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Processes



Stick (SMAW) Welding



MIG (GMAW) Welding
Flux Cored (FCAW) Welding



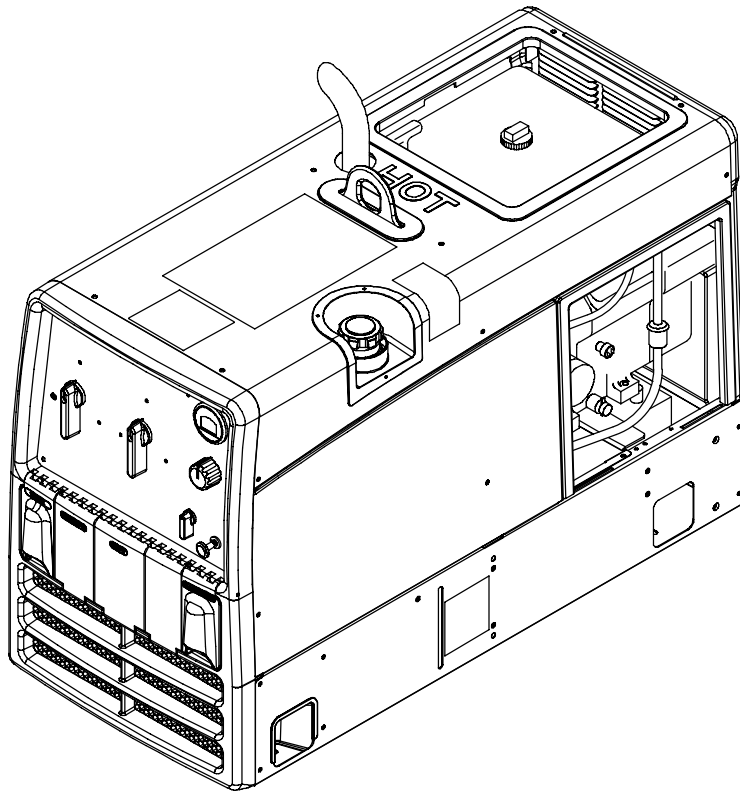
Non-Critical TIG (GTAW)
Welding

Description



Engine Driven Welding Generator

Bobcat™ 225



OWNER'S MANUAL

File: Engine Drive



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From Miller to You

Thank you and congratulations on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite.

We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide the exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.



Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001:2000 Quality System Standard.

Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual specification sheets. **To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at www.MillerWelds.com on the web.**



Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.



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SECTION 1 – SAFETY PRECAUTIONS – READ BEFORE USING

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 Protect yourself and others from injury — read and follow these precautions.

1-1. Symbol Usage



DANGER! – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

NOTICE – Indicates statements not related to personal injury.

 Indicates special instructions.



This group of symbols means Warning! Watch Out! ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Arc Welding Hazards



The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-7. Read and follow all Safety Standards.



Only qualified persons should install, operate, maintain, and repair this unit.



During operation, keep everybody, especially children, away.



ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.

- Always verify the supply ground — check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord for damage or bare wiring — replace cord immediately if damaged — bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

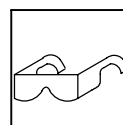
SIGNIFICANT DC VOLTAGE exists in inverters after stopping engine.

- Stop engine on inverter and discharge input capacitors according to instructions in Maintenance Section before touching any parts.



HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.



FLYING METAL or DIRT can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.



FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding fumes and gases.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch-person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



BUILDUP OF GAS can injure or kill.

- Shut off shielding gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.



ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes from arc rays and sparks when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare, and sparks; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather, heavy cotton, or wool) and foot protection.



WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.

- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.



NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



MAGNETIC FIELDS can affect Implanted Medical Devices.

- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.



CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder — explosion will result.
- Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

1-3. Engine Hazards



BATTERY EXPLOSION can BLIND.

- Always wear a face shield, rubber gloves, and protective clothing when working on a battery.
- Stop engine before disconnecting or connecting battery cables or servicing battery.
- Do not allow tools to cause sparks when working on a battery.
- Do not use welder to charge batteries or jump start vehicles.
- Observe correct polarity (+ and -) on batteries.
- Disconnect negative (-) cable first and connect it last.



FUEL can cause fire or explosion.

- Stop engine and let it cool off before checking or adding fuel.
- Do not add fuel while smoking or if unit is near any sparks or open flames.
- Do not overfill tank — allow room for fuel to expand.
- Do not spill fuel. If fuel is spilled, clean up before starting engine.
- Dispose of rags in a fireproof container.
- Always keep nozzle in contact with tank when fueling.



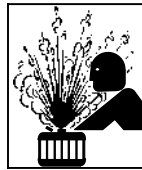
MOVING PARTS can cause injury.

- Keep away from fans, belts, and rotors.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Stop engine before installing or connecting unit.
- Have only qualified people remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting engine.
- Before working on generator, remove spark plugs or injectors to keep engine from kicking back or starting.
- Block flywheel so that it will not turn while working on generator components.



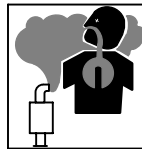
HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.



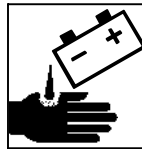
STEAM AND HOT COOLANT can burn.

- If possible, check coolant level when engine is cold to avoid scalding.
- Always check coolant level at overflow tank, if present on unit, instead of radiator (unless told otherwise in maintenance section or engine manual).
- If the engine is warm, checking is needed, and there is no overflow tank, follow the next two statements.
- Wear safety glasses and gloves and put a rag over radiator cap.
- Turn cap slightly and let pressure escape slowly before completely removing cap.



Using a generator indoors CAN KILL YOU IN MINUTES.

- Generator exhaust contains carbon monoxide. This is a poison you cannot see or smell.
- NEVER use inside a home or garage, EVEN IF doors and windows are open.
- Only use OUTSIDE and far away from windows, doors, and vents.



BATTERY ACID can BURN SKIN and EYES.

- Do not tip battery.
- Replace damaged battery.
- Flush eyes and skin immediately with water.



ENGINE HEAT can cause fire.

- Do not locate unit on, over, or near combustible surfaces or flammables.
- Keep exhaust and exhaust pipes way from flammables.



EXHAUST SPARKS can cause fire.

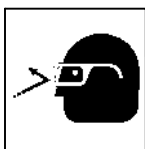
- Do not let engine exhaust sparks cause fire.
- Use approved engine exhaust spark arrestor in required areas — see applicable codes.

1-4. Compressed Air Hazards



BREATHING COMPRESSED AIR can cause serious injury or death.

- Do not use compressed air for breathing.
- Use only for cutting, gouging, and tools.



COMPRESSED AIR can cause injury.

- Wear approved safety goggles.
- Do not direct air stream toward self or others.



TRAPPED AIR PRESSURE AND WHIPPING HOSES can cause injury.

- Release air pressure from tools and system before servicing, adding or changing attachments, or opening compressor oil drain or oil fill cap.



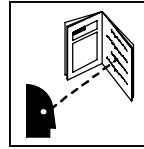
HOT METAL from air arc cutting and gouging can cause fire or explosion.

- Do not cut or gouge near flammables.
- Watch for fire; keep extinguisher nearby.



HOT PARTS can cause burns and injury.

- Do not touch hot compressor or air system parts.
- Let system cool down before touching or servicing.



READ INSTRUCTIONS.

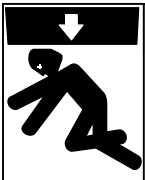
- Read Owner's Manual before using or servicing unit.
- Stop engine and release air pressure before servicing.
- Use only genuine replacement parts from the manufacturer.

1-5. Additional Symbols For Installation, Operation, And Maintenance



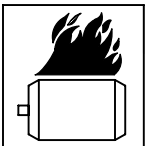
FIRE OR EXPLOSION hazard.

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.



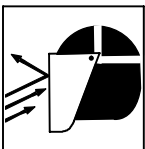
FALLING UNIT can cause injury.

- Use lifting eye to lift unit and properly installed accessories only, NOT gas cylinders. Do not exceed maximum lift eye weight rating (see Specifications).
- Lift and support unit only with proper equipment and correct procedures.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



OVERHEATING can damage motors.

- Turn off or unplug equipment before starting or stopping engine.
- Do not let low voltage and frequency caused by low engine speed damage electric motors.
- Do not connect 50 or 60 Hertz motors to the 100 Hertz receptacle where applicable.



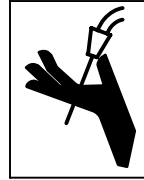
FLYING SPARKS can cause injury.

- Wear a face shield to protect eyes and face.
- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Sparks can cause fires — keep flammables away.



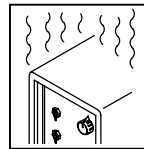
MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.



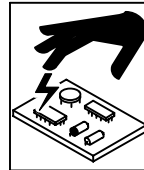
WELDING WIRE can cause injury.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.



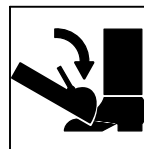
OVERUSE can cause OVERHEATING.

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



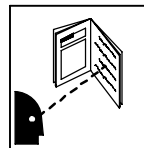
STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.



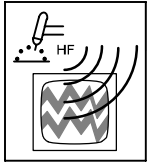
TILTING OF TRAILER can cause injury.

- Use tongue jack or blocks to support weight.
- Properly install welding generator onto trailer according to instructions supplied with trailer.



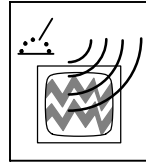
READ INSTRUCTIONS.

- Read Owner's Manual before using or servicing unit.
- Use only genuine replacement parts from the manufacturer.
- Perform engine and air compressor maintenance and service according to this manual and the engine/air compressor (if applicable) manuals.



H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.



ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as micro-processors, computers, and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

1-6. California Proposition 65 Warnings

- ⚠ Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)**
- ⚠ Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.**

For Gasoline Engines:

- ⚠ Engine exhaust contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.**

For Diesel Engines:

- ⚠ Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.**

1-7. Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, American Welding Society Standard AWS F4.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, P.O. Box 9101, Quincy, MA 02269-9101 (phone: 617-770-3000, website: www.nfpa.org and www.sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151 (phone: 703-788-2700, website: www.cganet.com).

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060 Mississauga,

Ontario, Canada L4W 5NS (phone: 800-463-6727 or in Toronto 416-747-4044, website: www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002 (phone: 212-642-4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, P.O. Box 9101, Quincy, MA 02269-9101 (phone: 617-770-3000, website: www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (phone: 1-866-512-1800) (there are 10 Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

1-8. EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields

Welding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep welding power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Implanted Medical Devices:

Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

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! Se protéger, ainsi que toute autre personne travaillant sur les lieux, contre les étincelles et le métal chaud.

2-1. Signification des symboles



DANGER! – Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.



Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

NOTE – Indique des déclarations pas en relation avec des blessures personnelles.

 Indique des instructions spécifiques.



Ce groupe de symboles veut dire Avertissement! Attention! DANGER DE CHOC ELECTRIQUE, PIECES EN MOUVEMENT, et PIECES CHAUDES. Consulter les symboles et les instructions ci-dessous y afférant pour les actions nécessaires afin d'éviter le danger.

2-2. Dangers relatifs au soudage à l'arc



Les symboles présentés ci-après sont utilisés tout au long du présent manuel pour attirer votre attention et identifier les risques de danger. Lorsque vous voyez un symbole, soyez vigilant et suivez les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité présentées ci-après ne font que résumer l'information contenue dans les normes de sécurité énumérées à la section 2-7. Veuillez lire et respecter toutes ces normes de sécurité.



L'installation, l'utilisation, l'entretien et les réparations ne doivent être confiés qu'à des personnes qualifiées.



Au cours de l'utilisation, tenir toute personne à l'écart et plus particulièrement les enfants.



UN CHOC ÉLECTRIQUE peut tuer.

Un simple contact avec des pièces électriques peut provoquer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension

dès que l'appareil est sur ON. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension à ce moment-là. En soudage semi-automatique ou automatique, le fil, le dévidoir, le logement des galets d'entraînement et les pièces métalliques en contact avec le fil de soudage sont sous tension. Des matériels mal installés ou mal mis à la terre présentent un danger.

- Ne jamais toucher les pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs ne comportant pas de trous.
- S'isoler de la pièce et de la terre au moyen de tapis ou d'autres moyens isolants suffisamment grands pour empêcher le contact physique éventuel avec la pièce ou la terre.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- Des précautions de sécurité supplémentaires sont requises dans des environnements à risque comme: les endroits humides ou lorsque l'on porte des vêtements mouillés; sur des structures métalliques au sol, grillages et échafaudages; dans des positions assises, à genoux et allongées; ou quand il y a un risque important de contact accidentel avec la pièce ou le sol. Dans ces cas utiliser les appareils suivants dans l'ordre de préférence: 1) un poste à

souder DC semi-automatique de type CV (MIG/MAG), 2) un poste à souder manuel (électrode enrobée) DC, 3) un poste à souder manuel AC avec tension à vide réduite. Dans la plupart des cas, un poste courant continu de type CV est recommandé. Et, ne pas travailler seul!

- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installer et mettre à la terre correctement cet appareil conformément à son manuel d'utilisation et aux codes nationaux, provinciaux et municipaux.
- Toujours vérifier la terre du cordon d'alimentation – Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Les câbles doivent être exempts d'humidité, d'huile et de graisse; protégez-les contre les étincelles et les pièces métalliques chaudes.
- Vérifier fréquemment le cordon d'alimentation pour voir s'il n'est pas endommagé ou dénudé – remplacer le cordon immédiatement s'il est endommagé – un câble dénudé peut provoquer une électrocution.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct – ne pas utiliser le connecteur de pièce ou le câble de retour.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- Ne pas toucher des porte électrodes connectés à deux machines en même temps à cause de la présence d'une tension à vide doublée.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Porter un harnais de sécurité quand on travaille en hauteur.
- Maintenir solidement en place tous les panneaux et capots.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.

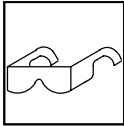
Une tension DC importante subsiste à l'intérieur des onduleurs après avoir coupé l'alimentation.

- Couper l'alimentation du poste et décharger les condensateurs d'entrée comme indiqué dans la Section Maintenance avant de toucher des composants.



DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

- Ne pas toucher à mains nues les parties chaudes.
- Prévoir une période de refroidissement avant de travailler à l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



DES PIÈCES DE METAL ou DES SALETES peuvent provoquer des blessures dans les yeux.

- Le soudage, l'écaillage, le passage de la pièce à la brosse en fil de fer, et le meulage génèrent des étincelles et des particules métalliques volantes. Pendant la période de refroidissement des soudures, elles risquent de projeter du laitier.
- Porter des lunettes de sécurité avec écrans latéraux ou un écran facial.



LES FUMÉES ET LES GAZ peuvent être dangereux.

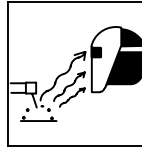
Le soudage génère des fumées et des gaz. Leur inhalation peut être dangereux pour votre santé.

- Eloigner votre tête des fumées. Ne pas respirer les fumées.
- À l'intérieur, ventiler la zone et/ou utiliser une ventilation forcée au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage.
- Si la ventilation est médiocre, porter un respirateur anti-vapeurs approuvé.
- Lire et comprendre les spécifications de sécurité des matériaux (MSDS) et les instructions du fabricant concernant les métaux, les consommables, les revêtements, les nettoyants et les dégraissants.
- Travailler dans un espace fermé seulement s'il est bien ventilé ou en portant un respirateur à alimentation d'air. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz de soudage peuvent déplacer l'air et abaisser le niveau d'oxygène provoquant des blessures ou des accidents mortels. S'assurer que l'air de respiration ne présente aucun danger.
- Ne pas souder dans des endroits situés à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir en présence de vapeurs et former des gaz hautement toxiques et irritants.
- Ne pas souder des métaux munis d'un revêtement, tels que l'acier galvanisé, plaqué en plomb ou au cadmium à moins que le revêtement n'ait été enlevé dans la zone de soudure, que l'endroit soit bien ventilé, et en portant un respirateur à alimentation d'air. Les revêtements et tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques en cas de soudage.



LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

- Fermer l'alimentation du gaz protecteur en cas de non utilisation.
- Veiller toujours à bien aérer les espaces confinés ou se servir d'un respirateur d'adduction d'air homologué.



LES RAYONS DE L'ARC peuvent provoquer des brûlures dans les yeux et sur la peau.

Le rayonnement de l'arc du procédé de soudage génère des rayons visibles et invisibles intense (ultraviolets et infrarouges) susceptibles de provoquer des brûlures dans les yeux et sur la peau. Des étincelles sont projetées pendant le soudage.

- Porter un casque de soudage approuvé muni de verres filtrants approprié pour protéger visage et yeux pendant le soudage (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des lunettes de sécurité avec écrans latéraux même sous votre casque.
- Avoir recours à des écrans protecteurs ou à des rideaux pour protéger les autres contre les rayonnements les éblouissements et les étincelles ; prévenir toute personne sur les lieux de ne pas regarder l'arc.
- Porter des vêtements confectionnés avec des matières résistantes et ignifuges (cuir, coton lourd ou laine) et des bottes de protection.



LE SOUDAGE peut provoquer un incendie ou une explosion.

Le soudage effectué sur des conteneurs fermés tel que des réservoirs, tambours ou des conduites peut provoquer leur éclatement. Des étincelles peuvent être projetées de l'arc de soudure. La projection d'étincelles, des pièces chaudes et des équipements chauds peut provoquer des incendies et des brûlures. Le contact accidentel de l'électrode avec des objets métalliques peut provoquer des étincelles, une explosion, un surchauffement ou un incendie. Avant de commencer le soudage, vérifier et s'assurer que l'endroit ne présente pas de danger.

- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité les recouvrir soigneusement avec des protections homologués.
- Ne pas souder dans un endroit où des étincelles peuvent tomber sur des substances inflammables.
- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 (voir les normes de sécurité).
- Ne soudez pas si l'air ambiant est chargé de particules, gaz, ou vapeurs inflammables (vapeur d'essence, par exemple).
- Brancher le câble de masse sur la pièce la plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, d'étincelles et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil à la pointe de contact.
- Porter des vêtements de protection dépourvus d'huile tels que des gants en cuir, une chemise en matériau lourd, des pantalons sans revers, des chaussures hautes et un couvre chef.
- Avant de souder, retirer toute substance combustible de vos poches telles qu'un allumeur au butane ou des allumettes.
- Une fois le travail achevé, assurez-vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe-circuits appropriés. Ne pas augmenter leur puissance; ne pas les ponter.

- Suivre les recommandations dans OSHA 1910.252(a)(2)(iv) et NFPA 51B pour les travaux à chaud et avoir de la surveillance et un extincteur à proximité.



LE BRUIT peut affecter l'ouïe.

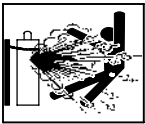
Le bruit des processus et des équipements peut affecter l'ouïe.

- Porter des protections approuvées pour les oreilles si le niveau sonore est trop élevé.



LES CHAMPS MAGNETIQUES peuvent affecter des implants médicaux.

- Porteur de simulateur cardiaque ou autre implants médicaux, rester à distance.
- Les porteurs d'implants doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction.

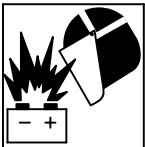


Si des BOUTEILLES sont endommagées, elles pourront exploser.

Des bouteilles de gaz protecteur contiennent du gaz sous haute pression. Si une bouteille est endommagée, elle peut exploser. Du fait que les bouteilles de gaz forment normalement partie du procédé de soudage, les manipuler avec précaution.

- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, des dommages physiques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais placer une torche de soudage sur une bouteille à gaz.
- Une électrode de soudage ne doit jamais entrer en contact avec une bouteille.
- Ne jamais souder une bouteille pressurisée – risque d'explosion.
- Utiliser seulement des bouteilles de gaz protecteur, régulateurs, tuyaux et raccords convenables pour cette application spécifique; les maintenir ainsi que les éléments associés en bon état.
- Ne pas tenir la tête en face de la sortie en ouvrant la soupape de la bouteille.
- Maintenir le chapeau de protection sur la soupape, sauf en cas d'utilisation ou de branchement de la bouteille.
- Utiliser les équipements corrects, les bonnes procédures et suffisamment de personnes pour soulever et déplacer les bouteilles.
- Lire et suivre les instructions sur les bouteilles de gaz comprimé, l'équipement connexe et le dépliant P-1 de la CGA (Compressed Gas Association) mentionné dans les principales normes de sécurité.

2-3. Dangers existant en relation avec le moteur



L'EXPLOSION DE LA BATTERIE peut RENDRE AVEUGLE.

- Toujours porter une protection faciale, des gants en caoutchouc et vêtements de protection lors d'une intervention sur la batterie.
- Arrêter le moteur avant de débrancher ou de brancher les câbles de batterie.
- Eviter de provoquer des étincelles avec les outils en travaillant sur la batterie.
- Ne pas utiliser le poste de soudage pour charger les batteries ou des véhicules de démarrage rapide.
- Observer la polarité correcte (+ et -) sur les batteries.
- Débrancher le câble négatif (-) en premier lieu. Le rebrancher en dernier lieu.



LE CARBURANT MOTEUR peut provoquer un incendie ou une explosion.

- Arrêter le moteur avant de vérifier le niveau de carburant ou de faire le plein.
- Ne pas faire le plein en fumant ou proche d'une source d'étincelles ou d'une flamme nue.
- Ne pas faire le plein de carburant à ras bord; prévoir de l'espace pour son expansion.
- Faire attention de ne pas renverser de carburant. Nettoyer tout carburant renversé avant de faire démarrer le moteur.
- Jeter les chiffons dans un récipient ignifuge.
- Toujours garder le pistolet en contact avec le réservoir lors du remplissage.



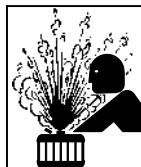
DES ORGANES MOBILES peuvent provoquer des blessures.

- Ne pas approcher les mains des ventilateurs, courroies et autres pièces en mouvement.
- Maintenir fermés et fixement en place les portes, panneaux, recouvrements et dispositifs de protection.
- Arrêter le moteur avant d'installer ou brancher l'appareil.



DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

- Ne pas toucher à mains nues les parties chaudes.
- Prévoir une période de refroidissement avant de travailler à l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT CHAUD peuvent provoquer des brûlures.

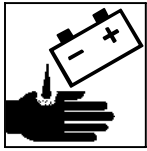
- Il est préférable de vérifier le liquide de refroidissement une fois le moteur refroidi pour éviter de se brûler.
- Toujours vérifier le niveau de liquide de refroidissement dans le vase d'expansion (si présent), et non dans le radiateur (sauf si précisé autrement dans la section maintenance du manuel du moteur).
- Si le moteur est chaud et que le liquide doit être vérifié, opérer comme suivant.
- Mettre des lunettes de sécurité et des gants, placer un torchon sur le bouchon du radiateur.

- Dévisser le bouchon légèrement et laisser la vapeur s'échapper avant d'enlever le bouchon.



L'utilisation d'un groupe autonome à l'intérieur PEUT VOUS TUER EN QUELQUES MINUTES.

- Les fumées d'un groupe autonome contient du monoxyde de carbone. C'est un poison invisible et inodore.
- JAMAIS utiliser dans une maison ou garage, même avec les portes et fenêtres ouvertes.
- Uniquement utiliser à l'EXTERIEUR, loin des portes, fenêtres et bouches aération.



L'ACIDE DE LA BATTERIE peut provoquer des brûlures dans les YEUX et sur la PEAU.

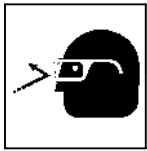
- Ne pas renverser la batterie.
- Remplacer une batterie endommagée.
- Rincer immédiatement les yeux et la peau à l'eau.

2-4. Dangers liés à l'air comprimé



RESPIRER L'AIR COMPRIMÉ peut provoquer des blessures graves ou causer la mort.

- Ne pas utiliser l'air comprimé pour respirer.
- Utiliser l'air comprimé seulement pour le coupage, gougeage et les outils pneumatiques.



L'AIR COMPRIMÉ peut provoquer des blessures.

- Porter des lunettes de sécurité approuvées.
- Ne pas diriger le jet d'air vers d'autres ou soi-même.



L'AIR COMPRIE EMMAGASINE ET DES TUYAUX SOUS PRESSION peuvent provoquer des blessures.

- Relâcher la pression d'air de l'outillage ou du système avant d'effectuer la maintenance, avant de changer ou de rajouter des éléments ou avant d'ouvrir la purge ou le bouchon de remplissage d'huile.



LA CHALEUR DU MOTEUR peut provoquer un incendie.

- Ne pas placer l'appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Tenir à distance les produits inflammables de l'échappement.



LES ÉTINCELLES À L'ÉCHAPPEMENT peuvent provoquer un incendie.

- Empêcher les étincelles d'échappement du moteur de provoquer un incendie.
- Utiliser uniquement un pare-étincelles approuvé – voir codes en vigueur.



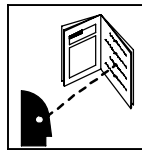
Le METAL CHAUD lors du coupage et gougeage plasma peut provoquer un incendie ou une explosion.

- Ne pas couper ou gouger à proximité de produits inflammables.
- Surveillez et garder un extincteur à proximité.



DES PIÈCES CHAUDES peuvent provoquer des brûlures et blessures.

- Ne pas toucher le compresseur ou d'autres éléments du circuit air comprimé chauds.
- Laisser l'ensemble se refroidir avant de toucher ou d'effectuer la maintenance.



LIRE LES INSTRUCTIONS.

- Lisez le manuel d'instructions avant l'utilisation ou la maintenance de l'appareil.
- Arrêter le moteur et relâcher la pression avant d'effectuer la maintenance.
- N'utiliser que les pièces de rechange recommandées par le constructeur.

2-5. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance



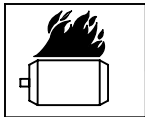
Risque D'INCENDIE OU D'EXPLOSION.

- Ne pas placer l'appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Ne pas installer l'appareil à proximité de produits inflammables.
- Ne pas surcharger l'installation électrique – s'assurer que l'alimentation est correctement dimensionnée et protégée avant de mettre l'appareil en service.



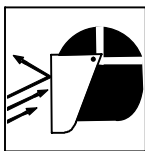
LA CHUTE DE L'APPAREIL peut blesser.

- Utiliser l'anneau de levage pour lever l'appareil et les accessoires correctement installés seuls, PAS les bouteilles de gaz. Ne pas dépasser le poids nominal maximal de l'œilleton (voir les spécifications).
- Ne lever et ne soutenir l'appareil qu'avec de l'équipement approprié et en suivant les procédures adéquates.
- En utilisant des fourches de levage pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.



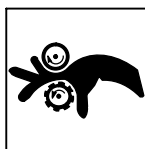
LE SURCHAUFFEMENT peut endommager le moteur électrique.

- Arrêter ou déconnecter l'équipement avant de démarrer ou d'arrêter le moteur.
- Ne pas laisser tourner le moteur trop lentement sous risque d'endommager le moteur électrique à cause d'une tension et d'une fréquence trop faibles.
- Ne pas brancher de moteur de 50 ou de 60 Hz à la prise de 100 Hz, s'il y a lieu.



LES ÉTINCELLES VOLANTES risquent de provoquer des blessures.

- Porter un écran facial pour protéger le visage et les yeux.
- Affûter l'électrode au tungstène uniquement à la meuleuse dotée de protecteurs. Cette manœuvre est à exécuter dans un endroit sûr lorsque l'on porte l'équipement homologué de protection du visage, des mains et du corps.
- Les étincelles risquent de causer un incendie – éloigner toute substance inflammable.



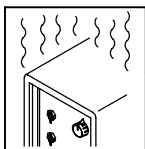
DES ORGANES MOBILES peuvent provoquer des blessures.

- Ne pas s'approcher des organes mobiles.
- Ne pas s'approcher des points de coincement tels que des rouleaux de commande.



LES FILS DE SOUDAGE peuvent provoquer des blessures.

- Ne pas appuyer sur la gâchette avant d'en avoir reçu l'instruction.
- Ne pas diriger le pistolet vers soi, d'autres personnes ou toute pièce mécanique en engageant le fil de soudage.



L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Laisser l'équipement refroidir ; respecter le facteur de marche nominal.
- Réduire le courant ou le facteur de marche avant de poursuivre le soudage.
- Ne pas obstruer les passages d'air du poste.



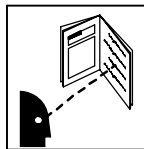
LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Établir la connexion avec la barrette de terre avant de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédier des cartes de circuits imprimés.



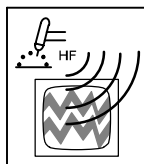
UNE REMORQUE QUI BASCULE peut entraîner des blessures.

- Utiliser les supports de la remorque ou des blocs pour soutenir le poids.
- Installer convenablement le poste sur la remorque comme indiqué dans le manuel s'y rapportant.



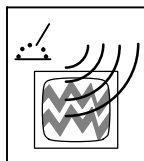
LIRE LES INSTRUCTIONS.

- Lisez le manuel d'instructions avant l'utilisation ou la maintenance de l'appareil.
- N'utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer la maintenance et le service du moteur et du compresseur d'air suivant les instructions dans ce manuel ou le manuel du moteur/compresseur (si applicable).



LE RAYONNEMENT HAUTE FRÉQUENCE (H.F.) risque de provoquer des interférences.

- Le rayonnement haute fréquence (H.F.) peut provoquer des interférences avec les équipements de radio-navigation et de communication, les services de sécurité et les ordinateurs.
- Demander seulement à des personnes qualifiées familiarisées avec des équipements électroniques de faire fonctionner l'installation.
- L'utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences résultant de l'installation.
- Si le FCC signale des interférences, arrêter immédiatement l'appareil.
- Effectuer régulièrement le contrôle et l'entretien de l'installation.
- Maintenir soigneusement fermés les portes et les panneaux des sources de haute fréquence, maintenir les éclateurs à une distance correcte et utiliser une terre et un blindage pour réduire les interférences éventuelles.



LE SOUDAGE À L'ARC risque de provoquer des interférences.

- L'énergie électromagnétique risque de provoquer des interférences pour l'équipement électronique sensible tel que les ordinateurs et l'équipement commandé par ordinateur tel que les robots.
- Veiller à ce que tout l'équipement de la zone de soudage soit compatible électromagnétiquement.
- Pour réduire la possibilité d'interférence, maintenir les câbles de soudage aussi courts que possible, les grouper, et les poser aussi bas que possible (ex. par terre).
- Veiller à souder à une distance de 100 mètres de tout équipement électronique sensible.
- Veiller à ce que ce poste de soudage soit posé et mis à la terre conformément à ce mode d'emploi.
- En cas d'interférences après avoir pris les mesures précédentes, il incombe à l'utilisateur de prendre des mesures supplémentaires telles que le déplacement du poste, l'utilisation de câbles blindés, l'utilisation de filtres de ligne ou la pose de protecteurs dans la zone de travail.

2-6. Proposition californienne 65 Avertissements

⚠ Les équipements de soudage et de coupage produisent des fumées et des gaz qui contiennent des produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des malformations congénitales et, dans certains cas, des cancers. (Code de santé et de sécurité de Californie, chapitre 25249.5 et suivants)

⚠ Les batteries, les bornes et autres accessoires contiennent du plomb et des composés à base de plomb, produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des cancers et des malformations congénitales ou autres problèmes de procréation. Se laver les mains après manipulation.

Pour les moteurs à essence :

⚠ Les gaz d'échappement des moteurs contiennent des produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des cancers et des malformations congénitales ou autres problèmes de procréation.

Pour les moteurs diesel :

⚠ Les gaz d'échappement des moteurs diesel et certains de leurs composants sont reconnus par l'État de Californie comme provoquant des cancers et des malformations congénitales ou autres problèmes de procréation.

2-7. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, de Global Engineering Documents (téléphone : 1-877-413-5184, site Internet : www.global.ih.com).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, American Welding Society Standard AWS F4.1 de Global Engineering Documents (téléphone : 1-877-413-5184, site Internet : www.global.ih.com).

National Electrical Code, NFPA Standard 70, de National Fire Protection Association, P.O. Box 9101, Quincy, MA 02269-9101 (téléphone : 617-770-3000, site Internet : www.nfpa.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, de Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151 (téléphone : 703-788-2700, site Internet : www.cganet.com).

Code for Safety in Welding and Cutting, CSA Standard W117.2, de Canadian Standards Association, 5060 Mississauga, Ontario, Canada

L4W 5NS (téléphone : 800-463-6727 ou à Toronto 416-747-4044, site Internet : www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, de American National Standards Institute, 11 West 43rd Street, New York, NY 10036-8002 (téléphone : 212-642-4900, site Internet : www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, de National Fire Protection Association, P.O. Box 9101, Quincy, MA 02269-9101 (téléphone : 617-770-3000, site Internet : www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, de U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (téléphone : 1-866-512-1800) (il y a 10 bureaux régionaux--le téléphone de la région 5, Chicago, est 312-353-2220, site Internet : www.osha.gov).

2-8. Information EMF

Considérations sur le soudage et les effets de basse fréquence et des champs magnétiques et électriques.

Le courant de soudage, pendant son passage dans les câbles de soudage, causera des champs électromagnétiques. Il y a eu et il y a encore un certain souci à propos de tels champs. Cependant, après avoir examiné plus de 500 études qui ont été faites pendant une période de recherche de 17 ans, un comité spécial ruban bleu du National Research Council a conclu : « L'accumulation de preuves, suivant le jugement du comité, n'a pas démontré que l'exposition aux champs magnétiques et champs électriques à haute fréquence représente un risque à la santé humaine ». Toutefois, des études sont toujours en cours et les preuves continuent à être examinées. En attendant que les conclusions finales de la recherche soient établies, il vous serait souhaitable de réduire votre exposition aux champs électromagnétiques pendant le soudage ou le coupage.

Pour réduire les champs magnétiques sur le poste de travail, appliquer les procédures suivantes :

























1. Garder les câbles ensemble, les torsader, les scotcher, ou les recouvrir d'une housse.
2. Disposer les câbles d'un côté et à distance de l'opérateur.
3. Ne pas courber pas et ne pas entourer pas les câbles autour de votre corps.
4. Garder le poste de soudage et les câbles le plus loin possible de vous.
5. Connecter la pince sur la pièce aussi près que possible de la soudure.

Des implants médicaux :

Les porteurs d'implants doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

SECTION 3 – DEFINITIONS

3-1. Symbol Definitions

	Stop Engine		Fast (Run, Weld/Power)		Fast/Slow (Run/Idle)		Slow (Idle)
	Start Engine		Read Operator's Manual	A	Amperes	V	Volts
	Engine Oil		Fuel		Battery (Engine)		Engine
	Engine Choke		Check Valve Clearance		Do not switch while welding		Work Connection
+	Positive	—	Negative		Alternating Current (AC)		Output
	Welding Arc (Electrode)		MIG (GMAW), Wire		Stick (SMAW)		TIG (GTAW)
h	Hours	s	Seconds		Time		Protective Earth (Ground)
	Circuit Protector		Temperature				

SECTION 4 – SPECIFICATIONS

4-1. Weld, Power, and Engine Specifications

This unit uses either a Subaru/Robin EH-65 or a Kohler CH-23 engine. Differences between models are noted throughout this manual.

Welding Mode	Weld Output Range	Rated Welding Output	Maximum Open Circuit Voltage	Generator Power Rating	Fuel Capacity	Engine
CC/AC	50 – 225 A	225 A, 25 V, 100% Duty Cycle	80	Subaru/Robin EH-65 Peak: 10 kVA/kW Continuous: 9.5 kVA/kW, Single-Phase, 84/42 A, 120/240 V AC, 60 Hz (while not welding) Kohler CH-23 Peak: 10.5 kVA/kW Continuous: 9.5 kVA/kW, Single-Phase, 88/44 A, 120/240 V AC, 60 Hz (while not welding)	12 gal (45 L) Tank	Subaru/Robin EH-65 Air-Cooled, Two-Cylinder, Four-Cycle, 22 HP Gasoline Engine or Kohler CH-23 Air-Cooled, Two-Cylinder, Four-Cycle, 23 HP Gasoline Engine
CC/DC	50 – 210 A	210 A, 25 V, 100% Duty Cycle	80			
CV/DC	19 – 28 V	200 A, 20 V, 100% Duty Cycle	33			

4-2. Dimensions, Weights, and Operating Angles

Dimensions	
Height	33-1/2 in (851 mm) (To Top Of Exhaust)
Width	20 in (508 mm)
Depth	45-3/8 in (1153 mm)
A	20 in (508 mm)
B	16-1/2 in (419 mm)
C	1-3/4 in (44 mm)
D	6-1/16 in (154 mm)
E	32-3/4 in (832 mm)
F	45-3/8 in (1153 mm)
G	13/32 in (10 mm) Dia.
Weight	
Subaru/Robin-Powered Unit: 560 lb (254 kg)	
Kohler-Powered Unit: 562 lb (254 kg)	
Lifting Eye Weight Rating: 1280 lbs (580 kg)	

Engine End 800 426

⚠ Do not exceed tilt angles or engine could be damaged or unit could tip.

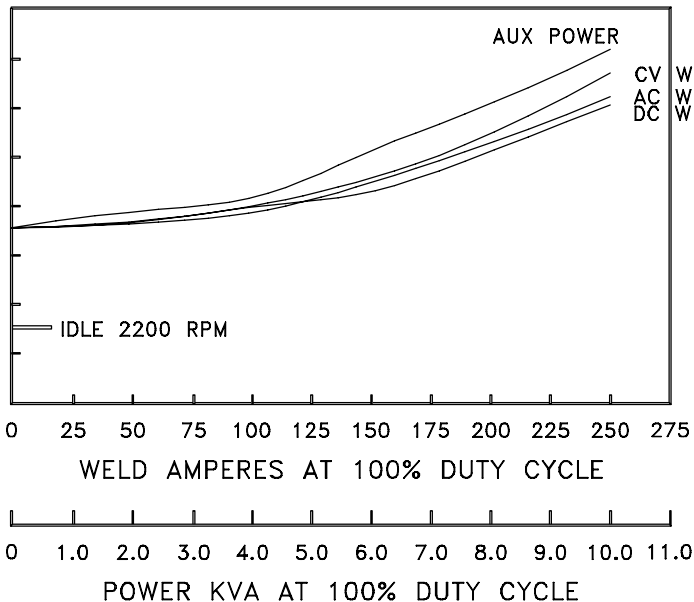
⚠ Do not move or operate unit where it could tip.

4-3. Dimensions For Units With Optional Running Gear

Dimensions	
Height	All Running Gear Options: 42-1/2 in (1079 mm) (To Top Of Handle Assembly)
A	Protective Cage Width: 26 in (660 mm)
B	Running Gear Width: 32 in (813 mm)
C	Protective Cage Length: 48 in (1219 mm)
D	Running Gear Length: 45-1/2 in (1156 mm)

4-4. Fuel Consumption (Subaru/Robin-Powered Units)

LITERS/HR.	IMP. GAL/HR.	U.S. GAL/HR.
7.57	1.67	2.00
6.62	1.46	1.75
5.67	1.25	1.50
4.73	1.04	1.25
3.78	0.84	1.00
2.84	0.63	0.75
1.89	0.42	0.50
0.95	0.21	0.25



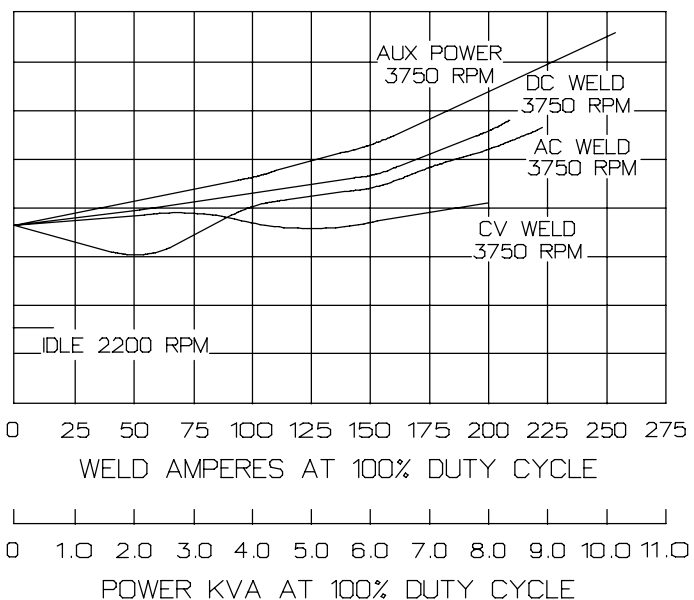
On a typical job using 1/8 in 7018 electrodes (125 amps, 20% duty cycle), expect about 20 hours of operation.

Welding at 150 amps at 40% duty cycle uses approximately 3/4 gallon per hour, or about 16 hours of operation.

220 571

4-5. Fuel Consumption (Kohler-Powered Units)

LITERS/HR.	U.S. GAL/HR.
7.57	2.00
6.62	1.75
5.67	1.50
4.73	1.25
3.78	1.00
2.84	0.75
1.89	0.50
0.95	0.25



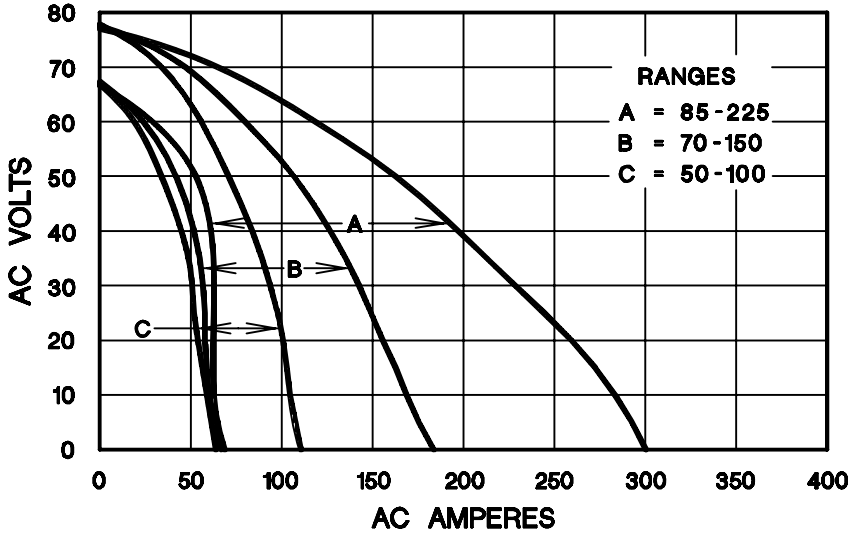
On a typical job using 1/8 in 7018 electrodes (125 amps, 20% duty cycle), expect about 20 hours of operation.

Welding at 150 amps at 40% duty cycle uses approximately 3/4 gallon per hour, or about 16 hours of operation.

179 939

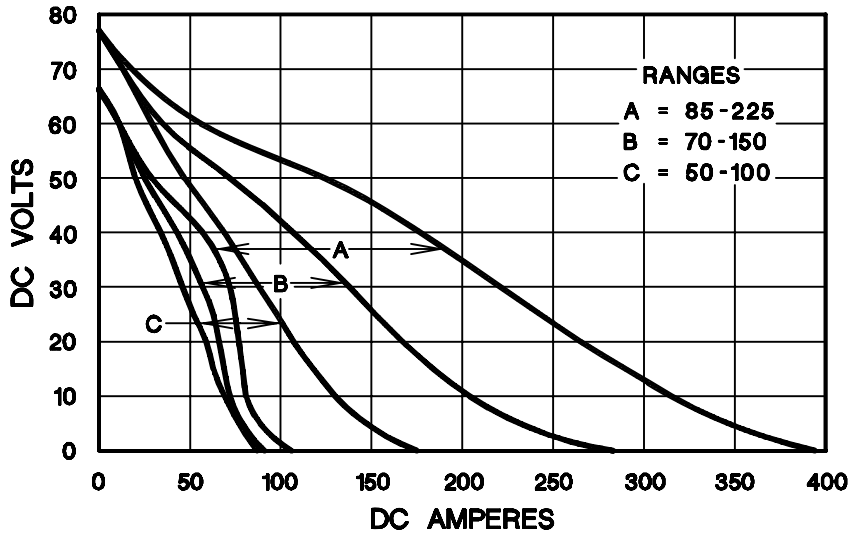
4-6. Volt-Ampere Curves

A. For CC/AC Mode

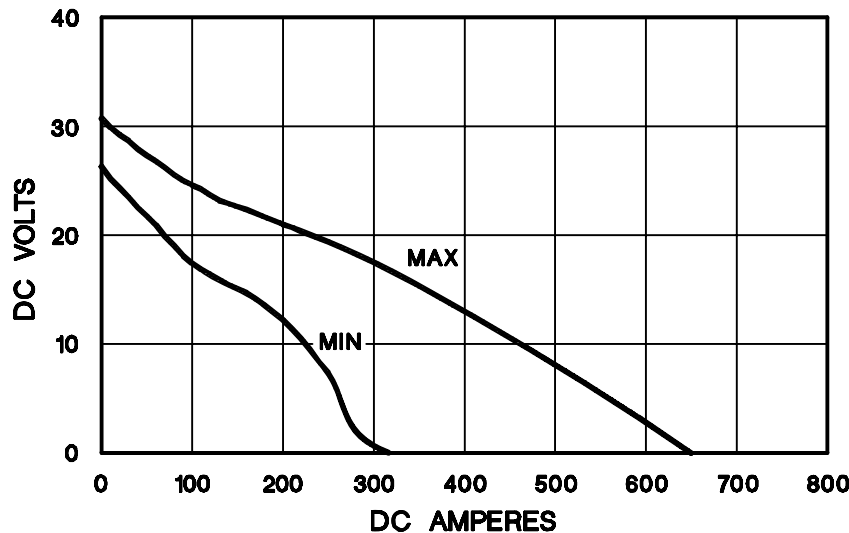


The volt-ampere curve shows the minimum and maximum voltage and amperage output capabilities of the welding generator. Curves of all other settings fall between the curves shown.

B. For CC/DC Mode

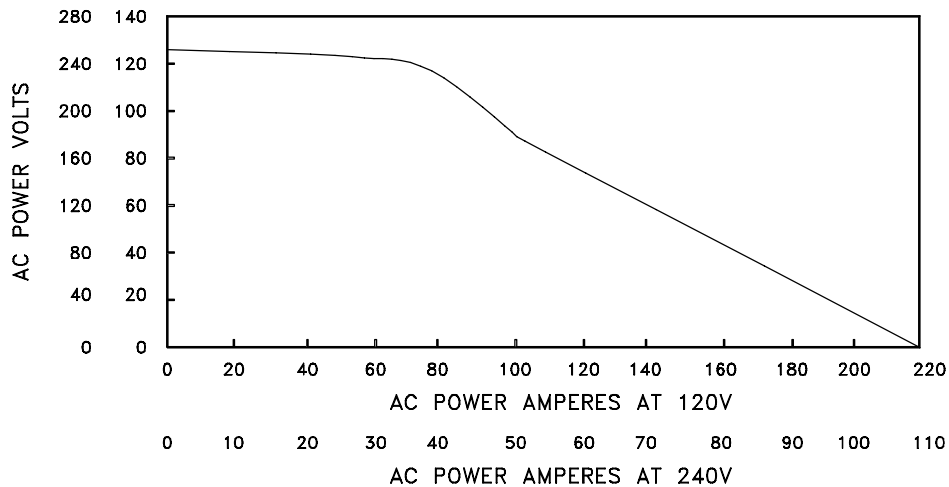


C. For CV/DC Mode



4-7. Generator Power Curve

The generator power curve shows the generator power in amperes available at the receptacles.



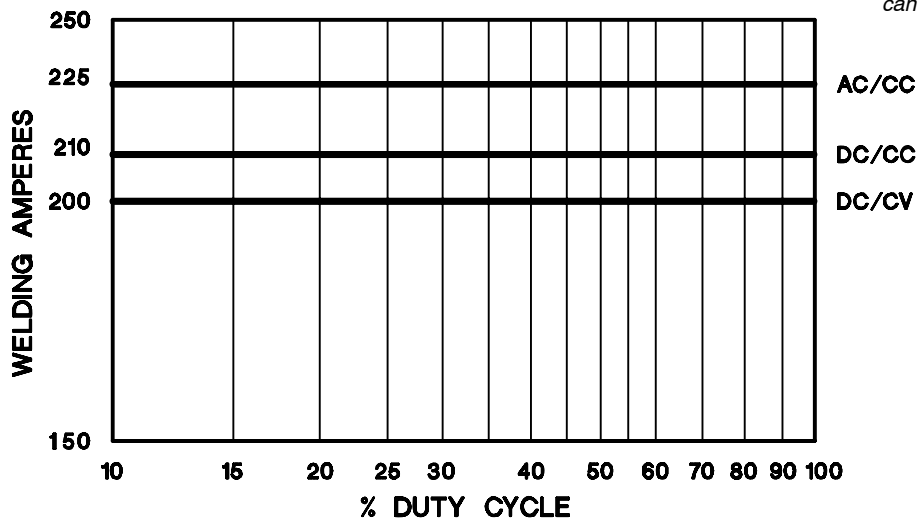
200 294

4-8. Duty Cycle



Duty cycle is the percentage of 10 minutes that unit can weld at rated load without overheating.

NOTICE - Exceeding duty cycle can damage unit and void warranty.



Continuous Welding

100% Duty Cycle at 225 Amperes CC/AC, 210 Amperes CC/DC, 200 Amperes CV/DC

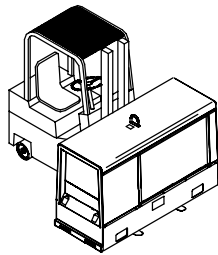
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SECTION 5 – INSTALLATION

5-1. Installing Welding Generator

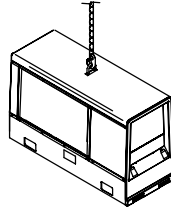


Movement

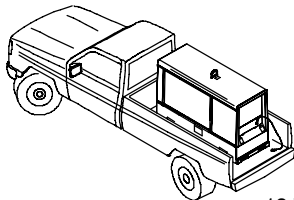


⚠ Do not lift unit from end.

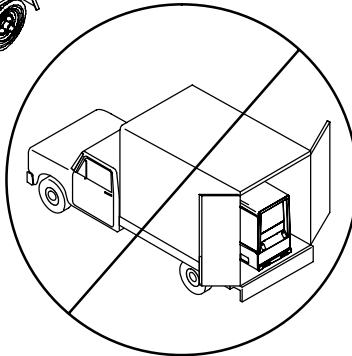
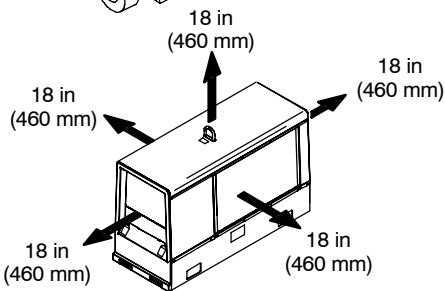
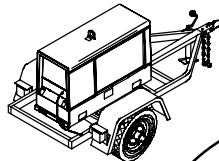
OR



Location / Airflow Clearance



OR



⚠ Do not weld on base. Welding on base can cause fuel tank fire or explosion. Bolt unit down using holes provided in base.

⚠ Always securely fasten welding generator onto transport vehicle or trailer and comply with all DOT and other applicable codes.

⚠ Do not mount unit by supporting the base only at the four mounting holes. Use cross-supports to adequately support unit and prevent damage to base.

⚠ Always ground generator frame to vehicle frame to prevent electric shock and static electricity hazards.

⚠ If unit does not have GFCI receptacles, use GFCI-protected extension cord.

NOTICE – Do not install unit where air flow is restricted or engine may overheat.

Mounting:

- 1 Cross-Supports

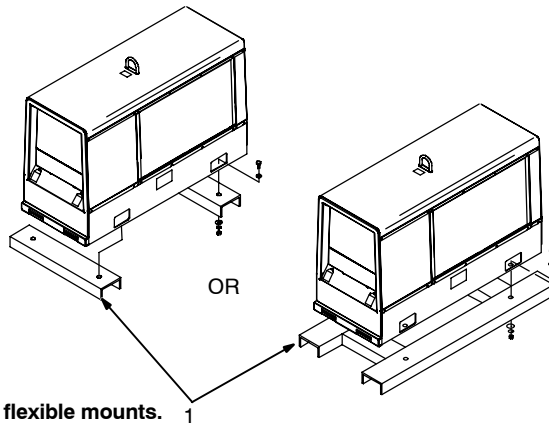
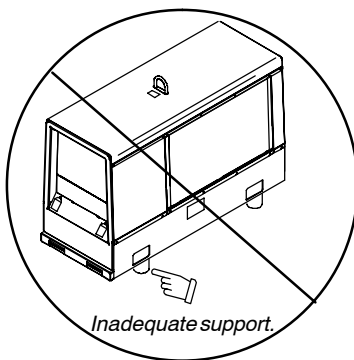
Mount unit on flat surface or use cross-supports to support base.

Grounding:

- 2 Equipment Grounding Terminal (On Front Panel)
- 3 Grounding Cable (Not Supplied)
- 4 Metal Vehicle Frame

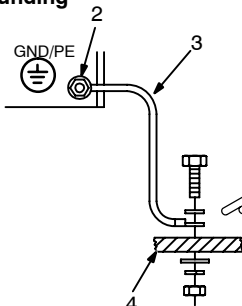
Connect cable from equipment ground terminal to metal vehicle frame. Use #10 AWG or larger insulated copper wire.

Mounting



⚠ Do not use flexible mounts.

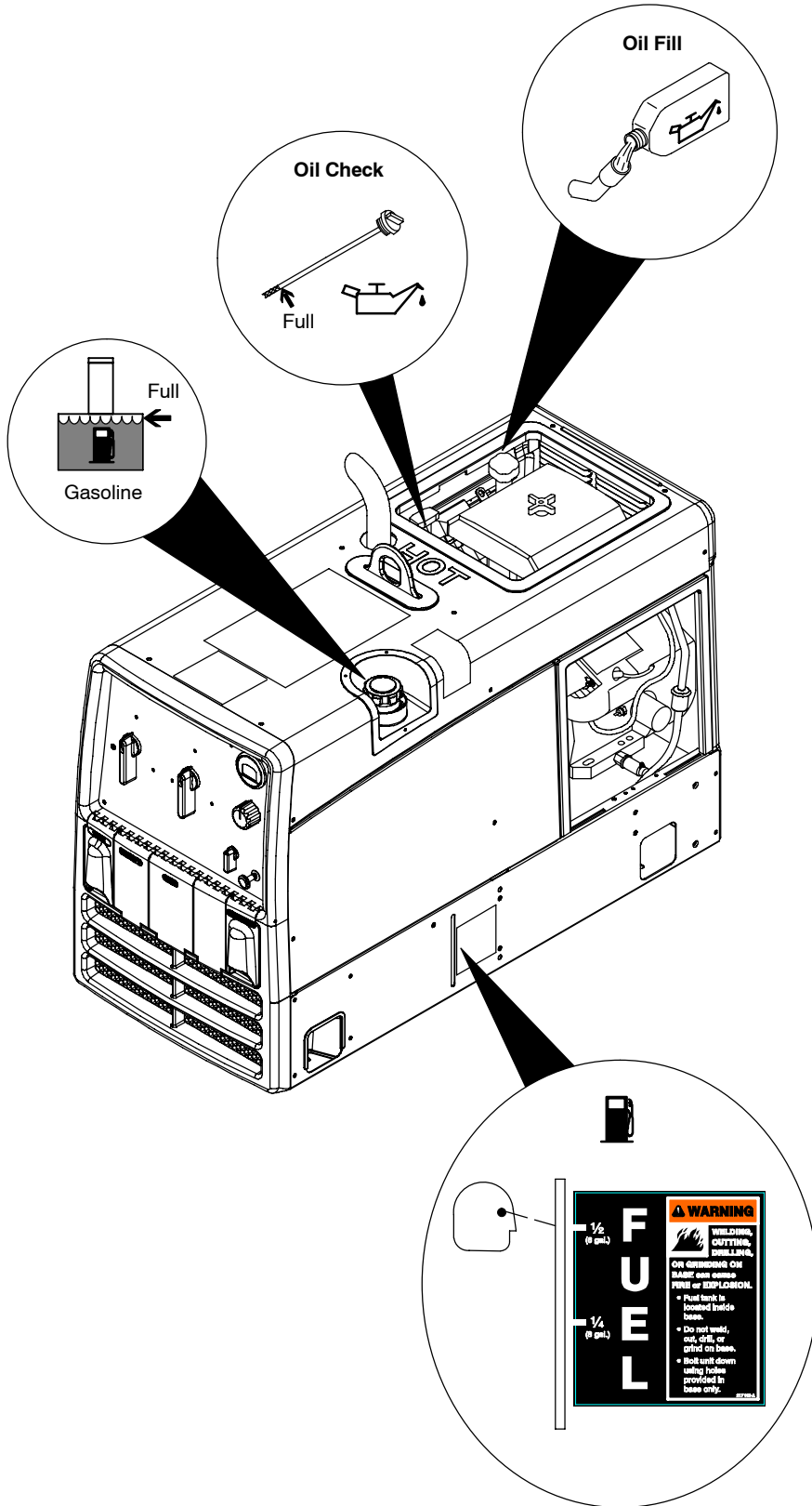
Grounding



⚠ Bed liners, shipping skids, and some running gears insulate the welding generator from the vehicle frame. Always connect a ground wire from the generator equipment grounding terminal to bare metal on the vehicle frame as shown.

Electrically bond generator frame to vehicle frame by metal-to-metal contact.

5-2. Engine Prestart Checks (Subaru/Robin-Powered Units)



Check all fluids daily. Engine must be cold and on a level surface. Unit is shipped with 10W30 engine oil.

☞ Follow run-in procedure in engine manual.

NOTICE – This unit has a low oil pressure shutdown switch. However, some conditions may cause engine damage before the engine shuts down. Check oil level often and do not use the oil pressure shutdown system to monitor oil level.

Fuel

To help prime the fuel system at initial start-up, fill tank with fresh fuel (see maintenance label for specifications). Always leave filler neck empty to allow room for expansion. Check fuel level on a cold engine before use each day.

Oil

☞ Do not exceed the "Full" mark on the oil level dipstick. The fuel pump may operate erratically if crankcase is overfilled.

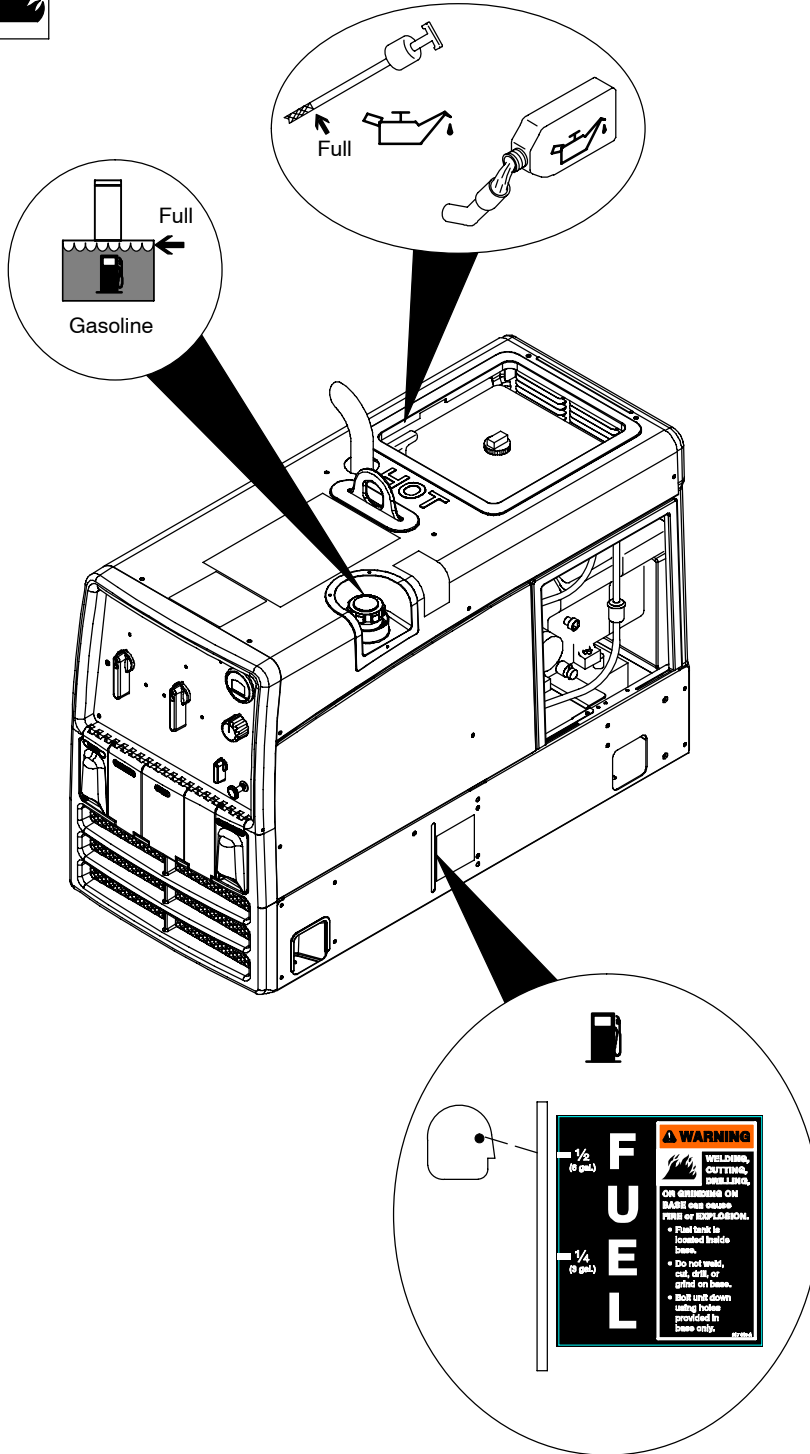
After fueling, check oil with unit on level surface. If oil is not up to full mark on dipstick, add oil (see maintenance label).

☞ To improve cold weather starting:

Keep battery in good condition. Store battery in warm area.

Use correct grade oil for cold weather.

5-3. Engine Prestart Checks (Kohler-Powered Units)



Check all fluids daily. Engine must be cold and on a level surface. Unit is shipped with 10W30 engine oil.

☞ Follow run-in procedure in engine manual.

NOTICE – This unit has a low oil pressure shutdown switch. However, some conditions may cause engine damage before the engine shuts down. Check oil level often and do not use the oil pressure shutdown system to monitor oil level.

Fuel

To help prime the fuel system at initial start-up, fill tank with fresh fuel (see maintenance label for specifications). Always leave filler neck empty to allow room for expansion. Check fuel level on a cold engine before use each day.

Oil

☞ Do not exceed the "Full" mark on the oil level dipstick. The fuel pump may operate erratically if crankcase is overfilled.

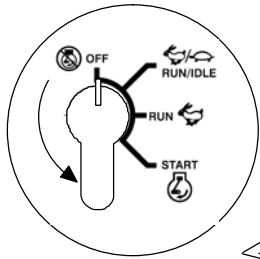
After fueling, check oil with unit on level surface. If oil is not up to full mark on dipstick, add oil (see maintenance label).

☞ To improve cold weather starting:

Keep battery in good condition. Store battery in warm area.

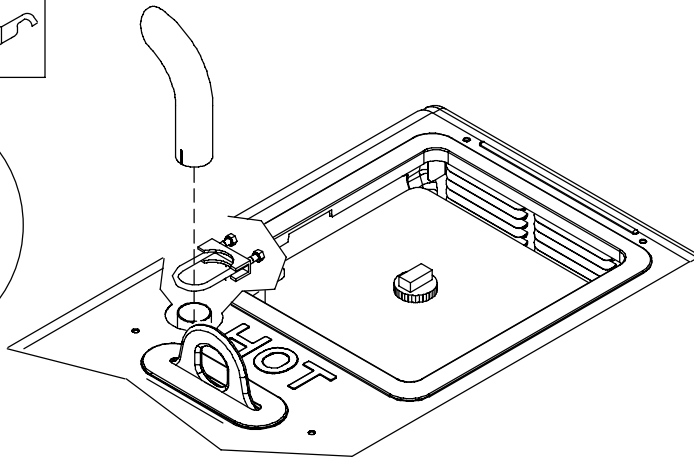
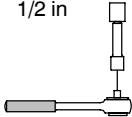
Use correct grade oil for cold weather.

5-4. Installing Exhaust Pipe



Tools Needed:

1/2 in



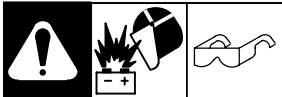
⚠ Engine backfire can cause severe burns or other injuries. Do not point exhaust pipe toward control panel. Keep away from exhaust outlet.

⚠ Point exhaust pipe in desired direction but always away from front panel and direction of travel.

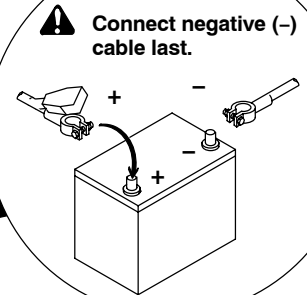
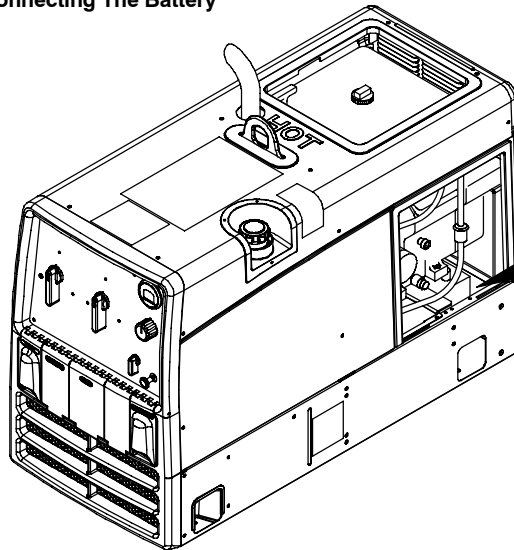
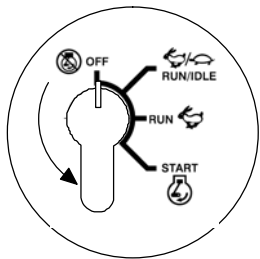
☞ Be sure to tighten exhaust clamp nuts. Exhaust clamp supplied with muffler.

803 847 / Ref 801 681 / Ref. 228 199-A

5-5. Connecting Or Replacing the Battery

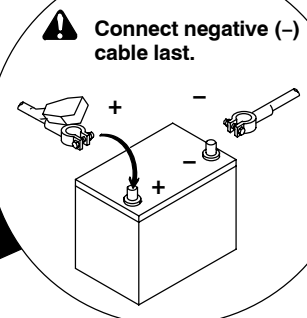
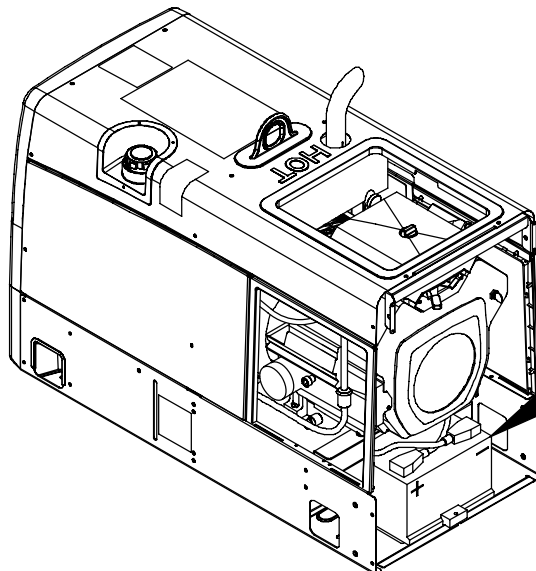


Connecting The Battery



Replacing The Battery

☞ Remove end panel to replace battery.

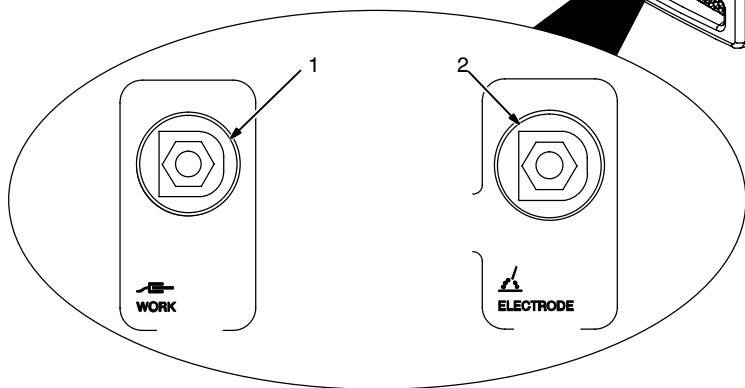
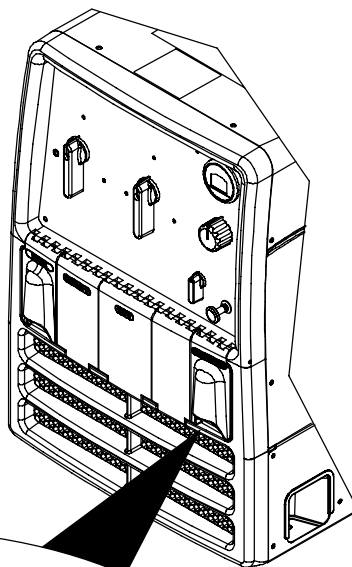


Tools Needed:

3/8, 1/2 in

803 847-C / 803 849 / Ref. S-0756-D

5-6. Connecting to Weld Output Terminals



⚠ Stop engine.

- 1 Work Weld Output Terminal
 - 2 Electrode Weld Output Terminal
- Connect work cable to Work terminal.
- Connect electrode holder cable or electrode weld cable to Electrode terminal for Stick and MIG welding.
- Connect torch cable to Electrode terminal for TIG welding.

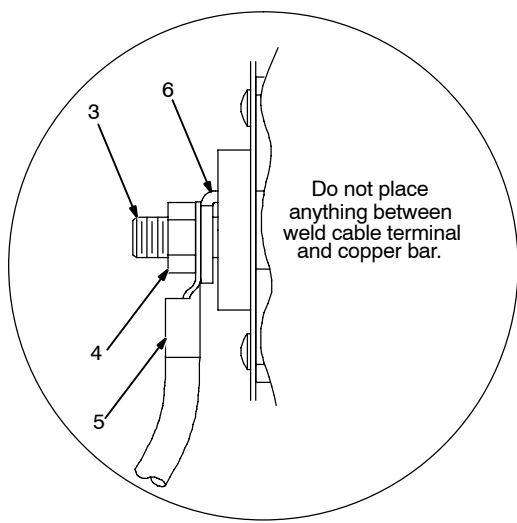
Use Process Selector switch to select type of weld output (see Section 6-1).

☞ See Sections 6-3 thru 6-5 for typical process connections and control settings.

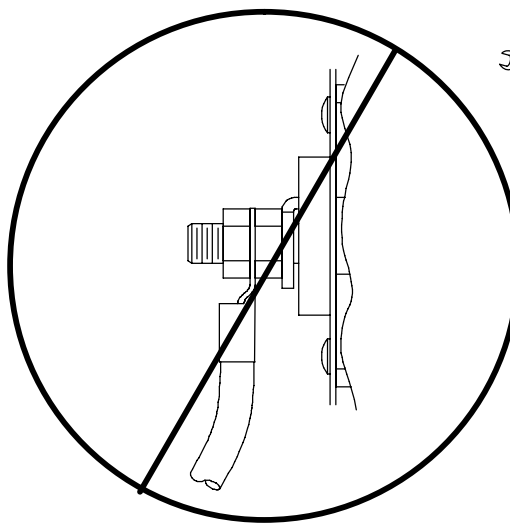
⚠ Failure to properly connect weld cables may cause excessive heat and start a fire, or damage your machine.

- 3 Weld Output Terminal
- 4 Supplied Weld Output Terminal Nut
- 5 Weld Cable Terminal
- 6 Copper Bar

Remove supplied nut from weld output terminal. Slide weld cable terminal onto weld output terminal and secure with nut so that weld cable terminal is tight against copper bar. **Do not place anything between weld cable terminal and copper bar. Make sure that the surfaces of the weld cable terminal and copper bar are clean.**



Correct Installation

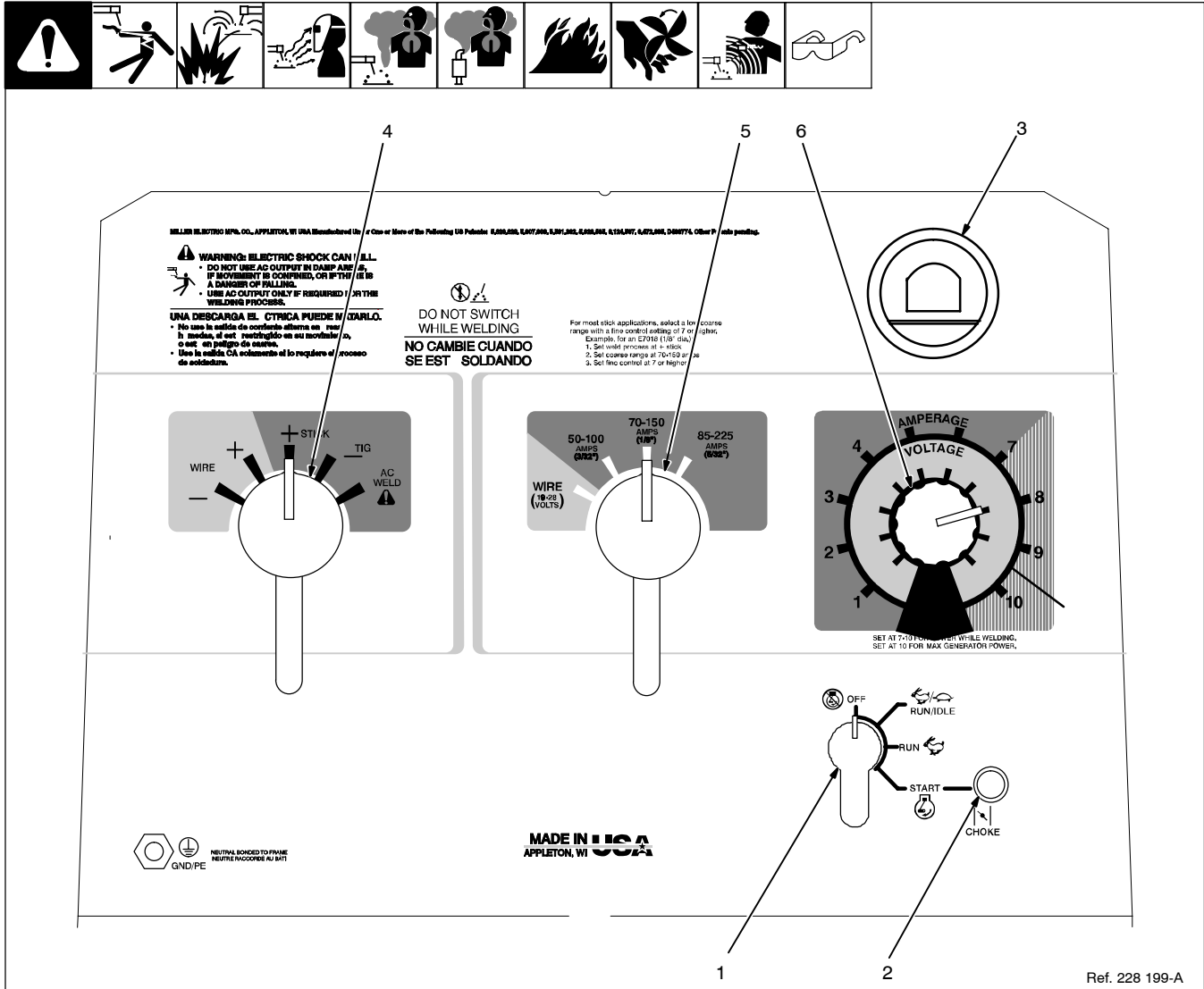


Incorrect Installation

Tools Needed:
 3/4 in

SECTION 6 – OPERATING THE WELDING GENERATOR

6-1. Front Panel Controls



Ref. 228 199-A

1 Engine Control Switch

Use switch to start engine, select speed, and stop engine. In Run/Idle position, engine runs at idle speed at no load, and weld/power speed under load. In Run position, engine runs at weld/power speed.

Place switch in Run position to operate most MIG equipment.

2 Engine Choke Control

Use control to change engine air-fuel mix.
To Start: pull out choke and turn Engine Control switch to Start position. Release switch and slowly push choke in when engine starts.

If the engine does not start, let engine come to a complete stop before attempting restart.

To Stop: turn Engine Control switch to Off position.

3 Engine Hour Meter/Idle Control

Hour Meter: With engine off, place Engine Control switch in Run/Idle position to view engine hours.

Oil Change Interval: With engine off, place Engine Control switch in the Run position to see hours before next oil change. Oil hours start at 100 and count down to 0 (zero) (oil change due).

Negative hours indicated when past recommended oil change interval.

To reset, cycle Engine Control switch from Run/Idle to Run three times within five seconds (engine off).

4 Weld Process Selector Switch

NOTICE – Do not switch under load.

Use switch to select type of weld output.
 Wire (GMAW) Welding: Use a positive (+) position for Direct Current Electrode Positive (DCEP) and a negative (-) position for Direct Current Electrode Negative.

Stick (SMAW) and TIG (GTAW Welding): Use a positive (+) position for Direct Current Electrode Positive (DCEP) and a negative (-) position for Direct Current Electrode Negative. Use AC position for alternating current.

5 Coarse Range Switch

NOTICE – Do not switch under load.

Use switch to select weld amperage range when Weld Process Selector switch is in Stick/Tig position, or voltage range when switch is in Wire position.

For best arc starts and when using weld and generator power together, use a low Coarse Range setting with the Fine control set at 7 or higher.

6 Fine Control

Use control to select weld amperage (Stick/Tig) or voltage (Wire) within the range selected by the Coarse Range switch. Control may be adjusted while welding.

Set control at 10 for maximum generator power.

Weld output would be about 110 A DC based on control settings shown (80% of 70 to 150 A). Settings shown are typical for welding with a 7018 (1/8) electrode.

See Sections 6-3 thru 6-5 for typical process connections and control settings.

6-3. Typical Stick Welding Connections And Control Settings



Stop engine.

This section provides general guidelines and may not suit all applications.

The control panel shows the typical settings for welding with a 7018 (1/8 in) electrode. Consult the amperage selection tables below if welding with other electrodes.

- 1 Work Clamp
- 2 Electrode Holder

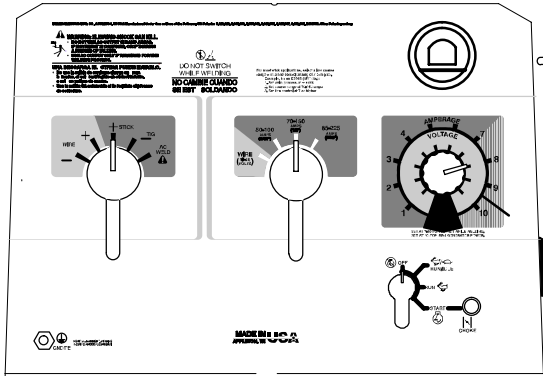
Connect Work cable to Work terminal and Electrode holder cable to Electrode terminal on welding generator.

Be sure to use the correct size weld cables (see Section 5-7).

For best performance, set the Coarse Range switch to the **lowest** range that covers the desired weld amperage. Use the Fine control to select the desired amperage within the range selected. When properly set, the Fine control is normally set at 7 or higher.

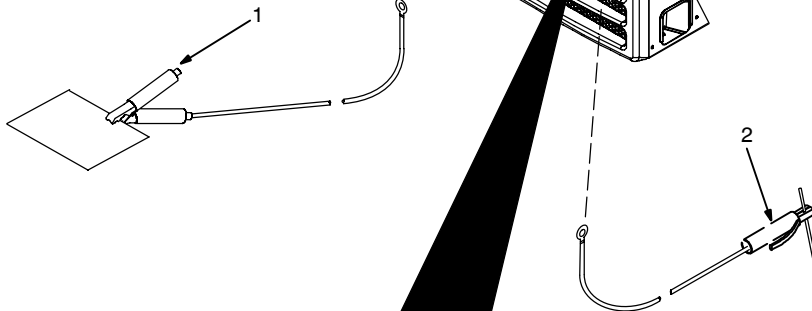
Typical Settings For 7018 (1/8 in) Electrode:

- Set Weld Process Selector switch to + Stick position.
- Set Coarse Range switch to 70-150 (1/8") position.
- Set Fine control at 7 or higher for best results.



For best arc starts and best results using weld and generator power together, use a low Coarse Range setting and the Fine control set at 7 or higher.

Typical Settings For 7018 (1/8 in) Electrode



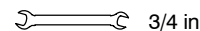
Electrode Selection Table (Beneath Cover)

ELECTRODE	DIAMETER	AMPERAGE RANGE								
		50	100	150	200	250	300	350	400	450
6010 & 6011	3/32									
	1/8									
	5/32									
	3/16									
	7/32									
6013	1/4									
	5/64									
	3/32									
	1/8									
	5/32									
7014	3/16									
	7/32									
	1/4									
	3/32									
	1/8									
7018	5/32									
	3/16									
	7/32									
	1/4									
	3/32									
7024	1/8									
	5/32									
	3/16									
	7/32									
	1/4									
Ni-Cl	3/32									
	1/8									
	5/32									
308L	3/16									
	1/8									
	5/32									

ELECTRODE	DC*	AC	POSITION	PENETRATION	USAGE
6010	EP		ALL	DEEP	MIN. PREP, ROUGH HIGH SPATTER
6011	EP	✓	ALL	DEEP	
6013	EP,EN	✓	ALL	LOW	GENERAL
7014	EP,EN	✓	ALL	MED	SMOOTH, EASY, FAST
7018	EP	✓	ALL	LOW	LOW HYDROGEN, STRONG
7024	EP,EN	✓	FLAT HORIZ FILLET	LOW	SMOOTH, EASY, FASTER
NI-CL	EP	✓	ALL	LOW	CAST IRON
308L	EP	✓	ALL	LOW	STAINLESS

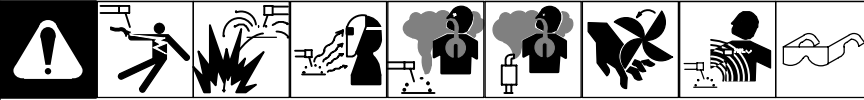
*EP = ELECTRODE POSITIVE (REVERSE POLARITY)
EN = ELECTRODE NEGATIVE (STRAIGHT POLARITY)

Tools Needed:



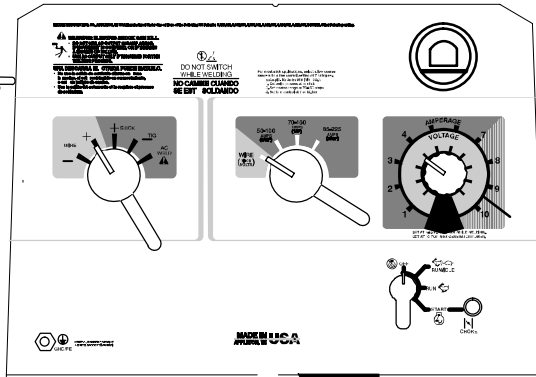
6-4. Typical MIG Welding Connections And Settings

A. Solid Wire Applications



Typical Control Settings For .035 (ER70S-3) Solid Wire – Short Circuit Transfer

Note Coarse Range, Fine Control, and Weld Process switch settings.



⚠ Stop engine.

This section provides general guidelines and may not suit all applications.

The control panel shows the typical settings for welding with .035 (ER70S-3) solid wire. Use Argon-based shielding gas.

- 1 Work Clamp
- 2 Wire Feeder
- 3 MIG Gun
- 4 Gun Trigger Plug
- 5 Voltage Sensing Clamp
- 6 Gas Cylinder:

75/25 Argon-Based Gas for Short Circuit Transfer

80% Argon (Or Higher) For Spray Transfer

- 7 Gas Hose

Connect work cable to welding generator Work terminal. Connect cable from wire feeder to cable from welding generator Electrode terminal.

Be sure to use the correct size weld cables (see Section 5-7).

Loosen MIG gun securing knob. Insert gun end through opening in feeder and position as close as possible to drive rolls without touching. Tighten knob.

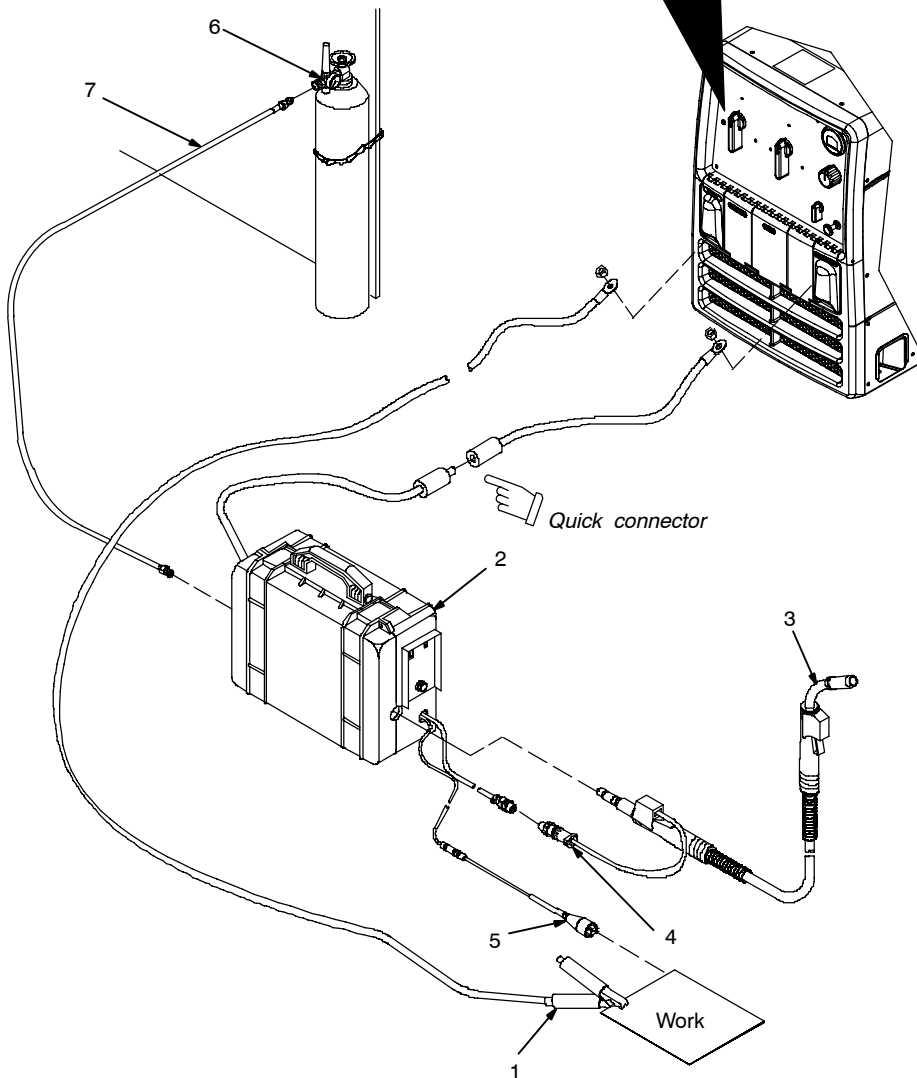
See wire feeder manual for wire threading procedure.

Insert gun trigger plug (item 4) into matching receptacle and tighten threaded collar.

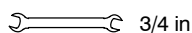
Connect gas hose from feeder to regulator on cylinder.

Typical Control Settings For Short Circuit Transfer Using .035 (ER70S-3) Solid Wire And 75/25 Argon-Based Gas:

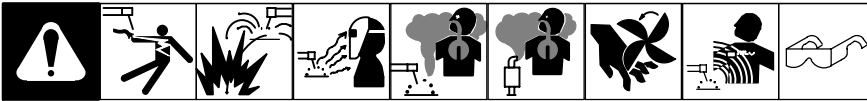
- > Set Weld Process Selector switch to Wire + (DCEP) position.
- > Set Coarse Range switch to Wire 19-28 volts position.
- > Set Fine Control to obtain minimum spatter.
- > Set wire feed speed between 150-300 ipm.



Tools Needed:

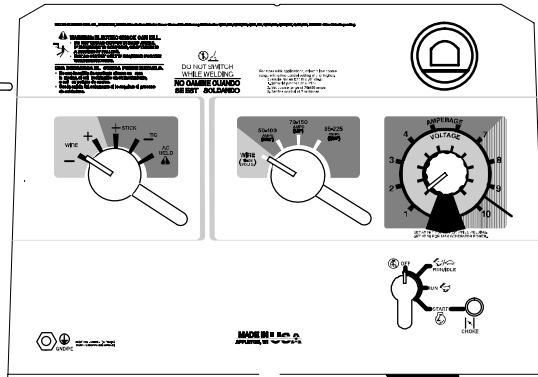


B. Self-Shielded Flux Core Wire Applications



Typical Control Settings For .045 (71T-11) Self-Shielded Flux Core Wire

Note Coarse Range, Fine Control, and Weld Process switch settings.



⚠ Stop engine.

This section provides general guidelines and may not suit all applications.

The control panel shows the typical settings for welding with .045 (71T-11) self-shielded flux core wire.

- 1 Work Clamp
- 2 Wire Feeder
- 3 MIG Gun
- 4 Gun Trigger Plug
- 5 Voltage Sensing Clamp

Connect work cable to welding generator Work terminal. Connect cable from wire feeder to cable from welding generator Electrode terminal.

Be sure to use the correct size weld cables (see Section 5-7).

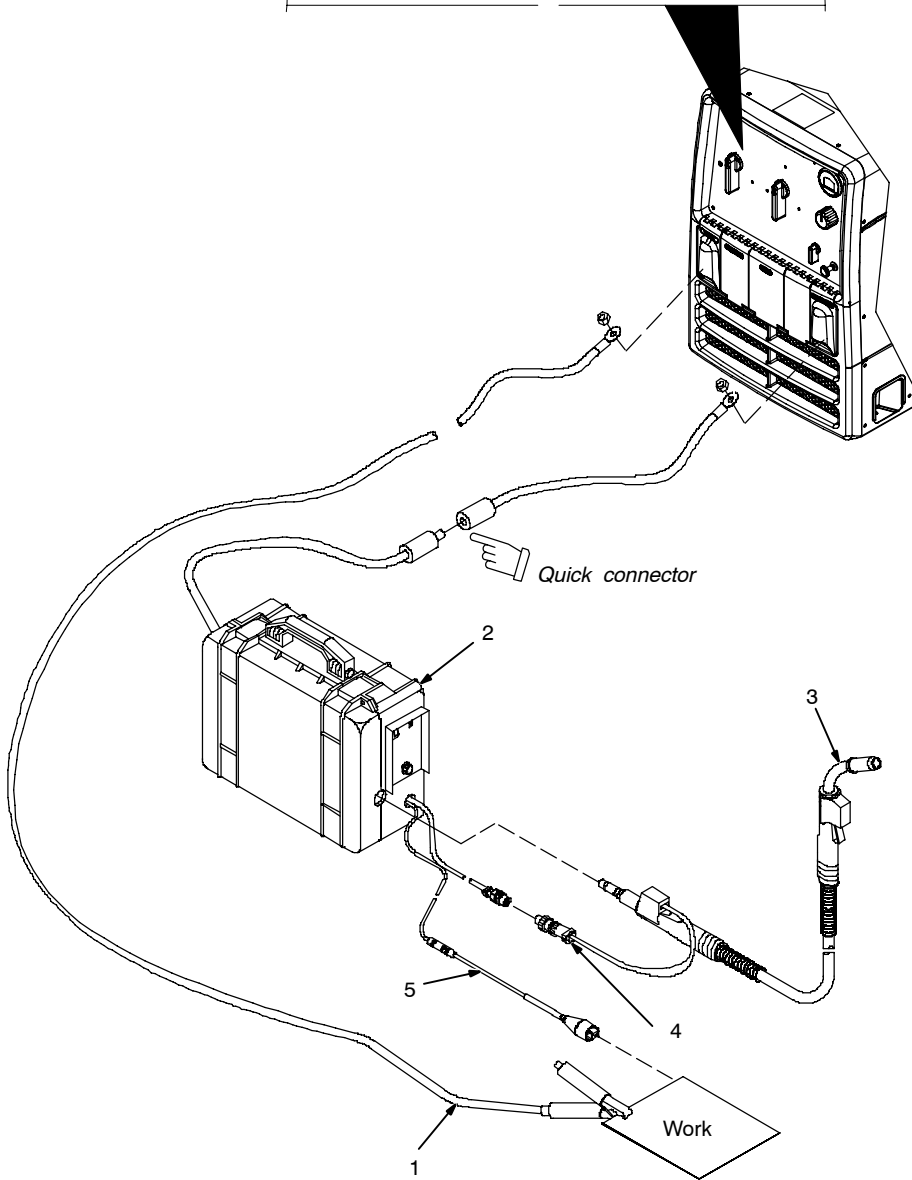
Loosen MIG gun securing knob. Insert gun end through opening in feeder and position as close as possible to drive rolls without touching. Tighten knob.

See wire feeder manual for wire threading procedure.

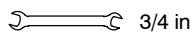
Insert gun trigger plug (item 4) into matching receptacle and tighten threaded collar.

Typical Control Settings Using .045 (71T-11) Self-Shielded Flux Core Wire :

- > Set Weld Process Selector switch to Wire – position (DCEN).
- > Set Coarse Range switch to Wire 19-28 volts position.
- > Set Fine Control near minimum setting.
- > Set wire feed speed between 125-200 ipm.
- > Do a test weld. To increase arc length, increase Fine Control setting. To shorten arc length, reduce fine control setting or increase wire feed speed.



Tools Needed:



6-5. Typical MIG Connections And Settings Using Weld Control And Spoolgun

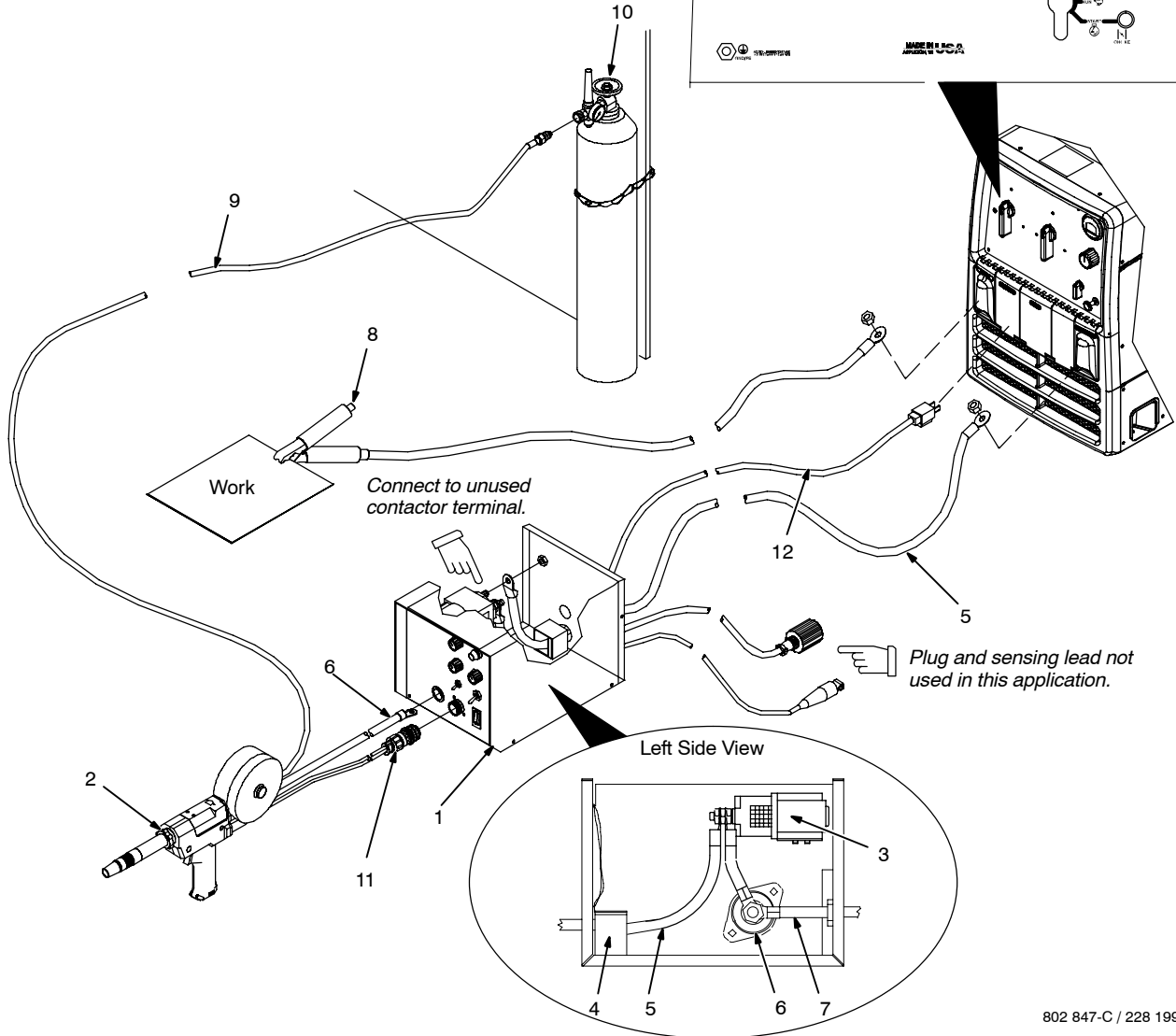
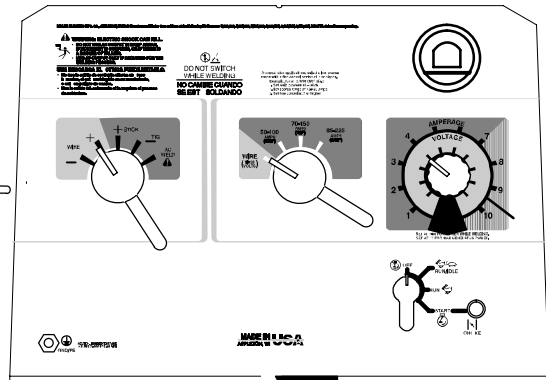


Tools Needed:

3/4 in

**Typical Settings For
4043 (.035) Aluminum On
1/8 in Material:**

Note Coarse Range and Weld
Process switch settings.



802 847-C / 228 199-A

This section provides general guidelines and may not suit all applications.

- 1 Weld Control
- 2 Spoolgun
- 3 Optional Contactor (Recommended)
- 4 Reed Switch
- 5 Weld Cable (Customer-Supplied)
- 6 Weld Control Weld Terminal
- 7 Weld Power Cable From Spoolgun
- 8 Work Clamp
- 9 Gas Hose
- 10 Argon Cylinder
- 11 Trigger Control Cord

12 Input Power Cord

Be sure to use the correct size weld cables (see Section 5-7).

Route weld cable from welding generator Electrode terminal through reed switch to unused contactor terminal. Connect weld cable from spoolgun to weld control weld terminal (item 6).

Connect work cable to welding generator Work terminal.

Insert trigger control plug (item 11) into weld control receptacle. Tighten threaded collar.

Connect ac power cord (item 12) to 120 volt ac receptacle on welding generator.

Connect gas hose from spoolgun to regulator on Argon bottle.

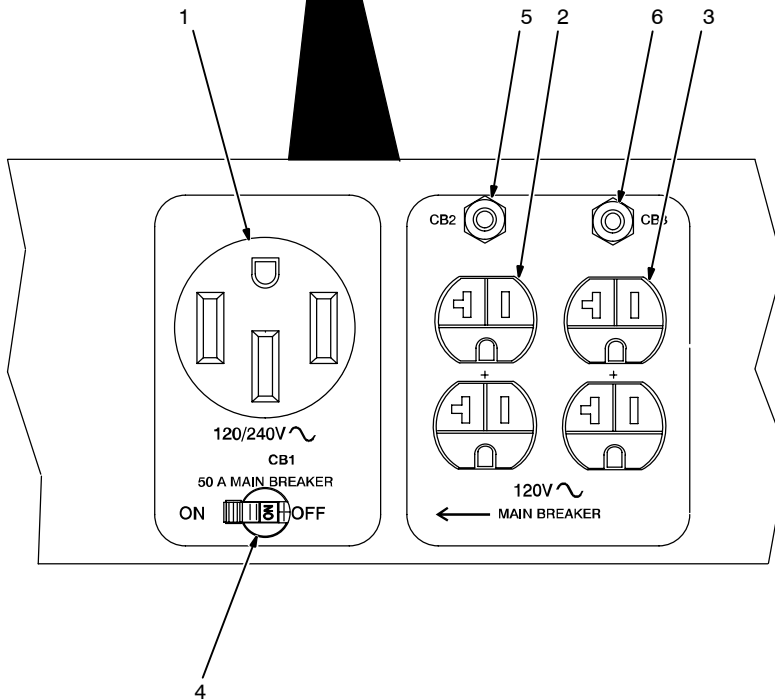
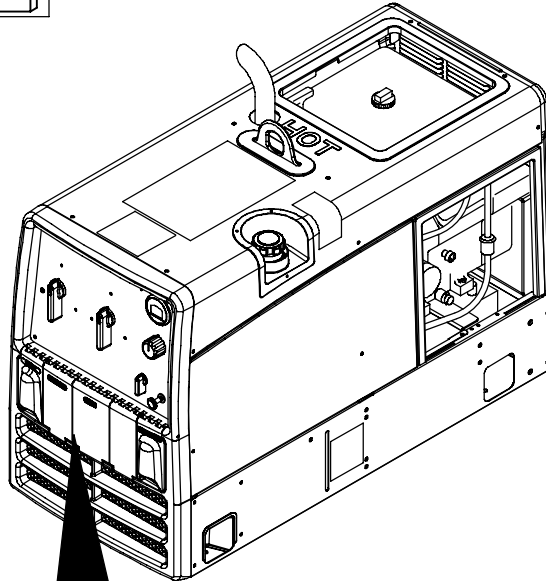
Reinstall weld control wrapper.

Typical Settings For 4043 (.035) Aluminum On 1/8 in Material:

- > Set Weld Process Selector switch to Wire + (DCEP) position.
- > Set Coarse Range switch to Wire 19-28 volts position.
- > Set Fine Control to desired voltage (arc length). Start with a low voltage setting (about 4) to prevent burnback.
- > Set wire feed speed between 240-270 ipm.

SECTION 7 – OPERATING AUXILIARY EQUIPMENT

7-1. Standard Receptacles



⚠ If unit does not have GFCI receptacles, use GFCI-protected extension cord.

ℹ Generator power decreases as weld current increases. Set Fine Control R1 at 10 for full generator power.

- 1 240 V 50 A AC Receptacle RC1
- 2 120 V 20 A AC Duplex Receptacle RC2
- 3 120 V 20 A AC Duplex Receptacle RC3

RC2 and RC3 supply 60 Hz single-phase power at weld/power speed. Maximum output from RC2 or RC3 is 2.4 kVA/kW.

4 Supplementary Protector CB1
CB1 protects receptacles RC1, RC2, and RC3 from overload. If CB1 opens, the receptacles do not work. Place switch in On position to reset.

5 Supplementary Protector CB2
6 Supplementary Protector CB3
CB2 protects RC2 and CB3 protects RC3 from overload. If a supplementary protector opens, the receptacle does not work.

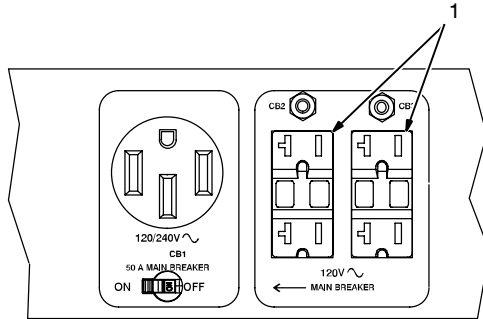
ℹ Press button to reset. If supplementary protector continues to open, contact Factory Authorized Service Agent.

Combined output of all receptacles limited to 10 kVA/kW rating of the generator.

EXAMPLE: If 20 A is drawn from each 120 V duplex receptacle, only 21 A is available at the 240V receptacle:

$$2 \times (120 \text{ V} \times 20 \text{ A}) + (240 \text{ V} \times 21 \text{ A}) = 10 \text{ kVA/kW}$$

7-2. Optional Generator Power Receptacles



⚠ If unit does not have GFCI receptacles, use GFCI-protected extension cord.

Generator power decreases as weld current increases.

Set Fine Control R1 at 10 for full generator power.

Combined output of all receptacles limited to 10 kVA/kW rating of the generator.

CSA/GFCI Receptacle Option

- 1 120 V 20 A AC GFCI Receptacles
GFCI-2 and GFCI-3

GFCI2 and GFCI3 supply 60 Hz single-phase power at weld/power speed. Maximum output from GFCI-2 or GFCI-3 is 2.4 kVA/kW. Circuit protection is the same as standard receptacles.

If a ground fault is detected, the GFCI Reset button pops out and the circuit opens to disconnect the faulty equipment. Check for damaged tools, cords, plugs, etc. connected to the receptacle. Press button to reset receptacle and resume operation.

⚠ Power is still present at the 240 volt receptacle when only one circuit breaker trips.
Unplug power cord before attempting to service accessories or tools.

At least once a month, run engine at weld/power speed and press Test button to verify GFCI is working properly.

Ref. 228 199-A

Notes




Work like a Pro!
Pros weld and cut safely. Read the safety rules at the beginning of this manual.

7-3. Simultaneous Weld And Power

Weld Current in Amperes	Total Power in Watts	120 V Full kVA Receptacle Amperes	240 V Full kVA Receptacle Amperes
250	2200	18	9
180	3500	29	14
125	5200	43	21
90	8000	66	33
0	10,000 Subaru/Robin Engine 10,500 Kohler Engine	84 Subaru/Robin Engine 88 Kohler Engine	42 Subaru/Robin Engine 44 Kohler Engine

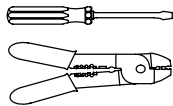
7-4. Wiring Optional 240 Volt Plug



The plug can be wired for a 240 V, 2-wire load or a 120/240V, 3-wire load. See circuit diagram.

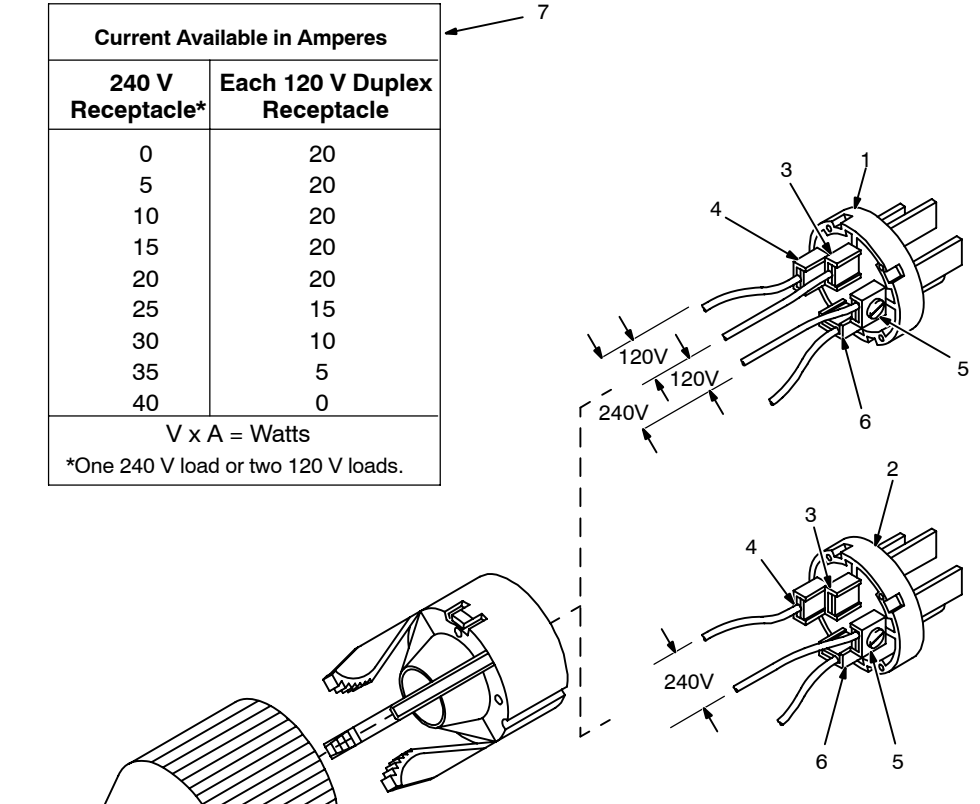
- 1 Plug Wired for 120/240 V, 3-Wire Load
- 2 Plug Wired for 240 V, 2-Wire Load
- 3 Neutral (Silver) Terminal
- 4 Load 1 (Brass) Terminal
- 5 Load 2 (Brass) Terminal
- 6 Ground (Green) Terminal
- 7 Amperes Available using 120/240 V Plug

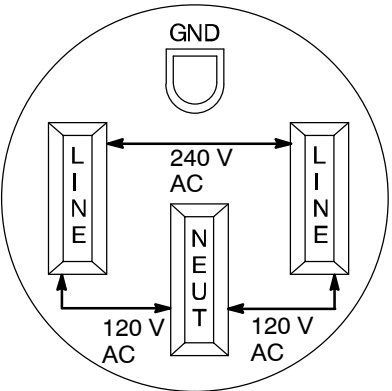
When wired for 120 V loads, each duplex receptacle shares a load with one half of 240 V receptacle.

Tools Needed:


Current Available in Amperes	
240 V Receptacle*	Each 120 V Duplex Receptacle
0	20
5	20
10	20
15	20
20	20
25	15
30	10
35	5
40	0

V x A = Watts
*One 240 V load or two 120 V loads.





plug1 11/03 - 120 813-D

SECTION 8 – MAINTENANCE (SUBARU/ROBIN-POWERED UNITS)

8-1. Maintenance Label (Subaru/Robin-Powered Units)

KOHLER CH20/CH23, ROBIN EH64/EH65 GAS ENGINES

See Engine Manual for complete engine care. Give Engine Specification and Serial Number when ordering parts.

Check Daily

To Drain Oil:
Push And Turn CCW
PULL

Recommended Oil
API Service Classification . . . SG or higher
(if using LP fuel, use synthetic oil.)

Oil Change 100 hours
Oil Filter Change 200 hours
Oil Filter KOHLER: MILLER 066 898, Kohler 1205001
ROBIN: MILLER 198 754, Robin 249-65801-00

Oil Capacity w/filter change . . . Approximately 1.5 quarts

**DO NOT OVERFILL . . . KOHLER: Keep oil level between L & F marks on dipstick.
ROBIN: Keep oil level between 2 holes on dipstick.**

**NO SOBRELLENE . . . KOHLER: Mantenga el nivel del aceite entre las marcas L y F del medidor.
ROBIN: Mantenga el nivel del aceite entre los dos huecos del medidor.**

Fuel Grade Unleaded, 87 Octane min.
Fuel Filter KOHLER: MILLER 215 984, Kohler 2505022
ROBIN: MILLER 215 984, Robin 283-65012-A3

12 Volt Battery BCI Group 68
Cranking Performance at 0°F (-18°C) . . . 430 Amps min.

Engine Speed
No Load High Speed 3675-3750 RPM
Idle 2200-2300 RPM

METER MAINTENANCE FUNCTIONS

- **HOUR METER:** with engine off, place Engine Control switch in RUN/IDLE position to view engine hours.
- **OIL CHANGE INTERVAL:** with engine off, place Engine Control switch into the RUN position to see hours before next oil change. Oil hours start at 100 and count down to 0 (oil change due).

NOTE: Negative hours indicated when past recommended oil change interval.
TO RESET: Cycle Engine Control switch from the RUN/IDLE to RUN position 3 times within 5 seconds (engine Off).

FUNCIONES DE MANTENIMIENTO DE LOS MEDIDORES*

- **HORÓMETRO:** con el motor apagado, ponga el control del motor en la posición RUN/IDLE (marcha/ralenti) para ver las horas en el motor.
- **INTERVALO DEL CAMBIO DE ACEITE:** con el motor apagado, ponga el CONTROL DEL MOTOR en la posición RUN (marcha) para ver las horas que quedan antes del cambio de aceite. Las horas comienzan en 100 y descienden a 0 (momento de cambiar el aceite).

NOTE: Horas negativas indican que se a sobre pasado el intervalo del cambio del aceite.
PARA REARMAR: Cicle el control del motor de la posición RUN/IDLE a RUN tres veces dentro de 5 segundos (con el motor apagado).

Air Filter Service 100 hours – see Owner's Manual
 Air Filter KOHLER CH20: MILLER 067 272, Kohler 4708803
 CH23: MILLER 230 016, Kohler 2408803-S
 Air Filter Wrapper KOHLER CH20: MILLER 067 273, Kohler 2408802
 CH23: MILLER 230 017, Kohler 2408805-S
 Air Filter ROBIN: MILLER 198 755, Robin 283-32610-A1
 (Includes Air Filter Wrapper)

Spark Plug KOHLER: MILLER 067 007, Kohler 1213202,
 Champion RC-12YC
 Gap: 0.030 In.
 Spark Plug ROBIN: MILLER 198 777, Robin X65-01407-30,
 NGK BPR4EY
 Gap: 0.025 In.
 Use only resistor spark plugs and wires.

Tune-up and Filter Kit . . . (Includes Air, Oil and Fuel Filters, and 2 Spark Plugs)

KOHLER CH20: MILLER 180 036
 CH23: MILLER 230 015
 ROBIN: MILLER 199 062

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8-2. Routine Maintenance (Subaru/Robin-Powered Units)

						Recycle engine fluids.	Stop engine before maintaining.
							<i>See Engine Manual and Maintenance Label for important start-up, service, and storage information. Service engine more often if used in severe conditions.</i>

		✓ = Check ◇ = Change ● = Clean ☆ = Replace * To be done by Factory Authorized Service Agent			Reference				
Every 8 Hours		✓ Fuel Level		✓ Oil Level		● Oil, Fuel Spills	Section 5-2		
Every 20 Hours		✓● Spark Arrester Screen					Section 8-4		
Every 25 Hours		● Air Cleaner Wrapper					Section 8-3		
Every 50 Hours		● Weld Terminals							
Every 100 Hours		● Battery Terminals		● Cooling System		◇ Oil		✓☆ Air Cleaner Element	Engine Manual, Section 8-3, 8-5
Every 200 Hours		☆ Unreadable Labels		✓ Spark Plug Gap		◇ Oil Filter		☆ Fuel Filter	Engine Manual, Section 8-5
Every 500 Hours		✓☆ Weld Cables		✓● Slip Rings* ✓☆ Brushes*		✓ Valve Clearance*		Engine Manual	

8-3. Servicing Air Cleaner (Subaru/Robin-Powered Units)

⚠ Stop engine.

NOTICE – Do not run engine without air cleaner or with dirty element.

1 Precleaner
Wash precleaner with soap and water solution. Allow precleaner to air dry completely.

Spread 1 tablespoon SAE 30 oil evenly into precleaner. Squeeze out excess oil.

2 Element
Replace element if damaged, dirty, or oily.

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8-4. Servicing Optional Spark Arrestor (Subaru/Robin-Powered Units)

⚠ Stop engine and let cool.

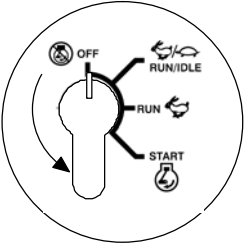
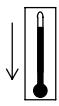
1 Spark Arrestor Screen
Clean and inspect screen. Replace spark arrestor if screen wires are broken or missing.

Tools Needed:

1/4 in

Ref. 803 848-C / Ref. 801 682

8-5. Changing Engine Oil, Oil Filter, and Fuel Filter (Subaru/Robin-Powered Units)



⚠ Stop engine and let cool.

- 1 Oil Drain Valve
- 2 1/2 ID x 7 in Hose
- 3 Oil Filter

Change engine oil and filter according to engine owner's manual.

⚠ Close valve and valve cap before adding oil and running engine.

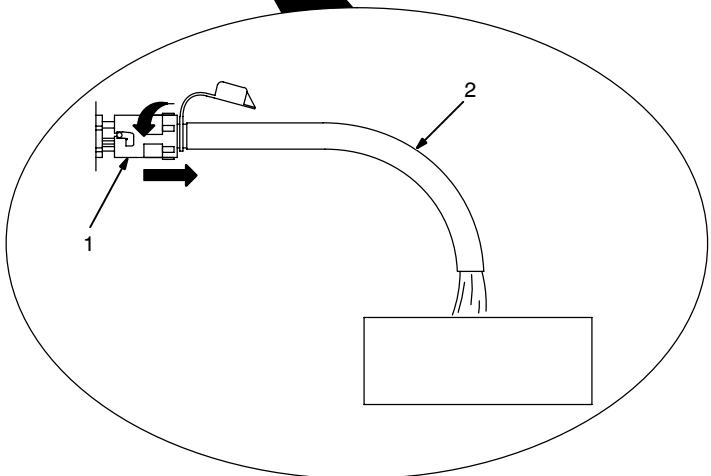
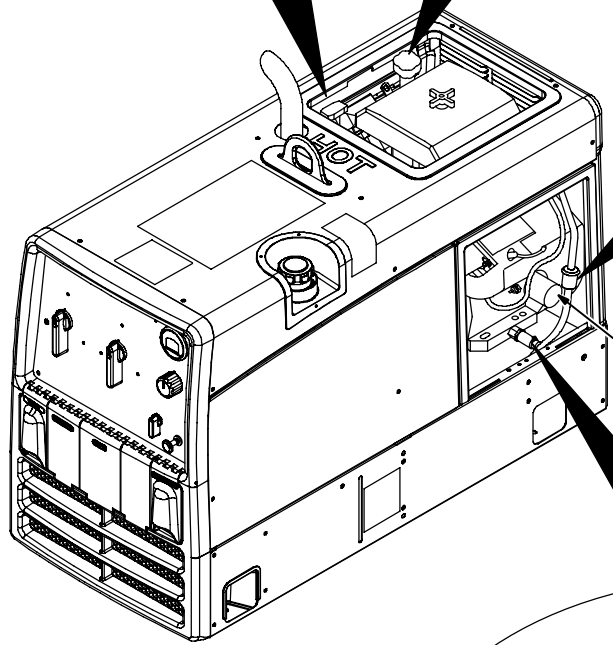
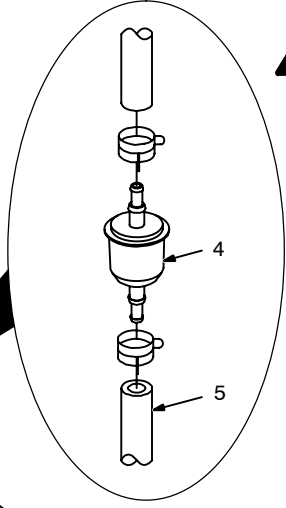
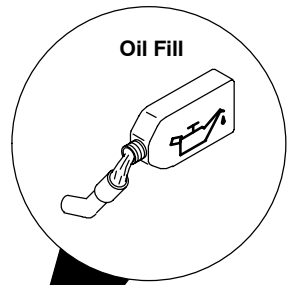
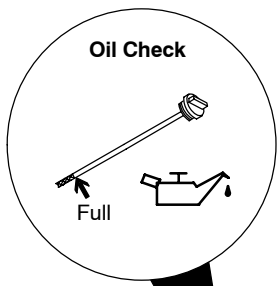
Fill crankcase with new oil to full mark on dipstick (see Section 5-2).

- 4 Fuel Filter
- 5 Fuel Line

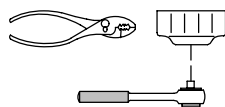
Replace line if cracked or worn. Install new filter. Wipe up any spilled fuel.

Start engine, and check for fuel leaks.

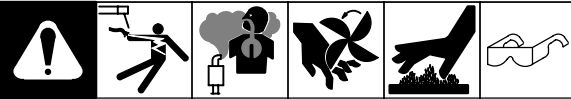
⚠ Stop engine, tighten connections as necessary, and wipe up fuel.



Tools Needed:



8-6. Adjusting Engine Speed (Subaru/Robin-Powered Units)



	2200 - 2300 rpm (36.6 - 38.3 Hz)
	3675 - 3750 rpm (61.3 - 62.5 Hz)

After tuning engine, check engine speeds with a tachometer (see table). If necessary, adjust speeds as follows:

Start engine and run until warm.

Remove rear panel and air cleaner to access idle speed adjustments. Remove top cover to access weld/power speed adjustments.

Idle Speed Adjustment

Move Engine Control switch to Run/Idle position.

- 1 Throttle Solenoid
- 2 Mounting Screws
- 3 Idle Speed Screw

Loosen mounting screws. Adjust solenoid position so engine runs at idle speed. If necessary, back out idle speed screw so solenoid can be moved to correct position. Tighten mounting screws. Be sure solenoid linkage works smoothly.

Turn idle speed screw for fine adjustments.

Weld/Power Speed Adjustment

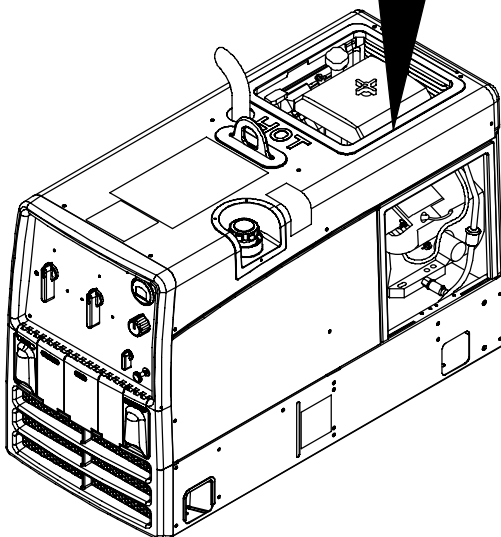
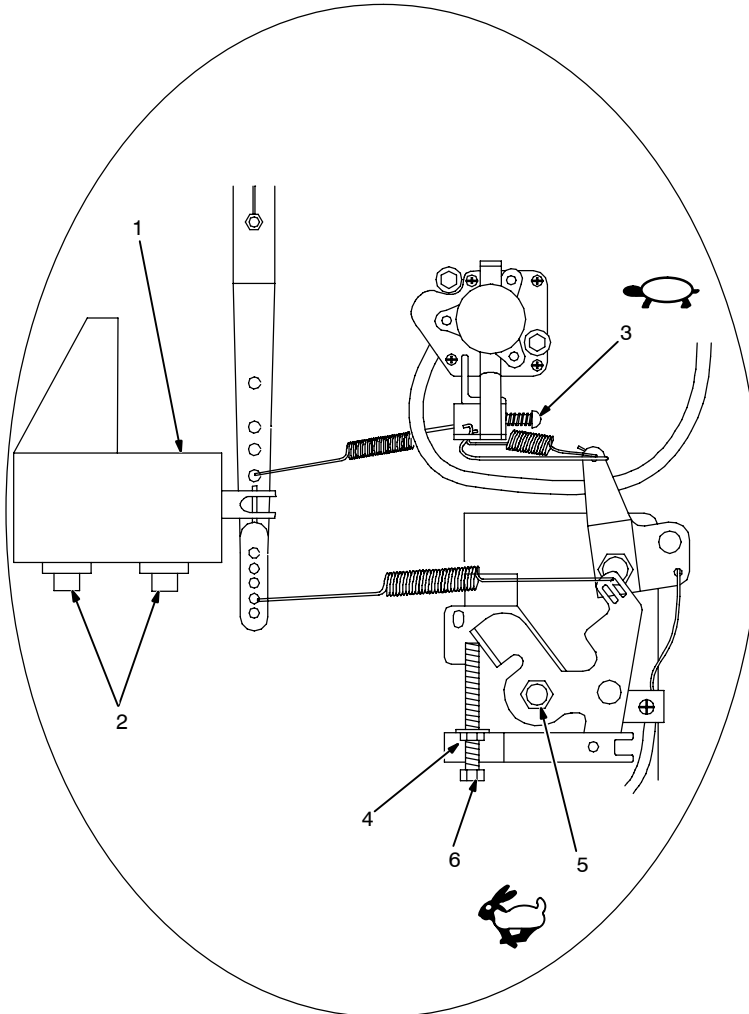
Move Engine Control switch to Run position.

- 4 Jam Nut
- 5 Lock Nut
- 6 Weld/Power Speed Adjustment Screw

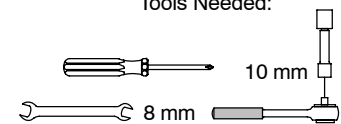
Loosen jam nut and lock nut. Turn adjustment screw until engine runs at weld/power speed. Tighten jam nut, and then tighten lock nut.

Stop engine.

Reinstall air cleaner, rear panel, and top cover.



Tools Needed:



SECTION 9 – MAINTENANCE – (KOHLER-POWERED UNITS)

9-1. Maintenance Label (Kohler-Powered Units)

KOHLER CH20/CH23, ROBIN EH64/EH65 GAS ENGINES

See Engine Manual for complete engine care. Give Engine Specification and Serial Number when ordering parts.

Check Daily.

To Drain Oil:
Push And Turn COW
Fill

Recommended Oil
API Service Classification SG or higher
(If using LP fuel, use synthetic oil.)

Oil Change 100 hours
Oil Filter Change 200 hours
Oil Filter KOHLER: MILLER 066 698, Kohler 1205001
ROBIN: MILLER 198 754, Robin 248-65801-00

Oil Capacity w/filter change Approximately 1.5 quarts

DO NOT OVERFILL. KOHLER: Keep oil level between L & F marks on dipstick.
ROBIN: Keep oil level between 2 holes on dipstick.

NO SOBRELLENE . . . KOHLER: Mantenga el nivel del aceite entre las marcas L y F del medidor.
ROBIN: Mantenga el nivel del aceite entre los dos huecos del medidor.

Fuel Grade Unleaded, 87 Octane min.
Fuel Filter KOHLER: MILLER 215 984, Kohler 2505022
ROBIN: MILLER 215 984, Robin 288-65012-A8

12 Volt Battery BCI Group 68
Cranking Performance at 0°F (-18°C) 430 Amps min.

Engine Speed
No Load 3875-3750 RPM
Idle 2200-2300 RPM

METER MAINTENANCE FUNCTIONS


- **HOUR METER:** with engine off, place Engine Control switch in RUN/IDLE position to view engine hours.
- **OIL CHANGE INTERVAL:** with engine off, place Engine Control switch into the RUN position to see hours before next oil change. Oil hours start at 100 and count down to 0 (oil change due).

NOTE: Negative hours indicated when past recommended oil change interval.
TO RESET: Cycle Engine Control switch from the RUN/IDLE to RUN position 3 times within 5 seconds (engine Off).

FUNCIONES DE MANTENIMIENTO DE LOS MEDIDORES*


- **HORÓMETRO:** con el motor apagado, ponga el control del motor en la posición RUN/IDLE (marcha/ralentí) para ver las horas en el motor.
- **INTERVALO DEL CAMBIO DE ACEITE:** con el motor apagado, ponga el CONTROL DEL MOTOR en la posición RUN (marcha) para ver las horas que quedan antes del cambio de aceite. Las horas comienzan en 100 y descienden a 0 (momento de cambiar el aceite).

NOTE: Horas negativas indican que se a sobre pasado el intervalo del cambio del aceite.
PARA REARMAR: Cicle el control del motor de la posición RUN/IDLE a RUN tres veces dentro de 5 segundos (con el motor apagado).



Air Filter Service 100 hours – see Owner's Manual
Air Filter KOHLER CH20: MILLER 067 272, Kohler 4708903
CH23: MILLER 230 016, Kohler 2408903-S
Air Filter Wrapper KOHLER CH20: MILLER 067 273, Kohler 2408902
CH23: MILLER 230 017, Kohler 2408905-S
Air Filter ROBIN: MILLER 198 755, Robin 283-32610-A1
(includes Air Filter Wrapper)

Spark Plug KOHLER: MILLER 067 007, Kohler 1213202,
Champion RC-12YC
Gap: 0.030 In.
Spark Plug ROBIN: MILLER 198 777, Robin X65-01407-30,
NGK BPR4EY
Gap: 0.025 In.
Use only resistor spark plugs and wires.



Tune-up and Filter Kit . . . (Includes Air, Oil and Fuel Filters, and 2 Spark Plugs)
KOHLER CH20: MILLER 180 096
CH23: MILLER 230 015
ROBIN: MILLER 199 082

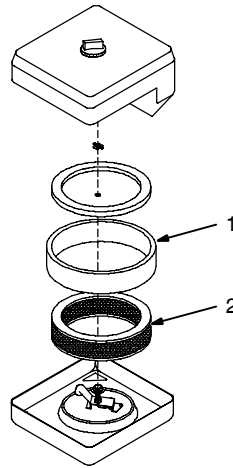
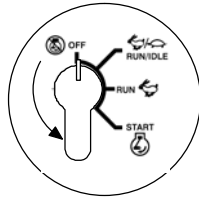
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9-2. Routine Maintenance (Kohler-Powered Units)

									Stop engine before maintaining.
								Recycle engine fluids.	See <i>Engine Manual and Maintenance Label</i> for important start-up, service, and storage information. Service engine more often if used in severe conditions.

		✓ = Check ◇ = Change ● = Clean ☆ = Replace * To be done by Factory Authorized Service Agent			Reference				
Every 8 Hours		✓ Fuel Level		✓ Oil Level		● Oil, Fuel Spills	Section 5-3		
Every 20 Hours		✓ ● Spark Arrestor Screen					Section 9-7		
Every 25 Hours		● Air Cleaner Wrapper					Section 9-3		
Every 50 Hours		● Weld Terminals							
Every 100 Hours		● Battery Terminals		● Cooling System		◇ Oil		✓ ☆ Air Cleaner Element	Engine Manual, Section 9-3, 9-4
Every 200 Hours		☆ Unreadable Labels		✓ Spark Plug Gap		◇ Oil Filter		☆ Fuel Filter	Engine Manual, Section 9-4
Every 500 Hours		✓ ☆ Weld Cables		✓ ● Slip Rings*				✓ ☆ Brushes*	Engine Manual

9-3. Servicing Air Cleaner (Kohler-Powered Units)



⚠ Stop engine.

NOTICE – Do not run engine without air cleaner or with dirty element.

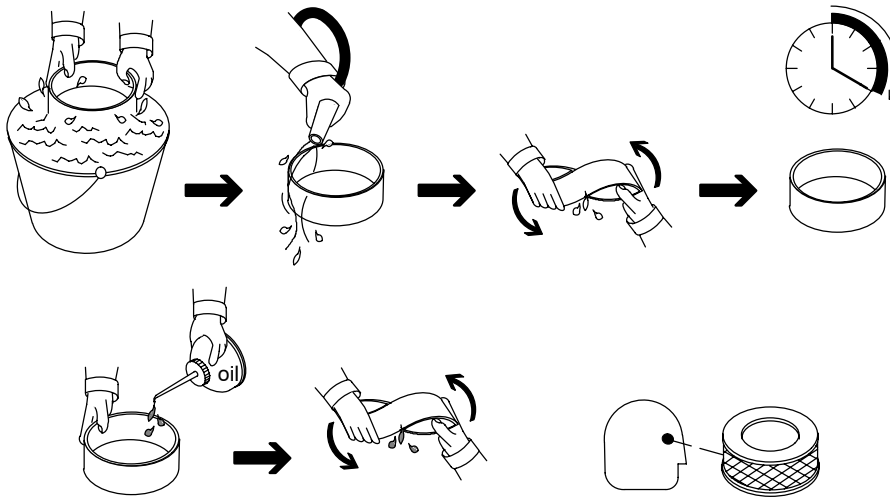
1 Precleaner

Wash precleaner with soap and water solution. Allow precleaner to air dry completely.

Spread 1 tablespoon SAE 30 oil evenly into precleaner. Squeeze out excess oil.

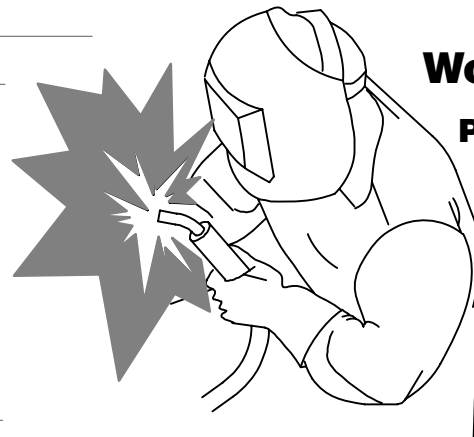
2 Element

Replace element if damaged, dirty, or oily.



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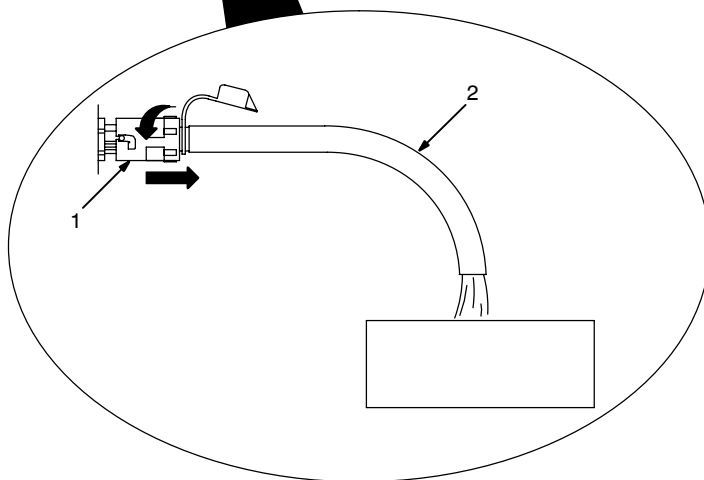
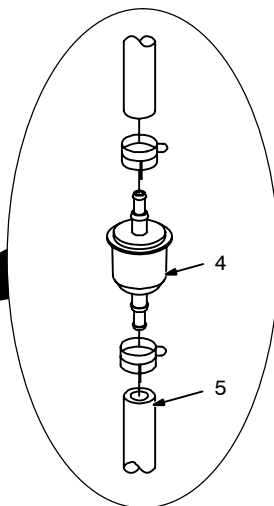
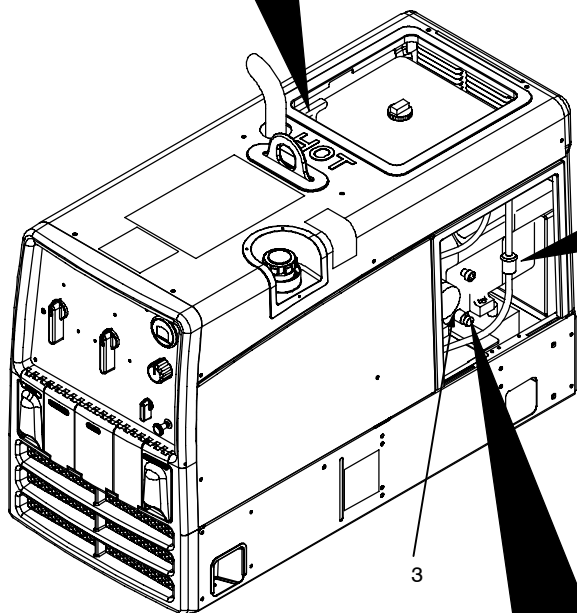
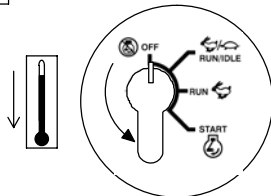
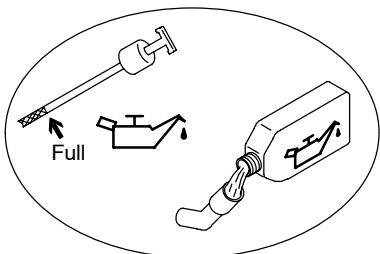
Notes



Work like a Pro!

Pros weld and cut safely. Read the safety rules at the beginning of this manual.

9-4. Changing Engine Oil, Oil Filter, and Fuel Filter (Kohler-Powered Units)



⚠ Stop engine and let cool.

- 1 Oil Drain Valve
- 2 1/2 ID x 7 in Hose
- 3 Oil Filter

Change engine oil and filter according to engine owner's manual.

⚠ Close valve and valve cap before adding oil and running engine.

Fill crankcase with new oil to full mark on dipstick (see Section 5-3).

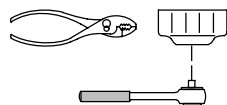
- 4 Fuel Filter
- 5 Fuel Line

Replace line if cracked or worn. Install new filter. Wipe up any spilled fuel.

Start engine, and check for fuel leaks.

⚠ Stop engine, tighten connections as necessary, and wipe up fuel.

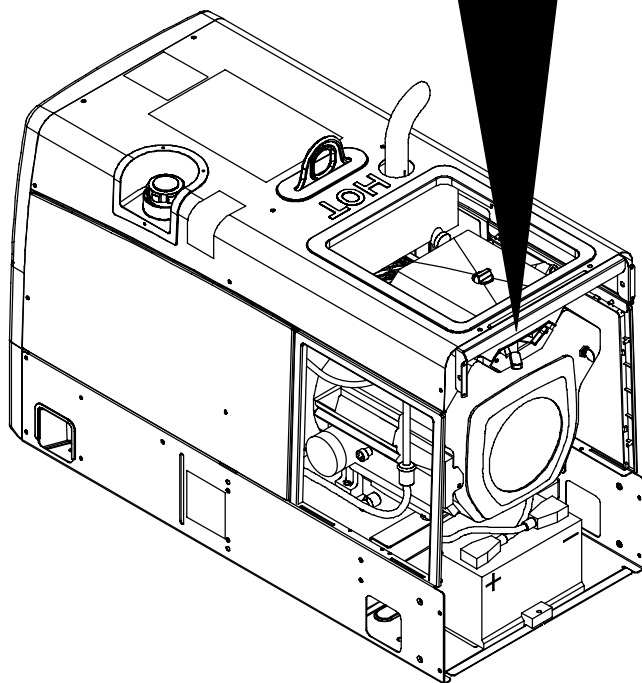
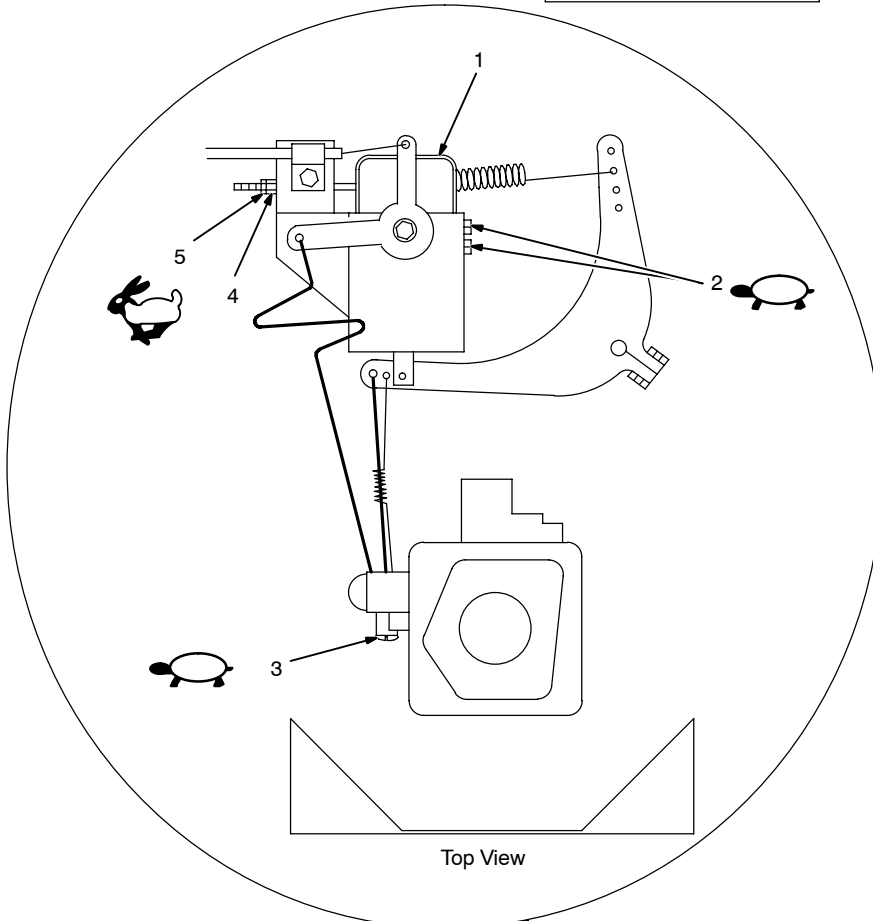
Tools Needed:



9-5. Adjusting Engine Speed (Kohler-Powered Units)



	2200 - 2300 rpm (36.6 - 38.3 Hz)
	3675 - 3750 rpm (61.3 - 62.5 Hz)



After tuning engine, check engine speeds with a tachometer (see table). If necessary, adjust speeds as follows:

Start engine and run until warm. Turn Fine Control to 10.

Remove rear panel and air cleaner to access idle speed adjustments. Remove top cover to access weld/power speed adjustments.

Idle Speed Adjustment

Move Engine Control switch to Run/Idle position.

- 1 Throttle Solenoid
- 2 Mounting Screws
- 3 Idle Speed Screw

Loosen mounting screws. Adjust solenoid position so engine runs at idle speed. If necessary, back out idle speed screw so solenoid can be moved to correct position. Tighten mounting screws. Be sure solenoid linkage works smoothly.

Turn idle speed screw for fine adjustments.

Weld/Power Speed Adjustment

Move Engine Control switch to Run position.

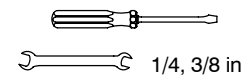
- 4 Weld/Power Speed Adjustment Nut
- 5 Lock Nut

Loosen lock nut. Turn adjustment nut until engine runs at weld/power speed. Tighten lock nut.

Stop engine.


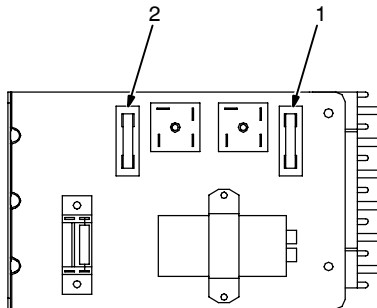
Reinstall air cleaner, rear panel, and top cover.

Tools Needed:

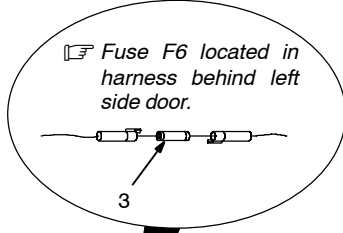


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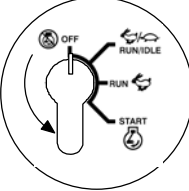
9-6. Overload Protection (Kohler-Powered Units)

Fuses F1, F2 located on bracket behind left side panel.



Fuse F6 located in harness behind left side door.



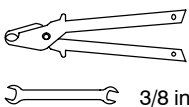
⚠ Stop engine. Disconnect negative (-) battery cable.

- 1 Fuse F1 (See Section 11-1)
F1 protects the weld excitation winding from overload. If F1 opens, weld output stops or is low.
- 2 Fuse F2 (See Section 11-1)
F2 protects the generator power excitation winding from overload. If F2 opens, generator power output stops or is low.
- 3 Fuse F6 (See Section 11-1)
F6 protects the engine wiring system from overload. If F6 opens, engine will not crank.

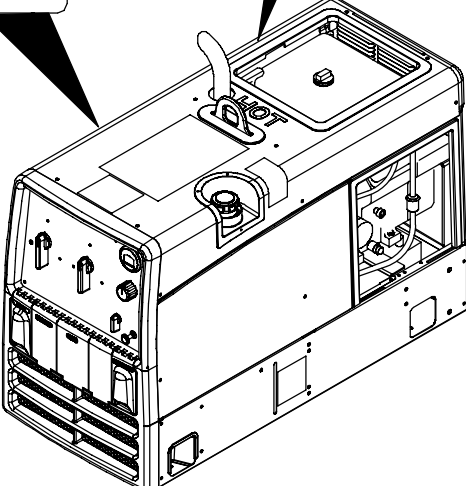
Replace any open fuses. Reinstall cover before operating.

☞ If a fuse opens, it usually indicates a more serious problem exists. Contact a Factory Authorized Service Agent.

Tools Needed:


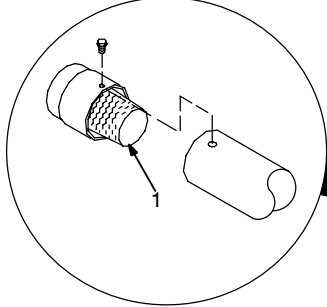
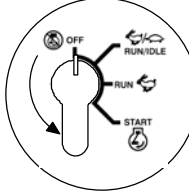


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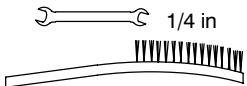
9-7. Servicing Optional Spark Arrestor (Kohler-Powered Units)

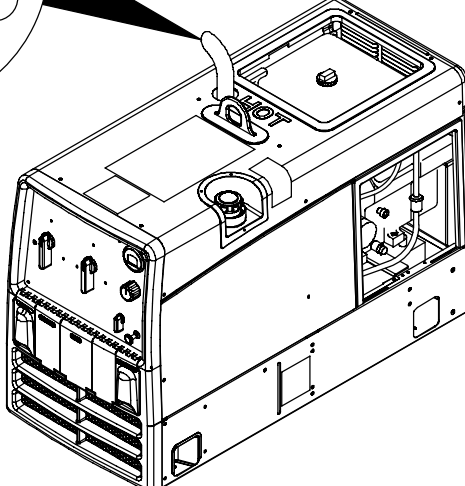
⚠ Stop engine and let cool.

- 1 Spark Arrestor Screen
Clean and inspect screen. Replace spark arrestor if screen wires are broken or missing.

Tools Needed:



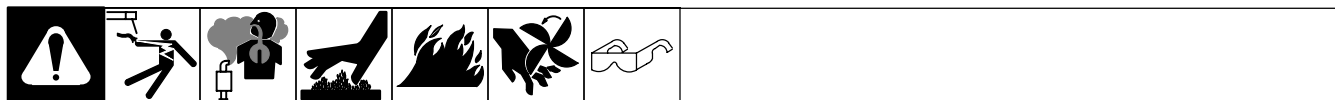
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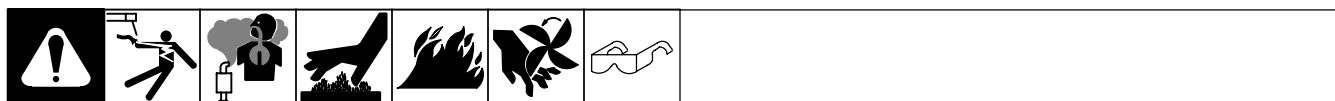
SECTION 10 – TROUBLESHOOTING

10-1. Welding Troubleshooting



Trouble	Remedy
Low or no weld output; generator power output okay at ac receptacles.	Check control settings.
	Check weld connections.
	Check fuse F1, and replace if open (see Section 8-7 or 9-6).
	Have Factory Authorized Service Agent check brushes, slip rings, capacitor C1, and integrated rectifiers SR2 and SR3.
No weld output or generator power output at ac receptacles.	Be sure all equipment is disconnected from receptacles when starting unit.
	Check fuses F1 and F2, and replace if open (see Section 8-7 or 9-6).
	Check plug PLG6 connection.
	Have Factory Authorized Service Agent check brushes, slip rings, capacitor C1, and integrated rectifiers SR2 and SR3.
Low weld output.	Check fuse F1, and replace if open (see Section 8-7 or 9-6).
	Check control settings.
	Check engine speed, and adjust if necessary (see Section 8-6 or 9-5).
	Service air cleaner according to engine manual.
	Have Factory Authorized Service Agent check brushes, slip rings, capacitor C1, and integrated rectifiers SR2 and SR3.
High weld output.	Check control settings.
	Check engine speed, and adjust if necessary (see Section 8-6 or 9-5).
Erratic weld output.	Check control settings.
	Tighten and clean connections to electrode and workpiece.
	Use dry, properly-stored electrodes for Stick and TIG welding.
	Remove excessive coils from weld cables.
	Clean and tighten connections both inside and outside welding generator.
	Check engine speed, and adjust if necessary (see Section 8-6 or 9-5).
	Have Factory Authorized Service Agent check brushes, slip rings, and integrated rectifiers SR2, SR3.

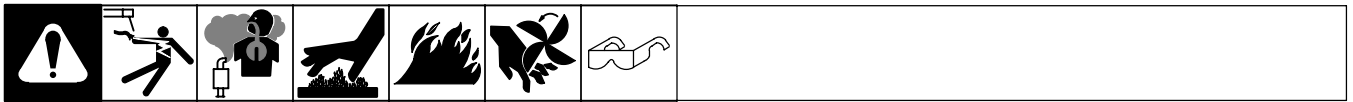
10-2. Generator Power Troubleshooting



Trouble	Remedy
No or low generator power output at ac receptacles; weld output okay.	Reset supplementary protectors (see Section 7-1 or 7-2).
	Press optional GFCI receptacle Reset button (see Section 7-2).
	Check fuse F2, and replace if open (see Section 8-7 or 9-6).
	Check plug PLG6 connection.
	Have Factory Authorized Service Agent check brushes, slip rings, and integrated rectifier SR3.

Trouble	Remedy
No generator power or weld output.	Be sure all equipment is disconnected from receptacles when starting unit.
	Check fuses F1 and F2, and replace if open (see Section 8-7 or 9-6).
	Check plug PLG6 connection.
	Have Factory Authorized Service Agent check brushes, slip rings, capacitor C1, and integrated rectifiers SR2 and SR3.
Low power output at ac receptacles.	Check fuse F2, and replace if open (see Section 8-7 or 9-6).
	Increase Fine control R1 setting to max.
High power output at ac receptacles.	Check engine speed, and adjust if necessary (see Section 8-6 or 9-5).
Erratic power output at ac receptacles.	Check fuel level.
	Check engine speed, and adjust if necessary (see Section 8-6 or 9-5).
	Check receptacle wiring and connections.
	Have Factory Authorized Service Agent check brushes and slip rings.

10-3. Engine Troubleshooting



Trouble	Remedy
Engine will not crank.	Check fuse F6, and replace if open (see Section 8-7 or 9-6).
	Check battery voltage.
	Check battery connections and tighten if necessary.
	Check plug PLG4 and plug PLG8 connections.
	Have Factory Authorized Service Agent check Engine Control switch S2.
Engine will not start.	Check fuel level.
	Check battery voltage.
	Check battery connections and tighten if necessary.
	Check oil level (see Section 5-2 or 5-3).
	Check low oil pressure shutdown switch.
	Have Factory Authorized Service Agent check fuel shutoff solenoid FS1 and diode D8. (FS1 optional on Subaru/Robin-powered units.)
Engine starts but stops when Engine Control switch returns to Run position.	Check oil level.
	Check and refill crankcase with proper viscosity oil for operating temperature, if necessary.
	Check low oil pressure shutdown switch.
Engine stopped during normal operation.	Check fuel level.
	Check oil level (see Section 5-2 or 5-3).
	Check low oil pressure shutdown switch.
	Periodically recharge battery (approximately every 3 months).
	Replace battery.
	Check voltage regulator and connections according to engine manual.
	Have Factory Authorized Service Agent check fuel shutoff solenoid FS1 (FS1 optional on Subaru/Robin-powered units).

Trouble	Remedy
Battery Discharges between uses.	Clean battery, terminals, and posts with baking soda and water solution; rinse with clear water.
	Periodically recharge battery (approximately every 3 months).
	Replace battery.
	Check voltage regulator and connections according to engine manual.
Engine idles but does not come up to weld speed.	Have Factory Authorized Service Agent check hour meter/idle module, and current transformer CT1.
Unstable or sluggish engine speeds.	Readjust throttle linkage if necessary. Check throttle solenoid TS1 for smooth operation.
	Check oil level. Oil level should not exceed Full mark on dipstick. Fuel pump will operate erratically if crankcase is overfilled.
	Tune-up engine according to engine manual.
Engine does not return to idle speed.	Remove weld and generator power loads.
	Check throttle linkage for smooth, non-binding operation.
	Have Factory Authorized Service Agent check hour meter/idle module, current transformer CT1, Engine Control switch S2, and throttle solenoid TS1.

SECTION 11 – PARTS LIST

11-1. Recommended Spare Parts

Dia. Mkgs.	Part No.	Description	Quantity
Recommended Spare Parts			
..... F1, F2 ...	169296 ..	Fuse, Mintr GI 25. Amp 125 Volt	2
..... F6	021718 ..	Fuse, Mintr GI 30. Amp 32 Volt	1
.....	215984 ..	Filter, Fuel In-line .250 (Kohler)	1
.....	230015 ..	Tune-up & Filter Kit, Kohler (Includes)	1
.....	230016	Air Filter Element, Kohler	1
.....	066698	Oil Filter, Kohler	1
.....	215985	Filter, Fuel w/Clamps & 1/4 in Fuel Line	1
.....	067007	Spark Plug	2
.....	230017	Air Filter Wrapper	1
.....	066113 ..	Filter, Fuel In-line .250 (Subaru/Robin)	1
.....	199062 ..	Tune-up & Filter Kit, Subaru/Robin (Includes)	1
.....	198755	Element, Air Filter	1
.....	198754	Filter, Oil	1
.....	215985	Filter, Fuel w/Clamps & 1/4 Fuel Line	1
.....	198777	Spark Plug	1

A complete Parts List is available on-line at www.MillerWelds.com.

SECTION 12 – ELECTRICAL DIAGRAMS

	WARNING Do not touch live electrical parts. Disconnect input power or stop engine before servicing. Do not operate with covers removed. Have only qualified persons install, use, or service this unit.
	ELECTRIC SHOCK HAZARD

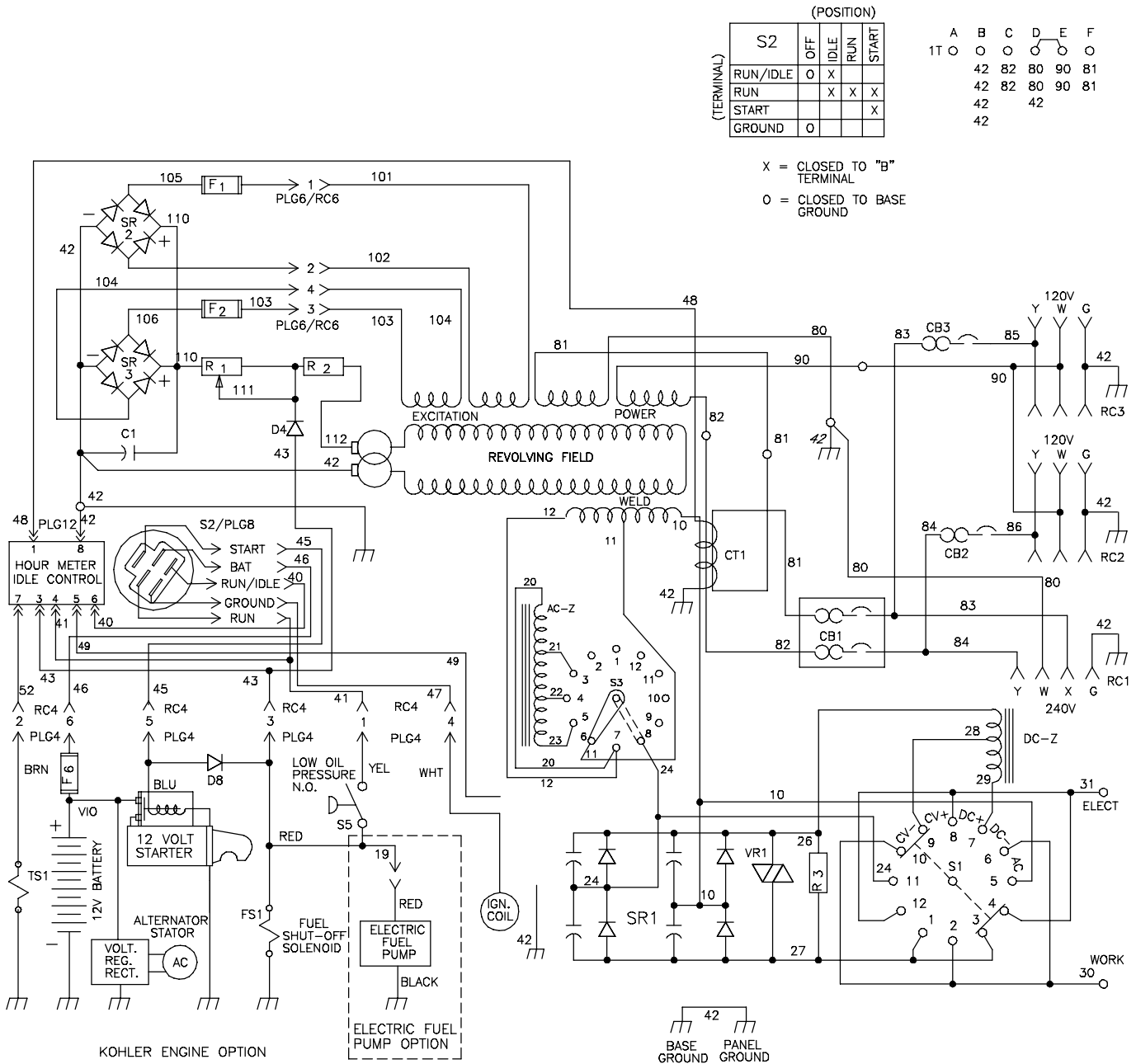
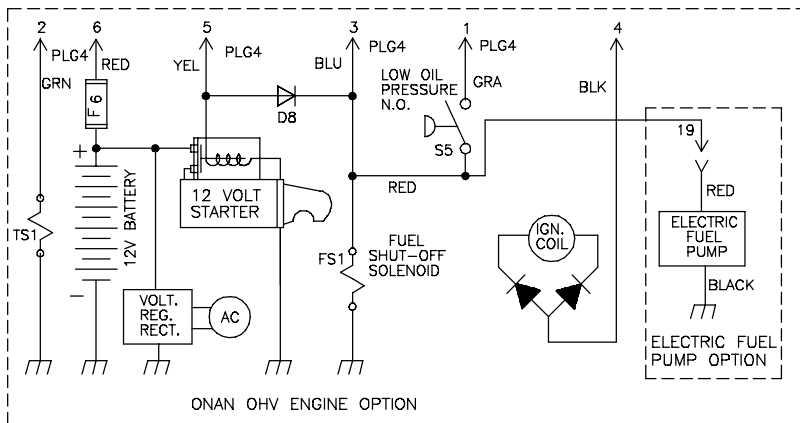
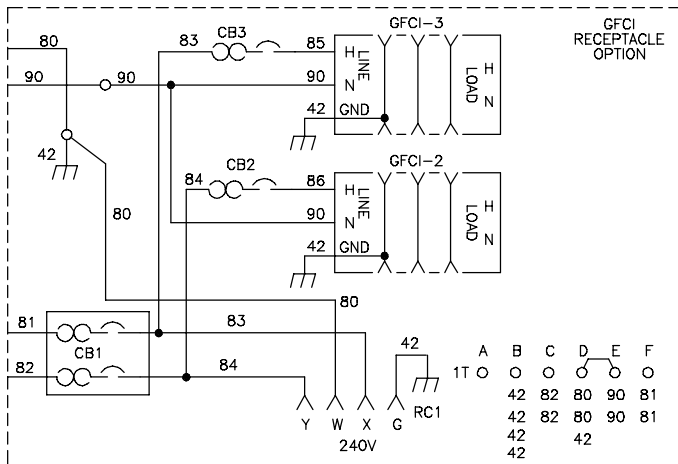





Figure 12-1. Circuit Diagram For Welding Generator

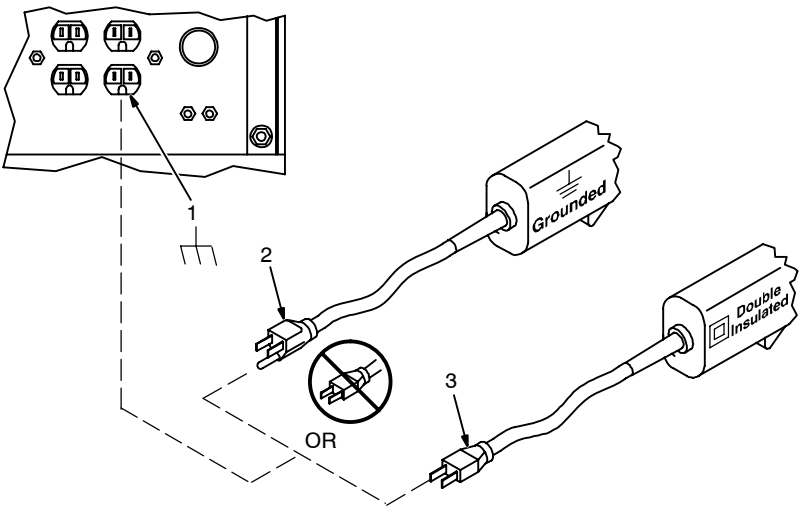


SECTION 13 – GENERATOR POWER GUIDELINES


 The views in this section are intended to be representative of all engine-driven welding generators. Your unit may differ from those shown.


13-1. Selecting Equipment







- 1 Generator Power Receptacles – Neutral Bonded To Frame
- 2 3-Prong Plug From Case Grounded Equipment
- 3 2-Prong Plug From Double Insulated Equipment

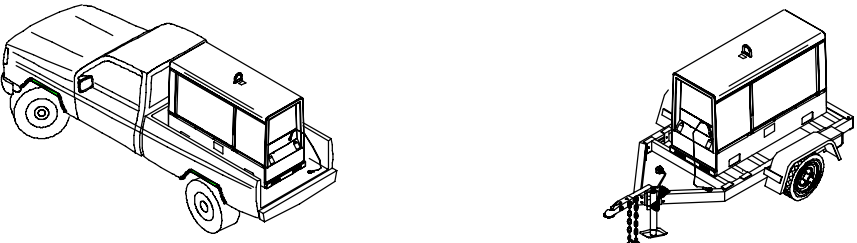
 Be sure equipment has double insulated symbol and/or wording on it.

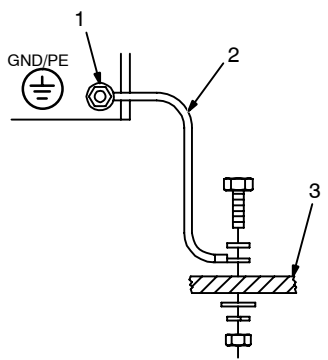
 Do not use 2-prong plug unless equipment is double insulated.


gen_pwr 2007-04 – Ref. ST-159 730 / ST-800 577


13-2. Grounding Generator To Truck Or Trailer Frame









 Always ground generator frame to vehicle frame to prevent electric shock and static electricity hazards.


 Also see AWS Safety & Health Fact Sheet No. 29, Grounding of Portable And Vehicle Mounted Welding Generators.

- 1 Equipment Grounding Terminal (On Front Panel)
- 2 Grounding Cable (Not Supplied)
- 3 Metal Vehicle Frame

Connect cable from equipment ground terminal to metal vehicle frame. Use #10 AWG or larger insulated copper wire.

 Electrically bond generator frame to vehicle frame by metal-to-metal contact.

 Bed liners, shipping skids, and some running gear insulate the welding generator from the vehicle frame. Always connect a ground wire from the generator equipment grounding terminal to bare metal on the vehicle frame as shown.

 If unit does not have GFCI receptacles, use GFCI-protected extension cord.

S-0854

13-3. Grounding When Supplying Building Systems

1 Equipment Grounding Terminal
 2 Grounding Cable
 Use #10 AWG or larger insulated copper wire.
 3 Ground Device

Use ground device as stated in electrical codes.

Ground generator to system earth ground if supplying power to a premises (home, shop, farm) wiring system.

Also see AWS Safety & Health Fact Sheet No. 29, Grounding of Portable And Vehicle Mounted Welding Generators.

ST-800 576-B

13-4. How Much Power Does Equipment Require?

1 Resistive Load
 A light bulb is a resistive load and requires a constant amount of power.

2 Non-Resistive Load
 Equipment with a motor is a non-resistive load and requires approximately six times more power while starting the motor than when running (see Section 13-8).

3 Rating Data
 Rating shows volts and amperes, or watts required to run equipment.

Amperes x Volts = Watts

Example 1: If a drill uses 4.5 amperes at 115 volts, calculate its running power requirement in watts.
 $4.5 \text{ A} \times 115 \text{ V} = 520 \text{ W}$
 The load applied by the drill is 520 watts.

Example 2: If three 200 watt flood lamps are used with the drill from Example 1, add the individual loads to calculate total load.
 $(3 \times 200\text{W}) + 520 \text{ W} = 1120 \text{ W}$
 The total load applied by the three flood lamps and drill is 1120 watts.

S-0623

13-5. Approximate Power Requirements For Industrial Motors

Industrial Motors	Rating	Starting Watts	Running Watts
Split Phase	1/8 HP	800	300
	1/6 HP	1225	500
	1/4 HP	1600	600
	1/3 HP	2100	700
	1/2 HP	3175	875
Capacitor Start-Induction Run	1/3 HP	2020	720
	1/2 HP	3075	975
	3/4 HP	4500	1400
	1 HP	6100	1600
	1-1/2 HP	8200	2200
	2 HP	10550	2850
	3 HP	15900	3900
Capacitor Start-Capacitor Run	5 HP	23300	6800
	1-1/2 HP	8100	2000
	5 HP	23300	6000
	7-1/2 HP	35000	8000
Fan Duty	10 HP	46700	10700
	1/8 HP	1000	400
	1/6 HP	1400	550
	1/4 HP	1850	650
	1/3 HP	2400	800
	1/2 HP	3500	1100

13-6. Approximate Power Requirements For Farm/Home Equipment

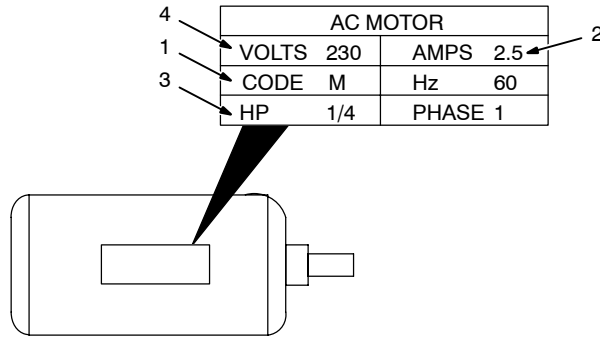
Farm/Home Equipment	Rating	Starting Watts	Running Watts
Stock Tank De-Icer		1000	1000
Grain Cleaner	1/4 HP	1650	650
Portable Conveyor	1/2 HP	3400	1000
Grain Elevator	3/4 HP	4400	1400
Milk Cooler		2900	1100
Milker (Vacuum Pump)	2 HP	10500	2800
FARM DUTY MOTORS	1/3 HP	1720	720
Std. (e.g. Conveyors,	1/2 HP	2575	975
Feed Augers, Air	3/4 HP	4500	1400
Compressors)	1 HP	6100	1600
	1-1/2 HP	8200	2200
	2 HP	10550	2850
	3 HP	15900	3900
	5 HP	23300	6800
High Torque (e.g. Barn	1-1/2 HP	8100	2000
Cleaners, Silo Unloaders,	5 HP	23300	6000
Silo Hoists, Bunk Feeders)	7-1/2 HP	35000	8000
	10 HP	46700	10700
3-1/2 cu. ft. Mixer	1/2 HP	3300	1000
High Pressure 1.8 Gal/Min	500 PSI	3150	950
Washer 2 gal/min	550 PSI	4500	1400
2 gal/min	700 PSI	6100	1600
Refrigerator or Freezer		3100	800
Shallow Well Pump	1/3 HP	2150	750
	1/2 HP	3100	1000
Sump Pump	1/3 HP	2100	800
	1/2 HP	3200	1050

13-7. Approximate Power Requirements For Contractor Equipment

Contractor	Rating	Starting Watts	Running Watts
Hand Drill	1/4 in	350	350
	3/8 in	400	400
	1/2 in	600	600
Circular Saw	6-1/2 in	500	500
	7-1/4 in	900	900
	8-1/4 in	1400	1400
Table Saw	9 in	4500	1500
	10 in	6300	1800
Band Saw	14 in	2500	1100
Bench Grinder	6 in	1720	720
	8 in	3900	1400
	10 in	5200	1600
Air Compressor	1/2 HP	3000	1000
	1 HP	6000	1500
	1-1/2 HP	8200	2200
	2 HP	10500	2800
Electric Chain Saw	1-1/2 HP, 12 in	1100	1100
	2 HP, 14 in	1100	1100
Electric Trimmer	Standard 9 in	350	350
	Heavy Duty 12 in	500	500
Electric Cultivator	1/3 HP	2100	700
Elec. Hedge Trimmer	18 in	400	400
Flood Lights	HID	125	100
	Metal Halide	313	250
	Mercury	1000	
	Sodium Vapor	1400	1000
Submersible Pump	400 gph	600	200
Centrifugal Pump	900 gph	900	500
Floor Polisher	3/4 HP, 16 in	4500	1400
	1 HP, 20 in	6100	1600
High Pressure Washer	1/2 HP	3150	950
	3/4 HP	4500	1400
	1 HP	6100	1600
55 gal Drum Mixer	1/4 HP	1900	700
Wet & Dry Vac	1.7 HP	900	900
	2-1/2 HP	1300	1300

13-8. Power Required To Start Motor

Single-Phase Induction Motor Starting Requirements								
Motor Start Code	G	H	J	K	L	M	N	P
KVA/HP	6.3	7.1	8.0	9.0	10.0	11.2	12.5	14.0



- 1 Motor Start Code
- 2 Running Amperage
- 3 Motor HP
- 4 Motor Voltage

To find starting amperage:

Step 1: Find code and use table to find kVA/HP. If code is not listed, multiply running amperage by six to find starting amperage.

Step 2: Find Motor HP and Volts.

Step 3: Determine starting amperage (see example).

Welding generator amperage output must be at least twice the motor's running amperage.

$$\frac{(kVA/HP \times HP \times 1000)}{\text{Volts}} = \text{Starting Amperage}$$

Example: Calculate starting amperage required for a 230 V, 1/4 HP motor with a motor start code of M.

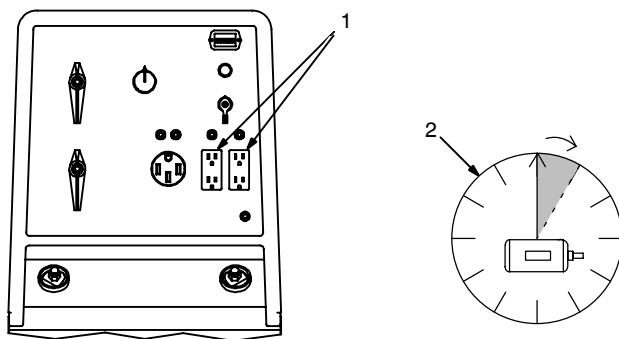
Volts = 230, HP = 1/4, kVA/HP = 11.2

$$(11.2 \times 1/4 \times 1000) / 230 = 12.2A$$

Starting the motor requires 12.2 amperes.

S-0624

13-9. How Much Power Can Generator Supply?



- 1 Limit Load To 90% Of Generator Output

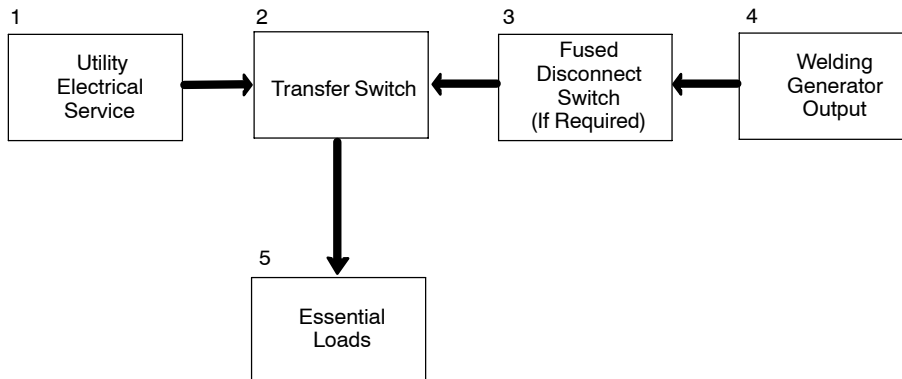
Always start non-resistive (motor) loads in order from largest to smallest, and add resistive loads last.

- 2 5 Second Rule

If motor does not start within 5 seconds, turn off power to prevent motor damage. Motor requires more power than generator can supply.

Ref. ST-800 396-A / S-0625

13-10. Typical Connections To Supply Standby Power



⚠ Have only qualified persons perform these connections according to all applicable codes and safety practices.

⚠ Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.

📖 Customer-supplied equipment is required if generator will supply standby power during emergencies or power outages.

1 Utility Electrical Service

2 Transfer Switch (Double-Throw)

Switch transfers the electrical load from electric utility service to the generator. Transfer load back to electric utility when service is restored.

Install correct switch (customer-supplied). Switch rating must be same as or greater than the branch overcurrent protection.

3 Fused Disconnect Switch

Install correct switch (customer-supplied) if required by electrical code.

4 Welding Generator Output

Generator output voltage and wiring must be consistent with regular (utility) system voltage and wiring.

Connect generator with temporary or permanent wiring suitable for the installation.

Turn off or unplug all equipment connected to generator before starting or stopping engine. When starting or stopping, the engine has low speed which causes low voltage and frequency.

5 Essential Loads

Generator output may not meet the electrical requirements of the premises. If generator does not produce enough output to meet all requirements, connect only essential loads (pumps, freezers, heaters, etc. – See Section 13-4).

13-11. Selecting Extension Cord (Use Shortest Cord Possible)



Cord Lengths for 120 Volt Loads

⚠ If unit does not have GFCI receptacles, use GFCI-protected extension cord.

Current (Amperes)	Load (Watts)	Maximum Allowable Cord Length in ft (m) for Conductor Size (AWG)*					
		4	6	8	10	12	14
5	600			350 (106)	225 (68)	137 (42)	100 (30)
7	840		400 (122)	250 (76)	150 (46)	100 (30)	62 (19)
10	1200	400 (122)	275 (84)	175 (53)	112 (34)	62 (19)	50 (15)
15	1800	300 (91)	175 (53)	112 (34)	75 (23)	37 (11)	30 (9)
20	2400	225 (68)	137 (42)	87 (26)	50 (15)	30 (9)	
25	3000	175 (53)	112 (34)	62 (19)	37 (11)		
30	3600	150 (46)	87 (26)	50 (15)	37 (11)		
35	4200	125 (38)	75 (23)	50 (15)			
40	4800	112 (34)	62 (19)	37 (11)			
45	5400	100 (30)	62 (19)				
50	6000	87 (26)	50 (15)				

*Conductor size is based on maximum 2% voltage drop

Cord Lengths for 240 Volt Loads

⚠ If unit does not have GFCI receptacles, use GFCI-protected extension cord.

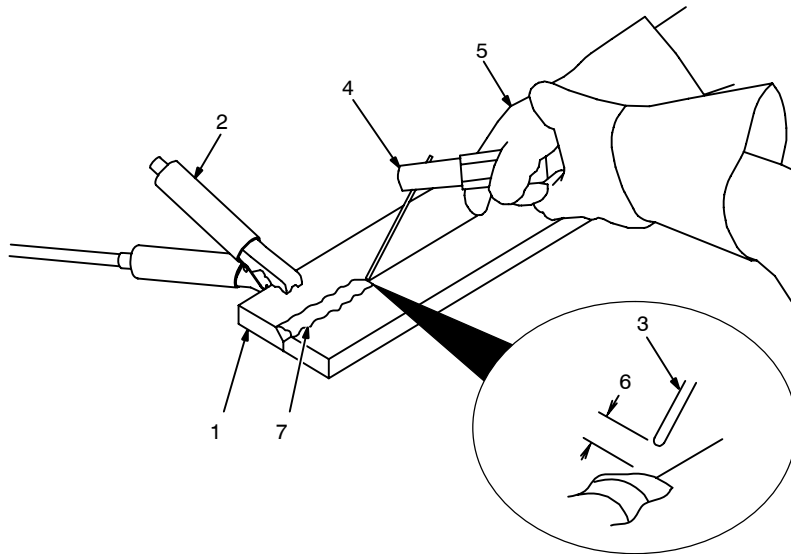
Current (Amperes)	Load (Watts)	Maximum Allowable Cord Length in ft (m) for Conductor Size (AWG)*					
		4	6	8	10	12	14
5	1200			700 (213)	450 (137)	225 (68)	200 (61)
7	1680		800 (244)	500 (152)	300 (91)	200 (61)	125 (38)
10	2400	800 (244)	550 (168)	350 (107)	225 (69)	125 (38)	100 (31)
15	3600	600 (183)	350 (107)	225 (69)	150 (46)	75 (23)	60 (18)
20	4800	450 (137)	275 (84)	175 (53)	100 (31)	60 (18)	
25	6000	350 (107)	225 (69)	125 (38)	75 (23)		
30	7000	300 (91)	175 (53)	100 (31)	75 (23)		
35	8400	250 (76)	150 (46)	100 (31)			
40	9600	225 (69)	125 (38)	75 (23)			
45	10,800	200 (61)	125 (38)				
50	12,000	175 (53)	100 (31)				

*Conductor size is based on maximum 2% voltage drop

SECTION 14 – STICK WELDING (SMAW) GUIDELINES



14-1. Stick Welding Procedure



⚠ Weld current starts when electrode touches workpiece.

⚠ Weld current can damage electronic parts in vehicles. Disconnect both battery cables before welding on a vehicle. Place work clamp as close to the weld as possible.

1 Workpiece

Make sure workpiece is clean before welding.

2 Work Clamp

3 Electrode

A small diameter electrode requires less current than a large one. Follow electrode manufacturer's instructions when setting weld amperage (see Section 14-2).

4 Insulated Electrode Holder

5 Electrode Holder Position

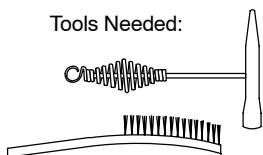
6 Arc Length

Arc length is the distance from the electrode to the workpiece. A short arc with correct amperage will give a sharp, crackling sound.

7 Slag

Use a chipping hammer and wire brush to remove slag. Remove slag and check weld bead before making another weld pass.

Tools Needed:



stick 2007-04 – ST-151 593

14-2. Electrode and Amperage Selection Chart

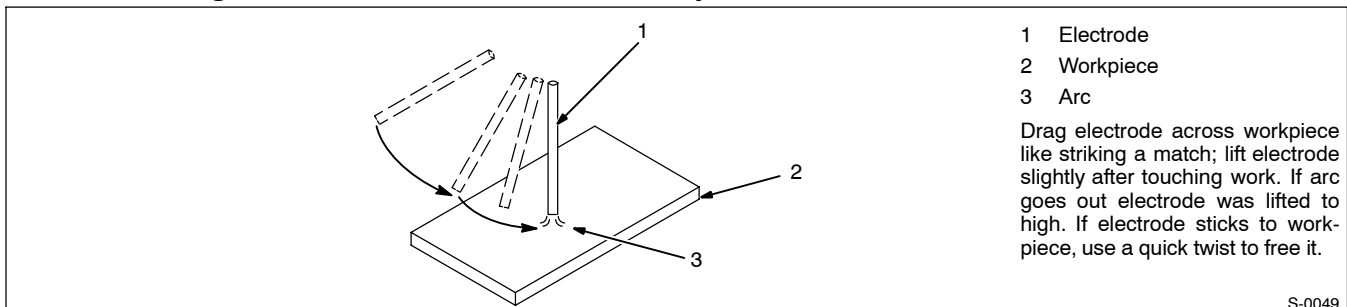
ELECTRODE	DIAMETER	AMPERAGE RANGE								
		50	100	150	200	250	300	350	400	450
6010 & 6011	3/32									
	1/8									
	5/32									
	3/16									
	7/32									
6013	1/4									
	1/16									
	5/64									
	3/32									
	1/8									
	5/32									
	3/16									
7014	7/32									
	1/4									
	3/32									
	1/8									
	5/32									
7018	3/16									
	7/32									
	1/4									
	3/32									
	1/8									
7024	5/32									
	3/16									
	7/32									
	1/4									
	3/32									
Ni-CI	1/8									
	5/32									
	3/16									
308L	3/32									
	1/8									
	5/32									

ELECTRODE	DC*	AC	POSITION	PENETRATION	USAGE
6010	EP		ALL	DEEP	MIN. PREP, ROUGH
6011	EP	✓	ALL	DEEP	HIGH SPATTER
6013	EP,EN	✓	ALL	LOW	GENERAL
7014	EP,EN	✓	ALL	MED	SMOOTH, EASY, FAST
7018	EP	✓	ALL	LOW	LOW HYDROGEN, STRONG
7024	EP,EN	✓	FLAT HORIZ FILLET	LOW	SMOOTH, EASY, FASTER
NI-CL	EP	✓	ALL	LOW	CAST IRON
308L	EP	✓	ALL	LOW	STAINLESS

*EP = ELECTRODE POSITIVE (REVERSE POLARITY)
EN = ELECTRODE NEGATIVE (STRAIGHT POLARITY)

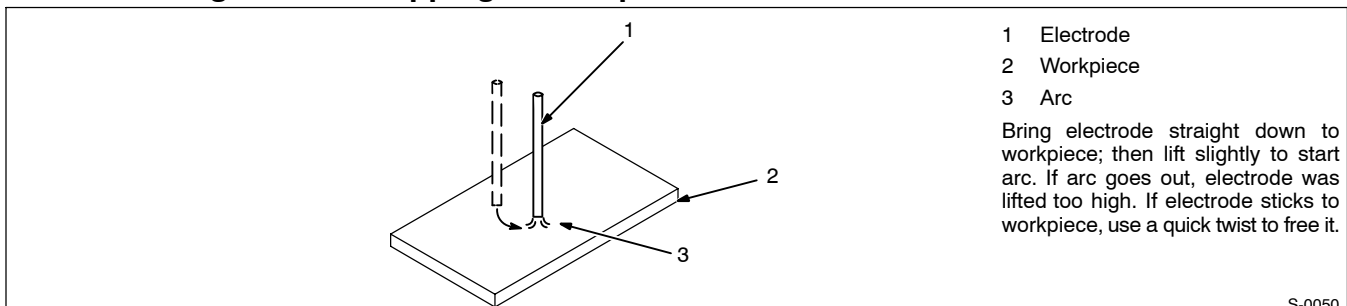
Ref. S-087 985-A

14-3. Striking an Arc – Scratch Start Technique



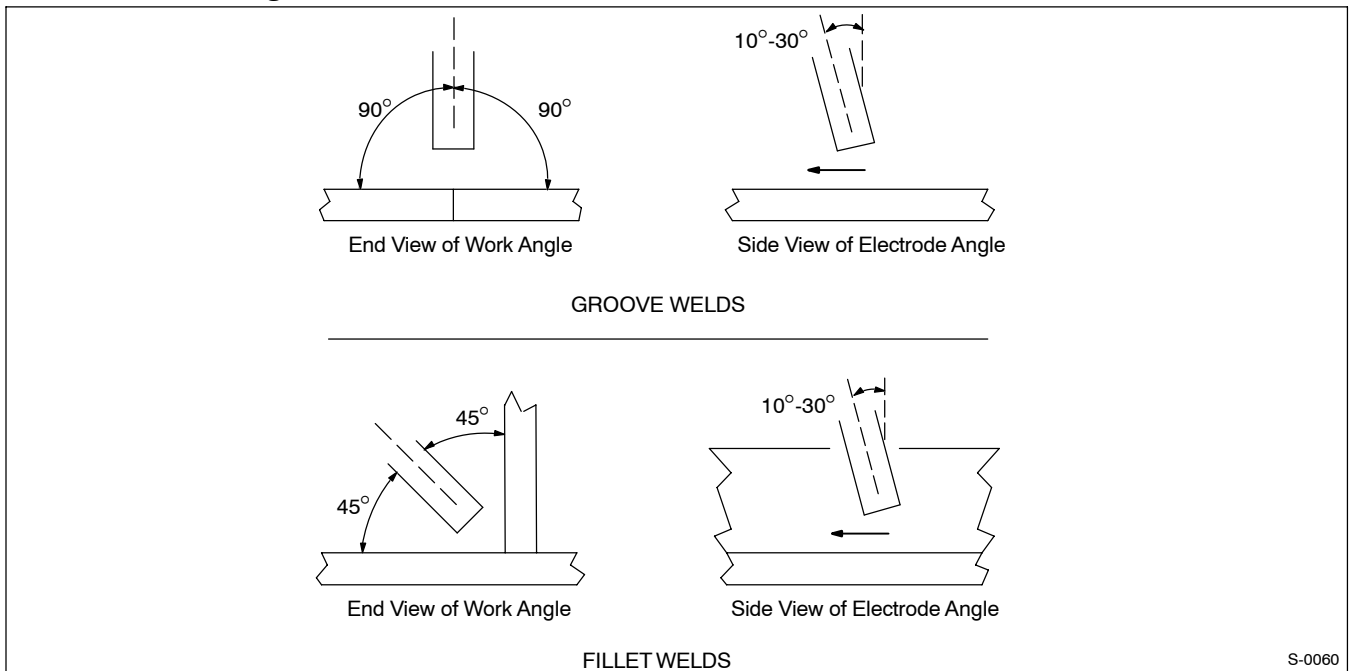
S-0049

14-4. Striking an Arc – Tapping Technique



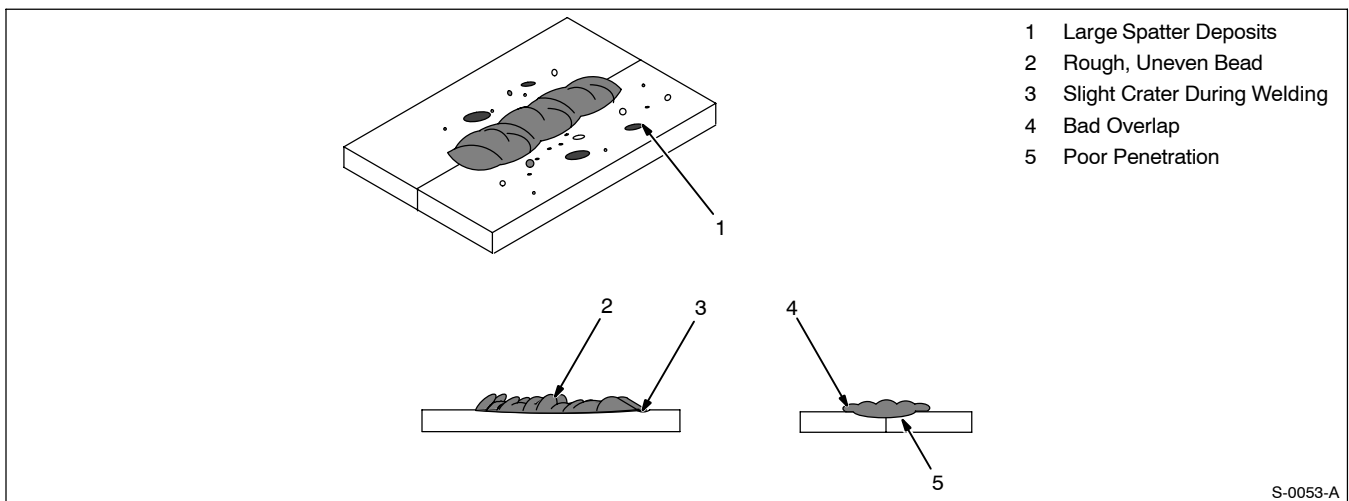
S-0050

14-5. Positioning Electrode Holder



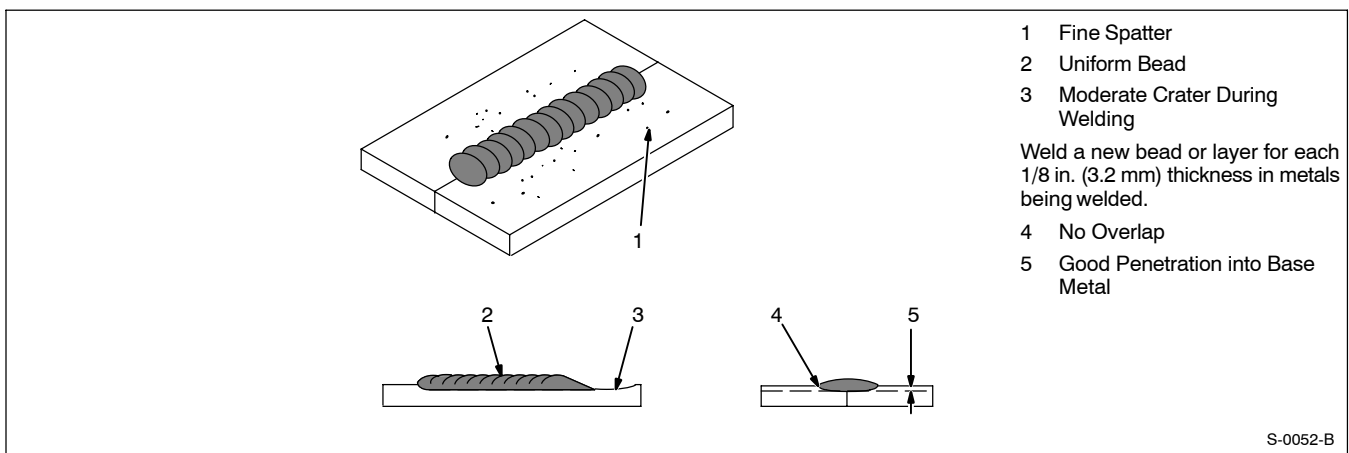
S-0060

14-6. Poor Weld Bead Characteristics



S-0053-A

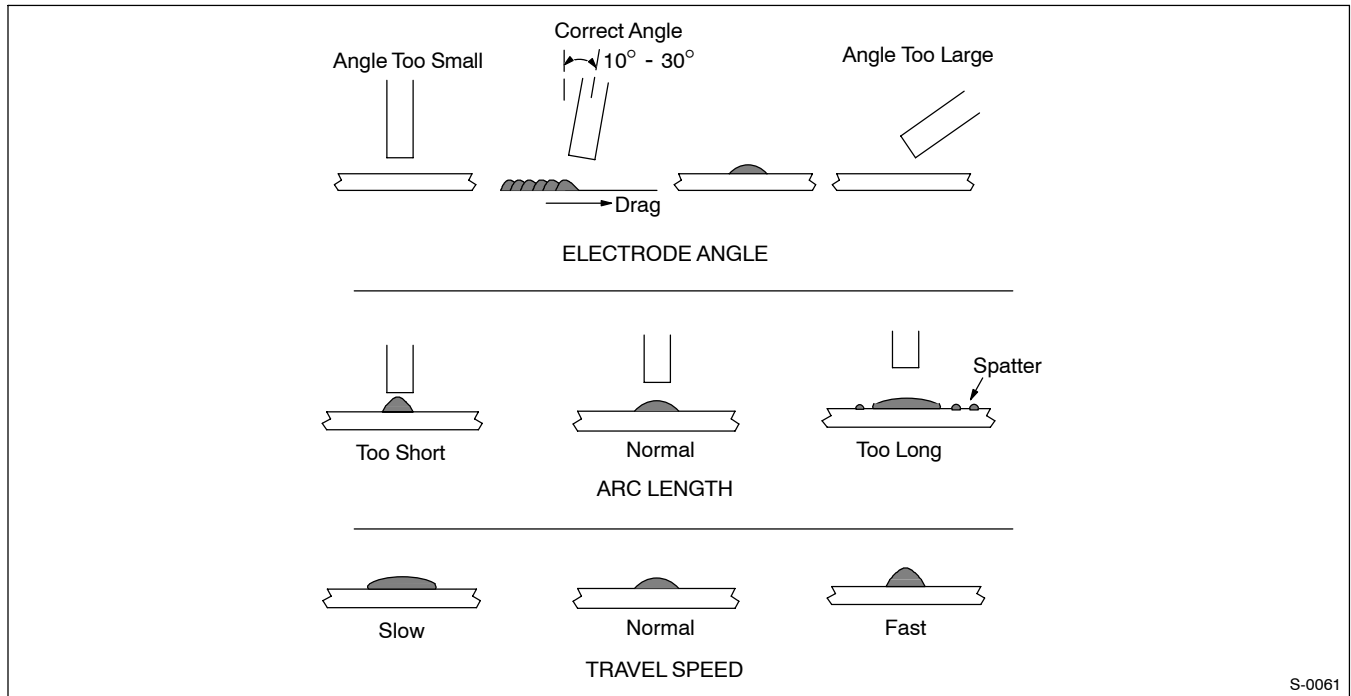
14-7. Good Weld Bead Characteristics



S-0052-B

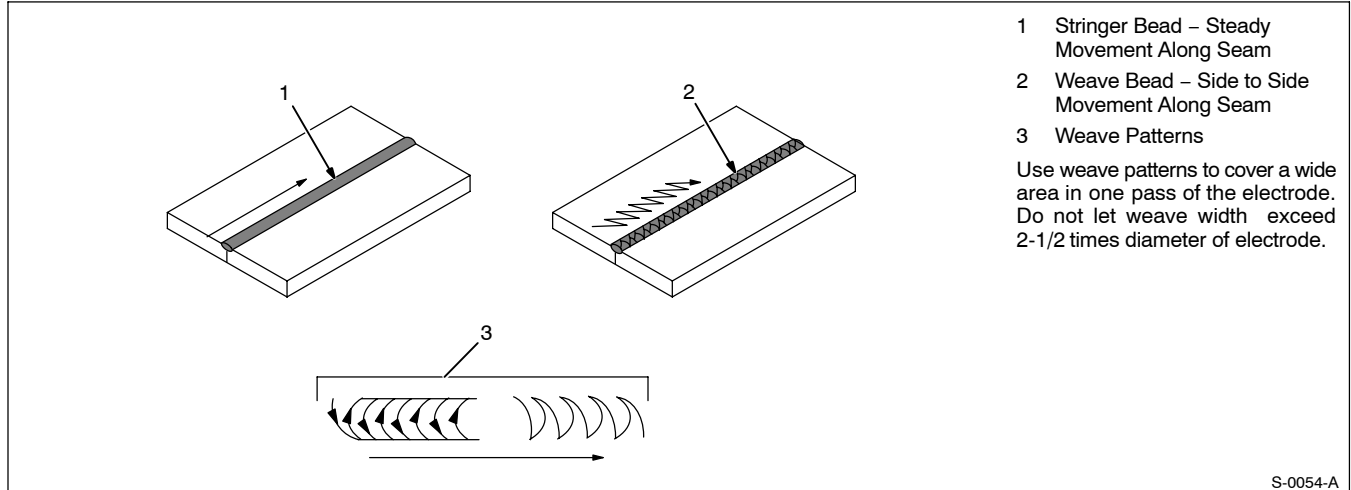
14-8. Conditions That Affect Weld Bead Shape

☞ Weld bead shape is affected by electrode angle, arc length, travel speed, and thickness of base metal.

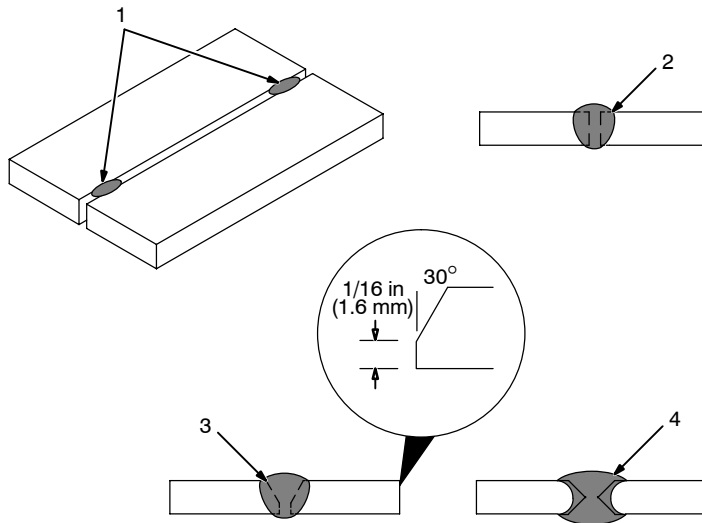


14-9. Electrode Movement During Welding

☞ Normally, a single stringer bead is satisfactory for most narrow groove weld joints; however, for wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads work better.



14-10. Butt Joints



1 Tack Welds

Prevent edges of joint from drawing together ahead of electrode by tack welding the materials in position before final weld.

2 Square Groove Weld

Good for materials up to 3/16 in (5 mm) thick.

3 Single V-Groove Weld

Good for materials 3/16 – 3/4 in (5-19 mm) thick. Cut bevel with oxy-acetylene or plasma cutting equipment. Remove scale from material after cutting. A grinder can also be used to prepare bevels.

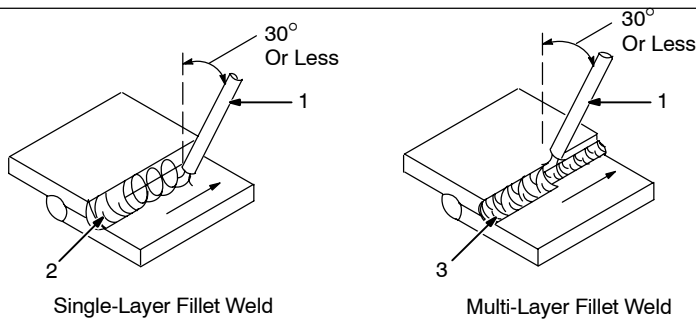
Create 30 degree angle of bevel on materials in V-groove welding.

4 Double V-Groove Weld

Good for materials thicker than 3/16 in (5 mm).

S-0662

14-11. Lap Joint



Single-Layer Fillet Weld

Multi-Layer Fillet Weld

1 Electrode

2 Single-Layer Fillet Weld

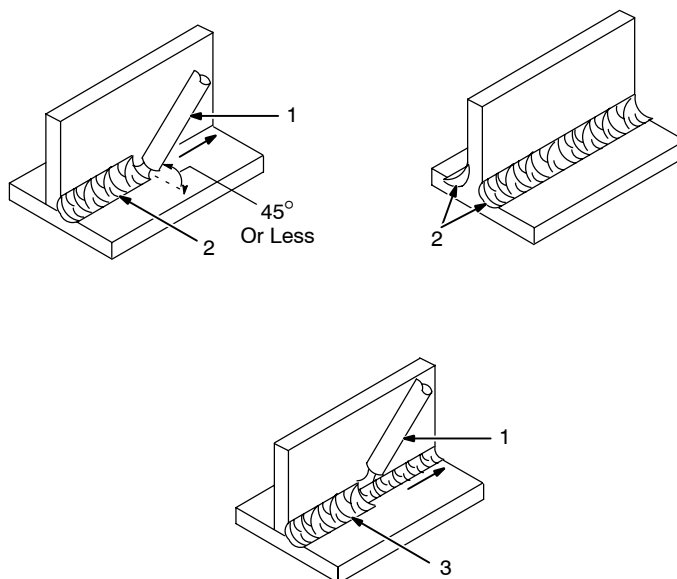
Move electrode in circular motion.

3 Multi-Layer Fillet Weld

Weld a second layer when a heavier fillet is needed. Remove slag before making another weld pass. Weld both sides of joint for maximum strength.

S-0063 / S-0064

14-12. Tee Joint



1 Electrode

2 Fillet Weld

Keep arc short and move at definite rate of speed. Hold electrode as shown to provide fusion into the corner. Square edge of the weld surface.

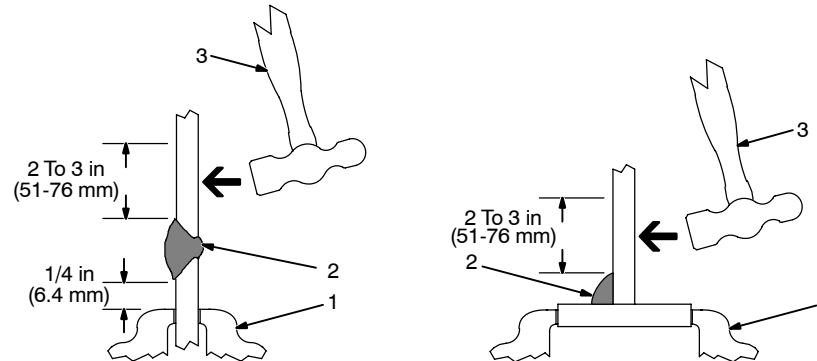
For maximum strength weld both sides of upright section.

3 Multi-Layer Deposits

Weld a second layer when a heavier fillet is needed. Use any of the weaving patterns shown in Section 14-9. Remove slag before making another weld pass.

S-0060 / S-0058-A / S-0061

14-13. Weld Test

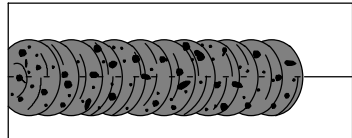


1 Vise
2 Weld Joint
3 Hammer

Strike weld joint in direction shown.
A good weld bends over but does not break.

S-0057-B

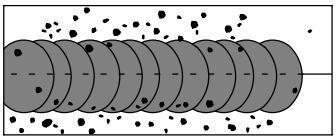
14-14. Troubleshooting – Porosity



Porosity – small cavities or holes resulting from gas pockets in weld metal.

Possible Causes	Corrective Actions
Arc length too long.	Reduce arc length.
Damp electrode.	Use dry electrode.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.

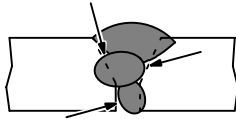
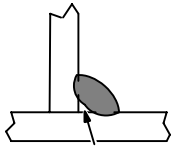
14-15. Troubleshooting – Excessive Spatter



Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.

Possible Causes	Corrective Actions
Amperage too high for electrode.	Decrease amperage or select larger electrode.
Arc length too long or voltage too high.	Reduce arc length or voltage.

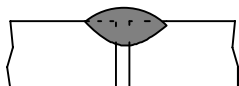
14-16. Troubleshooting – Incomplete Fusion



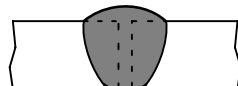
Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceding weld bead.

Possible Causes	Corrective Actions
Insufficient heat input.	Increase amperage. Select larger electrode and increase amperage.
Improper welding technique.	Place stringer bead in proper location(s) at joint during welding.
	Adjust work angle or widen groove to access bottom during welding.
	Momentarily hold arc on groove side walls when using weaving technique.
	Keep arc on leading edge of weld puddle.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.

14-17. Troubleshooting – Lack Of Penetration



Lack of Penetration

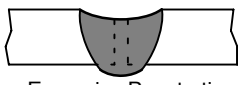


Good Penetration

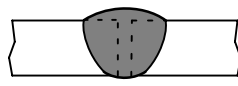
Lack Of Penetration – shallow fusion between weld metal and base metal.

Possible Causes	Corrective Actions
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove.
Improper weld technique.	Keep arc on leading edge of weld puddle.
Insufficient heat input.	Increase amperage. Select larger electrode and increase amperage.
	Reduce travel speed.

14-18. Troubleshooting – Excessive Penetration



Excessive Penetration

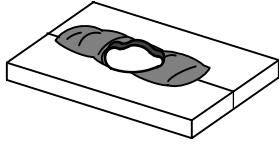


Good Penetration

Excessive Penetration – weld metal melting through base metal and hanging underneath weld.

Possible Causes	Corrective Actions
Excessive heat input.	Select lower amperage. Use smaller electrode.
	Increase and/or maintain steady travel speed.

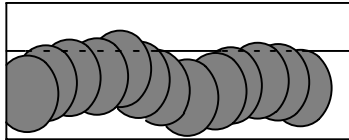
14-19. Troubleshooting – Burn-Through



Burn-Through – weld metal melting completely through base metal resulting in holes where no metal remains.

Possible Causes	Corrective Actions
Excessive heat input.	Select lower amperage. Use smaller electrode.
	Increase and/or maintain steady travel speed.

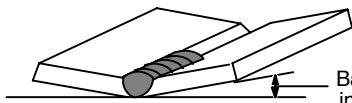
14-20. Troubleshooting – Waviness Of Bead



Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.

Possible Causes	Corrective Actions
Unsteady hand.	Use two hands. Practice technique.

14-21. Troubleshooting – Distortion



Base metal moves in the direction of the weld bead.

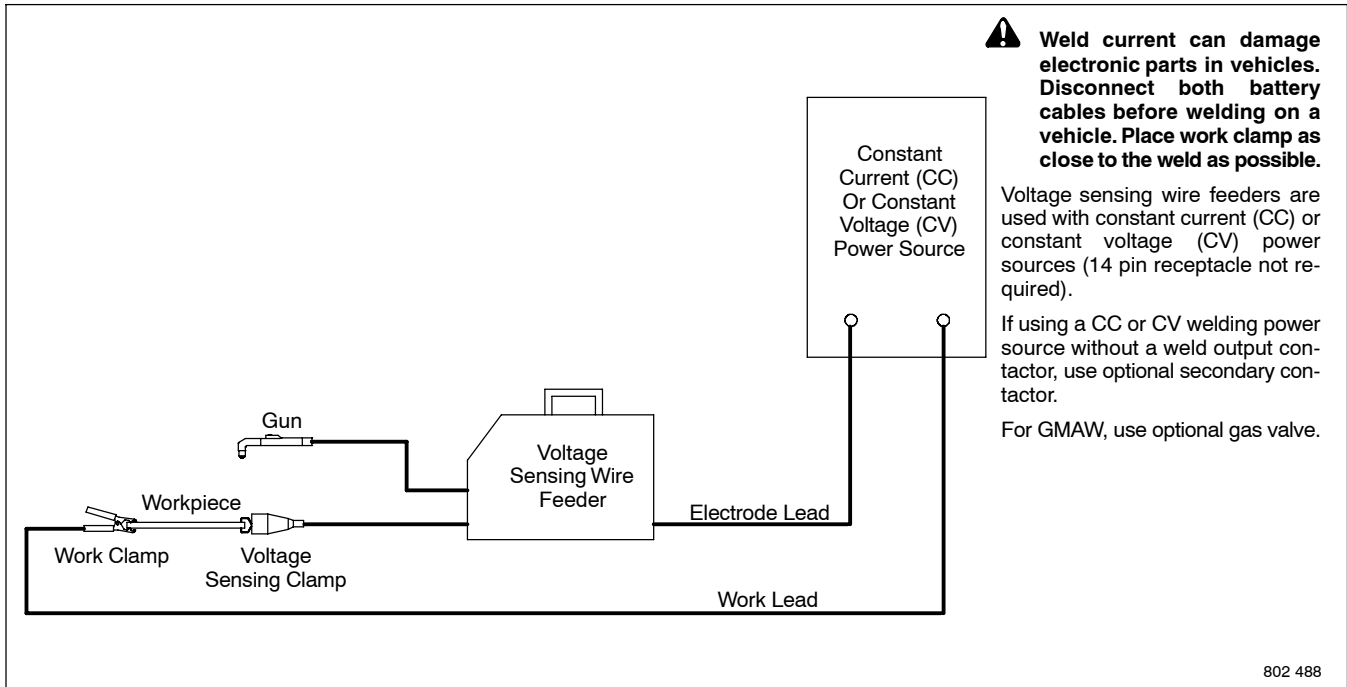
Distortion – contraction of weld metal during welding that forces base metal to move.

Possible Causes	Corrective Actions
Excessive heat input.	Use restraint (clamp) to hold base metal in position.
	Make tack welds along joint before starting welding operation.
	Select lower amperage for electrode.
	Increase travel speed.
	Weld in small segments and allow cooling between welds.

SECTION 15 – MIG WELDING (GMAW) GUIDELINES

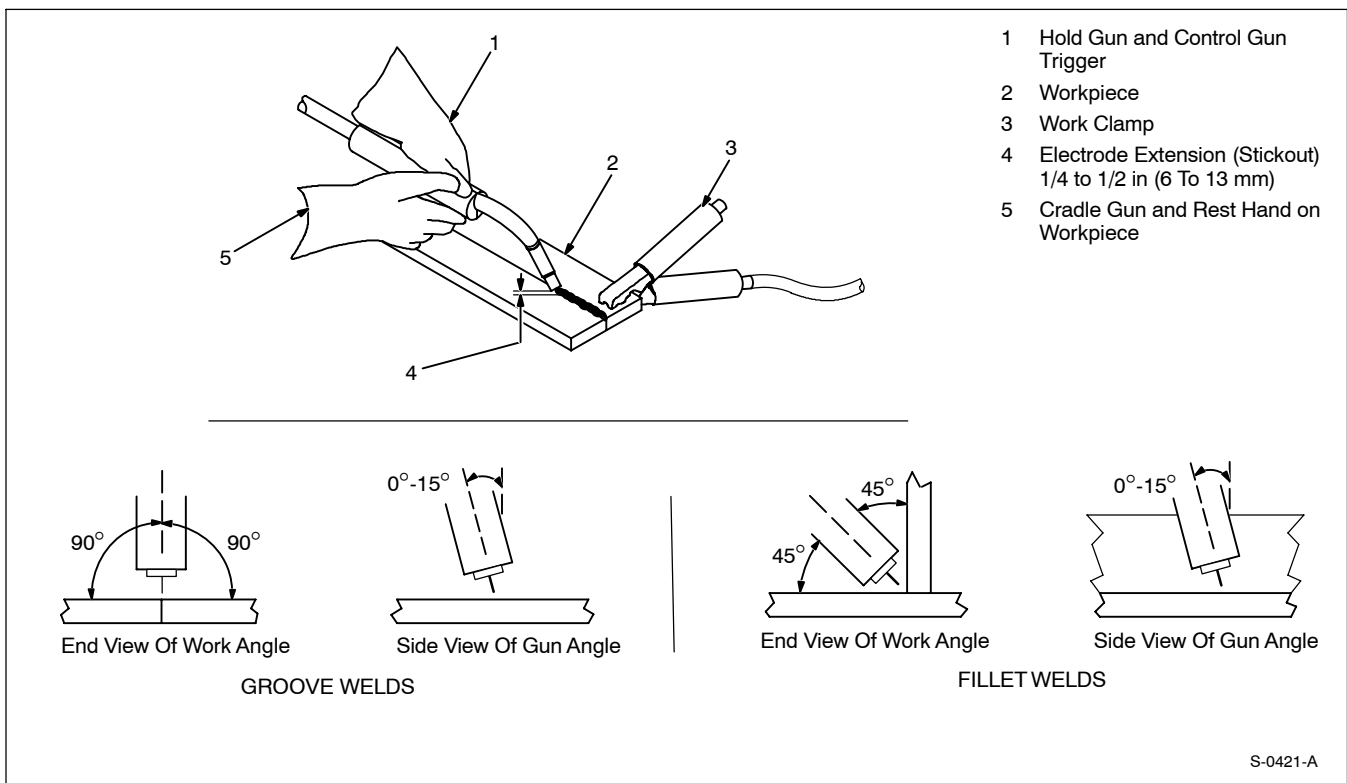


15-1. Typical MIG Process Connections Using A Voltage-Sensing Wire Feeder



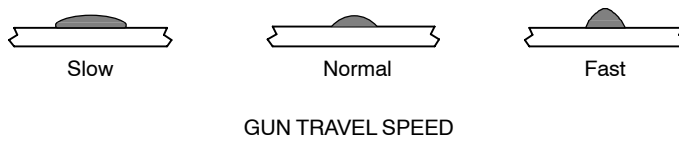
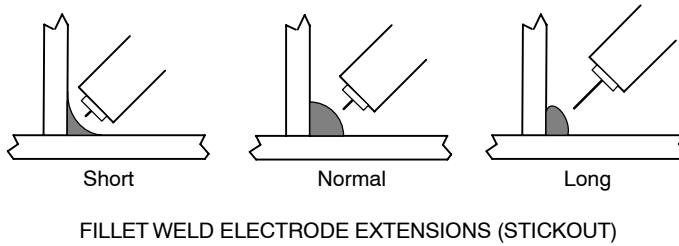
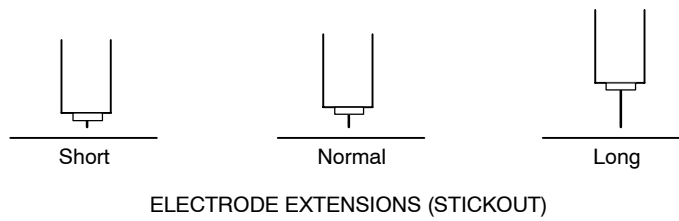
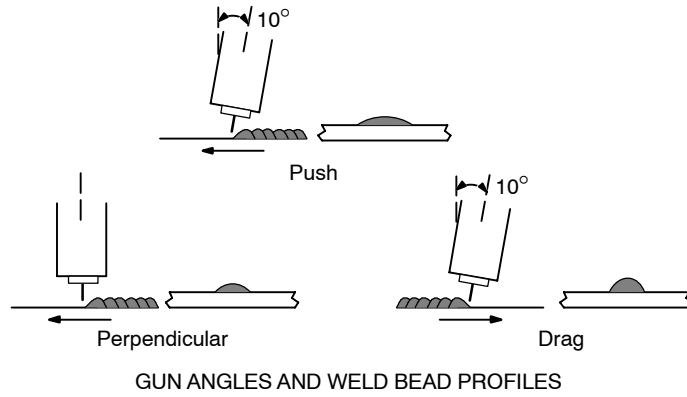
15-2. Holding And Positioning Welding Gun

☞ Welding wire is energized when gun trigger is pressed. Before lowering helmet and pressing trigger, be sure wire is no more than 1/2 in (13 mm) past end of nozzle, and tip of wire is positioned correctly on seam.



15-3. Conditions That Affect Weld Bead Shape

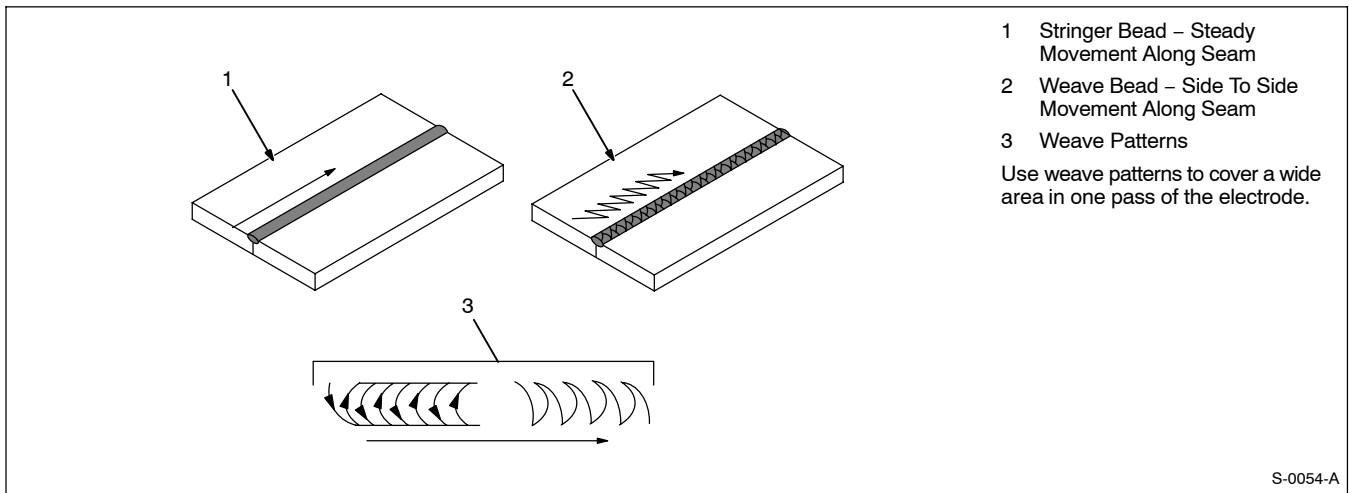
☞ Weld bead shape depends on gun angle, direction of travel, electrode extension (stickout), travel speed, thickness of base metal, wire feed speed (weld current), and voltage.



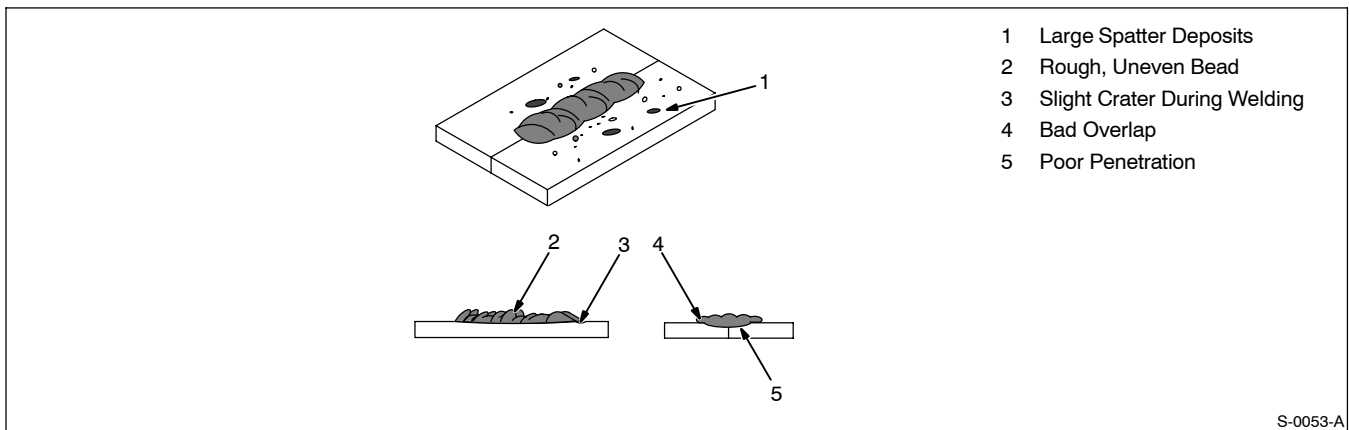
S-0634

15-4. Gun Movement During Welding

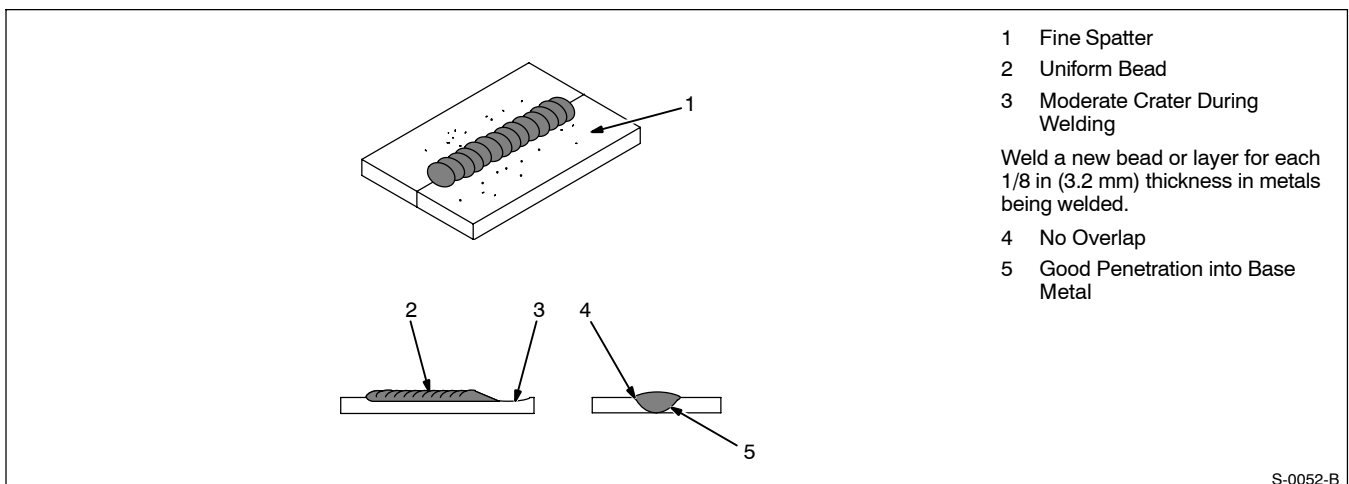
☞ Normally, a single stringer bead is satisfactory for most narrow groove weld joints; however, for wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads works better.



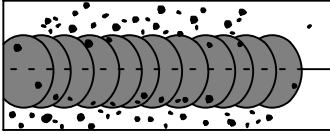
15-5. Poor Weld Bead Characteristics



15-6. Good Weld Bead Characteristics



15-7. Troubleshooting – Excessive Spatter

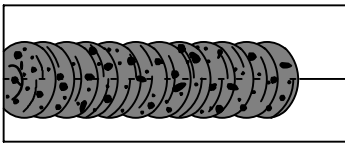


Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.

S-0636

Possible Causes	Corrective Actions
Wire feed speed too high.	Select lower wire feed speed.
Voltage too high.	Select lower voltage range.
Electrode extension (stickout) too long.	Use shorter electrode extension (stickout).
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
Insufficient shielding gas at welding arc.	Increase flow of shielding gas at regulator/flowmeter and/or prevent drafts near welding arc.
Dirty welding wire.	Use clean, dry welding wire.
	Eliminate pickup of oil or lubricant on welding wire from feeder or liner.

15-8. Troubleshooting – Porosity

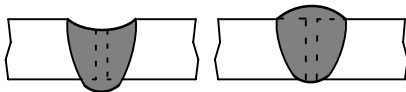


Porosity – small cavities or holes resulting from gas pockets in weld metal.

S-0635

Possible Causes	Corrective Actions
Insufficient shielding gas at welding arc.	Increase flow of shielding gas at regulator/flowmeter and/or prevent drafts near welding arc.
	Remove spatter from gun nozzle.
	Check gas hoses for leaks.
	Place nozzle 1/4 to 1/2 in (6-13 mm) from workpiece.
	Hold gun near bead at end of weld until molten metal solidifies.
Wrong gas.	Use welding grade shielding gas; change to different gas.
Dirty welding wire.	Use clean, dry welding wire.
	Eliminate pick up of oil or lubricant on welding wire from feeder or liner.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, and dirt from work surface before welding.
	Use a more highly deoxidizing welding wire (contact supplier).
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.

15-9. Troubleshooting – Excessive Penetration



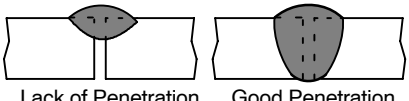
Excessive Penetration Good Penetration

Excessive Penetration – weld metal melting through base metal and hanging underneath weld.

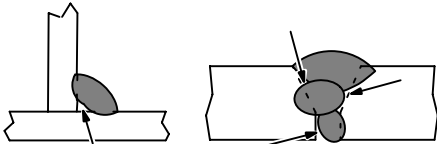
S-0639

Possible Causes	Corrective Actions
Excessive heat input.	Select lower voltage range and reduce wire feed speed.
	Increase travel speed.

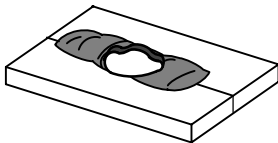
15-10. Troubleshooting – Lack Of Penetration

 <p>Lack of Penetration Good Penetration</p>		<p>Lack Of Penetration – shallow fusion between weld metal and base metal.</p>	S-0638
Possible Causes	Corrective Actions		
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove while maintaining proper welding wire extension and arc characteristics.		
Improper weld technique.	Maintain normal gun angle of 0 to 15 degrees to achieve maximum penetration.		
	Keep arc on leading edge of weld puddle.		
	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.		
Insufficient heat input.	Select higher wire feed speed and/or select higher voltage range.		
	Reduce travel speed.		

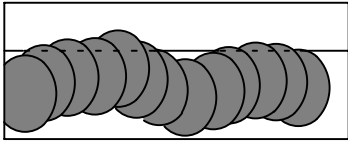
15-11. Troubleshooting – Incomplete Fusion

		<p>Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceding weld bead.</p>	S-0637
Possible Causes	Corrective Actions		
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.		
Insufficient heat input.	Select higher voltage range and/or adjust wire feed speed.		
Improper welding technique.	Place stringer bead in proper location(s) at joint during welding.		
	Adjust work angle or widen groove to access bottom during welding.		
	Momentarily hold arc on groove side walls when using weaving technique.		
	Keep arc on leading edge of weld puddle.		
	Use correct gun angle of 0 to 15 degrees.		

15-12. Troubleshooting – Burn-Through

		<p>Burn-Through – weld metal melting completely through base metal resulting in holes where no metal remains.</p>	S-0640
Possible Causes	Corrective Actions		
Excessive heat input.	Select lower voltage range and reduce wire feed speed.		
	Increase and/or maintain steady travel speed.		

15-13. Troubleshooting – Waviness Of Bead

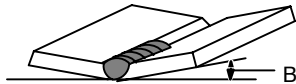


Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.

S-0641

Possible Causes	Corrective Actions
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.
Unsteady hand.	Support hand on solid surface or use two hands.

15-14. Troubleshooting – Distortion



Base metal moves in the direction of the weld bead.

Distortion – contraction of weld metal during welding that forces base metal to move.

S-0642

Possible Causes	Corrective Actions
Excessive heat input.	Use restraint (clamp) to hold base metal in position.
	Make tack welds along joint before starting welding operation.
	Select lower voltage range and/or reduce wire feed speed.
	Increase travel speed.
	Weld in small segments and allow cooling between welds.

15-15. Common MIG Shielding Gases

This is a general chart for common gases and where they are used. Many different combinations (mixtures) of shielding gases have been developed over the years. The most commonly used shielding gases are listed in the following table.

Gas	Application					
	Spray Arc Steel	Short Circuiting Steel	Spray Arc Stainless Steel	Short Circuiting Stainless Steel	Spray Arc Aluminum	Short Circuiting Aluminum
Argon					All Positions ⁵	All Positions
Argon + 1% O₂	Flat & Horizontal ⁵ Fillet		Flat & Horizontal ⁵ Fillet			
Argon + 2% O₂	Flat & Horizontal ⁵ Fillet		Flat & Horizontal ⁵ Fillet			
Argon + 5% O₂	Flat & Horizontal ⁵ Fillet					
Argon + 8% CO₂	Flat & Horizontal ⁵ Fillet	All Positions				
Argon + 25% CO₂	Flat & Horizontal ¹ Fillet	All Positions		All Positions ³		
Argon + 50% CO₂		All Positions				
CO₂	Flat & Horizontal ¹ Fillet	All Positions				
Helium					All Positions ²	
Argon + Helium					All Positions ²	
Tri-Mix⁴				All Positions		

- 1 Globular Transfer
- 2 Heavy Thicknesses
- 3 Single Pass Welding Only
- 4 90% HE + 7-1/2% AR + 2-1/2% CO₂
- 5 Also for GMAW-P, All Positions

TRUE BLUE[®]

WARRANTY

Effective January 1, 2007

(Equipment with a serial number preface of "LH" or newer)

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

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Contact your distributor.
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step of the way.

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Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed.

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the delivery date of the equipment to the original end-user purchaser, and not to exceed one year after the equipment is shipped to a North American distributor or eighteen months after the equipment is shipped to an International distributor.

1. 5 Years Parts — 3 Years Labor
 - * Original main power rectifiers
2. 3 Years — Parts and Labor
 - * Transformer/Rectifier Power Sources
 - * Plasma Arc Cutting Power Sources
 - * Process Controllers
 - * Semi-Automatic and Automatic Wire Feeders
 - * Inverter Power Sources (Unless Otherwise Stated)
 - * Water Coolant Systems (Integrated)
 - * Intellitig
 - * Engine Driven Welding Generators
(NOTE: Engines are warranted separately by the engine manufacturer.)
3. 1 Year — Parts and Labor Unless Specified
 - * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
 - * Positioners and Controllers
 - * Automatic Motion Devices
 - * RFCS Foot Controls
 - * Induction Heating Power Sources, Coolers, and Electronic Controls/Recorders
 - * Water Coolant Systems (Non-Integrated)
 - * Flowgauge and Flowmeter Regulators (No Labor)
 - * HF Units
 - * Grids
 - * Spot Welders
 - * Load Banks
 - * Arc Stud Power Sources & Arc Stud Guns
 - * Racks
 - * Running Gear/Trailers
 - * Plasma Cutting Torches (except APT & SAF Models)
 - * Field Options
(NOTE: Field options are covered under True Blue[®] for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
 - * Bernard-Branded Mig Guns (No Labor)
 - * Weldcraft-Branded TIG Torches (No Labor)
 - * Subarc Wire Drive Assemblies
4. 6 Months — Batteries
5. 90 Days — Parts
 - * MIG Guns/TIG Torches and Subarc (SAW) Guns

- * Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
- * APT & SAF Model Plasma Cutting Torches
- * Remote Controls
- * Accessory (Kits)
- * Replacement Parts (No labor)
- * Spoolmate Spoolguns
- * Canvas Covers

Miller's True Blue[®] Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear. (Exception: brushes, slip rings, and relays are covered on Bobcat, Trailblazer, and Legend models.)**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller's option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. Miller's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a Miller authorized service facility as determined by Miller. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

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miller_warr 2007-01





Owner's Record

Please complete and retain with your personal records.

Model Name

Serial/Style Number

Purchase Date

(Date which equipment was delivered to original customer.)

Distributor

Address

City

State

Zip



For Service

Contact a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

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Welding Supplies and Consumables

Options and Accessories

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Circuit Diagrams

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