave shape can be reformed to create special wave form shapes which improve welding properties. The wave form shapes offered on this unit are Advanced Square Wave, Triangular Wave, and Soft Square Wave. Each special shape imparts special characteristics to the weld.

- Advanced Square wave shape offers Fast wet-in and Fast Freeze properties. Fast travel speed and a well defined puddle are the hallmark characteristics. It does so by maximizing the peak voltage time of the wave form with square sides and a nearly vertical sides of the wave shape with little transition between negative and positive polarity. This wave form should be the normal wave form used in most cases.

- Triangular wave shape offers very light penetration since the wave shape only stays at peak voltage very briefly before it begins to fall. The triangle shape slopes up and down very noticeably, which minimizes penetration and heat input. This is not recommended for anything but very thin gauge metals. At higher Amperage on thick materials there will be issues with proper wet-in and penetration. Weld speed will be slow and will provide a poor bead profile and root penetration.

- Soft Square is caught between a true Sine wave and Advanced Square Wave. The softer shoulders of the wave form contribute to a buttery, slower to freeze puddle. While wet-in time and freezing time is slower, this offers a more gentle feel than the Advanced Square wave. In many cases, the Soft Square is used where a wide, lazy bead is wanted, with a softer freeze ripple in the weld. This doesn't provide as much heat as Advanced Square wave so, on thicker material, the capacity to penetrate will be reduced.

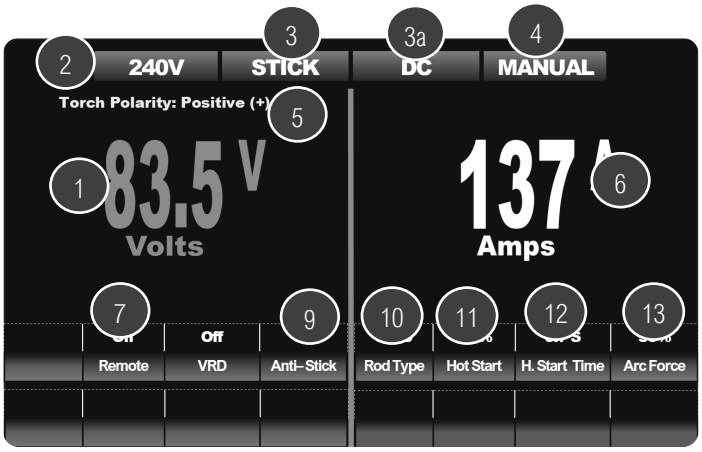
- Sine wave is the oldest wave form of AC TIG welding. This is the standard wave form that represents most older transformer welders up until the soft square wave units were brought out. Sine wave is the softest wave form, leading to less efficient welding speed. But it does have a reputation of being able to produce nice welds , wide, wet puddle. However, travel speed is among the slowest.. The sine wave arc is quiet and buzzy and is easily distinguishable by the sound. The nature of the wave form with the sloping shoulders allows good penetration with an even dish shaped penetration zone.

Component Identification and Explanation

Control Panel Operation and Navigation

The stick manual menu is simplest menu of all the manual menus. However, there are a few functions that the user should take note of. Ignoring these setting and not providing a setting for them, may make arc starting difficult or may make maintaining a satisfactory arc impossible.

1. Main Left Display, Default Voltage Display. The voltage displayed in



the Main display in Stick mode is a measured reading of output. It is not adjustable. The voltage will always be displayed in green color to remind the user that the voltage is non adjustable. The left control knob will not be able to adjust voltage. While adjusting other parameters, the voltage will change function and will display the selected parameter. It will also turn red to indicate it has entered the adjustment mode.

2. Voltage Input Confirmation. Voltage Input Confirmation. This confirms the correct voltage to be supplied to the machine. The correct Voltage is 240V. If 220, 230 or 208V is supplied the Voltage will still read 240V.

3. Process Reminders. When viewed together, both 3 and 3a reminds the user which process has been selected. For Stick, DC will also be highlighted on this machine to remind the user that this unit is DC, and not AC mode. (This welder supplies DC output only for Stick)

4. Manual/PowerSet Mode. This indicates which mode the machine is operating in, whether in full manual mode or in PowerSet mode which is a synergic, more automated mode. In PowerSet mode, some functions may not be available for adjustment and will be preset. (See the Stick PowerSet section).

5. Reminder/Information Area. The area in yellow is designed to inform or remind the user to check or change polarity and to confirm which shielding gas (5a) should be used. For Stick, this area will remain unchanged. Torch polarity in Stick mode will always be positive (+). Some rods that may allow use on electrode negative, but those are typically not considered standard types or preferred polarity in most cases.

6. Main Right Display, Default Amp Display. Adjust with Right adjustment knob. By default this display area indicates the Amperage. In adjustment mode, the function or parameter selected will display and the display numbers/letters will turn red to indicate adjustment mode. After 5 seconds of no input or adjustment of any parameter or function, the selected setting will default back to the amperage reading and return to the default white color. *While actively welding, the display function will change to read actual measured amperage output.*

7. Remote. The remote function allows the stick function to be used with an adjustable remote to control amperage at the electrode holder.

8. Voltage Reduction Device (VRD). The VRD acts as a safety device by lowering the OCV while the unit is not welding to below 24V. This helps prevent accidental shock and electrocution.

9. Anti-Stick. The anti-stick helps prevent the rod from sticking fast in the weld puddle by reducing the output when it is shorted accidentally while welding. This makes the stuck rod easier to remove. It will not actually prevent the rod from sticking, but it will help prevent it from sticking fast in the weld and flaming up.

10. Rod Type. This feature helps improve overall rod performance and provides a base for the machine to fine tune parameters.

11. Hot Start. This is a rush of amperage over the set amount that is provided to help improve the starting of the rod. NOTICE: Hot Start may be limited and seem to be muted due to the amount of amperage available left over to operate the hot start. The closer to the maximum amperage the machine is set, the impact of the hot start will be softened. Typically iron powder and titania fluxed rods require less than cellulose. For iron powder/titania fluxed rods, 40-50% is typical. For cellulose 70-90% may be required. Low-Hydrogen rods that are not properly stored or used and are considered "wet" (open, non heated storage of greater than 4 to 8 hours), may require higher settings similar to cellulose to keep the rod burning properly. But fresh rods or rods stored in rod ovens will use the lower settings.

12. Hot Start Time. This is the duration of the Hot Start This keeps the hot start active and helps heat up the puddle.

13. Arc Force. As the rod is held closer, the arc voltage will drop and the total wattage will fall. In some cases this may cause the rod to stick in the puddle. The Arc Force offsets this by supplying additional amperage (over the amount set) to help maintain welding wattage. This allows the user to use a tight arc, to prevent impurities from entering the weld. The Arc Force will be triggered when welding voltage falls below approximately 20V. Adding Arc Force will improve the feel and wet in of the puddle. Typically iron powder and titania fluxed rods require less than cellulose. For iron powder/titania fluxed rods, 20 to 40% is typical. For cellulose 60-85% may be required. Low-Hydrogen rods that are not properly stored or used and are considered "wet" (open, non heated storage of greater than 4 to 8 hours), may require higher settings to keep the rod burning properly. But fresh

Control Panel Operation and Navigation

rods or rods stored in rod ovens will use the lower settings.

In Manual Welding Modes, What Are the Welder's Default Settings?

The welder is designed to include many extra features and functions in the Manual mode that aren't included with basic welders. These extra features are meant to give the user the maximum amount of control over the weld performance. But along with maximum amount of control, a user should have the knowledge and skill to use them properly.

The unit has no factory default settings except for the specific programming offered in the PowerSet mode that either offers suggested settings or has some functions fixed or locked. With no default settings, this also means there is no way to "reset" the machine to factory settings. However, any adjustable setting in PowerSet mode also needs to be properly set. Any ignored setting can lead to malfunction or poor welding performance of the machine. If you are not comfortable with setting the unit up manually completely, or do not have time to go through each setting to set it properly, it is suggested that you use PowerSet mode instead. Keep in mind, that PowerSet still requires setup of the features that are not fixed or locked by the programming.

The unit is programmed during manufacturing and is tested before being shipped. The programming, in many cases, requires place holder settings to be loaded into the welder. Depending upon the last test performed with the unit, the welder may not have a workable combination of settings entered, and any adjustable setting entered should not to be considered a default or suggested setting unless this manual states specifically otherwise.

In many cases there are no "right or wrong" settings. Some settings like Pre-Flow and Post Flow are ultimately up to user preference, even though some pre flow and post flow should always be used. However, settings like Inductance have a range of workable possible settings. But in a case like this an extreme setting (even though the welder allows it) will produce unsatisfactory welds.

Component Identification and Explanation

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Using the PowerSet Menus.

The PowerSet function is an advanced synergic function designed to provide the user with a simplified set up process by using a combination of color -coded graphics and preprogrammed settings based on industry recommended standard values. In addition to the recommended settings, it provides an adjustable setting range above and below the recommended setting to allow the you to fine tune the setting to better suit the application and your welding style. It can also be used as a general guide for setup parameters in the manual mode and eliminates the need for complicated charts and user guides. PowerSet is not meant to be the solution to every welding situation. Position, joint design, and user welding style all affect the accuracy of settings. Additionally, if input voltage is in the lower part of the acceptable range, it may affect the accuracy of the PowerSet mode.

To use the PowerSet menu properly, the user must input basic operating parameters, such as wire type (selected by the process), wire diameter and material thickness to provide useable results. These are all the same type settings you'd have to reference in a user setup chart. Although the settings provided to the user are based off of industry accepted "norms," the settings provided in the programming may not work for every user in every application. The programming is designed to provide a target recommended setting, but the welder also provides a range of adjustment higher and lower than the target setting value to allow fine tuning to accommodate differences of joint design, user welding style and weld position. Although the range of adjustment is fairly generous, there are limits set by the machine's programming to attempt to keep the unit from going too far off track. The programming will block further adjustment after the limits of the range are reached. The PowerSet is also equipped with visual graphical aids to help the user see and visualize the settings. The settings will have a tapered graphic is also color coded to indicate a normal range of a setting and guide the user further in fine tuning. As the setting is fine-tuned, away from the recommended settings and toward the setting limits, the graphic will eventually change from green to yellow, and finally to red to indicate the general "safeness" of a permitted adjustment.

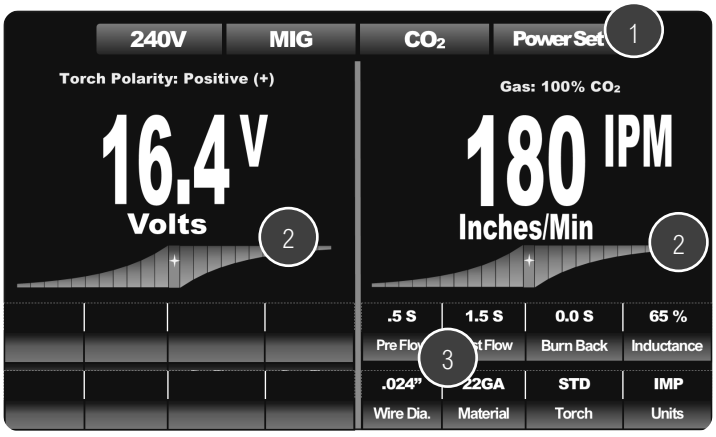
Keep in mind that synergic settings cannot take into account every variable and allows the user independent control to manually correct the provided settings to accommodate differences in welding environment, user experience and skill. Remember: weld position, joint fit-up, and cleanliness all are "hidden variables" that can make a difference in the accuracy and effectiveness of the PowerSet settings. There is no perfect synergic system for every eventuality. The settings provided are given based off of in-position welding, good fit-up/joint design and assumes at least an intermediate level of understanding and skill of the operator. The PowerSet function has been tested for acceptable function under industry recommended operating conditions and parameters for general purpose welding.

It should also be noted that welds that are performed on metal plate greater than 1/4" are generally performed in multiple passes for best results for short circuit MIG welding. This is similar to TIG and Stick maximum recommendations as well for single pass. The unit does offer higher settings and may recommend a gas change as the wire speed and voltage enter the Globular and Spray transfer range to perform single pass welds (MIG C25 process selection). If the user is not informed on the differences between the types of MIG wire transfers, including Synergic Pulse MIG, and does not understand the requirements and expectations and limits of different forms of wire transfer and observe the recommendations given, the unit may not perform satisfactorily.

NOTICE: To prevent a completely unworkable setting, wire diameter, tungsten size or electrode capability, selection choices of inputs and some parameter adjustments may be limited or completely blocked to prevent a mismatched setting that may cause the welder to exceed the Amp capacity of the MIG wire, TIG tungsten, or Stick electrode. This is intended to remind the user that there are physical limits to choices of wire, tungsten or electrode (welding rod) can support and to help prevent an "unworkable" setting recommendation. Even with these limits, it does not always mean that performance will be perfect or desirable. Near or at the physical limits of wire or electrodes (or input voltage), spatter may increase and weld performance or arc stability will decrease. **The limitation of adjustment with some settings or certain combinations of user input is not a malfunction of the unit.**

PowerSet Menus Items Shared in Common Between Processes.

In comparison to the Manual Menus, the PowerSet Menus are simplified in regards to the amount of controls and functions needed for proper adjustment. The menu is reduced to more basic functions, but still allows all critical adjustments to be made. The rest are preset by the factory or all together eliminated. The basic layout, operational information provided on screen and method of navigation/adjustment are mostly unchanged from the manual mode, so the information will not be repeated, unless there is a difference in function or process of setup.



1. When the PowerSet mode button is activated, this box will change from Manual to PowerSet to confirm the setting.
2. The adjustment range graphic is designed to aid the user a visually by indicating how the adjustment is affecting the setting. Depending

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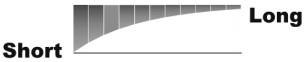
upon the parameter being adjusted, the graphic may change in appearance. For Volts, Amps and Wire Feed Speed, the graphic appears as shown above in the picture. As the user makes progresses further away from the recommended adjustment, the graphic will also change color, turning from green to yellow and finally to red. The red and yellow areas indicate that the adjustment is not recommended and serves as a general warning that performance may not be optimal, even if it is allowed. For other adjustable parameters or input functions the graphics will change in appearance to better illustrate the. **Input functions such as Wire Diameter or Material thickness have no target or recommended value and simply relay the chosen input value in the form of a graphic as a visual aid.** Other basic parameters such as torch or pre/post flow have no recommendation so there is no adjustment graphic for those. For specific parameters, such as inductance, the graphic indicates the recommended preset and allows the user to make adjustments, but indicates settings that may not be ideal as the graphic slopes up or down, away from the center setting. Other types of graphic representations are:

- Material Thickness: 

- MIG Inductance or Stick Arc Force: 
- Diameter (wire, tungsten or electrode): 
- Arc Trim (Pulse MIG Arc Length): 

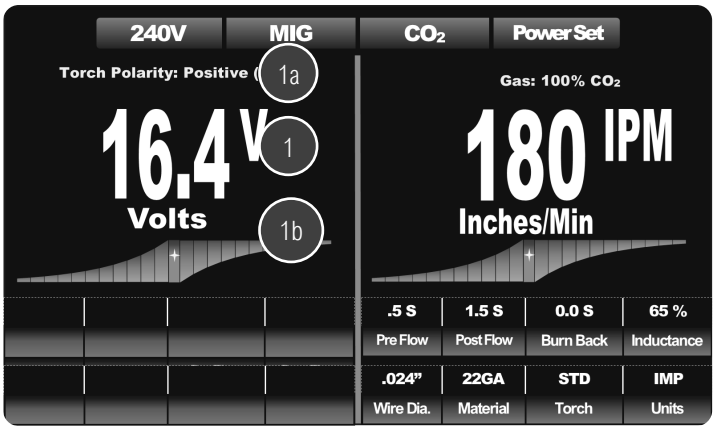
3. PowerSet requires user defined input parameters.

- For MIG, the required input parameters, after selecting the correct process (for wire standard feed processes, the correct wire and gas type are assumed by the selection of the wire process) are the input of the wire diameter and material thickness.
- For Synergic Pulse MIG the required user input parameters, after selecting the correct process (for pulse MIG, the correct gas is dictated on the panel) are the input of wire diameter, wire type, and material thickness.
- For TIG, the required user input parameters are Tungsten Diameter, and Material Thickness.
- For Stick, the required user input parameters are Rod type (Electrode Selection, Rod Diameter and Material Thickness.

MIG, Syn. Pulse MIG, TIG and Stick PowerSet information.

MIG/Flux-Cored:

Standard, non-pulse MIG and Flux Cored processes are similar processes and appear similar with only minor differences in the programming in the PowerSet mode. The appearance and layout of PowerSet functions is similar and both are treated the same in this section. In the PowerSet mode, while there are items that correspond to the manual mode, the arrangement and number of adjustable functions is different. Overall the number of adjustable functions are reduced. The balance of the functions that normally appear in the manual mode are either fixed as a preset in the programming or automatically set themselves based off the user inputs. There are a some functions that have limited ranges of adjustment to reduce the potential for operator error and/or poor machine performance. Some ranges of adjustment (or selectability) are reduced based of the exact operator input such as the wire diameter. The wire diameter is governs/ limits the maximum selectable thickness of material and limits the maximum wire speed. Also, the range of inductance () is limited to an range that will typically produce the most acceptable results. The center target setting for inductance will vary based off the wire feed process selection. This range will not always be symmetrical from the center target. These limits in range or presets do not always prevent a "bad" setting from occurring if the user inputs create a setting is already straining the wire's capacity at either the physical minimum or maximum limit if the Wire Feed Speed or Voltage is overridden manually with a value that exceeds the physical limit of the wire. It should be noted again, that not every setting offered by PowerSet mode will fit every situation and fine tuning may be needed. In some cases, it may be necessary to revert to manual mode to gain enough adjustment to get the performance expected by the user.



1. **Main Left Display, Default Voltage Display.** Adjust the voltage with left adjustment knob. Voltage is the default setting of the left side. There are no other adjustments made on this side. The left side controls only apply to the voltage setting in PowerSet mode. The Polarity (1a) will change based off of the process selected. In general, all MIG will

Component Identification and Explanation

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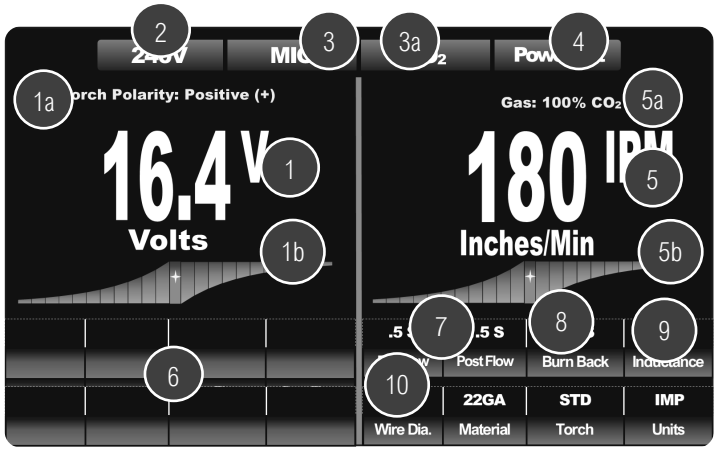

use electrode positive (+). This includes most Gas-Shielded Flux-cored wires. Self-Shielded Flux-cored wires are typically electrode negative (-). The default graphic representation ( ) indicates the adjustment range of the voltage. The centered starred adjustment indicates the recommended setting but anywhere within the green range of adjustment should result in satisfactory performance. The highlighted bars will change from green to yellow to red, as the adjustments made to the recommended setting become less desirable and less likely to provide satisfactory results.

2. **Voltage Input Confirmation. Voltage Input Confirmation.** This confirms the voltage that is to be supplied to the machine. The correct Voltage is 240V. If 220, 230 or 208V is supplied, the Voltage will still read 240V.

3. **Process and Gas Reminders.** When viewed together, both 3 and 3a reminds the user which process and metal has been selected.

4. **Manual/PowerSet Mode**. This indicates in which mode the machine is operating. The PowerSet mode which is a synergic, more automated mode that eliminates some user required settings. In PowerSet mode, many functions may not be available for adjustment and will be preset or optimized by the programming based off of user inputs.

5. **Main Right Display, Default Wire Feed Speed Display.** Adjust the wire feed speed (WFS) with right adjustment knob. This display can indicate the wire feed speed in either Inches Per Minute (IPM), Meters Per Minute) M/Min or Amps. This is the default setting of the right side. Other parameters and functions will be represented in the display when in adjustment mode. When the Wire Feed Speed or other parameter is selected for adjustment the display will turn red in color. After 5 seconds of no input or adjustment of any parameter or function, the selected setting will default back to the Wire Speed setting and return to white. *While actively welding, the display function will change to read actual measured amperage output.* 5a indicates the gas selection. Except for Synergic Pulse MIG, a selected MIG process will always require either C25 (75/25 Ar/CO_2 for Steel), C100 (100% CO_2 for Steel), Mix Gas (98/2 Ar CO_2 for Stainless/Inox), Ar Gas (100% Argon for Aluminum), or No Gas (For Flux-Cored on Steel) in standard wire feeding modes.

6. **Blank Area.** Due to the PowerSet mode being active, this side will be gray and blank. No information should be displayed on this side.

7. **Pre-Flow/Post Flow Timers.** Pre and Post Flow provide adjustable shielding gas flow time before and after the weld. This is important to reducing contamination in the weld. The arc start and wire feed will be delayed slightly by the amount of pre-flow time used but helps provide a gas envelope around the weld. Post flow helps cool the torch and provides shielding around the weld after the arc is terminated. This helps prevent oxidation of the weld. **NOTICE: In gasless Flux-Cored mode, Pre and Post Flow will be unavailable for adjustment and the space will be blank.** Typically a setting of about 0.5 seconds for Pre-flow and 3-5 seconds for Post Flow are used.

8. **Burn-back.** This is the amount of time the arc stays on after the wire stops feeding. It is used to help prevent the wire from sticking in the weld and to reduce the need for constant trimming of the wire before restarting. Use a setting of .02 to .2 seconds to begin with for most applications. Smaller diameter wires need less burn-back time.

9. **Inductance. IMPORTANT NOTICE FOR EXISTING EVERLAST MIG OWNERS AND USERS:** Inductance improves the wet-in of the weld. A high setting will result in a very poor arc, with a high pitch. The result will be a raised ridge in the middle and poor wet-in. Excess spatter may be observed. The result of too low of a setting will result in a very fluid, flat puddle. The pitch will be raspy and rough sounding. Starts will not be as smooth. Generally, a setting of 25 to 35% is a good starting point on Steel with C25. With Steel and C100, 10 to 20% is a good starting point. Generally, pure CO2 is not very smooth on many welders, but with inductance control, high quality welds can be achieved. Stainless requires the lowest inductance with 10% or less. Aluminum can range depending upon the wire from 40 to 60% or so. Flux-Cored behaves a little differently with a 35 to 60% starting point. Of course, different weld positions, joint designs and thicknesses of metal can affect the inductance requirement slightly. The range of inductance ( ) is limited to help users maintain workable ranges that eliminate most spatter and provide the best wet in properties. In PowerSet mode Inductance has a default setting based on the wire type selected. Although the inductance has a targeted “center”, this is not meant to be a “50%” setting. It is centered around what is felt to offer the best overall performance for each wire type selected. Adjusting to one extreme or the other in PowerSet mode will usually provide satisfactory results as long as the user understands that this will change the way the welder welds overall and may not provide an arc feel that the user is accustomed too. In some circumstances, even though it may be a weldable setting, the level of spatter or smoothness of the arc will be affected at the extreme ends of adjustment.

10. **Wire Diameter.** Always double check that the proper wire diameter is

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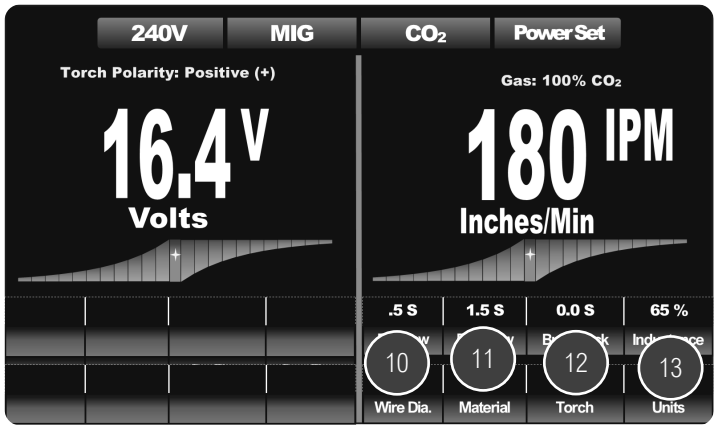


selected when operating in PowerSet mode. Selecting the wrong size will drastically affect the accuracy of the PowerSet settings provided. The wire size ultimately affects the thickness of material that can be selected and ultimately controls the gas recommendation for steel, since upper settings may cause the gas recommendation to change so that a transition to spray arc welding can occur. If this happens and the gas is not changed upon recommendation, welding output will be not be stable.

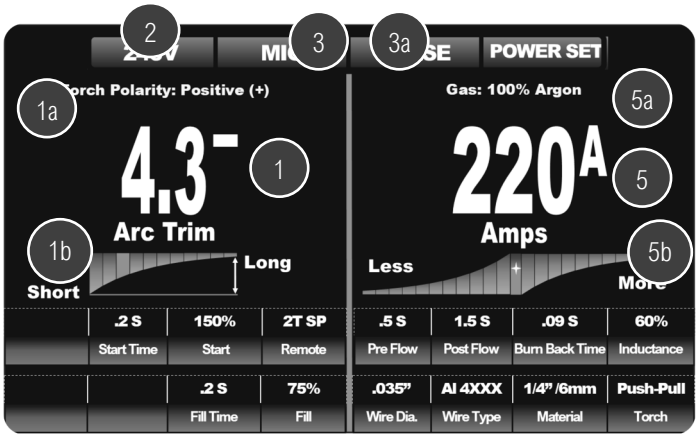
11. **Material (Thickness):** Setting material thickness is important to achieving a good weld with proper penetration. If the wrong thickness is selected, the settings may prove to be too hot or too cold. If the thickness of the material that you have to weld is not provided, select the setting that is one step below in thickness of the metal you have to weld. If you are unsure of the metal thickness that you have, take time to measure the thickness or PowerSet will not work well. *Material thickness may also eliminate certain wire size choices as well.*

12. **Torch.** Select the type MIG torch that is being used. The Standard torch will be listed as "STD." This should be the default setting, but if the setting for the torch is changed to "Spool" or "Pull" the machine will not feed wire properly Also, if the spool gun or push pull gun is connected and the gun is not properly selected the wire feed will not function correctly on the gun itself.

13. **Units.** Everlast recognizes that there is a need to provide different units of measures to different industries and regions of the world. This unit is equipped to read in Standard Imperial (US or English) units such as inches per minute or decimal inch equivalents. The unit is also equipped to read in Metric (SI) units such as Meters/ Minute and millimeters. Choose between MET (Metric) or IMP (Imperial) on the screen to convert all relevant measurements to the desired or required units. This can also read in Amps for protocols requiring an amperage to be set instead of wire feed speed.

Synergic Pulse MIG (For Lightning 275 MTS-P Only):

Synergic Pulse MIG is designed a little differently than any non-pulse MIG mode. The required input of values of some functions change from an exact Amperage/ Trim setting to percent over/under the weld setting. This is done to allow a sliding scale adjustment that eliminates the need to readjust these functions each time a change is made to the welding Amperage. Arc Trim is automatically set based off the main arc trim setting. Additionally, Amperage is the default output, instead of wire speed feed rate (WFS). The location of some functions is moved as well from the Standard Synergic Pulse MIG mode to simplify adjustment as much as possible.



1. **Arc Trim.** Use the left adjustment knob to modify the Arc Trim setting. The Arc Trim is a relative voltage setting (-5 to +5) which replaces the Voltage setting used in the other MIG modes. The arc trim is used to adjust the average pulsed voltage to control the arc length. (Arc length is the observed distance from the end of the wire to the puddle surface while welding.) To adjust other parameters or functions, enter the adjustment mode with left down arrow key to navigate to the desired parameter to highlight and enable adjustment. When a parameter or function is selected for adjustment, the numbers will turn from white to red. Arc Trim is the default setting of the left side display. After 5 seconds of no input or adjustment of other parameters or functions on this side, the selected setting will default back to the Arc Trim setting and exit adjustment mode. Polarity is indicated in 1a and will always indicate Positive (+) in Pulse MIG mode. In 1b, the graphic (Short Long) is used to represent the change in arc length as the arc trim function is adjusted.

2. **Voltage Input Confirmation.** This confirms the correct voltage to be supplied to the machine. The correct Voltage is 240V. If 220, 230 or 208V is supplied the Voltage will still read 240V. 208V may affect the machines performance in relation to calibration of WFS.

3. **Process Reminders.** When viewed together, both 3 and 3a reminds the user which process has been selected. In this mode gas is not displayed except above the right hand section of the screen.

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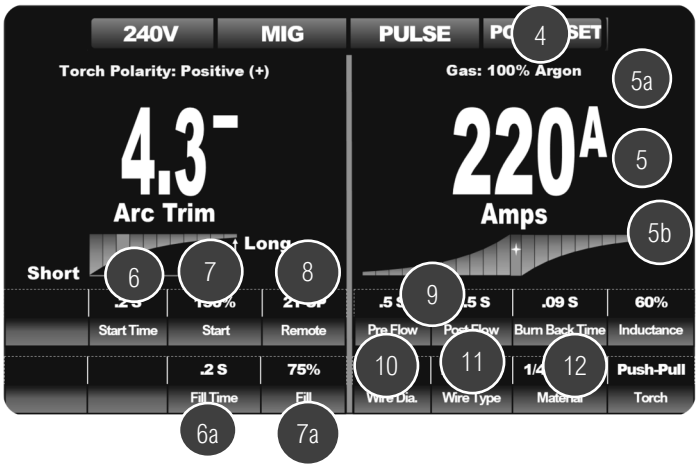

4. **Manual/PowerSet Mode**. This indicates which mode the machine is operating in, whether in full Synergic mode or in PowerSet mode which is a synergic, more automated mode. In PowerSet mode, many functions may not be available for adjustment and will be preset. (See the MIG Pulse PowerSet section). In PowerSet mode for Pulse MIG, the value of the function, or the way the function is represented may change.

5. **Main Right Display, Amp Display.** This side displays selected welding Amps by default and is adjusted with the right adjustment knob. Due to the way Amps are controlled in a MIG welder by wire speed, adjusting Amperage simultaneously adjusts WFS, even though the value is shown in Amperage. Using Amperage as the adjustment reference allows the user to transfer and use the same settings between different wire diameters. If Amperage were not used as an adjustment, each wire size will require a different wire speed for the same amperage. This creates difficulty for users in determining the actual wire feed needed to achieve the same Amperage setting since Amperage is often prescribed for a weldment and required Amperage is directly related to thickness of the plate. **The programming automatically takes wire diameter and type of wire input by the user and calculates the Amperage based off of these variables, which eliminates the need for a less accurate Wire Feed Speed (WFS) adjustment.** Other parameters and functions will be represented in the display when in adjustment mode. When the Amps, or other parameter is selected for adjustment the display will turn red in color. After 5 seconds of no input or adjustment of any parameter or function, the selected setting will default back to the Wire Speed setting and return to white. While actively welding, the display function will change to read actual measured amperage output**.** In 5a, changes in wire type will change the required gas recommendation. Be sure to follow the gas recommendation. 5b indicates the ideal setting with the center starred bar being highlighted in green

6. **Start/Fill Time (Duration).** Start/Fill duration provides a timed Hot Start (6) and a Crater (End) Fill (6a) duration when used with the 2TSP/4TSP settings. Set in seconds.

7. **Start/Fill Amps.** The Start/Fill Amps settings provide a starting and ending point for Amperage over/under the welding amperage. Start Amperage is typically set higher than the welding Amperage to provide a "Hot Start," although it can be set lower than the welding Amperage if needed for special applications. For PowerSet mode the value is changed from exact Amperage, to a percentage over or under the weld Amperage setting. Typically Start Hot Start(7) is set to 115% to 130% higher than welding Amperage. Fill Amperage (7a), which is used to complete the weld by filling the weld puddle (crater) to help prevent cracking at the end of the weld, is usually set lower than welding amperage, although it may be set equal to the Welding Amperage. However, Fill Amperage is usually set to 70 to 85% of welding Amperage. **NOTICE: The corresponding settings of Start Trim and Fill Trim are not adjustable in PowerSet Mode, and is factory set to be at the same level as the main Arc Trim.**

8. **Remote.** This controls how the welder reacts to the torch trigger in MIG mode. The functions, while similar will vary slightly from the TIG process. In 2T, the trigger is pressed and held to weld. In 4T, the trigger is pressed briefly to start the arc, then released to continue to weld. The weld is continued without the torch trigger being held down. The trigger is once again pressed, held and then released to terminate the arc. See more detailed 2T/4T Remote information and explanation found later in this manual. The Synergic Pulse MIG mode additionally offers two more settings: 2TSP (Special) mode and 4TSP (Special) mode which allows additional programmable settings when selected not available in non pulse MIG modes. These programmable settings are all visible in the screen sample above. If 2T or 4T is selected, many of these function and parameter options will disappear.

9. **Pre-Flow/Post Flow Timers.** Pre and Post Flow provide adjustable shielding gas flow time before and after the weld. This is important to reducing contamination in the weld. The arc start and wire feed will be delayed slightly by the amount of pre-flow time used but helps provide a gas envelope around the weld. Post flow helps cool the torch and provides shielding around the weld after the arc is terminated. This helps prevent oxidation of the weld. Typically, a setting of about 0.5 seconds for Pre-flow and 3-5 seconds for Post Flow are used under 200A. Over 200A, use at least 5-10 seconds of Post Flow for best results.

10. **Wire Diameter. IMPORTANT:** The input of the wire diameter helps calibrates the machine so that proper Amperage can be displayed. Minimum allowed wire size is .030" in Pulse MIG. This is sufficient to allow the unit to weld the full range. For this welder, .045" wire is the most versatile diameter, making it able to weld with virtually with any gauge and type of material in Synergic/PowerSet Pulse MIG mode.

11. **Wire Type.** Select wire type using to calibrate the unit and determine the programming needed to weld the metal. **NOTICE:** *Instead of having separate Synergic Pulse MIG process selections for Steel,*

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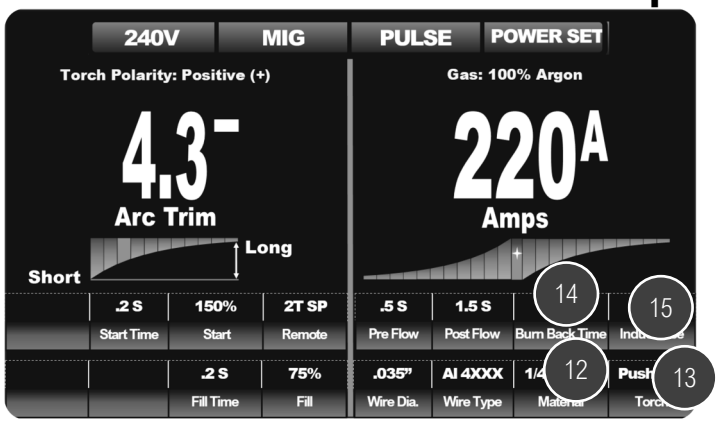


Stainless, Aluminum and Bronze at the top of the panel inline with other process selections, the selection is made with this setting. Scroll through the possible selections and select the wire and metal type you need. If an exact match is not found, select the metal and wire type that is nearest in properties to what is being used.

12. **Material (Thickness).** Setting material thickness is important to achieving a good weld with proper penetration. If the wrong thickness is selected, the settings may prove to be too hot or too cold. If the thickness of the material that you have to weld is not provided, select the setting that is one step below in thickness of the metal you have to weld. If you are unsure of the metal thickness that you have, take time to measure the thickness or PowerSet will not work well. *Material thickness may also eliminate certain wire size choices as well.*

13. **Torch.** Select between the main MIG gun, Push-Pull and Spool Gun function. **NOTICE: Operation with Spool and Push-Pull Guns yields control of Amps to the control knob on the gun.**

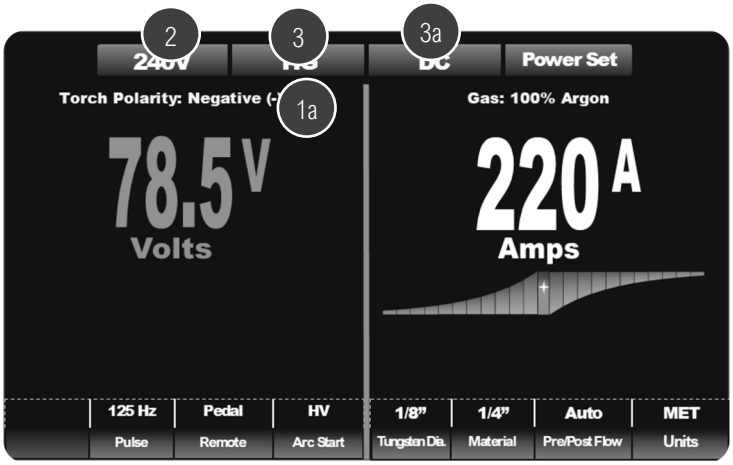
14. **Burn-back.** This is the amount of time the arc stays on after the wire stops feeding. It is used to help prevent the wire from sticking in the weld and to reduce the need for constant trimming of the wire before restarting. Use a setting of .02 to .2 seconds to begin with for most applications. Smaller diameter wires need less burn-back time.

15. **Inductance. IMPORTANT NOTICE FOR EXISTING EVERLAST MIG OWNERS AND USERS:** *Due to the nature of the Pulse MIG design, the Inductance values used for setting inductance on this model differ from other non-pulse capable units in the Everlast lineup. These settings use a reciprocal value of the other Everlast models.* Inductance improves the wet-in of the weld. A high setting will result in a very poor arc, with a high pitch. The result will be a raised ridge in the middle and poor wet-in. Excess spatter may be observed. The result of too low of a setting will result in a very fluid, flat puddle. The pitch will be raspy. Starts may not be as smooth. Generally, a setting of 25 to 35% is a good starting point for Steel. Stainless typically requires 0 to 20% or less. Aluminum, depending upon the wire chemistry, ranges from 35 to 50% or so. Weld position, joint design and metal thickness can slightly affect the inductance requirement.

NOTICE: The units will ship with the last settings used in performance testing. Inductance may be set to 0% or 100% after testing the range of function and will need to be reset.

AC and DC TIG:

The TIG PowerSet version has several differences and changes to the function. The Pulse features a Pulse that is greatly simplified. No wave form is selectable in DC (AC pulse does not have wave form shaping) and Pulse is limited to only the Pulse Frequency (Hz) adjustment. The default wave form is Square. The other parameters of Pulse Time On and Pulse Amps have been optimized for general purpose use and have been preset to simplify setup. Users may find that changes in pulse frequency may require adjustment to the recommended Amp settings to maintain the desired wet-in effects. Material thickness and Amp output is limited by Tungsten Diameter. Pre and Post Flow mode is combined simplified and reduced to an automatic setting or it can be turned off if not desired.



1. **Main Left Display, Default Voltage Display.** The voltage displayed in the Main display in TIG mode is a measured reading of actual volt output. Output voltage is not adjustable. The voltage will always be display in the color green to remind the user that the voltage is non-adjustable. The left control knob does not adjust voltage. When adjusting other parameters, the voltage will change function and display the selected parameter. It will also turn to red to indicate that the welder is in the adjustment mode. Item 1a is the torch polarity reminder. For TIG it will always be electrode negative.

2. **Voltage Input Confirmation. Voltage Input Confirmation.** This confirms the correct voltage to be supplied to the machine. The correct Voltage is 240V. If 220, 230, or 208V is supplied at the outlet, the Voltage will still display 240V unless the voltage is too high or low.

3. **Process Reminders.** When viewed together, both 3 and 3a reminds the user which process has been selected. For TIG, DC will also be highlighted on this machine to remind the user that this unit is DC. (This TIG supplies DC output only for TIG. It is not suitable for weld-

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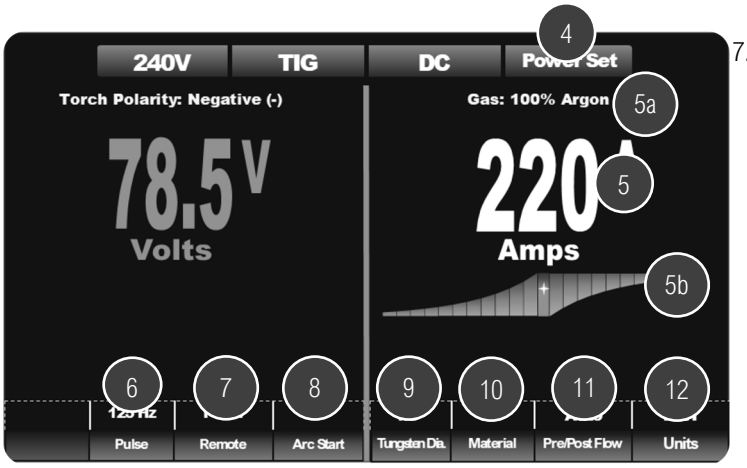


ing Aluminum or Magnesium.)

4. Manual/PowerSet Mode. This indicates which mode the machine is operating in, whether in full manual mode or in PowerSet mode which is a synergic, more automated mode. In PowerSet mode, many functions may not be available for adjustment and will be preset.

5. Main Right Display, Default Amp Display/Reminder/Information Area. Adjust with right adjustment knob. By default this display area indicates the Amperage. In adjustment mode, the function or parameter selected will display and the display numbers/letters will turn red to indicate adjustment mode. After 5 seconds of no input or adjustment of any parameter or function, the selected setting will default back to the amperage reading and return to the default white color. *While actively welding, the display function will change to read actual measured amperage output.* The area in yellow is designed to inform or remind the user to check or change polarity and to confirm which shielding gas (5a) should be used. For TIG, this area will remain unchanged. Torch polarity in TIG mode will always be negative (-). The recommended shielding gas will always be 100% Argon. The graphic ( ), 5b, indicates the recommended setting and adjustment range. The colors of the graph will begin to change color the further away from the recommended setting the setting is adjusted. It will change from green to yellow to red, indicating that the adjustment may stray too far from the recommended setting and that performance may not be ideal. Even though the color code is designed to warn the user that the setting may not yield sound results, it is not an absolute guide and the user should rely on observed performance adjust accordingly.

6. Pulse Function. The PowerSet mode features a simplified setup process for pulse. Only the frequency (Hz) is adjustable. The Pulse Time -On and the Pulse Amperage are fixed and not adjustable in the unit programming. These settings are balanced so that the pulse delivers satisfactory performance at most settings. If Pulse is not wanted, set the Pulse to OFF so that no frequency is displayed. To turn on, simply start adjusting the pulse frequency.

7. Remote/Torch Trigger/Pedal Function. The Remote function settings that are offered vary depending upon whether you are in MIG, Pulse MIG, or TIG modes. For TIG you will have: 2T, 4T, Pedal, 2T+A, or 4T+A. These settings dictate how the welder's amperage and screen programming are set and controlled. Depending upon the remote selection choice, the Remote function also controls which other functions and parameters are available for adjustment. For example, in TIG, the pedal eliminates Up and Down Slope functions because they are not needed since slope is controlled through the pedal manually. 2T and 4T are used with the torch switch only. The amperage, slope and all functions related to the weld cycle are available. The torch switch does not control welding amperage or increase or decrease of amperage directly. The programming on the panel controls this. But the cycling of the torch switch does affect when this happens. The 2T+A and 4T+A, though similar to standard 2T and 4T and work with a type of TIG torch equipped with a separate amp control and switch. This allows the user to use the welder programming for start and end amperage, up and down slope but still be able to fine tune the max amperage on the torch while welding without a foot pedal. See more detailed 2T/4T Remote information and explanation found later in this manual for illustrated examples.

8. Arc Start. The TIG welding arc can be initiated in two basic ways. The arc can be started without contacting the metal or can be touched to the metal and lifted up to create the arc.

- *HV Start.* For contactless starting, which is usually preferred for most applications, the unit features an electronic form of HF starting called HV. This type start is very similar to the old HF contactless start, but is now generated electronically without the use of adjustable points. HV/HF starting may be restricted in some environments where this may cause electronic interference such as hospitals.

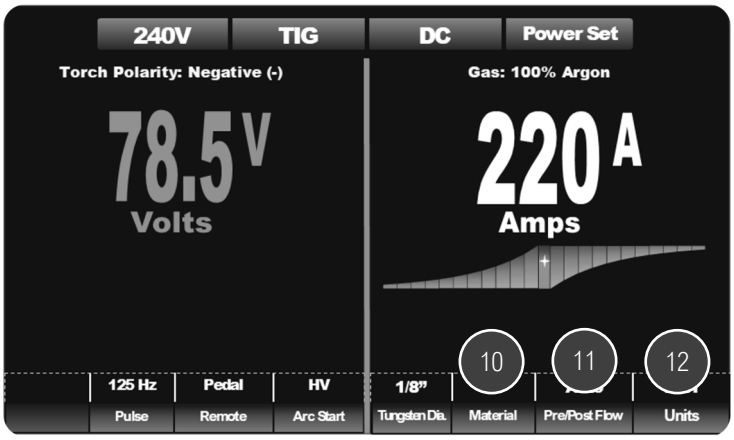
- *Lift Start.* The other method of starting is called Lift Start. This is where the tungsten is briefly touched to the metal and lifted up to start the arc. There are two types of Lift start. The first is the Live lift. This lift start means the tungsten is always live. Touching down to the metal, the contact is sensed and the output is reduced until the tungsten is lifted up and the arc is started. This is preferred by pipe welders and job site fabricators because it eliminates pedals and wires. This type start also disallows all adjustment except Post Flow. Gas automatically starts flowing when the tungsten is touched. The second type of lift start is activated by the switch or foot pedal. The tungsten stays "dead" until the switch is activated. In this mode, the torch is touched to the work and the switch or pedal is pressed and held and the torch is then lifted up and the arc is struck. This method is safer and is often used where HF/HV use is restricted.

9. Tungsten Diameter. The diameter of the Tungsten is important to determine the amount of Amps allowed and the material thickness that can be selected. The graphic ( ) indicates the relative diameter of the Tungsten and corresponds to a size listed in the win-

Component Identification and Explanation

Control Panel Operation and Navigation

dow. **NOTICE:** Use 2% Lanthanated Tungsten for best performance.



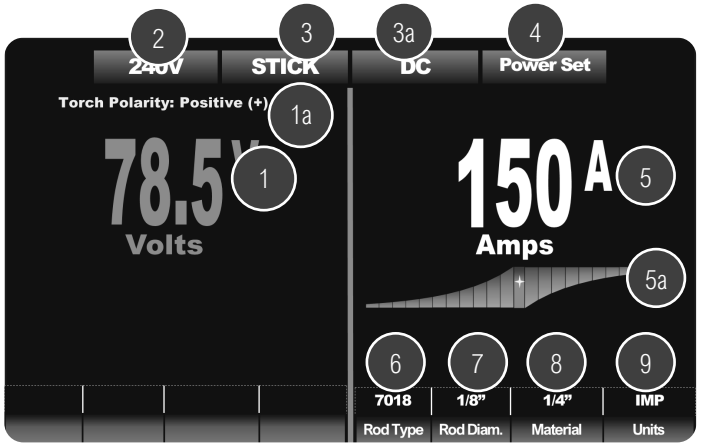
10. **Material Thickness.** Material thickness must be set properly to achieve an accurate setting of Amps. If the exact thickness is not listed, use the next lower standard thickness and adjust Amps up as needed.

11. **Pre/PostFlow.** The pre and post flow of shielding gas can either be set to off, or to Automatic. When set to "Auto" the unit will automatically control the Pre and Post Flow timing of the shielding gas and will set the time according to the welder programming. Setting to "OFF" eliminates all Pre and Post Flow.

12. **Units.** This determines the units of measure used for PowerSet input. The units can be selected for either Imperial "IMP" or Metric "MET" units of measure.

DC Stick:

Stick performance relies upon the proper selection of the rod type/class to work well. However not all possible welding rods are listed. If a rod is not listed, pick the selection with properties nearest the rod type listed. This may not work in every case. For any cellulose rod not listed, pick E6010. For E7014 try either 6013 or 7018 and use the one that provides best results. The simplest of PowerSet functions, the Stick mode uses a flat position for the ideal settings. The adjustment within the range provides enough leeway to accommodate other welding positions.



1. **Main Left Display, Default Voltage Display.** The voltage displayed in the Main display in Stick mode is a measured reading of output. It is not adjustable. The voltage will always be displayed in green color to remind the user that the voltage is non adjustable. The left control knob will not be able to adjust voltage. While adjusting other parameters, the voltage will change function and will display the selected parameter. It will also turn red to indicate it has entered the adjustment mode. 1a represents the recommended Stick polarity for most welding electrodes (welding rods) which is electrode positive (+). This is not an absolute recommendation as some welding rods can use electrode negative (-) as well. Be sure to consult the welding rod manufacturer information and view it as the ultimate authority on Stick welding polarity. Electrode Negative can provide some benefits for rods like E6011 and even E6010 in some limited applications.

2. **Voltage Input Confirmation. Voltage Input Confirmation.** This confirms the correct voltage to be supplied to the machine. The correct Voltage is 240V. If 220, 230 or 208V is supplied the Voltage will still read 240V.

3. **Process Reminders.** When viewed together, both 3 and 3a reminds the user which process has been selected. For Stick, DC will also be highlighted on this machine to remind the user that this unit is DC, and not AC mode. (This welder supplies DC output only for Stick)

4. **Manual/PowerSet Mode**. This indicates which mode the machine is operating in, whether in full manual mode or in PowerSet mode

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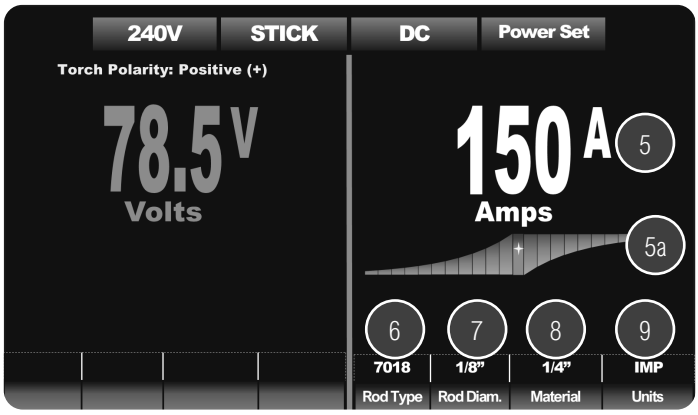
which is a synergic, more automated mode. In PowerSet mode, some functions may not be available for adjustment and will be preset for best general performance. If optimum performance is not achieved, discontinue use of PowerSet and use the full manual setting to achieve better results.



5. **Right Side Display.** The Amperage will display in the main part and will be preset based on the user inputs of rod type, rod diameter and material thickness. The graphic ( ), 5b, indicates the recommended setting and adjustment range. The colors of the graph will begin to change color the further away from the recommended setting the setting is adjusted. It will change from green to yellow to red, indicating that the adjustment may stray too far from the recommended setting and that performance may not be ideal. Even though the color code is designed to warn the user that the setting may not yield sound results, it is not an absolute guide and the user should rely on observed performance adjust accordingly.

6. **Rod Type.** This feature helps improve overall rod performance and provides a base for the machine to fine tune parameters. If the correct rod type is not listed, select a rod type that offers properties or arc characteristics that most nearly matches the rod desired.

7. **Rod Diameter.** The selection of the rod diameter is important so that the correct settings can be achieved.

8. **Material Thickness**. Material thickness must be set properly to achieve an accurate setting of Amps. If the exact thickness is not listed, use the next lower standard thickness and adjust Amps up as needed.

9. **Units.** This determines the units of measure used for PowerSet input. The units can be selected for either Imperial "IMP" or Metric "MET" units of measure.

Component Identification and Explanation

NOTICE:

The following sections cover MIG, Synergic Pulse MIG, TIG, and Stick terms, definitions, and basic operation. Some of the terms overlap from process to process and serve essentially the same functions. Take note that some terms will repeat from process to process, but will be described in a way that is specific to the process being used. In some cases where function is identical or so similar to the same function found relating to another process it may not be repeated or redefined. For example, the 2T/4T torch switch function applies to both MIG and TIG, and it behaves similarly for each. However, there are slight differences to what it controls The general description under MIG and TIG will describe it slightly differently to accommodate the operational differences, but in the main drawing and discussion, the function will be more generic to accommodate both processes.

NOTICE:

This unit features a slow run-in feature. This means the wire will feed slowly until the arc is started. It is used to improve arc initiation and reduce weld porosity which results in poor fusion during the arc starting process. Once the arc is sensed, the wire speed will ramp up and weld at the selected wire speed. If not desired, especially for rapid tacking or use with the Spot/Stitch function, the Run-in may be turned off on the panel face, but it may cause an undesirable stutter at arc start.

Component Identification and Explanation

Using The Trigger/Torch Switch Remote Functions

Operating the 2T/4T Remote Function

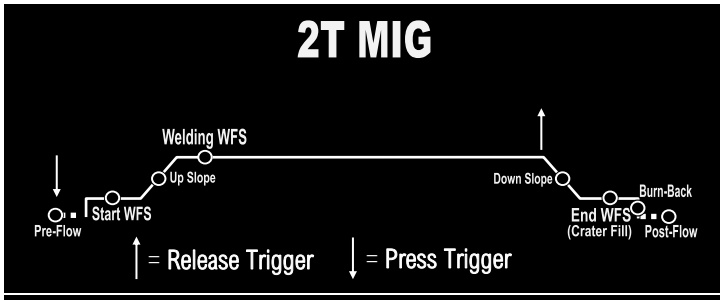
The Remote Torch Control function works with both the MIG and TIG processes. The Trigger (MIG) and Switch (TIG) function is designed to allow the user to program the welder so that the stages of the weld cycle can be controlled via operation of the torch switch. This should not be confused with a Remote Amp control like a Foot Pedal or a Spool Gun Amp control wheel. The switch itself provides no adjustable control. It is only designed to cycle a stage or stages of the weld cycle. Both TIG and MIG processes behave similarly in 2T and 4T modes since there are very similar controls in both processes.

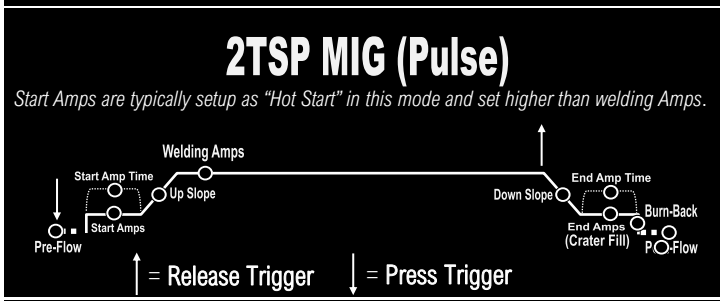
2T function controls all of the weld cycle with a simple press-and-hold and release action. This is the traditional "pull the trigger" mode that is familiar to most users, but it involves controlling more functions than a simple "on and off" of the weld arc. This is also called a 2 step function. The torch trigger moves in two directions, each change of direction signals the welder to advance to the next stage of the weld cycle.

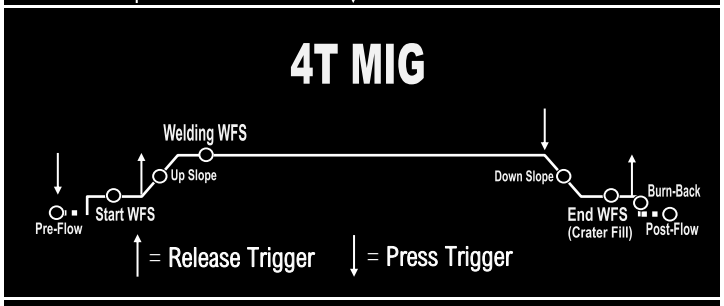
4T function controls each stage of the weld cycle by multiple press and hold actions of the torch trigger. This is used to retain manual control over the slope stages and start and end portions of the weld cycle through each movement of the torch trigger. Press the trigger and hold to start the Pre-flow cycle and start the weld. Once the arc has started, stabilized, and begins to wet in properly, release the trigger to upslope and weld at the normal set Amperages. Pull and hold the trigger to allow the down slope cycle to occur. Once the down slope cycle has completed and the weld crater is adequately filled, release the trigger to end the weld. The arc will terminate and the Post Flow cycle will begin. A common error is to simply click the torch trigger rather than hold the trigger during the down slope. The only time the trigger should be clicked is in the middle of the down slope cycle to toggle the weld back to the welding cycle Amperage. If the cycle has fully reached the bottom of the down slope the cycle cannot be restarted and the arc will terminate when the trigger is released. This is useful for managing the weld heat once it begins to get too hot. This toggling feature can be repeated during the weld. It's not meant to be a adjustable amp substitute, but it is useful to help manage heat temporarily when a weld gets too hot to manage.

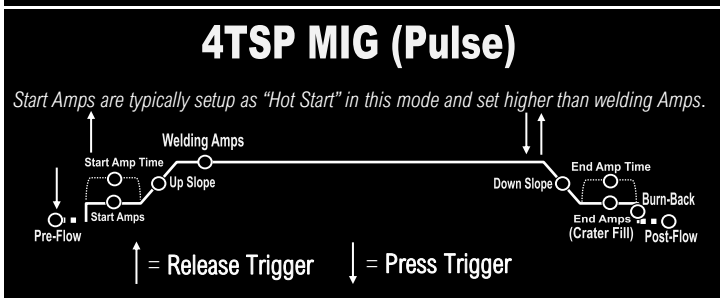
2T Special (2TSP) and 4T Special (4TSP) functions are both functions designed for Synergic Pulse MIG welding. They are similar to 2T and 4T but go a step further by providing a Start Amp (Hot Start) Time (duration of Hot Start) and an End Amp (Crater Fill) Time. The 2TSP function continues to be a "press and hold" function, but upon release extends the end Amp time duration. This allows time for both downslope to fill the crater automatically. With the 4TSP function, instead of manually controlling the point of transition between the Start Amps (Hot Start) and the Up Slope, the duration of the Start Amps (Hot Start) is controlled by the Start Amp Timer.

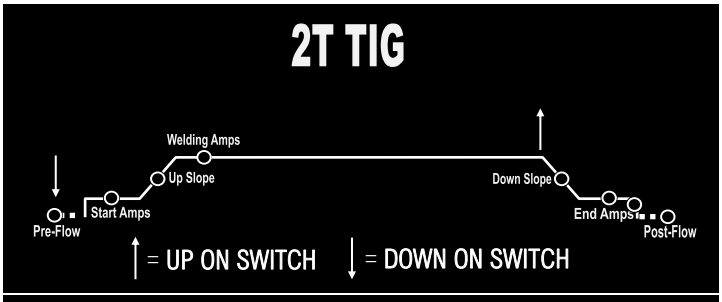
When using the TIG foot pedal, the Up and Down Slope functions are irrelevant because the user's foot is controlling the weld function manually. It's important to select only the "Pedal" function for the unit when the foot pedal is plugged in.

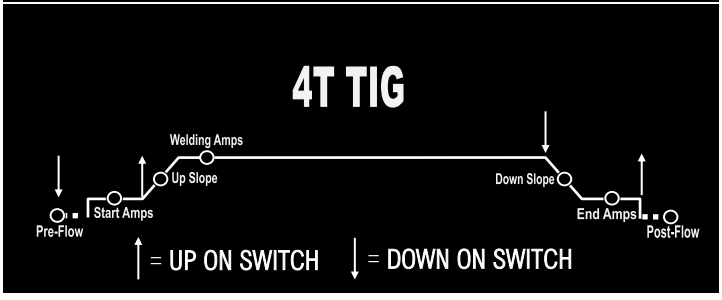












Component Identification and Explanation

Using The Trigger/Torch Switch Remote Functions

While using the MIG Spool Gun or Push-Pull Gun, the selection of the correct torch type automatically gives you control over the Amperage on the gun. The Amperage control knob on the Spool and Push-Pull guns adjusts Amperage from minimum possible setting up to the maximum limit set by the main Amp control knob on the panel. While the Spool and Push-Pull guns Amps or WFS, it still cycles all of the 2T/2TSP and 4T/4TSP programming through the separate trigger pulls. The Wire Speed/Welding Amps are adjusted on the gun, while the maximum Amperage is set on the screen. While it is technically possible to adjust Amperage/WFS up or down while welding, similar to a TIG foot pedal action, it is not recommended. The location of the knob make this impractical and increases wear on the potentiometer connected to the control on the gun. *To operate with a Spool Gun or Push-Pull Gun, preset the Maximum Amperage or Wire Feed Speed on the Panel, then set the Spool Gun/Push-Pull Gun Amperage/WFS.If further adjustment is needed, make adjustment on the gun first. If the output is not enough, then add additional Amperage/WFS on the panel and readjust the gun higher.*

See the previous page for a visual explanation of 2T and 4T function in TIG and MIG. Notice that the arrow buttons indicate an up (release) or down (press) movement of the torch switch/gun trigger.

NOTE CONCERNING TIG FOOT PEDAL USE: When the pedal mode is selected, this unit allows full independent control of Amperage, up slope and down slope. The slope functions are not needed or used. Never attempt to use the Pedal in any torch trigger or other remote function setting or malfunction of the weld cycle will occur. To control the amperage, the maximum amperage is set on the screen. The pedal then controls the range of amperage from minimum set amperage up to the maximum Amperage set on the panel. The pedal should not act like an on/off switch. After setting the maximum Amperage on the screen, the unit may default to read actual pedal position Amps rather than maximum output within 5 seconds. As the pedal is pressed down the actual Amp output will display on the screen.

NOTE: The 2T+A and 4T+A settings allowed by this welder in TIG mode are special functions that operate essentially the same way as 2T and 4T. These settings are only meant for use with a TIG torch that has a separate torch switch for starting the arc and triggering the programming and a separate potentiometer/amptrol. The purpose of this type optional torch is to be able to pre-program the slopes, start/end amps, but still retain a moderate amount of control of welding amps without having to go to the machine to readjust. This torch is not meant to "roll on or roll off" the Amperage during welding. The tapering is done with the slope cycle. This type of torch configuration is only meant to be used to fine tune amperage before welding and during welding. The maximum amperage is still set on the machine which dictates the control the range of the torch amptrol.

NOTE: The standard torch switch does not control Amperage. It only cycles the programming on the screen based off of the remote setting selected (2T/4T, etc.).

Component Identification and Explanation

Explanation of Parameters, Functions and Welding Terms

EXPLANATION OF GENERAL WELDER FUNCTIONS.

Volt and Amp Settings (Short Circuit MIG).

When welding, the two main functions that require adjustment are Voltage and Wire feed speed. The function of voltage in MIG welding is to control the overall width and to a great extent, the height of the weld bead. In other words, voltage controls the bead profile. It controls wet-in at the toes of the weld, and arc length. Short arc lengths provide wider welds. The wire feed speed directly controls the amps, and in turn amps control penetration. When setting the welder up you will notice that the wire speed is displayed in Inches Per Minute. The relationship between wire diameter, wire speed and amps is easily figured with the following approximate industry conversions (for steel):

.023": 3.5 x Amps = Inches per minute (IPM)

.025": 3.1 x Amps = Inches per minute (IPM)

.030": 2 x Amps = Inches per minute (IPM)

.035": 1.6 x Amps = Inches per minute (IPM)

.045": 1 x Amps = Inches per Minute (IPM)

To convert wire speed (IPM) into approximate Amps, use the following conversion formula (for steel):

.023": IPM ÷ 3.5 = Amps

.025": IPM ÷ 3.1 = Amps

.030": IPM ÷ 2 = Amps

.035": IPM ÷ 1.6 = Amps

.045": IPM ÷ 1 = Amps

Keep in mind these are approximate conversions and do fall off in accuracy as amps are increased into the upper current limits for the given wire diameter.

Even though you will find general recommendations about setting the Amps, Volts and even shielding gas through a variety of free downloadable apps and online calculators, every filler metal manufacturer has its own specific parameters for Volt and Amp settings for each wire diameter and class of wire. The ranges of volt and amp parameters generally varies somewhat from brand to brand, so be sure to read the packaging and/or manufacturer literature to determine what range of settings are recommended. The wire diameter also limits the practical maximum thickness of what can be reasonably welded. The issue with following charts, graphs and calculator recommendations is that most people find them either too hot or too cold. For some people, it may not be close to the setting they are used to. However, nothing can substitute for watching and listening to the arc. If the arc is correct, a steady sound, similar to the sound of bacon should be heard. The actual frying sound can vary somewhat and may have somewhat of a higher pitch whine to it. If these sounds are present, look at the arc to see if it is steady, and producing low amounts of spatter. If large amounts of spatter are present, the puddle seems fluid (appears wet) and the wire speed is within the targeted range, decrease volts a little at a time to reduce the spatter. If this does not correct the problem, change the torch angle and torch height. Hold the torch more vertical, with less than a 15 degree deviation from vertical and make sure wire stick-out is 3/8" or more. If this still does not help, reduce the wire speed. Some slight spatter is normal, though it should be minimal overall.

The wire can also pop and spatter if the voltage is too low for the wire speed and/or wire diameter. This is mostly observed as flying bits of red-hot but un-melted wire, along with popping as the wire inconsistently stubs into the puddle. This is followed by the wire pushing back against your hand pressure while the wire visibly turns white/red hot before burning off. Too low of voltage will also produce a high piled bead with the toes (edges) of the weld not properly wetting in resulting in poor fusion.

Even though the PowerSet feature has been provided, sometimes additional adjustment may need to be made to the settings based off of welding position or joint type. With this unit, we've tried to provide plenty of adjustment range in the PowerSet function. Normally, this will still allow a functional setting. However, when the welding wire is pushed to its maximum limits with Volts and Wire Speed limit, welding may not be smooth and spatter, undercut, and burn-back (when the wire melts back to the tip) may occur.

Starting the Arc and Welding In the Short Circuit MIG Process.

Starting the arc is a relatively simple process. Before beginning, the wire should initially be trimmed to between 1/4 to 3/8". Once the wire is trimmed, the gun should be firmly grasped to prevent a phenomenon often referred to as "machine gunning". A light grasp, especially at start, can cause the arc to stutter as the wire pushes back on the gun, lengthening the wire stick-out and creating an irregular start and a porous weld.

The end of the wire should be positioned just barely above the metal when the trigger is pulled for the cleanest start. This will position the end of the contact tip about 1/2" to 5/8" above the weld. The gun should be in the vertical position, with no more than 5-10 degrees lean in either direction.

Holding the wire too far off from the metal will result in rough starting and too long of wire stick out.

Once the arc has been established, the gun can then either be pushed or pulled in the direction of the weld. With either method, the gun nozzle should be positioned directly over the weld without angling the wire to one side or the other of the weld as already mentioned. The gun should have no more than 15 degrees lean pointed into (push) or pointed away from (pull) the direction of travel. In most cases a push motion is desired. However, a lot of texts offer conflicting information on whether to push or to pull the gun. In reality, both are correct if used correctly and with each having particular strength and weakness. Either one done with too much gun angle will result in undesirable results. Most people who are well versed in MIG quickly develop a sense of when to push and when to pull the gun. Even for novices, a sense of when to push and pull the gun

Explanation of Parameters, Functions and Welding Terms

comes quickly with a little practice. Pushing can result in shallower penetration but the molten puddle is easier to see and the arc sits easily on the leading edge. It will usually leave a aesthetically pleasing bead. However, be careful to prevent the gun from leaning toward or away from the direction of travel too much as spatter will increase and shielding gas flow may become turbulent, creating porosity in the weld. Pulling will result in deeper penetration, but can result in a narrow bead without much side fusion. It also can leave an undesirable humped appearance if not done correctly or if travel is too slow. **Whenever MIG welding with Aluminum, whether with the standard MIG gun or the Spool gun ALWAYS push the gun. If using Flux Cored wire, a dragging motion is almost always recommended.**

For TIG, a push angle of the torch is always recommended. This keeps the gas pushing in front of the weld, and keeps shielding built up in front of the weld. The filler rod should be introduced in front of the torch travel.

For Stick, a drag angle should be used unless welding vertically. The angle may change to a more perpendicular or push angle to keep the puddle in place.

Weaving in Short Circuit MIG Welding. Weaving (oscillating the torch or electrode from side to side in one pattern or the other), particularly in MIG, is a topic of controversy as much as whether to push or pull the MIG gun. Stringer beads are often best for novice welders. Stringers are simply straight beads that move forward with little or no side to side travel or oscillation. These will offer the soundest welds for a beginner in MIG or Stick. Stringer welds leave little or no room for contaminates to enter the weld and are the fastest to produce without creating an opportunity for cold lap. Moving too quickly however with a stringer can create undercut which will weaken the weld. The best policy is to move a slow steady speed, making sure the sides of the weld are filled. If undercut is present, it is either from too much voltage or moving before the wire has time to fill the area the arc has melted. **NOTICE: Weaving should be minimized or eliminated in Pulse MIG welding. Never use a whipping motion.**

Think of weaving as a method of "sewing" the metal together. If weaving is of interest to you, start with the basic weave pattern. Simple weaves using one variation or the other of a cursive "e" motion are best to begin with. Other weave patterns can be used of course. C's, V'S, U's , Triangles and many more weave patterns can be used depending upon the application. Vertical stick will use a more exaggerated side to side Z pattern weave when traveling up hill on thicker plate metals. Whether it is MIG, TIG or Stick, weave patterns are employed for a number of reasons. Weaves are often considered to have a more pleasing appearance and can help bridge gaps where fit up is a problem. A weave is also frequently used to manage heat build up. For example: when welding vertically weaves are almost always used to prevent the molten metal from sagging due to the force of gravity. The major drawback of weaving is that it introduces a greater possibility of getting inclusions and other forms of contamination in the weld. Properly done weaving is a valuable tool, but it must be practiced before employing it in any structural or critical application.

Metal Cleaning.

MIG and TIG welding requires a well prepped surface to obtain a sound weld. The removal of paint, rust mill scale, or other contaminate such as grease should be done before welding. Stick welding is more forgiving of rust and mill scale, but when MIG welding, contaminates will result in porosity and inclusions in the weld, weakening it. In TIG welding it can be disastrous. TIG requires the most cleaning effort. A grinder will usually prep the metal sufficiently to remove oxidation and paint. However, to remove grease a degreaser such as acetone should be used. Do not use any degreaser such a brake cleaner with chlorinated solvents or death or serious injury may occur!

MIG and TIG filler wires such as ER70S-6 or ER70S-2 include a sufficient level of deoxidizers such as silicone and copper that are formulated to allow it to handle minor to moderate amounts of rust and mill scale. These deoxidizers will float out most moderate amounts of contaminates out of the weld and will appear in the usual form of glassy like deposits on top of the cooled metal. They are easily brushed off before starting the next pass. They should not be welded over. Any pinholes that appear are a result of trapped gas in the weld and should be ground out before the next pass. It should be noted that some MIG wires such as ER70S-3 have low levels of deoxidizers and must be thoroughly cleaned and ground before welding. MIG and TIG ER70S-2 and ER70S6 are the same except that TIG wire is cut to lengths and MIG wire is continuous. When welding fine gauge materials in TIG, you can substitute sections of thinner MIG wire.

Multiple Pass Welds.

One of the common misunderstandings that people have when beginning to weld is that if the welder has the power, then a single heavy pass should be used to weld it up. This is wrong. This technique will induce cold-lap and inclusions to the weld. Single pass welds should not exceed 1/4" even with the heaviest wire the welder is capable of handling. A thick pass may also begin to cool before contaminates and gas pockets have the time to float out to the surface. It's far better to make multiple smaller passes to complete a plate weld for a higher quality result. For best results, this requires that most joints 1/4" and over be prepared with a grinder to accept multiple weld passes. The weldment edges should be ground to form a V, U or J shaped groove to create a recess where the welds can be welded one on top of another. For MIG/Flux-Cored welding with .035" wire and under, create a bead no thicker than 3/16" in a single pass, no more than 1/8" with .030" wire, and with .025"wire and smaller no more than 3/32 for best results. This will help maintain proper fluidity of the weld and prevent gas from being trapped in the weld and give time for any minor contaminates to float out of the weld. It will also help to maintain reasonable forward travel speeds. Too slow of travel speeds will create excess build up and can tend to create cold lap at the weld toes resulting in poor tie in. One issue created with a weaving technique even if the metal deposited is the correct thickness is that it can slow the forward progress down. If weaving is too wide, one side of the puddle will cool and oxidize before the torch is brought back across to that side. This is a point where porosity can be introduced.

Component Identification and Explanation

Explanation of Parameters, Functions and Welding Terms

Single Pulse MIG Operation.

At its core, Single Pulse MIG function is comprised of 3 parts, Pulse Voltage (average voltage between Peak and Base Voltage settings), Pulse Time On (the balance of time between Peak and Base Voltage), and Pulse Frequency (Hertz, or the number of pulses per second). **Each pulse component has a distinct and specific role in the pulse cycle on the weld**. These functions must be kept in balance for the pulse to work properly. However, from a practical standpoint, the pulse functions can have an overlapping effect on the pulse, but only to a minor extent before the pulse begins to malfunction or lose its effectiveness. With this in mind, the effectiveness of the pulse ultimately depends upon how each individual pulse function is adjusted relative to the other two remaining functions. A change in one pulse component necessitates changes in the other values of the pulse to maintain a balanced, effective pulse. Due to the complexities and endless combinations of potential pulse settings, the unit is programmed with synergic, formula-based program that has been scientifically developed and tested to keep all settings in the perfect balance when the Amperage is adjusted via the control knob. All pulse-related settings are raised, lowered, and kept in balance based off the Amperage setting.

NOTICE: Settings that do not directly affect the pulse are not synergically controlled or preset except in PowerSet mode.

In the Synergic Pulse MIG mode, the Amperage setting replaces the wire feed speed control. This is because the Amperage setting is a direct function of wire speed, wire type and wire diameter. Since the unit requires the input of the wire diameter and wire type the programming can accurately determine and set the required wire feed speed rate (WFS) based off the Amperage setting. Ultimately using Amperage instead of a direct wire feed speed setting makes more sense because welding protocols are typically developed around Amperage requirements needed to make a weld. Also, this helps eliminate "guess work" and operator error if the user changes wire diameters (i.e. changing from .035" wire to .045" wire) since to achieve the same amperage, a different wire speed must be set for each wire. With synergic control and using the Amperage as the setting wire speed is set automatically and accurately so that control can always be maintained. This may sound confusing at first, but hands-on experience will clear things up.

NOTICE: The proper setting of Amperage is directly related to the metal type and thickness. As a general rule, start with using 1 amp per thousandth of an inch (.001") as a baseline setting. Steel will usually subtract 10-25 percent from this setting. Aluminum will usually add 10-25 percent to this baseline setting. Alternatively the PowerSet setting can be used to help establish a proper manual base line setting.

Although the Pulse settings are kept in balance by a synergic formula, it does not mean that the pulse cannot be fine tuned. In fact, the overall pulse effect can be fine tuned by using the Arc Trim function. The Arc Trim replaces Voltage control in Synergic Pulse MIG mode. It does so by slightly bending or curving the average Pulse Voltage that is set by the synergic Pulse programming. Keep in mind that in Pulse mode, there is a Peak and Base voltage value that is being maintained by the programming, so it has to be thought of as an average voltage value that constantly changes as the Amperage is adjusted up or down. Bending the programmed voltage curve up or down in relation to the Amperage has a serious effect on the arc length of the welder. (Arc length is simply defined as the distance from the end of the wire to the weld puddle.) Simply put, the Arc Trim controls the arc length which affects puddle fluidity, bead profile, arc smoothness and overall heat input. With that said, it's clear that maintaining optimal arc length is critical to good pulse performance. The range of adjustment is from –5 to +5. The factory setting is typically set to 0.0. While one would be led to believe this would be the optimal, best setting, it typically needs to be further adjusted for best performance, operator style, position etc. To properly set the Arc length with the Arc Trim function, weld a short bead. While welding, pay close attention to the performance and the arc length. The arc length should be maintained between 1/16" and 1/8" for most applications. This will allow the most control in a wide variety of situations. Typically this will require the welder to be set with a negative (-) Trim. Adjust in small increments until the arc length reaches at most 1/8" long. If too little arc length is maintained, the wire will behave more like short circuit and will create excess spatter and wire feeding will become irregular from the shorting of the wire into the puddle and it can even possibly stick in the puddle and cause a bird's nest inside the machine. If the arc length is too long, the wire can burn-back to the tip. If it is marginally too long, the puddle will become too wide.

Assuming the correct Amperage is being used, when the arc trim is properly adjusted, the weld will be smooth with almost no spatter. If spatter occurs this usually results from either too short of an arc length (excessive negative trim setting) or gun manipulation. It can also be caused by improper drive roll and gun liner selection.

NOTICE: While welding, any burn-back to the tip is not related to the Burn-back function setting! Burn-back to the tip while welding is almost always a result of wrong arc trim setting or wrong drive roll selection of either size or type.

Due to the different gases, operator styles and welding positions used, the Arc Trim can be used to "tune" the welder to the best operating settings. As a "best-practice" policy, start around –1 and increasing or decreasing the setting to achieve the correct arc length .1 increments. Using a wider adjustment increment than this will often cause you to skip past a ideal parameter setting without giving you an indication that you may be nearing the "sweet spot" for the setting. As you adjust this setting, you will notice a change in arc quality and in sound. This is normal. Resist the temptation to go too far toward the positive end of the scale or burn-burn-back and tip melting will become an issue. This unit is programmed for using Standard shielding gases designed for use with Pulse MIG. Different gas mixes may be used however. Each variation of gas blend will result in a different setting of the Arc Trim. As more CO_2 is used in the shielding gas (always use 20% or less CO_2), you will need to increase the value of Arc Trim to a more positive setting in relation to the usual standard. Lower CO_2 concentrations require less Arc Trim correction.

NOTICE: Once a suitable arc trim setting has been achieved for a particular metal/wire type, this setting will not require much, if any further adjustment throughout the entire Amperage range. Except for minor changes due to weld position or deviations from the recommended shielding gas, no further changes should be made to the Arc Trim. In other words, there is no need to constantly adjust the Arc Trim. However, when changing metal/wire types the Arc Trim will typically require some fine tuning. *If amperage is increased and an arc trim adjustment is suddenly required to correct the wire burn off rate, this is a clear indication that the Amperage setting has exceeded the practical physical welding capability of the wire diameter. In this case, step up to the next wire diameter. Beyond a certain physical limit, depending on the wire type, excessive smoke, spatter, weld graininess, and residue may begin to appear.*

Remember, the pulse feature is intended to be used to control heat input and improve out-of-position welding capability without large sacrifices in travel speed or penetration. However, improper settings can lead to significant changes in travel speed and penetration. It should be noted that Pulse MIG travel speed is much faster than standard short circuit MIG , and is typically a little slower than

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Spray Arc Transfer. It should be accepted that there may be a slight fall off in travel speed over Spray Arc. There may be a tendency for a user to try to achieve faster or similar travel speeds to Spray Arc Transfer by adjusting the Arc Trim so that the arc length becomes too long (the arc length should be shorter than typical spray arc). Even though an longer arc length can be tolerated, it lessens the effectiveness and heat control properties of the pulse and will actually further slow travel speed and decrease penetration by producing too wide of an arc. In addition, it may result in wild, uncontrollable arc and undercut in the weld.

It should also be noted that Inductance plays an additional role in controlling the effectiveness of the pulse. It is very important to the function of the Pulse Mode. The machine provides a wider range of control over inductance than is typically needed. Too much inductance can reduce the effectiveness of the pulse by smoothing out the pulse ripples and reducing the control. Too much added inductance can have a similar effect of having too much arc length, even though the arc length may experience little change. Too little inductance will result in a very stiff, unpleasant arc with large amounts of heavy spatter. See previous comments regarding the Inductance settings. Remember, on this welder, more inductance is experienced with a lower setting. However, a good Inductance setting will still be less than 50% since too little inductance will reduce wet in and affect weld profile to the point that it is undesirable, except on thinner metals. Even in PowerSet mode, setting Inductance properly is required.

While Pulse MIG welding, excess spatter will develop if the contact tip-to-work-distance (CTWD) is not maintained at the proper length. This is also sometime referred to as gun stand-off height, although there is a technical difference between the two. Generally the gun should be held off the metal no less than 3/4" and no more than 1". This is likely the top operator error committed when Pulse MIG welding and causes the most issues at the outset. As a quick frame of reference, maintain at least a bare thumbs width standoff height of the gun from the weld surface. If too short of a distance is maintained many problems will arise such as poor feeding, excessive spatter, melted contact tips, conductive contact tips, clogged nozzles, irregular arc and uneven, ropey welds.

It is important to never use a pull angle while Pulse MIG welding. This will cause poor weld quality and will cause spatter, irregular arc, and poor gas coverage. Always push the gun while using at least a 10 to 20 degree angle. Never lean the gun too far or the droplets of metal will "shoot" in front of the puddle and skip over the weld. In some instances, while transferring from one weld position to the other, a slight pull anglemay develop, but avoid extreme angles and reduce the time spent pulling in corners as much as possible.

The sound of a proper pulse MIG weld is not a "bacon frying sound." Rather it is often commented that Pulse MIG sounds like "an angry hornet". This is indeed a different sound than any other type of welding. The sound and pitch also varies with changes in Amperage and Arc Trim settings. It should also be noted that the customary "hornet" sound is much higher pitched at the same Amperage with smaller diameter wires. Larger wires result in a lower, more throaty sound, descending into a slower, machine gun, or slow fire rattle at lower Amperages. The exact pitch or sound should not concern the user, unless irregular feeding begins to occur. The lower pitched welds often produce some of the smoothest welds at lower Amperages.

With this welder, even though wire diameters down to .030" are permissible for Pulse MIG welding, larger wires such as .045" often provide the heat best control on thin metals. For Aluminum, .040" and .045" diameter wires are required to be used even on sheet metal down to .035- .040" thick. The lower pitched, wider spaced pulsing of thicker wire reduces overheating of the base metal while the filler wire also seems to absorb some of the impact of the pulsing voltage in contrast to a thinner wire.

Because Pulse MIG welding can tend to "over drive" a wire's normal Amperage carrying capability due to the higher voltages used for spray than normal, the physical limits of the wire is lower than with standard short circuit or even spray arc. *Too much Amperage for the wire will begin to break down the alloys in the wire and even atomize them, rather than being deposited in the weld. It should be noted that PowerSet will not always prevent this condition since the goal is always to allow as much fine tuning as possible and to provide the user with the maximum possible selection range.*

The table below is not an absolute guide, but is a general guide based on Amperage. Arc Trim, position, and even personal preference/welding style all play a part in determining the ultimate limits of the wire. These limits may also vary by manufacturer due to wire chemistry.

Maximum Suggested Limits For Wire Types/Diameters for Pulse MIG Use:

Steel:
- .030" up to 150A
- .035" up to 200A
- .040" up to 220A
- .045" up to 300A

Stainless:
- .030" up to 120A
- .035" up to 175A
- .040" up to 200A
- .045" up to 250A

Aluminum:
- .030" up to 100A
- .035" up to 150A
- .040" up to 200A
- .045" up to 275A

Bronze:
- .035" up to 175A
- .045" up to 220A

When Pulse MIG welding, it is important to never whip the gun back into

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the puddle in an effort to create a stepped "TIG" look. In general it is a good idea to maintain a straight, even travel forward to maintain maximum weld quality and heat control. If any manipulation is required to fill or bridge a gap, use a Z motion and maintain steady forward travel speed.

If a "TIG" appearance is preferred, the way to accomplish this is a move-pause-and-fill approach. This may require a slightly lower Amperage setting and a more deliberate and slower travel speed, but high quality results can be easily achieved.

When a whipping motion which crosses back into the puddle is used to create the "TIG" look, the arc length suddenly changes because the puddle slopes up hill toward the coalescing bead. This causes the arc length to shorten and the wire to stub suddenly into the molten puddle. This will usually cause molten "BBs" of metal to eject from the puddle. While the machine will sense the stub into the puddle and quickly re-establish the arc length, the damage has been done and not only will large droplets be ejected from the puddle, inclusions and porosity may develop under the bead. Only use a move, pause and fill motion to create the "TIG look.
NOTICE: Pulse MIG welding is stressful on the work clamp connection and can cause overheating of the work clamp, particularly if corrosion or poor connections are made. Always connect the work clamp direct to the part being welded. Periodically remove the rubber cover over the DINSE type power adapter (the connector at the machine) and check the cable retaining set screws for tightness. Replace work clamp as necessary if corrosion or overheating is observed. Use a clamp rated for at least 300A.

Using PowerSet and Synergic Pulse MIG

At the beginning, especially for new users unfamiliar with MIG pulse, it's recommended that the PowerSet mode be used for the easiest setup experience. While it does not offer the level of control that full manual Synergic MIG offers, it does provide a lower level of skill and knowledge to setup and use proficiently. Professionals will appreciate the straight forward control found in the PowerSet mode. PowerSet removes the need to refer to complicated charts and setup graphs. It provides you the exact settings that would be provided on a chart or graph but in a more digested form. Even though the range of adjustment is limited, it provides enough fine tune adjustment to satisfy most professional users under ordinary use. The manual mode of the Synergic Pulse MIG does offer complete control of all functions and may be the best solution long term as experienced is gained through the use of the PowerSet mode.

Ultimately, the key to success whether using the full manual Synergic MIG function or PowerSet mode of the Synergic Pulse MIG function is to not ignore any setting or function. Learn what each setting controls and how it interacts with the weld cycle and how it affects quality of results. Ignoring proper settings for Arc Trim and Inductance will have an immediate detrimental effect on the weld and welder performance. These settings are required for both manual and PowerSet modes. Other settings like Pre/Post flow are important too, but these settings are set based off of user requirements and experience and in some cases can be set to 0, though both generally improve weld quality. **NOTICE:** Always double check that the inputs of wire type, diameter, shielding gas, and metal thickness, where applicable, are accurate or poor performance or malfunction of the welder may occur.

Key Notes to Remember About Synergic MIG Welding

- Always adjust Amps before adjusting Arc Trim to control the weld.
- Set Arc Trim to –1.0 and adjust up or down from there in increments of .1.
- Adjusting more negative (-) Arc Trim yields a relatively shorter arc length.
- Adjusting more positive (+) Arc Trim yields a relatively longer arc length.
- An Arc Trim setting of 0.0 rarely results in the optimum weld, though it should result in a "useable" weld for most wire types and diameters.
- Too long of an arc length will result in burn-back to the tip and destruction of the contact tip.
- Always set Inductance below 50%.
- Set Inductance to 25-35% for Steel with 90/10 Ar/CO_2.
- Set Inductance to 5-10% for Stainless with 98/2 Ar/CO_2.
- Set Inductance to 35-45% for Aluminum with 100% Ar.
- Never Use Tri-Mix For Stainless in Pulse MIG mode.
- Never whip or excessively manipulate the gun. This will cause excess spatter and bird's nesting (particularly with Aluminum).
- Never use a Pull Angle. Always Push the gun at 10 to 20 degrees or spatter and poor gas coverage will result.
- Use only a Z pattern or a very shallow C pattern if manipulation is required. Never use a deep U, E or Circle pattern.
- Keep a smooth, steady and consistent forward travel speed. Use two hands if necessary to do so.
- Keep torch Stand off height between 3/4" to 1". **Do not use stand-off heights typically used with short circuit MIGs.**
- Target having no more than 1/8" arc length. Longer arc lengths are permissible up to 1/4" but not generally recommended for best travel speed and bead profile.
- Arc lengths shorter than 1/16" may stub into the puddle and cause poor feeding.
- For Aluminum and Bronze use a gas flow rate of at least 40CFH.
- For Steel and Stainless use a gas flow rate of at least 25 to 30 CFH.
- Use at least .5 seconds Pre-Flow and 5 to 7 seconds Post flow for up to 200A and 7 to 15 seconds up to 275A for maximum quality welds.
- Hot Start is available only with 2TSP or 4TSP torch modes only.
- Use a direct connection of the work clamp. Keep work clamp distances as short as possible. Do not exceed MIG gun length for best results.
- Examine work clamp regularly for signs of wear and overheating.
- Check cable connection under the rubber DINSE power adapter cover to make sure the cable remains secure in the brass fitting. Tighten the set screws firmly if needed.

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Arc Length and Contact Tip to Work Distance in Welding.

Keeping a tight, short arc for TIG and Stick is important to prevent inclusions in the weld, especially while weaving. It helps control the puddle. Keep arc length ≤ 1/8" for TIG. For Stick dragging the rod is the best policy unless using a cellulose rod, then about 1/8" with a slight whipping/stepping motion helps the puddle to penetrate.

When welding in MIG mode, too tight of contact tip to work distance (<3/8" for Short Circuit and 3/4" to 1" for Spray/Pulsed MIG) will produce excess spatter as the wire shorts into the puddle. This is also dependent up the MIG gun size choice. This creates a violent reaction in the puddle and will send globules of metal flying out of the weld. If excess spatter is noticed while MIG welding increase the arc length and reduce wire speed. If the arc is too long the arc will tend to wander at the end of the wire. For Pulsed MIG, use an arc length of 3/4" to 1" with an arc length of <1/8".

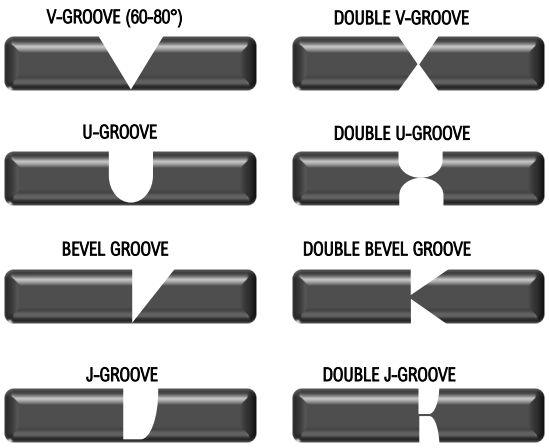
What Are the Different Kinds of Welds?

Besides a butt joint (Flat edge to flat edge) and lap joint (overlapping edges) which are often used for thinner metal gauges, consider using one of these groove joints for best welding results. When grinding or cutting the bevels, especially with a single V-groove, it may be beneficial to leave a small land with a gap between the joint to achieve full penetration. In this case a temporary backer plate can be used to support the bottom of the weld to create the root pass. The root weld will weld the backer to the main plate. This backer can later be ground or cut off. However, in many cases a plain open root can be used as a backer plate adds to the time and labor involved. A knife edge is also acceptable so long as the joint is fully penetrated when the weld is completed. Open root gaps without a backer can range from 1/16" to 1/8" depending upon wire diameter and application.

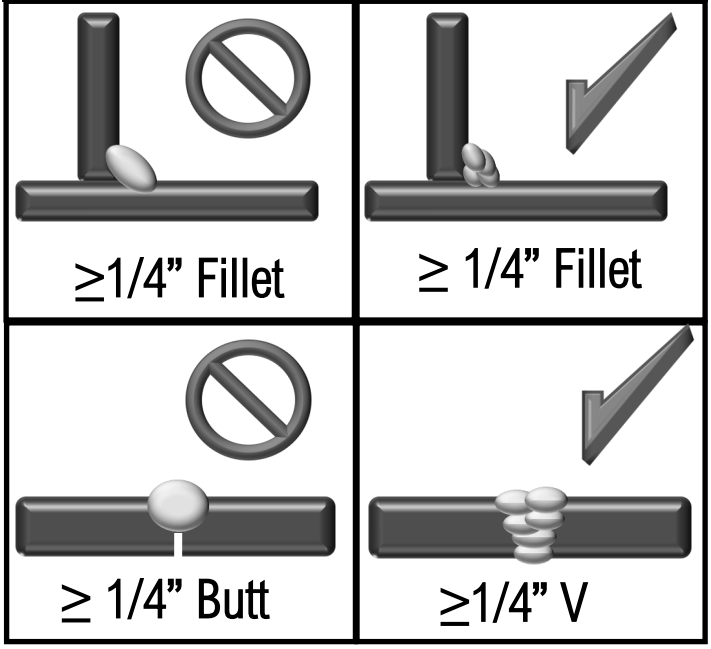
When Do I Use Multi-Pass Welds?

When welding material 1/4" and over be careful about trying to put too much metal down in a single pass. Use multiple passes to complete the weld along with any necessary joint preparation especially with wires of smaller diameter. As metal thickness goes up so does the number of required passes. Depending upon the wire diameter and power settings used, a 1/4" joint may only require 1 or 2 passes, but a 3/8" joint in plate metal or pipe will require not only beveling but 4 to 6 overlapping weld passes including a cap and root pass. See example in next column.

Joint Preparation



Weld Pass Examples



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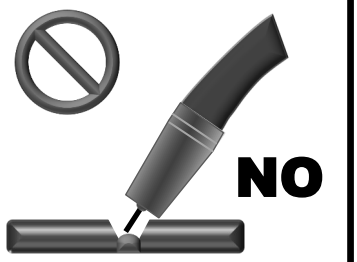
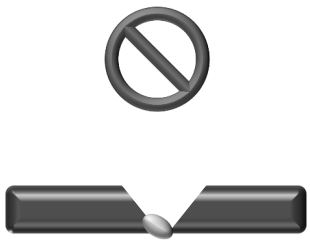
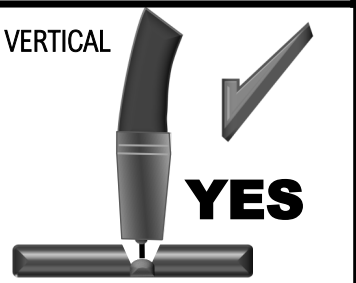
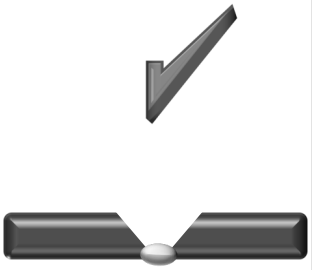
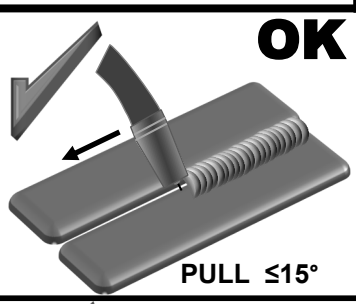
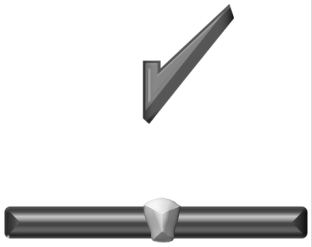
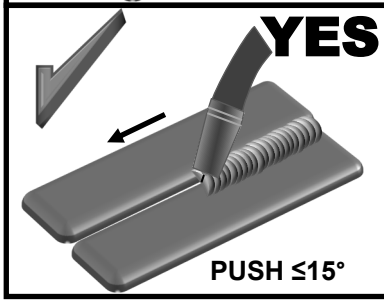
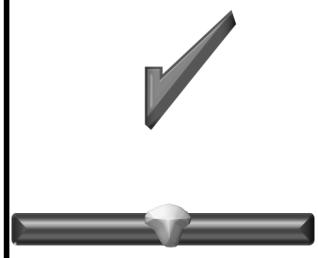
Drag or Push MIG?
MIG Welding is fairly simple. Just keep travel angle and direction in mind when welding. **A push angle is often recommended for short circuit MIG and Spray Arc Welding for the least amount of spatter and bead profile. Push is always recommended for welding Aluminum and Pulsed MIG.** *The old welder's saying "If it has slag, you drag." applies to Flux-Cored Wire welding.*

	**Problem Technique:** The Gun is not being held vertical from side to side. Wire is not being directed to the center of the puddle. This concentrates heat on one side of the joint and results in poor fusion on the neglected side. It also can create more buildup on one side of the joint than the other. **Correction:** Hold the gun so that the angle of the neck stands perpendicular from side to side.	
	**Correct Technique:** The gun is held in a near vertical position. A variance of 5 degrees or less is acceptable from side to side. The purpose is to prevent the arc from being concentrated on one side of the weld joint or the other. This balances the heat on both sides of the joint and keeps the bead centered. Don't confuse this with push or pull angle in the travel direction.	
	**Correct Technique:** The gun is angled toward the back of the weld when traveling forward. This angle should not exceed 15 degrees. This provides a narrower but more deeply penetrating weld. Use this method when Flux Core wire is being used. Use this method where the unit may be reaching its maximum welding capacity. Not for use with Aluminum wire.	
	**Correct Technique:** The gun can be angled toward the front of the weld when traveling forward. This angle should not exceed 15 degrees. This provides a wider and generally more pleasing weld. However it is shallower penetrating. This method typically allows a much better view of the arc. Use for most types of welding unless deeper penetration must be achieved.	

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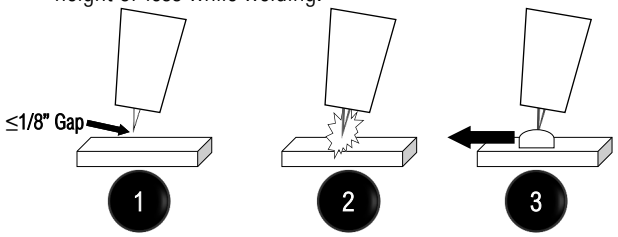
The TIG arc start can be performed in three basic ways.

The first and primary arc starting method used is **High Voltage Start**. HV start is a contactless start which is performed by holding the Tungsten off the metal about 1/8" or less and using the remote to activate the Solid state HV which will send a high Voltage impulse to the Tungsten, causing the arc to jump and create continuity to the work, allowing the inverter to kick in and put out a normal welding arc. This is the most preferred way of starting, especially with Aluminum. The tip of the Tungsten is not easily contaminated this way, and it requires little skill to perform. *While this unit technically is considered an HV start, it electronically simulates the HF start.*

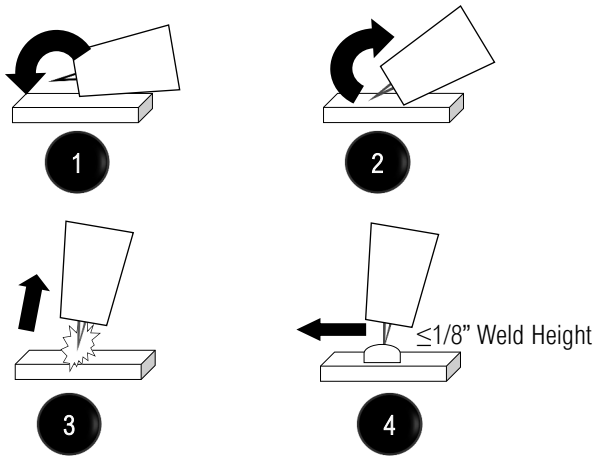
How Do I Perform an HF/HV Start?

1. Place the point of the tungsten 1/8" or less over the work piece.
2. Press the torch trigger or foot pedal, and the HV spark will be emitted. It may appear as small sparks or lighting if the arc doesn't start immediately. (If Live Lift is used, no pedal or trigger is required.)
3. Once continuity establishes, the welding arc will begin. You may begin to advanced the torch when a puddle forms. Maintain 1/8" height or less while welding.



How Do I Perform a Lift Start?

1. Rest the edge of the cup on the work piece so that the tungsten is slightly off the work. Press the trigger or foot pedal. Quickly rotate the tungsten to the work using the cup edge as a pivot.
2. A small spark may be noticed as it touches. Once the Tungsten touches, quickly and seamlessly rotate the cup back to draw an arc.
3. Raise the cup to establish the arc to 1/8" or less in height.
4. Allow the puddle to form and move the torch forward maintaining 1/8 or less height.



The second method is **Lift Start** which requires direct, purposeful contact with the surface of the metal to create continuity followed by a quick lift-off of the Tungsten to strike the arc. To understand how this works, when the Tungsten is touched to the metal, there is a small current supplied to the tip. At the time the Tungsten is lifted up, the welder senses the break of continuity. Then, the inverter sends full output to the Tungsten tip as the arc is established through the small spark created by breaking continuity. This form of Arc Starting is used when people need to start an arc without the use of an HF energy being present which can interfere with sensitive electronics nearby. It works well with steel, stainless and similar metals. It can work with Aluminum, but there is a chance of contamination of the Tungsten and more rapid wear.

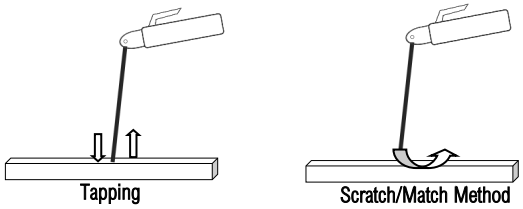
The third method is the **Scratch Start** method. This method involves a full current start with a live Tungsten that requires the Tungsten to be lightly, but quickly scratched on the metal, or drug quickly over the filler wire which is temporarily touching the metal to draw and strike up the arc. The quick brush across the metal can create a skipping motion if not performed correctly which can result in a stuck Tungsten. This is the least efficient method, but is in common use in the field with basic DC TIG rigs that have no automatic control of shielding gas and use a gas-valve torch. However this unit is not equipped with this type of function, though Live Lift can function similarly while also providing automatic control over the gas. Live lift can also be used with a TIG Rig with a valve controlled torch, *but* the solenoid will need to be covered when not in use. Use the plastic dust caps that are included with the unit and are installed on the fittings of the welder to cover the holes when the solenoid gas valve will not be used.

Starting the Stick arc with a tapping or striking method.

Stick is a fairly simple process. Arc starting can be done with a scratch or tapping method. The electrode is always live, but the VRD function can reduce the risk of electrocution, and may be required in some situations for safety. But it will be more difficult to start the arc. A quick double tap can help improve arc starting with the VRD engaged.

How Do I Start an Arc With Stick?

There are two basic types of arc starting methods used. The tapping motion allows pin point placement of the arc, while the scratch start method is similar to a match strike and is easier for beginners.



Component Identification and Explanation

Explanation of Parameters, Functions and Welding Terms

Alternating Current or AC (TIG). Used to describe an alternating flow of electrons that switch between negative and positive polarity. This is used for welding Aluminum and Magnesium. AC current provides necessary cleaning action required to weld aluminum and magnesium.

AC Advanced Pulse (TIG). This is a pulse dedicated for welding aluminum and achieving greater penetration than standard AC TIG welding. This pulse type constantly cycles between pure DC negative polarity and AC and offers a mix of pure DC. By using this pulse with the DC pulse Amperage portion set high, the penetration can be increased up to 50% greater than AC welding alone. The DC portion of the pulse works effectively for penetration as the AC portion of the pulse provides the cleaning action needed to clear the way for the DC portion of the pulse. See pulse definition for more information on parts of the pulse cycle.

AC Balance (TIG). This the ratio of positive to negative polarity expressed during one AC cycle. This provides the cleaning action required for removing unweldable oxidation from the surface of Aluminum and Magnesium. For this welder, AC Balance is expressed of Electrode Positive

AC Frequency (TIG). This is the number of times per second that the AC cycle fully oscillates between electrode negative and electrode positive polarity. This is expressed in the value of Hertz. This controls the width of the arc cone and heat imparted to the weld. Higher frequencies (120Hz to 250 Hz) give maximum control, and narrow the welding cone. Lowe frequencies improve wet in and spread the arc cone wider, which results in a wider bead. It also imparts more heat into the weld. On maximum capacity welds, lower frequencies (60 to 90 Hz) allow more felt power in the weld. The most common settings for AC Frequency is between 90 to 120Hz for most applications.

AC Wave Form Control (TIG). This controls the shape of the wave form and renders 4 different Sine wave form shapes: Advanced Square, Soft Square, Triangular, and Sine wave forms Each shape is designed to impart a distinct feel and look to the weld. It affects the wet-in, travel speed, and control imparted to the Aluminum/Magnesium weld. For general purpose welding the Advanced Square wave form is the best performing for wet in and welding thicker materials. Noise pitch is higher and signals the more aggressive wave form characteristics of the Advanced Square Wave. In contrast the Triangular provides low wet in and gives a more proud bead on thin gauge metals. Soft Square and Sine offer smooth less aggressive arcs. These will typically mimic a more traditional transformer TIG welder feel.

Amps (TIG/Stick). Shortened from "Amperes." Amps is a measurable value of Current. Amperage is used to refer to the magnitude of Current. *Amps will also be displayed while actively welding in MIG mode as well instead of wire feed speed.*

Anti-Stick (Stick). This is a special function that helps make removing stuck rods easier. When the mode is activated, the unit senses the low voltage ouput of the stuck rod and drops current to prevent the rod from sticking fast in the weld puddle, overheating and flaming out. The goals is to make releasing and removing the stuck rod easier so that it can be salvaged.

Arc Force (Stick) Arc force is used to offset the loss of overall wattage (V x A = W) as the arc length is shortened and voltage begins to drop while stick welding with short arc conditions. It offsets the drop in voltage by injecting extra amps into the weld when voltage drops below the 20V threshold. This enables the amperage to react aggressively or mildly, depending upon settings. It also helps to prevent arc outages, and allows the user to hold a tight arc and maintain better control. This function is also referred to as "Dig" and "Inductance" in the industry. Arc force is set as a percent of Amps over the set welding Amps. As the welder nears the top end of the Amp rating for stick welding, Arc Force action will be reduced due to less compensating Amperage being available for use. This will happen regardless of Arc Force Setting. Typically Arc force settings with rods such as E7018 and E6013 should be set to around 20 to 35%. Arc force for Cellulose based Flux rods such as E6010 and E6011 is 60% or greater.

Arc Length. Arc length is the distance between the end of the electrode (TIG/Stick), or filler wire (MIG) and the puddle.

Arc Trim. In Synergic MIG mode, the arc trim is used to control the arc length of the MIG weld. The Arc Trim actually controls the average pulse voltage and is represented by a relative scale (-5 to +5). The more negative the Arc Trim is adjusted the shorter the arc length will be. The more positive the Arc Trim is adjusted, the longer the arc length will be. Too much arc trim will result in burning back to the tip. Too little arc length will result in the wire stubbing into the puddle and large amounts of spatter will occur and in some cases bird's nesting may occur. When Arc Trim is used, there is no direct Voltage setting due to the rapid pulsing up and down of the voltage.

Burn-Back. The Burn-back function is a MIG function used to control the arc at the end of the weld. Burn-back control keeps the arc on for brief period of time after the wire stops feeding. This helps to prevent wire sticking in the puddle as the user hovers briefly over the weld after the arc is terminated. If extra over-run of the wire is experienced or the wire welds itself to the puddle after the arc is terminated, increase burn-back time. Usually .02 to .2 seconds is sufficient. If too much time is used, the wire will burn-back to the tip after the weld is terminated (Burn-back control does not prevent wire burn-back to the tip while actively welding.)

Direct Current or **DC (MIG/TIG/Stick).** Used to describe one way flow of electrons. Used in TIG to weld Steel, Stainless Steel (Inox), Chrome Moly, Titanium, and more. Not used with Aluminum and Magnesium. For MIG this is the standard method of MIG welding with all metals. This is the preferred method of stick welding. For most MIG and Stick applications, DC polarity of the torch will be positive (DCEP +). For Flux-Cored and TIG use the DC polarity will be negative (DCEN -). The welder will remind you of this polarity.

Down Slope (MIG/TIG). Downslope is the duration of time that it takes for the programming to transition the Amperage from the Welding Amps to

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the End Amp setting . Adjustment in TIG Pedal mode will be blocked. This timer controls the decrease of the amperage and provides a window to fill the crater as the puddle begins to cool before the arc terminates. Used with all remote functions except the foot pedal in manual mode.

End Amps (TIG) or End Wire Feed Speed (MIG) or Fill Current (Syn Pulse MIG). This is the destination current value (or MIG end wire feed speed) set for the end of the weld cycle. When used with the torch switch, this is the final current (end wfs) set used to taper off and fill the crater at the end of the weld. For TIG foot pedal use, this value should be kept at a minimum for proper tail off. However, the Tungsten size will ultimately dictate the exact minimum amperage that a stable tail off of amperage can be performed. For MIG, this helps slow the wire and makes a more gentle termination and better crater fill.

For Synergic Pulse MIG, this is usually set at a lower Amperage (Manual mode) or as a lower percent (PowerSet mode) than the Welding Amps value. This should be used to fill the crater.

NOTICE:

The HF on an inverter is not continuous. Formerly the term "HF" was synonymous with AC welding as it was required continuously to help stabilize the arc on a transformer welder since switching time in AC was so slow. The two terms were often confused used interchangeably. Inverter switching frequencies are so rapid that the need for continuous HF overlay is eliminated. HF now refers to the HV arc start.

High Voltage Start or HV Start (TIG). Depicted as HV on the menu screen under the start function, this is a touchless type of start. It is actually an simulated HF electronic controlled start, but due to the familiarity of users with HF, it is labeled as such to avoid confusion. When HV start is selected, the user positions the torch 1/8" or less above the weld area and either presses the foot pedal or the torch switch and the arc will jump. This HV start is created by a HV electronic system, instead of the traditional point gap design. A high voltage, low amperage current is created which jumps from the Tungsten to the work piece when activated. Once the machine sends a High Voltage impulse to the torch, the HV energy jumps the gap between the electrode and the work piece. Then, the welding arc will initiate after continuity is established. When continuity is established, the HF/HV shuts off. On this unit the HF/HV parameters can be programmed in the back ground menu. The length of HV start attempt, the strength of the HV arc and the HV impulse Amperage can all be set in the background menu. Once set, these parameters will seldom be changed. If the arc attempts to start longer than the set time, an error code "E05" will be displayed temporarily, meaning the switch is either stuck closed, or the arc has been activated too long without an arc start. This helps prevent damage to the machine and chance of accidental shock to the user. Do not "air fire" with the pedal or torch switch pressed unless testing gas flow function. Use the gas purge to set gas flow rate instead of firing the torch. The arc should only be used to strike an arc against the work piece.

Hot Start Amps (Stick). This setting controls the intensity of the arc start by boosting the initial amps at the start of the weld cycle. It is used to improve arc starting and reduce the time needed to establish a puddle and helps to prevent porosity at the beginning of the weld. The Hot Amps are set as a percent of Amperage over the welding Amps. Maximum Hot Start action may be limited by available Amperage for stick welding. As the current is raised near the top Amperage of the welder, Hot Start Action will be less forceful due to less Amperage being available, regardless of machine setting. Typical settings can be between 30 and 70%, depending on electrode type. Iron Powder and Low Hydrogen rods will require less Hot Start action from 30 to 50%. Cellulosic rods may require 60 to 75%.

Hot Start Time (Stick). This is the time the Hot Start Stays engaged. The Hot Start Time will be increased on thicker plates, but in general, .5 to .7 seconds works well for plate thicknesses up to 3/8".

Inductance (MIG). Although the action is different, this is similar to arc force in stick that helps change the puddle characteristics and defines the feel of the arc, whether stiff, or soft and fluid. It is a relative amount and cannot be turned off completely. The user may also notice that the arc width is also controlled to a small extent. The Inductance setting is as important as setting Volts or Amps and should not be ignored.

Lift Start (TIG). Lift start requires touchdown and lifting up of the Tungsten to start the Arc. *There are two types of Lift Start that this unit has.* The first is a live lift start. This means the tungsten is always electrically live until the arc is started. When the tungsten is touched to the metal, continuity is sensed and the welder sends welding power as soon as the continuity is broken. The other type of lift start is a "remote lift start". It functions essentially the same except, the tungsten is not electrically live and the torch switch or foot pedal must be used to make the torch live. This is a safer form of lift start and helps prevent accidental starting of the arc. It also means that the start type can be used with the welder programming in 2T and 4T mode, or with the foot pedal.

Open Circuit Voltage (OCV). OCV is the voltage that is present when the arc is not struck. OCV is particularly important to stick arc starting. OCV is reflected in the left main display area as the default when not welding.

NOTICE:

The arc start will be delayed by the amount of time chosen for Pre Flow. If Pre Flow is set for 2 seconds, the arc will not start for 2 seconds. This is sometimes easy to forget, especially when tacking or spot welding.

Post Flow (MIG/TIG). Post Flow is the amount of time (in seconds) that the shielding gas flows after the arc is terminated. This is an important function. The flow of shielding gas after welding is stopped helps to 1) Cool the torch and/or tungsten and prevents oxidation of the tungsten/filler wire as it cools. 2) Provide cooling and shielding while the weld puddle solidifies and cools. This helps to prevent the weld from forming porosity and prevents oxidation of the weld as it cools. Post Flow should be increased at the Amperage increases. **For TIG use, use one second of Post Flow for every 15 to 25 Amps used. At a minimum, 2 to 3 seconds**

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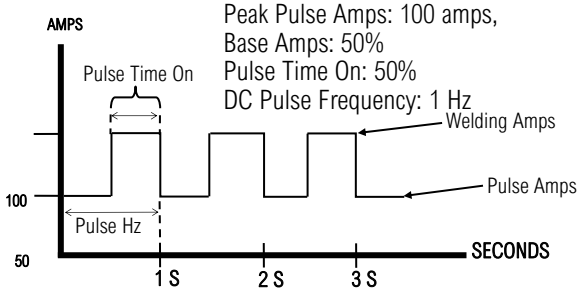
should always be used. For MIG use, use 2 to 3 seconds for every 50-70 Amps. To properly use Post Flow, the torch should be held in place over the weld after termination until the gas shuts off.

Pre-Flow (MIG/TIG). Pre Flow is the amount of time (in seconds) that the shielding gas flows before the weld starts. It is very important that the Pre Flow be set for at least a short flow before any weld. The Pre-Flow not only purges the torch of any contamination, but it also establishes a protective envelope of shielding gas around the weld before the arc initializes. In TIG mode this protects the tungsten, and helps to establish an arc more quickly by surrounding the tungsten and work with more easily ionized gas so that arc starts are more efficient. For MIG, it provides a stable gas pocket to strike the arc and helps prevent inclusions at the beginning of the weld. It also allows time for the gas flow to stabilize before the arc is struck. When initializing the Pre Flow a "rush" of gas can often be heard just ahead of the arc strike. Then the gas flow will quieten down as the weld begins. This is normal. This rush of gas is caused by several things, but it is in part due to regulator attempting to regulate the sudden rush of gas. As it does this, extra gas may be consumed until the regulator has had time to react. The extra flow of gas may create turbulence around the weld. The Gas flow rate may also temporarily increase due to the back pressure "ballooning" of the gas lines. As the slightly swollen gas lines stabilize, extra gas is propelled as the solenoid opens relieving the back pressure. For MIG or TIG, using .3 to .7 seconds is usually enough to allow the "gas rush" to stabilize, unless extra large shielding cups are used. If over-sized TIG cups are used (≥#10) or longer torch cables are used, increase to 1 to 2 seconds.

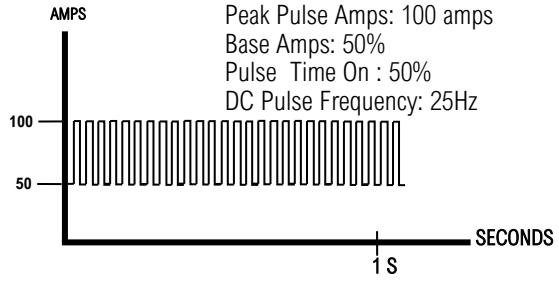
Is There a Better Way to Understand Pulse?

Pulse is essentially a wave form created by the pulsing amperage. This wave form can be skewed, expanded, compressed, increased or decreased in magnitude. Each change in Amps, Pulse Time On Balance, and Frequency all affect average heat being put into the weld. The examples below attempt to explain the parts of the pulse and how each part of the pulse functions. *Examples not to scale.*

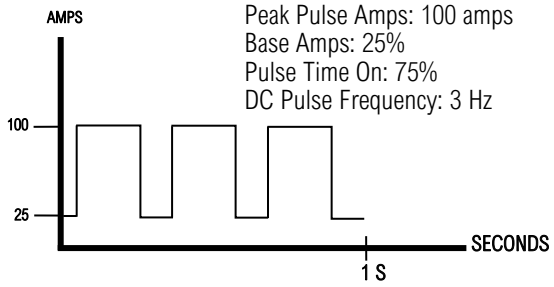
EXAMPLE 1
Peak Pulse Amps: 100 amps,
Base Amps: 50%
Pulse Time On: 50%
DC Pulse Frequency: 1 Hz



EXAMPLE 2
Peak Pulse Amps: 100 amps
Base Amps: 50%
Pulse Time On : 50%
DC Pulse Frequency: 25Hz



EXAMPLE 3
Peak Pulse Amps: 100 amps
Base Amps: 25%
Pulse Time On: 75%
DC Pulse Frequency: 3 Hz



PowerSet (MIG/ Synergic MIG Pulse/ Flux-Cored/TIG/Stick). The welder offers a unique power set menu mode that allows the user to input several operating parameters such as Tungsten/Wire/Electrode Diameter, Metal type, and Material Thickness. In return, the unit will provide a usable range of settings based off the user inputs. It will limit and preset most all other parameters and functions so that the user doesn't have to go through an extensive set-up routine. for the user. For TIG, the PowerSet mode also includes the option to use a simplified form of pulse, with only a frequency (Hz) adjustment. The basic Pulse parameters are fixed so that consistent results can be achieved without having to worry about additional adjustment of settings. For users that are new to the welder or unfamiliar with basic functions or setup, this should be the mode that is used. It is also used to provide settings in lieu of a weld chart. Consider the PowerSet settings to be the weld chart on this unit, but expressed in a digital format.

Pulse (TIG). The TIG pulse creates two amp values, a high and a low value that cycle back and forth between each other while welding. This helps preserve travel speed while reducing the size of the Heat Affected Zone (HAZ). The pulse is divided in to two phases or stages. The upper amperage phase is called the Welding Amps, which is the default Amp setting on the unit. This is sometimes also referred to as Peak current. The lower amperage phase of the pulse is called "Pulse Amps". This is also called "background" or "base" current and represents a drop in Amps. Pulse Amps are set as a percent value of Welding Amps. Pulse has several uses and can be used to control arc directability, arc cone width, heat spread, penetration, travel speed and even weld appearance. It is particularly useful on metals that are prone to structural deterioration from the HAZ or burn through. Pulse is used strategically to create a lower average Amperage, by varying one or more of several adjustable pulse parameters to reduce heat input. For AC Advanced Pulse, the Pulse Amps serves as the DC portion of the pulse. For most penetration with the AC Advanced Pulse, DC Pulse amperage should be set at maximum. Also in AC Advanced Pulse mode, the Welding Amps represent the AC portion of the pulse. Other parts of the AC Advanced Pulse operate on the same principle as described in the following information.

1. Pulse Amps (Base). Base Amps is the low Amperage value of the

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pulse. When you adjust the base Amps in pulse mode, you are actually setting a ratio of base Amps to peak welding Amps. Base amps are expressed as a percentage of Peak welding Amps. So, when you set base amps, you are only setting it as a percentage, not the actual Amps. As you increase Peak welding Amperage through the use of the foot pedal, or the panel control, the pulse will maintain the same ratio of Base to Peak welding Amps, raising the base Amps automatically. To illustrate: Adjust the Peak (main welding) Amps, to 100. Set the base Amps to 50%. This will yield a 50 Amp value for the base Amps. The foot pedal controls both Peak welding Amperage and Base Amperage simultaneously, using the pre-set ratio.

2. **Pulse Frequency (Hz).** Pulse speed is referred to as Frequency, which is measured in Hertz. Pulse frequency controls the arc constriction and also helps with heat management. A slower pulse frequency around 1 to 3 hertz gives the "stacked dime" appearance. At higher frequencies the "stacked" appearance will be lost while heat control is increased. This is also referred to as "Pulses Per Second" or "PPS".

3. **Pulse Time On (Balance/Duty Cycle).** Pulse Balance is the percentage (%) of time that the pulse stays in the TIG (Peak) pulse Amp phase of the cycle. Increasing the Pulse time-on will increase the duration the Peak Amp phase of the cycle which in turn will increase the heat and will increase penetration. Pulse Balance is also known in the industry as "duty cycle". For TIG welding purposes the term "Pulse Time On" is used here.

Setting up TIG pulse is not a one-size-fits-all process. There's no template or list of settings that can be offered to the user that will work in all situations. It's very difficult to offer pulse setting lists for even well-defined applications. (Even though the PowerSet menu features pulse, the pulse control is limited to Frequency (Hz) only operation. All others parameters are fixed at an optimized level.) In manual setup mode changes to any one pulse parameter, whether it be frequency, balance, or Pulse Amperage will skew the effect of the pulse. Keep this in mind when making changes and make only small changes to one parameter at a time to dial in the desired effect.

A slow pulse between .7 and 2.5 Hz with an equal 50% pulse time on and somewhere around a 30-60% Pulse Amp setting can be used to help with timing the addition of filler metal to the weld puddle. This type of setting will improve bead appearance. A high pulse frequency that is combined with complimentary settings of 50% or below Pulse Time On and a low pulse Amps settings of 40% or below can be used to prevent burn through and speed up welding on thin materials. It can also help maintain a proper bead profile on a thin edge weld or prevent burn through on extremely thin metal. A fast pulse speed will make fine ripples in the weld while a slow pulse speed will give a much more coarse, but visually appealing result. There are limitless ways to adjust the pulse. Regardless of how you choose to adjust the pulse, always keep in mind, that the basic purpose of the pulse is to average the heat input while maintaining penetration and welding speed.

Pulse Wave Form Control. Modern technology allows the wave shape of the DC pulse TIG to be shaped into several different wave shapes. (AC Pulse does not have this type of wave form control) This unit includes 4 wave shapes, which include Square, Sine, and Triangular. These pulse wave shapes help reduce noise and improve effectiveness of the pulse, based off of the operator requirements. The sine and triangular help reduce noise. The square wave form increases travel speed.

Regulator/Flow Meter (MIG/TIG). Controls the flow rate of the shielding gas at the cylinder. The regulator should never be left turned on. Leaks can and do develop over time or suddenly. Gas solenoids can fail to close properly. Whenever a regulator is not in use, the pressure should be relieved so that the diaphragm/spring will not prematurely fail or lose accuracy.

CAUTION*: Always open the regulator slowly, while standing to the side so that if it were to fail parts will be ejected away from you. Never stand over a regulator while opening.*

Remote (MIG/TIG/Stick). Remote refers to the ability to start the arc and control the weld cycle at a distance. High Frequency Start must be used with a remote to operate. Lift Start can also be used with a Remote. A remote can be a foot pedal, torch switch, torch mounted slider or hybrid Amp-trol torch. All of them are used to start and end the arc as well as control other parts of the weld cycle to varying extents. The unit has multiple Remote settings to choose from. **2T/2T+A/4T/4T+A/Pedal** settings all must be used with a remote switch. Pedal mode is reserved for use with a Foot pedal or slider Amp control mounted on the torch handle. The hybrid torch switch/amp-trol must be used with the special 2T+ Amp and 4T+ Amp functions.

TIG Pedal mode is the most straight forward. Operation is quite simple. The maximum amperage is set on the panel. Then the foot pedal is used to start and stop the arc as well as vary the amperage from the minimum welding setting, up to the maximum welding setting selected on the panel. When used in pedal mode, many weld cycle parameters will not be available for adjustment since the pedal itself controls those functions manually.

This welder also allows the stick function to be used with a remote amperage control device.

Shielding Gas (MIG/TIG). Shielding Gas is necessary while MIG or TIG welding. It is not use for Flux-Cored welding on this machine. Shielding gas protects the weld from oxidation by the atmosphere while the weld puddle is still molten. Gas flow rates are controlled by the supplied regulator. Too little gas flow will cause porosity, heavy scale and or oxidation. Too much gas flow is wasteful and can also create a turbulent flow, which can pull the atmosphere into the weld, creating oxidation. *The recommended shielding gas type is always listed on the display as a reminder.*

Start Amps (TIG) or Start Wire Feed Speed (MIG) or Hot Start (Pulse MIG). This is the initial Amperage of the weld in TIG mode and the initial,

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or the starting wire feed speed in MIG mode. This is the starting stage of the weld cycle, at which the arc initiates. For TIG, the Start Amps setting is sometimes confused with the surge amperage required to start the arc. These are separate items. The surge amperage (which all TIG welders have, whether it's published on the screen or not) is a micro surge of Amperage required to establish the arc lasting only milliseconds. TIG Start Amperage is the actual Amps at which the arc will establish itself as it stabilizes. It becomes particularly effective when using the torch switch for welding aluminum by allowing a more rapid wet in at the beginning of the weld. For larger diameter tungsten, the Start Amps can be increased to provide a more stable low end start with the foot pedal. The Tungsten size function dictates the minimum Starting Amperage so that the best start can be obtained. However, it is not the absolute lowest limit. To obtain complete control over the Start Amp parameter, set the Tungsten function to "Manual." Start Amps may be set higher than the Welding Amperage, but more rapid wear of the Tungsten may result.

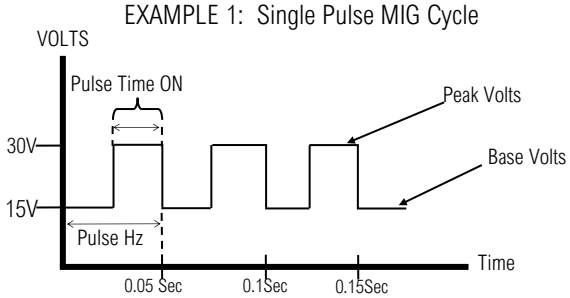
MIG Start Wire Feed Speed is the beginning wire feed speed used to initiate the arc and controls how smooth the arc starts, when combined with upslope. This can serve as a "reverse" hot start by slowing the wire speed at the beginning of the weld while providing a higher voltage.

During Synergic Pulse MIG, the Start Amperage (manual) or Start percentage (PowerSet) is used to create a hotter start to provide quick wet in of the puddle. This is used in conjunction with the 2TSP or 4TSP torch modes.

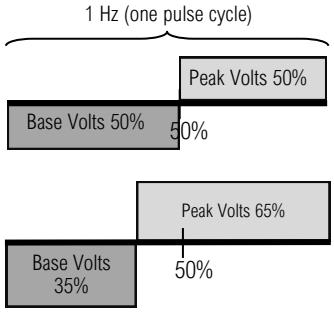
How Does MIG Pulse Work?

This welder has a Synergic Single Pulse Process. The pulse is not unlike that of a TIG pulse, except the MIG version of pulse pulses Voltage instead of Amperage (TIG). The functions or Peak Volts, Base Volts, Pulse Frequency (Hz), and Pulse Time-On (balance) are all synchronized and kept in balanced and adjusted off of the Amp setting of the unit. While these functions are not set explicitly during MIG by the user, the user indirectly controls the functions by using Amps. The user also can bend the average voltage slightly through the use of the Arc-Trim. Even though these settings are mostly controlled automatically through a mathematical formula, the function and action of the settings is depicted below in a basic graphic to help explain what is happening in the pulse cycle.

EXAMPLE 1: Single Pulse MIG Cycle



EXAMPLE 2: Single Pulse Time-On (Pulse Balance)



Spot Weld Timer (MIG/TIG). The Spot weld timer simply is an Arc-On timer for MIG/TIG and is calibrated in tenths of a second. The function is intended to help the user create better tack welds with improved consistency in weld size and penetration. Once the torch switch trigger is activated and held, the arc will stay turned on for the amount of time selected. After the time has expired, the welding arc will shut down. The Spot function should be used with 2T only. . This is not meant to be used with or serve as a controller for tong-type Spot welders.

Stitch (MIG/TIG). Whereas the Spot function is an "Arc-On" timer, the Stitch timer is an "Arc-Off" timer which works in a continuous cycle as long as the switch is continually held. This creates a repeating on/off cycle that is useful for welding long seams on sheet metal, or creating regular sized spot welds along a object while tacking up an object for fitment.

Synergic MIG Pulse. Synergic pulse in MIG is similar to the pulse in TIG. However, instead of pulsing Amperage between high and low settings as in TIG, MIG Pulse actually pulses Voltage between a high and low voltage value. The pulsing action happens multiple times per second and all pulse parameters such as pulse time on, pulse voltage (base and peak) and Pulse Frequency are controlled automatically through the welders synergic programming. The output of the pulse is based on the Amperage setting of the machine. *Pulse is used to control heat input without sacrificing travel speed. It has other benefits as well, with smooth bead appearance, minimal spatter, and less warping of the base metals.* Instead of a direct wire speed feed rate, the unit relies on Amperage setting to control the wire feed rate and it relies on the Arc Trim instead of a direct Voltage Control. Since the programming requires the input of wire type and diameter Amperage can be computed mathematically instead of using the wire feed speed and "guessing" what the Amperage output will be. The Arc trim directly controls the Arc length since the Arc Trim bends, or curves the factory programmed average pulse voltage (computed mathematically using the average between Peak and Base voltage, pulse time on and frequency). This increase or decrease in average voltage by the Arc Trim modifies the programming enough to change the arc length considerably.

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Up-Slope (MIG/TIG). Upslope is the duration in time that it takes for the programming to transition the TIG Start Amperage (or MIG Wire Feed Speed) from the TIG Start Amp/ MIG Start WFS value to the Welding Amp value. If TIG Start Amps/MIG Start WFS are set higher than the Welding Amp values, then technically it will down slope to the Welding Amp value. However high TIG start values can increase Tungsten wear. Used with all remote functions except the foot pedal in manual mode.

Voltage (MIG/TIG/Stick). Voltage is the main default control in the left screen. For TIG and Stick, Voltage is not adjustable because the length of the arc will dictate the voltage. This is a static function and only reflects the output voltage and will be displayed in green for TIG and Stick. For MIG/ Flux-Cored use, the voltage is able to be set and controlled. Voltage is also referred commonly to "Heat" when referring to MIG and helps to control the arc length. Too much voltage will cause undercut, while too little will cause poor wet-in of the weld and cold lap at the toes of the weld.

Voltage Reduction Device or VRD (Stick). This function reduces Open Circuit Voltage (OCV) while welding stick. This is required in some applications to comply with safety standards. This reduces high OCV down to 20V or less. This can also make arc starting slightly more difficult. A quick double tap can offset the hard starting. *See specifications on page 12 for OCV data to determine if the use of the VRD is required.*

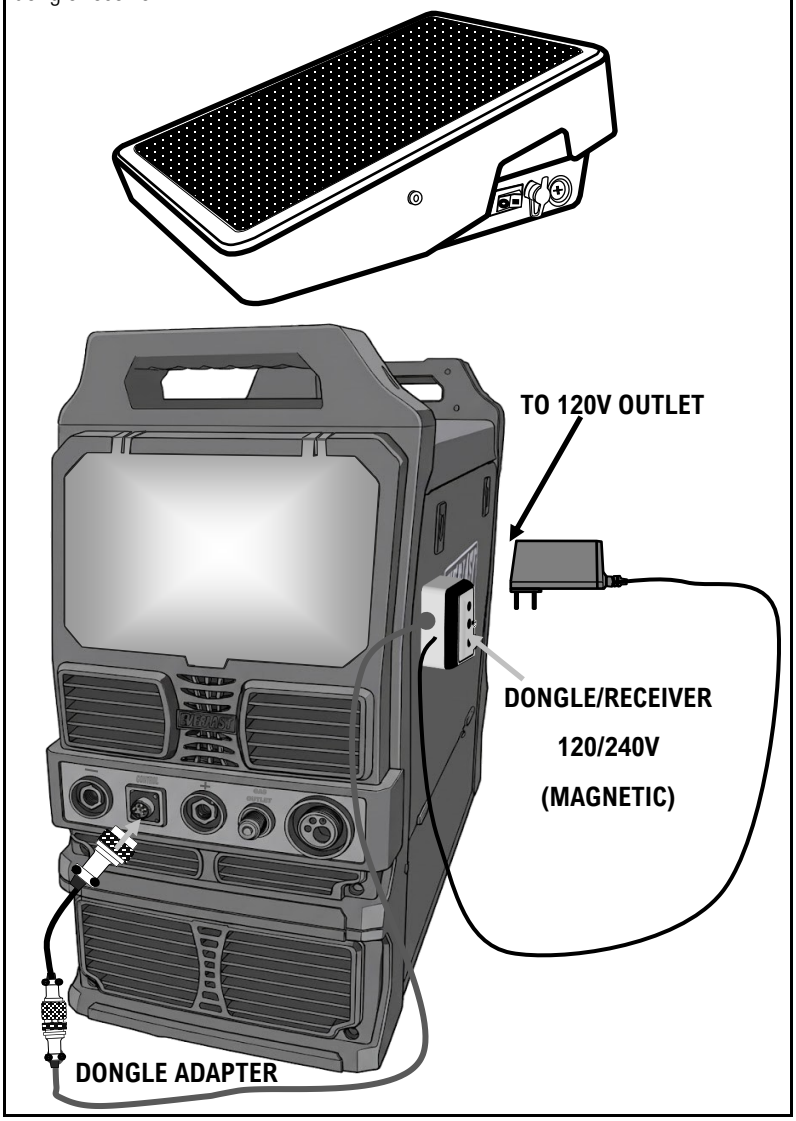
Welding Amps (TIG/Stick/ Pulse MIG) or Wire Feed Speed(Standard MIG WFS). This is the main default current control in the right screen. For TIG, when used in the context of Pulse, this is the "Peak" part of the pulse while the Pulse Amps is the "Base Amp" part of the pulse. Without Pulse, the main welding amps simply controls the Amperage of the welder. For MIG, Wire feed speed is expressed in inches per minute or in meters per minute, depending upon the units selected. For Pulse MIG, the screen will display Amperage. This is a more accurate way of setting Pulse and maintaining consistent weld performance between different wire sizes on the same thickness of metals. Amps are controlled by wire speed, but since both wire type and wire diameter are entered, the machine automatically figures the predicted Weld Amperage. Weld Amperage in Pulse MIG mode can be set by metal thickness similar to TIG and Stick practice. The issue with using wire feed speed in Pulse MIG is that to obtain 100A with .030" wire, the wire feed speed must be much higher than .045" wire at the same Amp output. This leads to errors in setting Pulse MIG. Setting by Amperage will maintain consistency between different wire sizes and helps eliminate some user error.

Component Identification and Explanation

Wireless Foot Pedal Option

Can I Use a Remote Wireless Pedal?

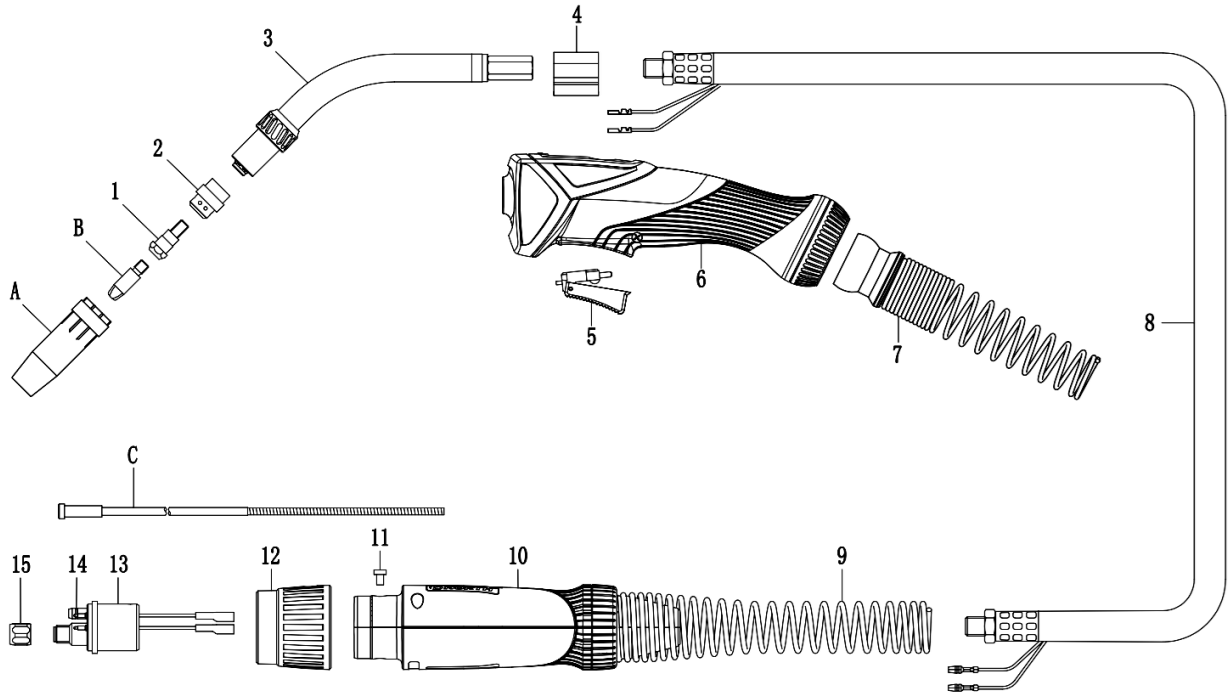
The Lightning series is able to be used with the NOVA wire less pedal system. This system is composed of the pedal and internal transmitter and the external dongle receiver.



Component Identification and Explanation

North SN24 SERIES MIG TORCH PARTS BREAKDOWN

Optional Gun(MB24KD Style)



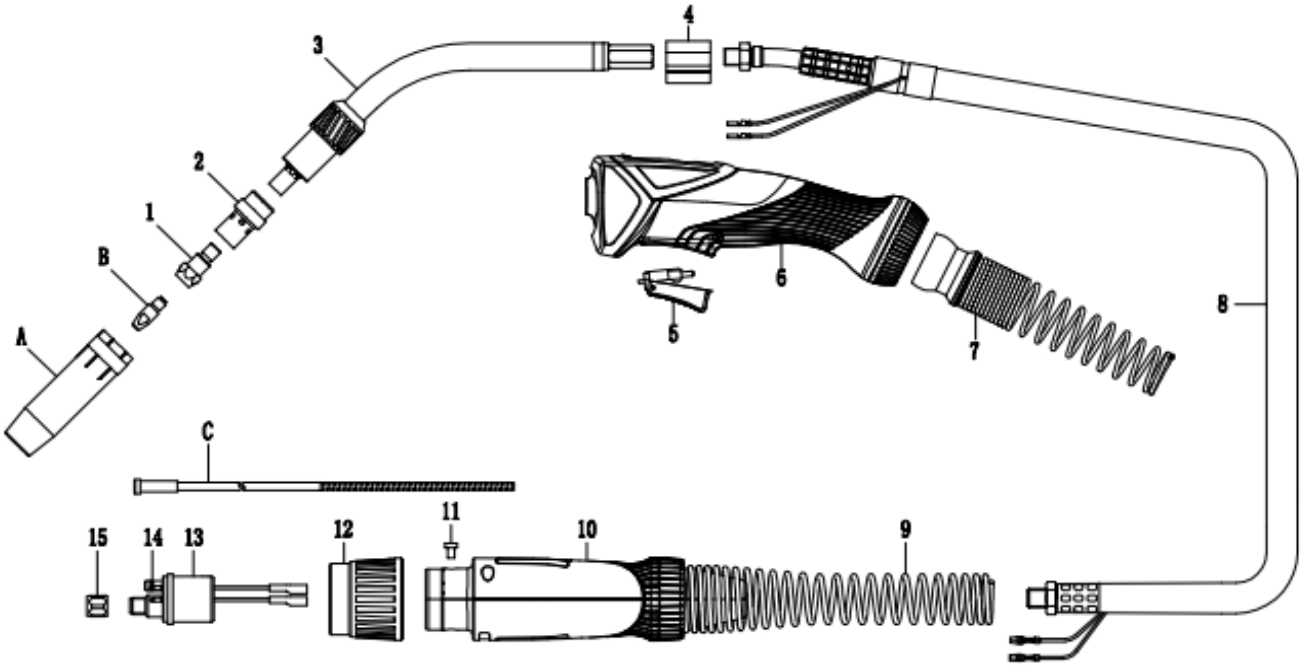
North SN 24 Series MIG Gun (MB24KD Style)		
Item	Part Number	Description
A	200300	Gas Cone/Nozzle 12.5mm
B	EB2206	Contact Tip .6mm M6x8x26 (.023" Heavy Style)
	EB2208	Contact Tip .8mm M6x8x28 (.030" Heavy Style)
	EB2209	Contact Tip .9mm M6x8x28 (.035" Heavy Style)
	EB2212	Contact Tip 1.2mm M6x8x28 (.045" Heavy Style)
C	302530	Red Liner .9 to 1.2 mm (.035"-.045") Opt. Blue liner for .6 and .8mm (.023"-.030") Steel. Optional polymer liner for Aluminum
1	EC2001	Contact Tip Holder
2	ED2001	Ceramic Diffusor
3	300624	Gun Neck 45°
4	305500	Plastic Receiver Body
5	EJ0001B	Trigger
6	NH0102HGG	Gun Handle
7	NS0101	Gun End Strain Relief Spring
8	EL2530	Cable Assembly 3m (9.5 ft
9	8M8500	Connector Spring Relief
10	NH0202HGG	Connector Body
11	Q210406B	Screw M4x6
12	NH020203	Connector Flaring Nut
13	EU1001A	Brass Power and Gas Connector Plate
14	Q504010	O-Ring 4mm x 1mm
15	EU1011	Liner Retaining Nut M10x1

Component Identification and Explanation

North SN36 SERIES MIG TORCH PARTS BREAKDOWN

Stock Gun (MB36KD Style)

Rating:340A CO_2 300A mixed gas, 60% duty cycle. wires: 0.8-1.6mm.



Nozzles

No.	Part Number	Description
A	200620	Tapered Nozzle, 14mm
	200610 *	Conical Nozzle, 16mm
	200600	Cylindrical Nozzle, 20.1mm

Contact Tips

No.	Part Number	Description
B	EB3210	Contact Tip 1.0mm M8×10×30 Ecu
	EB3212 *	Contact Tip 1.2mm M8×10×30 Ecu
	EB3216	Contact Tip 1.6mm M8×10×30 Ecu
	EB3210L	Contact Tip 1.0mm M8×10×30 CuCrZr
	EB3212L	Contact Tip 1.2mm M8×10×30 CuCrZr
	EB3216L	Contact Tip 1.6mm M8×10×30 CuCrZr

Liners

No.	Part Number	Description
C	303630	Steel Liner 2.5/4.5, Yellow, 3m
	303640	Steel Liner 2.5/4.5, Yellow, 4m
	303650	Steel Liner 2.5/4.5, Yellow, 5m

*Denotes Standard Build for Most Sales Regions

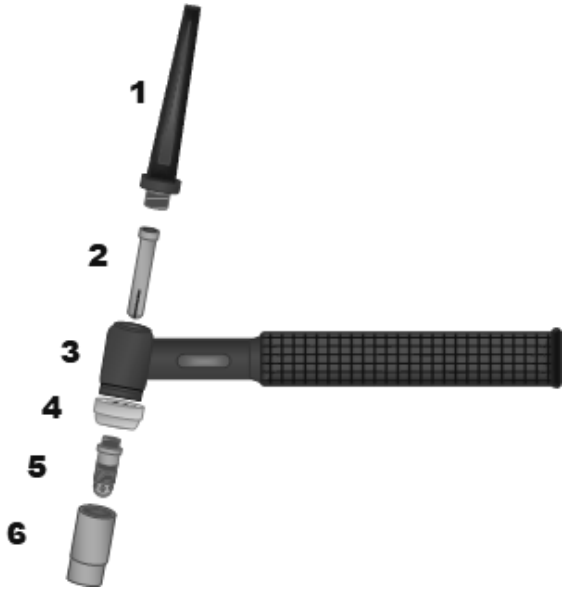
Compontents

No.	Part Number	Description
1	EC3001 *	Contact Tip Socket M8×28
	EC3002	Contact Tip Socket M8×32
2	ED3002 *	Diffuser, DMC
	ED3001	Diffuser, Ceramic
3	300636 *	4CE-36 SWAN NECK 45°
	3006362	4CE-36 SWAN NECK 45° SHORT
4	305500	Plastic Body
5	EJ0001B	Trigger
6	NH010216HGG	Handle E16
7	NS0101	Front Spring Cable Support
8	EL3530	Cable Assembly 3m
	EL3540	Cable Assembly 4m
	EL3550	Cable Assembly 5m
9	8M9500	Back Spring Cable Support
10	NH0202HGG	Back Handle
11	Q210406B	Screw M4×6
12	NH020203	Gun Plug Nut
13	EU1001A	Euro Gun Plug
14	Q504010	O-Ring 4×1
15	EU1011	Nut M10×1

Component Identification and Explanation

18 Series Water-Cooled Welding Torch (Typical Type) Parts and Assembly.

DC: 350A @ 100% Duty Cycle; AC: 250A @ 100% Duty Cycle



Typical Everlast and NOVA Torch Assembly (17,18, 26 Series)

(Some parts may not appear exactly the same but are equal in assembly order and type.)

Tungsten not included, but available in select Consumable Kits on the website at www.everlastwelders.com.

Consumables are standard sized for series 3 torches, and interchange with consumables made for similar torches with similar nomenclature.

#	Description	Size/Type	Part#	Alternate Ref.	Note
1	Back Cap	Long	NVA57Y04-3	57Y02	
1	Back Cap	Medium	NVA41V35-3	41V35	Or 300M
1	Back Cap	Short	NVA57Y04-3	57Y04	
2	Collet	.040”	NVA10N22-3	10N22	1.0mm
2	Collet	1/16”	NVA10N23-3	10N23	1.6mm
2	Collet	3/32”	NVA10N24-3	10N24	2.4mm
2	Collet	1/8”	NVA10N25-3	10N25	3.2mm
3	Torch Body/Handle	17,26, or 18	Call for App.		Varies by Type
4	Heat Shield	17/26/18	NVA-HS172618	Heat Shield	Interchanges with similar aftermarket
5	Collet Body	Universal one size fits 1/16” to 1/8”	Stock	Stock	Universal Collet Body and Collets supplied with original starter kit
5	Collet Body	.040”	NVA-10N30	10N30	1.0mm, match to collet size
5	Collet Body	1/16”	NVA-10N31	10N31	1.6mm, match to collet size
5	Collet Body	3/32”	NVA10N	10N32	2.4mm, match to collet size
5	Collet Body	1/8”	NVA10N28	10N28	3.2mm, match to collet size
6	Cup	4	NVA-10N50-3	10N50	Standard, non gas lens 1/4”
6	Cup	5	NVA-10N49-3	10N49	Standard, non gas lens 5/16”
6	Cup	6	NVA-10N48-3	10N48	Standard, non gas lens 3/8”
6	Cup	7	NVA-10N47	10N47	Standard, non gas lens 7/16”
6	Cup	8	NVA-10N46-3	10N46	Standard, non gas lens 1/2”

Troubleshooting

Common MIG/Flux-Cored Welding Issues

NO.	Trouble	Possible Cause	Solution
1.	Unit is switched on, but the fans and display won't run or light up.	Switch damaged.	Check.
2.	After welding machine is overheating and the fan does not work.	Fan damaged.	Replace.
4.	Intermittent, wandering arc.	Work Clamp not connected directly to part being welded. Work Clamp worn/damaged	Reconnect. Replace. Reduce MIG torch height to under 3/8".
5.	Porosity of the Weld. Discolored weld color. Tungsten is discolored.	Low flow rate of shielding gas. High flow rate of shielding gas. Possible gas leaks internally or externally due to loose fittings. Base metal	Increase flow rate on regulator. Check for kinks in tubing. Increase post-flow time. Reduce stick-out to less than 1/4". Increase gas nozzle size. Clean metal thoroughly with approved metal cleaner, or
6.	Weld quality is poor. Weld is dirty/oxidized, or porous.	Drafty conditions. The welder is located on the workpiece and is blowing gas off due to fan activity. Solenoid is sticking. For Flux Core, a certain amount of spatter, haxe and smoke is common.	Eliminate drafts. Move welder. Check if there is sufficient shielding gas left in tank. Check gas flow. Adjust for higher flow of gas. Listen for audible click of gas solenoid. If no click is heard, then contact Everlast Support. Clean weld properly. Increase pre flow or post flow. Check polarity is correct for either MIG or Flux-Core, especially
7.	Unstable Arc. Spatter.	Bad work clamp connection. Metal is indirectly connected through table or other item. Incorrect settings	Change Work Clamp. Use a direct connection to the part being welded. Check and adjust settings. Spatter usually increases when smaller wires are at the maximum welding capacity.
8.	Continuous Overheating	Settings too high. Too large of wire for job. Fan not running.	Reduce Settings, use smaller wire Check fan, repair or replace if not running or running at low speed. If it is not running correctly (fan should run continuously) contact Everlast.
9.	Other.		Contact Everlast.

Troubleshooting

Common TIG Welding Issues

NO.	Trouble	Possible Cause	Solution
1.	Unit is switched on, but the power light isn't on.	Switch damaged. Service Breaker/ Input Line Damaged.	Check. Replace.
2.	After welding machine is overheating .	Duty Cycle Exceeded. Fan damaged and not running. Fan connector plus is loose. Temp Sensor damaged Unit is dirty	Do Not Turn off if fan is running. Allow to cool while running and unit should automatically reset. Allow to continue to cool for no less than 15 minutes after duty cycle is exceeded, even if the unit resets before this time. Replace. Check. Reinstall. Check operating temperature in background menu and check fan operation. Check and clean.
3.	When switch/pedal is pressed, no gas flows.	Empty Cylinder/ Closed Valve. Regulator Faulty/shut off. Solenoid Dirty/Stuck Shut. Damaged PCB.	Check. Replace/Open Valve. Check regulator and cylinder. Check. Clean or replace. (Contact Everlast Technical Support). Contact Everlast Technical Support.
4.	When switch/pedal is released gas continues to flow after Post-Flow cycle has timed out. May happen irregularly, or when unit is turned on.	Solenoid Dirty/Stuck. Excess moisture from Argon Cylinder.	Disassemble and clean, or replace. (Contact Everlast Technical Support). Install a dryer inline to remove moisture. Solenoid may need to be cleaned or replaced.
5.	Intermittent, wandering arc.	Work Clamp not connected directly to part being welded. Work Clamp worn/damaged. Torch height too high. Wrong Polarity	Reconnect. Replace. Reduce TIG torch height to under 1/8". Drag Welding Rod (Stick. Torch should be in negative for all TIG work. Stick should be positive.
6.	Arc will not start unless lift started.	HV/HF board is damaged or disconnected HV/HF settings are incorrect HV Start not selected.	Make sure unit is set to HF Start. Adjust Settings
7.	Tungsten is rapidly consumed.	Inadequate gas flow. Too small of tungsten. Wrong shielding gas. Using green tungsten. Wrong polarity. Possible contamination of shielding gas from gas supplier. Welder is too close to work.Fans are blowing gas.	Check gas flow. Check for Leaks thoughout system/regulator/tank. Check for 100% Argon. Use Lanthanated 2% or any other type besides Green (Pure) or Zirconiated. Put torch in Negative terminal. Move unit 6 to 8 ft away.
8.	Tungsten is contaminated, arc changes to a green color.	Tungsten is dipping into weld. Too long of stick-out. Tungsten is melting.	Check and adjust stick out to 1/8". Reduce stick-out to less than 1/4". Reduce amperage or increase tungsten size.
9.	Porosity of the Weld. Discolored weld color. Tungsten is discolored.	Low flow rate of shielding gas. High flow rate of shielding gas. Tungsten stick-out is too far. Too short of post flow period. Wrong TIG cup size. Possible gas leaks internally or externally due to loose fittings. Base metal is contaminated with dirt or grease.	Increase flow rate on regulator. Check for kinks in tubing. Increase post-flow time. Reduce stick-out to less than 1/4". Increase cup size, or use gas lens. Clean metal thoroughly with approved metal cleaner, or use acetone and a rag to clean metal.
10.	Weld quality is poor. Weld is dirty/oxidized, or porous.	Drafty conditions. The welder is located on the workpiece and is blowing gas off due to fan activity. Solenoid is sticking. Too short of pre-flow or post-flow.	Eliminate drafts. Move welder. Check if there is sufficient shielding gas left in tank. Check gas flow. Adjust for higher flow of gas. Listen for audible click of gas solenoid. If no click is heard, then contact Everlast Support. Clean weld properly. Increase pre flow or post flow.
11.	Unstable Arc.	Poorly ground or shaped tungsten. Bad work clamp connection. Metal is indirectly connected through table or other item.	Regrind to proper point. Wrong polarity. Place torch in DC negative (-). Connect work clamp directly to item being welded.
12.	Other.		Contact Everlast.

Troubleshooting

Common Welding Issues

NO.	Trouble	Possible Cause	Solution
1.	Unit is switched on, but the power light isn't on.	Switch damaged. Service Breaker/ Input Line Damaged.	Check. Replace.
2.	After welding machine is overheating .	Duty Cycle Exceeded. Fan damaged and not running. Fan connector plus is loose. Temp Sensor damaged Unit is dirty	Do Not Turn off if fan is running. Set fan to run continuously. Allow to cool while running and unit should automatically reset. Allow to continue to cool for no less than 15 minutes after duty cycle is exceeded, even if the unit resets before this time. Replace. Check. Reinstall. Check operating temperature in background menu and check fan operation. Check and clean.
3.	Intermittent, wandering arc.	Work Clamp not connected directly to part being welded. Work Clamp worn/damaged. Torch height too high. Wrong Polarity	Reconnect. Replace. Stick should be positive.
4.	Arc will not start easily	Wet Welding Rods Low Hot Start Settings VRD is on	Use fresh clean welding rods Increase hot start percent and time. Turn VRD off
5.	Porosity of the Weld. Discolored weld color.	Too long of arc length. Amperage set too high.	Reduce arc length. Reduce amperage.
6.	Weld quality is poor.	Dirty metal. Too much or too little amperage.	Clean metal. Readjust amperage.
7.	Arc goes out while welding	Arc Length too long. Wrong rod selection on machine screen. Poor quality rods or wet rods. Arc length too short with anti-stick turned on.	Shorten arc length and increase arc force. Make sure correct rod is chosen. Use fresh, high quality rods. Turn off anti-stick.
8.	Unstable Arc.	Arc length is too long Metal is indirectly connected through table or other item.	Shorten arc length and increase arc force. Connect work clamp directly to item being welded.
9.	Other.		Contact Everlast.

Troubleshooting

Error Codes

TROUBLE CODE WITH WARNING LIGHT/UNIT STOPS WELDING BUT IS TURNED ON.	DIAGNOSIS
E01	OVER TEMPERATURE/ DUTY CYCLE EXCEEDED. Allow unit to rest for 15 minutes while running. The unit should reset. If it does not or condition reoccurs, check for obstacles near unit blocking cooling. Then clean unit internals paying close attention to boards and heat sinks. Make sure unit is unplugged for 10 minutes before opening up for cleaning. Check for proper fan operation.
E02	OVER OR UNDER CURRENT. Check power input cable for length/size, check input voltage. Running on poor quality power supply or dirty power from generator. Possible Internal Issue.
E05	TORCH SWITCH IS STUCK CLOSED. This simply means that the arc has been trying to start and for too long. If this does not clear after releasing the switch, turn off unit immediately and check torch switch for stuck contact. If the pilot arc or HF Start is engaged without attempting to cut or weld for more than 3 seconds this will activate.
OTHER	CONTACT EVERLAST

Maintenance

What is the Lightning's Maintenance Schedule ?

This unit uses a HV electronic device to simulate an HF start. There are no points to maintain or point gaps to adjust.

However, every 3 to 4 months (or more depending upon use level), the unit should be opened up for inspection and cleaning. Use compressed dry air to blow out dust. Take care to remove any metal dust or other buildup from fan blades and vents. Take time to check the seating of all connectors and accessible wires. *Opening the unit up for cleaning does not void the warranty, but rather preserves it. Neglected cleaning can lead to failures of boards and components. Cleaning is a necessary component of operation to maximizing service life and maintaining warranty.* Warranty claims submitted that are a result of neglect or abuse may not be covered under warranty.

CAUTION! *Use Safety glasses and protective equipment when using compressed air or attempting to service this equipment!*

To Access and Clean the Unit:

1. Unplug unit for 10 minutes before starting to allow capacitors to discharge.
2. Remove front, middle and rear handle screws. (If handles are not installed, remove top bezel screws on front and rear. Remove any top mounted screws used in lieu of handles.
3. Remove handles.
4. Remove rear plastic bezel screws. Be sure to remove the screws located on the bottom of the bezel.
5. Remove rear bezel. Do not attempt to remove underlying metal case end. The case end is a structural part of the frame.
6. Remove the main green cover screws.
7. Insert fingers under bottom edge of the cover, near the rear of the cover. Gently spread the cover about 1 inch.
8. Slide the main cover to the rear and up carefully to clear any wires or obstructions.
9. When the cover has been removed, use dry compressed air to gently blow off boards and connectors.
10. Check to make sure all connectors are clean and fully seated. Make sure no wires have been unseated from the connectors themselves.
11. Clean bezel vents and fan blades. Fan blades accumulate build-up which can cause reduced cooling efficiency, vibration and eventually failure.
12. Once cleaned, reassemble unit in reverse order.

IMPORTANT: *Never remove the front cover or upper operator's panel unless instructed by Everlast.*