Owner's Manual

MIG 200i

MTS 210

Pro Pulse 220 MTS

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Foreword

Thank you for purchasing a new HTP® Inverter MIG welder. This manual covers the HTP MIG 200i, the HTP MTS 210, and the HTP Pro Pulse™ 220 MTS. All three welders feature HTP's advanced one knob Synergic Control. The MIG 200i is an analog, full synergic welder with an Easy Set feature. The MTS 210 is an advanced, multi-process, full synergic welder with a digital LCD. The Pro Pulse 220 MTS is our advanced, multi-process, full synergic, pulse MIG welder. The Pro Pulse 220 MTS produces high quality, virtually spatter free welds on all common metals when you use the correct gas and consumables for your welding application. By following the instructions closely, you can achieve success when welding with the Pro Pulse 220 MTS, even when welding aluminum where the margin of error is very small (when welding aluminum, almost everything must work out just right in order to achieve good results). This does not mean that a novice welder will not be able to perform aluminum welds successfully with the Pro Pulse 220 MTS. No matter your skill level, the more knowledge you have about the operation of your HTP welder and the specific welding processes, the more likely you are to produce professional results. HTP provides this manual and some videos to familiarize and help you weld successfully with your new HTP welder.

Customers interested in the Pro Pulse 220 MTS often ask us the following questions: *If I buy the Pro Pulse 220 MTS, will I be able to weld aluminum right out of the box?* and *Why do some customers find welding with the Pro Pulse 220 MTS difficult? Why do some customers, including customers with decades of regular MIG welding experience, struggle when welding with the Pro Pulse 220 MTS, even after reading the entire manual twice and watching several videos?* First, many of our customers successfully weld aluminum with the Pro Pulse 220 MTS within hours, not days. Second, experienced welders struggle when welding with the Pro Pulse 220 MTS for multiple reasons, including the following:

- *Muscle Memory*. Operators who typically MIG weld steel are accustomed to holding the gun close to the work piece, and the frying bacon sound the machine makes when welding. Operators may be thrown off by the sound the Pro Pulse 220 MTS makes when welding, and muscle memory causes the operator to keep the gun too close to the work piece when welding aluminum, which requires a 3/4" to 1" CTWD (contact tip to work distance).

- *Old Habits and Frugalness*. For aluminum welding (all spray arc transfer and pulse), your gas flow rate must be significantly higher than for classic MIG welding (steel). Flow rates must be set between 35 and 50 CFH. We also see operators running economy Asian import wire or random wound wire. For aluminum welding, where everything must be just right, a bad roll of wire can make a bad day in aluminum welding. We recommend using a high-quality wire. Currently, HTP sells Alcotec wire, which is a premium quality, precision wound wire that is made in the U.S.A. We found that Alcotec wire works best with the Pro Pulse 220 MTS. We do not recommend using 1 lb., 4" diameter spools.

- *Unrealistic Expectations*. No matter what, MIG welds will never look identical to TIG welds. Although, when the settings on your machine and the movement of your hand are in perfect harmony in a double pulse program, they can come pretty close.

  Also, when everything works right, welding aluminum is a lot like welding steel, though there are a few differences—from the gas, to the MIG welding gun, to the consumables, to consumable use. When welding aluminum, even a skilled welder may go through a few contact tips before finishing a roll of wire; unlike when welding steel, where some operators can weld an entire 30 lb., 12" diameter spool of wire with one tip. Aluminum requires more contact tips because it is welded in spray transfer, where it is more likely to burn back into the tip because of high heat. As a novice welder, you may go through five to ten contact tips in the first few hours or the first day.

  Birds nesting is not an issue with the Pro Pulse 220 MTS. However, burn back may occur and must be addressed immediately—failure to do so will result in EXCESSIVE tip usage! When burn back occurs, the damaged tip becomes useless and must be replaced. Furthermore, run about 10' of wire through your MIG gun to discard any wire damaged by slipping in the drive roll (which occurs due to burn back into the contact tip).

- *Material Thickness Rating Displayed in the Machine*. We designed this feature to give you an idea about settings (wire speed and voltage). The ratings displayed, generally speaking, are designed for straight line, push or pull (depending on the application) welds, made at a rather fast travel speed (to reduce heat input and distortion) and without any gun manipulation (no weaving, swirly motion, etc.). However, depending on the joint configuration (butt, lap, or t-joint) and on the welding position (flat, horizontal, vertical up or down, and overhead), ***you need to adjust the synergic settings accordingly***.

Now, with a better understanding of what you will experience when welding with the Pro Pulse 220 MTS, read the rest of the manual and watch the accompanying videos for a more thorough explanation of the machines' features.

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Manufacturer's Warranty

It is expressly agreed that there are no warranties, expressed or implied, made by either the Salesman, Dealer, or HTP America, Inc. on products or parts furnished hereunder, except the Manufacturer's Warranty against defective materials or workmanship as follows:

HTP America, Inc. warrants each new welding machine to be free from defects in material and workmanship under normal use and service for Three (3) Years after delivery to the original purchaser. HTP America, Inc. will repair and replace, at its factory, any part or parts thereof. Products should be returned to HTP America, Inc., with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective. This warranty being in lieu of all other warranties, expressed or implied, and all other obligations or liabilities on its part and it neither assumes nor authorizes any person to assume for it any liability in connection with the sale of its machines.

This warranty shall not apply to any welding machine which has been repaired or altered by unauthorized service departments in any way so as, in the judgment of HTP America, Inc., to affect its stability and reliability, nor which has been subjected to misuse, negligence, or accident.

HTP America, Inc. shall not be liable in any event, unless HTP America, Inc. receives notice of alleged breach of warranty, actual or constructed, specifying the claimed defect within not more than Thirty (30) Days after discovery.

HTP America, Inc. has reserved the right to make changes in design or add any improvements to its products, at any time, without incurring any obligation to install the same on equipment.

This warranty is void unless warranty card is sent to HTP America, Inc. within Fifteen (15) Business Days from the date of purchase.

Exclusions to Warranty:

1. The MIG Welding Gun is warrantied for a period of Ninety (90) Days against defects in material and workmanship.
2. The contact tips, tip holders, gas diffusers, gas nozzles, and liner are consumable items, WHICH CARRY NO WARRANTY.

Note: This warranty is to the original purchaser only. The warranty can be transferred to another owner, with HTP's approval, for a warranty transfer fee. HTP America, Inc. must be notified within Fourteen (14) days of the sale and must be provided with the contact information of the original owner, the contact information of the new owner, and the serial number of the machine.

Safety Suggestions

It is forbidden for people with PACEMAKERS to use or come near the machine.

Electric arc welding produces ultra-violet rays, which are harmful to skin and eyes. Ultra-violet radiation can penetrate lightweight clothing, reflect from light-colored surfaces, and burn the skin and eyes.

- Wear a heavy, pocket-less, long-sleeved shirt, cuff-less trousers, and high-topped work shoes.
- Wear a full-faced welding helmet with a number ten or darker shade and a cap.

Electric arc welding produces flying sparks and hot material, which can cause fire.

- To avoid fire, do not weld on wood, plastic tile, or carpeted floors. Concrete or masonry floors are safest.
- Do not weld on pressurized containers.
- Do not weld on drums, barrels, tanks, or other containers until they have been cleared and cleaned as described in AWS Standard A6.01.
- Do not wear flammable materials.
- Wear non-oily/non-greasy, flameproof welding gloves; any oil or grease on gloves may ignite.
- Avoid having any type of fuel, such as cigarette lighters or matches, on your person as you weld.
- Ensure that there is a fire extinguisher in the welding area.

Noise can damage your hearing. Protect yourself suitably to avoid hearing damage.

The welding arc can cause burns. Keep the tip of the welding gun/torch far from your body and from other persons.

Electric arc welding produces toxic fumes.

- Provide adequate ventilation in the welding area at all times.
- Do not weld on galvanized zinc, cadmium, or lead beryllium materials unless you are POSITIVE that sufficient ventilation is provided. These materials produce toxic fumes.
- Do not weld in areas close to degreasing or spraying operations. Chlorinated hydrocarbon vapors may react with the ultra-violet rays and form highly toxic phosphate gas.
- If you develop momentary eye, nose, or throat irritation during welding, stop welding immediately. This is an indication that ventilation is not adequate. Do not continue to weld until ventilation is improved.

ELECTRIC SHOCK CAN KILL.

Exposed, electrically hot conductors, other bare metal in the welding circuit, or ungrounded, electrically hot equipment can fatally shock a person whose body becomes a conductor. Do not stand, sit, lie, lean on, or touch a wet surface when welding.

- Disconnect the power supply before working on the welding machine.
- Do not work with deteriorated or damaged cables.
- Frequently inspect cables for wear, cracks, and damage. Replace those with excessively worn insulation to avoid a possible lethal shock from bare cable.
- Do not touch bare electrical parts.
- Ensure that all of the panels covering the welding machine are firmly secured in place when the machine is connected to the power supply.
- Insulate yourself from the workbench and from the floor (ground); use insulating footwear and gloves.
- Keep gloves, footwear, clothes, the work area, and the welding equipment clean and dry.
- Check the machine power cable frequently; the power cable must be free from damage to the insulation. BARE CABLES ARE DANGEROUS. Do not use the machine if the power cable is damaged; a damaged power cable must be replaced immediately.
- If it is necessary to open the machine, first disconnect the power supply. Wait Five (5) Minutes to allow the capacitors to discharge. Failure to take this precaution may expose you to the dangerous risk of electric shock.

For more information, refer to the following standards and comply as applicable.

1. ANSI Standard Z49.1 SAFETY IN WELDING AND CUTTING, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
2. ANSI Standard Z87.1 SAFE PRACTICE FOR OCCUPATIONAL AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
3. AWS Standard A6.0 WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from the American Welding Society, 2051 NW 7th St., Miami, FL 33125.
4. NFPA Standard 51 OXYGEN-FUEL GAS SYSTEMS FOR WELDING AND CUTTING, obtainable from the National Fire Protection Association, 470 Atlantic Ave., Boston, MA 02210.
5. NFPA Standard 51B CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, 470 Atlantic Ave., Boston, MA 02210.
6. CGA Pamphlet P-1 SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 500 Fifth Ave., New York, NY 10036.
7. OSHA Standard 29 CFR, Part 1910, Subpart Q WELDING, CUTTING, AND BRAZING.

Fig. 1

MIG 200i Specifications

Maximum Output Amperage	200A
Minimum Output Amperage	20A
Maximum Recommended Thickness	1/4”
Duty Cycle	20% @ 180A (104º F) 60% @ 110A (104º F) 100% @ 90A (104º F)
Arc Voltage	13 to 35V
Open Circuit Voltage	85V
Cooling	Fan
Wire Size	.023” to .035”
Input Voltage	208 to 240V
Input Amperage	34A
Frequency	50/60Hz
Wire Feed Rate (In./Min.)	55 to 630 IPM
Size Length Width Height	 19-3/4” 10” 14-1/2”
Weight	39 Lbs.

Lifting

Weight:
Power Source Alone: 39 Lbs.
Power Source + 11 Lb. Spool of Wire: 50 Lbs.
Power Source + 33 Lb. Spool of Wire: 72 Lbs.

Lifting by Hand: You may lift the power source with or without an 11 Lb. spool of wire installed.

ATTENTION! Do not lift the power source with a 33 Lb. spool of wire installed. Remove the 33 Lb. spool of wire before lifting the power source.

MTS 210 & Pro Pulse 220 MTS Specifications

Maximum Output Amperage	200A (220A for 10 seconds on the Pro Pulse 220 MTS only)
Minimum Output Amperage	MIG: 12A TIG & Stick: 4A
Maximum Recommended Thickness *Single pass capacity varies depending on the material being welded and the setting of the machine.	1/4” to 3/8”
Duty-Cycle	35% @ 200A (77º F) 100% @ 140A (77º F) 25% @ 200A (104º F) 60% @ 140A (104º F) 100% @ 120A (104º F)
Open Circuit Voltage	75V
Electronic Overload Protection	Yes
Cooling (On-demand, electric fan, variable speed)	Air
Wire Spool Capacity *Up to a 44 Lb. weight capacity; 8” spools recommended for Double Pulse aluminum welding.	8” & 12”
Wire Diameter *Depends on the material being welded (not all wire can be welded in all sizes.	.023” to .045”
Input Voltage	208 to 240V
Input Amperage	MIG & TIG: 35A Stick: 40A
Frequency	50/60 Hz
Wire Feed Rate (In./Min.)	55 to 630 IPM
Size Length Width Height	 19-3/4” 10” 14-1/2”
Weight *Without wire and cables.	42 Lbs.

Electrical Connection

MIG 200i

Your MIG 200i operates on single-phase, 230V power (208V-240V). The machine draws 34 amps out of the wall when operating at a welding output of 200 amps. If you operate the machine on a generator, it needs to be a clean power generator with a minimum of 8500 watts (8500 watts must be the continuous rating or running watts rating of the generator, NOT the peak rating or starting watts rating of the generator).

MTS 210 & Pro Pulse 220 MTS

Your MTS 210 or Pro Pulse 220 MTS operates on single-phase, 230V power (208V-240V). The machine draws 35 amps out of the wall when operating at a MIG or TIG welding output of 200 amps. 200 amps of Stick welding output requires 40 amps of 230V input. If you operate the machine on a generator, it needs to be a clean power generator with a minimum of 8500 watts (8500 watts must be the continuous rating or running watts rating of the generator, NOT the peak rating or starting watts rating of the generator) for MIG or TIG operation. Stick operation requires a 10,000 watt generator. If you operate the machine in MIG or TIG on an extension cord, the wire size of the cord needs to be at least 10AWG and should not exceed a length of 100'.

General Characteristics

HTP inverter MIG welders, which feature electronic adjustments controlled by a microprocessor, allow you to achieve excellent welding quality thanks to the advanced technologies applied. The microprocessor circuit controls and optimizes arc transfer irrespective of the load variation and impedance of the welding cables. The inverter technology used in our welding machines enabled us to achieve the following:

- Compact, lightweight welders
- Reduced energy consumption
- Excellent dynamic response
- Very high power factor and yields
- Better welding characteristics

The sensitive electronic components used in our inverter MIG welders are cooled with forced air by fans with low noise production, and our inverter welders also feature sophisticated, electronic overheat protection to prevent damage to your machine.

MIG 200i

The MIG 200i is a synergic welding machine that features an incredible arc dynamic, which makes the MIG 200i suitable for any kind of wire and for any material thickness from 26 gauge up to 1/4". With the MIG 200i, you can weld in manual mode or in synergic mode with Easy Set™ technology. The Easy Set feature makes set up a breeze by automatically setting your welder, in a couple of simple steps, to the correct parameters. A simple polarity reversal allows you to weld with gas (solid wire) or without gas (flux-cored wire). The MIG 200i also features manual wire feed ("jog"), manual gas purge, and start speed adjustment.

NOTE: The HTP MIG 200i is not suitable for thawing pipes.

The MIG 200i package includes:

1) HTP MIG 200i Power Source
2) 10' 15 Series MIG Welding Gun
3) 10' Ground Clamp and Cable Assembly
4) Flowmeter
5) 6' Gas Hose
6) Owner's Manual

MTS 210 & Pro Pulse 220 MTS

The MTS 210 operates the same way as the Pro Pulse 220 MTS. The only difference between the two machines is that the MTS 210 does not offer any of the pulse programs found in the Pro Pulse 220 MTS. You can upgrade the MTS 210 to a Pro Pulse 220 MTS by adding the pulse module to the front panel logic board later for a fee.

The MTS 210 and the Pro Pulse 220 MTS are synergic welding machines.

The key feature of a synergic welding machine is the ease of set up. In the past, you needed charts from wire manufacturers to determine wire speed and voltage, as well as CTWD (contact tip to work distance) of different welding applications, which ultimately determined the arc length and also indicated which shielding gas to use. With the MTS 210 and the Pro Pulse 220 MTS, this information is preprogrammed and displayed to you. Both machines feature an LCD that allows you to select a synergic program for a specific wire, such as steel, aluminum, stainless steel (available on the Pro Pulse 220 MTS only), silicon bronze, etc. Once you select a program, the machine tells you which gas to use and then allows you to select the thickness of the material being welded. After selecting the synergic program and the material thickness, the machine automatically sets the correct wire feed speed (in inches per minute, or IPM) and the matching voltage to achieve the best welding results. Of course, since you will encounter atypical situations, especially during repairs on used or dirty material, the machine gives you the option to adjust the settings either colder or hotter by reducing or increasing the voltage.

The MTS 210 and the Pro Pulse 220 MTS also offer an ST-arc function. The ST-arc function reads welding parameters back to the welding machine live (while welding). The ST-arc function monitors and maintains the arc length, while allowing the stick-out (CTWD) to vary. ST-arc allows the new welder to focus on the location of the weld, as well as the travel speed, while allowing the experienced welder to keep a perfectly uniform weld bead and uniform heat input. This enables the welder to achieve good welds in tight corners—a feat that couldn't previously be achieved with conventional welding equipment.

What is pulsed process MIG welding?

Pulsed process welding is a form of welding that happens in spray arc transfer, while classic MIG welding is done in short arc, or short circuit, transfer and sounds somewhat like frying bacon. Spray arc welding is a lot hotter, has excellent penetration, and is typically very quiet (mostly a quiet hissing with an occasional crackle). This form of welding is so hot that it typically can only be used in flat position or horizontal position. Pulse gives you the option to run the process out of position while retaining the same desirable characteristics of deep penetration—a virtually spatter-free, leak tight weld with excellent bead appearance—but does so while enabling you to join materials of different thicknesses at increased travel speed, all while lowering the heat input and distortion.

Pulsed process MIG welding is different than pulsed TIG welding. In the MIG process, filler material has to be added constantly to maintain the welding arc, and this sets the ground rules for the pulse function. When pulsing with TIG, you have the ability to adjust peak current, background current, pulse ON time, and pulse frequency. When using pulsed process MIG, on the other hand, you typically only have the choice of pulse ON or pulse OFF. However, the Pro Pulse 220 MTS offers peak pulse (in some programs, under certain conditions, and up to 300 amps), pulse ON time, as well as background current—all preprogrammed, according to scientific studies for best results, at the factory. The pulse frequency adjusts with the wire speed; slower wire speeds have a lower frequency, while higher wire speeds have a higher frequency. This is essential for consistency; the size of the molten (spray) droplet is the same size no matter if you are welding very thin material (slow wire feed speeds) or very thick material (high wire feed speeds).

Because of the pulse frequency, electronic interference may occur. For this reason, **it is forbidden for people with PACEMAKERS to use or come near the machine.** During the research and development process at HTP, we found that some brands/models of auto-darkening welding helmets experience interference issues with the Pro Pulse 220 MTS. Since the frequency changes according to wire speed, we noticed that a wire speed adjustment of +/-20 IPM typically alleviates the issues. We also noticed that video cameras or security cameras within close proximity to the Pro Pulse 220 MTS, when welding in a pulse program, show the interference in the recorded picture.

Although the spray arc itself is almost silent (just a slight hiss), the sound of the pulse is well noticeable. It sounds, at times, much like an AC TIG welder. If you are used to the classic MIG frying bacon sound, getting used to the sound of the Pro Pulse 220 MTS will take a little time.

Welding guns compatible with the MTS 210 and the Pro Pulse 220 MTS include:

HTP 15 Series MIG Welding Gun
HTP 24 Series MIG Welding Gun
HTP 26 Series MIG Welding Gun
HTP RSG 250 PP220 Air-Cooled Spool Gun
HTP PPAC 6M 0.9 Air-Cooled Push/Pull Gun

Below, we discuss the capabilities and limitations of each of these guns.

HTP 15 Series MIG Welding Gun—The smallest of the guns. Has a 60% duty-cycle at 180 amps. Excellent for reaching into tight spaces (e.g., work on cars). Also, lightweight for less operator fatigue. Best for welding steel in short circuit metal transfer. Not suitable for pulse welding steel, and limited potential for pulse welding silicon bronze in the collision repair industry. Although we also sell the gun in 12' and 15' lengths, only the 10' gun should be used when welding .023" diameter wire, and even larger diameter wires will most likely NOT give you a trouble-free welding experience. We recommend using a maximum gun length of 10'. If you require a longer gun, either upgrade to a push/pull system or to the Pro Pulse 300, which features a different wire feed system.

HTP 24 Series MIG Welding Gun—Slightly larger than the 15 Series MIG Welding Gun. Has a 60% duty-cycle at 240 amps. Still lightweight and fits into most small spaces. For pulse welding, we recommend a maximum gun length of 10'. Although we also sell the gun in 12' and 15' lengths, only the 10' gun should be used when welding .023" diameter wire, and even larger diameter wires will most likely NOT give you a trouble-free welding experience. If you require a longer gun, either upgrade to a push/pull system or to the Pro Pulse 300, which features a different wire feed system. For any kind of pulse welding, long-life tips should be used. Failure to do so will result in premature tip wear, poor weld quality, burn backs, birds nesting, and other problems. The 24 Series MIG Welding Gun can be used for:

- Steel (all diameters and thicknesses; both pulse and non-pulse)
- Flux-cored (all thicknesses; with or without gas)
- Stainless Steel and Silicon Bronze (all thicknesses)

HTP 26 Series MIG Welding Gun—Noticeably larger than the 24 Series MIG Welding Gun with a thicker torch cable (the thicker torch cable helps the operator keep the gun straight, which is especially important when welding aluminum). Has a 60% duty cycle at 260 amps. Comes in an 8' length with M8 size long-life contact tips. The 26 Series MIG Welding Gun can be used for:

- Aluminum (EVERY wire diameter from .030" to .047" (3/64"); EVERY alloy (4043, 5356, and 5554 namely))

The 26 Series MIG welding gun can also be used for:

- Steel (all diameters and thicknesses; both pulse and non-pulse)
- Flux-cored (all thicknesses; with and without gas)
- Stainless Steel and Silicon Bronze (all thicknesses)

In doing so, modifications to the gun must be made (a different liner must be installed). A modification like this may be a good choice if you require an extra heavy-duty welding gun for high heat situations and the 24 Series MIG welding gun does not provide sufficient performance.

HTP RSG 250 PP220 Air-Cooled Spool Gun—If you need some extra distance between yourself and your welding machine (beyond the reach of the HTP 8' 26 Series MIG Welding Gun for Aluminum), or if you cannot avoid flexibility and tight turns of the connecting cable, a spool gun might be the right tool for the job. In the past, welders considered spool guns more of a crutch than an actual tool made for professionals. Why? Because, in the past, you could only adjust the wire feed speed on the spool gun and not the voltage. A voltage adjustment required you to stop welding, climb off the trailer, or crawl out from under the truck (essentially leave whatever you were welding), walk back to the welding machine, adjust your voltage, walk back to what you were welding, climb back in place, and resume welding. With the HTP RSG 250 spool gun, all of the above mentioned time-consuming movement is now a thing of the past! With our USA-Made, state-of-the-art spool gun, we put all the adjustments right at your fingertips to access while welding; with the HTP RSG 250 PP220 air-cooled spool gun, simply adjust your settings where you are and while you are welding! Hot start? Slope down? Hotter? Colder? No problem! You want to do that in regular spray arc MIG? Single pulse? Double pulse? No problem either. Our spool gun does what the competition only dreams about...all a reality here at HTP! Available in a 25' length.

HTP PPAC 6M 0.9 Air-Cooled Push/Pull Gun—Push/pull guns come in handy when your job requires a lot of welding and you don't want to constantly change 1 Lb. aluminum rolls of wire in a spool gun. This is exactly what our engineers considered when they designed the Pro Pulse 220 MTS. For maximum versatility, we designed the Pro Pulse 220 MTS to accept push/pull systems. HTP offers an 18' air-cooled push/pull gun, with remote control capabilities, that plugs directly into the front of your Pro Pulse 220 MTS. And because we have quality in mind on everything we do, our push/pull system is like the rest of our products: nothing short of excellent. Made in Germany.

Remote Control Options for ALL MIG Guns

Remote control options when MIG welding give you the option to set Hot Start, Slope Down (crater fill options), as well as match the "heat" (output level of the welder; i.e., wire speed and voltage) when welding out-of-position or when welding with poor fit up. A remote control allows you to do this with only one finger, all at the same time, and while welding. Other welding machines require you to stop welding, make adjustments on the machine, and then start welding again. Stops and restarts create potential leak and stress points; stress cracks typically originate from a stop or a restart of the weld. We offer sliding remote controls for your 8' or 10' MIG gun. Available as an add-on at any time.

MIG 200i Front Panel Controls

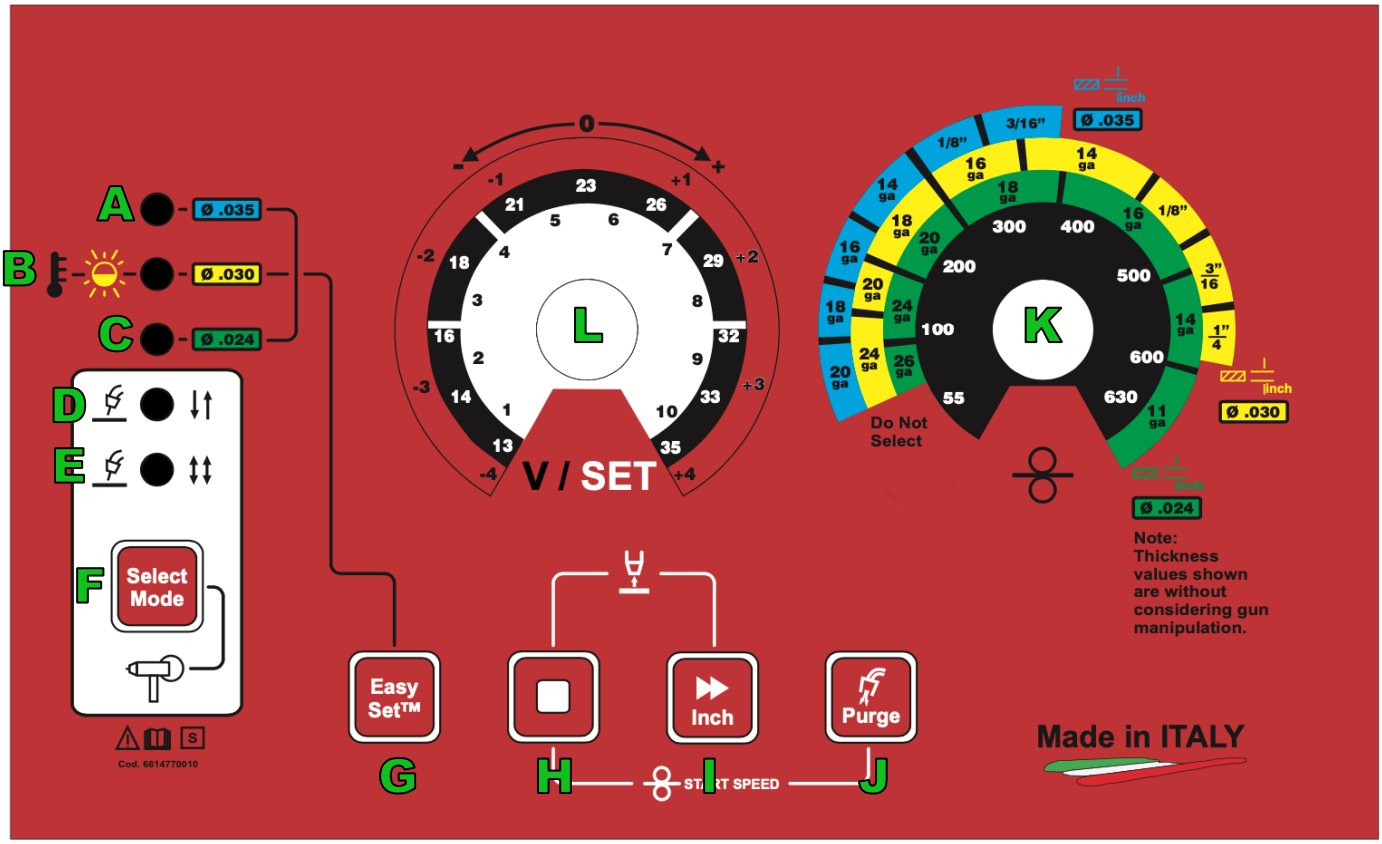


Fig. 2

A) Synergic Mode LED for .035” Welding Wire

B) Synergic Mode LED for .030” Welding Wire/Over-Heat Alarm LED

C) Synergic Mode LED for .023”/.024”/.025” Welding Wire

D) MIG 2T LED

E) MIG 4T LED

F) Select Mode Button

G) Easy Set™ Button (Synergic Mode Button)

H) Advanced Settings “SET” Button

I) Manual Wire Feed Button

J) Manual Gas Purge Button

K) Wire Speed/Material Thickness (for Synergic Welding Mode) Knob

L) V/SET Knob

MIG 200i Front Panel Connections

Fig. 3

Position	Connection
A	MIG Gun Receptacle
B	Polarity Cable
C	Positive (+) Output Receptacle
D	Negative (-) Output Receptacle

MIG 200i

MIG Welding with Gas

To weld with gas, the MIG welding gun must be set to Positive (+) polarity, and the ground cable must be set to Negative (-) polarity. Please proceed as follows:

1) Connect the MIG welding gun to the **MIG Gun Receptacle** (**Fig. 3**, **A**).
2) Connect the **Polarity Cable** (**Fig. 3**, **B**) to the **Positive (+) Output Receptacle** (**Fig. 3**, **C**).
3) Connect the ground cable to the **Negative (-) Output Receptacle** (**Fig. 3**, **D**).
4) Next, connect one end of the gas hose to the coupling on the rear panel of the machine and the other end of the gas hose to the flowmeter or regulator connected to your gas bottle.

After making all of the above connections, load the wire into the machine.

Insert the wire into the wire feeder; feed the wire into the groove on the bottom drive roll and close the pressure roller.

NOTE: The drive roll has two grooves. To choose the desired groove size, simply flip the drive roll.

When changing the size (diameter) of the wire, you must also change the drive roll and the contact tip to match the new wire size (diameter).

The contact tip is the little copper tip, with a hole in it, that screws into the end of the welding gun. The wire exits the hole in the tip, and the tip transfers all of the welding current into the welding wire.

TIP: Remove the nozzle and the contact tip, and also hold the gun as straight as possible, to more easily feed the wire through the welding gun lead.

Insert the power plug into a suitable power receptacle, switch the machine on by turning the line switch to the **ON** position, and press the **Manual Wire Feed Button** (**Fig. 2**, **I**) to feed the wire through the gun lead/cable assembly.

Reinstall the contact tip and the nozzle, and then adjust the pressure of the wire feeder (for steel wire, set the pressure to approximately 2 or 3).

MIG Welding in Manual Mode

1) With the **Select Mode Button** (**Fig. 2**, **F**), select either MIG 2T or MIG 4T. In MIG 2T, depressing the trigger starts the wire feed motor and applies current to the welding wire. Releasing the trigger stops the wire feed motor and extinguishes the arc. In MIG 4T, depressing the trigger starts pre-gas flow, releasing the trigger starts the wire feed motor and applies current to the welding wire, depressing the trigger again stops the wire feed motor and extinguishes the arc, and releasing the trigger again starts post-gas flow. Essentially, using MIG 4T allows you to weld without having to keep the trigger depressed, like a trigger lock on a drill.
2) Press the **Easy Set Button** (**Fig. 2**, **G**) repeatedly until all of the Wire Selection LEDs turn off.
3) Regulate the welding voltage using the **V/SET Knob** (**Fig. 2**, **L**). Welding voltage is the black scale that goes from 13 to 35.
4) Regulate the wire speed using the **Wire Speed Knob** (**Fig. 2**, **K**). The wire feed is the black scale that goes from 55 to 630 IPM.
5) Begin welding.

MIG Welding in Synergic Mode

1) Press the **Easy Set Button** (**Fig. 2**, **G**) to select an appropriate wire diameter (indicated by LEDs; **Fig. 2**, **A** for .035" wire, **Fig. 2**, **B** for .030" wire, **Fig. 2**, **C** for .023"/.024"/.025" wire). If all of the LEDs are turned off, the machine is in manual mode.
2) Select the thickness of the material to be welded using the **Wire Speed Knob** (**Fig. 2**, **K**; the scale of color corresponds to the selected wire diameter: blue for .035" wire, yellow for .030" wire, and green for .023"/.024"/.025" wire).
3) If you would like to fine tune the synergic setting, use the **V/SET Knob** (**Fig. 2**, **L**) to adjust the welding voltage (-4V, +4V; red scale) to your liking. The default position is 0, at the center of the scale.

MIG Welding without Gas

To use flux-cored wire, which allows welding without the use of gas, the MIG welding gun must be set to Negative (-) polarity and the ground cable must be set to Positive (+) polarity. Please proceed as follows:

1) Connect the MIG welding gun to the **MIG Gun Receptacle** (**Fig. 3**, **A**).
2) Connect the **Polarity Cable** (**Fig. 3**, **B**) to the **Negative (-) Output Receptacle** (**Fig. 3**, **D**).
3) Connect the ground cable to the **Positive (+) Output Receptacle** (**Fig. 3**, **C**).
4) Follow the rest of the instructions laid out in **MIG Welding with Gas** from above.

Advanced Settings “SET”

While post-flow time is fixed at 0.5 seconds and start time is fixed at 0.3 seconds, you can adjust the start speed from 10 to 100% (the default start speed value is 80%). You can also adjust burn back from 0 to 10. The burn back setting adjusts the amount of time you apply current to the welding wire after the wire feed motor has stopped. A burn back setting of 0 (current stops immediately) provides the most stick out, while a burn back setting of 10 (current is on the longest) provides the least stick out. Depending on the wire type and diameter, a higher burn back setting may cause the wire to burn back into the contact tip, damaging it. To adjust the start speed or burn back parameters, follow these instructions:

1) Turn the **V/SET Knob** (**Fig. 2**, **L**) to the desired position (use the white scale, numbered 1-10).
2) Hold down the buttons corresponding to the setting you want to change for about 5 to 6 seconds (**Fig. 2**, **H** and **I** for burn back, and **Fig. 2**, **H** and **J** for start speed) until you hear a triple beep.

At this point, the setting is stored, and you can proceed as usual.

NOTE: To reset the default value of the start speed or burn back parameters, hold down buttons G and H (Fig. 2) until you hear a continuous beep after three (3) shorter beeps.

NOTE: The HTP MIG 200i does not feature a TIG or Stick welding mode.

Overcurrent Protection

If the welding current is more than 200 amps, the MIG 200i automatically reduces the wire speed and the welding parameters. In this case, the **Overheat Alarm LED** (**Fig. 2**, **B**) blinks until the operator sets the welding parameters lower than those that activated the MIG 200i’s overcurrent protection.

MTS 210 & Pro Pulse 220 MTS Front Panel Controls

Fig. 4

A (Select Mode Button)—Allows you to access different welding modes by pressing repeatedly.

B, C, D, E (Setup and Selection Buttons)—The function of these buttons differs depending on which mode the machine is in and what setup screen the machine is on. The function of the individual button is shown in the display right above each button.

F (Upper Encoder)—Turning the upper encoder in manual mode adjusts the wire feed speed, while turning the upper encoder in all synergic and pulse programs adjusts the material thickness, wire feed speed, amperage, and voltage. (This can also be done while welding).

G (Lower Encoder)—Turning the lower encoder in manual mode sets the voltage, while turning the lower encoder in all synergic and pulse programs adjusts the voltage of the synergic curve but does not set an absolute arc voltage as it does in manual mode. (This can also be done while welding). If the machine is in a setup menu screen, you may use the lower encoder to scroll through lists and adjust other parameters.

How to Weld (Express)

1. Press and release button **A** (Select Mode) as often as required to set the desired mode (MIG 2T is probably the most popular).
2. Press and release button **B** once to enter program selection. Use encoder **G** to scroll through the program list and find the program you need. Push and release button **C** to select the program, and use encoder **F** to set the desired material thickness. **Note:** If button **B** is pressed twice within a short time, the machine will go into manual mode. In the manual mode, simply use encoder **F** to set the wire feed speed and encoder **G** to set the arc voltage.
3. Pull the trigger and weld.

The Programs—Overview

The MTS 210 offers 9 synergic programs, all without pulse, and a manual mode, while the Pro Pulse 220 MTS offers 22 synergic programs, both with and without pulse, and a manual mode. The manual mode operates just like a classic MIG machine with wire speed adjustment in IPM (from 55 to 630) and voltage adjustment (from 13.0 to 35.0). Manual mode can be used for wire types not included in the synergic programs list (e.g., cast iron wire or hard surfacing wire). Please obtain the correct settings from your wire distributor or manufacturer.

The synergic, non-pulse programs sound very similar to classic MIG welding. These programs offer inductance adjustments, which make the arc crisp or soft. On inverter-based machines, changing the arc characteristics is a desired feature, while on classic transformer-based machines, it is not possible to change the arc characteristics.

The pulse programs are also fully synergic (the wire speed/voltage ratio is synergic, as well as all of the pulse parameters), but they sound different than classic MIG welding. The sound when pulse welding changes with the material thickness (wire feed speed). These programs offer a slope down function, which can be used to fill craters at the end of aluminum welds.

Both pulse and non-pulse programs offer adjustment in start speed (wire run-in), start time, burn back, and pinch. Start speed offers the ability to set a crisp arc ignition without a "machine gun" start. Use a lower start speed for harder, larger diameter wires to aid in smooth arc ignition, and use a higher start speed for softer, thinner diameter wires. Start time refers to the amount of time the start speed is in effect once the wire contacts the work. In 2T aluminum pulse programs, start time also includes a pre-programmed hot start feature. Burn back determines how long the wire sticks out of the contact tip once the trigger has been released. The lower the burn back time, the longer the stick out; the higher the burn back time, the shorter the stick out (**ATTENTION! Higher numbers can cause the wire to burn back into the contact tip, destroying it**). Pinch refers to the shape of the end of the wire when you stop welding. With a transformer based MIG welder, a ball usually forms at the end of the wire upon completion of the weld. Then, you typically trim the ball off with a pair of pliers. However, the MTS 210 and the Pro Pulse 220 MTS can do that for you, electrically, by setting the pinch. The higher the pinch number, the more the wire gets trimmed electrically (**ATTENTION! The number required will change by type and diameter of wire. Also, numbers higher than 75 can cause burn back when welding with aluminum wire**).

Regardless of whether you are running a synergic or a pulsed program, the pre– and post– gas flow can also be adjusted. Pre-flow ensures shielding gas is already in place when the welding arc starts, which minimizes or eliminates porosity, discoloration, and/or peppering. Post-flow shields hot, glowing wire from contamination through ambient air and also protects the weld (as long as the MIG welding gun is kept in place for the post-flow duration after the weld is completed). This function is extremely helpful when welding stainless steel and aluminum.

Welding Aluminum with the MTS 210 & the Pro Pulse 220 MTS

The MTS 210 offers 3 programs for welding aluminum, and the Pro Pulse 220 MTS offers 11 programs for welding aluminum. All of the programs are designed to get the best results using 100% Argon gas. For aluminum welding, the use of a shallow or wide U-shaped (sometimes referred to as V90) drive roll is required (HTP Aluminum Drive Rolls have an "A" stamped on them). The tension on the wire feed unit must be properly adjusted. Aluminum wire requires very little tension. A setting just less than 1 will be sufficient most of the time (never more than 1.5!). If the tension is too high, wire feed issues, such as deformation of the wire, wire getting stuck in the contact tip, burn back, and birds nesting, will arise. Aluminum shavings will also be deposited in the liner, which will clog the liner.

We recommend using long-life contact tips for all pulse welding applications because they can better handle the heat generated from the pulse process (HTP Long-Life, High Heat tips have a groove machined in the base of the tip so you can differentiate them from standard tips). When welding aluminum, contact tips need to be .005" bigger than normal (e.g., .040" tips for .035" wire). Aluminum wire should be fed through a designated gun if cross contamination is a concern. While 5356 alloy aluminum wire may be fed through a 10' MIG welding gun (providing the liner is in good condition and the cable is held as straight as possible), 4043 wire needs to be fed through an 8' MIG welding gun. Teflon or Graphite liners are available and must be used for aluminum welding. Flush tips or slightly recessed tips (tip holders) can be used for aluminum welding or stainless steel welding. To improve shielding gas coverage, use a cylindrical nozzle.

Please see the instructions that came with your aluminum wire for shielding gas flow rates and CTWD. Aluminum should be welded with a minimum of 35 to 50 CFH of pure Argon (when pulse MIG welding aluminum, try to stay at the upper end of the range), but this depends on wire diameter, nozzle shape, nozzle size, etc. A good CTWD starting point for welding aluminum is about 3/4" to 1".

The pinch function needs to be set lower than 75 (when using .035" aluminum wire) to prevent burn back. Our suggestion is to start at 25 and then work your way up in increments of five or ten until the ball at the end of the wire is cut off when you stop welding. More pinch is not necessary. The harder the wire and the larger the diameter, the more pinch you will need. Pinch for any size steel wire, and for 3/64" 5554 aluminum alloy wire, is usually set at 100.

NOTE: If you purchased a remote control for your MIG, spool, or push/pull gun, the following is only of limited interest to you as you can adjust your weld parameters at any time WHILE welding! So, essentially, you can make your own hot start, slope down, and final current, at any time, to suit your needs. The MTS 210 does not have built-in hot start or crater fill functions. Only pulse programs on the Pro Pulse 220 MTS have those. If you wish to use those functions, you must use a remote control. The universal remote control for MIG guns is also referred to as a *MIG Slider*. All spool guns and push/pull guns feature built-in remote controls.

To fill the crater at the end of the weld, the slope down (t2) may be set (a slope down time between 2.5 and 4 seconds should suffice, but again, this number depends on material thickness and type of filler wire).

Everybody knows that aluminum is supposed to be preheated before welding. There are a few situations in which preheating the material is not possible, practical, or safe. If you choose not to preheat the part(s) that you are welding, for whatever reason, there is a hot start function built into the Pro Pulse 220 MTS that will reduce the effects of starting an aluminum MIG weld on a cold part.

The hot start function will boost the welding current by about 35% above the selected settings. As the chosen settings reach 200 amps, that boost will be reduced because the machine is only capable of putting out 220 amps for a very short period of time. There are two ways to access hot start:

1) Through time (0.2 to 4 seconds) that can be pre-selected in the MIG 2T mode Start Menu:
    a. Set the start speed to 100% and the start time to 0.1 seconds for no hot start. This will give you 0.2 seconds of hot start time, but, in reality, that is the time it takes to ignite the arc so you will not notice any hot start.
    b. Set the time to 2 seconds to get 4 seconds of hot start time. During the first 2 seconds, you will get 35% hot start, the following 2 seconds (seconds 3 and 4) you will get hot start tapering down from +35% to the selected welding current.
2) Fully controlled by you with no time limit (as needed) through trigger motion in MIG 4T mode:
    a. Pull and hold the trigger; 35% added hot start in addition to the selected welding settings.
    b. Let go of the trigger; the selected settings are being run, the arc stays lit, and welding is in progress.
    c. Pull and hold the trigger; the machine initiates the slope down sequence and fills the crater at the end of the weld. Once the slope down timer runs out, the welding current stops automatically.
    d. Let go of the trigger; welding completed and gas flow stopped.

PRO TIP: During hot start, slope down, or final current, there is no double pulse. If double pulse is desired during hot start or slope down, please use a remote control (sliders on MIG guns and spool guns or potentiometers on push/pull guns) to achieve the desired effect manually.

NOTE: The 4T trigger was reprogrammed in the aluminum programs.

The material thickness settings in the display are approximate, especially when welding aluminum. When welding aluminum, the values change with the temperature or with the material welded. If the material is cold, the chosen material thickness in the display may have to be a little higher than the actual material thickness. When the material is preheated properly or has been welded on for a while, then the thickness in the display needs to be lower or a lot lower than the actual material thickness. Therefore, you have the ability to adjust the material thickness (which will adjust the wire speed and the voltage at the same time), while welding, by turning the upper encoder counter-clockwise.

Because this is not always practical while welding, there is a second way to control the heat input. For instance, if the machine is in MIG 2T and the slope down time is set, for example, anywhere between 3 and 6 seconds, you have the option, if you notice that the weld is getting too hot, to let go of the trigger. Laying off the trigger lets the machine go into slope down, causing the welding current to taper gradually. Just before the machine turns off, depress the trigger again, though only for a very short time, and then lay off the trigger again, allowing the process to repeat. Doing this allows you to fill in gaps and/or manually compensate for excessive heat.

MTS 210 & Pro Pulse 220 MTS Front Panel Connections

Fig. 5

Position	Connection
V	Polarity Cable
W	Positive (+) Output Receptacle
X	MIG Gun Receptacle
Y	14-Pin Remote Receptacle
Z	Negative (-) Output Receptacle

Stick Welding

Press and release button **A** (Select Mode) to toggle through the menu until the LED next to Stick illuminates. The welding machine is now in stick welding mode.

The LCD shows the welding amperage. Unplug polarity cable **V** (**Fig. 5)** that supplies the welding current to the MIG gun receptacle (**Fig. 5**, **X**). Plug the electrode holder (stinger) into the desired outlet. Most stick electrodes use DCEP, which requires the electrode holder to be plugged into positive output receptacle **W** (**Fig. 5)** and the ground clamp into negative output receptacle **Z** (**Fig. 5**). Then, use encoder **F** to set your welding amperage.

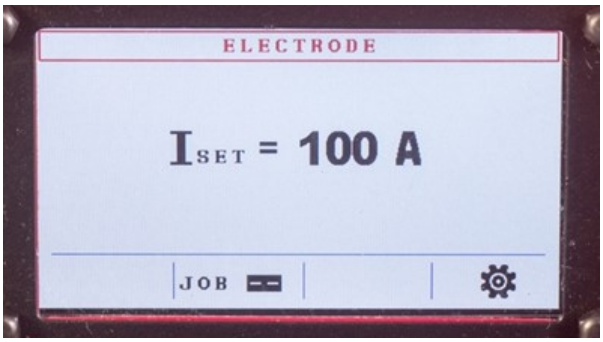


Fig. 6

Fig. 6 shows a selected welding amperage of 100 amps. When you strike an arc, the display will change and show the actual welding amperage and arc voltage.

In order to access the settings submenu, press button **E** to show the following screen:

Fig. 7

The submenu in **Fig. 7** allows you to select a Hot-Start value for the stick rods. By turning encoder **G**, you can change the hot start percentage to the desired setting. In order to adjust the Arc-Force setting, press button **C**; you should see the little arrow behind the % sign move from the first line in the display down to the second line in the display. Now, turning encoder **G** will change the arc force value. For an explanation of what Hot-Start and Arc-Force are and what they do, please refer to the Glossary at the back of the manual.

In order to start welding, either press home button **B**, or wait 5 seconds for the machine to revert back to the welding screen. Now, strike an arc.

PRO TIP: The MTS 210 and the Pro Pulse 220 MTS are both great stick welders. Although they can burn a wide variety of rod, we do not recommend using 6010 rod. While they can keep the arc lit, we do not find the arc dynamic satisfactory. All other rods, including 6011, work great.

TIG Welding

Press and release button **A** to toggle through the menu until the LED next to TIG illuminates. TIG refers to DC TIG lift-arc ignition. This welding process requires DCEN (electrode negative). Plug the ground clamp into the positive output receptacle **W** (**Fig. 5**), plug the TIG torch into the MIG gun receptacle **X** (**Fig. 5**), and plug the polarity cable **V** (**Fig. 5**) into the negative output receptacle **Z** (**Fig. 5**). In order to initiate an arc and vary the amperage while welding, a remote control, such as a foot pedal or hand control, is needed. The remote control needs to be plugged into the 14-pin remote receptacle **Y** (**Fig. 5**).

The TIG welding process typically uses 100% Argon gas. Install the flowmeter supplied with your machine on the tank and connect the flowmeter to the machine with the supplied gas hose. To connect the gas hose, fasten one end of the gas hose to the flowmeter and the other to the gas inlet on the back of the welding machine. These connections need to be a bit more than finger tight but be careful not to over-tighten them. They seal by the fittings so do not use Teflon tape. A 15-20 CFH flow rate is a good starting point (although this ultimately depends on the cup style and size). This machine uses the same gas solenoid valve for MIG and TIG welding.

When the machine is in TIG mode, the display will read an amperage number (e.g., 200 A). By pressing and releasing button **E**, you can access the setup menu (**Fig. 8; NOTE: The gear symbol refers to setup.)**

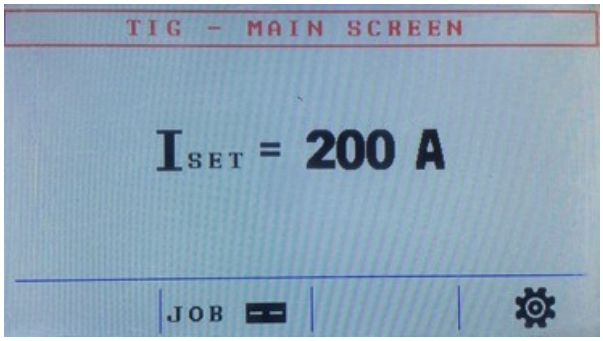


Fig. 8

If you use a foot pedal, we recommend setting the slope down time to 0.1 seconds.

You can adjust the slope down time by turning encoder **G** until the display shows the desired duration (**Fig. 9**).

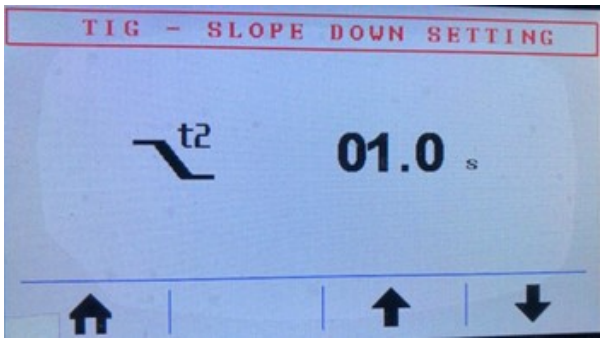


Fig. 9

To get to the next screen, press and release button **E**. The next screen shows the gas flow options (**Fig. 10**).

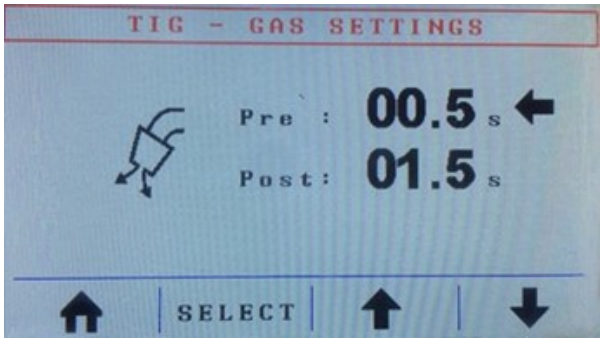


Fig. 10

You can adjust the pre-flow gas setting by turning encoder **G**. Pressing and releasing button **C** moves the arrow from pre– to post-flow and turning encoder **G** now adjusts the post-flow gas setting.

We recommend a 5-10 second post-flow setting for most TIG applications.

To Start the Arc

Touch the clean and freshly sharpened tungsten to the clean metal of the work piece. Attach the ground cable to the work piece. Press and hold the momentary contact switch, or depress the foot pedal (just slightly), and lift the tungsten off the work piece about 1/8". The machine senses that the tungsten lifted and initiates an arc. At this point, the weld can be made. If you use a hand control or foot pedal, you can vary the amperage during welding. When you finish, if using a momentary contact switch, release the switch. The machine goes into slope down, and the arc terminates by itself. If you use a foot pedal, gently lift your foot off the pedal to extinguish the arc.

MIG Welding—General Information

MIG welding with the MTS 210 can be done two different ways: manual and synergic. MIG welding with the Pro Pulse 220 MTS can be done three different ways: manual, synergic, and pulse. In any case, the following things are critical to making good welds:

⇒ Use the correct wire for the material being welded.
⇒ Use the correct gas, at the correct flow rate, for the wire.
⇒ Use the correct drive roll that matches the wire diameter and type. There are different sizes and shapes of drive rolls. For .023", .024", and .025" diameter wire, use a drive roll marked 0.6; for .030" wire, use a drive roll marked 0.8; for .035" wire, use a drive roll marked 0.9 or 1.0; for .045", .047", and 3/64" wire, use a drive roll marked 1.2. (**NOTE: Drive rolls are reversible; there are two different size grooves on the same drive roll. The number facing you when you install the drive roll in the machine is the diameter of the groove you are using**.) Also, different materials require different drive roll groove shapes. For instance, mild steel wire, stainless steel wire, and silicon bronze wire typically use a standard V shaped drive roll (**Fig. 11**). Softer aluminum wire uses a U shaped (V90) drive roll (**Fig. 12**). Aluminum drive rolls are designated by an "**A**". Flux-cored wire, whether used with or without gas, and most hard-facing wire, requires the use of a knurled drive roll—the little teeth provide extra traction on these wires (**Fig. 13**). This is designated by an "**R**" after the wire diameter.

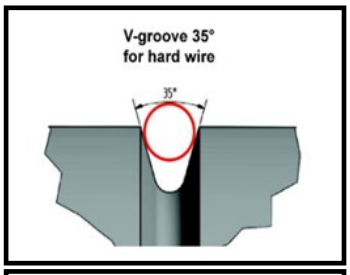


Fig. 11

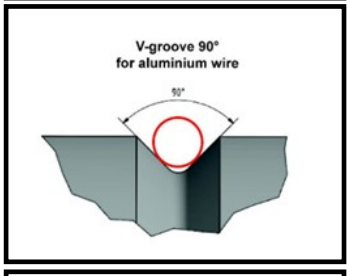


Fig. 12

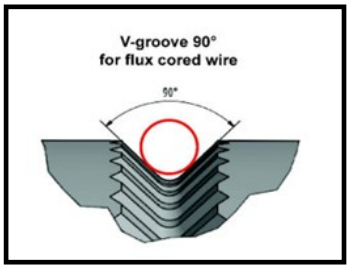


Fig. 13

⇒ Use the proper wire tension. When welding with mild steel or stainless steel, feed tension is important but a little forgiving. Generally, the wire tension should be set around 3. If that does not give you good results, there is most likely a problem unrelated to wire tension present. For example, a bad contact tip, a bad liner, a defective welding gun, etc. can cause wire to not feed smoothly. When welding flux-cored wire, the tension should be set lower than 2. If flux-cored wire is being fed through a wire feeder with too much tension, the tubular flux-cored wire will deform; the wire will become oblong and too big to fit through the contact tip. Improper electrical contact, poor weld quality, burned tips, and other issues will follow. Also, over-tightened drive roll tension and deformed wire will cause metal particles to separate from the wire. Those particles will, over time (sometimes a very short time, such as after welding only several pounds of wire), deposit themselves in the liner as the wire is transported through the gun, ultimately clogging the liner and rendering it useless. When welding aluminum, the drive roll tension should be less than 1. This minimizes the chances of the wire birds nesting (**NOTE: If there is burn back or another issue that jams the wire feed, the tension should be set so low that the drive rolls slip on the wire rather than continuing to feed, because continuing to feed will result in birds nesting**).

⇒ Use contact tips that match the diameter of the wire selected. For example, use .030” contact tips with .030” wire, use .035” contact tips with .035” wire, and so on. Follow these instructions for all wire types except aluminum. With aluminum wire, we strongly recommend the use of long-life contact tips with the groove machined into the tip. For aluminum, the tip size must be .005” larger than the wire size. For example, .035” aluminum wire would require a .040” tip, and 3/64” aluminum wire would require a .052” tip.

⇒ Use the correct polarity. Most MIG wires are welded DCEP (electrode positive), and there are very few exceptions to this rule (gasless flux-cored wire and some specialty hard-surfacing wires are exceptions). If in doubt, please consult the data sheet that came with the wire, the box the wire came in, or contact the distributor you bought the wire from.

⇒ Use the correct gas nozzle. For welding stainless steel wire or aluminum wire, a cylindrical nozzle provides better gas coverage.

⇒ Use the correct welding gun.

⇒ If welding in synergic or pulse mode, select the correct material thickness (reduce the material thickness if you need to fill big gaps or if the material you are welding is very hot) and observe the wire manufacturer’s recommended CTWD.

MIG 2T

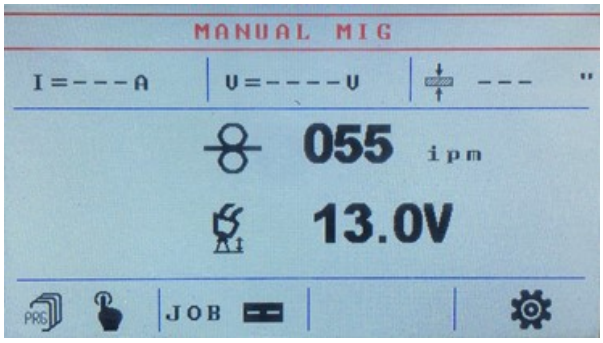


Fig. 14

Press and release Select Mode button **A** as many times as needed until the green LED next to 2T illuminates. If welding in the manual mode is desired, press and release button **B** twice quickly. The machine is now in manual mode (**Fig. 14**). Turn encoder **F** to set the wire feed speed, and turn encoder **G** to set the voltage.

If welding with synergic or pulse programs is desired, press and release button **B** once to display the program list (**Fig. 15**).

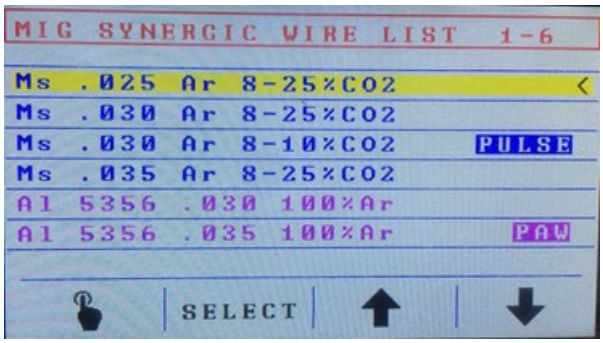


Fig. 15

Use encoder **G** to scroll through the program list and select the program that best fits your current job (the yellow bar that highlights the program will move as you turn encoder **G**).

There are 9 programs in the MTS 210 and 22 programs in the Pro Pulse 220 MTS. To see a complete list of the programs installed on your welding machine, please see Appendix I starting on page 42. Each program in the list includes a short description. Please see a few examples of what you will see below:

1. Ms—ER70S6 Alloy Mild Steel
2. Al 5356—5356 Alloy Aluminum
3. Al 5554—5554 Alloy Aluminum
4. Al 4043—4043 Alloy Aluminum
5. SS308—308 Alloy Stainless Steel
6. SiBro—Silicon Bronze (brazing wire)
7. Flux-Cored Gasless—E71T-11 or E71TGS
8. Flux-Cored—E71T1
9. .025, .030, .035, 3/64—These numbers refer to the wire diameter required for the selected program.
10. Ar 8-25%CO2—Indicates the welding gas required. This program requires a mixed gas with the majority being Argon and the balance being CO2. Mixtures from 92% Argon and 8% CO2 to 75% Argon and 25% CO2 are acceptable.
11. Ar 8-10%CO2—Indicates that either a 92% Argon and 8% CO2 or a 90% Argon and 10% CO2 gas mixture is required.
12. Ar 2%CO2—Indicates that a 98% Argon and 2% CO2 gas mixture is required.
13. Ar 25%CO2—Indicates that a 75% Argon and 25% CO2 gas mixture is required.
14. 100%Ar—Indicates that 100% Argon is required.

All of the programs listed are synergic. **PULSE** means that the program runs in single pulse mode. The sound of the machine changes and the spray arc transfer is used.

PAW means Precision Aluminum Welding. **PAW** is a single pulse program and is a special process for very thin aluminum (as it is commonly found in the automotive industry). The weld-able material thickness in this program is approximate—material thicknesses range from .030" to .080".

DOUBLE PULSE means that the pulse weld (the pulse frequency changes with the material thickness) is overlaid with a second lower pulse frequency (that stays constant no matter the material thickness), which reduces the heat input even further when welding and produces MIG welds that look like TIG welds.

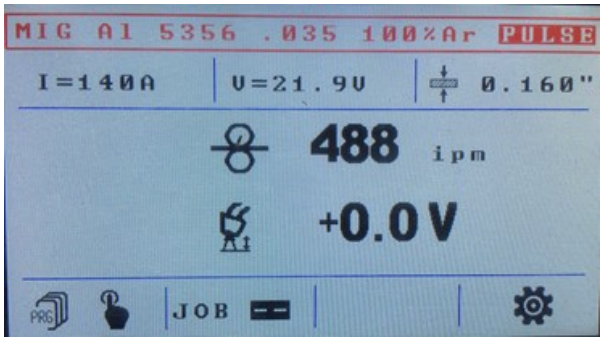


Fig. 16

Once you select a program, the program list disappears and the program is displayed in red (**Fig. 16**). The top line in the display shows the name of the program (MIG Al 5356), the wire diameter (.035), and the required gas (100%AR). It also indicates if it is a synergic or a pulse program (PULSE). The line below displays, starting from the left, the approximate amperage (I=140A; calculated based on material, wire speed, wire diameter, and other variables), arc voltage (V=21.9V), and material thickness (0.160"). By turning encoder **F**, you can adjust the material thickness; adjusting the material thickness also adjusts the wire speed and the voltage. In the center of the LCD, the wire speed is displayed in IPM. Below that, the voltage deviation of the synergic curve is displayed. This value is supposed to read 0.0V at most times, for most welding operations. You can adjust this value by turning encoder **G**. If an adjustment is made, the absolute arc voltage changes and the color changes from black to red. A deviation of the synergic arc does two things: it changes the arc length and it makes the weld hotter or colder. However, on a synergic machine, the main heat adjustment is made with encoder **F** by setting material thickness. The voltage deviation made with encoder **G** is considered fine-tuning or a personal preference adjustment. You will find the function buttons (**B**, **C**, **D**, and **E**) on the bottom of the display. In this case (**Fig. 16**), button **B**, if pressed and released once, brings up the program list, or, if pressed and released twice quickly, switches the machine into manual mode. Pressing button **C** accesses the Job menu, button **D** has no function at this point, and pressing button **E** accesses the advanced setup menu.

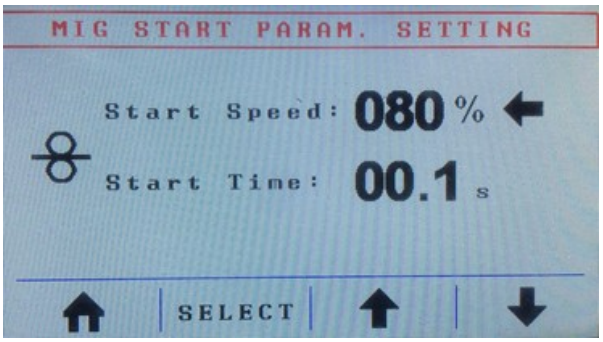


Fig. 17

By pressing and releasing button **E** once, you enter the setup menu (**Fig. 17**). The first screen in the setup menu gives you the option to adjust the start speed. Typically, numbers between 70% and 100% are suitable for the start speed.

For steel wire, start speeds between 35 and 80% can be a good starting point. For .035" diameter aluminum wire, start speeds of 100% are common and for 3/64" diameter aluminum wire, start speeds between 30 and 50% are typical.

The start time determines how long the machine runs at the selected wire speed until it switches to 100% wire speed. Start times between 0.1 and 0.5 seconds are common. Typically, 0.3 seconds is most common. Correct adjustment of the start parameters allow for a smooth, spatter-free arc initiation. To set the start speed, turn encoder **G**; to set the start time, press and release

button **C** (the little, left-pointing arrow will move down from start speed to start time). Turning encoder **G** now adjusts the start time.

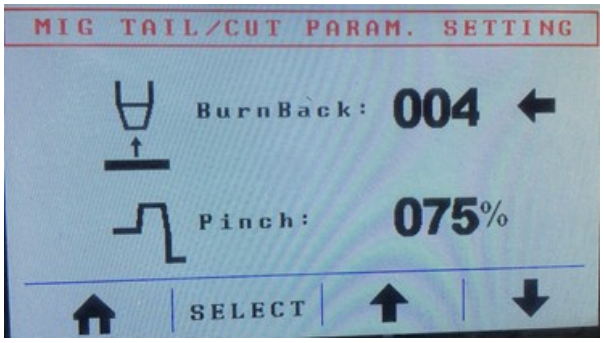


Fig. 18

To go to the next screen, press and release button **E**. Burn back adjusts how long the wire sticks out after you finish welding. The lower the burn back, the longer the stick out; the higher the burn back, the shorter the stick out. Different wires react differently. For example, aluminum reacts differently than steel; when welding aluminum, set burn back to 004.

ATTENTION! High burn back numbers create the risk of burning the wire back into the contact tip. We recommend starting out with very low numbers.

The pinch function clips wire electrically. Right before you finish the weld, the machine sends a burst of current that shapes the end of the wire. Depending on the setting, there might not be a ball on the end of the wire that needs to be clipped off before re-striking an arc. To set the pinch, push and release button **C** once, and then turn encoder **G** to the desired setting. Different wire types need different settings. For instance, flux-cored wire doesn't need much pinch, while aluminum wire tends to work well with 30% to 60% pinch, depending on the alloy and diameter (high pinch rates, such as more than 75% pinch, cause burn back near or into the tip, which causes damage to the tip). Steel wire and 3/64" diameter 5554 aluminum wire needs 100% pinch to get the desired result. Our recommendation is to start with the pinch at 25 and then work your way up in increments of five or ten until the ball at the end of the wire is no longer present when you stop welding. The harder the wire and the larger the diameter, the more pinch you will need.

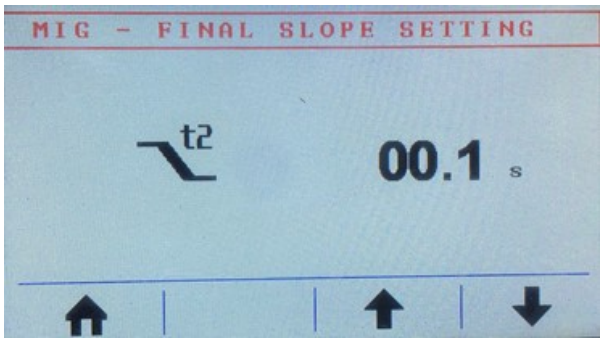


Fig. 19

After adjusting burn back and pinch, press and release button **E** again to get to the next screen. This screen (**Fig. 19**) allows you to adjust the slope down setting for pulse welding. The slope down feature allows you to fill the crater at the end of an aluminum weld, or neatly feather out a stainless steel weld. On aluminum, set t2 between 3 and 5 seconds by turning encoder **G**. After you release the trigger, the machine still runs for the amount of time selected, but tapers down automatically during the slope down time. The tapering is visible in the arc and is also audible (the frequency and the sound of the machine change). If no slope down is desired, set t2 to 0.1 seconds.

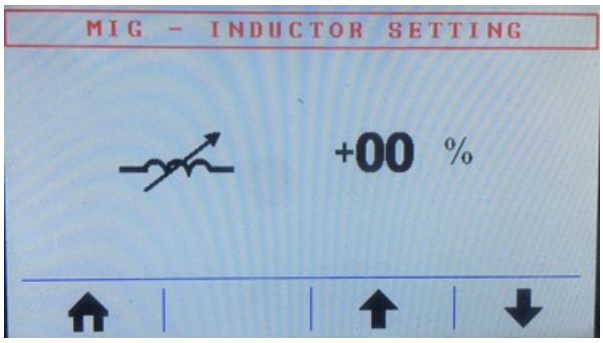


Fig. 20

The slope down feature is only available in pulse programs. Synergic, non-pulse programs have an option to adjust inductance (**Fig. 20**). By turning encoder **G**, you can adjust the inductance of the machine. Typically, this feature is not available on transformer machines or budget inverter machines. The inductance feature allows you to set the arc characteristics from stiff/crisp to soft.

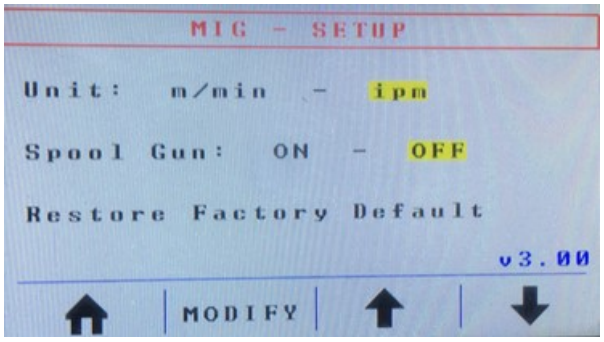


Fig. 21

You can access the final screen (**Fig. 21**) by pressing and releasing button **E** once again. Options on the final screen should not be adjusted by you unless previously instructed by HTP America, Inc. technical service. In this screen, the machine can be switched from Imperial to Metric (which is preferred by many collision repair shops). Also, if an optional spool gun is used on the machine, it needs to be activated here.

MIG 4T

The selection and setup of MIG 4T works identically to MIG 2T. The only difference between MIG 2T and MIG 4T is trigger function. In MIG 2T, depressing the trigger starts the wire feed motor and applies current to the welding wire. Releasing the trigger stops the wire feed motor and extinguishes the arc. In MIG 4T, depressing the trigger starts pre-gas flow, releasing the trigger starts the wire feed motor and applies current to the welding wire, depressing the trigger again stops the wire feed motor and extinguishes the arc, and releasing the trigger again starts post-gas flow. Essentially, MIG 4T allows you to weld without having to keep the trigger depressed. The procedure is the same when welding every kind of welding wire.

ATTENTION! The 4T trigger is reprogrammed for ALL pulsed aluminum programs. We assigned a hot start function to the initial pull. Please read Welding Aluminum with the MTS 210 & the Pro Pulse 220 MTS (pages 18 and 19) to fully understand the hot start function.

Stitch Welding

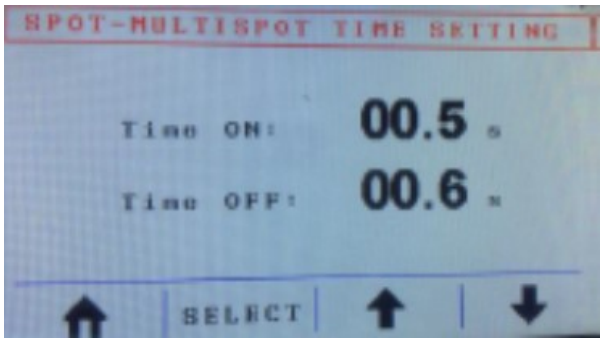


Fig. 22

NOTE: The Stitch weld function can also be used as a Spot weld function. Set your Time ON for the spot weld size/duration you want to do and select a long Time OFF (for example 5-10 seconds) so you can let go of the trigger before the next spot weld starts.

Press and release button **A** (Select Mode) until the LED next to STITCH illuminates, and then press and release button **E** to enter the menu. The new screen (**Fig. 22**) lets you adjust Time ON and Time OFF for stitch welding. To adjust Time ON, turn encoder **G** to the desired time, and then press and release button **C**. Now encoder **G** will adjust Time OFF. When initially setting up the stitch feature, set the start speed to 100% and the time to 0.1 seconds. Later, the settings may be adjusted to yield the best results. Stitch welding can be used to reduce heat input, to fill gaps where the fit is less than perfect, or on thin material where burning through is a concern. When you press and hold the trigger, the machine welds for the amount of time that Time ON is set to, then it will stop (while the trigger is still depressed) for the amount of time that Time OFF is set to. The stitch process repeats itself indefinitely until you release the trigger.

PRO TIP: Don't use any slope down with spot or stitch timers unless you are aware of the consequences.

NOTE: Try to avoid turning the machine off when in stitch mode. If you turn the machine off in stitch mode, you may encounter an overheat message when you turn the machine back on. If you turn the machine off and encounter the overheat message, turn the machine off again and then back on. When you turn the machine back on, press button A (Select Mode) three (3) times within 3-5 seconds. This will put the machine back into MIG 2T mode. At this point, the machine should be operational, but we suggest that you once again turn the machine off and then power back on.

JOB Mode

The Job Mode function, which is active in all welding modes, allows you to store and recall up to 30 JOBS (welding parameter settings).

How to Store JOBs (Welding Parameter Settings)

1. Press the JOB button **C** to pull up the JOB LIST page.
2. Use the ↑ button **D**, the ↓ button **E**, or the V/SET encoder **G** to select the program in which you want to save the welding parameter settings.
3. Press and hold the SAVE button **C** for about three (3) seconds until you hear a double beep. If you hear a triple beep and see "THIS JOB IS PROTECTED, DO YOU WANT TO OVERWRITE IT?" in the display, either press button **E** to proceed or button **D** to cancel.
4. After saving the JOB, the LCD reverts back to the main page where you can see the JOB number above button **C.**

NOTE: An * symbol next to the JOB means the JOB is in use, and a flashing * symbol next to the JOB means the JOB is modified from the original.

To leave the current JOB and return the Pro Pulse into the "regular" welding mode, quickly press and release the JOB button **C**, and then press and hold the Select Mode button **A** for approximately five (5) seconds. You should hear five (5) short beeps and one longer beep, after which the * symbol next to the JOB you were using clears. Wait an additional three (3) seconds, and the machine will be back in the regular welding mode.

How to Load Stored Jobs

1. Press the JOB button **C** to pull up the JOB LIST page.
2. Use the ↑ button **D**, the ↓ button **E**, or the V/SET encoder **G** to select the JOB you want to recall.
3. Press and hold the RECALL button **B** for about three (3) seconds until you hear a double beep.
4. After recalling the JOB, the LCD reverts back to the main page where you can see the JOB number above button **C**.

ATTENTION! THE PARAMETERS SAVED IN JOBS 1 THROUGH 12 ARE PROTECTED. WHEN YOU RECALL JOBS 1 THROUGH 12, THEY ARE LOCKED, WHICH MEANS YOU CANNOT MODIFY THEM. IN ORDER TO MODIFY JOBS 1 THROUGH 12, YOU MUST OVERWRITE THEM.

Overwriting JOBS 1 Through 12

- Quickly press and release the JOB button **C**, and then press and hold the Select Mode button **A** for about five (5) seconds; you will hear five (5) short beeps and one (1) long beep, and the * symbol next to the JOB you were using disappears. After an additional three (3) seconds, the machine will be back in the regular welding mode.
- Make the desired adjustments and modifications to the program.
- Follow the steps from the **How to Store JOBs (Welding Parameter Settings)** instructions to overwrite the protected parameters with the new parameters.

Trigger JOB Function

The first three JOBs in the JOB LIST can be loaded and recalled simply by pulling the trigger of the welding gun. The following criteria must be met in order to use the Trigger JOB Function:

- At least two of the first three slots in the JOB LIST need to have welding parameter settings, or a JOB, assigned to them (the slots are empty when the machine leaves the factory).
- Each set of parameters (JOB) saved in slots 1 through 3 needs to be MIG 2T. The Trigger JOB Function **does not work** with MIG 4T. In MIG 2T, pressing and holding the trigger makes the machine weld and releasing the trigger makes the machine stop welding.
- Each set of parameters (JOB) saved in slots 1 through 3 needs to have a pre-gas flow time of at least 0.3 seconds or higher.

Follow the instructions below to switch between JOBs 1 through 3 via the Trigger JOB Function:

- Hold the gun in the air; press and immediately release the torch trigger without striking an arc.
- Watch the display to see the settings change.
- Every time you use the trigger in the manner described above, the machine accesses the next JOB (e.g., running through the instructions the first time activates JOB #1, a second run through activates JOB #2, a third run through activates JOB #3, a fourth run through activates JOB #1 once again, and so on).

Important Things to Know about the JOB Mode

When you receive your machine, the machine includes preprogrammed JOBs (typically, slots 20-29). However, you can delete the preprogrammed JOBs, as well as the JOBs you saved on the machine. To delete **all** saved JOBs, press and release the JOB button **C**, and then press and hold the Select Mode button **A** and button **E** at the same time for approximately five (5) seconds. After hearing five (5) beeps, all JOBs, including the preprogrammed demo JOBs, will be permanently erased from the machine's memory.

When saving a JOB, please note that the machine saves **everything**, which means not just wire speed, material thickness, and voltage, but also any voltage corrections you make, if you made the weld in 2T or 4T mode, induction (when and where applicable), run-in speed and time (or hot start), burn back, pinch, pre– and post-flow, t2 slope down (when and where applicable), etc. For different JOBs, these settings can and will be different, and, as you recall each JOB, the JOBs will load with the exact settings used when you saved them.

Why is the JOB Mode Important and How Do You Use It?

We will illustrate the importance of the JOB mode and explain how you use it with an example (more particularly, with an example using the JOB mode, as well as the Trigger JOB Function). Let's say you weld with a lot of mild steel. You may choose to save two or three JOBs with your favorite or most often used wire diameters in the first three memory slots. To access each of your three most often used JOBs, you simply need to pull the trigger (see **Trigger JOB Function** on page 27) to switch from one JOB to the next. Regarding the JOBs themselves, for example, you could set up the first JOB based on the actual material thickness you are welding (for flat work or in-position welding). Then, you could set up the second JOB for vertical welding (so the parameters would be slightly cooler than JOB #1). Lastly, you could set up the third JOB as a stitch weld function to fill gaps more easily on less than perfect fit up.

TIPS:

If you program a JOB for stainless steel, we suggest using a long post-flow time (5 to 10 seconds) to shield the weld.

If you program a JOB for aluminum, we recommend setting the pinch low to prevent burn backs. Also, set the t2 slope down between 2.5 and 5 seconds to fill the crater at the end of the weld.

Remote Control Options

Your welding machine features a remote control (foot pedal or hand control) option for MIG welding. The unique feature of using a remote control for MIG welding allows you to change settings (material thickness = wire speed + voltage) while welding—giving you 100% control, 100% of the time. If, for instance, you encounter a section of poor fit-up when welding and need to lower the settings of the machine to bridge the gap, you can do so with a simple movement of the remote control.

The remote control feature is especially handy when welding aluminum because it allows you to adjust hot start parameters and duration, as well as crater fill at the end of the weld. The properties and weldability of aluminum change dramatically with increased heat so bridging gaps on poor fit up can be difficult. However, the remote control feature makes welding aluminum a breeze, in every thickness and temperature range and with good or poor fit up.

Troubleshooting

Issue	Solution
Arc Stability Issues and Excessive Soot When Welding Aluminum	Insufficient Argon flow: flow rates should be set between 35 and 50 CFH (when pulse MIG welding aluminum, stay on the higher end of the range)
Burn Back Issues	Set the burn back to 004, and then lower the pinch to zero (the pinch snips the wire by sending a final electrical current to trim the ball off of the end of the wire). When setting pinch, start at zero (0) and increase the pinch by increments of 10. Then, to fine tune, increase the pinch by increments of 5. If you experience **burn back issues at start-up**, then the start speed is set too low. The start speed determines how crisp the arc ignition will be—high speeds cause machine gunning and/or a sluggish arc start. The start speed should be 0.3 or less (never above 0.5). Start speeds vary depending on the material you are welding; thicker or harder wire requires a slower start speed, and thinner or softer wire requires a higher start speed. If you experience **burn back issues in the middle of the weld**, the issue may stem from the contact tip, wear on the liner, drive roll pressure, or wire brake pressure. When welding aluminum, insufficient gas flow may be causing the issue. Your voltage compensation could also be set too high (e.g., on +8). If you are experiencing **burn back issues at the end of the weld**, then the pinch is set too high. Go into the settings and change the pinch back to 0. Increase the pinch by 5-10 until the machine electrically snips the ball from the end of the wire. For 4043 aluminum, the prime pinch setting falls in the 40 to 50 range, 5356 aluminum falls around 75, and 5554 aluminum falls around 100. For steel, the prime pinch setting falls around 100, and for silicon bronze, the prime pinch setting falls between 50-75. **NOTE: The above ranges are approximate.** If in doubt about burn back or pinch settings, set burn back to 004, set pinch to 010, and use wire cutters to remove the ball on the end of the wire.
Machine Does Not Weld/ Wire Feeds and Gas Flows but No Arc Initiation	Ensure that you connected the polarity cable (**Fig. 5**, **V**), which puts the welding current into the MIG wire, into the positive (+) output receptacle (**Fig**. **5**, **W**). When you plug the polarity cable into the positive (+) output receptacle, give the plug a good counter-clockwise twist before you plug it in so that as you insert the plug and let go, the plug rotates toward the lock position. Also, make sure you have a good ground connection.
Wire Feed Issues	Drive roll pressure in a well maintained machine, with good tips and a good liner, does not need to be set high. Extremely high drive roll pressure is counterproductive. On soft aluminum wires, you destroy the surface finish and develop birds nesting issues. Even on steel wires, you deform the wire, creating a corkscrew shape, which creates more contact points within the liner and ultimately causes feeding issues.
Arc Start Issues	Please review the following settings: **<u>ER70S6 Mild Steel Wire</u>** 1) Set the start speed between 35 and 80% (60-80% for .023" wire and 35-60% for .030" and .035" wire) and set the start time to 0.3 seconds (if 0.3 seconds does not give you the results you are looking for, try 0.2 or 0.4 seconds) **<u>Aluminum Wire</u>** 1) .035" wire: Set the start speed to 100% and the start time to 0.1 seconds 2) 3/64" wire: Set the start speed between 30 and 40% and the start time to 0.2 seconds (if 0.2 seconds does not give you the results you are looking for, try 0.1 or 0.3 seconds)

MIG 200i Duty Cycle & Over-Heat Protection

The HTP MIG 200i is designed for the maintenance welder. It can weld many different materials and a wide variety of thicknesses. Thicker material, depending on the type, temperature, etc. may require multi-pass welds.

Duty cycle ratings can be confusing, but we want to make duty cycle less confusing. A 60% duty cycle means that, out of a 10-minute time span (duty cycle is always a 10-minute time span, per definition), the machine can weld for six (6) minutes and then needs to idle with the cooling fan running for four (4) minutes. Do not turn off or unplug the machine during this time.

However, these numbers change with the selected welding amperage and the ambient temperature. In reality, very few can keep track of welding time like this, so we equipped the MIG 200i with very sophisticated over-heat protection. The machine monitors the temperature of several vital internal components. Just before temperatures venture outside of the safe operating range, the yellow LED (**Fig. 2**, **B**) will flash. The cooling fan continues to run, and the welding output is shut down for four (4) minutes. This time allows the machine and internal components to cool down to a safe operating temperature. There is no harm to the machine when the message is displayed, and it does not matter how often this happens. There is no way to override this function.

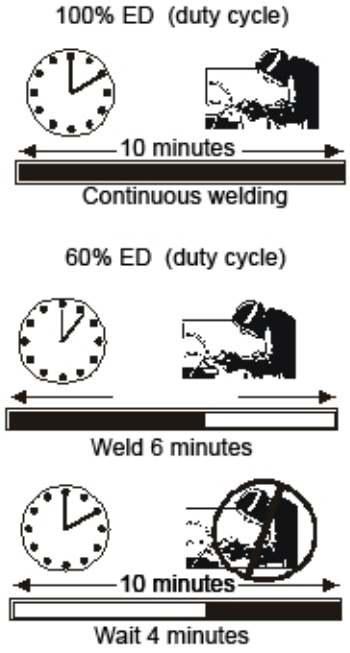


Fig. 23

MTS 210 and Pro Pulse 220 MTS Duty Cycle & Over-Heat Protection

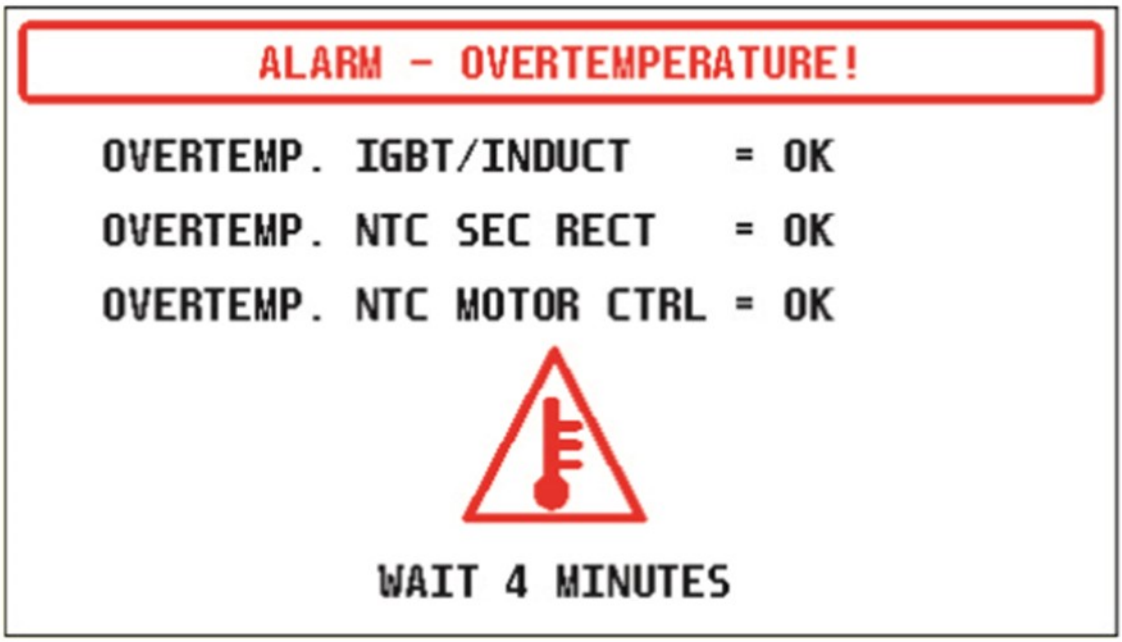


Fig. 24

The MTS 210 and the Pro Pulse 220 MTS are designed for the maintenance welder. Both machines can weld many different materials and a wide variety of thicknesses. Thicker material, depending on type, temperature, etc. may require multi-pass welds.

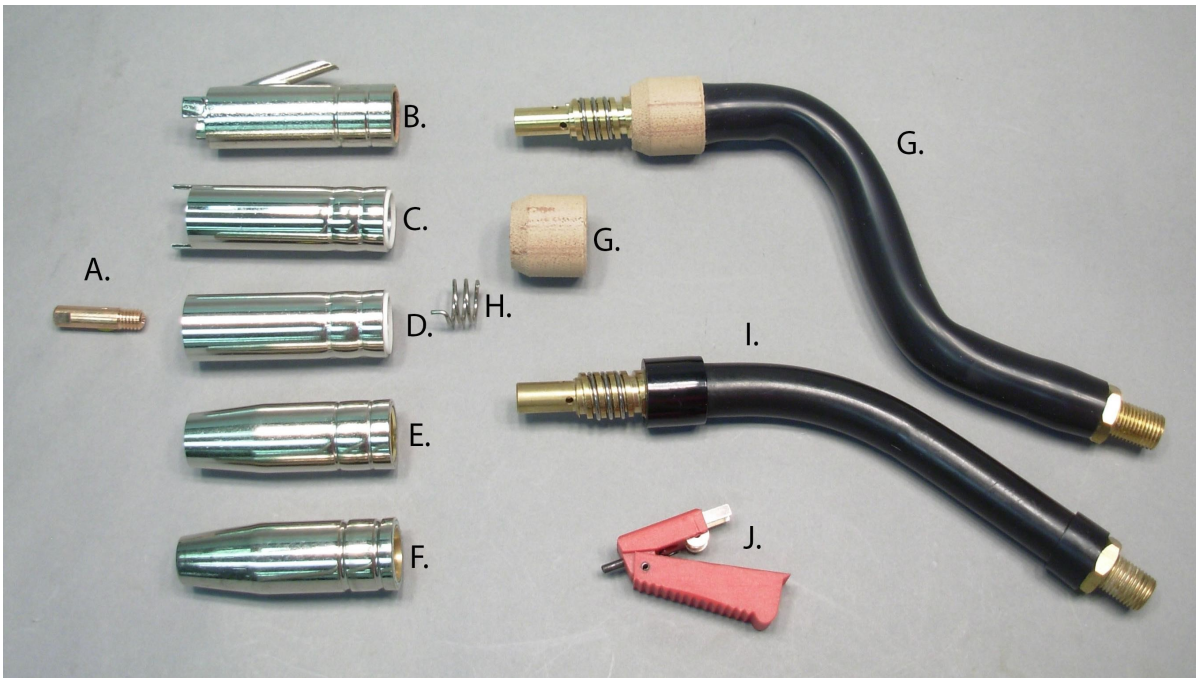
Duty cycle ratings can be confusing, but we want to make duty cycle less confusing. A 60% duty cycle means that, out of a 10-minute time span (duty cycle is always a 10-minute time span, per definition), the machine can weld for six (6) minutes and then needs to idle with the cooling fan running for four (4) minutes. Do not turn off or unplug the machine during this time.

However, these numbers change with the selected welding amperage and the ambient temperature. In reality, very few can keep track of welding time like this, so we equipped the MTS 210 and the Pro Pulse 220 MTS with a very sophisticated over-heat protection. Each machine monitors the temperature of several vital internal components. Just before temperatures venture outside the safe operating range, the machine displays a message to the operator, the cooling fan continues to run, and the welding output is shut down for four (4) minutes. This time allows the machine and internal components to cool down to a safe operating temperature. There is no harm to the machine when the message is displayed, and it does not matter how often this happens. There is no way to override this function.

The MTS 210 and the Pro Pulse 220 MTS are machines in the 200 amp class; they are designed for welding operations up to 200 amps. The Pro Pulse 220 MTS has the capability to run at 220 amps for up to 10 seconds (this will take effect in some aluminum hot start functions and in situations where the operator holds too tight of an arc length (where stick out is too close)). Depending on the selected program and the welding material, the peak pulse can be as high as 300 amps (**NOTE: This will not show in the display; the display shows an average amperage, comparable to a classic MIG machine**). If its capabilities are exceeded, the machine automatically lowers the settings for protection purposes. This happens only rarely in the pre-programmed synergic and pulse programs, but it can happen due to insufficient CTWD, worn contact tips or liners, insufficient shielding gas flow, unclean metal, or wire that is out of specifications (e.g., too big in diameter for the program it is run in). In the case of the machine lowering the settings automatically, you will be informed via the LCD. The welding parameters lower, the wire speed symbol color changes from black to red, and the value (number in IPM) for the wire speed flashes in black and red (normally the value is shown in solid black). There is no harm to the machine when this happens, and you can continue welding at the lower settings. To avoid this, you should correct the problem and/or select slightly lower settings than previously selected.

HTP 15 Series MIG Welding Gun (For use with the MIG 200i, MTS 210, or Pro Pulse 220 MTS)

This is the smallest welding gun. It has a duty cycle of 60% @ 180 amps. Excellent for reaching into tight spaces (e.g., work on cars). Also, lightweight for less operator fatigue. Best for use on steel (non-pulse). Not suitable for pulse welding steel, and limited potential for pulse welding silicon bronze in the collision repair industry. Although we also sell the gun in 12' and 15' lengths, only the 10' gun may be used when welding .023" diameter wire, and even larger diameter wires will most likely NOT give you a trouble-free welding experience. We recommend using a maximum gun length of 10'. If you require a longer gun, either upgrade to a push/pull system or to the Pro Pulse 300, which features a different wire feed system.

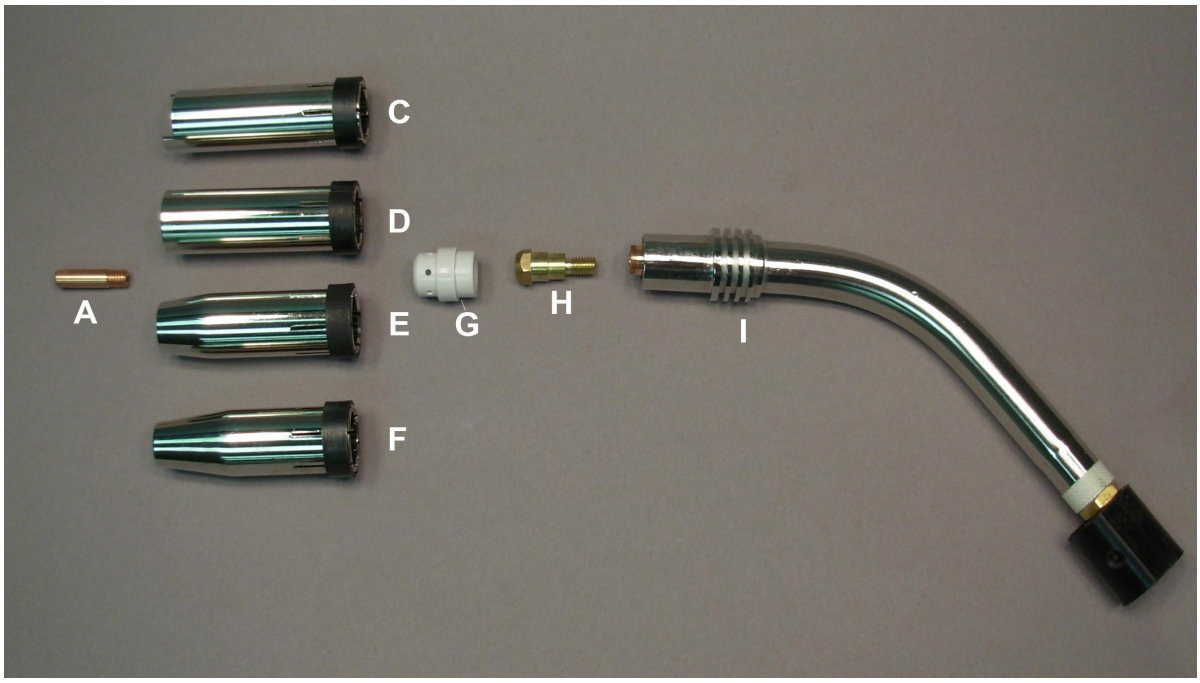


	Part#	Description		Part#	Description
A.	15023-10	.023" Contact Tip, 10-Pack	I.	13002-DLT	Gas Diffuser
A.	15030-10	.030" Contact Tip, 10-Pack	J.	14009	Trigger Switch
A.	15035-10	.035" Contact Tip, 10-Pack	L.	15100	10' MIG Gun
C.	15106	Spot Weld Nozzle	L.	15120	12' MIG Gun
D.	15104	Cylindrical Nozzle	L.	15150	15' MIG Gun
E.	15105B	Conical Nozzle, 3-Pack	M.	15040-16	16' Steel Liner
F.	15108	Small Conical Nozzle	N.	50013	Consumable Kit
G.	15058	Head Insulator f/Flex Neck	O.	63160	Drive Roll f/Steel, .023"-.030"
G.	15500	Flexible Swan Neck	P.	63498	Drive Roll f/Flux-Cored Wire
H.	15062B	Nozzle Retaining Spring, 4-Pack	Q.	15510	10' Flex Neck MIG Gun
I.	14058	Head Insulator	Q.	15512	12' Flex Neck MIG Gun
I.	15002	Swan Neck, Standard Rigid Neck	Q.	15515	15' Flex Neck MIG Gun

HTP 24 Series MIG Welding Gun (For use with the MTS 210 or the Pro Pulse 220 MTS)

The 24 Series welding gun has a duty cycle of 60% @ 240 amps. It is still lightweight and fits into most small spaces. For pulse welding, we recommend a maximum gun length of 10'. Although we also sell the gun in 12' and 15' lengths, only the 10' gun may be used when welding .023" diameter wire, and even larger diameter wires will most likely NOT give you a trouble-free welding experience. If you require a longer gun, either upgrade to a push/pull system or to the Pro Pulse 300, which features a different wire feed system. For any kind of pulse welding, long-life tips should be used. Failure to do so will result in premature tip wear, poor weld quality, burn backs, birds nesting, and other problems. The 24 Series MIG Welding Gun can be used for:

- Steel (all diameters and thicknesses; both pulse and non-pulse)
- Flux-cored (all thicknesses; with or without gas)
- Stainless Steel and Silicon Bronze (all thicknesses)



	Part#	Description		Part#	Description
A.	24023-10	.023" Contact Tip, 10-Pack	E.	24105B	Conical Nozzle, 3-Pack
A.	24030-10	.030" Contact Tip, 10-Pack	F.	24108B	Small Conical Nozzle, 3-Pack
A.	24035-10	.035" Contact Tip, 10-Pack	G.	24002-DIF	Gas Diffuser
A.	24045-10	.045" Contact Tip, 10-Pack	H.	24002-TH	Tip Holder
A.	24030-10CR	.030" Long-Life Contact Tip	I.	24002	Swan Neck
A.	24035-10CR	.035" Long-Life Contact Tip	J.	24100	10' MIG Gun
A.	24040-10CR	.040" Long-Life Contact Tip	J.	24120	12' MIG Gun
A.	24045-10CR	.045" Long-Life Contact Tip	K.	15040-16	16' Steel Liner
C.	24106B	Spot Weld Nozzle, 3-Pack	L.	63160	Drive Roll f/Steel, .023"-.030"
D.	24104B	Cylindrical Nozzle, 3-Pack	K.	634980	Drive Roll f/Flux-Cored Wire

HTP 26 Series MIG Welding Gun (For use with the MTS 210 or the Pro Pulse 220 MTS)

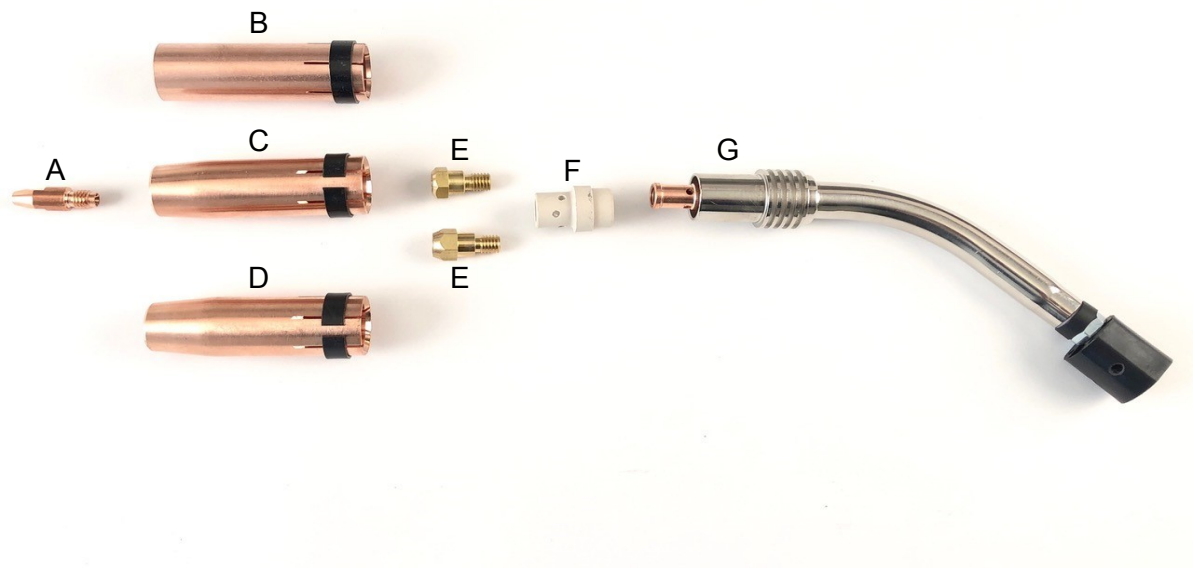
The 26 Series welding gun has a duty cycle of 60% @ 260 amps. Noticeably larger than the 24 Series MIG Welding Gun with a thicker torch cable (the thicker torch cable has more copper to carry more welding current and helps the operator keep the gun straight, which is especially important when welding aluminum). Comes in an 8' length with M8 size long-life tips. The 26 Series MIG Welding Gun can be used for:

- Aluminum (EVERY wire diameter from .030" to .047" (3/64"); EVERY alloy (4043, 5356, and 5554, namely))

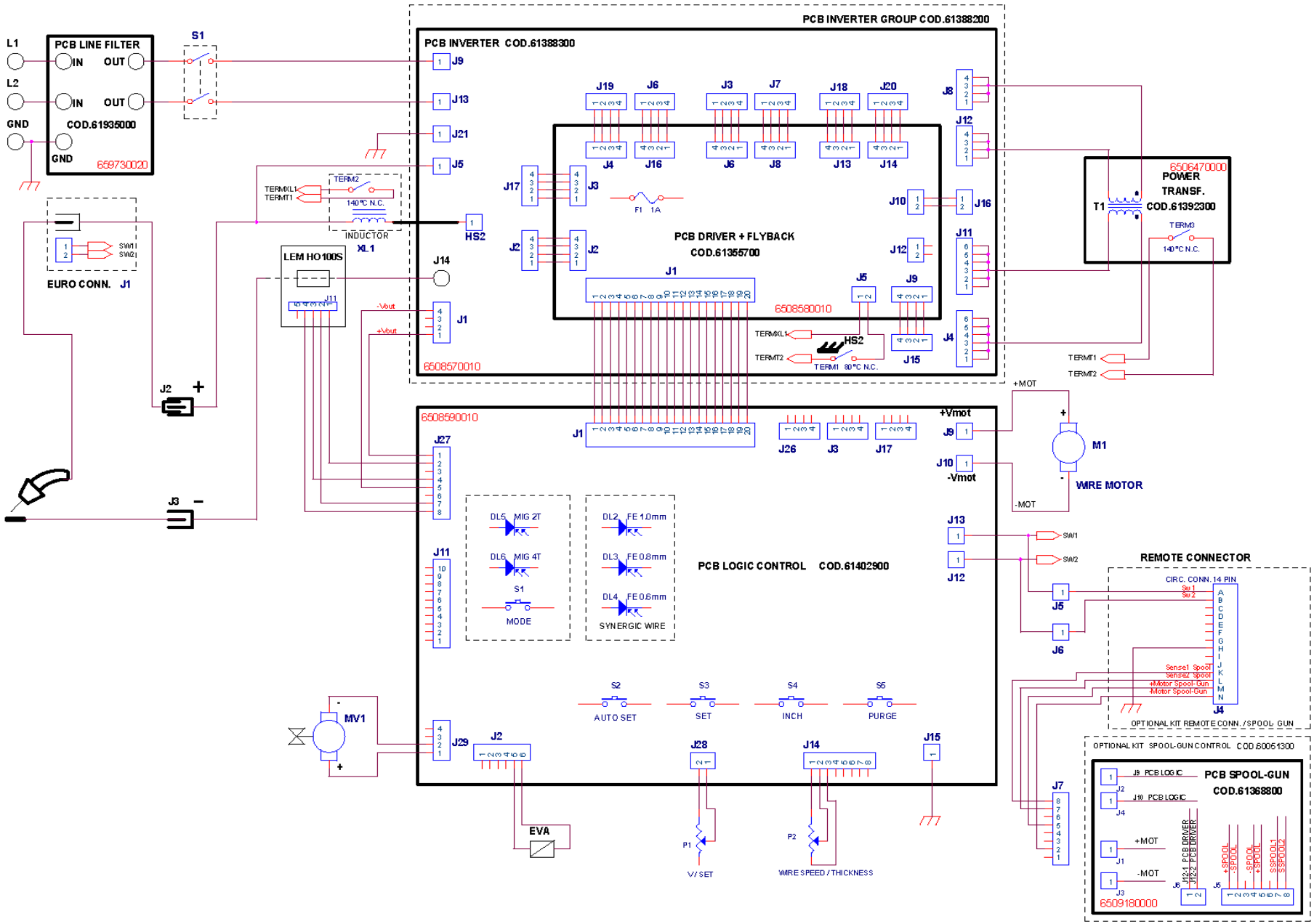
The 26 Series MIG welding gun might also be used for:

- Steel (all diameters and thicknesses; both pulse and non-pulse)
- Flux-cored (all thicknesses; with and without gas)
- Stainless Steel and Silicon Bronze (all thicknesses)

In doing so, modifications to the gun must be made (a different liner must be installed. However, a modification like this may be a good choice if you require an extra heavy-duty welding gun for high heat situations and the 24 Series MIG welding gun does not provide sufficient performance.

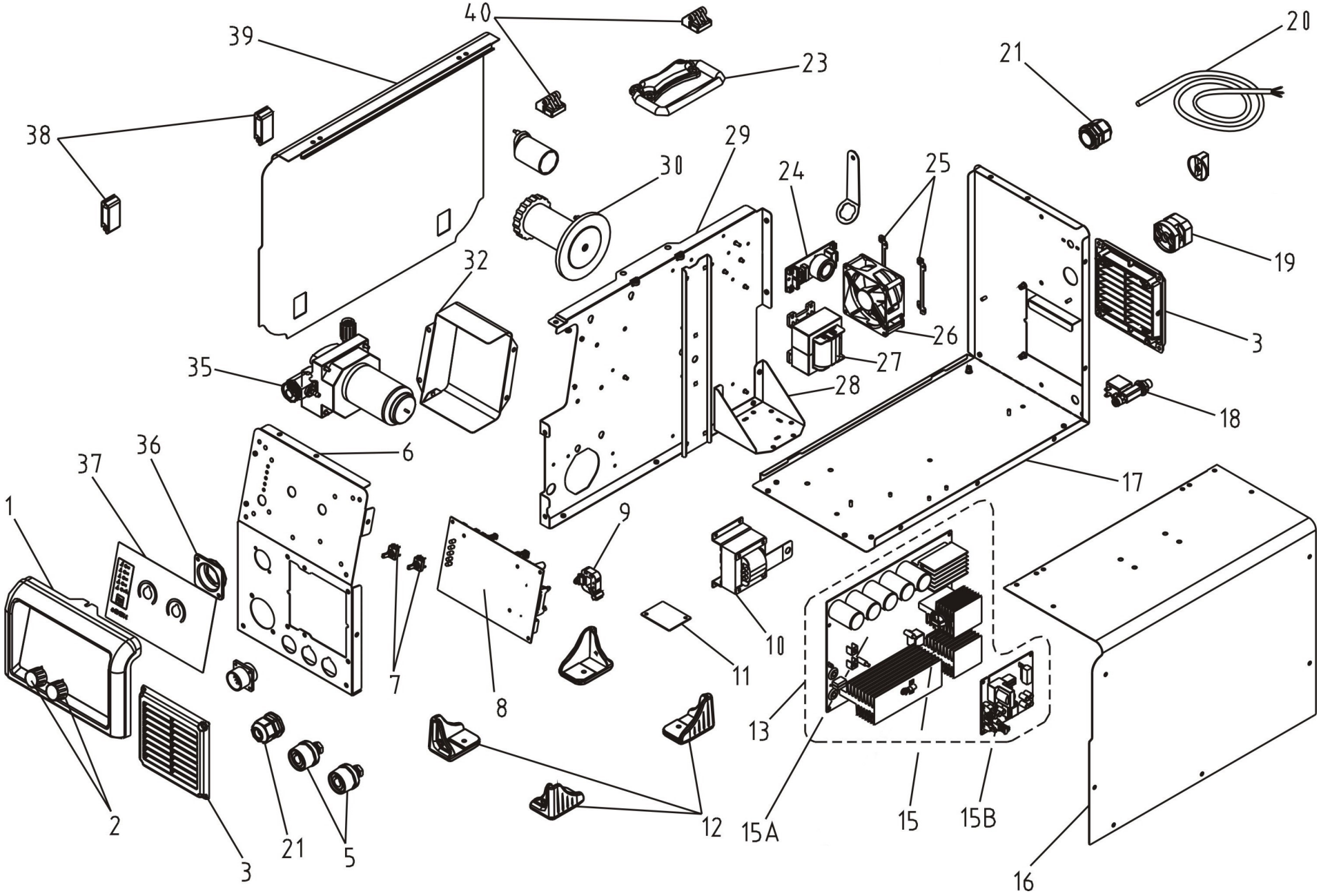


	Part#	Description		Part#	Description
A.	26030-10CR	.030" CRZR Contact Tip, 10-Pack	E.	26002-THM8L	Tip Holder, Long
A.	26035-10CR	.035" CRZR Contact Tip, 10-Pack	F.	26002-DIF	Gas Diffuser
A.	26045-10CR	.045" CRZR Contact Tip, 10-Pack	G.	26002	Swan Neck
B.	26104-3	Cylindrical Nozzle, 3-Pack	H.	26080	8' MIG Gun
C.	26105-3	Conical Nozzle, 3-Pack	I.	63464	Drive Roll f/Aluminum
D.	26108-3	Small Conical Nozzle, 3-Pack	J.	26040-11	11' Graphite Liner
E.	26002-THM8S	Tip Holder, Short	K.	50026	Consumable Kit



MIG 200i Wiring Diagram

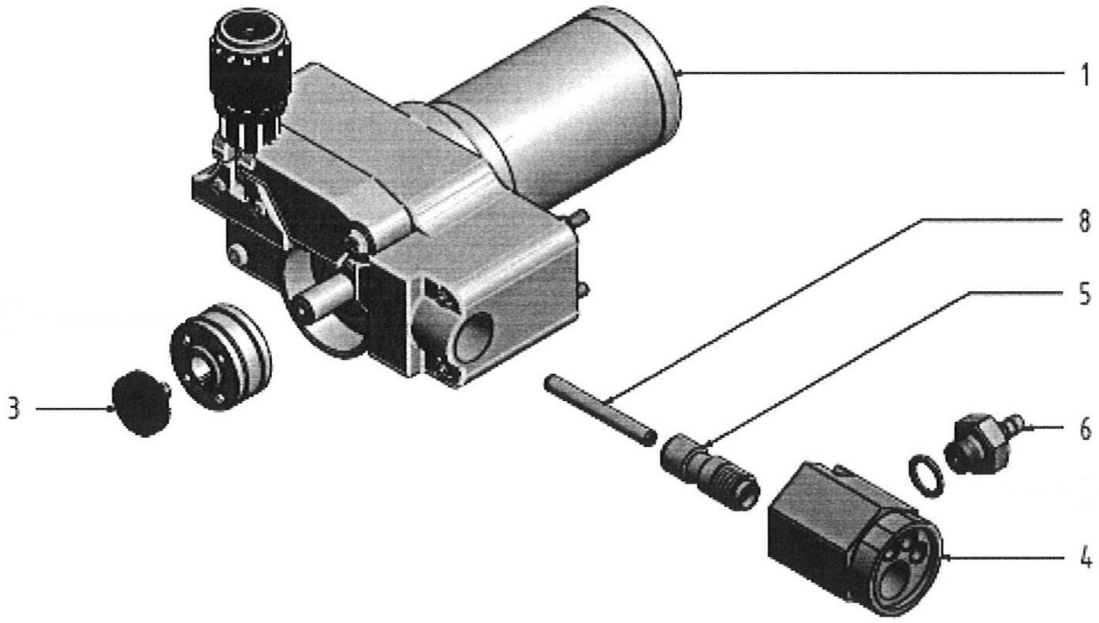
MIG 200i Parts Diagram



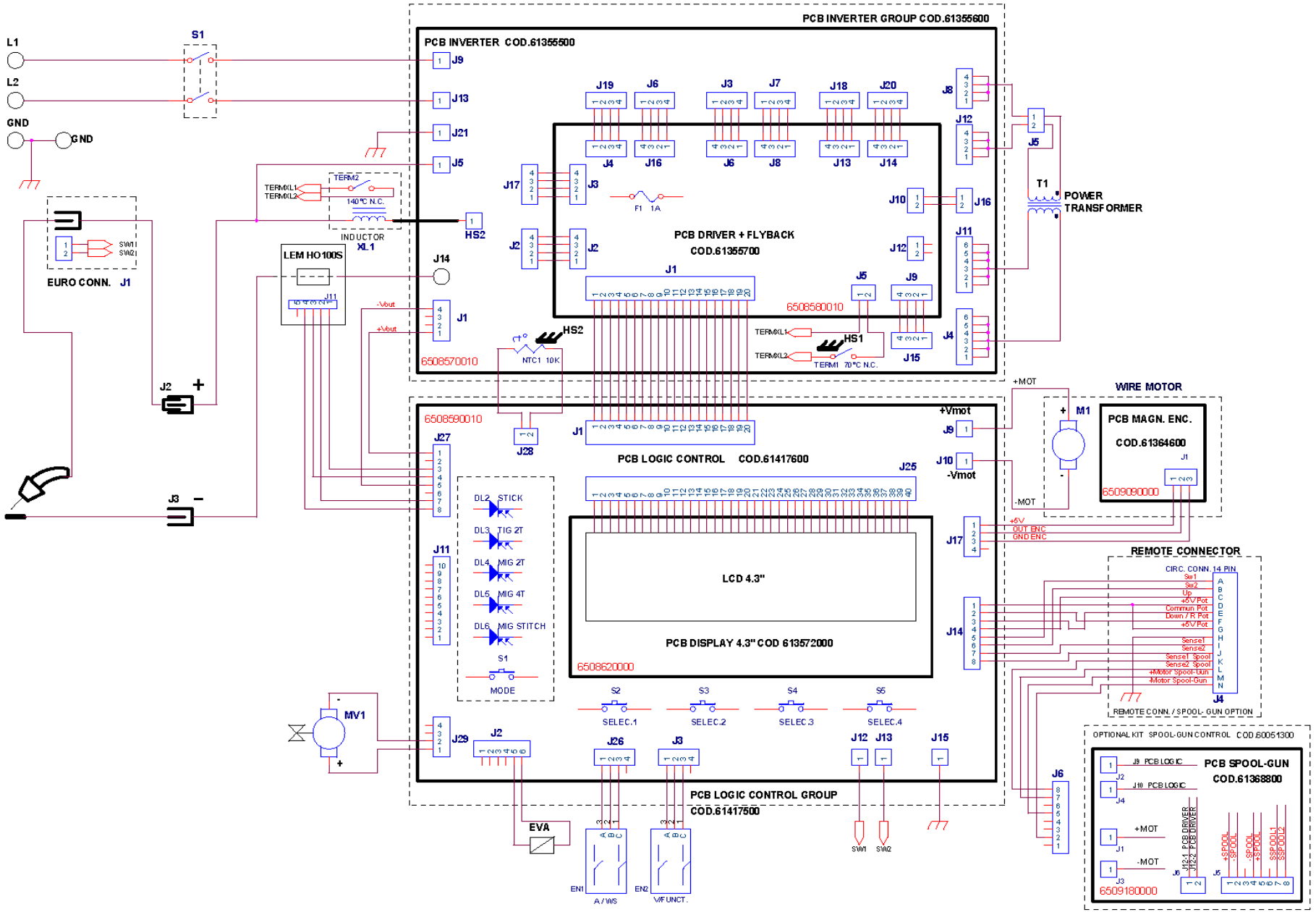
MIG 200i Parts List

Position	Part#	Description	Position	Part#	Description
1	661157	Plastic Frame	19	647240	Power Switch
2	661062	Knob	20	644240	Input Power Cable
3	661043	Fan Cover	21	660785	Cable Strain Relief
5	642740	Ground Receptacle/Socket	23	661034	Handle
6	620904	Front Panel	24	619350	Line Filter PCB
7a	613913	V/SET Potentiometer	25	620742	Fan Support
7b	613915	Wire Speed Potentiometer	26	611331	Fan
8	613922	Front Panel PCB	27	613923	Power Transformer
9	650897	Lem Probe	28	620743	Power Transformer Support
10	613653	Output Inductance	29	620898	Vertical Support
12	661418	Foot	30	664860	Spool Holder
13	613882	Inverter/Flyback/Driver PCB Group	32	620899	Protection PCB
15	650236	Thermal Switch	35	613849	Wire Feed Assembly
15a	613883	Inverter PCB	36	664620	Euro MIG Gun Connector Flange
15b	613557	Flyback & Driver PCB	37	661406	Control Panel Label
16	620896	Cover	38	664710	Sliding Latch
17	620894	Base	39	620897	Door
18	617030	Solenoid Valve	40	664680	Hinge

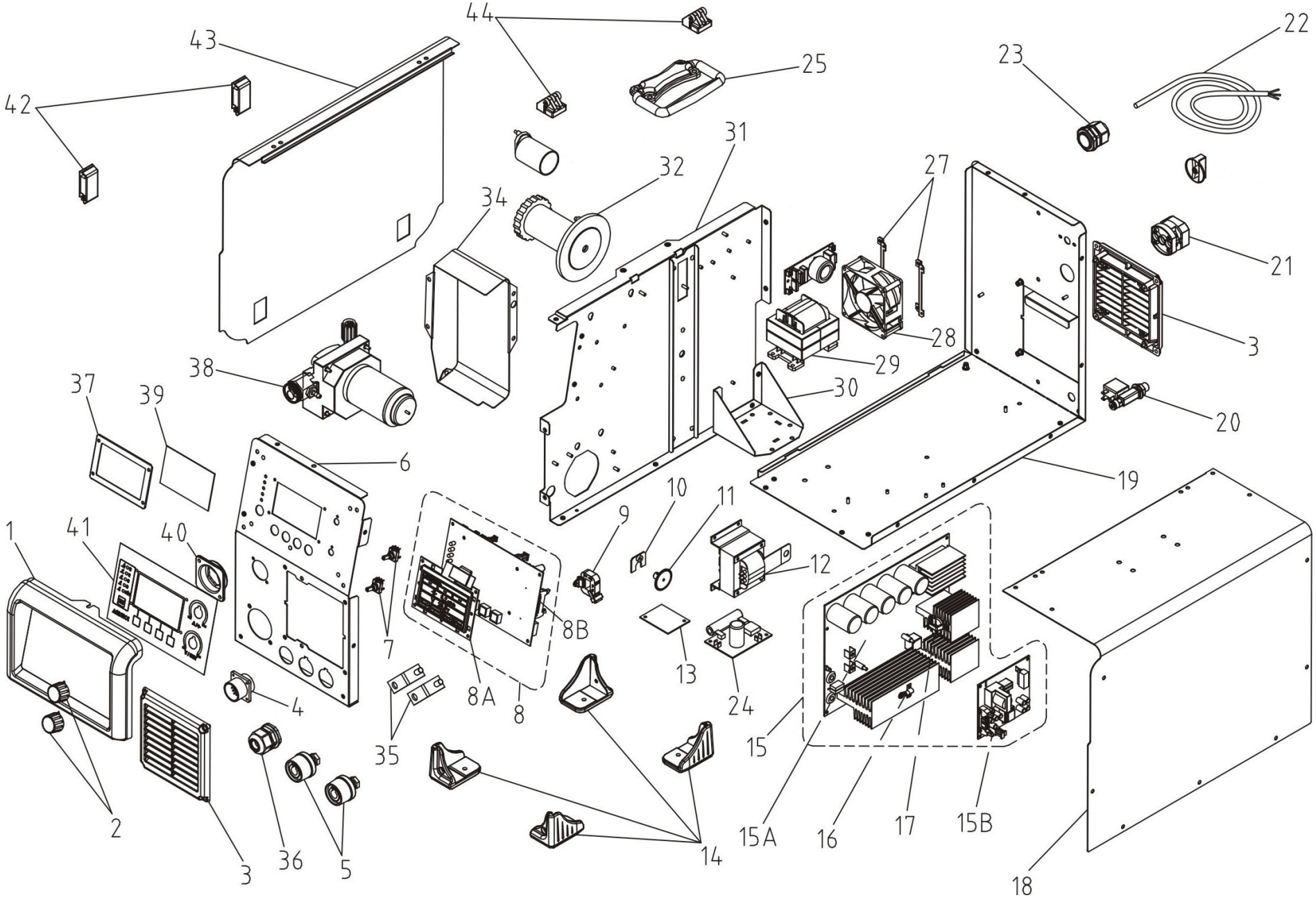
MIG 200i Wire Feed Assembly Parts Diagram



MIG 200i Wire Feed Assembly Parts List		
Position	**Part#**	**Description**
1	613849	Wire Feed Motor (24V/40W)
3	634690	Retaining Screw
4	634990	Euro MIG Gun Adapter
5	636250	Connecting Screw M12 x 1.5 x 35mm, Brass
6	636260	Gas Connection Screw, Brass
8	636370	Wire Guide Tube 5 x 2 x 57mm, Brass



MTS 210 & Pro Pulse 220 MTS Wiring Diagram



MTS 210 & Pro Pulse 220 MTS Parts Diagram

MTS 210 & Pro Pulse 220 MTS Parts List

Pos.	Part#	Description
1	661157	Plastic Frame
2	661062	Knob
3	661043	Fan Cover
4	601619	Remote Control Receptacle
5	642740	Ground Receptacle
6	620895	Front Panel Assembly
7	611902	Encoder
8	614175	Front Panel PCB Group
8a	613572	Display PCB
8b	614176	Logic PCB
9	650897	Lem Probe
10	613646	Magnetic Encoder PCB
11	636210	Wheel
12	613653	Output Inductance
13	601525	Spool Gun Kit
14	661418	Foot
15	613556	Inverter/Flyback/Driver PCB Group
15a	613555	Inverter PCB
15b	613557	Flyback & Driver PCB
16	612475	NTC Thermal Sensor
17	650697	Thermal Switch
18	620896	Cover
19	620894	Base

Pos.	Part#	Description
20	617030	Solenoid Valve
21	647240	Power Switch
22	647610	Input Power Cable
23	660785	Cable Strain Relief
24	601641	Push/Pull Kit
25	661034	Handle
27	620742	Fan Support
28	647460	Fan
29	613593	Power Transformer
30	620743	Power Transformer Support
31	620898	Vertical Support
32	664860	Spool Holder
34	620899	PCB Protector
35	620901	CU Connection
36	660785	Cable Strain Relief
37	620809	Screen Protector Support
38	614116	Wire Feed Assembly
39	661422	Screen Protector
40	664620	Euro MIG Gun Connector
41	661519	Front Label
42	664710	Sliding Latch
43	620897	Door
44	664680	Hinge

Appendix I

MTS 210 Programs

No.	Material	Wire Diameter	Shield Gas	Program Name	Gas Flow Rate (Approx.)	Min. Thickness
1	Mild Steel	.023” - .025”	AR 8-25%CO2	Ms .025 Ar 8-25%CO2	Between 20-25 CFH	.019”
2	Mild Steel	.030”	AR 8-25%CO2	Ms .030 Ar 8-25%CO2	Between 20-25 CFH	.023”
3	Mild Steel	.035”	AR 8-25%CO2	Ms .035 Ar 8-25% CO2	Between 30-35 CFH	.032”
4	Aluminum 5356	.030”	100% AR	Al 5356 .030 100%Ar		.040”
5	Aluminum 5356	.047” or 3/64”	100% AR	Al 5356 3/64 100%Ar		.059”
6	Aluminum 4043	.045” or 3/64”	100% AR	Al 4043 3/64 100%Ar		.079”
7	Silicon Bronze	.030”	100% AR	SiBro .030 100%Ar		.032”
8	Flux-Cored	.035”	No Gas	Flux-Cored .035 Gas-less	Plug pig tail into - receptacle and ground into + receptacle	.048”
9	Flux-Cored	.035”	75% AR 25% CO2	Flux-Cored .035 25%CO2		.079”

Pro Pulse 220 MTS Programs

No.	Material	Wire Diameter	Shield Gas	Program Name	Gas Flow Rate (Approx.)	Minimum Thickness	Maximum Thickness (*)	Start Speed	Start Time	Notes
1	Mild Steel	.023" - .025"	AR 8-25%CO2	Ms .025 Ar 8-25%CO2	20-25 CFH	26 Ga	1/8"	75-100%	0.2-0.3 Sec	
2	Mild Steel	.030"	AR 8-25%CO2	Ms .030 Ar 8-25%CO2	20-25 CFH	22 Ga	1/4"	50-80%	0.3 Sec	
3	Mild Steel	.030"	AR 8-10%CO2	Ms .030 Ar 8-10%CO2 PULSE	30-35 CFH	22 Ga	1/4"	25-40%	0.2-0.3 Sec	Use 90/10 or 92/8 gas only
4	Mild Steel	.035"	AR 8-25%CO2	Ms .035 Ar 8-25% CO2	20-25 CFH	21 Ga	1/4"	30-50%	0.3 Sec	
5	Aluminum 5356	.030"	100% AR	Al 5356 .030 100%Ar	40-50 CFH	18 Ga	.120"	100%	0.1 Sec	
6	Aluminum 5356	.035"	100% AR	Al 5356 .035 100%Ar PAW	40-50 CFH	20 Ga	12 Ga	100%	Hot Start in 2T (**)	.035" or .040" 5554 alloy wire can be run in this program with approximately +1.0 Volt
7	Aluminum 5356	.035"	100% AR	Al 5356 .035 100%Ar PULSE	40-50 CFH	15 Ga	3/16"	100%	Hot Start in 2T (**)	.035" or .040" 5554 alloy wire can be run in this program with approximately +1.0 Volt
8	Aluminum 5356	.035"	100% AR	Al 5356 .035 100%Ar DoubPULSE	40-50 CFH	.15 Ga	< 3/16"	100%	Hot Start in 2T (**)	.035" or .040" 5554 alloy wire can be run in this program with approximately +1.0 Volt
9	Aluminum 5356	.045" or 3/64"	100% AR	Al 5356 3/64 100%Ar	40-50 CFH	15 Ga	3/16"-5/16"	25-40%	0.1-0.3 Sec	
10	Aluminum 5554	.045" or 3/64"	100% AR	Al 5554 3/64 100%Ar PAW	40-50 CFH	18 Ga	15 Ga	25-40%	0.1-0.3 Sec	
11	Aluminum 5554	.045" or 3/64"	100% AR	Al 5554 3/64 100%AR PULSE	40-50 CFH	14 Ga	12 Ga	25-40%	0.1-0.3 Sec	
12	Aluminum 4043	.035"	100% AR	Al 4043 .035 100%Ar PAW	40-50 CFH	20 Ga	12 Ga	25-40%	Hot Start in 2T (**)	
13	Aluminum 4043	.035"	100% AR	Al 4043 .035 100%Ar PULSE	40-50 CFH	12 Ga	3/16"-1/4"	100%	Hot Start in 2T (**)	
14	Aluminum 4043	.035"	100% AR	Al 4043 .035 100%Ar DoubPULSE	40-50 CFH	12 Ga	3/16"	100%	Hot Start in 2T (**)	
15	Aluminum 4043	.045" or 3/64"	100% AR	Al 4043 3/64 100%Ar	40-50 CFH	12 Ga	3/16"-5/16"	25-40%	0.1-0.3 Sec	
16	Stainless Steel	.030"	98% AR 2% CO2	SS308 .030 Ar 2%CO2 PULSE	30-35 CFH	24 Ga	3/16"	30-50%	0.1-0.3 Sec	Use 98/2 or 97/3 gas only
17	Stainless Steel	.035"	98% AR 2% CO2	SS308 .035 Ar 2%CO2 PULSE	30-35 CFH	18 Ga	1/4"	25-40%	0.2-0.3 Sec	Use 98/2 or 97/3 gas only
18	Silicon Bronze	.030"	100% AR	CuSi3 .030 100%Ar PULSE	30-35 CFH	21 Ga	1/8"	30-50%	0.1-0.3 Sec	
19	Silicon Bronze	.030"	100% AR	CuSi3 .030 100%Ar	30-35 CFH	21 Ga	5/32"	30-50%	0.1-0.3 Sec	
20	Silicon Bronze	.035"	100% AR	CuSi3 .035 100%Ar PULSE	30-35 CFH	16 Ga	5/32"	30-50%	0.1-0.3 Sec	
21	Flux-Cored	.035"	No Gas	Flux-Cored .035 Gas-less	No Gas	18 Ga	5/16"	50-80%	0.2-0.3 Sec	Plug pig tail into - receptacle and ground into + receptacle
22	Flux-Cored	.035"	75% AR 25% CO2	Flux-Cored .035 25%CO2	40-50 CFH	14 Ga	5/16"	75-100%	0.1-0.3 Sec	

* Maximum material thickness varies based on joint configuration, the size of the part being welded, and the temperature of the part being welded. All hot start and crater fill functions associated with aluminum programs are ALWAYS single pulse only—regardless of the program. Synergic aluminum programs (all programs NOT marked Pulse, PAW, or Double Pulse) do not have hot start functions in the software; rather, an external remote control like a slider is required. For details, please call (847) 357-0700 to speak with an HTP America welding expert.

** In MIG 4T, set the start speed to 0.1 Sec and control hot start with the trigger. In MIG 2T, the start time (x2) is the total hot start time; please refer to our discussion of hot start on pages 23-25 of the manual.

Appendix II—Glossary

Arc Force Related to amps and volts when welding. When stick welding, the Pro Pulse 220 MTS power source produces a CC, or constant current, output; in other words, the machine holds a constant amperage level, while the voltage varies according to the arc length, or the distance between the rod and the work surface. Longer arc lengths increase voltage and shorter arc lengths decrease voltage. Increased voltage (a long arc length) keeps the puddle more fluid and the arc more stable, while decreased voltage (a short arc length) allows you to achieve better metal transfer and weld quality. The decrease in arc voltage, however, does pose the risk of extinguishing the arc, which is where arc force comes into play.

When you set arc force and your arc voltage begins to drop while welding due to a short arc length, arc force increases your amperage (not your voltage) to give the weld puddle more drive and to keep the rod lit, and burn in deeper (or burn through), without snuffing out the arc. Arc force is an adaptive-dynamic process. If, for instance, you select 50% arc force and set your welding machine to 100 amps, a decrease in arc voltage will cause the amperage to increase automatically up to 150 amps (as needed and only when you meet certain voltage drop conditions; you will NOT run at 150 amps continually). Likewise, if you weld at 100 amps and set arc force to 200%, the amperage can increase, under certain conditions, up to 200 amps. At a 200% setting, drops in arc voltage will cause the amperage to climb faster than it would if set at 50% arc force. Essentially, with arc force set, you will not see the voltage go up at all if you hold the correct arc length, and if you hold the arc length too tightly, your amperage will increase, as needed, so the rod stays lit. Of course, you cannot watch the machine's display and weld at the same time, but you will hear the difference if/when arc force kicks in—our inverter welding machines sound unique, especially when arc force kicks in.

Hot Start A burst of amperage for a very short time—typically less than one (**1**) second to help light the rod, or start the arc. When you set hot start, you select a percentage of the welding current. For instance, if you set the machine to weld at 100 amps and then set hot start to 30%, for a fraction of a second the machine puts out 130 amps to help light the rod and start the arc.

P.A.W.™ Stands for Precision Aluminum Welding. Designed for use on very thin aluminum (1 to 2mm thick) with a standard MIG welding gun. P.A.W. programs offer a short and concentrated welding arc.

Pulsed Process MIG Welding Pulsed process MIG welding happens in spray arc transfer as opposed to classic (steel) MIG welding, which happens in short arc transfer and sounds like frying bacon. In short arc transfer, the wire literally shorts out in the puddle, burns back, and then shorts out again. Spray arc welding is much hotter than short arc welding, has excellent penetration, virtually no spatter, and is typically very quiet (mostly a quiet hissing with an occasional crackle). This form of welding is so hot that it typically can only be used in flat position and horizontal position. When welding aluminum, spray arc can be used out-of-position. Pulsed MIG welding gives you the option to run the process out-of-position while retaining the same desirable characteristics of deep penetration and a virtually spatter-free weld with excellent bead appearance—and does so while enabling you to join materials of different thicknesses at an increased travel speed, all while lowering heat input and distortion.

Pulsed process MIG welding is different than pulsed process TIG welding. In the MIG process, filler material has to be added constantly to maintain the welding arc, and this sets the ground rules of the pulse function. When pulsing in TIG welding mode, you can adjust peak current, background current, pulse-on time, and pulse frequency. When pulse MIG welding, you typically only have the choice of pulse-on and pulse-off. Pulsed process MIG welding machines made by most reputable manufacturers today, like the HTP® Pro Pulse 220 MTS, typically have what is referred to as synergic pulse, which means the pulse frequency and other welding parameters are preprogrammed into the machine and change automatically when you adjust the wire feed speed and other welding parameters. The pulse frequency adjusts with the wire feed speed; slower wire feed speeds have a lower frequency, while higher wire feed speeds have a higher frequency. However, the Pro Pulse 220 MTS also offers peak pulse (in some programs, under certain conditions, and up to 300 amps, which is not shown in the display or selectable by you; the display will show an average amperage).

Because of the pulse frequency, electronic interference may occur. For this reason, **it is forbidden for people with PACEMAKERS to use or come near the machine**. During the research and development process at HTP, we found that some brands/models of auto-darkening welding helmets experience interference issues with the Pro Pulse 220 MTS. Since the frequency changes according to wire speed, we noticed that a wire speed adjustment of +/-20 IPM typically alleviates the issues. We also noticed that video cameras within close proximity to the Pro Pulse 220 MTS, when welding in a pulse program, show the interference in the recorded picture.

Although the spray arc transfer itself is almost silent (just a slight hiss), the sound of the pulse is well noticeable. It sounds, at times, much like an AC TIG welding machine. If you are used to the classic MIG frying bacon sound, getting used to the sound of the Pro Pulse 220 MTS will take a little time.