

# Owner's Manual & Safety Instructions

**Save This Manual** Keep this manual for the safety warnings and precautions, assembly, operating, inspection, maintenance and cleaning procedures. Write the product's serial number in the back of the manual near the assembly diagram (or month and year of purchase if product has no number). Keep this manual and the receipt in a safe and dry place for future reference.

21j

# TITANIUM™

## UNLIMITED140™

**MULTIPROCESS INVERTER POWER SOURCE  
WIRE FEEDER AND GUN PACKAGE**

**58828**



Visit our website at: <http://www.harborfreight.com>  
Email our technical support at: [productsupport@harborfreight.com](mailto:productsupport@harborfreight.com)

When unpacking, make sure that the product is intact and undamaged. If any parts are missing or broken, please call 1-888-380-0318 as soon as possible.

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No portion of this manual or any artwork contained herein may be reproduced in any shape or form without the express written consent of Harbor Freight Tools. Diagrams within this manual may not be drawn proportionally. Due to continuing improvements, actual product may differ slightly from the product described herein. Tools required for assembly and service may not be included.






### **⚠ WARNING**

Read this material before using this product. Failure to do so can result in serious injury. **SAVE THIS MANUAL.**

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## WARNING SYMBOLS AND DEFINITIONS

	This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	Addresses practices not related to personal injury.

## IMPORTANT SAFETY INFORMATION

### WARNING

**Read all safety warnings and instructions.**

*Failure to follow the warnings and instructions may result in electric shock, fire and/or serious injury.*

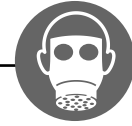
**Save all warnings and instructions for future reference.**

### General Safety

**PROTECT yourself and others. Read and understand this information.**

1. **Before use, read and understand manufacturer's instructions, Material Safety Data Sheets (MSDS's), employer's safety practices, and ANSI Z49.1.**
2. **Keep out of reach of children.**  
Keep children and bystanders away while operating.
3. **Place the welder on a stable location before use.**  
If it falls while plugged in, severe injury, electric shock, or fire may result.
4. **Do not overreach.**  
**Keep proper footing and balance at all times.**
5. **Stay alert, watch what you are doing and use common sense when operating a welder. Do not use a welder while you are tired or under the influence of drugs, alcohol or medication.**  
*A moment of inattention while operating welders may result in serious personal injury.*
6. **Avoid unintentional starting.** Make sure you are prepared to begin work before turning on the Welder.
7. **Never leave the Welder unattended while energized.** Turn power off if you have to leave.
8. **The warnings, precautions, and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur.** It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

# Fume and Gas Safety



## INHALATION HAZARD: Welding and Plasma Cutting Produce toxic fumes.

- Exposure to welding or cutting exhaust fumes can increase the risk of developing certain cancers, such as cancer of the larynx and lung cancer.** Also, some diseases that may be linked to exposure to welding or plasma cutting exhaust fumes are:
  - Early onset of Parkinson's Disease
  - Heart disease
  - Ulcers
  - Damage to the reproductive organs
  - Inflammation of the small intestine or stomach
  - Kidney damage
  - Respiratory diseases such as emphysema, bronchitis, or pneumoniaUse natural or forced air ventilation and wear a respirator approved by NIOSH to protect against the fumes produced to reduce the risk of developing the above illnesses.
- Do not use near degreasing or painting operations.**
- Keep head out of fumes.**  
Do not breathe exhaust fumes.
- Use enough ventilation, exhaust at arc, or both, to keep fumes and gases from breathing zone and general area.** If engineering controls are not feasible, use an approved respirator.
- Work in a confined area only if it is well-ventilated, or while wearing an air-supplied respirator.**
- Have a recognized specialist in Industrial Hygiene or Environmental Services check the operation and air quality and make recommendations for the specific welding situation.**  
Follow OSHA guidelines for Permissible Exposure Limits (PEL's) and the American Conference of Governmental Industrial Hygienists recommendations for Threshold Limit Values (TLV's) for fumes and gases.

# Arc Ray Safety

## ARC RAYS can injure eyes and burn skin.



- Wear ANSI-approved welding eye protection featuring at least a number 10 shade lens rating.**
- Wear leather leggings, fire resistant shoes or boots during use.** Do not wear pants with cuffs, shirts with open pockets, or any clothing that can catch and hold molten metal or sparks.
- Keep clothing free of grease, oil, solvents, or any flammable substances.**  
Wear dry, insulating gloves and protective clothing.
- Wear an approved head covering to protect the head and neck.** Use aprons, cape, sleeves, shoulder covers, and bibs designed and approved for welding and cutting procedures.
- When welding/cutting overhead or in confined spaces, wear flame resistant ear plugs or ear muffs to keep sparks out of ears.**

## Electrical Safety



**ELECTRIC SHOCK can KILL.**

1. **Turn off, disconnect power, and discharge electrode to ground before setting down torch/electrode holder and before service.**
2. **Do not touch energized electrical parts.** Wear dry, insulating gloves. Do not touch electrode holder, electrode, welding torch, or welding wire with bare hand. Do not wear wet or damaged gloves.
3. **Connect to grounded, GFCI-protected power supply only.**
4. **Do not use near water or damp objects.**
5. **People with pacemakers should consult their physician(s) before use.** Electromagnetic fields in close proximity to heart pacemaker could cause pacemaker interference or pacemaker failure.
6. **Do not expose welders to rain or wet conditions.** Water entering a welder will increase the risk of electric shock.
7. **Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the welder. Keep cord away from heat, oil, sharp edges or moving parts. Damaged or entangled cords increase the risk of electric shock.**
8. **Do not use outdoors.**
9. **Insulate yourself from the workpiece and ground.** Use nonflammable, dry insulating material if possible, or use dry rubber mats, dry wood or plywood, or other dry insulating material large enough to cover your full area of contact with the work or ground.

## Fire Safety



**ARC AND HOT SLAG can cause fire.**

1. **Clear away or protect flammable objects.** Remove or make safe all combustible materials for a radius of 35 feet (10 meters) around the work area. Use a fire resistant material to cover or block all open doorways, windows, cracks, and other openings.
2. **Keep ABC-type fire extinguisher near work area and know how to use it.**
3. **Maintain a safe working environment.** Keep the work area well lit. Make sure there is adequate surrounding workspace. Keep the work area free of obstructions, grease, oil, trash, and other debris.
4. **Do not operate welders in atmospheres containing dangerously reactive or flammable liquids, gases, vapors, or dust.** Provide adequate ventilation in work areas to prevent accumulation of such substances. *Welders create sparks which may ignite flammable substances or make reactive fumes toxic.*
5. **If working on a metal wall, ceiling, etc., prevent ignition of combustibles on the other side by moving the combustibles to a safe location.** If relocation of combustibles is not possible, designate someone to serve as a fire watch, equipped with a fire extinguisher, during the cutting process and for at least one half hour after the cutting is completed.
6. **Do not weld or cut on materials having a combustible coating or combustible internal structure, as in walls or ceilings, without an approved method for eliminating the hazard.**
7. **Do not dispose of hot slag in containers holding combustible materials.**
8. **After welding, make a thorough examination for evidence of fire.** Be aware that easily visible smoke or flame may not be present for some time after the fire has started.
9. **Do not apply heat to a container that has held an unknown substance or a combustible material whose contents, when heated, can produce flammable or explosive vapors.** Clean and purge containers before applying heat. Vent closed containers, including castings, before preheating, welding, or cutting.

# Welder Use and Care

1. **Do not use the welder if the switch does not turn it on and off.** *Any welder that cannot be controlled with the switch is dangerous and must be repaired.*
2. **Disconnect the plug from the power source before making any adjustments, changing accessories, or storing welders.** *Such preventive safety measures reduce the risk of starting the welder accidentally.*
3. **Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source or moving the welder.** *Carrying or energizing welders that have the switch on invites accidents.*
4. **Store idle welders out of the reach of children and do not allow persons unfamiliar with the welder or these instructions to operate the welder.** Welders are dangerous in the hands of untrained users.
5. **Use the welder and accessories in accordance with these instructions, taking into account the working conditions and the work to be performed.** *Use of the welder for operations different from those intended could result in a hazardous situation.*
6. **Do not use the welder for pipe thawing.**

## Maintenance

1. **Maintain welders. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the welder's operation. If damaged, have the welder repaired before use.** *Many accidents are caused by poorly maintained welders.*
2. **Have your welder serviced by a qualified repair person using only identical replacement parts.** *This will ensure that the safety of the welder is maintained.*
3. **Maintain labels and nameplates on the Welder.** These carry important information. If unreadable or missing, contact Harbor Freight Tools for a replacement.
4. **Unplug before maintenance.** Unplug the Welder from its electrical outlet before any inspection, maintenance, or cleaning procedures.

## Gas Shielded Welding – Cylinder Safety

Cylinders can explode when damaged.



1. **Never weld on a pressurized or a closed cylinder.**
2. **Never allow an electrode holder, electrode, welding torch, or welding wire to touch the cylinder.**
3. **Keep cylinders away from any electrical circuits, including welding circuits.**
4. **Keep protective cap in place over the valve except when the cylinder is in use.**
5. **Use only correct gas shielding equipment designed specifically for the type of welding you will do.** Maintain this equipment properly.
6. **Protect gas cylinders from heat, being struck, physical damage, slag, flames, sparks, and arcs.**
7. **Always use proper procedures to move cylinders.**



**SAVE THESE INSTRUCTIONS.**

## Grounding

### **⚠ WARNING**



**TO PREVENT ELECTRIC SHOCK AND DEATH  
FROM INCORRECT GROUNDING WIRE CONNECTION:**

Check with a qualified electrician if you are in doubt as to whether the outlet is properly grounded.

Do not use the Welder if the power cord or plug is damaged. If damaged, have it repaired by a service facility before use. If the plug will not fit the outlet, have a proper outlet installed by a qualified electrician, do not use adapter plugs.

1. The green wire inside the cord is connected to the grounding system in the Welder. The green wire in the cord must be the only wire connected to the Welder's grounding system and must never be attached to an electrically "live" terminal. Never leave the grounding wire disconnected or modify the Power Cord Plug in any way.
2. Make sure the tool is connected to an outlet having the same configuration as the plug. If the tool must be reconnected for use on a different type of electric circuit, the reconnection should be made by qualified service personnel; and after reconnection, the tool should comply with all local codes and ordinances.

## Extension Cords

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Do not use an extension cord on this Welder.







## Replacement Cords



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1. Use only the supplied power cord for this Welder or an identical replacement cord.
2. Do not install a thinner or longer cord on this Welder.
3. Do not patch cords of any length together for this item. Patches may allow moisture to penetrate the insulation, resulting in electric shock.

# **TITANIUM**<sup>TM</sup>

## Symbology

	Wire Feed (Speed)
	Workpiece Ground Cable
	Torch Cable
	Overheat Shutdown Indicator
	Cooling Fan
	Housing Ground Point
<b>VAC</b>	Volts Alternating Current
<b>A</b>	Amperes
<b>OCV</b>	Open Circuit Voltage
<b>KVA</b>	Kilovolt Amperes (Volts / 1000 * Amperes)

<b>IPM</b>	Inches Per Minute
<b>AWG</b>	American Wire Gauge
	Electric Shock Hazard. Do not touch energized parts.
	Inhalation Hazard. Keep head out of fumes and use proper ventilation.
	Read manual before setup and/or use.
	Fire Hazard. Keep flammable materials away during welding. Spatter can cause accidental fires.
	Arc Ray Hazard. Wear welding helmet with properly rated filter lens.
	Pacemaker Hazard. Welding processes may interfere with pacemakers. Consult doctor before use.

## Specifications

<b>Power Input</b>	120VAC / 60Hz
<b>Current Input</b>	GMAW/FCAW: 21A SMAW: 21.3A GTAW: 20.5A
<b>Welding Current Range</b>	GMAW/FCAW: 30–140A SMAW: 30–75A GTAW: 20–110A
<b>Rated Duty Cycle</b>	GMAW/FCAW: 30% @ 90A SMAW: 40% @ 75A GTAW: 20% @ 110A
<b>Open Circuit Voltage</b>	69VDC
<b>Wire Speed</b>	80–275 IPM
<b>Welding Wire Capacity</b>	Solid Core: 0.025" / 0.030" / 0.035" Flux Cored: 0.030" / 0.035"
<b>Wire Spool Capacity</b>	Up to 12 lb spool

# Front Panel Controls

SAFETY

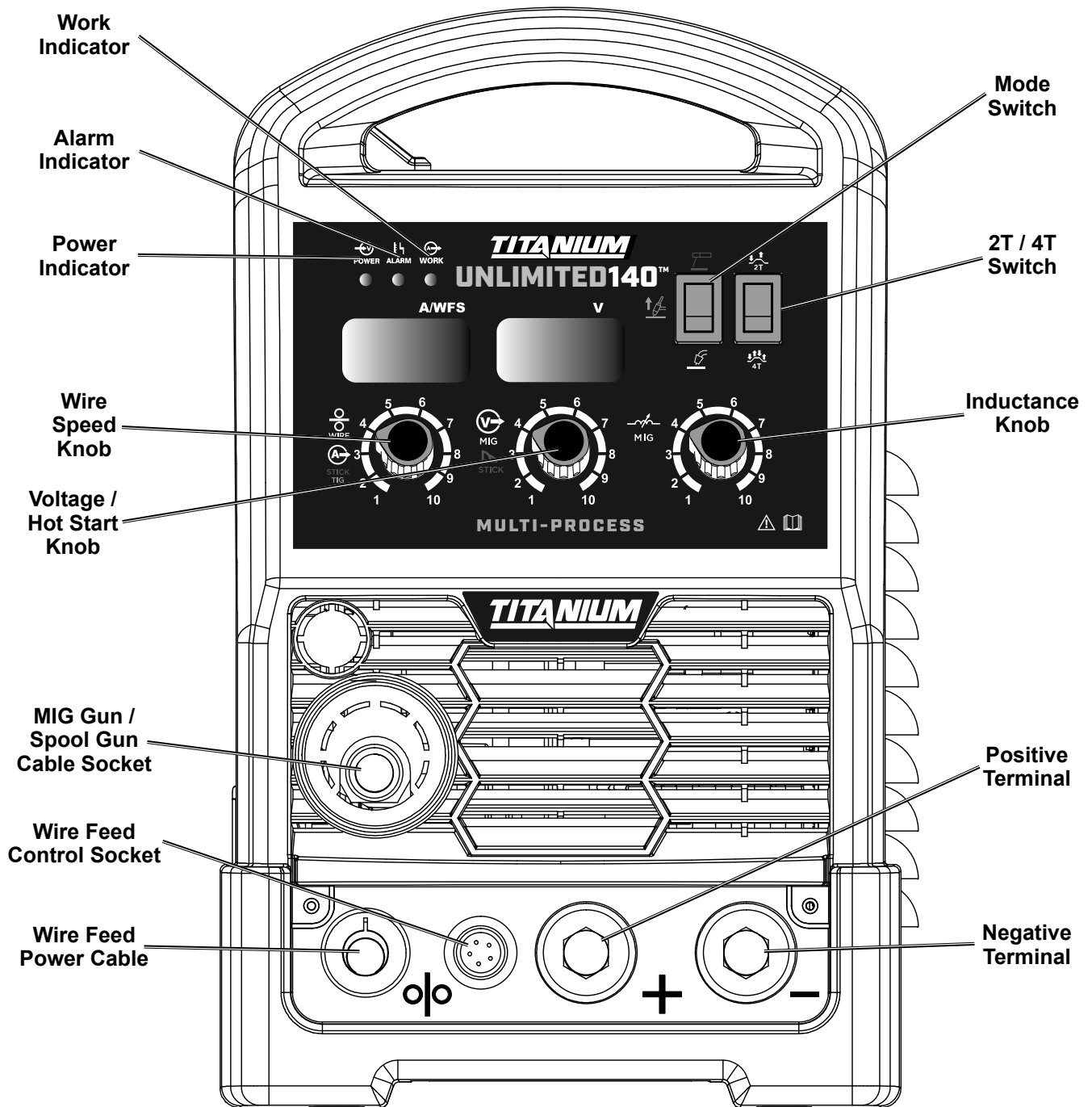
CONTROLS

WIRE

TIG / STICK

WELDING TIPS

MAINTENANCE



**Alarm Indicator:** Lights up if there is a problem with welder operation. See *Alarm Indicator Error Codes* on page 38.

**Wire Speed Knob:** Controls the speed that the welding wire feeds out of the MIG Gun or Spool Gun and the output amperage of the Welder.

**MIG Gun/Spool Gun Cable Socket:** The MIG Gun and Spool Gun Cables connect here. The wire, welding current, and shielding gas (if performing MIG) feed to the welding gun through here.

**Wire Feed Control Socket:** Connect the Wire Feed Control Cable here.

**2T/4T Switch:** Use this to set the Gun Trigger operation to either 2T or 4T mode:

**2T (2 touch) mode:**

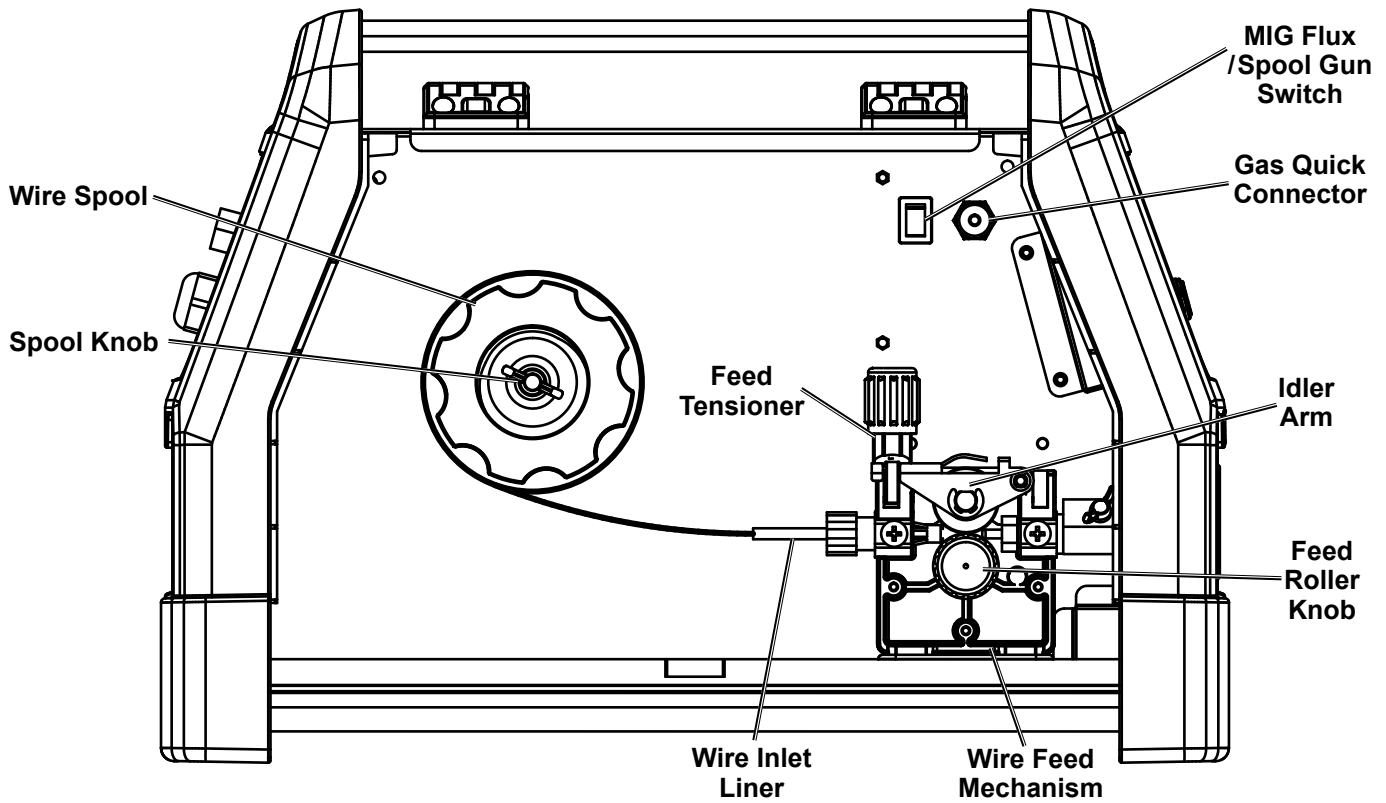
1. Squeeze the trigger to start the welding current.
2. Release trigger to stop the welding current.

**4T (4 touch) mode:**

1. Squeeze trigger to start welding.
2. Release trigger during welding.
3. Squeeze and release trigger to shut welding current off.



# Interior Controls



**Note:** When using an optional Spool Gun (sold separately), disconnect the Wire Feed Gas Hose from the Gas Quick Connector, thread the gas hose from the Spool Gun through the round hole in the front of the Welder and connect it to the Gas Quick Connector, and place the MIG Flux/Spool Gun Switch on the Spool Gun setting. For all other welding, place the MIG Flux/Spool Gun Switch on the MIG Flux Gun setting and connect the Wire Feed Gas Hose to the Gas Quick Connector. The collar on the Gas Quick Connector must click into place after attaching any hose to it.

# Weld Settings

Refer to the Settings Chart on the inside of the Welder door for MIG Weld settings. The chart is only intended to show general guidelines for different wire/electrode sizes and for different thicknesses of material. The initial settings used at the beginning of a weld may need to be adjusted after stopping and carefully inspecting the weld. Proper welding takes experience.



## Wire Welding



Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

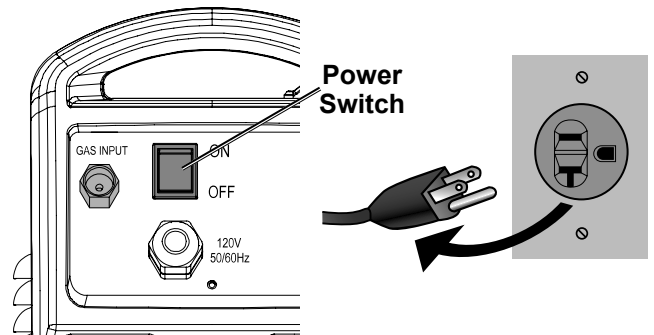


**TO PREVENT SERIOUS INJURY FROM ACCIDENTAL OPERATION:**  
Turn the Power Switch off and unplug the Welder before setup.

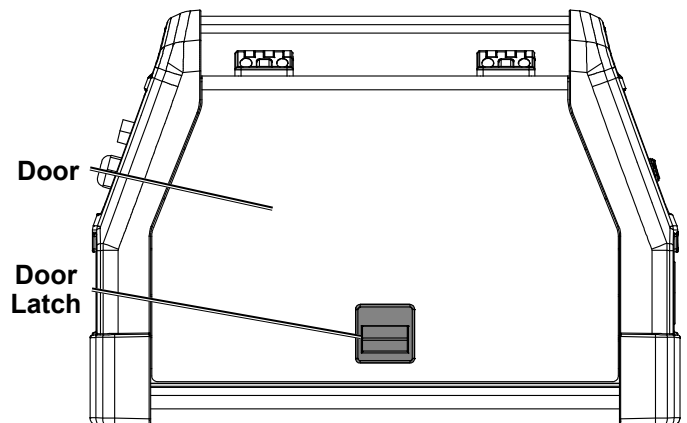
**Note:** Remove the protective foam and cardboard from the Welder before setup.

## Wire Spool Installation/Wire Setup

1. Turn the Power Switch OFF and unplug the Welder before proceeding.

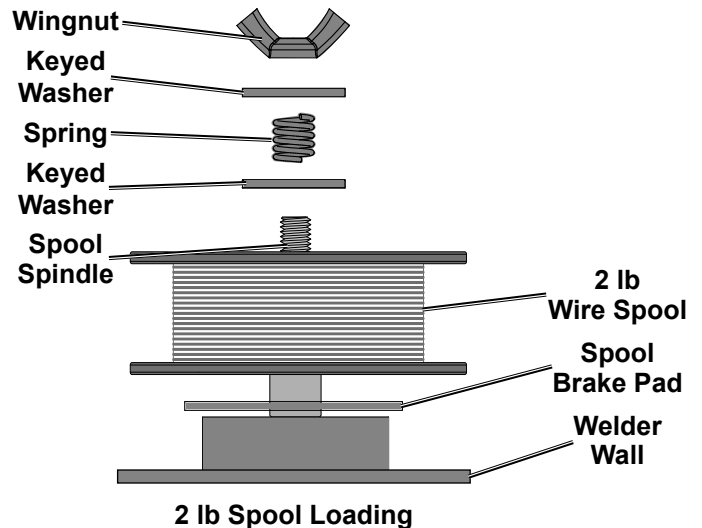


2. Pull up on the Door Latch, then open the Door.



3. **2 Pound Wire Spool Installation:**  
Remove the Wingnut, Keyed Washers, and Spring. If replacing a Spool, remove the old Spool and all remaining wire from the liners.

4. Place the new Wire Spool over the Spool Spindle and against the Spool Brake Pad as illustrated. **To prevent wire feed problems, set the Spool so that it will unwind counterclockwise.**



5. Line up the Keyed Washers with the groove on the Spindle. Replace the Keyed Washers and Spring over the Spool Spindle and secure Spool in place with the Wingnut.

**Notice:** If Wire Spool can spin freely, Wingnut is too loose. This will cause the welding wire to unravel and unspool which can cause tangling and feeding problems.

6. **10-12 Pound Wire Spool Installation:**  
Remove the Wingnut, Keyed Washers, and Spring. If replacing a Spool, remove the old Spool and all remaining wire from the liners.

7. Place the Spool Adapter over the Spool Spindle and against the Spool Brake Pad as illustrated.

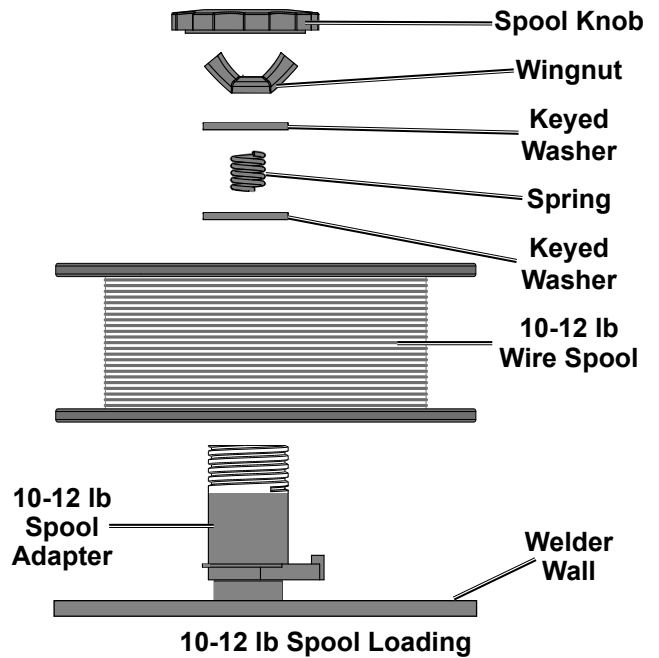
8. Place the new Wire Spool over the Adapter and line up pin on Adapter with hole in Spool. **To prevent wire feed problems, set the Spool so that it will unwind counterclockwise.**

9. Line up the Keyed Washers with the groove on the Spindle. Replace the Keyed Washers and Spring over the Spool Spindle and secure Spool in place with the Wingnut.

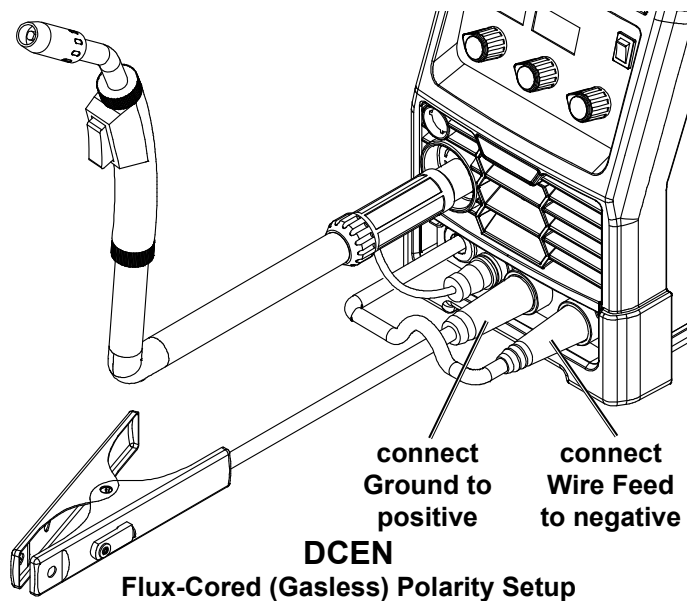
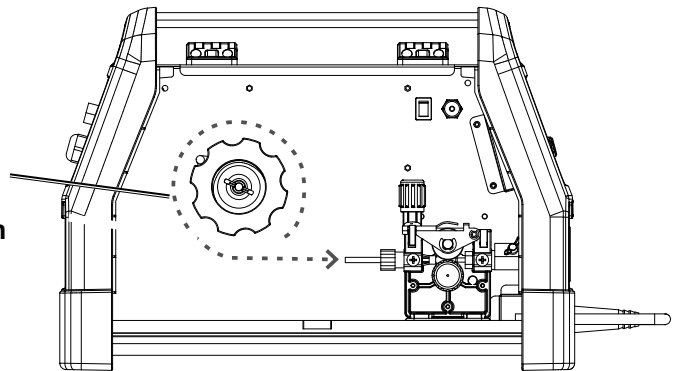
**Notice:** If Wire Spool can spin freely, Wingnut is too loose. This will cause the welding wire to unravel and unspool which can cause tangling and feeding problems.

10. Screw the Spool Knob into the Spool Adapter.

11. **DCEN Direct Current Electrode Negative Wire Setup for Flux-Cored (gasless) welding:**  
Connect the Wire Feed Connector to the Negative Terminal on the front of the Welder. Connect the Ground Cable to the Positive Terminal on the front of the Welder.

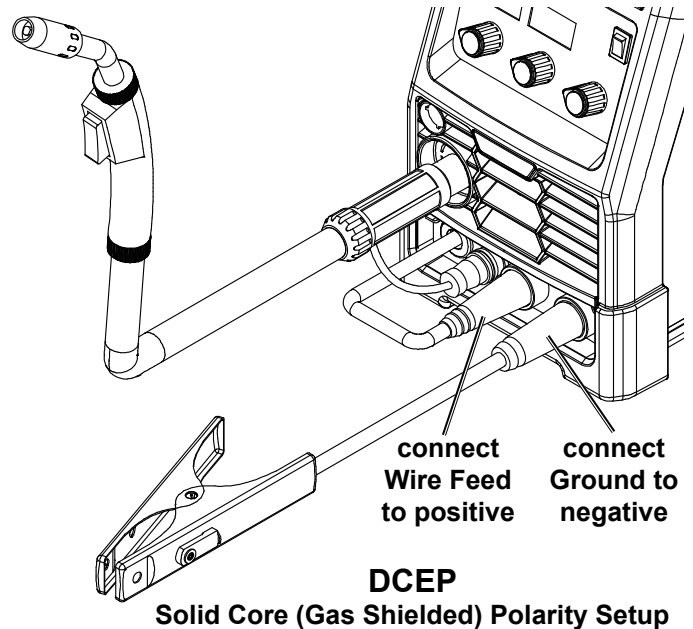


Wire must unwind in this direction



12. **DCEP Direct Current Electrode Positive Wire Setup for Solid Core (gas shielded) welding:**

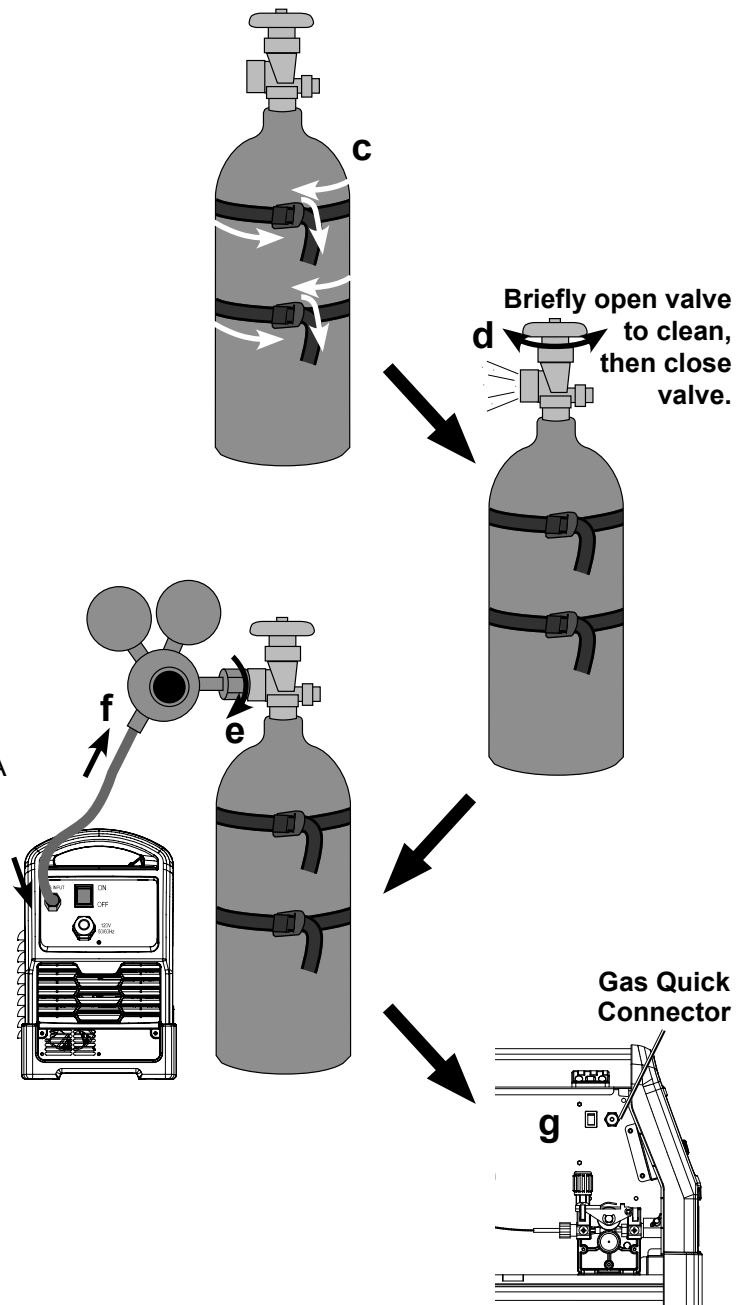
- Connect the Wire Feed Connector to the Positive Terminal on the front of the Welder. Connect the Ground Cable to the Negative Terminal on the front of the Welder.
- Determine which type of shielding gas would be appropriate for the welding you will do. Refer to the Settings Chart on the inside of the Welder door.



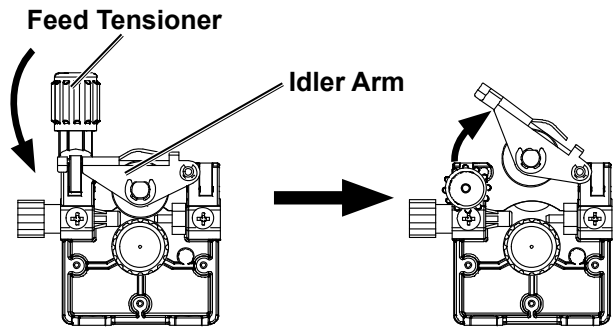
- With assistance, set the cylinder (not included) onto a cabinet or cart near the Welder and secure the cylinder in place with two straps (not included) to prevent tipping.
- Remove the cylinder's cap. Stand to the side of the valve opening, then open the valve briefly to blow dust and dirt from the valve opening. Close the cylinder valve.
- Locate the Regulator (included) and close its valve until it is loose, then thread Regulator onto cylinder and wrench tighten connection.

**Note:** When using C100 shielding gas, connect a CGA 580/320 adapter (not included) to the inlet connection of the Regulator and wrench tighten. Thread the adapter onto the gas cylinder and wrench tighten.

- Attach the Gas Hose (included) to the Regulator's outlet and the Welder's gas inlet. Wrench-tighten both connections.
- Connect the Wire Feed Gas Hose within the Welder to the Gas Quick Connector. The collar on the Gas Quick Connector must click into place after attaching any hose to it.



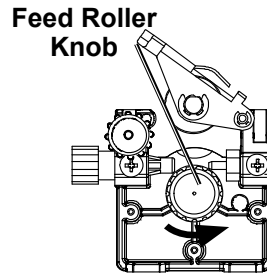
13. Turn the Feed Tensioner knob counterclockwise to loosen it enough to pull it down to remove tension. The spring-loaded Idler Arm will move up as shown.



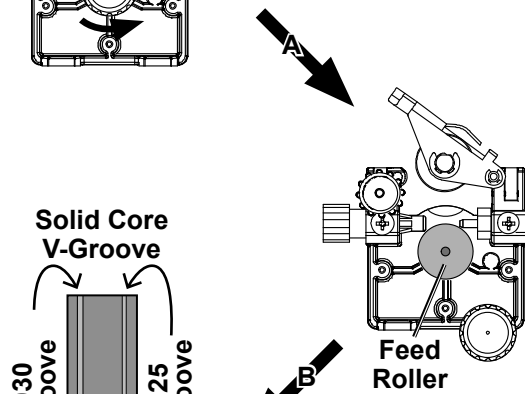
14. **Feed Roller Instructions:**

Check that the Feed Roller is correct for the type of wire being used (solid core or flux-cored) and that it is turned to properly match the wire size marked on the Wire Spool:

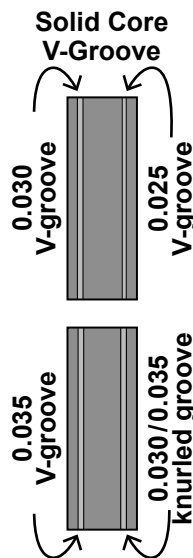
- a. Unscrew the Feed Roller Knob counterclockwise.



- b. Remove the Feed Roller Knob to expose the Feed Roller.

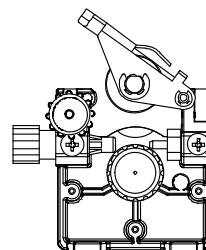


- c. Flip or replace the Feed Roller as needed and confirm that it is the correct Roller for the type of wire being used and that **the number showing is the same as the wire diameter on the Spool.**

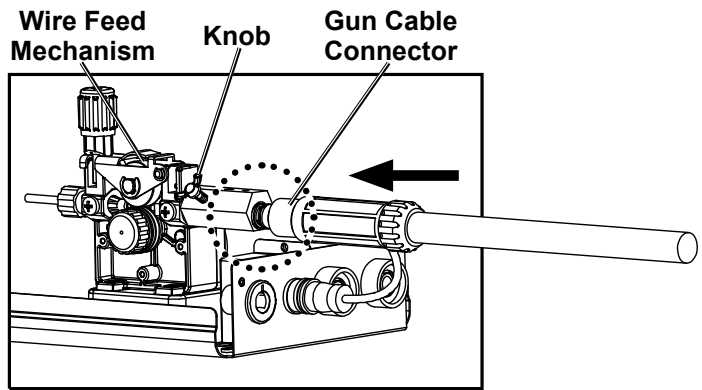


**Note:** The knurled groove is used for flux-cored wire. The V-grooves are used for solid / MIG wire.

- d. Screw the Feed Roller Knob back into place to secure the Feed Roller.



15. Loosen the Knob on the Wire Feed mechanism, then insert the Gun Cable Connector through the hole on the Welder front and into the socket on the Wire Feed.



Incorrect—Connector not fully inserted

16. Ensure that the Gun Cable Connector is fully inserted into the socket on the Wire Feed mechanism as shown.

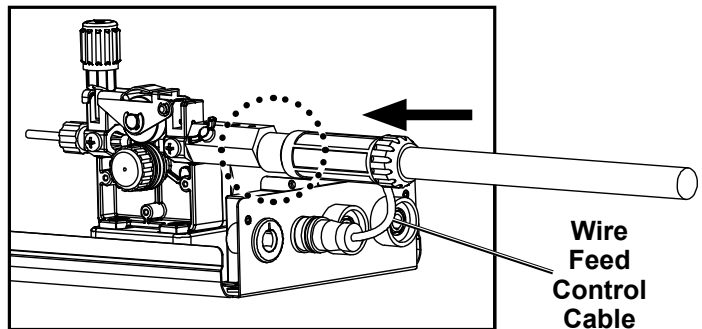
**No O-ring should be visible.**

Tighten the Knob securely.

If Connector is not fully inserted, the gas connection will leak, preventing shielding gas from reaching the welding arc.

**NOTICE:** To prevent damage, do not overtighten the Knob.

17. Connect the Wire Feed Control Cable to the Wire Feed Control Socket located on the front of the machine. Press it in until the collar snaps into place. Note that the plug on the Cable fits into the Socket in one specific orientation only. To disconnect it, pull the collar back first.



Correct—Connector fully inserted

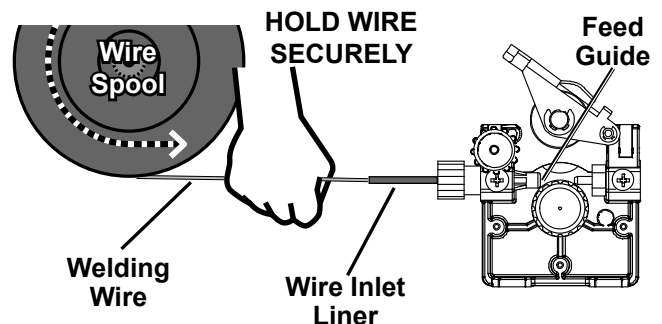
### IMPORTANT

Securely hold onto the end of the welding wire and keep tension on it during the following steps.

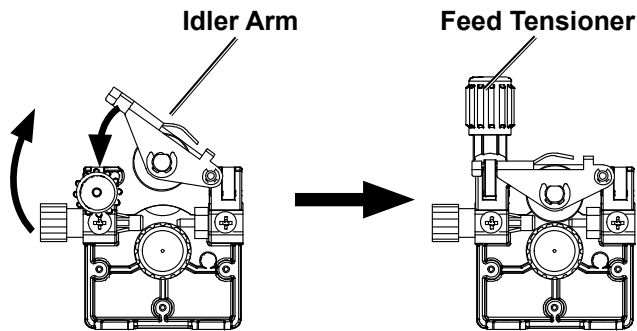
If this is not done, the welding wire will unravel and unspool which can cause tangling and feeding problems.

18. Cut off all bent and crimped wire. The cut end must have no burrs or sharp edges; cut again if needed.

19. Keep tension on the wire and guide at least 12 inches of wire into the Wire Inlet Liner and Feed Guide.



20. Make sure the welding wire is resting in the groove of the Feed Roller, then push the wire Idler Arm down, and swing the Feed Tensioner up to latch it across the tip of the arm.  
 After the wire is held by the Tensioner, you may release it.

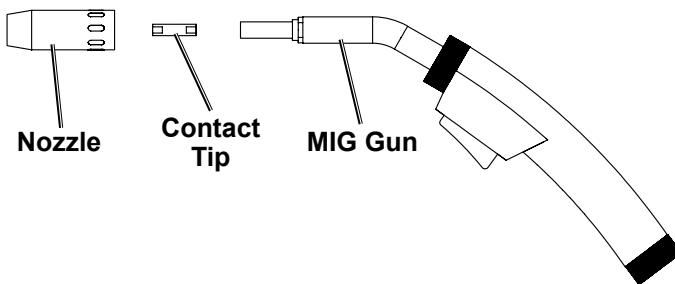


**Note:** The tension should be 3–5 for solid wire and 2–3 for flux-cored wire. Too much force on flux-cored wire will crush it and may cause feeding issues.

21. Pull and twist the Nozzle to remove it.

22. Unscrew the Contact Tip counterclockwise and remove.

23. Lay the MIG Gun Cable out in a straight line so that the welding wire moves through it easily. Leave the cover open, so that the feed mechanism can be observed.



**IMPORTANT**

Stainless steel wire is less flexible than other welding wire. Therefore, it is more difficult to feed through the liner and gun. It is especially important to keep the gun cable straight while feeding stainless steel wire.



**⚠ WARNING**

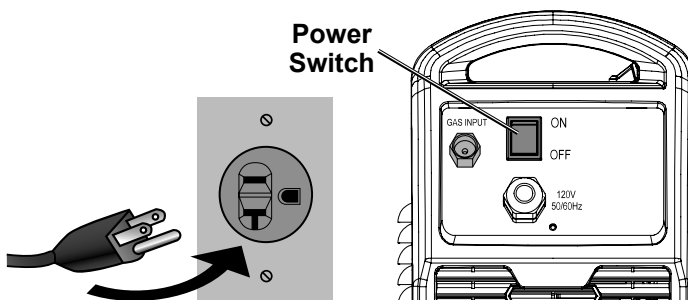
The following steps require applying power to the Welder with the cover open.

**To prevent serious injury from fire or electric shock:**

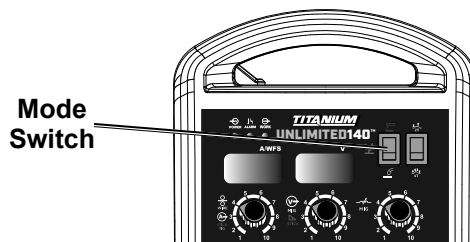
1. Do not touch anything, especially not the Ground Clamp, with the Gun or welding wire or an arc will be ignited.
2. Do not touch internal Welder components while it is plugged in.

24. Do not touch the Gun's Trigger. Turn the Power Switch OFF before connecting the Power Cord.

25. Plug the Power Cord into a properly grounded, GFCI protected 120 VAC (20 amp rated) receptacle that matches the plug and turn the Power Switch ON. The circuit must be equipped with delayed action-type circuit breaker or fuses.



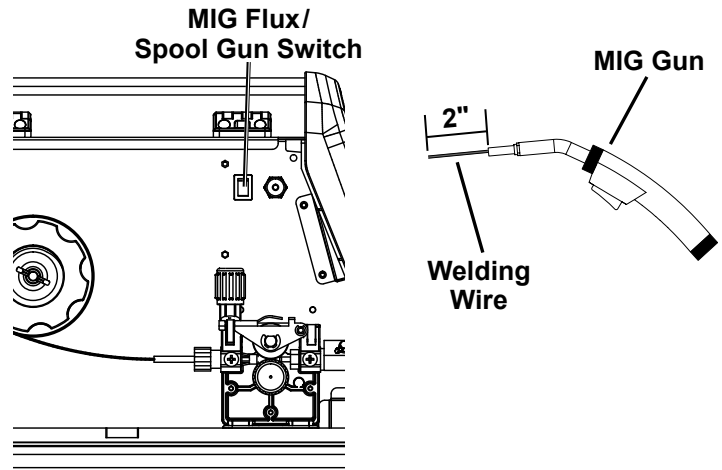
26. Set the Mode Switch to the bottom, wire welding setting.



27. Set the MIG Flux/Spool Gun Switch to MIG Flux Gun.
28. Point the Gun away from all objects. Press and hold the Trigger until the wire feeds through the end of the Gun two inches.

**The wire liner may come out with the welding wire. This is normal, just turn off the Welder and push the wire liner back into the Gun.**

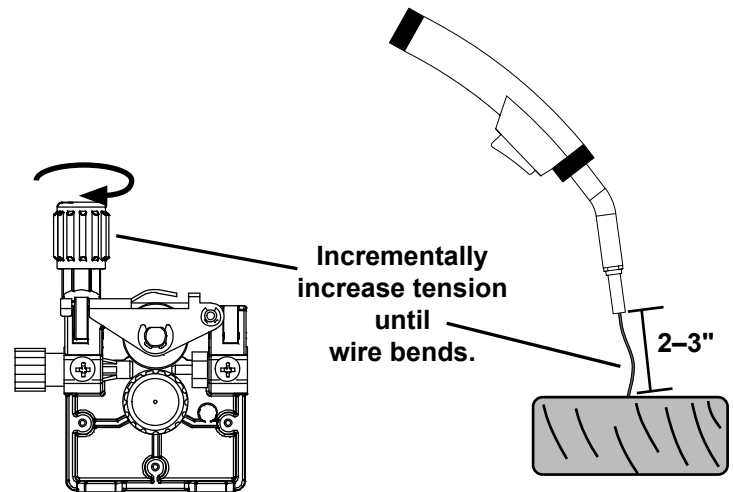
If the wire does not feed properly and the Spool is stationary, turn OFF and unplug the Welder and slightly tighten the Feed Tensioner clockwise before retrying.



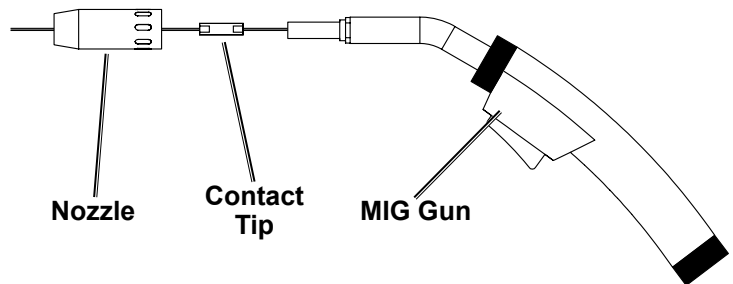
29. To check the wire's drive tension, press and hold Trigger to feed the wire against a piece of wood from 2 to 3 inches away.

If the wire stops instead of bending, unplug the Welder, slightly tighten the Feed Tensioner clockwise, and try again. If the wire bends from the feed pressure, then the tension is set properly.

30. Turn OFF the Power Switch and unplug the Power Cord from its electrical outlet.

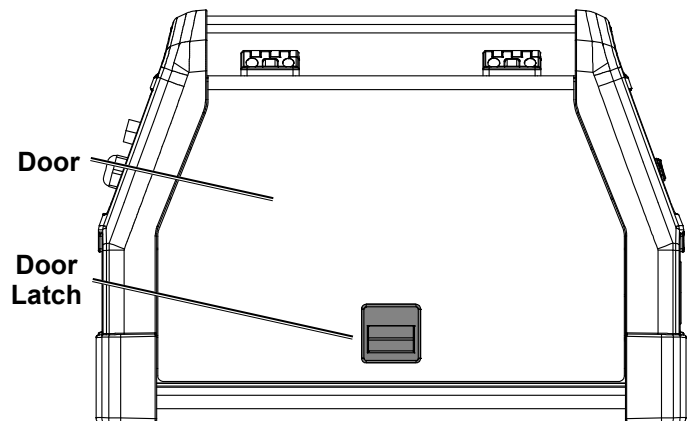


31. Select a Contact Tip that is compatible with the welding wire used. Slide the Contact Tip over the wire and thread it clockwise into the MIG Gun. Tighten the Contact Tip.



32. Replace the Nozzle and cut the wire off at 1/2" from tip (1/2" stickout).

33. Close the Door. Make sure Door is securely latched.





# Basic Welding



Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before welding.

## ⚠️ WARNING

### TO PREVENT SERIOUS INJURY:

Protective gear must be worn when using the Welder; minimum shade number 10 full face shield (or welding mask), ear protection, welding gloves, sleeves and apron, NIOSH-approved respirator, and fire resistant work clothes without pockets should be worn when welding.

Light from the arc can cause permanent damage to the eyes and skin.

Do not breathe arc fumes.

Flux-cored wire welding is used to weld mild steel and stainless steel without shielding gas.

MIG welding uses solid wire and shielding gas, and is used to weld mild steel and stainless steel. MIG welding can also be used to weld thinner workpieces than flux-cored welding can.

Aluminum welding can be performed with an optional Spool Gun (sold separately) using aluminum wire and shielding gas.

Good welding takes a degree of skill and experience.

Practice a few sample welds on scrap before welding your first project. Additional practice periods are recommended whenever you weld:

- a different thickness of material
- a different type of material
- a different type of connection
- using a different process (MIG vs. Flux)

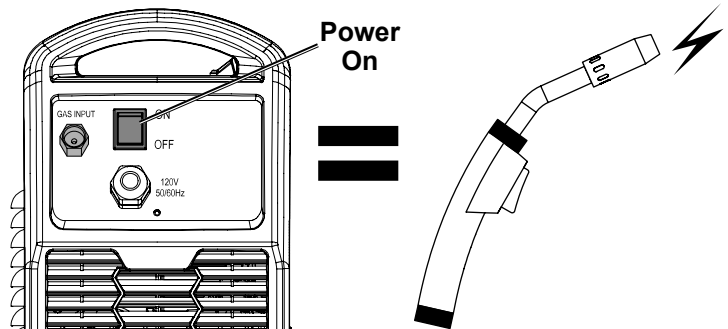
Make practice welds on pieces of scrap to practice technique before welding anything of value.



## ⚠️ WARNING



**TO PREVENT SERIOUS INJURY, FIRE AND BURNS:**  
Keep welding tip clear of grounded objects whenever unit is plugged in and turned on.



**Practice your welding technique on scrap pieces before welding anything of value.**

## Duty Cycle (Duration of Use)

**Avoid damage to the Welder by not welding for more than the prescribed duty cycle time.**

The Duty Cycle defines the number of minutes, within a 10 minute period, during which a given welder can produce a particular welding current without overheating.

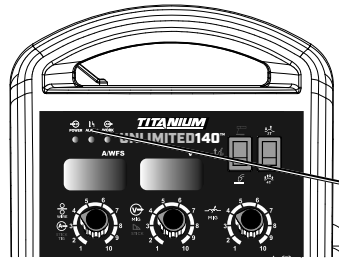
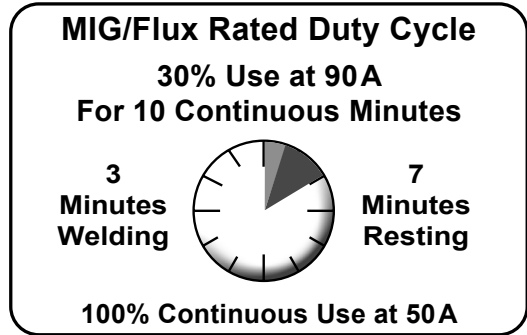
For example, a welder with a 30% duty cycle at 90A welding current must be allowed to rest for at least 7 minutes after every 3 minutes of continuous welding.

Failure to carefully observe any duty cycle limitations can easily over-stress a welder's power generation system contributing to premature welder failure.

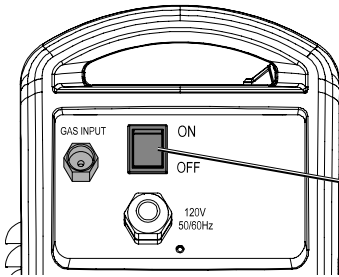
This Welder has an internal thermal protection system to help prevent this sort of over-stress. When the Welder overheats, it automatically shuts down and the Overload Indicator lights. The Welder automatically returns to service after cooling off. Should this occur, rest the MIG Gun on an electrically non-conductive, heat-proof surface, such as a concrete slab, well clear of the ground clamp.

**Allow the Welder to cool with the Power Switch on, so that the internal Fan will help cool the Welder.**

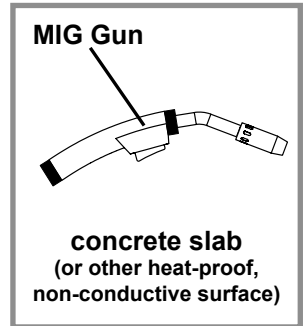
When the Overload Indicator is no longer lit and the Welder can be used again, use shorter welding periods and longer rest periods to prevent needless wear.



Overload Indicator



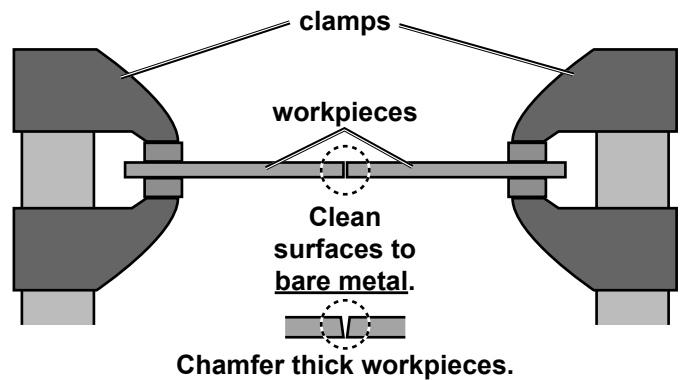
Power Switch



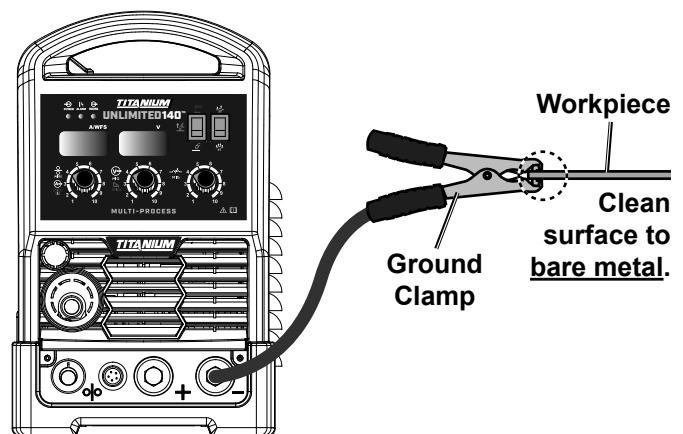
# Setting Up The Weld

1. **Make practice welds on pieces of scrap the same thickness as your intended workpiece to practice technique before welding anything of value.** Clean the weld surfaces thoroughly with a wire brush or angle grinder; there must be no rust, paint, oil, or other materials on the weld surfaces, only bare metal.
2. Use clamps (not included) to hold the workpieces in position so that you can concentrate on proper welding technique. The distance (if any) between the two workpieces must be controlled properly to allow the weld to hold both sides securely while allowing the weld to penetrate fully into the joint. The edges of thicker workpieces may need to be chamfered (or beveled) to allow proper weld penetration.

**Notice:** When welding equipment on a vehicle, disconnect the vehicle battery power from both the positive connection and the ground before welding. This prevents damage to some vehicle electrical systems and electronics due to the high voltage and high frequency bursts common in welding.

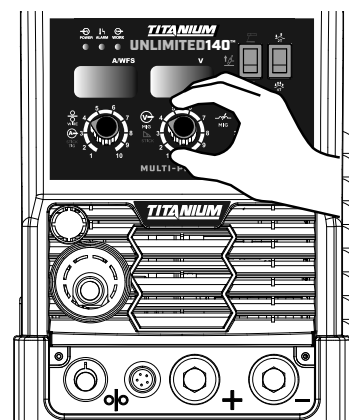


3. Clamp Ground Cable to bare metal on the workpiece near the weld area, or to metal work bench where the workpiece is clamped.



4. Set the Wire Speed, Voltage, and Inductance Knobs to the desired settings. Refer to the Settings Chart on the inside of the Welder door.

**Note:** The initial settings may need to be adjusted after stopping and carefully inspecting the weld. Proper welding takes experience.

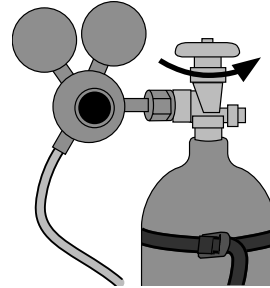


**DANGER! TO PREVENT DEATH FROM ASPHYXIATION:****Do not open gas without proper ventilation.****Fix gas leaks immediately.**

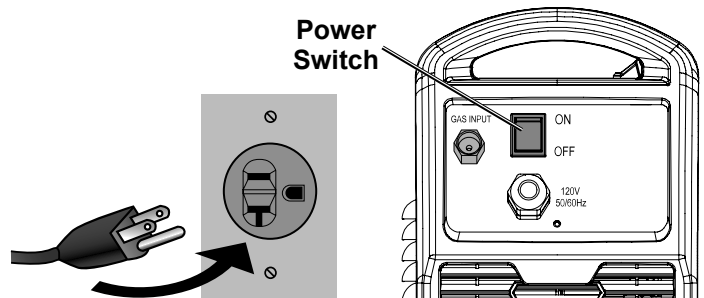
Shielding gas can displace air and cause rapid loss of consciousness and death.

**Shielding gas without carbon dioxide can be even more hazardous because asphyxiation can start without feeling shortness of breath.**

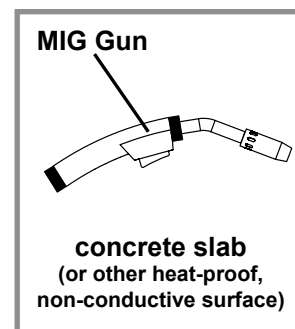
5. **Gas shielded, solid-core wire only:**
- Open gas cylinder valve all the way.
  - Set Flow Gauge to SCFH value indicated on Settings Chart.



6. Do not touch the Gun's Trigger. Turn the Power Switch OFF before connecting the Power Cord.
7. Plug the Power Cord into a properly grounded, GFCI protected 120 VAC (20 amp rated) receptacle that matches the plug. The circuit must be equipped with delayed action-type circuit breaker or fuses.



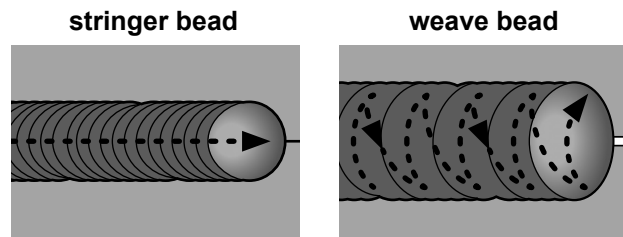
8. Set MIG Gun down on nonconductive, nonflammable surface away from any grounded objects. Turn the Power Switch ON.



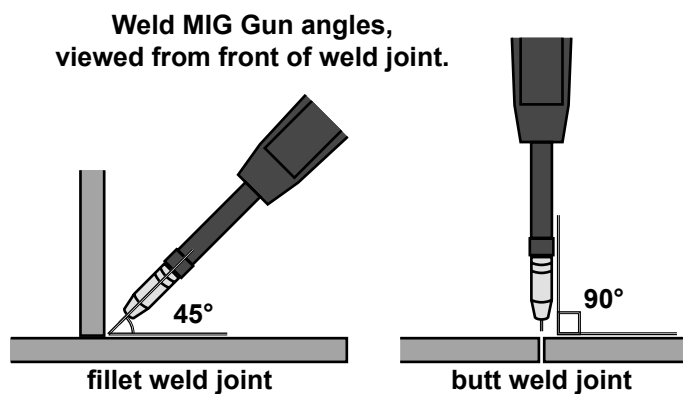
# Basic Welding Technique

1. Press (and hold) Trigger and contact the area to be welded with electrode wire to ignite arc.
2. For a narrow weld, you can usually draw the wire in a steady straight line. This is called a **stringer bead**.

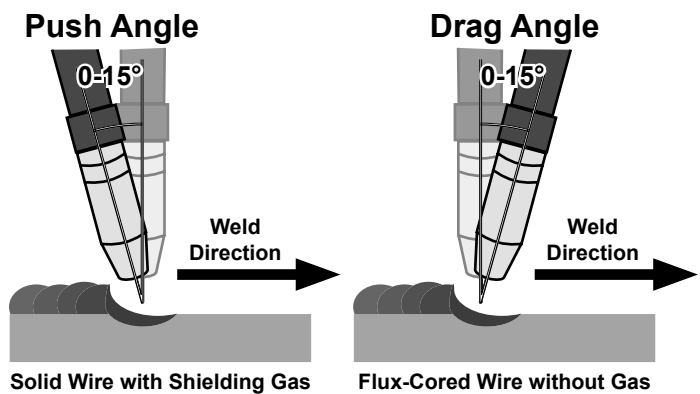
For a wider weld, draw the wire back and forth across the joint. This is called a **weave bead** and takes practice to perform properly.



3. Direct the welding wire straight into the joint. This gives an angle of 90° (straight up and down) for butt (end to end) welds, and an angle of 45° for fillet (T-shaped) welds.

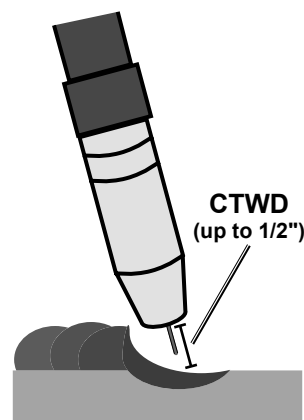


4. For MIG welding using solid wire and shielding gas, the end of the MIG Gun should be tilted so that wire is angled anywhere in-between straight on and 15° away from the direction you are welding. The amount of tilt is called the **push angle**.



5. When using flux-cored wire without shielding gas, the end of the MIG Gun should be tilted so that wire is angled anywhere in-between straight on and 15° in the direction you are welding. The amount of tilt is called the **drag angle**.

6. The Contact Tip should remain within 1/2" of the work surface. This distance is called **CTWD** - Contact Tip to Work Distance.



SAFETY

CONTROLS

WIRE

TIG / STICK

WELDING TIPS

MAINTENANCE

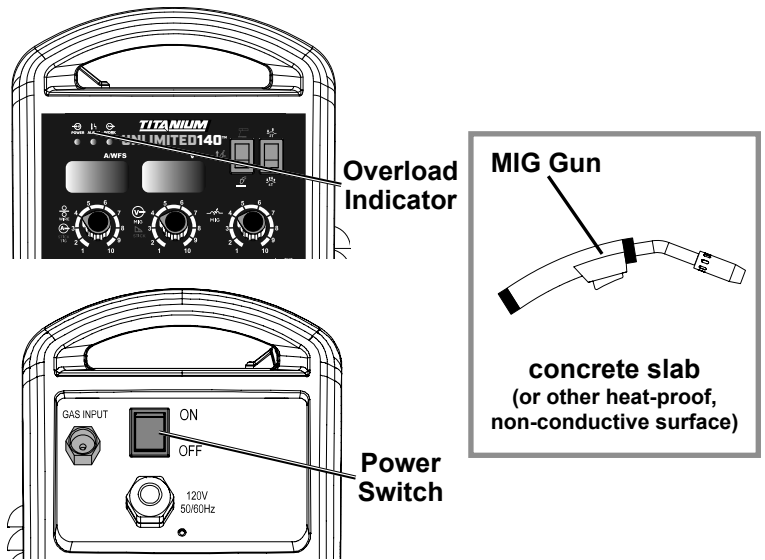
**Note:** If Welder is used too long, the Overload Indicator lights up and the unit automatically shuts down. The Welder automatically returns to service after cooling off. Should this occur, rest the MIG Gun on an electrically non-conductive, heat-proof surface, such as a concrete slab, away from the ground clamp.

**Allow the Welder to cool with the Power Switch on, so that the internal Fan will help cool the Welder.**

When the Overload Indicator is no longer lit and the Welder can be used again, use shorter welding periods and longer rest periods to help prevent needless wear.

7. **After welding the test weld on a piece of scrap for a few seconds, stop, and check your progress.** Clean, then compare your weld's appearance with the diagrams and descriptions in the **Welding Tips** section starting on the next page. After making any necessary adjustments, continue to weld **while carefully following the DUTY CYCLE guidelines as explained on page 18.**

**CAUTION!** Weld will be hot, do not touch.



**After practice welding for a few seconds, STOP and examine your weld using the guidelines starting on the next page.**

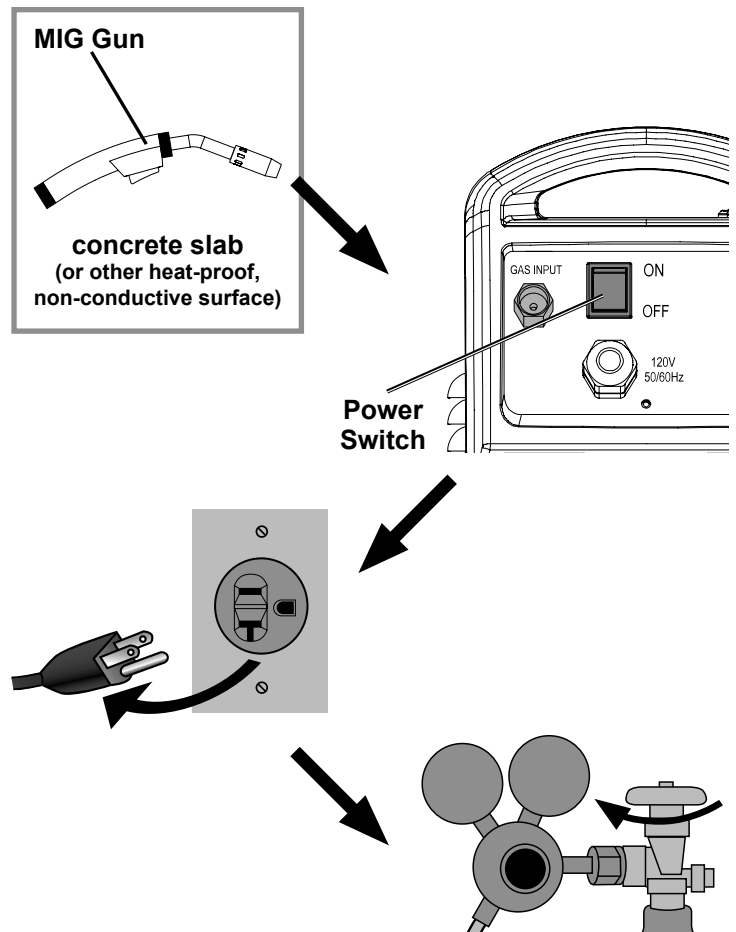
8. **When welding is complete, set the MIG Gun down on a heat-proof, electrically non-conductive surface.** Turn the Power Switch OFF.

9. Allow Welder to cool down, then unplug the Power Cord.

10. Remove Ground Clamp from workpiece or table and disconnect MIG Gun.

11. Respool wire by clipping wire, removing gas nozzle/contact tip on MIG Gun, releasing Idler Arm on Wire Feed mechanism, and rotating the Wire Spool counterclockwise. Be sure to securely hold wire as it is being respooled because the end of wire has a tendency to quickly unravel once it clears the wire feeder.

12. **MIG ONLY:** **Close shielding gas cylinder valve securely.** Remove Regulator and replace cap. Disconnect Gas Hose from Welder. Store and secure gas cylinder.



## TIG/Stick Welding



Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

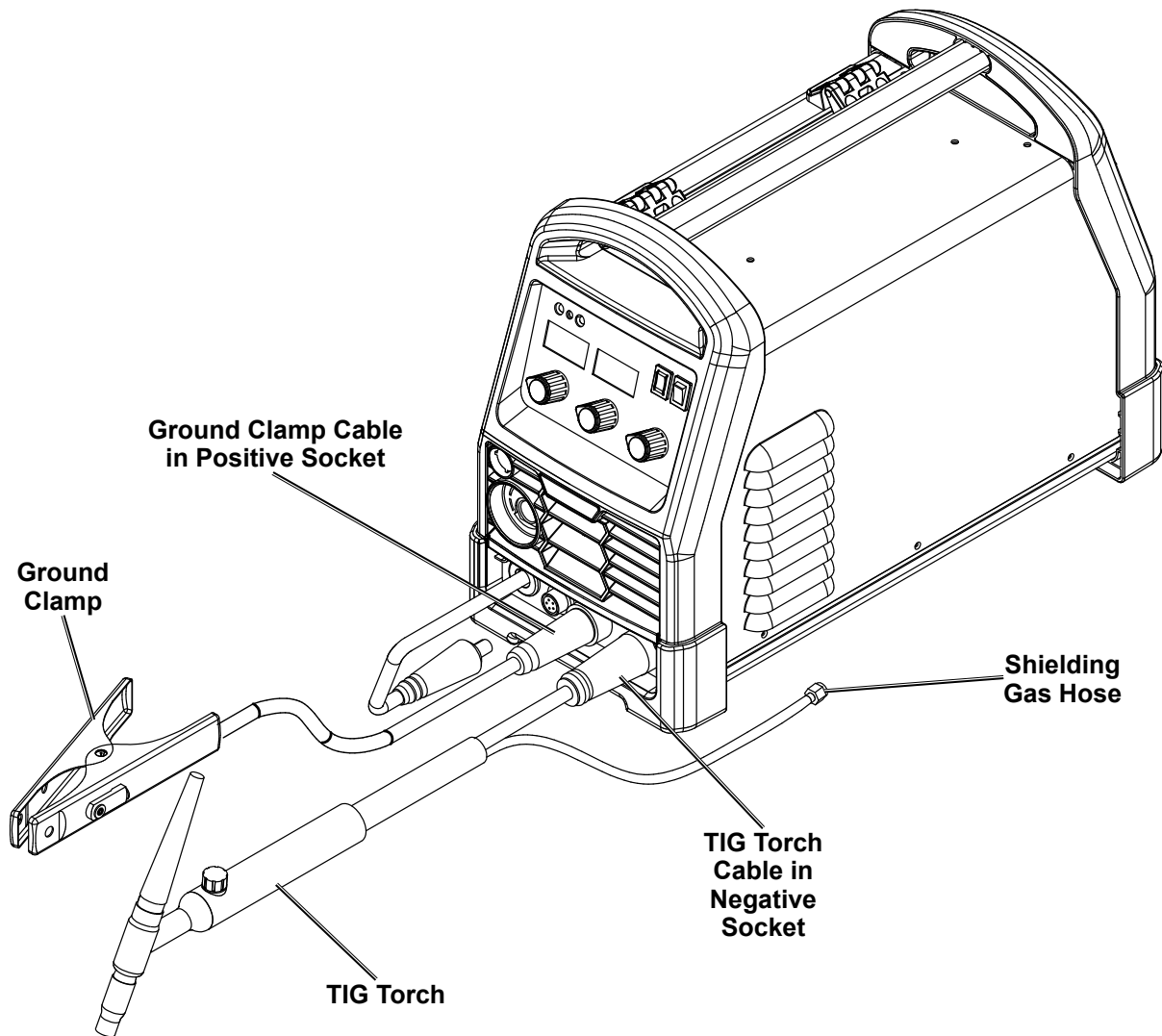
### **WARNING**

**TO PREVENT SERIOUS INJURY FROM ACCIDENTAL OPERATION:**  
Turn the Power Switch off and unplug the Welder before setup.

**Note:** Remove the protective foam and cardboard from the Welder before setup. Place the Welder on a level surface that can bear its weight near the work area. Leave space around the Welder for proper air flow.

## TIG Setup

### Connect Cables



1. Plug Ground Clamp Cable into Positive Socket. Twist clockwise all the way to lock in place.
2. Plug TIG Torch Cable into Negative Socket. Twist clockwise all the way to lock in place.
3. For connecting Shielding Gas Hose, refer to *Connect Shielding Gas* section on next page.

## Connect Shielding Gas

SAFETY

1. With assistance, place an 100% Argon cylinder (not included) onto a cabinet or cart near the Welder and secure the cylinder in place with two straps (not included) to prevent tipping.

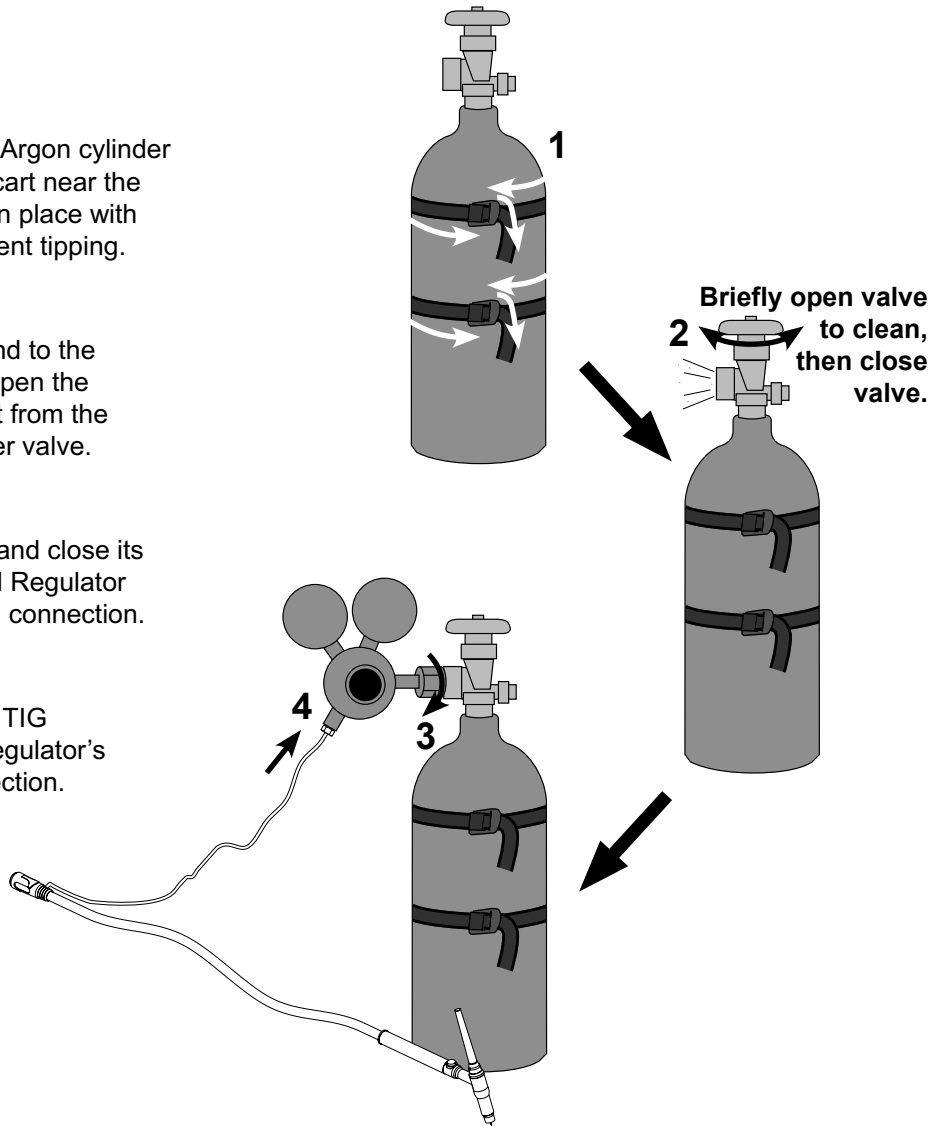
CONTROLS

2. Remove the cylinder's cap. Stand to the side of the valve opening, then open the valve briefly to blow dust and dirt from the valve opening. Close the cylinder valve.

WIRE

3. Locate the Regulator (included) and close its valve until it is loose, then thread Regulator onto cylinder and wrench-tighten connection.

4. Connect Shielding Gas Hose on TIG Torch Cable Connector to the Regulator's Outlet and wrench-tighten connection.




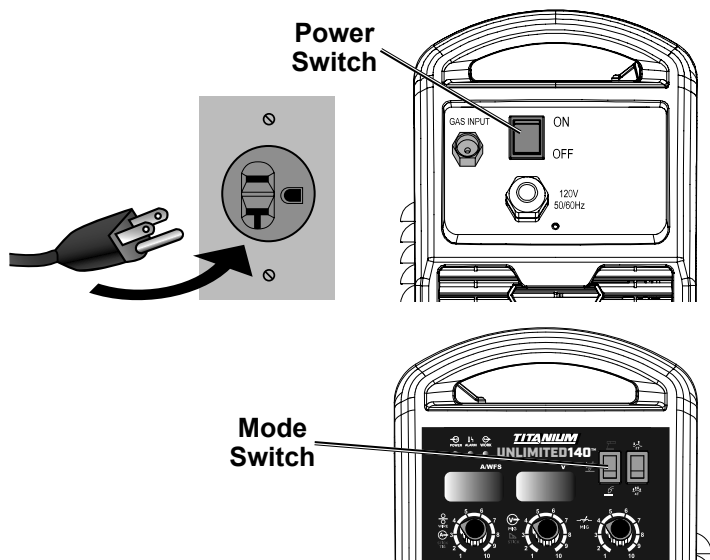
## Connect Power Cord

WELDING TIPS

1. Turn the Power Switch off before connecting Power Cord.
2. Plug the Power Cord into a properly grounded, GFCI protected 120 VAC (20 amp rated) receptacle that matches the plug and turn the Power Switch ON. The circuit must be equipped with delayed action-type circuit breaker or fuses.

MAINTENANCE

3. Set the Mode Switch to the middle, TIG welding  setting.





## Sharpen Tungsten Electrode

To avoid Electrode contamination, dedicate a fine grit grinding wheel exclusively to Electrode grinding.

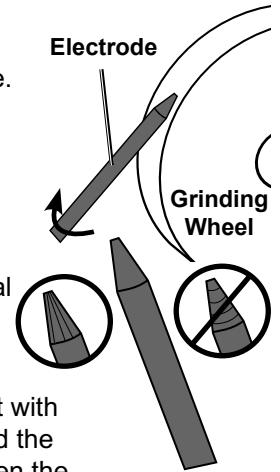
**WARNING! TO PREVENT SERIOUS INJURY:** Some Electrodes may contain materials that are hazardous to breathe. Wear a respirator and ANSI-approved safety goggles when grinding an Electrode.

1. Shut off the welder and wait until Electrode and Torch have cooled enough to handle.
2. Remove Back Cap to release Collet's grip on Electrode.
3. Pull Electrode out from front of Torch. (Pulling it from rear will damage Collet and create burrs on Electrode).
4. If Electrode has dulled or been otherwise contaminated, use pliers or a suitable tool to grip the Electrode above the contaminated section and snap off the end of the Electrode.

5. Lightly press Electrode tip against the surface of the grinding wheel at an angle. Rotate Electrode tip until a blunt point is formed.

**Note:** Grinding direction must be parallel to length of Electrode.

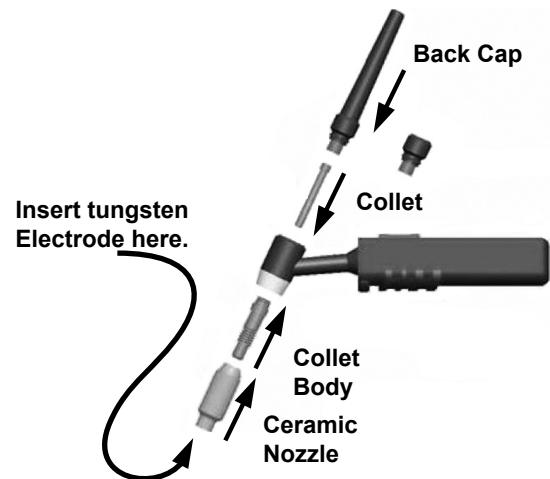
6. The conical portion of the ideal tip will be 2-1/2 times as long as the Electrode diameter.
7. Re-insert Electrode into Collet with tip protruding 1/8"-1/4" beyond the Ceramic Nozzle, then re-tighten the Back Cap to secure the Electrode in place.



## Assemble TIG Torch

1. Consult Settings Chart, on top of Welder, to determine proper Tungsten Electrode size to be used with thickness of material to be welded.
2. Match Collet and Collet Body sizes to Tungsten Electrode size.
3. Thread Collet Body into the front of the Torch.
4. Make sure Ceramic Nozzle size is appropriate for application.
5. Thread Ceramic Nozzle onto Collet Body.
6. Insert Collet into back of Torch and into Collet Body.
7. Insert Tungsten Electrode into Collet on front of Torch.

8. Lock Electrode in place with Back Cap. Electrode should protrude 1/8" to 1/4" beyond the Ceramic Nozzle.



# Stick Setup

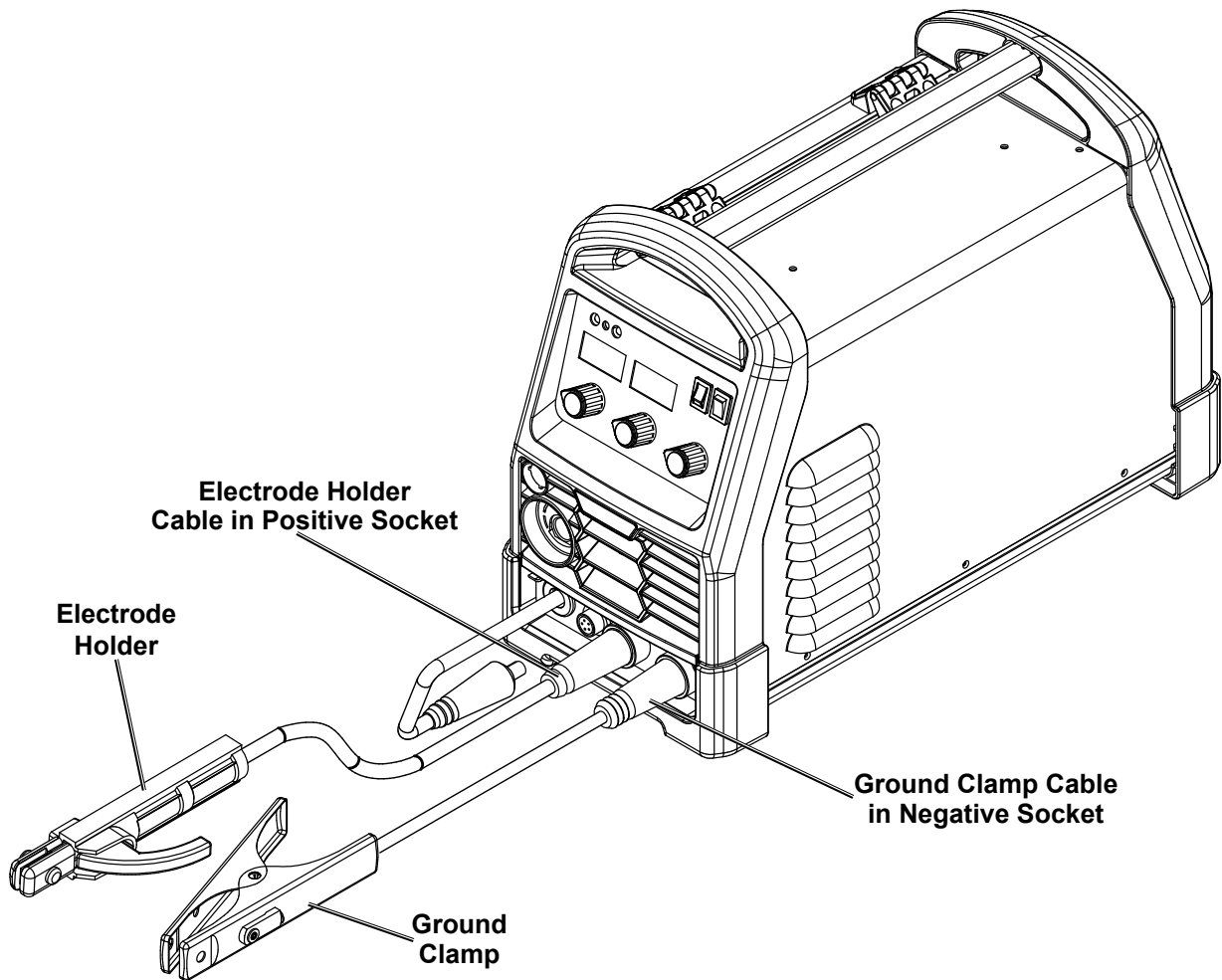
## Connect Cables

SAFETY

CONTROLS

WIRE

TIG / STICK




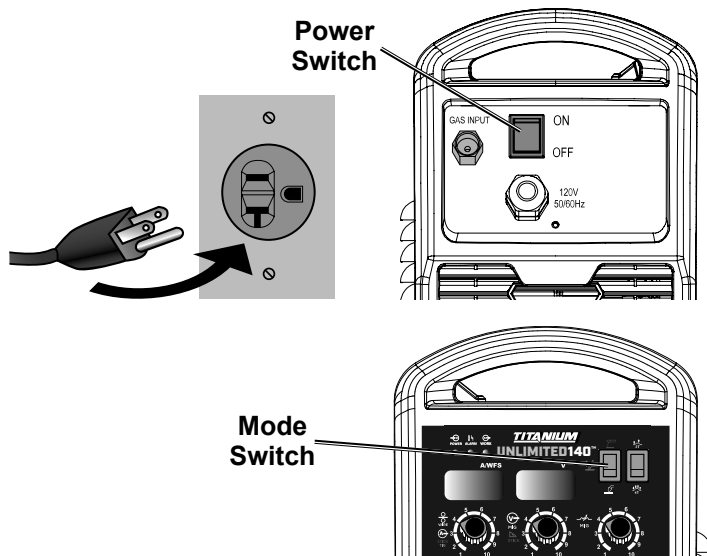
1. Plug Ground Clamp Cable into Negative Socket. Twist clockwise all the way to lock in place.
2. Plug Electrode Holder Cable into Positive Socket. Twist clockwise all the way to lock in place.

## Connect Power Cord

WELDING TIPS

MAINTENANCE

1. Turn the Power Switch off before connecting Power Cord.
2. Plug the Power Cord into a properly grounded, GFCI protected 120 VAC (20 amp rated) receptacle that matches the plug and turn the Power Switch ON. The circuit must be equipped with delayed action-type circuit breaker or fuses.
3. Set the Mode Switch to the top, Stick welding  setting.



# Basic TIG/Stick Welding



Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

## ⚠️ WARNING

### TO PREVENT SERIOUS INJURY:

Protective gear must be worn when using the Welder; minimum shade number 10 full face shield (or welding mask), ear protection, welding gloves, sleeves and apron, NIOSH-approved respirator, and fire resistant work clothes without pockets should be worn when welding. Light from the arc can cause permanent damage to the eyes and skin. Do not breathe arc fumes.

- DC TIG Welding is used to weld mild steel and stainless steel using a TIG Rod and shielding gas.
- AC TIG Welding is used to weld aluminum using a TIG Rod and shielding gas.
- Stick Welding is used to weld mild steel and stainless steel using a Stick Electrode without shielding gas.



Good welding takes a degree of skill and experience. Practice a few sample welds on scrap before welding your first project. Additional practice periods are recommended whenever you weld:

- a different thickness of material
- a different type of material
- a different type of connection
- using a different process

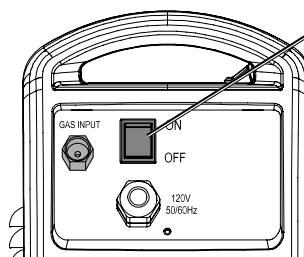


Make practice welds on pieces of scrap to practice technique before welding anything of value.

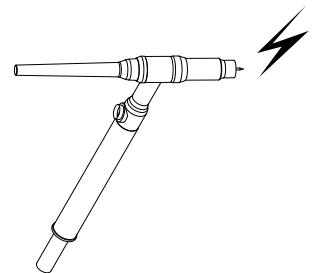
## ⚠️ WARNING



**TO PREVENT SERIOUS INJURY, FIRE AND BURNS:**  
Keep welding tip clear of grounded objects whenever unit is plugged in and turned on.



Power On



**Practice your welding technique on scrap pieces before welding anything of value.**

## Duty Cycle (Duration of Use)

**Avoid damage to the Welder by not welding for more than the prescribed duty cycle time.** The Duty Cycle defines the number of minutes, within a 10 minute period, during which a given welder can produce a particular welding current without overheating.

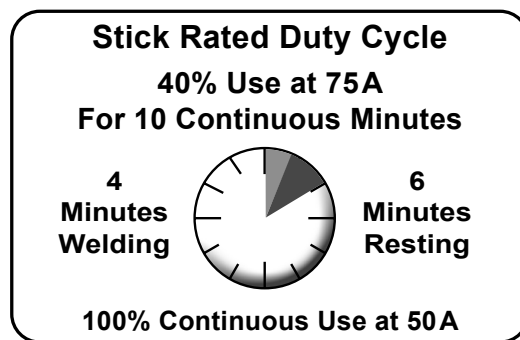
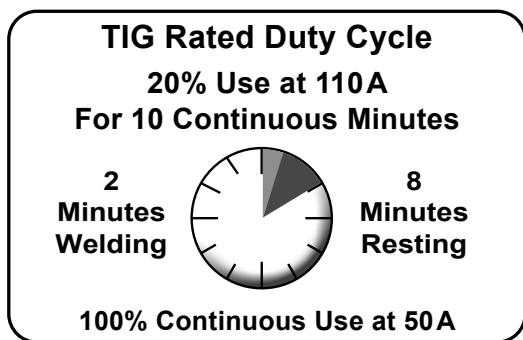
For example, a welder with a 40% duty cycle at 75A welding current must be allowed to rest for at least 6 minutes after every 4 minutes of continuous welding.

Failure to carefully observe duty cycle limitations can easily over-stress a welder's power generation system contributing to premature welder failure.

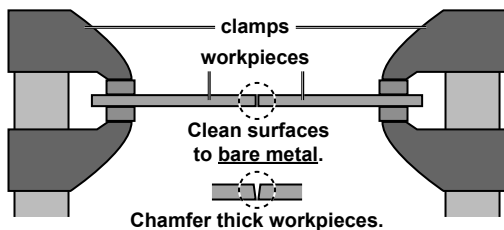
This Welder has an internal thermal protection system to help prevent this sort of over-stress. When the Welder overheats, it automatically shuts down. Should this occur, rest the TIG Torch or Electrode Holder on an electrically non-conductive, heat-proof surface, such as a concrete slab, well clear of the ground clamp.

**Allow the Welder to cool with the Power Switch on, so that the internal Fan will help cool the Welder.**

When normal operation resumes, use shorter welding periods and longer rest periods to prevent needless wear.



## Setting up the Weld

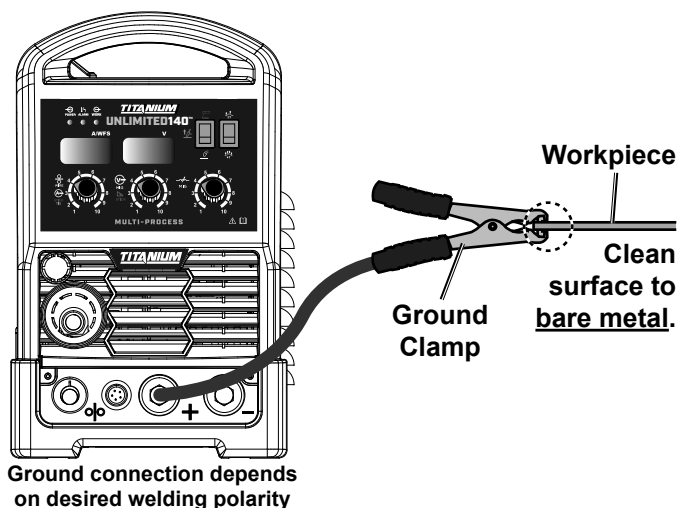


1. **Make practice welds on pieces of scrap the same thickness as your intended workpiece to practice technique before welding anything of value.** Clean the weld surfaces thoroughly with a wire brush or angle grinder; there must be no rust, paint, oil, or other materials on the weld surfaces, only bare metal.

2. Use clamps (not included) to hold the workpieces in position so that you can concentrate on proper welding technique. The distance (if any) between the two workpieces must be controlled properly to allow the weld to hold both sides securely while allowing the weld to penetrate fully into the joint. The edges of thicker workpieces may need to be chamfered (or beveled) to allow proper weld penetration.

**NOTICE:** When welding equipment on a vehicle, disconnect the vehicle battery power from both the positive connection and the ground before welding. This prevents damage to some vehicle electrical systems and electronics due to the high voltage and high frequency bursts common in welding.

3. Clamp Ground Cable to bare metal on the workpiece near the weld area, or to metal work bench where the workpiece is clamped.



# TIG Welding

## ⚠️ WARNING

### TO PREVENT SERIOUS INJURY AND DEATH:


Do not weld without Grounding Clamp. When the operator is not holding the Torch, it must be sitting on a nonconductive, nonflammable surface. Only hold TIG Rod with an electrically insulated welding glove.

## ⚠️ DANGER

### TO PREVENT DEATH FROM ASPHYXIATION:

Do not open gas without proper ventilation. Fix gas leaks immediately. Shielding gas can displace air and cause rapid loss of consciousness and death. **Shielding gas without carbon dioxide can be even more hazardous because asphyxiation can start without feeling shortness of breath.**

**NOTICE:** TIG welding is a complicated process, requiring experience and skill to achieve satisfactory results. Training beyond the scope of this manual is required to TIG weld properly.

1. Open gas cylinder's valve all the way.
2. Set Flow Gauge to SCFH value indicated on the Settings Chart on the inside of the Welder door.
3. Plug the Power Cord into a properly grounded and rated receptacle that matches the plug. The circuit must be equipped with delayed action-type circuit breaker or fuses.
4. Set the Mode Switch to the middle, TIG welding  setting.
5. Set TIG Torch down on nonconductive, nonflammable surface away from any grounded objects.
6. Turn the Power Switch ON.
8. Open valve on TIG Torch to start gas flow.
9. To initiate welding arc, touch Electrode to work piece and lift.
10. When welding puddle is hot enough, tilt Torch backward about 10-15 degrees from vertical and move it back slightly. Add TIG Rod material as needed to the front end of the weld puddle.
11. Alternate between pushing the torch/weld puddle and adding the TIG Rod material.

**NOTE:** Remove the TIG Rod each time the Electrode is advanced, but do not remove it from the gas shield. This prevents oxidation from contaminating the weld.

**Note:** The initial settings may need to be adjusted after stopping and carefully inspecting the weld. Proper welding takes experience.

**WARNING! TO PREVENT SERIOUS INJURY: Protective gear must be worn when using the Welder; minimum shade number 10 full face shield (or welding mask), ear protection, welding gloves, sleeves and apron, NIOSH-approved respirator, and fire resistant work clothes without pockets should be worn when welding. Light from the arc can cause permanent damage to the eyes and skin. Do not breathe arc fumes.**

**After practice welding on scrap**, stop, and check your progress. Perform Strike Test according to **Strike Test on page 31**. After making any necessary adjustments, continue to weld **while carefully following the DUTY CYCLE guidelines as explained on page 28**.

**WARNING! TO PREVENT SERIOUS INJURY: Metal work bench must be grounded when TIG welding.**

7. Hold TIG Torch in one gloved hand and the TIG Rod (sold separately) in other gloved hand.

**NOTE:** Maintain a constant distance between the Tungsten Electrode and the workpiece: between 1 and 1.5 times the diameter of the Electrode.

12. When finished welding, pull Torch away from work piece until welding arc is broken, then return the gas coverage until weld solidifies.
13. Close valve on TIG Torch and turn Right Knob to OFF to turn off power to TIG Torch.
14. Set TIG Torch down on nonconductive, nonflammable surface away from any grounded objects.
15. Turn the Power Switch OFF.
16. To prevent accidents, after use:
  - Allow Welder to cool down.
  - Unplug Welder's power cord from outlet.
  - Remove Ground Clamp from workpiece or table.
  - Disconnect TIG Torch and Ground Cables.
  - Close gas cylinder's valve securely, remove regulator and replace cap.
  - Disconnect Gas Hose from Welder.
  - Store and secure gas cylinder.
  - Clean, then store Welder and its accessories indoors out of children's reach.


# Stick Welding

## **⚠ WARNING**


**TO PREVENT SERIOUS INJURY AND DEATH:**

**Do not weld without Grounding Clamp.**

**When the operator is not holding the Electrode Holder, it must be sitting on a nonconductive, nonflammable surface.**

1. Turn the Power Switch to the OFF position.
2. Plug the Power Cord into a properly grounded and rated receptacle that matches the plug. The circuit must be equipped with delayed action-type circuit breaker or fuses.
3. Set Electrode Holder down on nonconductive, nonflammable surface away from any grounded objects.
4. Set the Mode Switch to the top, Stick welding  setting.
5. Turn the Power Switch ON.

**WARNING! Welder is now energized and Open Circuit Voltage is present.**

6.  **Hot Start Control:** In Stick Welding mode, the center knob controls the amount of amperage during arc starting. Hot Start assists in arc starting and makes striking an arc easier. After the arc is established, the welding current will automatically change to the pre-set amperage.

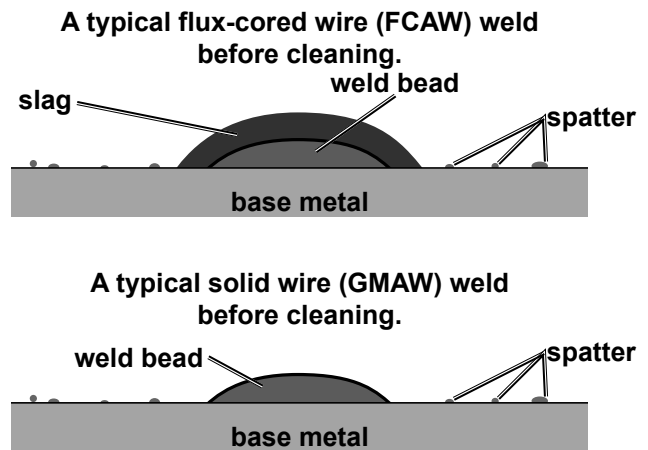
**Note:** The initial settings may need to be adjusted after stopping and carefully inspecting the weld. Proper welding takes experience.

**WARNING! TO PREVENT SERIOUS INJURY: Protective gear must be worn when using the Welder; minimum shade number 10 full face shield (or welding mask), ear protection, welding gloves, sleeves and apron, NIOSH-approved respirator, and fire resistant work clothes without pockets should be worn when welding. Light from the arc can cause permanent damage to the eyes and skin. Do not breathe arc fumes.**

***After practice welding on scrap, stop, and check your progress. Perform Strike Test according to **Strike Test on page 31**. After making any necessary adjustments, continue to weld while carefully following the **DUTY CYCLE guidelines as explained on page 28**.***

7. Place the bare metal end of the Stick Electrode (sold separately) inside the jaws of the Electrode Holder.
8. Stroke the workpiece lightly to ignite the arc. Tips for igniting the arc:
  - a. Tap the surface with the Electrode.
  - b. Stroke the surface with the Electrode.
  - c. Strike the surface like a match with the Electrode.
9. After the arc ignites:
  - a. Lift the Electrode off workpiece the same distance as the diameter of the bare metal end.
  - b. Tilt Electrode back 10 to 20 degrees.
  - c. Drag Electrode to the back end of the weld puddle to deposit material as needed.
10. When finished welding; lift the Electrode from the workpiece, then set Electrode Holder down on nonconductive, nonflammable surface away from any grounded objects.
11. Turn the Power Switch OFF.
12. To prevent accidents, after use:
  - Allow Welder to cool down.
  - Unplug Welder's power cord from outlet.
  - Remove Ground Clamp.
  - Disconnect Electrode Holder and Ground Cables.
13. Clean, then store Welder and its accessories indoors out of children's reach.

A good way to test welding technique is to examine a weld's appearance after it has cooled and the slag has been removed. Then, better welding can be learned by adjusting your weld technique to remedy any problems found.



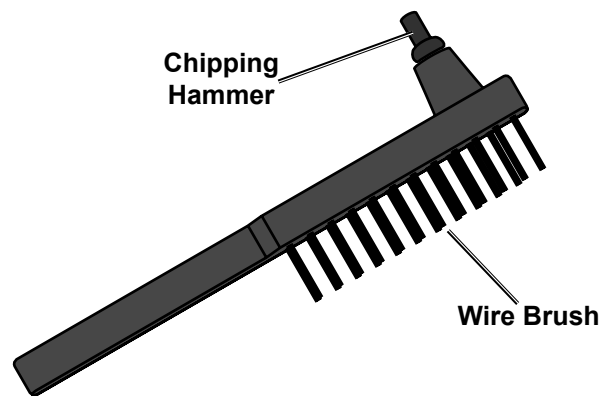
## Cleaning the Weld

### ⚠️ WARNING



**TO PREVENT SERIOUS INJURY:** Continue to wear ANSI-approved safety goggles and protective wear when cleaning a weld. Sparks or chips may fly when cleaning.

1. A weld from flux-cored wire will be covered by slag. Use a chipping hammer to knock this off. **Be careful not to damage the weld or base material.**
2. Use a wire brush to further clean the weld or use an angle grinder (sold separately) to shape the weld.

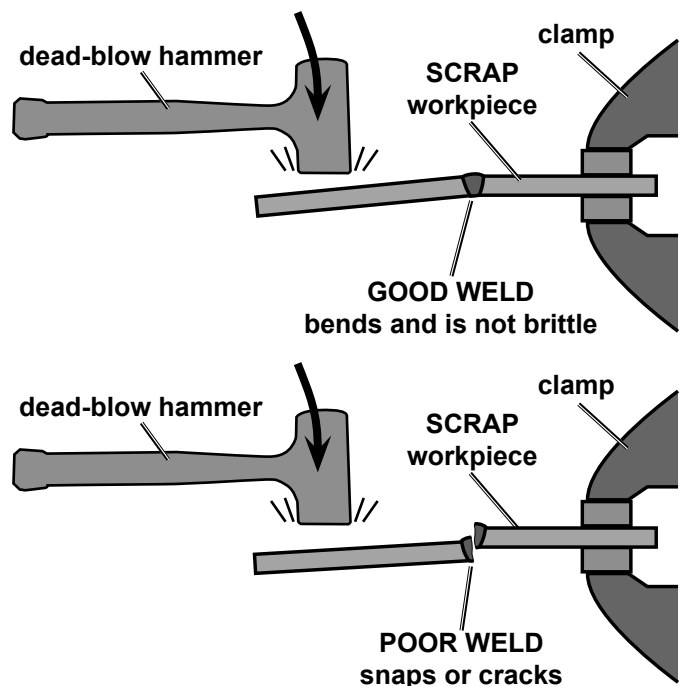


## Strike Test

A test weld on a **PIECE OF SCRAP** can be tested by using the following procedure. **WEAR ANSI-APPROVED SAFETY GOGGLES DURING THIS PROCEDURE.**

**WARNING!** This test **WILL** damage the weld it is performed on. This test is **ONLY** an indicator of weld technique and is not intended to test working welds.

1. After two scraps have been welded together and the weld has cooled, clamp one scrap in a sturdy vise.
2. Stay clear from underneath while you strike the opposite scrap with a heavy hammer, preferably a dead-blow hammer.
3. A **GOOD WELD** will deform but not break, as shown on top. A **POOR WELD** will be brittle and snap at the weld, as shown on bottom.



Workpiece Heat Control / Weld Penetration

SAFETY

CONTROLS

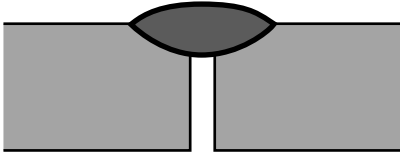
WIRE

TIG / STICK

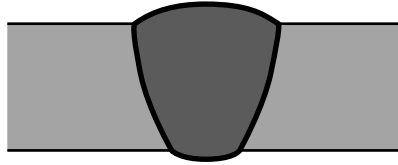
WELDING TIPS

MAINTENANCE

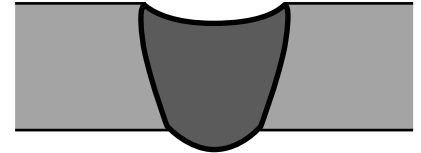
INADEQUATE PENETRATION



PROPER PENETRATION



EXCESS PENETRATION OR BURN-THROUGH



How to increase workpiece heat and increase penetration:  
(to weld THICKER workpieces properly)

- a. Increase weld current
- b. Decrease travel speed
- c. Use faster wire feed
- d. Use shorter CTWD

How to reduce workpiece heat and limit penetration:  
(to weld THINNER workpieces properly)

- a. Decrease weld current
- b. Increase travel speed
- c. Use slower wire feed
- d. Use longer CTWD

Example Weld Diagrams

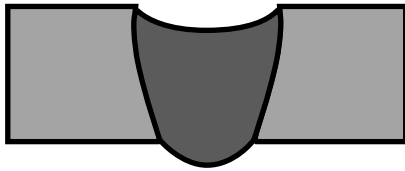
Good Weld	Voltage Too Low or Wire Feed Too Slow	Voltage Too High or Wire Feed Too Fast	Travel Speed Too Fast	Travel Speed Too Slow	CTWD Too Long or Wrong Polarity
	TO CORRECT:	TO CORRECT:	TO CORRECT:	TO CORRECT:	TO CORRECT:
	or	or	travel slower	travel faster	Check Polarity and maintain less than 1/2" CTWD



## Penetration (Workpiece Heat Control)

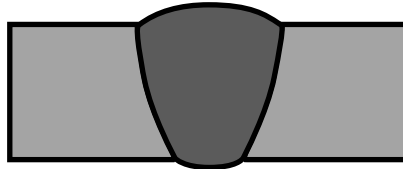
### EXCESS PENETRATION OR BURN-THROUGH

Weld droops on top and underneath, or falls through entirely, making a hole.



### PROPER PENETRATION

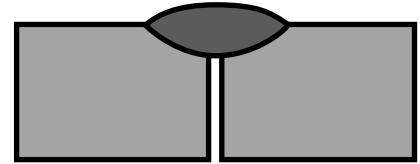
Weld is visible underneath and bulges slightly on top.



PROFILE VIEWS

### INADEQUATE PENETRATION

Weld does not penetrate the joint fully, just on the surface.



#### POSSIBLE CAUSES AND SOLUTIONS

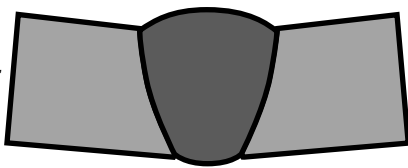
1. **Workpiece overheating:**  
Reduce wire feed speed.  
Decrease weld current.
2. **Travel speed too slow:**  
Increase travel speed and ensure that travel speed is kept steady.
3. **Excessive material at weld:**  
Reduce wire feed speed.

#### POSSIBLE CAUSES AND SOLUTIONS

1. **Incorrect welding technique:**  
Maintain 1/2" or less CTWD.  
Keep arc on leading edge of weld puddle.  
Hold MIG Gun at proper angles.
2. **Insufficient weld heat:**  
Reduce travel speed.  
Increase weld current.
3. **Workpieces too thick/close:**  
Bevel thick workpieces, allow slight gap, and weld in several passes.
4. **Insufficient weld material:**  
Increase wire feed speed.

## Bend at Joint

PROFILE VIEW



#### POSSIBLE CAUSES AND SOLUTIONS

1. **Improper clamping:**  
Clamp workpieces securely.  
Make tack welds to hold workpieces.
2. **Excessive heat:**  
Weld a small portion and allow to cool before proceeding.  
Increase travel speed.  
Reduce wire feed speed.

## Coat of Slag Over Weld

TOP VIEW



PARTIALLY CHIPPED AWAY TO SHOW WELD

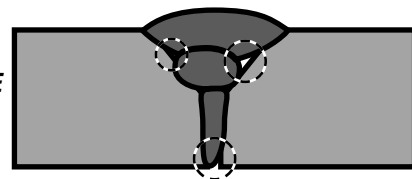
Slag is a necessary part of a flux-cored wire weld. It shields the weld from impurities. Clean off the slag with a Chipping Hammer and Wire Brush after welding.

Gas-shielded MIG welds are protected by the shielding gas and do not need slag to protect them.

## Weld Not Adhering Properly

Gaps present between weld and previous bead or between weld and workpiece. See areas below.

PROFILE VIEW



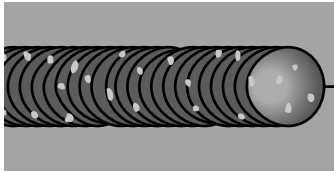
#### POSSIBLE CAUSES AND SOLUTIONS

1. **Incorrect welding technique:**  
Place stringer bead at correct place in joint.  
Adjust workpiece position or weld angle to permit proper welding to bottom of piece.  
Pause briefly at sides during weave bead.  
Keep arc on leading edge of weld puddle.  
Hold MIG Gun at proper angles.
2. **Insufficient weld heat:**  
Increase current.  
Increase wire feed speed.
3. **Dirty workpiece:**  
Clean workpiece down to bare metal.
4. **Insufficient weld material:**  
Increase wire feed speed.
5. **Workpiece gap too narrow:**  
Widen groove or increase bevel.

## Porosity

Small cavities or holes in the bead.

TOP  
VIEW



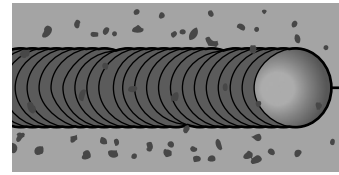
### POSSIBLE CAUSES AND SOLUTIONS

1. **Incorrect polarity:**  
Check that polarity is set correctly for type of welding.
2. **Insufficient shielding gas (MIG only):**  
Increase flow of gas.  
Clean nozzle.  
Maintain proper CTWD.
3. **Incorrect shielding gas (MIG only):**  
Use shielding gas recommended by wire supplier.
4. **Dirty workpiece or welding wire:**  
Clean workpiece down to bare metal.  
Make certain that wire is clean and free from oil, coatings, and other residues.
5. **Inconsistent travel speed:**  
Maintain steady travel speed.
6. **CTWD too long:**  
Reduce CTWD.

## Excessive Spatter

Fine spatter is normal.  
Spatter that is grainy and large is a problem.

TOP  
VIEW

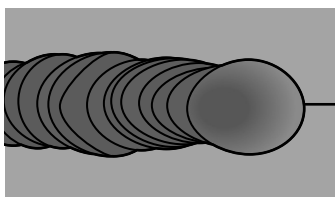


### POSSIBLE CAUSES AND SOLUTIONS

1. **Dirty workpiece or welding wire:**  
Clean workpiece down to bare metal.  
Make certain that wire is clean and free from oil, coatings, and other residues.
2. **Incorrect polarity:**  
Check that polarity is set correctly for type of welding.
3. **Insufficient shielding gas (MIG only):**  
Increase flow of gas.  
Clean nozzle.  
Maintain proper CTWD.
4. **Wire feeding too fast:**  
Reduce wire feed speed.
5. **CTWD too long:**  
Reduce CTWD.

## Crooked/Wavy Bead

TOP  
VIEW



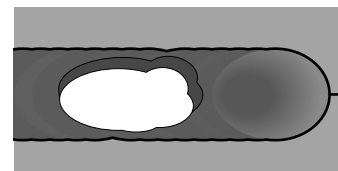
### POSSIBLE CAUSES AND SOLUTIONS

1. **Inaccurate welding:**  
Use two hands or rest hand on steady surface.
2. **Inconsistent travel speed:**  
Maintain steady travel speed.
3. **CTWD too long:**  
Reduce CTWD.

## Burn-Through

Base material melts away,  
leaving a hole in the weld.

TOP  
VIEW



### POSSIBLE CAUSES AND SOLUTIONS

1. **Workpiece overheating:**  
Reduce current and/or wire feed speed.
2. **Travel speed too slow:**  
Increase travel speed and ensure that travel speed is kept steady.
3. **Excessive material at weld:**  
Reduce wire feed speed.

## ⚠️ WARNING

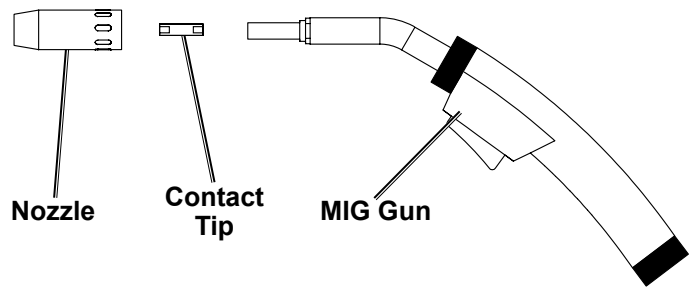


**TO PREVENT SERIOUS INJURY, FIRE AND BURNS:**  
**Unplug the Welder, rest the MIG Gun on a heat-proof, electrically non-conductive surface, and allow all parts of the Welder to cool thoroughly before service.**

1. **BEFORE EACH USE**, inspect the general condition of the Welder. Check for:
  - loose hardware
  - misalignment or binding of moving parts
  - damaged cord/electrical wiring
  - frayed or damaged cables
  - cracked or broken parts
  - any other condition that may affect its safe operation.
2. Periodically, have a qualified technician remove the Rear Panel and use compressed air to blow out all dust from the interior.
3. Store in a clean and dry location.
4. **For optimal weld quality, clean and inspect the Contact Tip and Nozzle before each use, as explained below.**

## Nozzle and Contact Tip Inspection and Cleaning

1. **Make sure that the entire MIG Gun is completely cool and that the Power Cord is unplugged from the electrical outlet before proceeding.**
2. Pull the Nozzle to remove it.
3. Scrub the interior of the Nozzle clean with a wire brush.
4. Examine the end of the Nozzle. The end should be flat and even. If the end is uneven, chipped, melted, cracked, or otherwise damaged, the Nozzle will adversely effect the weld and should be replaced.
5. Unscrew the Contact Tip counterclockwise and slide it off the welding wire to remove.
6. Scrub the outside of the Tip clean with a wire brush. Clean out the inside of the tip with a tip cleaner (sold separately). Check that the Tip is the proper type for the wire size used.
7. Examine the shape of the hole at the end of the Contact Tip. It should be an even circle; it should not be oblong or have any bulges in it.
8. If any problems are noted, replace the Contact Tip. Select a new Tip of the correct size for the welding wire used.
9. Reinstall the Tip and securely reinstall the Nozzle as well.



# Troubleshooting—MIG/Flux-Cored Welding

SAFETY

CONTROLS

WIRE

TIG / STICK

WELDING TIPS

MAINTENANCE

## IMPORTANT!

Be **CERTAIN** to shut off the Welder, disconnect it from power, and discharge the MIG Gun to ground before adjusting, cleaning, or repairing the unit.

Problem	Possible Causes	Likely Solutions
Wire feed motor runs but wire does not feed properly	<ol style="list-style-type: none"> <li>1. Insufficient wire feed tension.</li> <li>2. Incorrect wire feed roller size.</li> <li>3. Damaged MIG Gun, cable, or liner assembly.</li> <li>4. Feed Tensioner is too tight.</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase wire feed tension properly. Follow step 29 on page 16.</li> <li>2. Flip roller to correct size, follow the Feed Roller instructions on page 13.</li> <li>3. Have a qualified technician inspect these parts and replace as necessary.</li> <li>4. Loosen Feed Tensioner so it applies only enough pressure to prevent continued spinning after the Gun Trigger is released.</li> </ol>
Wire creates a bird's nest during operation	<ol style="list-style-type: none"> <li>1. Excess wire feed tension.</li> <li>2. Incorrect Contact Tip size.</li> <li>3. MIG Gun Cable Connector not fully inserted into Wire Feed mechanism.</li> <li>4. Damaged liner.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust wire feed pressure properly. Follow step 29 on page 16.</li> <li>2. Replace with the proper tip for wire used.</li> <li>3. Insert Gun Cable Connector properly. Follow steps 15 and 16 on page 14.</li> <li>4. Have a qualified technician inspect and repair/replace as necessary.</li> </ol>
Wire stops during welding	<ol style="list-style-type: none"> <li>1. Gun cable is severely bent and Wire Feed mechanism cannot feed wire.</li> <li>2. Gun liner is clogged or worn.</li> <li>3. Gun liner is too small for welding wire being used.</li> <li>4. Wire is tangled on the spool.</li> <li>5. Wire is not making contact with Feed Rollers.</li> <li>6. Feed Roller is not making enough contact with wire or is crushing flux-cored wire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Straighten Gun cable.</li> <li>2. Check gun liner for obstruction. Replace if necessary.</li> <li>3. Check that gun liner is correct size for wire.</li> <li>4. Check wire for cross winding or tangled spool.</li> <li>5. Check Feed Rollers and ensure correct groove for wire diameter is being used.</li> <li>6. Check Feed Tensioner and ensure it is set properly.</li> </ol>
Welding arc not stable	<ol style="list-style-type: none"> <li>1. Wire not feeding properly.</li> <li>2. Incorrect Contact Tip or liner size or excessive wear.</li> <li>3. Incorrect wire feed speed.</li> <li>4. Loose MIG Gun cable or ground cable.</li> <li>5. Damaged MIG Gun or loose connection within Gun.</li> <li>6. Incorrect polarity for process being run.</li> <li>7. Gas coverage may be insufficient or too high.</li> <li>8. Poor connection with workpiece.</li> </ol>	<ol style="list-style-type: none"> <li>1. See first Troubleshooting section above.</li> <li>2. Replace with the proper tip or liner size for wire used.</li> <li>3. Adjust wire feed speed to achieve a more stable arc.</li> <li>4. Check to ensure that all connections are tight.</li> <li>5. Have a qualified technician inspect and repair/replace as necessary.</li> <li>6. Ensure polarity is correct for operation: DCEP for MIG and DCEN for Flux-Cored.</li> <li>7. Ensure gas flow rate is set according to Settings Chart. Make sure MIG Gun Cable Connector is fully inserted into Wire Feed mechanism with no O-Rings exposed.</li> <li>8. Check the ground clamp connection to the workpiece and machine. Ensure the MIG Gun is properly secured.</li> </ol>
Weak arc strength	<ol style="list-style-type: none"> <li>1. Incorrect line voltage.</li> <li>2. Improper gauge or length of cord.</li> <li>3. Not enough current.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the line voltage and, if insufficient, have a licensed electrician remedy the situation.</li> <li>2. Do not use an extension cord on this Welder. Use only the supplied power cord for this Welder or an identical replacement cord.</li> <li>3. Switch current to proper setting for metal thickness.</li> </ol>



**Follow all safety precautions whenever diagnosing or servicing the equipment.**

# Troubleshooting–MIG/Flux-Cored Welding (continued)

## IMPORTANT!

Be **CERTAIN** to shut off the Welder, disconnect it from power, and discharge the MIG Gun to ground before adjusting, cleaning, or repairing the unit.

Problem	Possible Causes	Likely Solutions
When switched on, Power Indicator lights but Welder does not function	<ol style="list-style-type: none"> <li>1. Tripped thermal protection device.</li> <li>2. Faulty or improperly connected Trigger.</li> <li>3. Machine is in low- or over-voltage protection.</li> <li>4. Machine is in the incorrect mode.</li> </ol>	<ol style="list-style-type: none"> <li>1. If the Alarm Indicator is illuminated without an error code, Welder has overheated and shut down. Stop and wait with the Power Switch ON for the Welder to cool. The Welder automatically returns to service after cooling off. Reduce duration or frequency of welding periods to help reduce wear on the Welder. Refer to <i>Duty Cycle (Duration of Use)</i> on page 18.</li> <li>2. Ensure the gun connection is properly seated on machine. Qualified technician must check and secure/replace Trigger.</li> <li>3. If the Alarm Light is illuminated, check input voltage and ensure it falls within the specified range. If input voltage is correct, turn Welder off and back on.</li> <li>4. Ensure the MIG Flux/Spool Gun switch located above the Wire Feed mechanism is switched to the correct process. Refer to <i>Interior Controls</i> on page 9.</li> </ol>
Power ON Indicator does not light when switched on	<ol style="list-style-type: none"> <li>1. Unit is not connected to outlet properly.</li> <li>2. Outlet is unpowered.</li> <li>3. Circuit supplies insufficient input voltage or amperage.</li> <li>4. Plug does not have correct rating.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify the voltage at the outlet and the connection to the outlet.</li> <li>2. Check circuit breaker/GFCI devices; if any are tripped, determine and remedy cause before resetting.</li> <li>3. Verify that the circuit is designed to supply the required input voltage and amperage as detailed on the Specifications table. If the Voltage Input/Thermal Overload Indicator is illuminated on machine, check the input voltage to ensure it is within specified range.</li> <li>4. Make sure installed plug is correct rating. See <i>Specifications</i> on page 7.</li> </ol>
Wire feeds, but arc does not ignite	<ol style="list-style-type: none"> <li>1. Improper ground connection.</li> <li>2. Improperly sized Contact Tip.</li> <li>3. Excessively worn Contact Tip.</li> <li>4. Dirty Contact Tip.</li> </ol>	<ol style="list-style-type: none"> <li>1. Make certain that the workpiece is contacted properly by the Ground Clamp and that the workpiece is properly cleaned near the ground clamp and the welding location.</li> <li>2. Verify that Contact Tip is the proper size for welding wire. If needed, replace Contact Tip with proper size and type.</li> <li>3. Check that the hole in the tip is not deformed or enlarged. If needed, replace Contact Tip with proper size and type.</li> <li>4. Properly clean Contact Tip.</li> </ol>
Porosity in the weld metal	<ol style="list-style-type: none"> <li>1. Shielding gas cylinder is empty.</li> <li>2. Not enough or too much shielding gas.</li> <li>3. Dirty workpiece.</li> <li>4. Gun is being used too far away from workpiece.</li> <li>5. Polarity is incorrect for the application.</li> <li>6. Dirty welding wire is introducing contamination into the weld.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check gas cylinder and replenish as necessary.</li> <li>2. Check gas regulator to ensure proper flow.</li> <li>3. Clean workpiece down to bare metal.</li> <li>4. Check that CTWD (contact tip to work distance) is proper for the procedure.</li> <li>5. Check the polarity and ensure it is DCEP for MIG and DCEN for Flux-Cored.</li> <li>6. Make certain that welding wire is clean and free of rust and residues.</li> </ol>



Follow all safety precautions whenever diagnosing or servicing the equipment.

SAFETY

CONTROLS

WIRE

TIG / STICK

WELDING TIPS

MAINTENANCE

# Troubleshooting – TIG/Stick Welding

SAFETY

CONTROLS

WIRE

TIG / STICK

WELDING TIPS

MAINTENANCE

## IMPORTANT!

Be **CERTAIN** to shut off the Welder, disconnect it from power, and discharge the electrode to ground before adjusting, cleaning, or repairing the unit.

Problem	Possible Causes	Likely Solutions
Welder Does Not Function When Switched On	<ol style="list-style-type: none"> <li>1. Tripped thermal protection device.</li> <li>2. Faulty or improperly connected Trigger.</li> <li>3. Ground Clamp not attached to workpiece.</li> <li>4. Shielding Gas not connected.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduce duration or frequency of welding periods to help reduce wear on the welder. Refer to <i>Duty Cycle (Duration of Use)</i> on page 28.</li> <li>2. Qualified technician must check and secure/replace Trigger.</li> <li>3. Attach Ground Clamp to workpiece.</li> <li>4. Connect shielding gas to Welder.</li> </ol>
Power ON Indicator does not light when switched on	<ol style="list-style-type: none"> <li>1. Unit is not connected to outlet properly.</li> <li>2. Outlet is unpowered.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify the voltage at the outlet and the connection to the outlet.</li> <li>2. Check circuit breaker/GFCI devices; if any are tripped, determine and remedy cause before resetting. Verify that the circuit is designed to supply the required input amperage as detailed in <i>Specifications</i> on page 7.</li> </ol>
Weak Arc Strength	<ol style="list-style-type: none"> <li>1. Incorrect line voltage.</li> <li>2. Improper gauge or length of cord.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the line voltage and, if insufficient, have a licensed electrician remedy the situation.</li> <li>2. Do not use an extension cord on this Welder. Use only the supplied power cord for this Welder or an identical replacement cord.</li> </ol>
Welding Arc Not Stable.	<ol style="list-style-type: none"> <li>1. Loose electrode cable or ground cable.</li> <li>2. Damaged electrode holder or loose connection within electrode holder.</li> <li>3. Adjust current setting.</li> <li>4. Shielding gas getting low.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check to ensure that all connections are tight.</li> <li>2. Have a qualified technician inspect and repair/replace as necessary.</li> <li>3. Make sure setting matches recommended setting on chart.</li> <li>4. Replace shielding gas cylinder.</li> </ol>

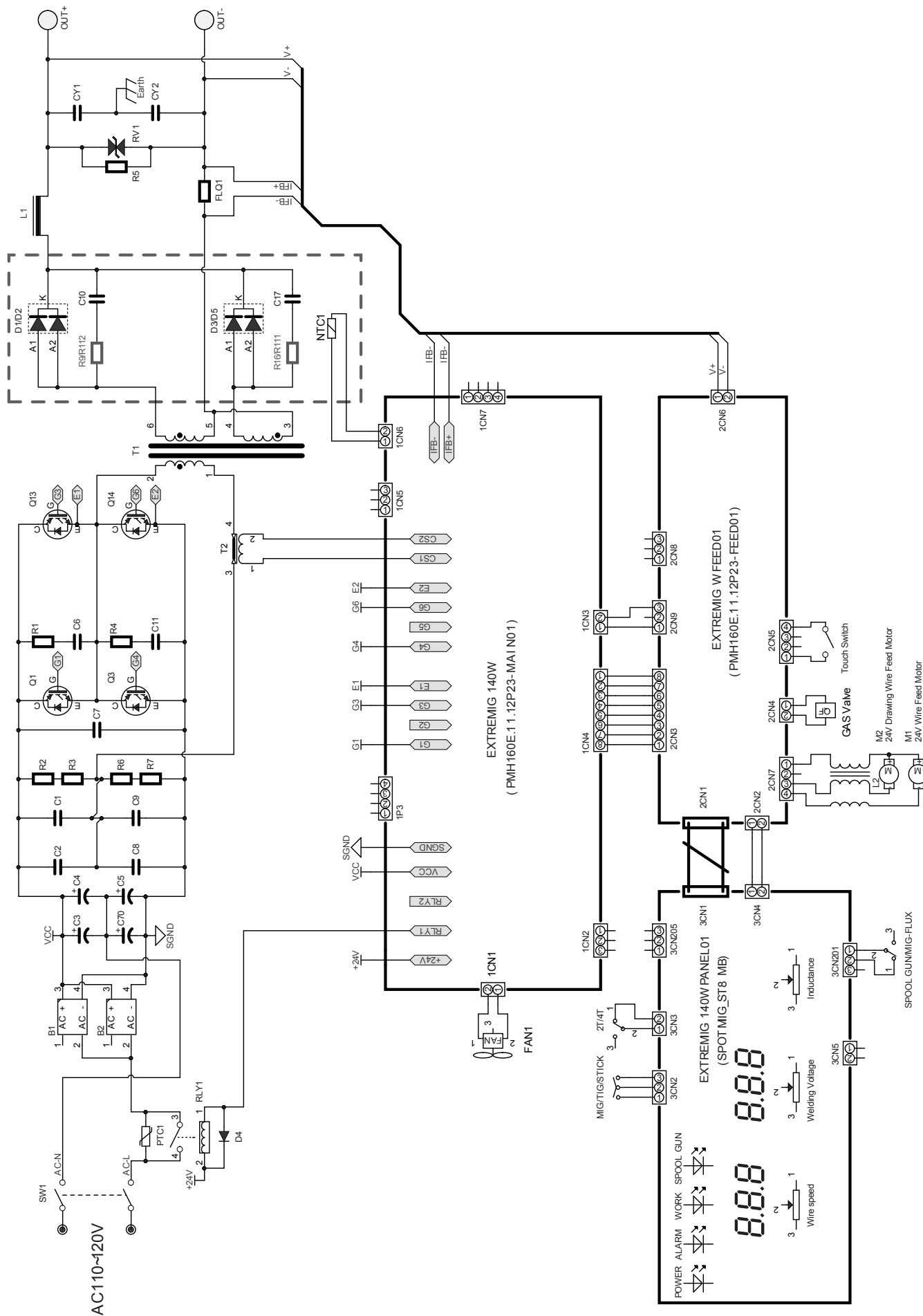


Follow all safety precautions whenever diagnosing or servicing the equipment.

## Alarm Indicator Error Codes

Code	Meaning	Solution
<b>Err Uol</b> (Error Voltage)	Input voltage and Voltage Switch setting do not match.	Flip Voltage Switch.
<b>Our Cur</b> (Over current)	Welder is using too much current. Welder may pull too much current from supply.	Reduce current/wire speed using Wire Speed Knob.
<b>Err Sht</b> (Error Short)	Electrode has shorted against workpiece, no arc is detected. The electrode is stuck against the workpiece, allowing all current to go directly through without welding.	Free the electrode from the plate.
Alarm indicator without code. Fan keeps running.	Welder has overheated. Duty Cycle was likely exceeded.	Follow instructions under <i>Duty Cycle (Duration of Use)</i> on page 18 or page 28.

# Wiring Schematic



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## PLEASE READ THE FOLLOWING CAREFULLY

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THE MANUFACTURER AND/OR DISTRIBUTOR HAS PROVIDED THE PARTS LIST AND ASSEMBLY DIAGRAM IN THIS MANUAL AS A REFERENCE TOOL ONLY. NEITHER THE MANUFACTURER OR DISTRIBUTOR MAKES ANY REPRESENTATION OR WARRANTY OF ANY KIND TO THE BUYER THAT HE OR SHE IS QUALIFIED TO MAKE ANY REPAIRS TO THE PRODUCT, OR THAT HE OR SHE IS QUALIFIED TO REPLACE ANY PARTS OF THE PRODUCT. IN FACT, THE MANUFACTURER AND/OR DISTRIBUTOR EXPRESSLY STATES THAT ALL REPAIRS AND PARTS REPLACEMENTS SHOULD BE UNDERTAKEN BY CERTIFIED AND LICENSED TECHNICIANS, AND NOT BY THE BUYER. THE BUYER ASSUMES ALL RISK AND LIABILITY ARISING OUT OF HIS OR HER REPAIRS TO THE ORIGINAL PRODUCT OR REPLACEMENT PARTS THERETO, OR ARISING OUT OF HIS OR HER INSTALLATION OF REPLACEMENT PARTS THERETO.

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The logo for TITANIUM, featuring the word "TITANIUM" in a bold, italicized, sans-serif font. The letters "T" and "I" are connected, and the "A" is stylized with a horizontal bar extending to the left. A small "TM" trademark symbol is located at the bottom right of the word.



**Record Serial Number Here:** \_\_\_\_\_

**Note:** If product has no serial number, record month and year of purchase instead.

**Note:** Some parts are listed and shown for illustration purposes only, and are not available individually as replacement parts. Parts may not be interchangeable. Specify number when ordering. Specify UPC 193175447272 when ordering parts.

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## Parts List and Diagram

### Parts List

Part	Description	Qty
1	Handle	1
2	Hinge	2
3	Enclosure	1
4	Control PCB	1
5	Inductor	1
6	Cover	1
7	Front Cover	1
8	Panel Support Plate	1
9	Faceplate Control Board	1
10	Welding Mode Switch	1
11	2T/4T Switch	1
12	Potentiometer Knob	3
13	Ground Clamp	1
14	Electrode Holder	1
15	MIG Gun	1
16	TIG Torch	1
17	Wire Feed Power Cable	1
18	Cable Socket	2
19	Control Socket	1
20	Grommet Holder	1
21	Gun Cable Socket	1

Part	Description	Qty
22	Base	1
23	Wire Feed Base	1
24	Wire Feed	1
25	Main Control Board	1
26	Cover	1
27	Gas Quick Connector	1
28	Fan	1
29	Fan Bracket	1
30	Rear Cover	1
31	Power Cord	1
32	Grommet	1
33	Power Switch	1
34	Gas Inlet	1
35	Back Panel	1
36	Gas Solenoid Valve	1
37	Spool Holder	1
38	MIG Flux / Spool Gun Switch	1
39	Divider	1
40	Door Latch	1
41	Door	1

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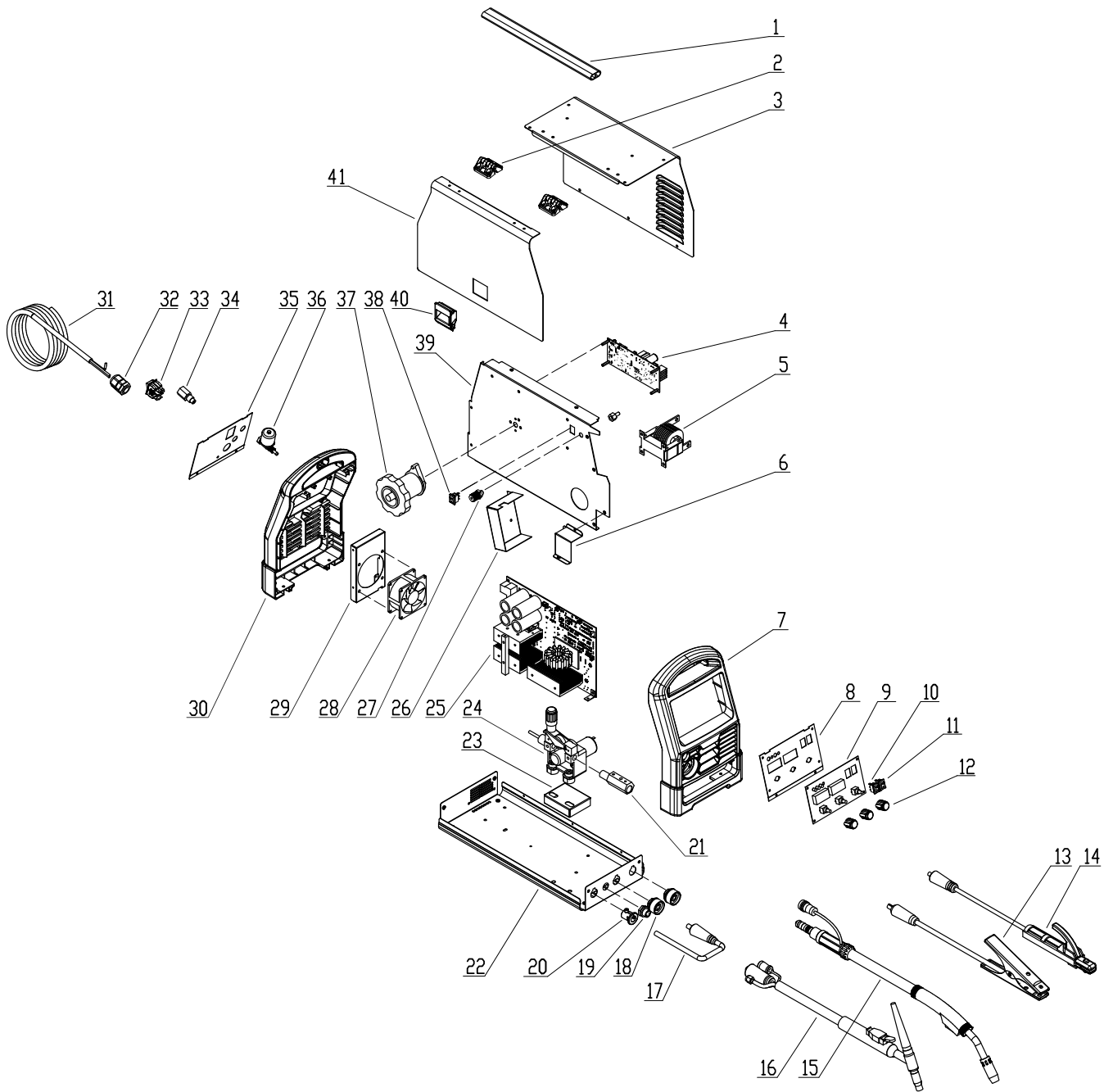
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# Assembly Diagram



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## Limited 90 Day Warranty

Harbor Freight Tools Co. makes every effort to assure that its products meet high quality and durability standards, and warrants to the original purchaser that this product is free from defects in materials and workmanship for the period of 90 days from the date of purchase. This warranty does not apply to damage due directly or indirectly, to misuse, abuse, negligence or accidents, repairs or alterations outside our facilities, criminal activity, improper installation, normal wear and tear, or to lack of maintenance. We shall in no event be liable for death, injuries to persons or property, or for incidental, contingent, special or consequential damages arising from the use of our product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation of exclusion may not apply to you. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

To take advantage of this warranty, the product or part must be returned to us with transportation charges prepaid. Proof of purchase date and an explanation of the complaint must accompany the merchandise. If our inspection verifies the defect, we will either repair or replace the product at our election or we may elect to refund the purchase price if we cannot readily and quickly provide you with a replacement. We will return repaired products at our expense, but if we determine there is no defect, or that the defect resulted from causes not within the scope of our warranty, then you must bear the cost of returning the product.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

The logo for TITANIUM features the word "TITANIUM" in a bold, italicized, sans-serif font. The letters are black with a white outline. A thick black horizontal bar runs underneath the letters, with a small white triangle pointing upwards from the bottom of the bar under the letter 'I'. A small "TM" trademark symbol is located at the end of the bar.

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