

# 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.

17e

# VULCAN™

## COMMANDER™ 225 AC/DC STICK WELDER



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

63620

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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### ⚠ WARNING

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

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SAFETY






SETUP

BASIC WELDING

WELDING TIPS

MAINTENANCE

## 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.

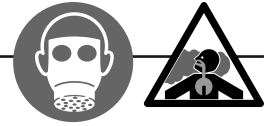
Failure to follow the warnings and instructions may result in electric shock, fire and/or serious injury. Save all warnings and instructions for future reference.

### General Safety

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

- Before use, read and understand manufacturer's instructions, Material Safety Data Sheets (MSDS's), employer's Safety practices, and ANSI Z49.1.**
- Keep out of reach of children.**  
Keep children and bystanders away while operating.
- Place the welder on a stable location before use.**  
If it falls while plugged in, severe injury, electric shock, or fire may result.
- Do not overreach.**  
Keep proper footing and balance at all times.
- 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.*
- Avoid unintentional starting.** Make sure you are prepared to begin work before turning on the Welder.
- Never leave the Welder unattended while energized.** Turn power off if you have to leave.
- 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.
- Wear an approved welding jacket or long sleeves to protect forearms from radiation burns.**
- 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

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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

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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.



**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









Do not use an extension cord on this welder.







## Replacement Cords

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.

# VULCAN™

## Symbology

	Workpiece Ground Cable
	Electrode Cable
	Overheat Shutdown Indicator
	Cooling Fan
	Housing Ground Point
	Single, Dual AC or DC Power
	Electrode Holder
	Single Phase AC Power Supply Frequency: 60Hz
<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>AWG</b>	American Wire Gauge
<b>X</b>	Duty Cycle
<b>I<sub>2</sub></b>	Conventional Welding Current
<b>U<sub>2</sub></b>	Conventional Load Voltage
	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

	AC	DC
Power Input at Output	59A at 225A	49A at 150A
Welding Current Range	40A–225A	30A–150A
Rated Duty Cycles	20% @ 225A 100% @ 100A	20% @ 150A 100% @ 67A
Maximum OCV	64V/78V	110V
Weldable Materials	Mild Steel, Stainless Steel, Cast Iron	

## Setup



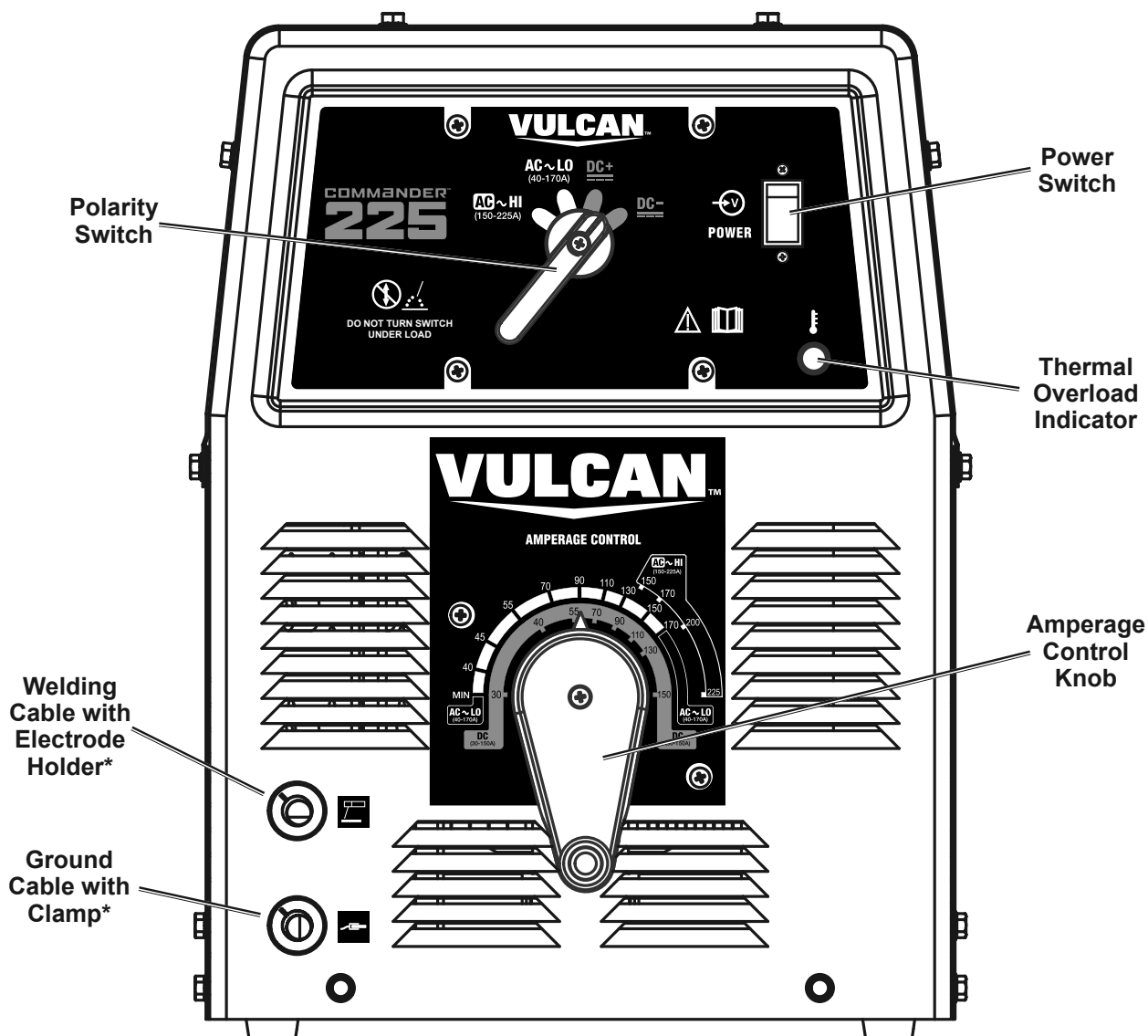
Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before set up or use of this product.



**TO PREVENT SERIOUS INJURY FROM ACCIDENTAL OPERATION:**  
Turn the Power Switch off and unplug the welder before set up.

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.

## Controls



\*Welding Cable and Ground Cable not shown.

## Basic 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.

- 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

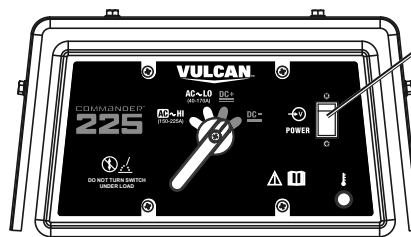
Make practice welds on pieces of scrap to practice technique before welding anything of value.



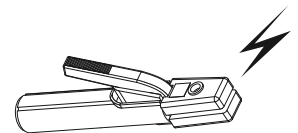
### ⚠️ WARNING



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



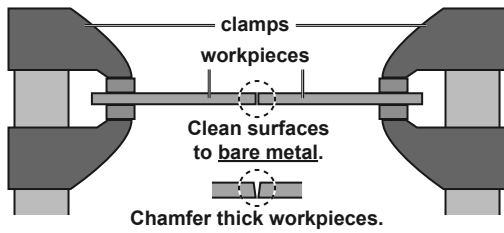
Power On



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

# Setting up the Weld

SAFETY



**NOTE:** Make practice welds on pieces of scrap the same thickness as your intended workpiece to practice technique before welding anything of value.

1. 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.

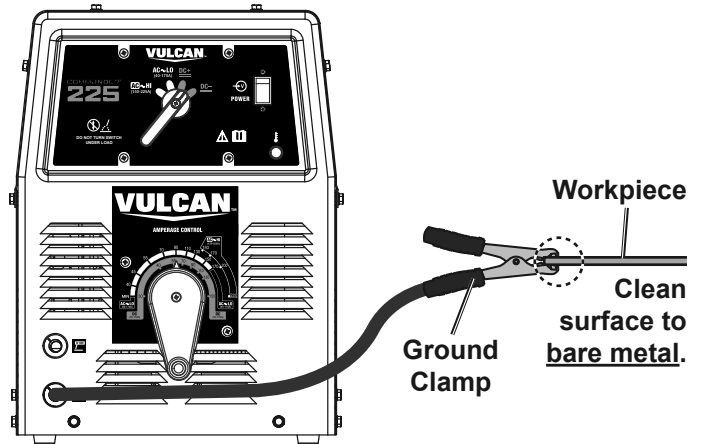
2. Use clamps (not included) to hold the workpieces in position so that you can concentrate on proper welding technique. The distance (if any) between the two workpieces must be controlled properly to allow the weld to hold both sides securely while allowing the weld to penetrate fully into the joint.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

SETUP

## Ground Workpiece

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



BASIC WELDING

## 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 welding process can produce a particular welding current without overheating.

For example, a welder with a 20% duty cycle at 225 A welding current must be allowed to rest for at least 8 minutes after every 2 minutes of continuous welding.

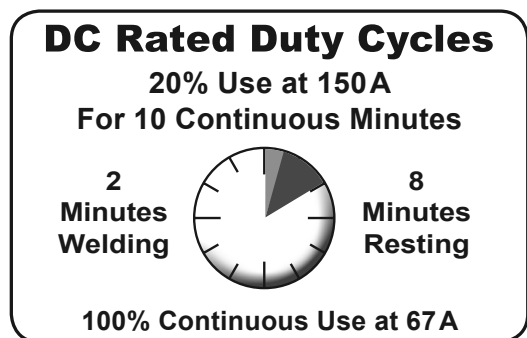
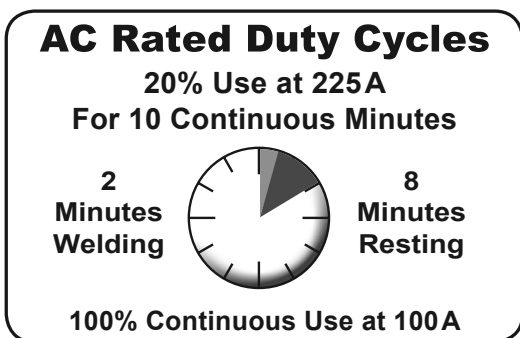
Failure to carefully observe duty cycle limitations can easily over-stress a welder's power generation system contributing to premature welder failure.

This Welder has an internal thermal protection system to help prevent this sort of over-stress. When the Welder overheats, it automatically shuts down and the Overload Indicator lights. The Welder automatically returns to service after cooling off. Rest the 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 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.

WELDING TIPS



MAINTENANCE

# Basic Stick Welding

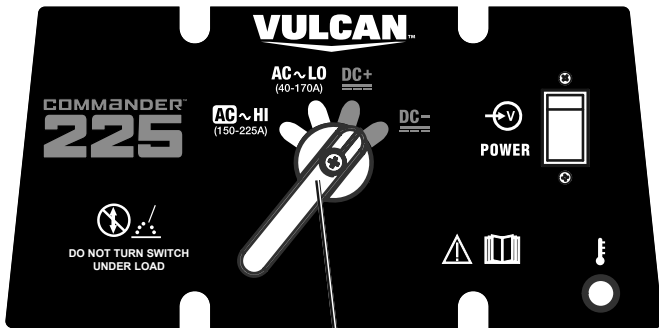
## ⚠ WARNING

**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.

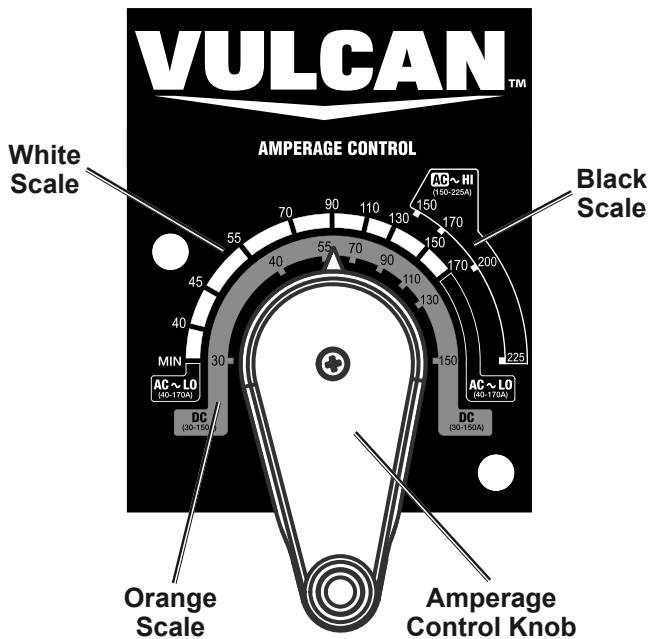
1. Place the Welder on a level surface that can bear its weight near the work area.
2. Secure the Grounding Clamp to a clean, exposed metal part of the workpiece, or to metal work bench where the workpiece is clamped.
3. Set polarity using the Polarity Switch. Refer to electrode package for correct polarity.

**NOTE:** Ensure Welder is turned OFF whenever polarity settings are adjusted.



Polarity Switch

4. Turn the Amperage Control Knob to adjust the welding current.



Set amperage according to Stick Settings Chart below.

**NOTE:** Settings are approximate. Adjust as necessary.

Stick Settings Chart		
Electrode Type	Electrode Diameter	Amperage Range
E6010 DC+ E6011 AC/DC+	3/32"	40–70
	1/8"	75–130
	5/32"	90–175
	3/16"	140–225
E6013 DC+/AC	7/32"	200–275
	1/16"	25–40
	3/32"	40–90
	1/8"	75–125
E7014 DC+/AC	5/32"	105–175
	3/16"	150–225
	3/32"	75–110
E7018 DC+/AC	1/8"	105–160
	5/32"	150–200
	3/16"	200–275
E7024 DC+/AC	3/32"	70–110
	1/8"	90–160
	5/32"	130–210
E7024 DC+/AC	3/16"	200–275
	3/32"	100–145
	1/8"	110–175
	5/32"	160–215
	3/16"	220–280

The approximate current setting can be read on the Amperage Control Indicator. Refer to the portion of the Indicator scale that corresponds to the selected polarity setting:

- For DC welding, use the Orange Scale.
- For AC welding with the Polarity Switch set to 40–170A, use the White Scale.
- For AC welding with the Polarity Switch set to 150–225A, use the Black Scale.

**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, then clean and 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 10.**

5. Place the bare metal end of the Stick Electrode (sold separately) inside the jaws of the Electrode Holder.
6. Turn the Power Switch to the OFF position, then plug the Welder into a properly grounded 230V receptacle that matches the plug. The circuit must be equipped with delayed action-type circuit breaker or fuses.
7. Set Electrode Holder down on nonconductive, nonflammable surface away from any grounded objects.

8. Turn the Power Switch ON.

**WARNING! TO PREVENT SERIOUS INJURY AND DEATH:** When Power Switch is turned ON, Welder is energized and Open Circuit Voltage is present. If the operator is not holding the Electrode Holder, it must be sitting on a nonconductive, nonflammable surface.

9. 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.
10. 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.
11. When finished welding, lift the Electrode from the workpiece, then set Electrode Holder down on nonconductive, nonflammable surface away from any grounded objects.
12. Turn the Power Switch OFF.
13. To prevent accidents, after use:
  - Allow Welder to cool down.
  - Unplug Welder's power cord from outlet.
  - Remove Ground Clamp.
  - Clean, then store Welder and its accessories indoors out of children's reach.

# VULCAN™

## Welding Tips

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.

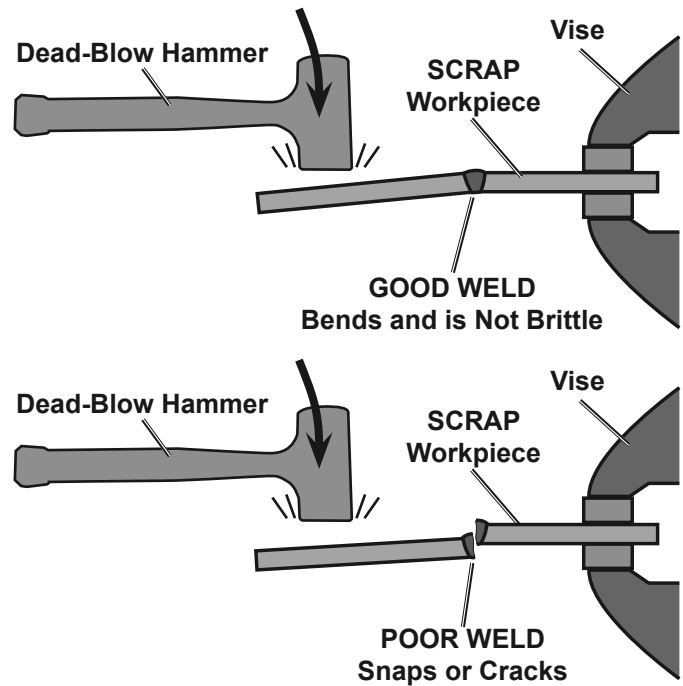
After practice welding a couple of welding beads, STOP and examine your weld using the following guidelines.

## 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 side in a sturdy vise.
2. Stay clear from underneath while you strike the opposite side 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.



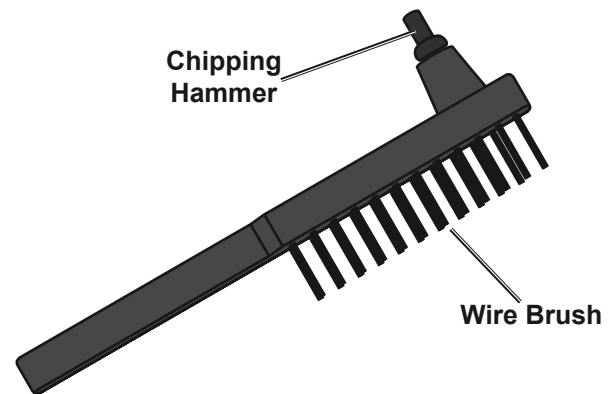
## Cleaning Stick Weld

### ⚠ WARNING



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

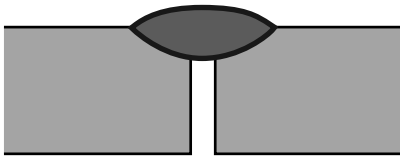
1. A weld from Stick welding will be covered by slag. Use a chipping hammer to knock this off. **Be careful not to damage the weld or base material.**
2. Use a wire brush to further clean the weld or use an angle grinder (sold separately) to shape the weld.



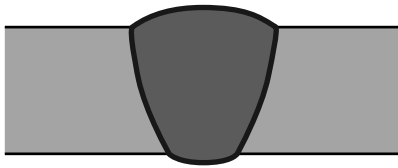
# Weld Diagnosis—Workpiece Heat Control / Weld Penetration

SAFETY

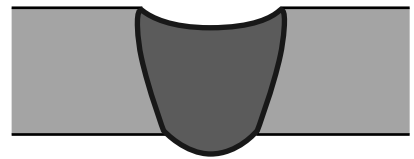
INADEQUATE PENETRATION



PROPER PENETRATION



EXCESS PENETRATION OR BURN-THROUGH



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

- a. Increase current.    b. Weld more slowly.

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

- a. Decrease current.    b. Weld more quickly.

SETUP

## Weld Example Diagrams

### CLEAN WELDS FIRST!

Stick welds will have a coat of slag over them until cleaned.

BASIC WELDING

<b>Good Weld</b>	<b>Current Too Low</b>	<b>Current Too High</b>	<b>Weld Speed Too Fast</b>	<b>Weld Speed Too Slow</b>	<b>Arc Length Too Short</b>	<b>Arc Length Too Long</b>
	<b>TO CORRECT:</b> Increase the current	<b>TO CORRECT:</b> Decrease the current	<b>TO CORRECT:</b> Weld slower	<b>TO CORRECT:</b> Weld faster	<b>TO CORRECT:</b> Increase distance	<b>TO CORRECT:</b> Decrease distance

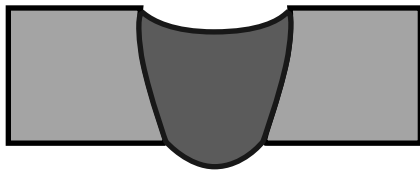
WELDING TIPS

MAINTENANCE

# Weld Penetration (Workpiece Heat Control)

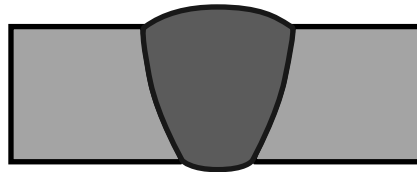
## EXCESS PENETRATION OR BURN-THROUGH

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



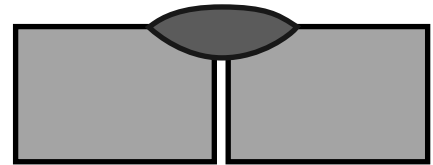
## PROPER PENETRATION

Weld is visible underneath and bulges slightly on top.



## INADEQUATE PENETRATION

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



PROFILE VIEWS

### POSSIBLE CAUSES AND SOLUTIONS FOR EXCESS PENETRATION OR BURN-THROUGH

1. **Workpiece overheating:**  
Reduce current.
2. **Welding speed too slow:**  
Increase welding speed and ensure that welding speed is kept steady.

### POSSIBLE CAUSES AND SOLUTIONS FOR INADEQUATE PENETRATION

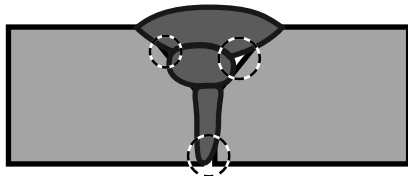
1. **Incorrect welding technique:**  
Keep arc on leading edge of weld puddle. Hold torch at proper angles.
2. **Insufficient weld heat:**  
Slow down so fill material has time to melt into the weld location. Increase current.
3. **Workpieces too thick/close:**  
Bevel thick workpieces, allow slight gap, and weld in several passes.
4. **Insufficient weld material:**  
Increase amount of fill material.

# Weld Not Adhering Properly

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

### POSSIBLE CAUSES AND SOLUTIONS

PROFILE VIEW



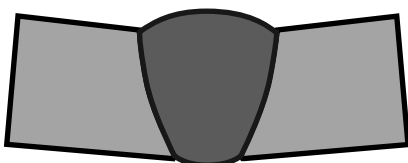
1. **Incorrect welding technique:**  
Place stringer bead at correct place in joint. Adjust workpiece position or weld angle to permit proper welding to bottom of piece. Keep arc on leading edge of weld puddle. Hold Electrode and fill material at proper angles.

2. **Insufficient weld heat:**  
Increase current.
3. **Dirty workpiece:**  
Clean workpiece down to bare metal.
4. **Insufficient weld material:**  
Increase amount of fill material.
5. **Distance between workpieces too large:**  
Decrease distance and increase bevel.

# Bend at Joint

### POSSIBLE CAUSES AND SOLUTIONS

PROFILE VIEW



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 weld speed.

## Coat of Slag Over Weld

TOP  
VIEW



PARTIALLY CHIPPED AWAY TO SHOW WELD

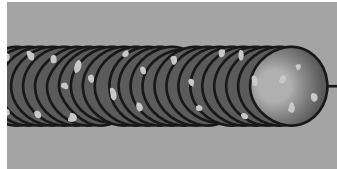
Slag is a necessary part of a stick weld. It shields the weld from impurities. Clean off the slag with the Chipping Hammer and Wire Brush after welding.

SAFETY

## Porosity — Small cavities or holes in the bead.

### POSSIBLE CAUSES AND SOLUTIONS

TOP  
VIEW



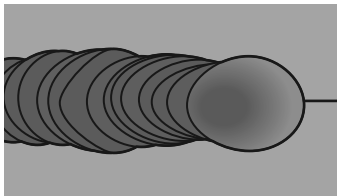
1. **Dirty workpiece or fill material:**  
Clean workpiece down to bare metal.  
Make certain that fill material and Electrode are clean and free from oil, coatings, and other residues.
2. **Inconsistent welding speed:**  
Maintain steady weld speed.

SETUP

## Crooked/Wavy Bead

### POSSIBLE CAUSES AND SOLUTIONS

TOP  
VIEW



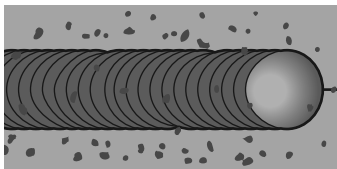
1. **Inaccurate welding:**  
Use two hands or rest hand on steady surface.
2. **Inconsistent welding speed:**  
Maintain steady weld speed.

BASIC WELDING

## Excessive Spatter

### POSSIBLE CAUSES AND SOLUTIONS

TOP  
VIEW



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

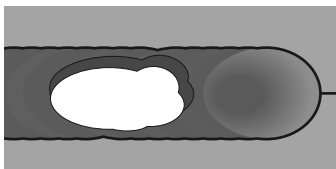
**Dirty workpiece or fill material:**  
Clean workpiece down to bare metal.  
Make certain that fill material and Electrode are clean and free from oil, coatings, and other residues.

WELDING TIPS

## Burn-Through — Base material melts away, leaving a hole in the weld.

### POSSIBLE CAUSES AND SOLUTIONS

TOP  
VIEW



1. **Workpiece overheating:**  
Reduce current.
2. **Welding speed too slow:**  
Increase welding speed and ensure that welding speed is kept steady.
3. **Excessive material at weld:**  
Reduce amount of fill material.

MAINTENANCE

### WARNING



#### TO PREVENT SERIOUS INJURY, FIRE AND BURNS:

Unplug the Welder, rest the Electrode Holder 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 unplug the Welder, remove the Top Cover Panel, and using compressed air, blow out all dust from the interior.
3. **AFTER EVERY USE**, store in a clean and dry location.

## Troubleshooting

### 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
No Welder Output When Switched On	<ol style="list-style-type: none"> <li>1. Tripped thermal protection device.</li> <li>2. Ground Clamp not attached to workpiece.</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 Duty Cycle (Duration of Use) on page 10.</li> <li>2. Attach Ground Clamp to workpiece.</li> </ol>
Welder Does Not Function 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> </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 amperage as detailed in Specifications 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> </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> </ol>



Follow all Safety precautions whenever diagnosing or servicing the tool.  
Disconnect power supply before service.

**PLEASE READ THE FOLLOWING CAREFULLY**

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.

**Parts List**

Part	Description	Qty
1	Ground Cable with Clamp	1
2	Welding Cable with Electrode Holder	1
3	Cable Clamp	2
4	Current Handle	1
5	Pointer	1
6	Polarity Switch	1
7	Front Panel	1
8	Thermal Protection Indicator	1
9	Breaker	1
10	Steel Cable	1
11	Pulley	3
12	Current Adjustment Disk	1
13	Screw Rod Sleeve	1
14	Support Welding	1
15	Bottom Plate	1
16	Right Panel	1
17	Power Cord	1
18	Power Cord Clamp	1
19	Clip	1

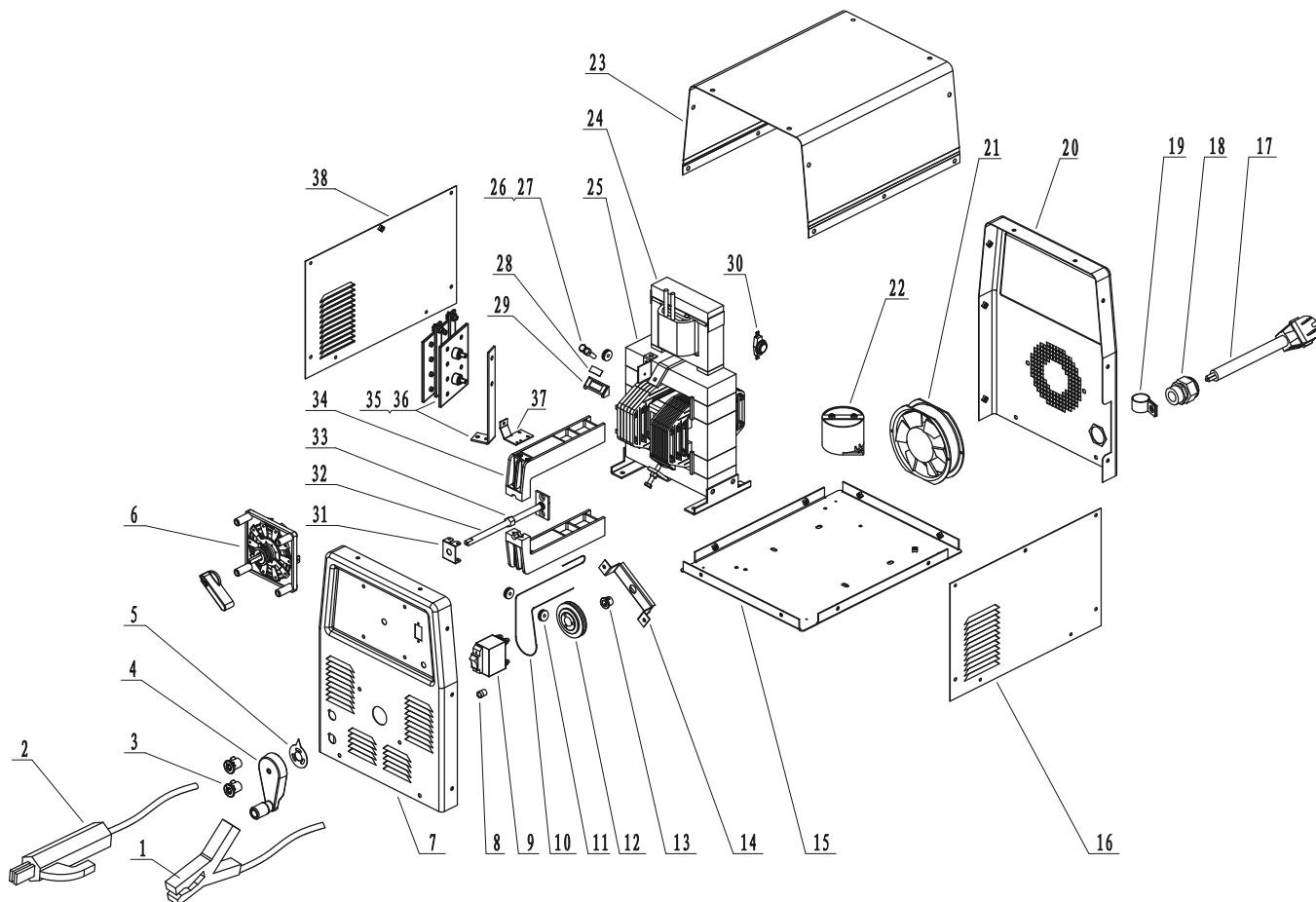
Part	Description	Qty
20	Back Panel	1
21	Fan	1
22	Filter Capacitor	1
23	Top Cover Panel	1
24	Inductor	1
25	Transformer	1
26	Hex Bolt M8x45	4
27	Hex Nut M8	4
28	Pointer Support	1
29	Moveable Core Keeper	1
30	Thermal Relay	1
31	Slide Splint	1
32	Screw Rod	2
33	Moveable Core Adjustment Nut	1
34	Moveable Core Slide	1
35	Rectifier Bracket	1
36	Rectifier	1
37	Pointer Support	1
38	Left Panel	1

**Record Product's Serial Number Here:** \_\_\_\_\_

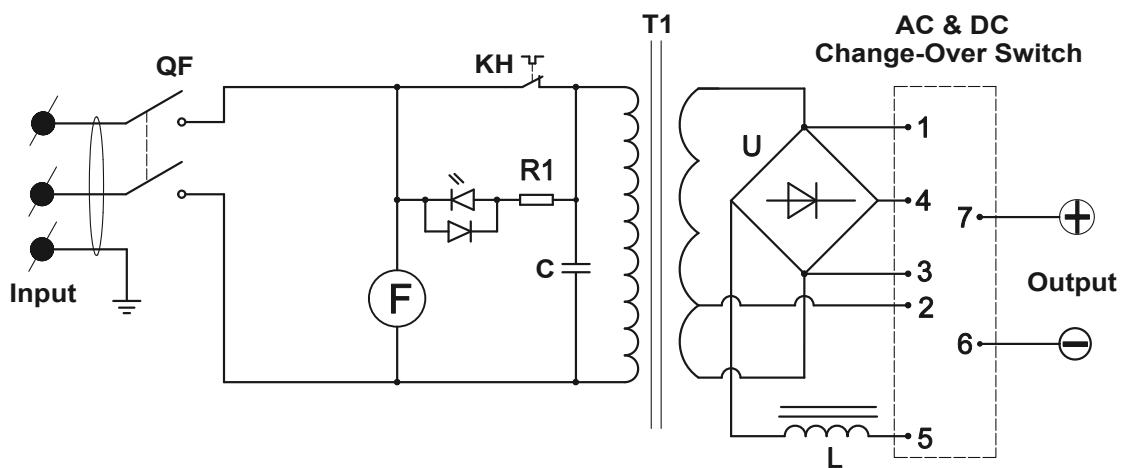
**Note:** If product has no serial number, record month and year of purchase instead.

**Note:** Some parts are listed and shown for illustration purposes only, and are not available individually as replacement parts.

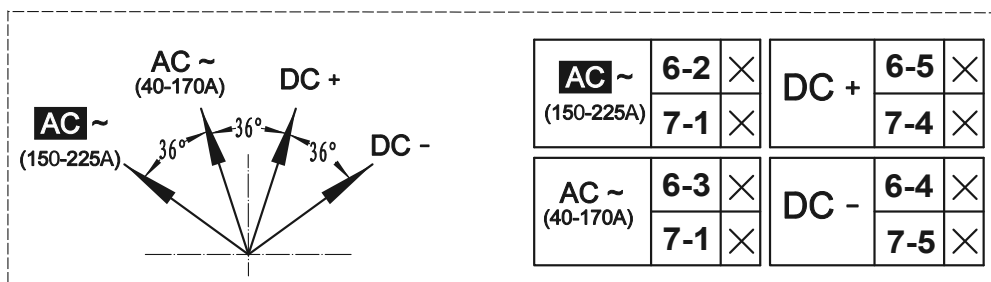
# Assembly Diagram



# Wiring Diagram



AC & DC Change-Over Switch



SAFETY

SETUP

BASIC WELDING

WELDING TIPS

MAINTENANCE

## Limited One Year 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 one year 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 VULCAN features the word "VULCAN" in a bold, black, sans-serif font. Below the text is a thick, black, downward-pointing chevron shape that tapers at the ends, resembling a stylized flame or a protective shield. A small "TM" trademark symbol is located at the bottom right of the chevron.

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