



OM-405

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October 1997

Processes



Stick (SMAW) Welding



MIG (GMAW) Welding
Flux Cored (FCAW) Welding



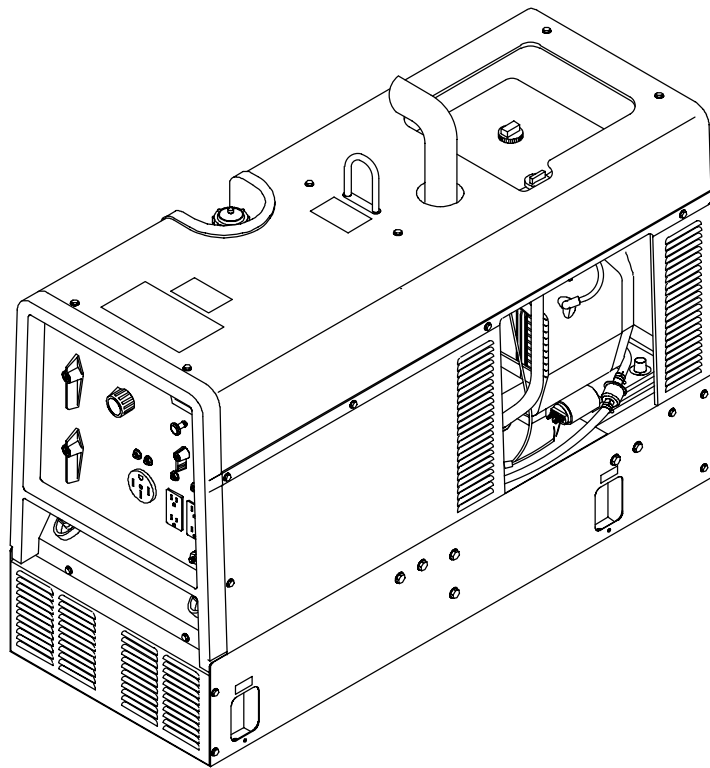
Non-Critical TIG (GTAW)
Welding

Description



Engine Driven Welding Generator

Bobcat™ 225 NT



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www.MillerWelds.com

OWNER'S MANUAL

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



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

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 which exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.

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 catalog sheets. To locate your nearest distributor call 1-800-4-A-Miller.



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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WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The following terms are used interchangeably throughout this manual:
TIG = GTAW
Stick = SMAW
MIG = GMAW

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SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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1-1. Symbol Usage



Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ Marks a special safety message.

☞ Means "Note"; not safety related.



This group of symbols means Warning! Watch Out! possible 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 1-5. Read and follow all Safety Standards.

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

▲ During operation, keep everybody, especially children, away.



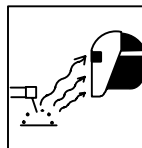
ELECTRIC SHOCK can kill.

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.
- 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.
- 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 use work clamp or work cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.

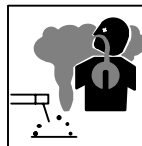
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near 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.



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 a welding helmet fitted with a proper shade of filter 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 and glare; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.



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 exhaust at the arc to remove welding fumes and gases.
- If ventilation is poor, use an approved air-supplied respirator.
- Read 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 watchperson 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 if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

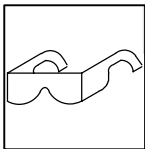


WELDING can cause fire or explosion.

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.

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- 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).
- 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 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.



FLYING METAL 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.



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.

1-3. Engine Hazards



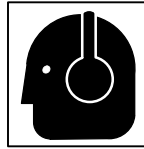
FUEL can cause fire or explosion.

- 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.



HOT PARTS can cause severe burns.

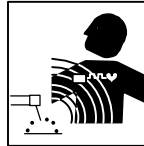
- Allow cooling period before maintaining.
- Wear protective gloves and clothing when working on a hot engine.
- Do not touch hot engine parts or just-welded parts bare-handed.



NOISE can damage hearing.

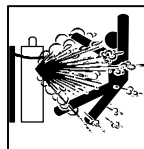
Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



MAGNETIC FIELDS can affect pacemakers.

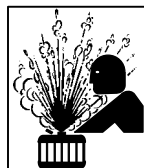
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



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, 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.
- Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.



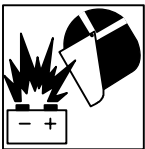
STEAM AND HOT COOLANT can burn.

- If possible, check coolant level when engine is cold to avoid scalding.
- If the engine is warm and checking is needed, 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.



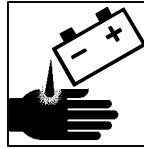
MOVING PARTS can cause injury.

- 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 guards or covers 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 panels or guards and close doors 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.



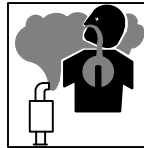
BATTERY EXPLOSION can BLIND.

- 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.



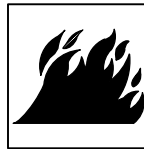
BATTERY ACID can BURN SKIN and EYES.

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



ENGINE EXHAUST GASES can kill.

- Use equipment outside in open, well-ventilated areas.
- If used in a closed area, vent engine exhaust outside and away from any building air intakes.



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.

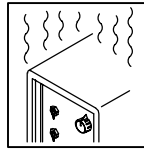
- Do not let engine exhaust sparks cause fire.
- Use approved engine exhaust spark arrestor in required areas – see applicable codes.

1-4. Additional Symbols for Installation, Operation, and Maintenance



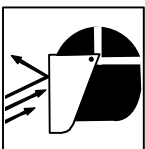
FALLING UNIT can cause injury.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, trailer, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



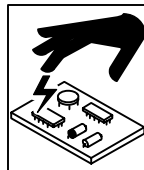
OVERUSE can cause OVERHEATING.

- 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.



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.



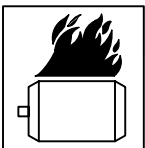
STATIC (ESD) can damage PC boards.

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



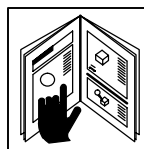
TILTING OF TRAILER can cause injury.

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



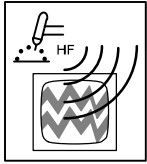
OVERHEATING can damage motors.

- 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.



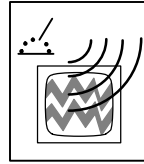
READ INSTRUCTIONS.

- Use only genuine MILLER replacement parts.
- Perform engine maintenance and service according to this manual and the engine manual.



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 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.

1-5. Principal Safety Standards

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices For Occupation And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting And Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1-6. 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.
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 Pacemakers:

Pacemaker wearers consult your doctor first. If cleared by your doctor, then following the above procedures is recommended.

SECTION 1 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

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1-1. Signification des symboles



Signifie Mise en garde ! Soyez vigilant ! Cette procédure présente des risques de danger ! Ceux-ci sont identifiés par des symboles adjacents aux directives.

▲ Identifie un message de sécurité particulier.

Signifie NOTA ; n'est pas relatif à la sécurité.



Ce groupe de symboles signifie Mise en garde ! Soyez vigilant ! Il y a des risques de danger reliés aux CHOCS ÉLECTRIQUES, aux PIÈCES EN MOUVEMENT et aux PIÈCES CHAUDES. Reportez-vous aux symboles et aux directives ci-dessous afin de connaître les mesures à prendre pour éviter tout danger.

1-2. 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 1-5. 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.

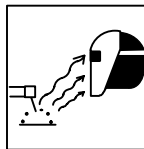


UN CHOC ÉLECTRIQUE peut tuer.

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.
- 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.
- 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 épaissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, la faire directement avec un câble distinct – ne pas utiliser le connecteur de pièce ou le câble de retour.

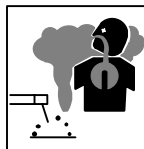
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Porter un harnais de sécurité 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.



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 intenses (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 muni d'un écran de filtre approprié pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des protections approuvés pour les oreilles si le niveau sonore est trop élevé.
- Utiliser des écrans ou des barrières pour protéger des tiers de l'éclair et de l'éblouissement; demander aux autres personnes de ne pas regarder l'arc.
- Porter des vêtements de protection constitué dans une matière durable, résistant au feu (laine ou cuir) et une protection des pieds.



LES FUMÉES ET LES GAZ peuvent être dangereux.

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

- Eloigner votre tête des fumées. Ne pas respirer les fumées.
- À l'intérieur, ventiler la zone et/ou utiliser un échappement au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage.
- Si la ventilation est insuffisante, utiliser un respirateur à alimentation d'air homologué.
- Lire les spécifications de sécurité des matériaux (MSDSs) 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 si nécessaire, en portant un respirateur à alimentation d'air. Les revêtements et

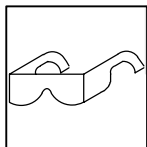
tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques en cas de soudage.



LE SOUDAGE peut provoquer un incendie ou une explosion.

Le soudage effectué sur des conteneurs fermés tels 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.

- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Ne pas souder dans un endroit où des étincelles peuvent tomber sur des substances inflammables.
- 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 homologuées.
- 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).
- Brancher le câble 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 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.



DES PARTICULES VOLANTES peuvent blesser 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.



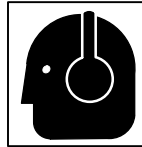
LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

- 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.



DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

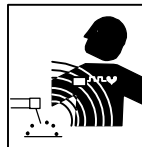
- Prévoir une période de refroidissement avant d'effectuer des travaux d'entretien.
- Porter des gants et des vêtements de protection pour travailler sur un moteur chaud.
- Ne pas toucher à mains nues les parties chaudes du moteur ni les pièces récemment soudées.



LE BRUIT peut affecter l'ouïe.

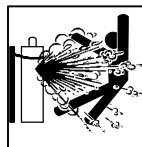
Le bruit des processus et des équipements peut affecter l'ouïe.

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



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

- Porteurs de stimulateur cardiaque, restez à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.



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 font normalement partie du procédé de soudage, les manipuler avec précaution.

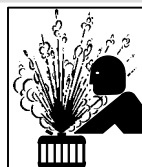
- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- 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.
- Lire et suivre les instructions concernant les bouteilles de gaz comprimé, les équipements associés et les publication P-1 CGA énumérées dans les normes de sécurité.

1-3. Dangers existant en relation avec le moteur



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.



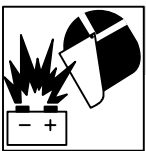
LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT CHAUD peuvent provoquer des brûlures.

- Il est préférable de vérifier le liquide de refroidissement une fois le moteur refroidi pour éviter de se brûler.
- 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.



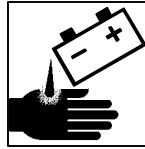
DES ORGANES MOBILES peuvent provoquer des blessures.

- 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.
- Demander seulement à un personnel qualifié d'enlever les dispositifs de sécurité ou les recouvrements pour effectuer, s'il y a lieu, des travaux d'entretien et de dépannage.
- Pour empêcher tout démarrage accidentel pendant les travaux d'entretien, débrancher le câble négatif (-) de batterie de la borne.
- Ne pas approcher les mains, cheveux, vêtements lâches et outils des organes mobiles.
- Remettre en place les panneaux ou les dispositifs de protection et fermer les portes à la fin des travaux d'entretien et avant de faire démarrer le moteur.
- Avant d'intervenir, déposer les bougies ou injecteurs pour éviter la mise en route accidentelle du moteur.
- Bloquer le volant moteur pour éviter sa rotation lors d'une intervention sur le générateur.



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.



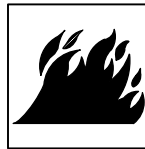
L'ACIDE DE LA BATTERIE peut provoquer des brûlures dans les YEUX et sur la PEAU.

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



LES GAZ D'ÉCHAPPEMENT DU MOTEUR peuvent provoquer des accidents mortels.

- Utiliser l'équipement à l'extérieur dans des zones ouvertes et bien ventilées.
- En cas d'utilisation dans un endroit fermé évacuer les gaz d'échappement du moteur vers l'extérieur à distance des entrées d'air dans les bâtiments.



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.

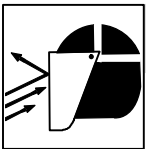
- Empêcher les étincelles d'échappement du moteur de provoquer un incendie.
- Utiliser uniquement un pare-étincelles approuvé – voir codes en vigueur.

1-4. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance



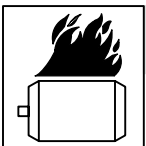
LA CHUTE DE L'APPAREIL peut blesser.

- Utiliser l'anneau de levage uniquement pour soulever l'appareil lui-même ; sans chariot, de bouteilles de gaz, remorque, ou autres accessoires.
- Utiliser un équipement de levage de capacité suffisante pour lever l'appareil.
- 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.



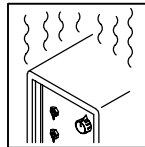
LES ÉTINCELLES VOLANTES risquent de provoquer des blessures.

- Porter un écran facial pour protéger le visage et les yeux.
- Affûter l'électrode au tungstène uniquement à la meuleuse dotée de protecteurs. Cette manoeuvre 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.



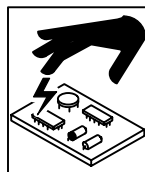
LE SURCHAUFFEMENT peut endommager le moteur électrique.

- 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.



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.



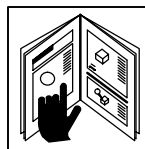
LES ÉLECTROSTATIQUES CHARGES peuvent endommager les circuits imprimés.

- 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.



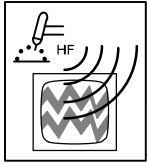
UNE REMORQUE QUI BASCULE peut entraîner des blessures.

- 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.



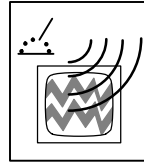
LIRE LES INSTRUCTIONS.

- Utiliser uniquement des pièces de rechange MILLER.
- Effectuer la maintenance et la mise en service d'après le manuel et celui du moteur.



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.

1-5. Principales normes de sécurité

Safety in Welding and Cutting, norme ANSI Z49.1, de l'American Welding Society, 550 N.W. Lejeune Rd, Miami FL 33126

Safety and Health Standards, OSHA 29 CFR 1910, du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practice for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, norme AWS F4.1, de l'American Welding Society, 550 N.W. Lejeune Rd, Miami FL 33126

National Electrical Code, NFPA Standard 70, de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, de la Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Règles de sécurité en soudage, coupage et procédés connexes, norme CSA W117.2, de l'Association canadienne de normalisation, vente de normes, 178 Rexdale Boulevard, Rexdale (Ontario) Canada M9W 1R3.

Safe Practices For Occupation And Educational Eye And Face Protection, norme ANSI Z87.1, de l'American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, norme NFPA 51B, de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1-6. Information sur les champs électromagnétiques

Données sur le soudage électrique et sur les effets, pour l'organisme, des champs magnétiques basse fréquence

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.

Afin de réduire les champs électromagnétiques dans l'environnement de travail, respecter les consignes suivantes :

























- 1 Garder les câbles ensemble en les torsadant ou en les attachant avec du ruban adhésif.
- 2 Mettre tous les câbles du côté opposé 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 Relier la pince de masse le plus près possible de la zone de soudure.

Consignes relatives aux stimulateurs cardiaques :

Les personnes qui portent un stimulateur cardiaque doivent avant tout consulter leur docteur. Si vous êtes déclaré apte par votre docteur, il est alors recommandé de respecter les consignes ci-dessus.

SECTION 2 – DEFINITIONS

2-1. 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 Breaker |  | Temperature | | | | |

SECTION 3 – SPECIFICATIONS

3-1. Weld, Power, and Engine Specifications

Note

This unit uses either an Onan or a Kohler engine. Differences between models are noted throughout this manual.

| Welding Mode | Weld Output Range | Rated Welding Output | Maximum Open Circuit Voltage | Auxiliary Power Rating | Fuel Capacity | Engine |
|--------------|-------------------|---------------------------------|------------------------------|--|--------------------|---|
| CC/AC | 50 – 225 A | 225 A, 25 V, 100% Duty Cycle | 80 | Single-Phase, 8 kVA/kW, 70/35 A, 120/240 V AC, 60 Hz | 10 gal (38 L) Tank | Onan Performer P216 Air-Cooled, Two-Cylinder, Four-Cycle, 16 HP Gasoline Engine or Kohler CH-18 Air-Cooled, Two-Cylinder, Four-Cycle, 18 HP Gasoline Engine |
| CC/DC | 50 – 210 A | 210 A, 25 V, 100% Duty Cycle | 72 | | | |
| CV/DC | 17 – 28 V | 200 A, 20 V, 100% Duty Cycle | 33 | | | |

3-2. Dimensions, Weights, and Operating Angles

| Dimensions | |
|--------------------------------------|-----------------------|
| Height | 33-1/2 in (851 mm) |
| Width | 18-3/4 in (476 mm) |
| Depth | 46 in (1164 mm) |
| A | 18 in (457 mm) |
| B | 16-1/2 in (419 mm) |
| C | 3/4 in (19 mm) |
| D | 3-1/8 in (79 mm) |
| E | 32-3/4 in (832 mm) |
| F | 45-1/2 in (1156 mm) |
| G | 13/32 in (10 mm) Dia. |
| Weight | |
| Onan-Powered Unit: 573 lb (260 kg) | |
| Kohler-Powered Unit: 565 lb (256 kg) | |

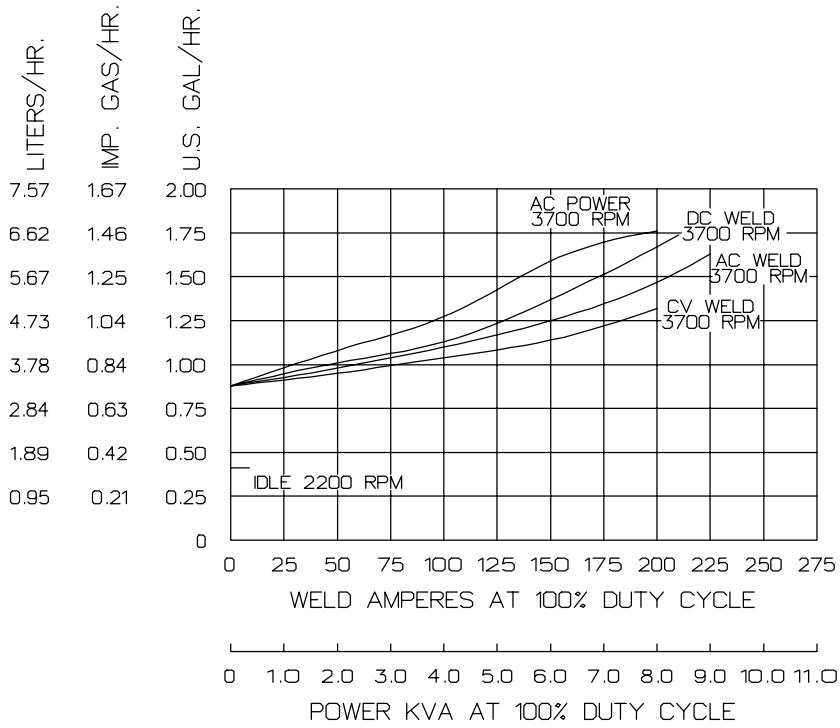
- ▲ Do not exceed operating angles while running or engine damage will occur.
- ▲ Do not move or operate unit where it could tip.

3-3. Auxiliary Power Curve

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

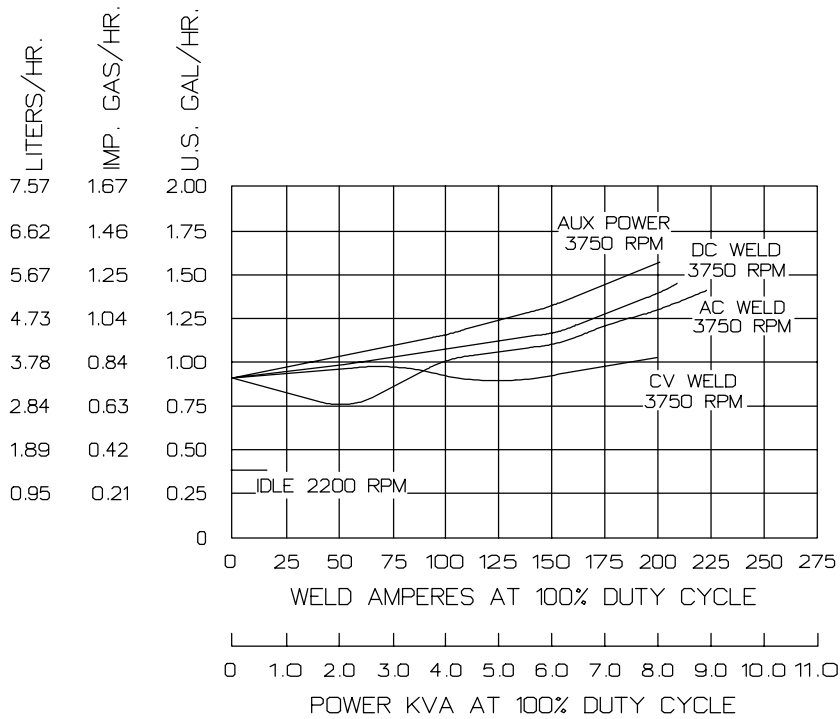
| AC Power Amperes at 120V | AC Power Amperes at 240V | AC Power Volts |
|--------------------------|--------------------------|----------------|
| 0 | 0 | 240 |
| 20 | 10 | 220 |
| 40 | 20 | 205 |
| 60 | 30 | 195 |
| 80 | 40 | 200 |
| 100 | 50 | 150 |
| 120 | 60 | 100 |
| 140 | 70 | 0 |

3-4. Fuel Consumption (Onan-Powered Units)



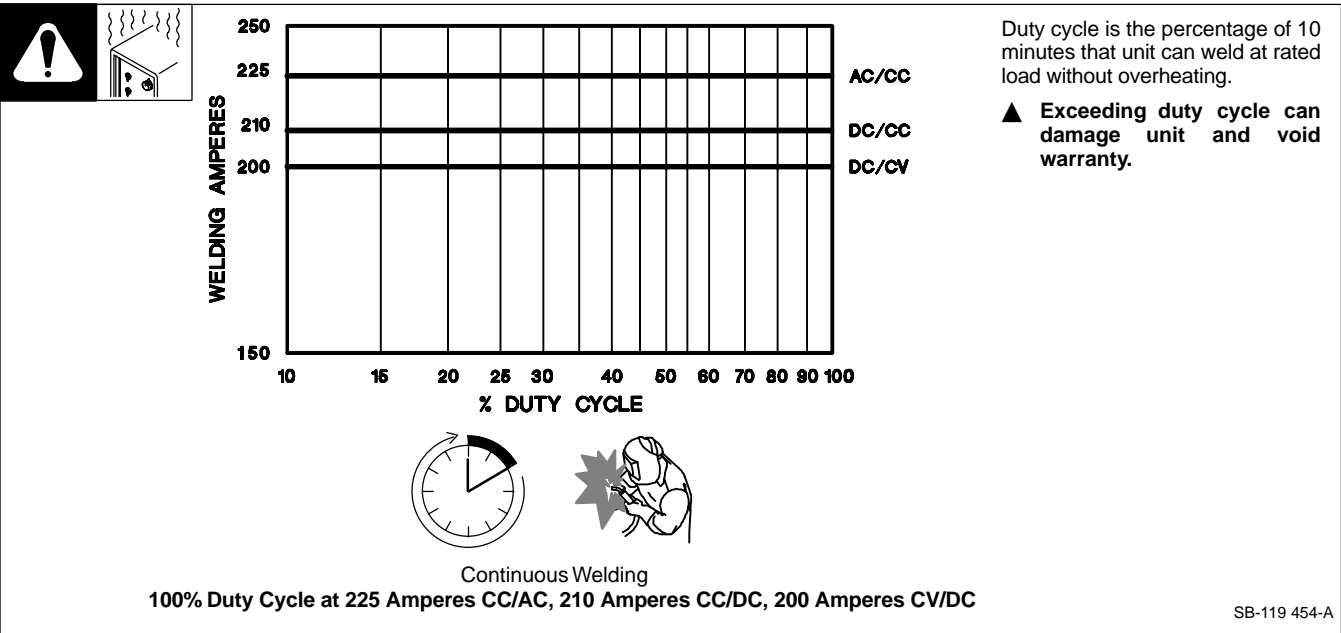
SB-119 455-A

3-5. Fuel Consumption (Kohler-Powered Units)

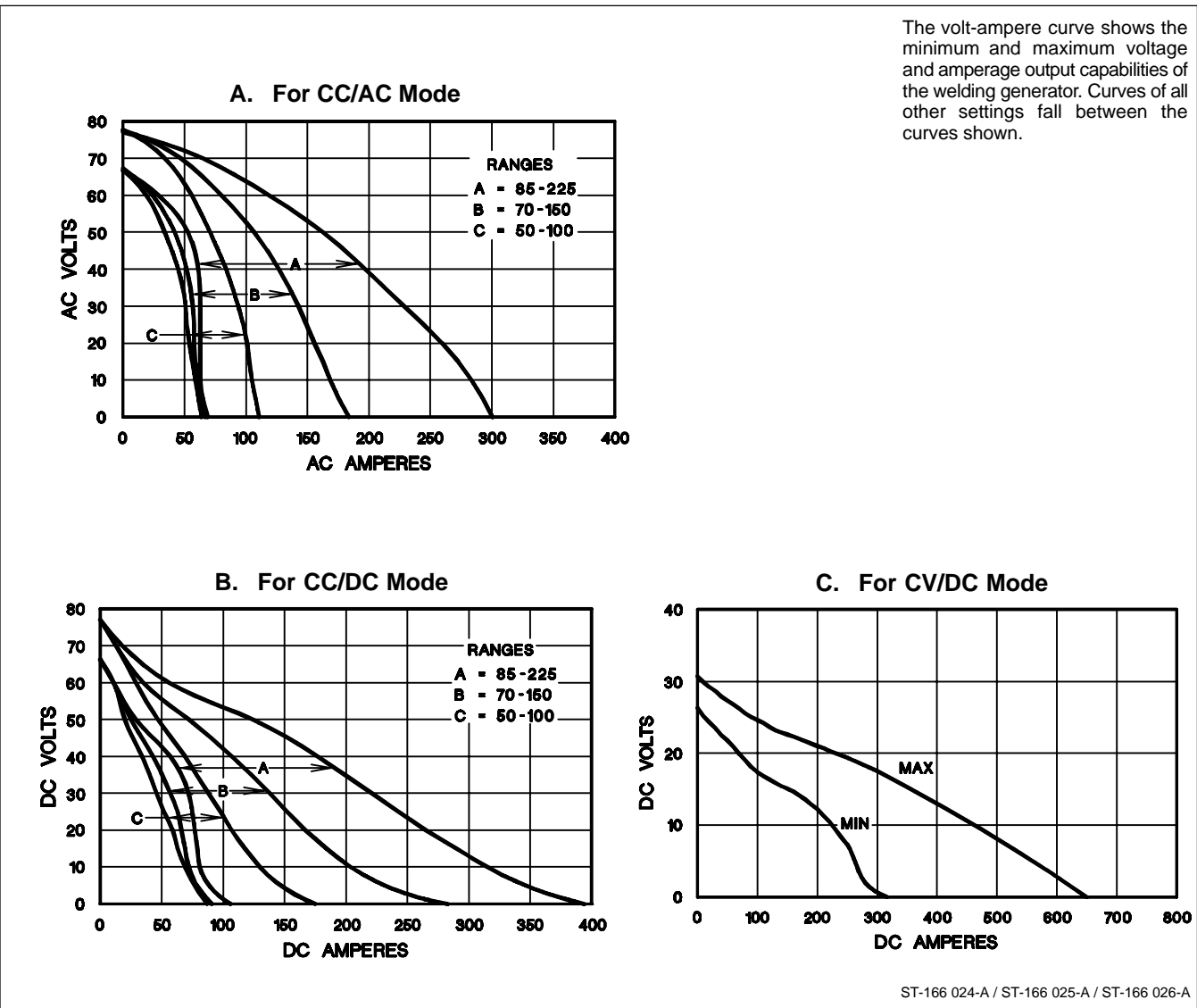


SB-179 939

3-6. Duty Cycle



3-7. Volt-Ampere Curves



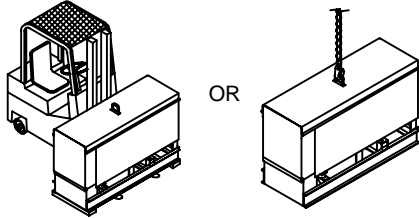
SECTION 4 – INSTALLATION

4-1. Installing Welding Generator

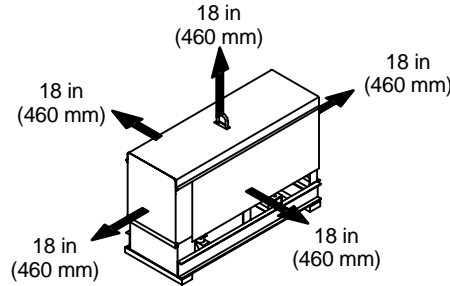


Movement

▲ Do not lift unit from end.



Airflow Clearance

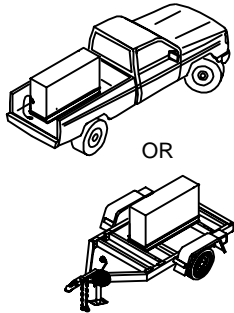


- 1 Generator Base
- 2 Metal Vehicle Frame
- 3 Equipment Grounding Terminal
- 4 Grounding Cable

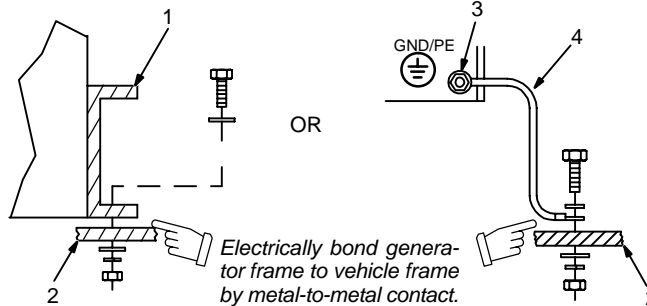
Use #10 AWG or larger insulated copper wire.

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

Location



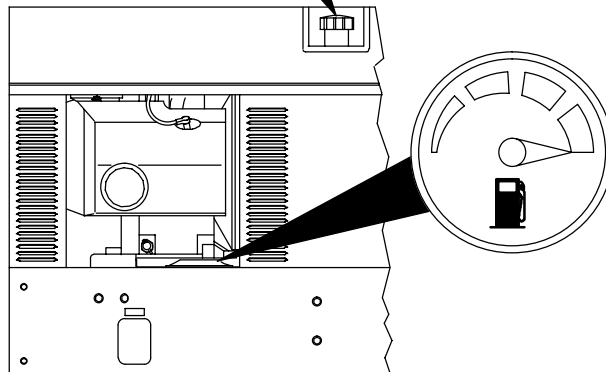
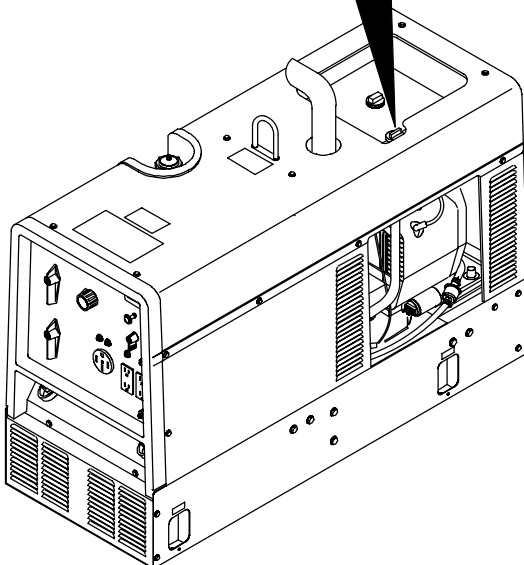
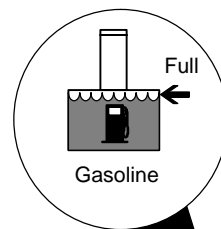
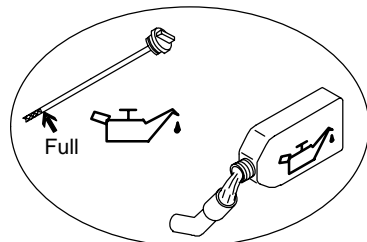
Grounding



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

install1 1/97 – Ref. ST-800 652 / Ref. ST-800 477-A / ST-158 936-A / S-0854

4-2. Engine Prestart Checks (Onan-Powered Units)



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

Engine stops if oil pressure gets too low.

☞ Follow run-in procedure in engine manual.

Ref. ST-800 395-B / Ref. ST-800 392-E

4-3. 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. Engine stops if oil pressure gets too low.

Follow run-in procedure in engine manual.

Ref. ST-801 188-B / Ref. ST-801 221-A


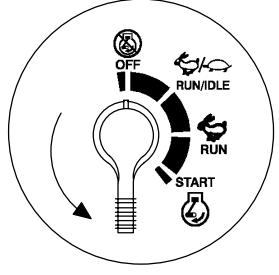
4-4. Connecting the Battery


Connect negative (-) cable last.

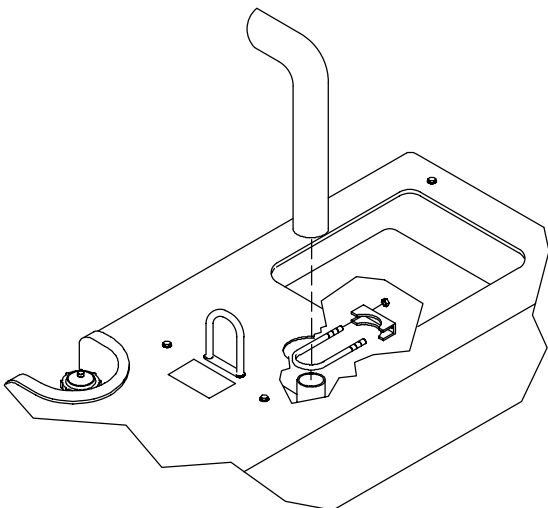
Tools Needed:
 3/8, 1/2 in

Ref. ST-800 394-C / Ref. ST-183 175-A / Ref. S-0756-D

4-5. Installing Exhaust Pipe


Tools Needed:
 1/2 in

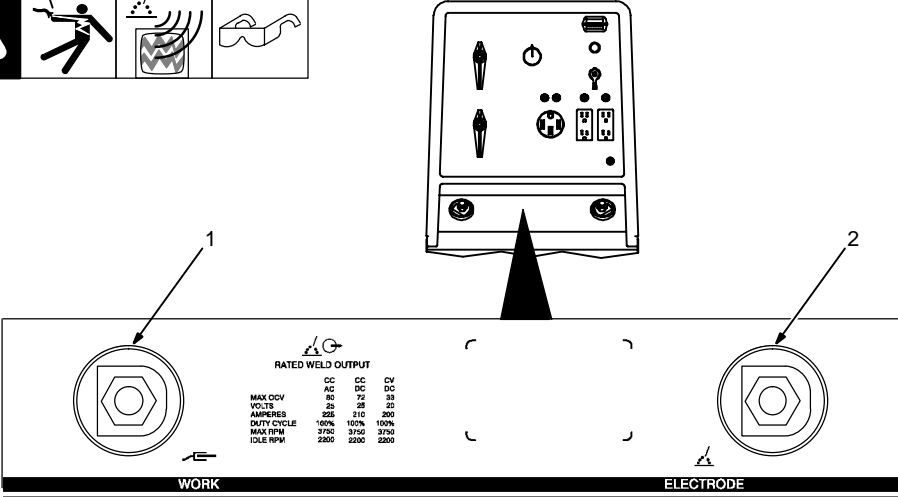


☞ Point exhaust pipe in desired direction. If unit is truck or trailer mounted, point pipe away from direction of travel.

ST-801 681 / Ref. ST-183 175-A

4-6. Connecting to Weld Output Terminals






- 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 5-1).

Tools Needed:
 3/4 in

ST-800 396-A / Ref. ST-183 175-A

4-7. Selecting Weld Cable Sizes

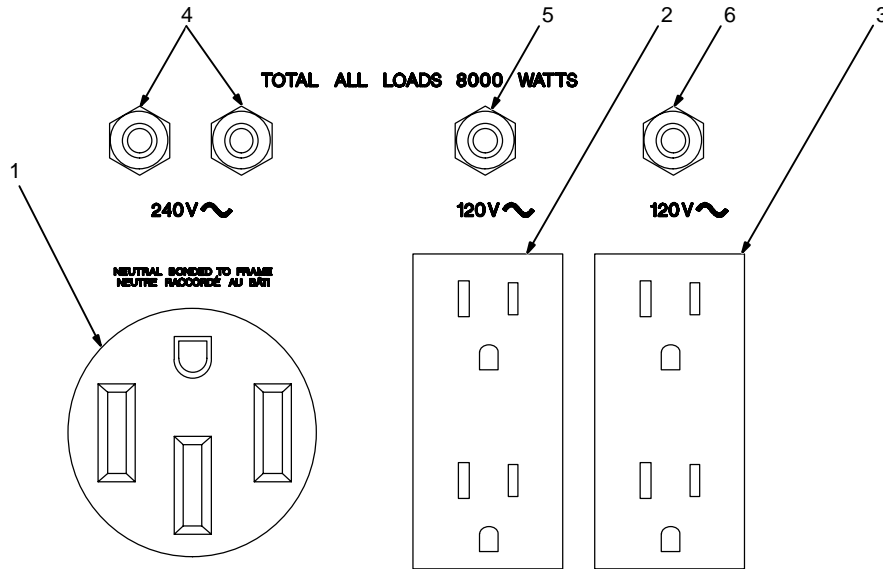
| Welding Amperes | Total Cable (Copper) Length In Weld Circuit Not Exceeding | | | | | | | |
|-----------------|---|----------------------|----------------------|---------------|---------------|---------------|----------------|----------------|
| | 100 ft (30 m) Or Less | | 150 ft (45 m) | 200 ft (60 m) | 250 ft (70 m) | 300 ft (90 m) | 350 ft (105 m) | 400 ft (120 m) |
| | 10 – 60% Duty Cycle | 60 – 100% Duty Cycle | 10 – 100% Duty Cycle | | | | | |
| 100 | 4 | 4 | 4 | 3 | 2 | 1 | 1/0 | 1/0 |
| 150 | 3 | 3 | 2 | 1 | 1/0 | 2/0 | 3/0 | 3/0 |
| 200 | 3 | 2 | 1 | 1/0 | 2/0 | 3/0 | 4/0 | 4/0 |
| 250 | 2 | 1 | 1/0 | 2/0 | 3/0 | 4/0 | 2-2/0 | 2-2/0 |
| 300 | 1 | 1/0 | 2/0 | 3/0 | 4/0 | 2-2/0 | 2-3/0 | 2-3/0 |
| 350 | 1/0 | 2/0 | 3/0 | 4/0 | 2-2/0 | 2-3/0 | 2-3/0 | 2-4/0 |
| 400 | 1/0 | 2/0 | 3/0 | 4/0 | 2-2/0 | 2-3/0 | 2-4/0 | 2-4/0 |
| 500 | 2/0 | 3/0 | 4/0 | 2-2/0 | 2-3/0 | 2-4/0 | 3-3/0 | 3-3/0 |

*Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere. Contact your distributor for the mm² equivalent weld cable sizes.

S-0007-E

SECTION 6 – OPERATING AUXILIARY EQUIPMENT

6-1. Standard Receptacles



AC POWER

**SIMULTANEOUS WELDING AND POWER
WITH FINE ADJUST SET AT 10**

| Weld Current In Amperes | Total Power In Watts | 120V Receptacle Amperes | 240V Receptacle Amperes |
|----------------------------|-------------------------|-------------------------------|-------------------------------|
| 210 | 1000 | 8 | 4 |
| 140 | 4300 | 36 | 18 |
| 90 | 6000 | 50 | 25 |

See Owner's Manual for additional information.

S-166 360-A

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

☞ Auxiliary power decreases as weld current increases.

Set Fine Adjust control R1 at 10 for full auxiliary power.

1 240 V 50 A AC Receptacle RC1

RC1 supplies 60 Hz single-phase power at weld/power speed. Maximum output is 8 kVA/kW.

2 120 V 15 A AC Duplex Receptacle RC2

3 120 V 15 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. (CSA : 1.8 kVA/kW).

4 Circuit Breakers CB1 and CB2

CB1 and CB2 protect RC1 from overload. If CB1 or CB2 opens, RC1 and one of the 120 volt receptacles does not work. 120 volts may still be present at RC1.

5 Circuit Breaker CB3

6 Circuit Breaker CB4

CB3 protects RC2 and CB4 protects RC3 from overload. If a circuit breaker opens, the receptacle does not work.

☞ Press button to reset circuit breaker. If breaker continues to open, contact Factory Authorized Service Agent.

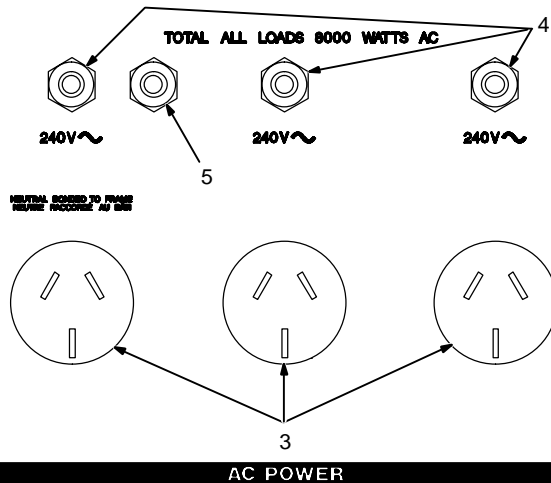
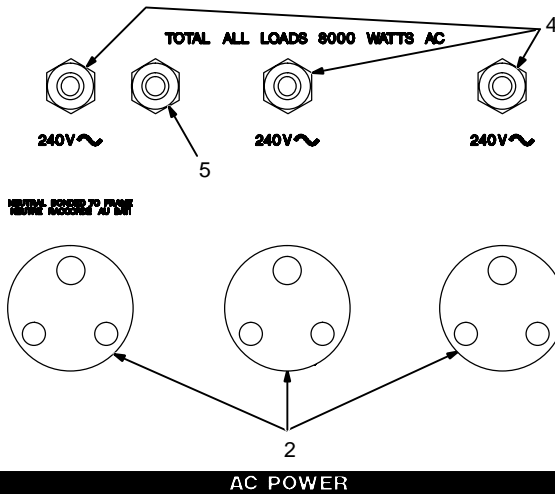
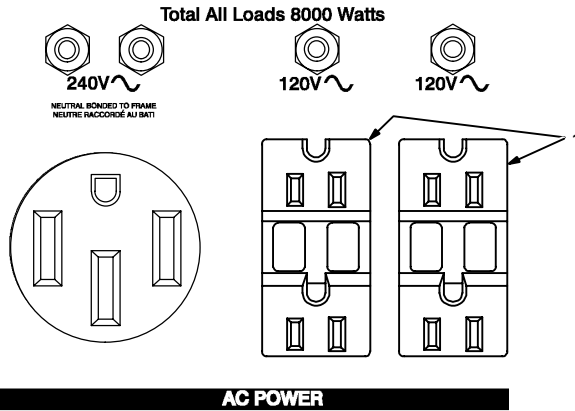
Combined output of all receptacles limited to 8 kVA/kW rating of the generator.

EXAMPLE: If 20 A is drawn from each 120 V duplex receptacle, only 13 A is available at the 240V receptacle:

$$2 \times (120 \text{ V} \times 20 \text{ A}) + (240 \text{ V} \times 13 \text{ A}) = 7.9 \text{ kVA/kW}$$

7 Auxiliary Power While Welding Label

6-2. Optional Auxiliary Power Receptacles



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

☞ Auxiliary power decreases as weld current increases.

Set Fine Adjust control R1 at 10 for full auxiliary power.

Combined output of all receptacles limited to 8 kVA/kW rating of the generator.

GFCI Receptacle Option

1 120 V 15 A AC GFCI Receptacles GFCI2 and GFCI3

GFCI2 and GFCI3 supply 60 Hz single-phase power at weld/power speed. Maximum output from GFCI2 or GFCI3 is 2.4 kVA/kW. Circuit breaker 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.

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

South African And Australian Receptacle Options

2 240 V 16 A AC South African Receptacles RC1, RC2, and RC3

3 240 V 15 A AC Australian Receptacles RC1, RC2, and RC3

Receptacles supply 60 Hz single-phase power at weld/power speed. Maximum output from each receptacle is 3.6 kVA/kW.

4 Circuit Breakers CB1, CB2, CB3

CB1, CB2, and CB3 protect RC1, RC2, and RC3 from overload. If a circuit breaker opens, the receptacle does not work.

5 Circuit Breaker CB4

CB4 protects all the receptacles from overload. If CB4 opens, none of the receptacles work.

☞ Press button to reset circuit breaker. If breaker continues to open, contact Factory Authorized Service Agent.

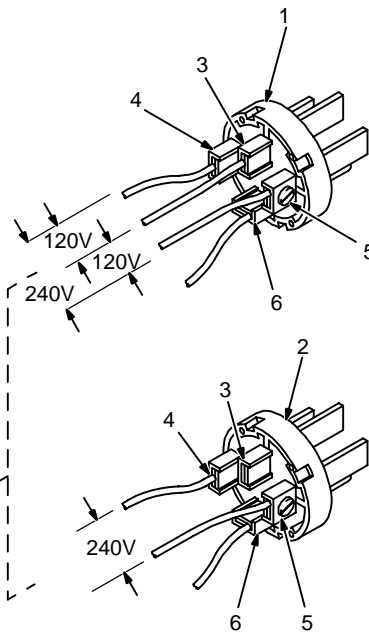
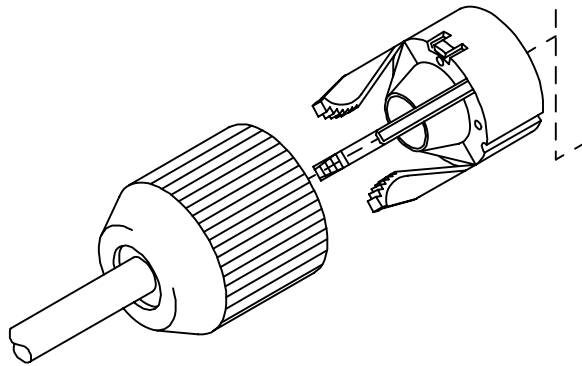
Ref. ST-183 175-A / Ref. ST-172 782-A / Ref. ST-172 113

6-3. Wiring Optional 240 Volt Plug



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

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



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

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

2 Plug Wired for 240 V, 2-Wire Load

3 Neutral (Silver) Terminal

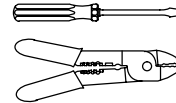
4 Load 1 (Brass) Terminal

5 Load 2 (Brass) Terminal

6 Ground (Green) Terminal

7 Amperes Available Using 120/240 V Plug

Tools Needed:



ST-120 813-D


SECTION 7 – MAINTENANCE (ONAN-POWERED UNITS)

7-1. Routine Maintenance (Onan-Powered Units)

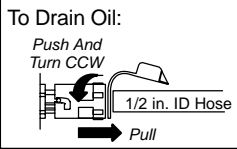
| | | | |
|--|--|--|---|
| | | <p>Recycle engine fluids.</p> | <p>▲ Stop engine before maintaining.</p> <p>☞ See also <i>Engine Manual</i> and maintenance label. Service engine more often if used in severe conditions.</p> |
| 8 h | | | |
| <p>Check fluid levels. See Section 4-2.</p> | | <p>Wipe up spills.</p> | |
| 20 h | | 25 h | |
| <p>Check and clean spark arrestor screen. See Section 7-7.</p> | | <p>Service air cleaner wrapper (foam element). See Section 7-3.</p> | |
| 50 h | | | |
| <p>Clean cooling system. See Engine Manual.</p> | | <p>Clean and tighten weld terminals.</p> | |
| 100 h | | | |
| <p>Change oil. See Section 7-5 and maintenance label.</p> | | <p>Change oil filter. See Section 7-5 and maintenance label.</p> | |
| | | <p>Clean and tighten battery connections.</p> | |
| | <p>Service air cleaner element. See Section 7-3.</p> | | |
| 200 h | | | |
| <p>Check valve clearance.</p> | | <p>Replace fuel filter. See Section 7-5.</p> | |
| | | <p>Check spark plugs.</p> | |
| | | <p>Replace unreadable labels.</p> | |
| 500 h | | | |
| | <p>Repair or replace cracked cables.</p> | | |
| 1000 h | | | |
| <p>Remove cylinder head deposits.</p> | | <p>Clean crankcase breather valve.</p> | |
| | | <p>Blow out or vacuum inside. During heavy service, clean monthly.</p> | |


7-2. Maintenance Label (Onan-Powered Units)

ONAN P216/P220 GAS ENGINE

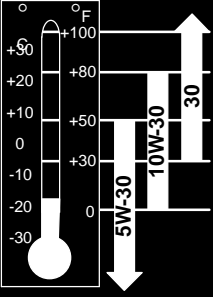


See Engine Manual for complete engine care. Give engine Specification and Serial Number when ordering parts.

To Drain Oil:
Push And Turn CCW

 1/2 in. ID Hose
Pull



Check daily.




Recommended Oil . . . API Service Classification SF/CC, SG/CE, SH

Oil & Filter Change CONDITIONS

| | Normal | Severe |
|----------------|-----------|----------|
| P216 | 100 hours | 50 hours |
| P220 | 50 hours | 50 hours |

Oil Filter MILLER 065 251, Onan 122-0645


Oil Capacity 1.5 qt (1.4 L) or 1.75 qt (1.6 L) with filter change



Gasoline

Fuel Grade Regular or Unleaded


Fuel Filter MILLER 066 113, Onan 149-2206-01, Fram G10E1



Air Filter Service 100 hours or less – see Owner's Manual


Air Filter Element MILLER 064 617, Onan 140-2628-01

Air Filter Wrapper MILLER 065 653, Onan 140-1496



12 Volt Battery BCI Group 58


Cranking Performance at 0°F (-18°C) 430 Amps min.



Engine RPM – No Load

Weld/ Power 3700


Idle 2200



Valve Clearance – Cold

In. 0.005 in (0.13 mm)


Ex. 0.013 in (0.33 mm)



Spark Plug Gap 0.025 in. (0.6 mm)

Spark Plug Champion RS17YX Preferred or RS14YC

Use only resistor spark plugs and wires.



Spark Arrester Inspection And Service 20 operating hours - see Owner's Manual

Optional

S-165 623-E

7-3. Servicing Air Cleaner (Onan-Powered Units)

▲ Stop engine.
▲ Do not run engine without air cleaner or with dirty element.

1 Wrapper (Foam Element)
 Wash wrapper with soap and water solution. Allow wrapper to air dry completely.

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

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

aircleaner3 1/97 – ST-156 852 / Ref. ST-183 175-A / S-0759

7-4. Overload Protection (Onan-Powered Units)

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

1 Fuse F1 (See Parts List)
 F1 protects the exciter excitation winding from overload. If F1 opens, there is no/low weld and auxiliary power output.

2 Fuse F6 (See Parts List)
 F6 protects the engine wiring system from overload. If F6 opens, engine will not crank.

Replace any open fuses. Reinstall cover before operating.

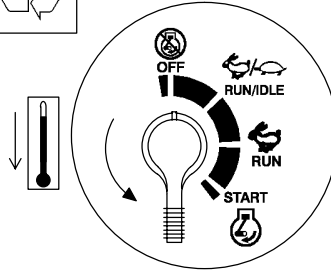
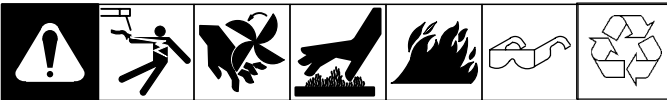
☞ If any fuse continues to open, contact Factory Authorized Service Agent.

Tools Needed:

 3/8 in

ST-800 398-F / Ref. ST-183 175

7-5. Changing Engine Oil, Oil Filter, and Fuel Filter (Onan-Powered Units)



▲ Stop engine and let cool.

- 1 Oil Drain Valve
- 2 1/2 ID x 12 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.

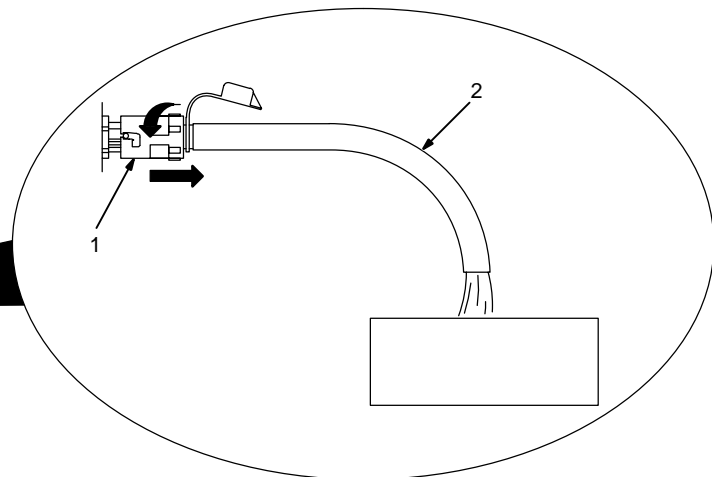
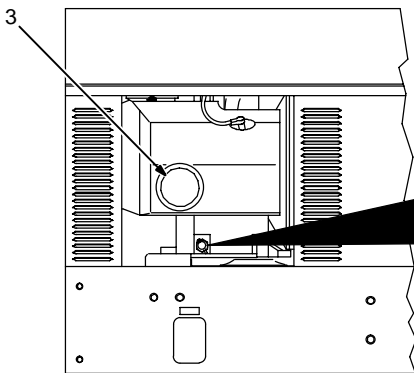
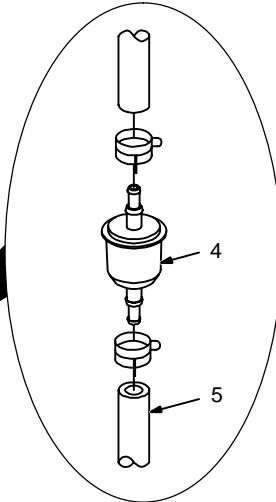
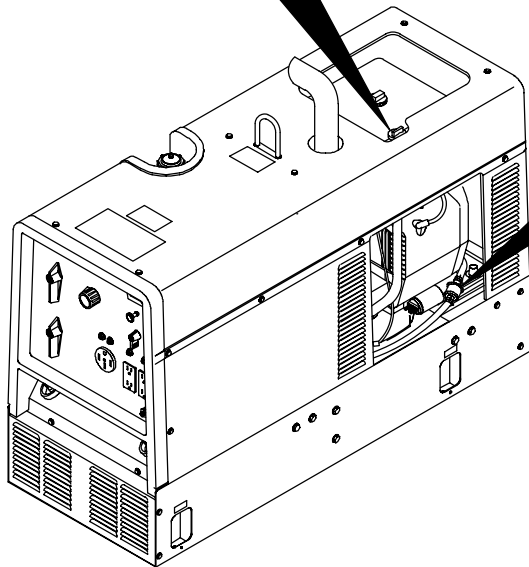
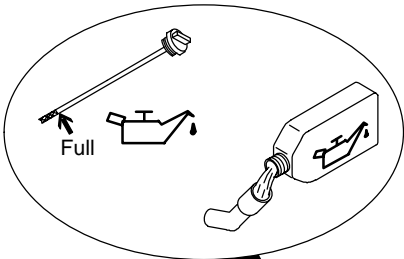
Fill crankcase with new oil to full mark on dipstick (see Section 7-2).

- 4 Fuel Filter
- 5 Fuel Line

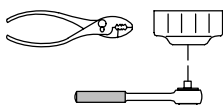
Replace line if cracked or worn. Install new filter. Wipe up any spilled fuel.

Start engine, and check for fuel leaks.

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



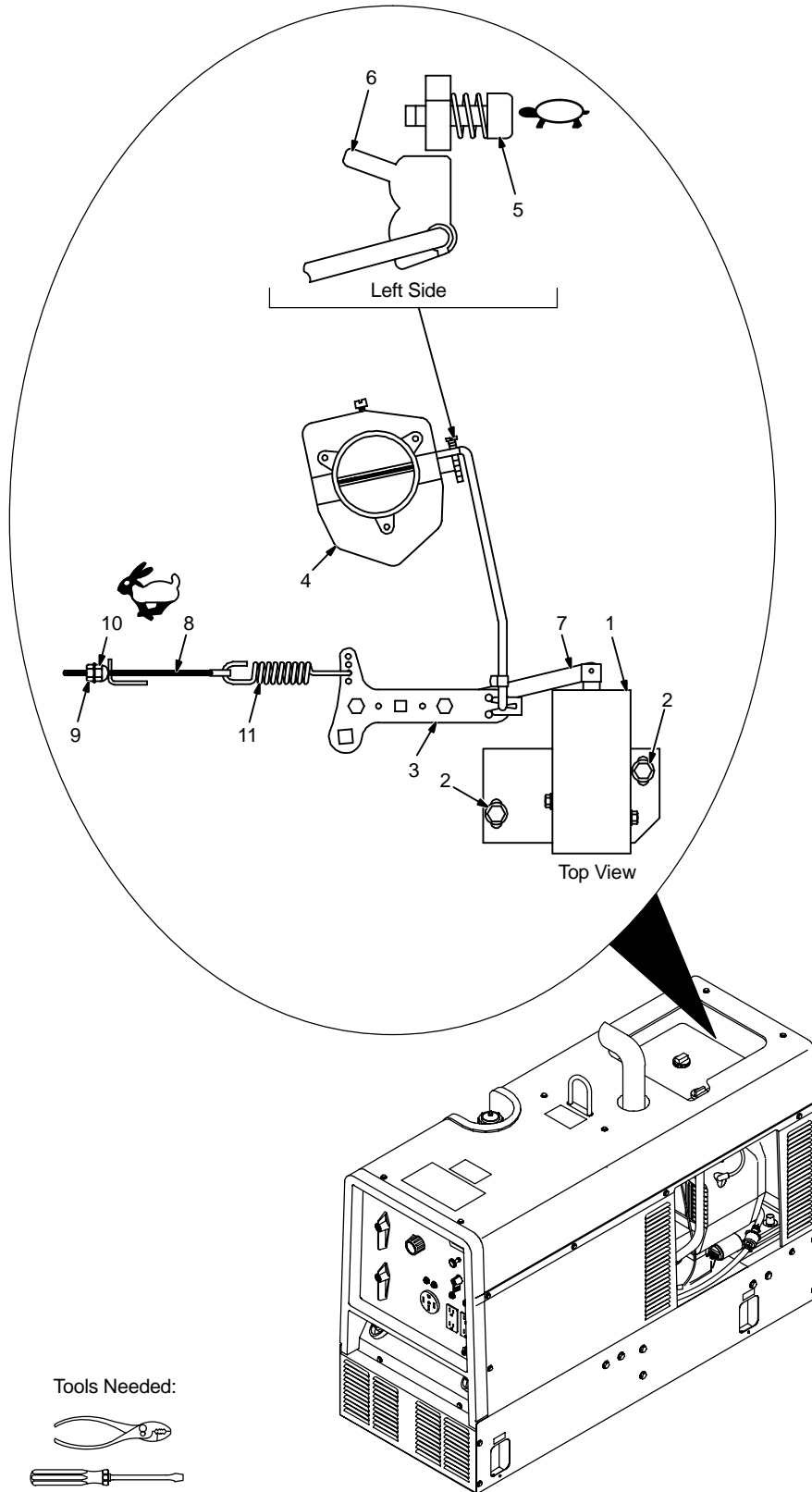
Tools Needed:



7-6. Adjusting Engine Speed (Onan-Powered Units)



| | |
|--|----------------|
| | |
| | 2200 ± 100 rpm |
| | 3700 ± 50 rpm |



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 Adjust control to 10.

Remove top cover to access speed adjustments.

Idle Speed Adjustment

- 1 Throttle Solenoid
- 2 Mounting Screw
- 3 Governor Arm
- 4 Carburetor
- 5 Idle Speed Screw

Loosen two mounting screws.

Pull governor arm away from carburetor and hold while making the following adjustment:

Turn idle speed screw until engine runs at idle speed (see table).

Release governor arm. Place Engine Control switch in Run/Idle position.

- 6 Carburetor Stop

With solenoid energized, slide solenoid until idle speed screw just touches carburetor stop. Tighten solenoid mounting screws.

- 7 Governor Arm Extension

Check for smooth operation, and readjust solenoid position if necessary.

Weld/Power Speed Adjustment

Place Engine Control switch in Run position.

- 8 Weld/Power Speed Rod
- 9 Locking Nut

Loosen nut.

- 10 Adjustment Nut

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

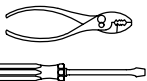
▲ Stop engine.

- 11 Sensitivity Spring

See engine manual for governor sensitivity adjustment.

Reinstall top cover.

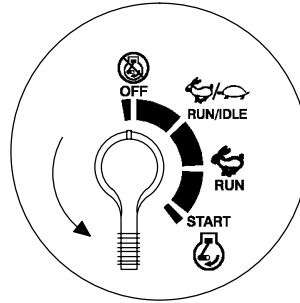
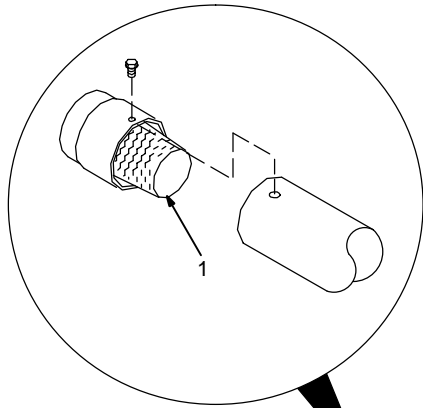
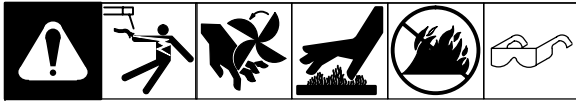
Tools Needed:



1/4, 3/8 in

ST-800 392-E / ST-800 397

7-7. Servicing Optional Spark Arrestor (Onan-Powered Units)

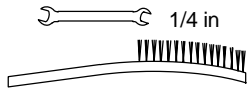


▲ Stop engine and let cool.

1 Spark Arrestor Screen

Clean and inspect screen. Replace spark arrestor if screen wires are broken or missing.

Tools Needed:



Ref. ST-801 682-A / Ref. ST-183 175-A


SECTION 8 – MAINTENANCE – (KOHLER-POWERED UNITS)


8-1. Routine Maintenance (Kohler-Powered Units)

| | | | |
|--|--|--|---|
| | | <p>Recycle engine fluids.</p> | <p>▲ Stop engine before maintaining.</p> <p>📖 See also Engine Manual and maintenance label. Service engine more often if used in severe conditions.</p> |
| 8 h | | | |
| Wipe up spills. | | Check fluid levels. See Section 4-2. | |
| 20 h | | 25 h | |
| Check and clean optional spark arrestor screen. See Section 8-7. | | Service air cleaner wrapper (foam element). See Section 8-3. | |
| 50 h | | | |
| Clean and tighten weld terminals. | | | |
| 100 h | | | |
| Change oil. See Section 8-4 and maintenance label. | | Check air cleaner element. See Section 8-3. | |
| Clean cooling system. See Engine Manual. | | Clean and tighten battery connections. | |
| 200 h | | | |
| Change oil filter. See Section 8-4 and maintenance label. | | Replace fuel filter. See Section 8-4. | |
| Check spark plugs. | | Replace unreadable labels. | |
| 500 h | | | |
| Repair or replace cracked cables. | | | |
| 1000 h | | | |
| Blow out or vacuum inside. During heavy service, clean monthly. | | | |

8-2. Maintenance Label (Kohler-Powered Units)

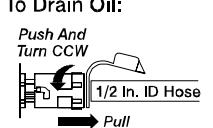
KOHLER CH18/CH20 GAS ENGINE

 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




1/2 In. ID Hose


Pull

Recommended Oil . . . API Service Classification SF-SG/CC-CD
(If using optional LP gas fuel, use synthetic oil after first oil change)

Oil Change 100 hours
Oil Filter Change 200 hours
Oil Filter MILLER 066 698, Kohler 1205001
Oil Capacity 1.75 qt (1.7L) or 2 qt (1.9L) with filter change

 Fuel Grade Unleaded, 87 Octane min.
Fuel Filter MILLER 066 113, Kohler 2505003


Gasoline




Air Filter Service 100 hours or less - see Owner's Manual

Air Filter Element MILLER 067 272, Kohler 4708303


Air Filter Wrapper MILLER 067 273, Kohler 2408302




12 Volt Battery BCI Group 58
Cranking Performance at 0°F (-18°C) . . . 430 Amps min.



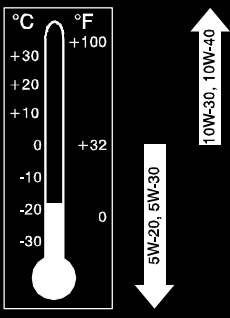
Engine RPM - No Load
Weld/Power 3700
Idle 2200



Spark Plug Gap 0.040 in. (1.02 mm)
Spark Plug Champion RC-12YC
Use only resistor spark plugs and wires.



Spark Arrestor Inspection and Service
20 operating hours - See Owner's Manual






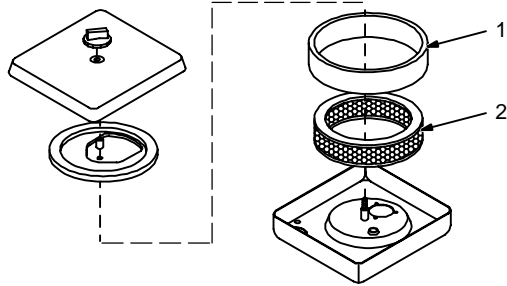
°C: +30, +20, +10, 0, -10, -20, -30
°F: +100, +32, 0

↑ 10W-30, 10W-40
↓ 5W-20, 5W-30

173 088-B

8-3. Servicing Air Cleaner (Kohler-Powered Units)



1 Wrapper (Foam Element)
2 Element

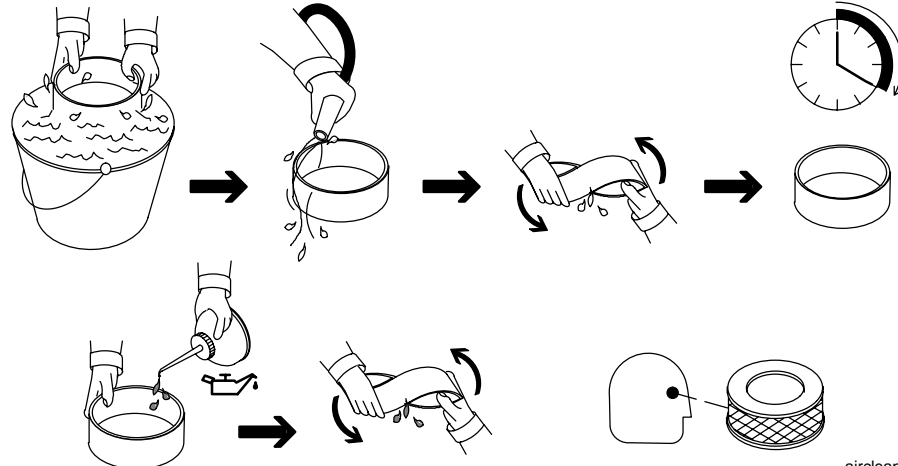
▲ Stop engine.

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

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

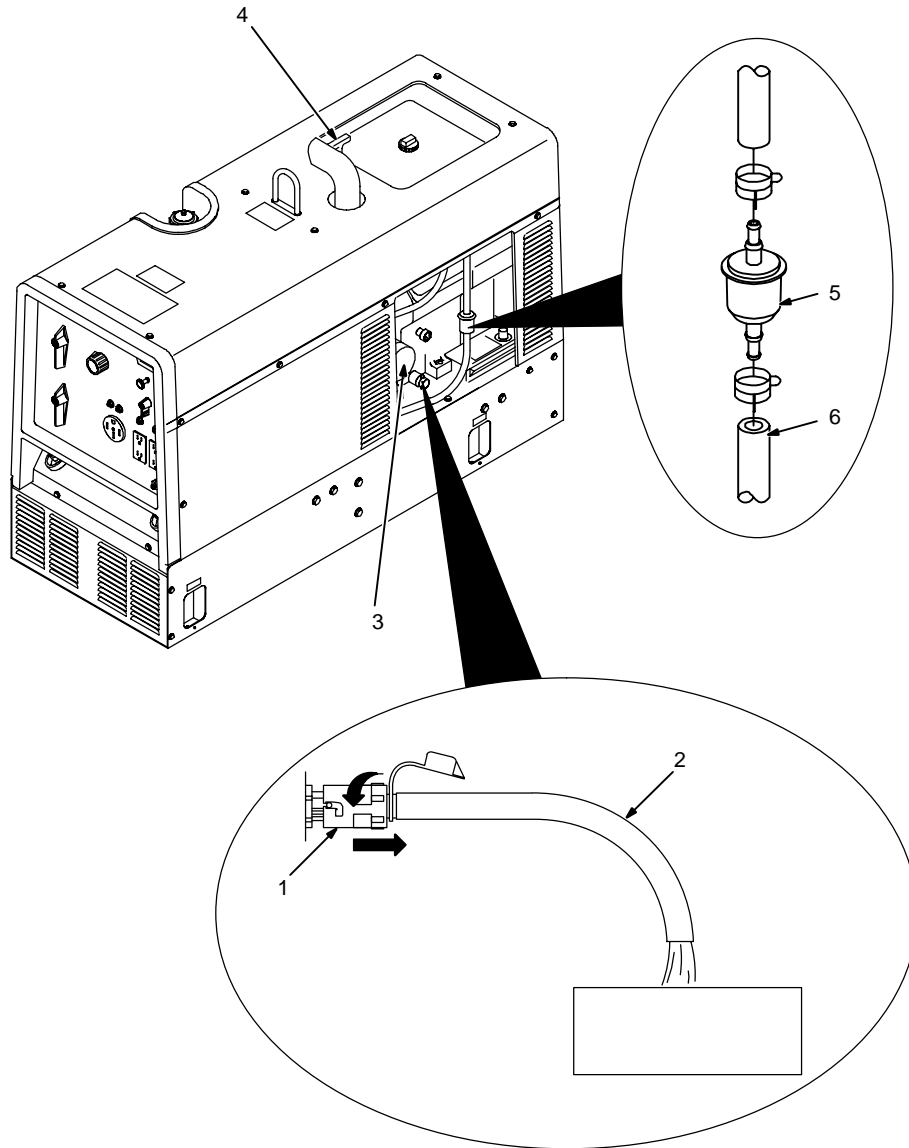
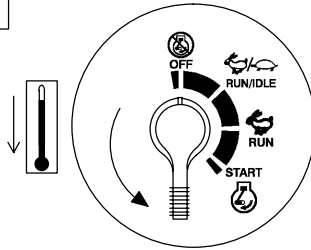
Spread 1 tablespoon SAE 30 oil evenly into wrapper. Squeeze out excess oil.

Replace element if dirty, oily, or damaged.



aircleaner3 1/97 - ST-156 852 / Ref. ST-183 175-A / S-0759

8-4. 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 12 in Hose
- 3 Oil Filter
- 4 Oil Fill Cap/Dipstick

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 7-2).

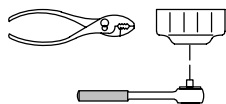
- 5 Fuel Filter
- 6 Fuel Line

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:

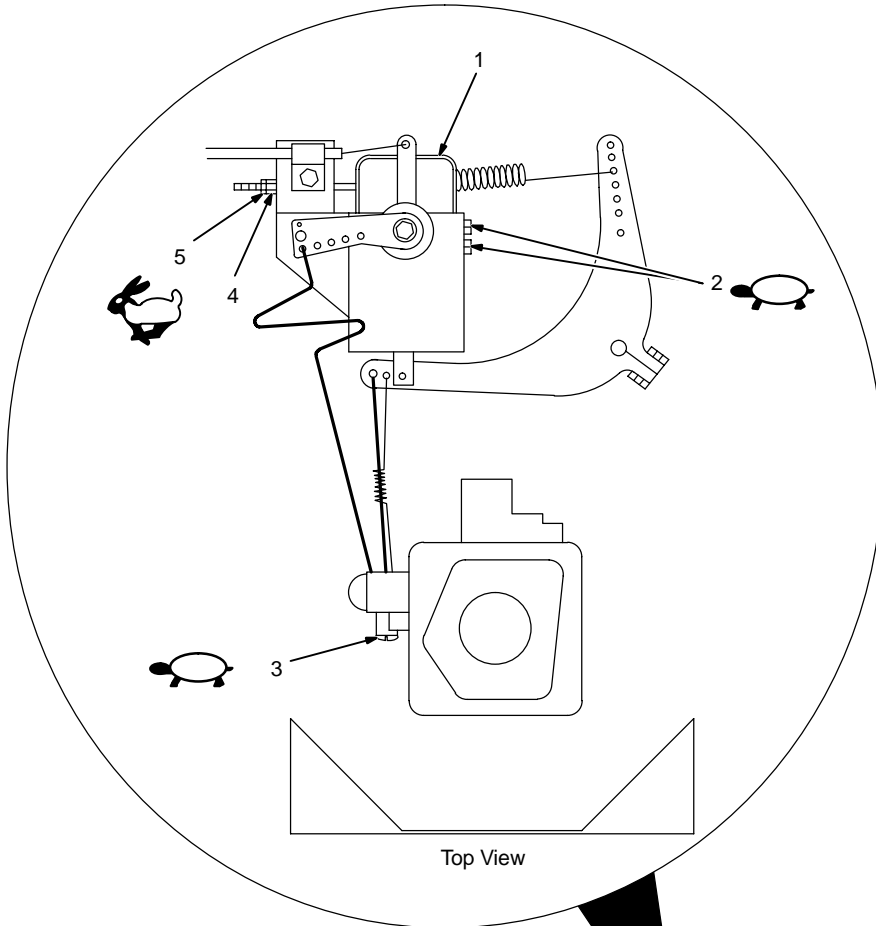


Ref. ST-801 188-B / Ref. ST-183 175-A / ST-800 395 / S-0842

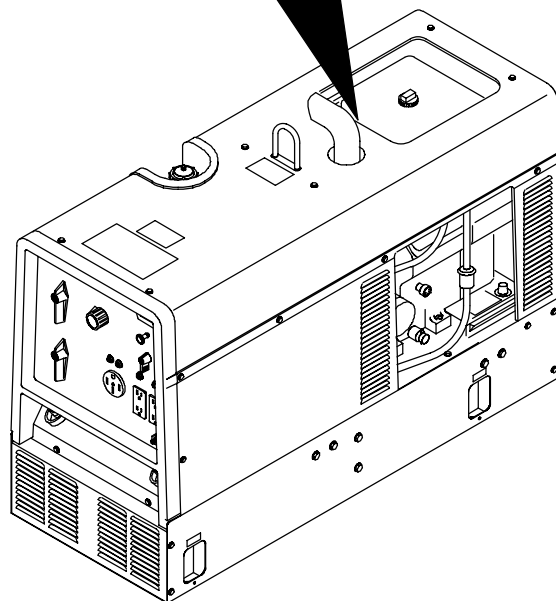
8-5. Adjusting Engine Speed (Kohler-Powered Units)



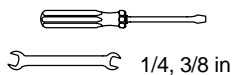
| | |
|--|---------------|
| | |
| | 2200 ± 50 rpm |
| | 3700 ± 50 rpm |



Top View



Tools Needed:



1/4, 3/8 in

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 Adjust control to 10.

Remove top cover to access 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.

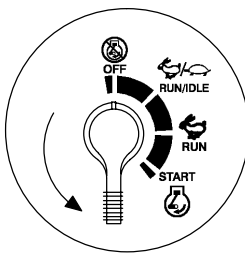
Reinstall top cover.

▲ **Stop engine.**

Ref. ST-801 188-C / ST-801 209-A

8-6. Overload Protection (Kohler-Powered Units)





▲ Stop engine.

- 1 Fuse F1 (See Parts List)

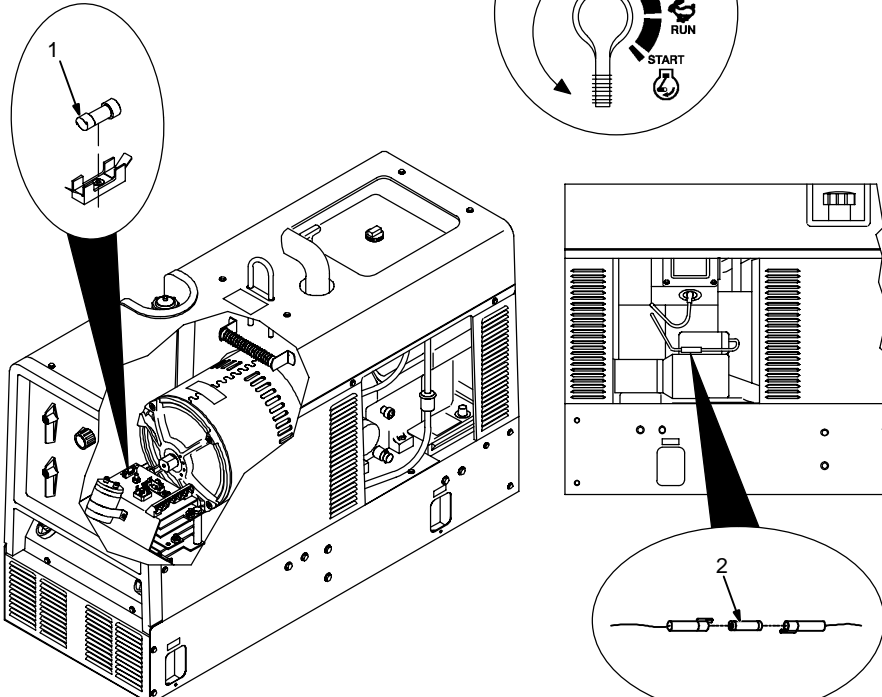
F1 protects the generator excitation circuit. If F1 opens, there will be no/low weld and auxiliary power output.

- 2 Fuse F6 (See Parts List)

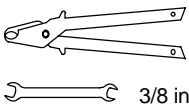
F6 protects the engine wiring harness. If F6 opens, the engine does not crank. If F6 opens while engine is running, weld and auxiliary power output stops.

Replace any open fuses. Reinstall panel before operating unit.

☞ If any fuse continues to open, contact Factory Authorized Service Agent.




Tools Needed:

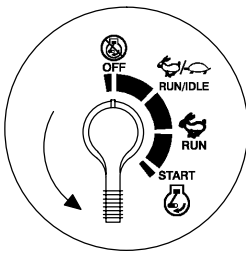


3/8 in

ST-801 226-B / Ref. ST-801 221-A / Ref. ST-183 175-A

8-7. Servicing Optional Spark Arrestor (Kohler-Powered Units)

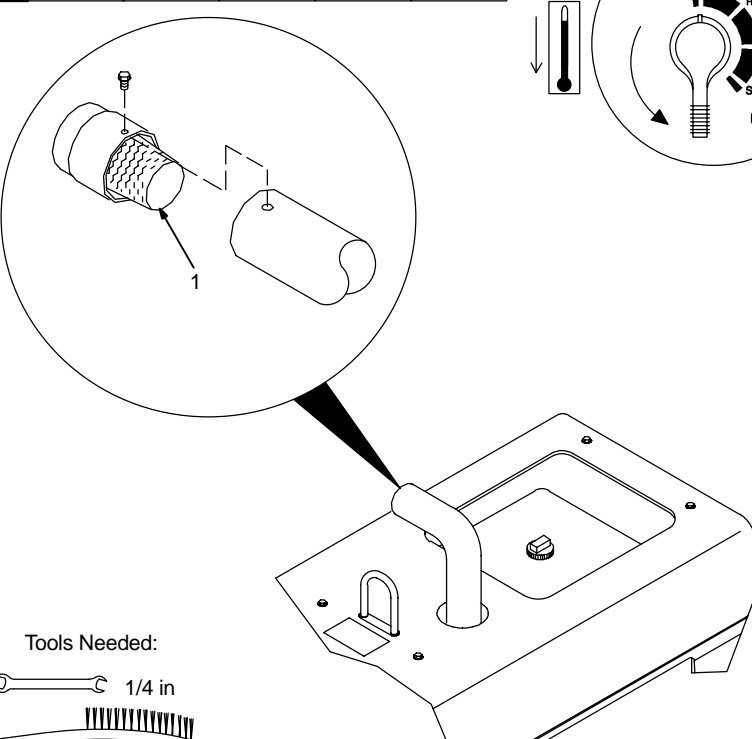




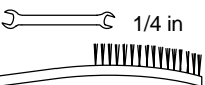
▲ Stop engine and let cool.

- 1 Spark Arrestor Screen

Clean and inspect screen. Replace spark arrestor if screen wires are broken or missing.



Tools Needed:

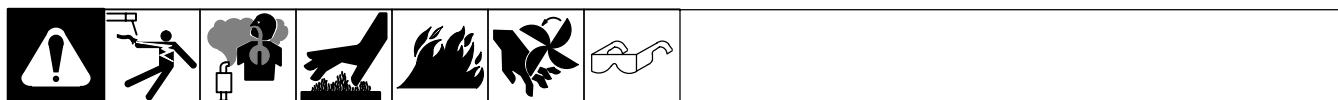


1/4 in

Ref. ST-801 695-A / Ref. ST-183 175-A

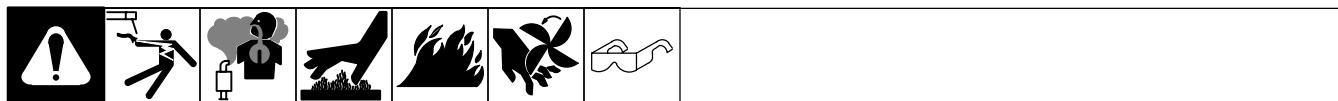
SECTION 9 – TROUBLESHOOTING

9-1. Welding Troubleshooting



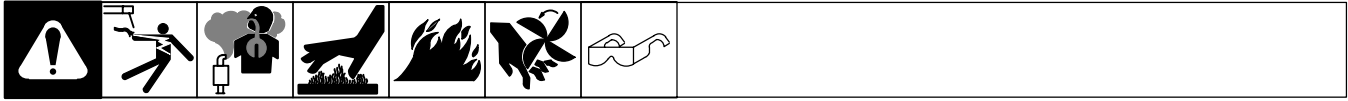
| Trouble | Remedy |
|---|--|
| No weld output. | Check control settings. |
| | Check weld connections. |
| | Check fuse F1 and replace if open (see Section 7-4 or 8-6). |
| | Be sure all equipment is disconnected from receptacles when starting unit. |
| | Have Factory Authorized Service Agent check brushes, slip rings, and integrated rectifier SR2. |
| Low weld output. | Check fuse F1 and replace if open (see Section 7-4 or 8-6). |
| | Check control settings. |
| | Check and adjust engine speed (see Section 7-6 or 8-5). |
| | Service air cleaner according to engine manual. |
| | Have Factory Authorized Service Agent check brushes and slip rings. |
| High weld output. | Check control settings. |
| | Check and adjust engine speed (see Section 7-6 or 8-5). |
| 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 and adjust engine speed (see Section 7-6 or 8-5). |
| Have Factory Authorized Service Agent check brushes and slip rings. | |

9-2. Auxiliary Power Troubleshooting



| Trouble | Remedy |
|---|--|
| No output at auxiliary power receptacles. | Reset circuit breakers (see Section 6-1 or 6-2). |
| | Press optional GFCI receptacle Reset button (see Section 6-2). |
| | Check fuse F1 and replace if open (see Section 7-4 or 8-6). |
| | Check plug PLG6 connection. |
| | Have Factory Authorized Service Agent check brushes, slip rings, and integrated rectifier SR2. |
| High power output. | Check and adjust engine speed (see Section 7-6 or 8-5). |
| Low power output. | Check fuse F1 and replace if open (see Section 7-4 or 8-6). |
| | Increase Fine Adjust control R1 setting. |
| Erratic power output. | Check fuel level. |
| | Check and adjust engine speed (see Section 7-6 or 8-5). |
| | Check receptacle wiring and connections. |
| | Have Factory Authorized Service Agent check brushes and slip rings. |

9-3. Engine Troubleshooting



| Trouble | Remedy |
|---|--|
| Engine will not crank. | Check fuse F6, and replace if open (see Section 7-4 or 8-6). |
| | 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 4-2). |
| | Check low oil pressure shutdown switch (see Parts List for location). |
| | Have Factory Authorized Service Agent check fuel shutoff solenoid FS1 (FS1 optional on Onan-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 (see Parts List for location). |
| Engine stopped during normal operation. | Check fuel level. |
| | Check oil level (see Section 4-2). |
| | Check low oil pressure shutdown switch (see Parts List for location) |
| | 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 Onan-powered units). |
| 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 auto idle module PC1, and current transformer CT1. |
| Unstable or sluggish engine speeds. | Readjust throttle linkage if necessary. Check throttle solenoid TS1 for smooth operation. |
| | Tune-up engine according to engine manual. |
| Engine does not return to idle speed. | Remove weld and auxiliary power loads. |
| | Check throttle linkage for smooth, non-binding operation. |
| | Have Factory Authorized Service Agent check idle module PC1, current transformer CT1, Engine Control switch S2, and throttle solenoid TS1. |

SECTION 10 – ELECTRICAL DIAGRAMS

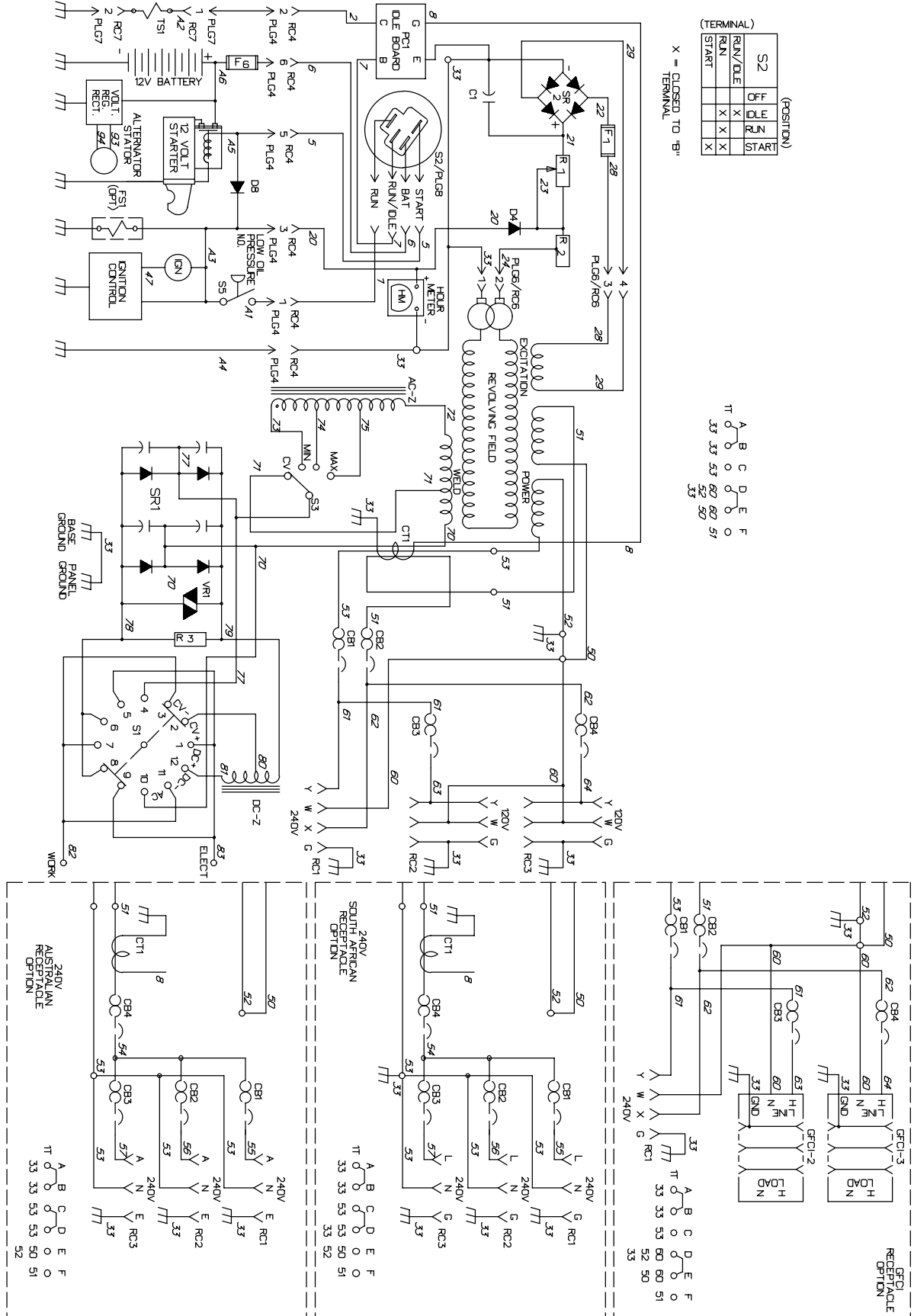


Figure 10-1. Circuit Diagram For Welding Generator (Onan-Powered Units)

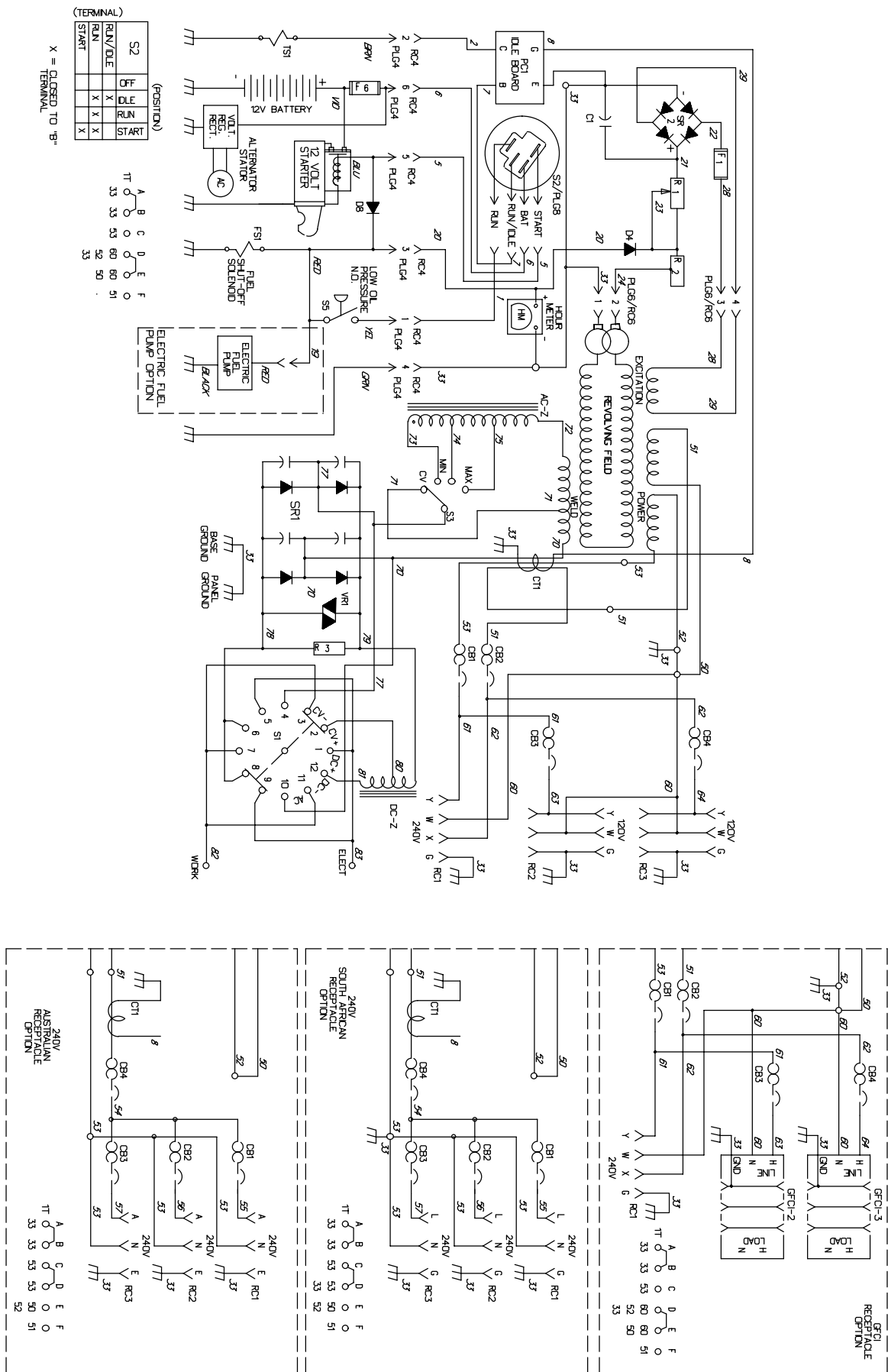




Figure 10-2. Circuit Diagram For Welding Generator (Kohler-Powered Units)

SECTION 11 – AUXILIARY POWER GUIDELINES



11-1. Selecting Equipment

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

aux_pwr 12/96 – Ref. ST-159 730 / ST-800 577

11-2. Grounding Generator To Truck Or Trailer Frame

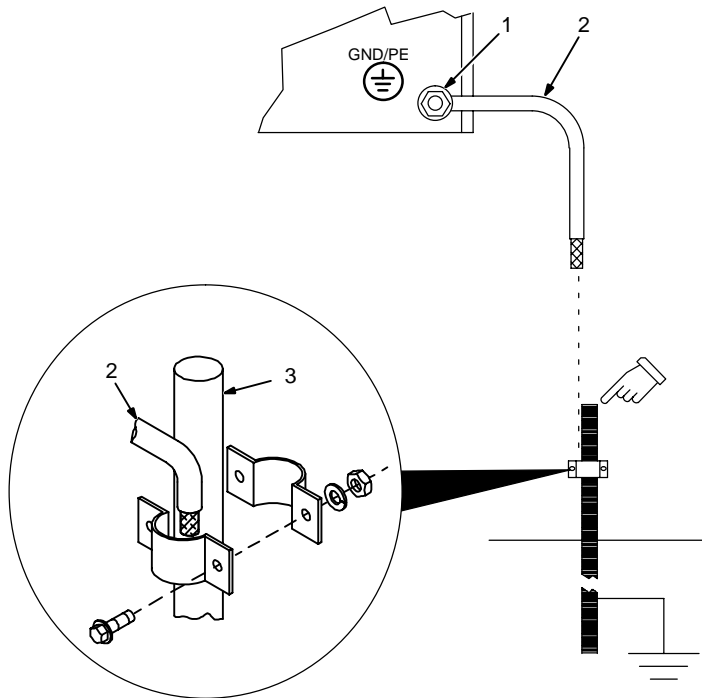
- 1 Generator Base
- 2 Metal Vehicle Frame
- 3 Equipment Grounding Terminal
- 4 Grounding Cable

Use #10 AWG or larger insulated copper wire.

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

S-0854

11-3. Grounding When Supplying Building Systems

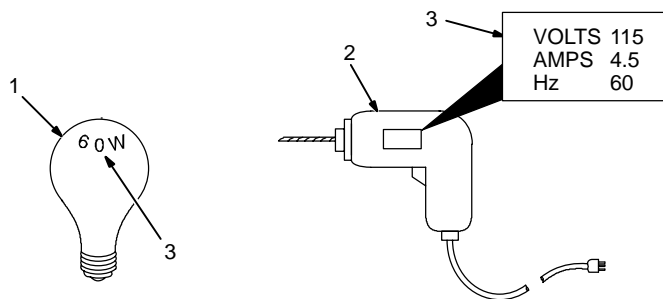


- 1 Equipment Grounding Terminal
 - 2 Grounding Cable
Use #10 AWG or larger insulated copper wire.
 - 3 Ground Device
- ▲ **Ground generator to system earth ground if supplying power to a premises (home, shop, farm) wiring system.**

Use ground device as stated in electrical codes.

ST-800 576-B

11-4. 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 11-8).
- 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.

$$(200 \text{ W} + 200 \text{ W} + 200 \text{ W}) + 520 \text{ W} = 1120 \text{ W}$$

The total load applied by the three flood lamps and drill is 1120 watts.

S-0623

11-5. 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 |
| | 5 HP | 23300 | 6800 |
| Capacitor Start-Capacitor Run | 1-1/2 HP | 8100 | 2000 |
| | 5 HP | 23300 | 6000 |
| | 7-1/2 HP | 35000 | 8000 |
| | 10 HP | 46700 | 10700 |
| Fan Duty | 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 |

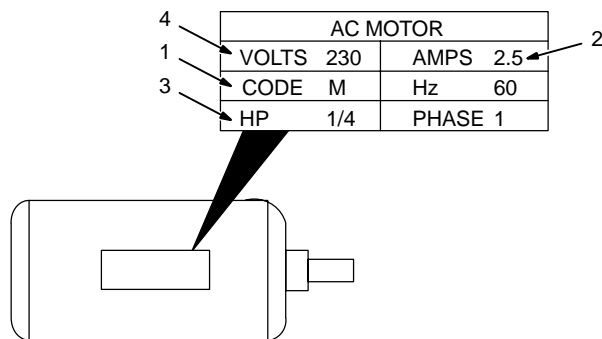
11-6. Approximate Power Requirements For Farm/Home Equipment

| 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 |

11-7. 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 |

11-8. Power Required To Start Motor



- 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.

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 |

$$\frac{\text{kVA/HP} \times \text{HP} \times 1000}{\text{VOLTS}} = \text{STARTING AMPERAGE}$$

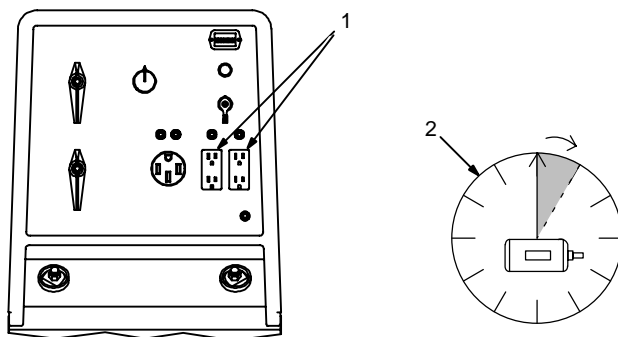
EXAMPLE: Calculate the starting amperage required for a 230 V, 1/4 HP motor with a motor start code of M.

Volts = 230 HP = 1/4 Using Table, Code M results in kVA/HP = 11.2

$$\frac{11.2 \times 1/4 \times 1000}{230} = 12.2 \text{ A} \quad \text{Starting the motor requires 12.2 amperes.}$$

S-0624

11-9. 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

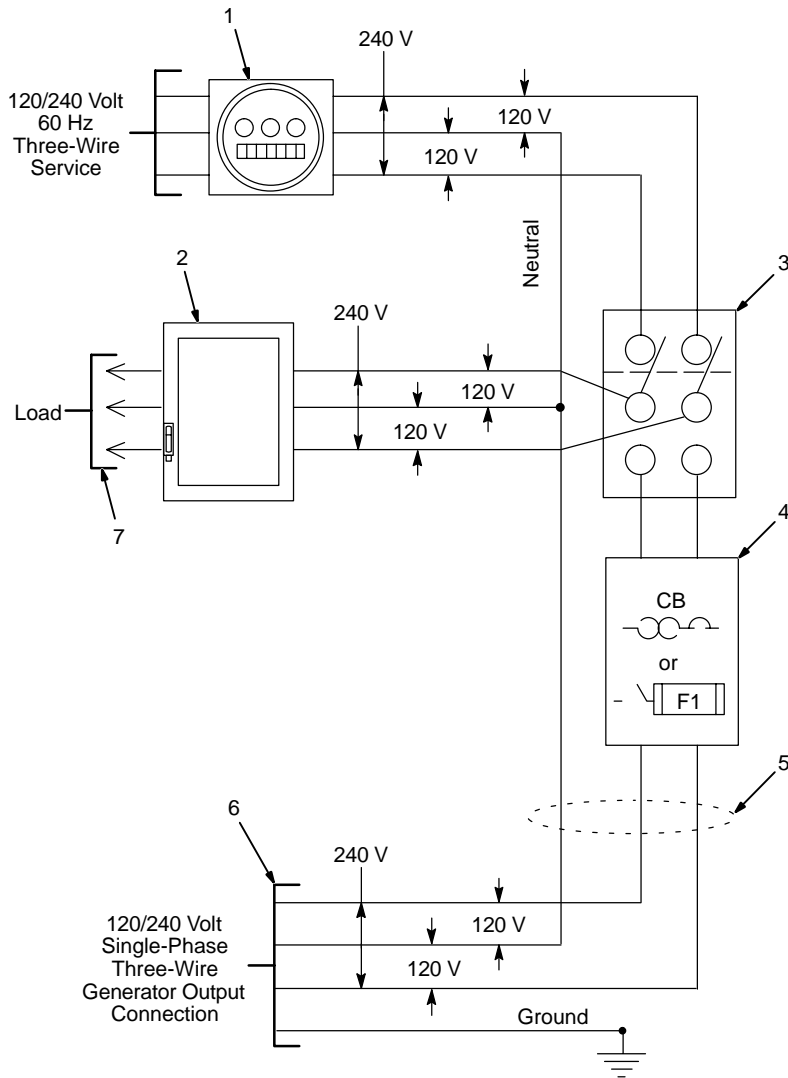
If motor does not start within 5 seconds, turn off power to prevent motor damage. Motor requires more power than generator can supply.

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

11-10. Typical Connections To Supply Standby Power



☞ *Customer-supplied equipment is required if generator is to supply standby power during emergencies or power outages.*



- 1 Power Company Service Meter
- 2 Main and Branch Overcurrent Protection
- 3 Double-Pole, Double-Throw Transfer Switch

Obtain and install correct switch. Switch rating must be same as or greater than the branch overcurrent protection.

- 4 Circuit Breakers or Fused Disconnect Switch

Obtain and install correct switch.

- 5 Extension Cord

Select as shown in Section 11-11.

- 6 Generator Connections

Connect terminals or plug of adequate amperage capacity to cord. Follow all applicable codes and safety practices.

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.

- 7 Load Connections

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



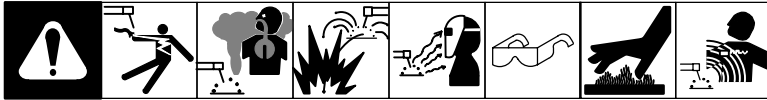
| Cord Lengths for 120 Volt Loads | | | | | | | |
|--|--------------|---|-----------|-----------|----------|----------|----------|
| ▲ If unit does not have GFCI receptacles, use GFCI-protected extension cord. | | | | | | | |
| Current (Amperes) | Load (Watts) | Maximum Allowable Cord Length in ft (m) 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

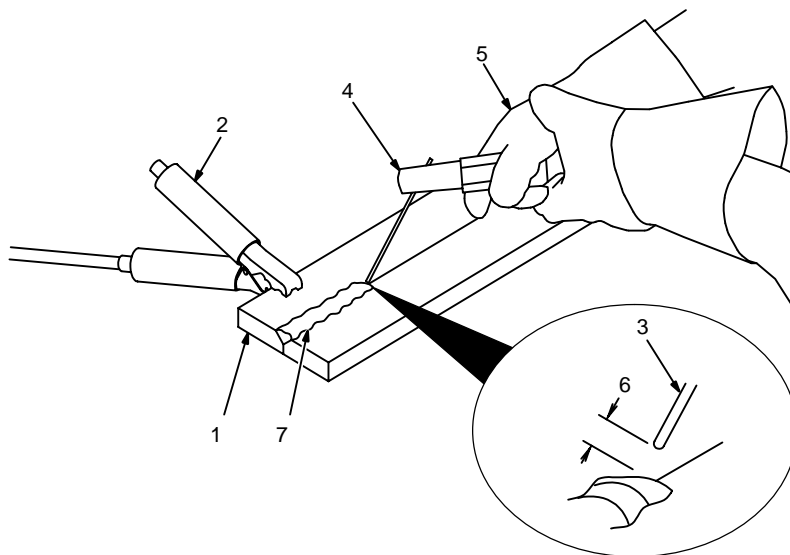
| Cord Lengths for 240 Volt Loads | | | | | | | |
|--|--------------|---|-----------|-----------|-----------|----------|----------|
| ▲ If unit does not have GFCI receptacles, use GFCI-protected extension cord. | | | | | | | |
| Current (Amperes) | Load (Watts) | Maximum Allowable Cord Length in ft (m) 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 12 – STICK WELDING (SMAW) GUIDELINES



12-1. 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 12-2).

4 Insulated Electrode Holder

5 Electrode Holder Position

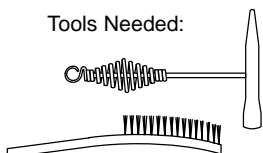
6 Arc Length

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 12/96 – ST-151 593

12-2. Electrode and Amperage Selection Chart

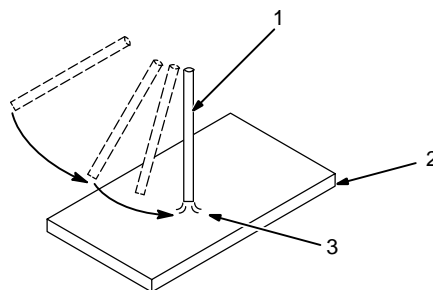
| ELECTRODE | DIAMETER | AMPERAGE RANGE | | | | | | | | |
|-------------|----------|----------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 |
| 6010 & 6011 | 3/32 | ■ | | | | | | | | |
| | 1/8 | | ■ | | | | | | | |
| | 5/32 | | | ■ | | | | | | |
| | 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

12-3. Striking an Arc – Scratch Start Technique

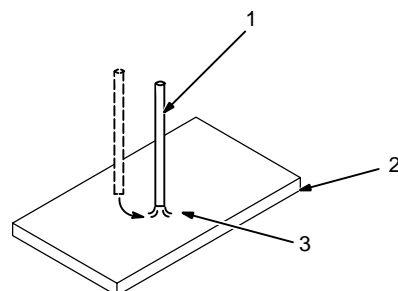


- 1 Electrode
- 2 Workpiece
- 3 Arc

Drag electrode across workpiece like striking a match; lift electrode slightly after touching work. If arc goes out electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

S-0049

12-4. Striking an Arc – Tapping Technique

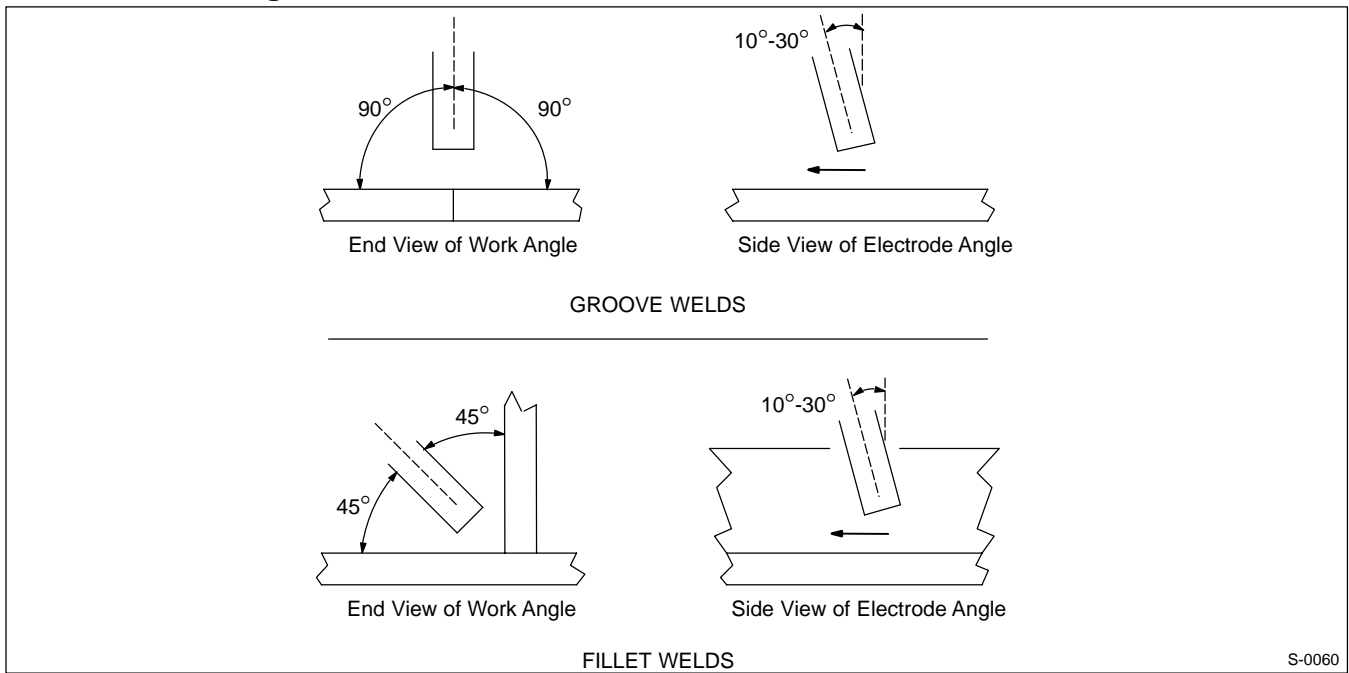


- 1 Electrode
- 2 Workpiece
- 3 Arc

Bring electrode straight down to workpiece; then lift slightly to start arc. If arc goes out, electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

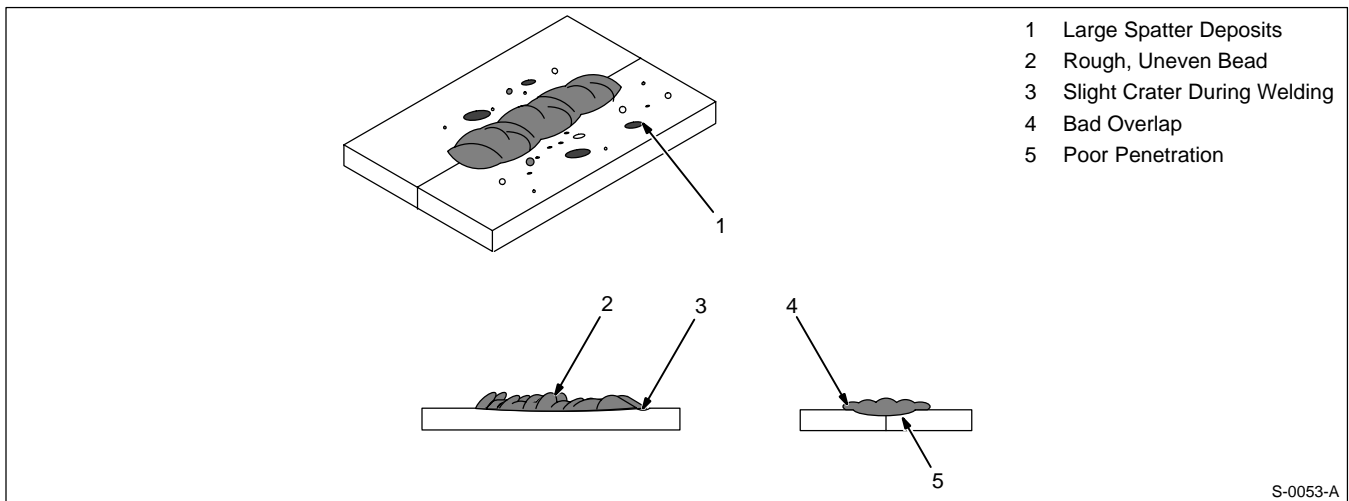
S-0050

12-5. Positioning Electrode Holder



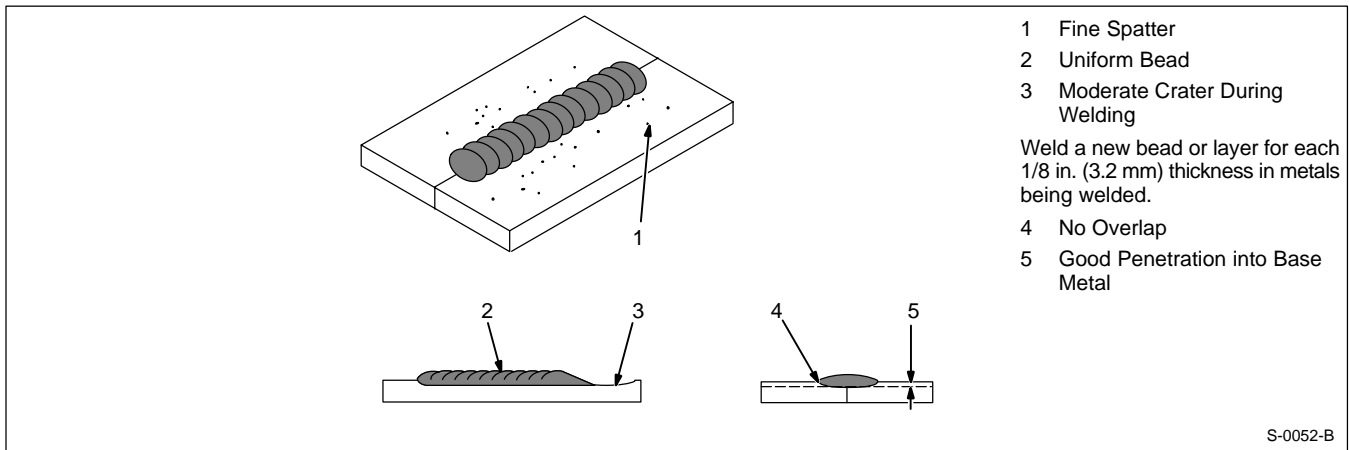
S-0060

12-6. Poor Weld Bead Characteristics



S-0053-A

12-7. Good Weld Bead Characteristics

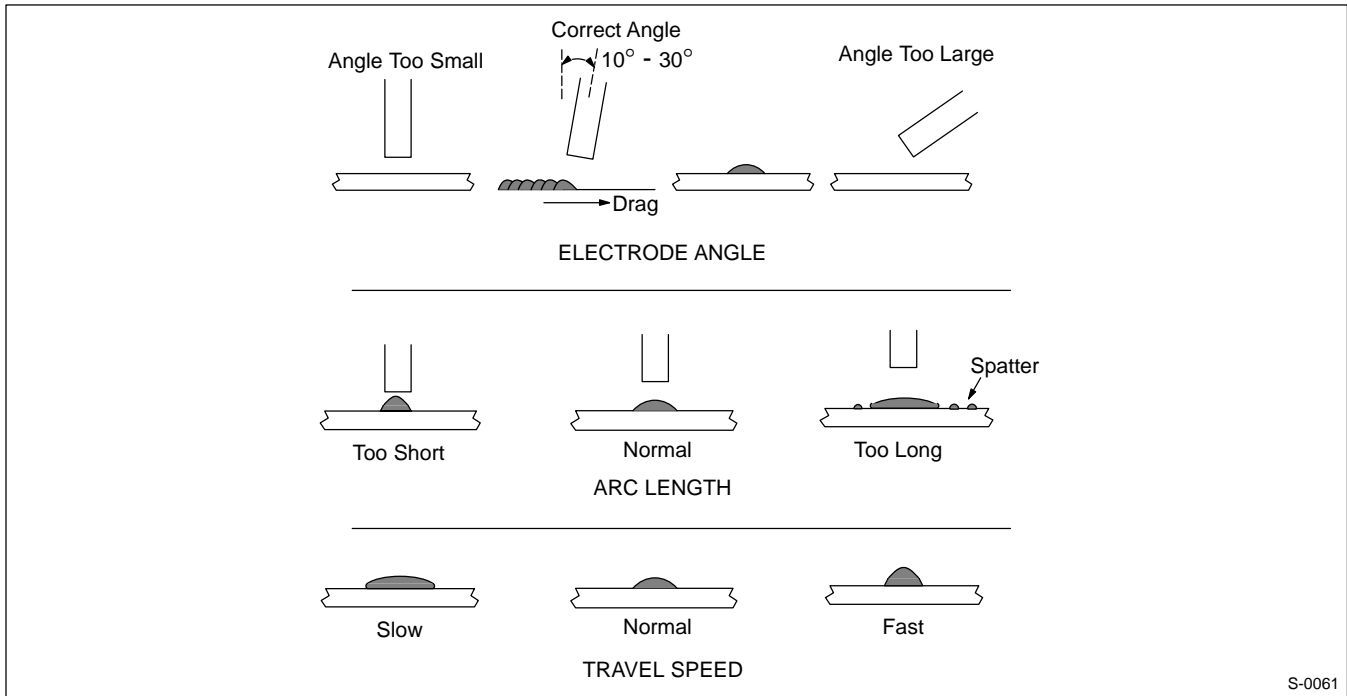


S-0052-B

12-8. Conditions That Affect Weld Bead Shape

NOTE

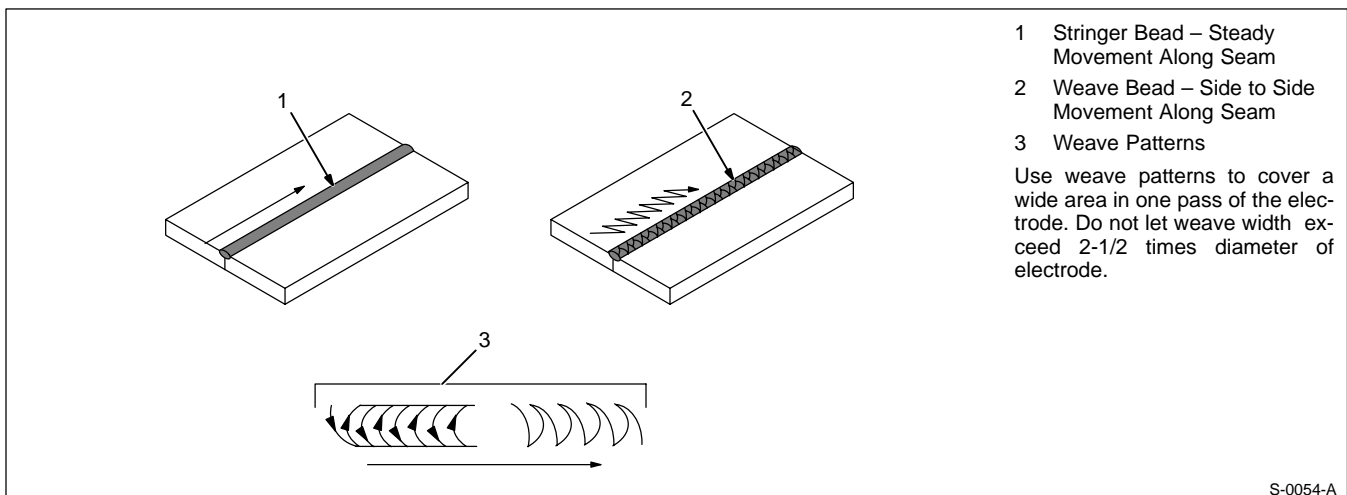
Weld bead shape is affected by electrode angle, arc length, travel speed, and thickness of base metal.



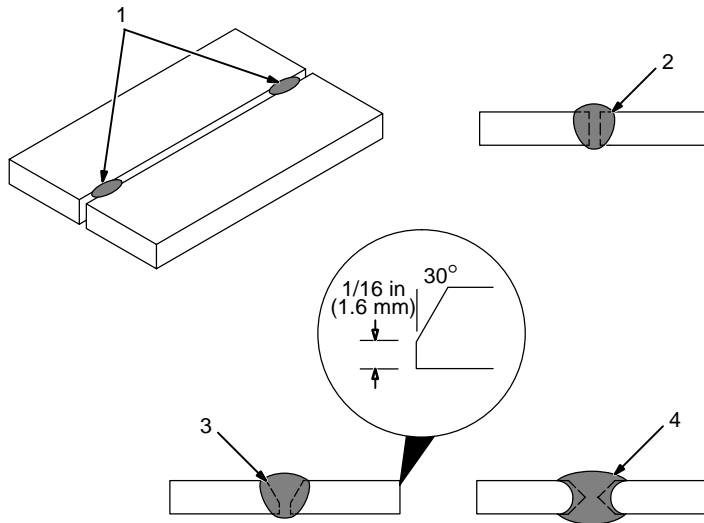
12-9. Electrode Movement During Welding

NOTE

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.



12-10. 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 oxyacetylene or plasma cutting equipment. Remove scale from material after cutting. A grinder can also be used to prepare bevels.

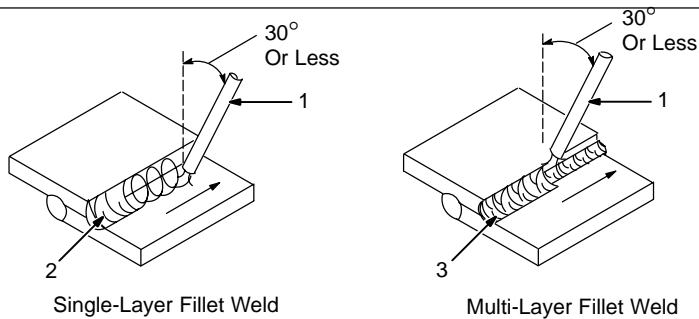
Create 30 degree angle of bevel on materials in V-groove welding.

4 Double V-Groove Weld

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

S-0662

12-11. Lap Joint



1 Electrode

2 Single-Layer Fillet Weld

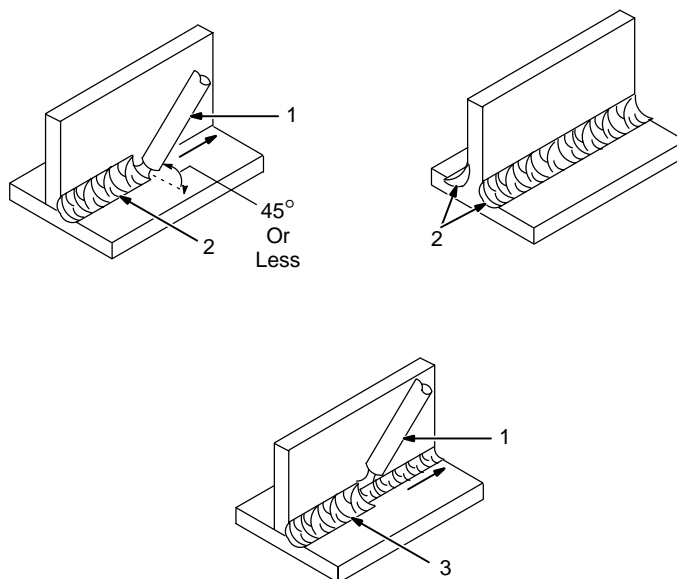
Move electrode in circular motion.

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

12-12. 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.

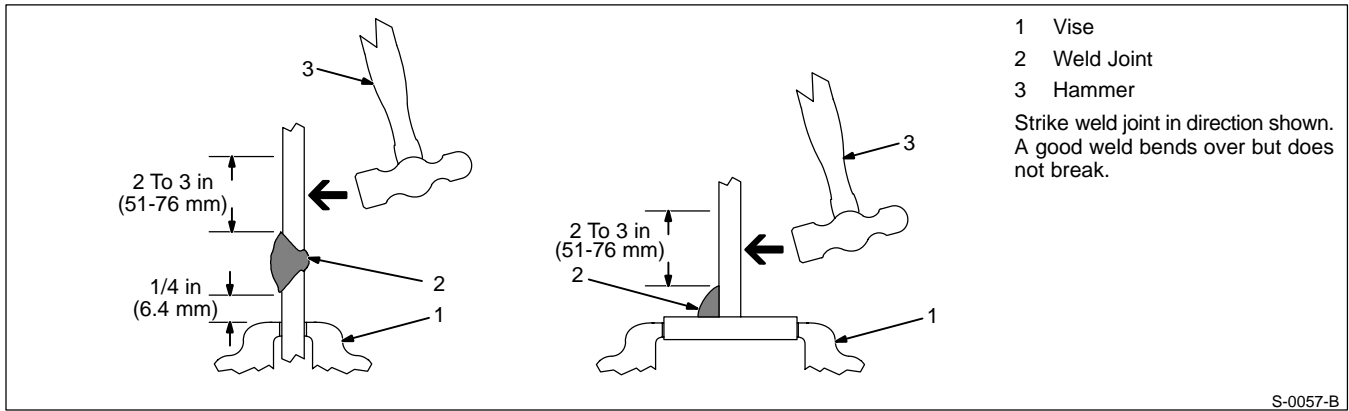
For maximum strength weld both sides of upright section.

3 Multi-Layer Deposits

Weld a second layer when a heavier fillet is needed. Use any of the weaving patterns shown in Section 12-9. Remove slag before making another weld pass.

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

12-13. Weld Test



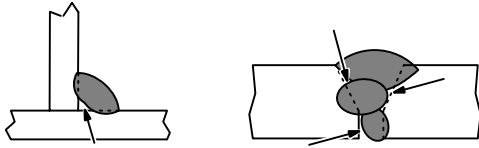
12-14. Troubleshooting – Porosity

| | <p>Porosity – small cavities or holes resulting from gas pockets in weld metal.</p> |
|----------------------|---|
| 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. |

12-15. Troubleshooting – Excessive Spatter

| | <p>Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.</p> |
|--|---|
| 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. |

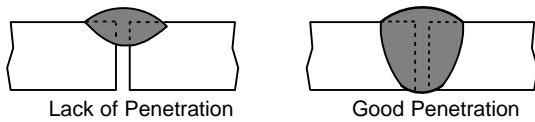
12-16. Troubleshooting – Incomplete Fusion



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. |

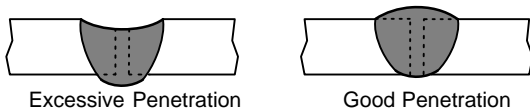
12-17. Troubleshooting – Lack Of Penetration



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. |

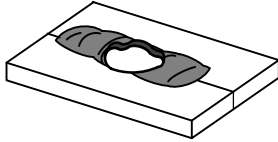
12-18. Troubleshooting – Excessive Penetration



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. |

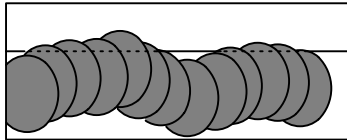
12-19. Troubleshooting – Burn-Through



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. |

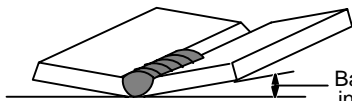
12-20. Troubleshooting – Waviness Of Bead



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. |

12-21. Troubleshooting – Distortion



Base metal moves in the direction of the weld bead.

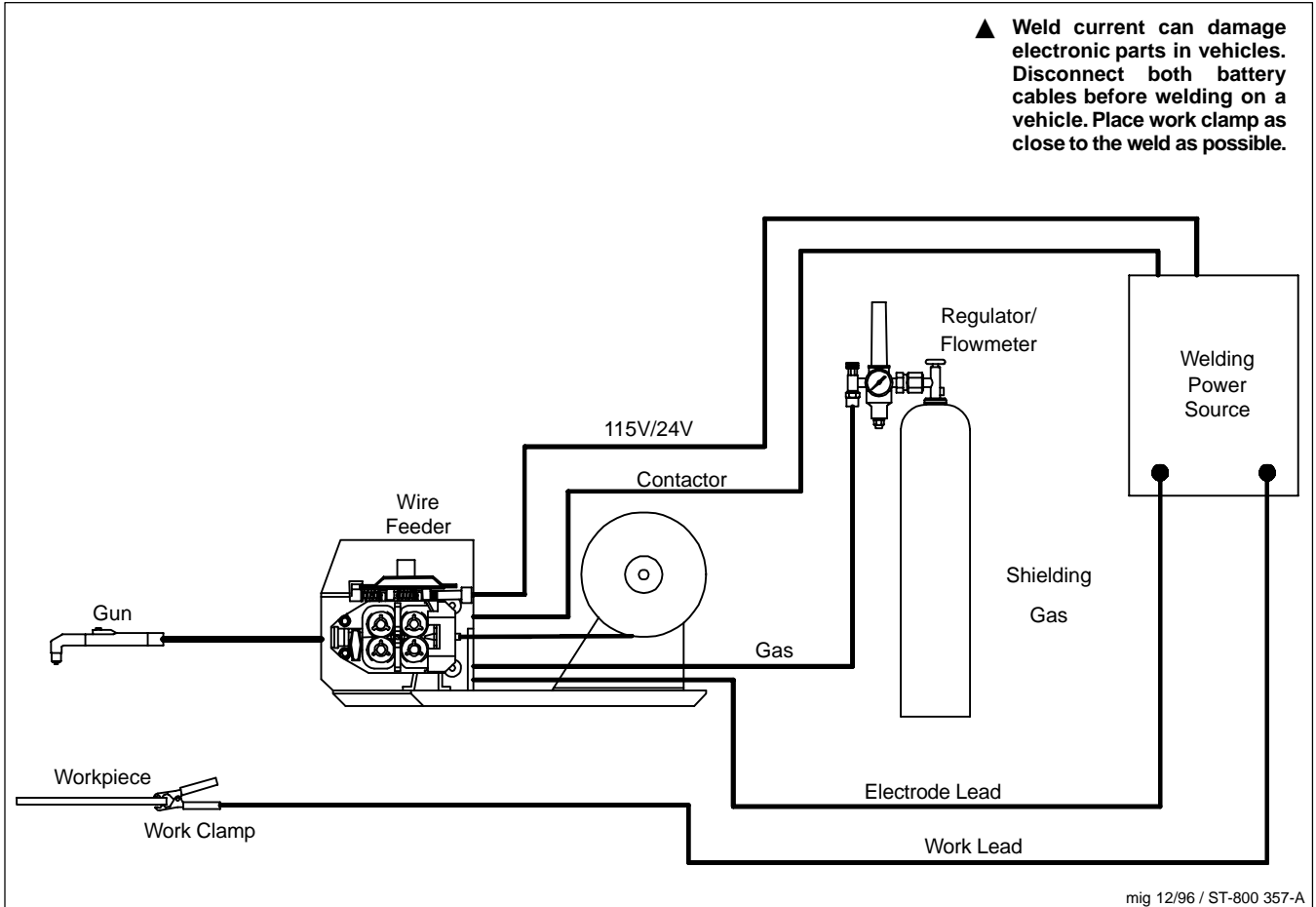
Distortion – contraction of weld metal during welding that forces base metal to move.

| 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 13 – MIG WELDING (GMAW) GUIDELINES



13-1. Typical MIG Process Connections

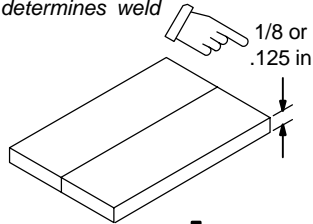


13-2. Typical MIG Process Control Settings

NOTE

These settings are guidelines only. Material and wire type, joint design, fitup, position, shielding gas, etc. affect settings. Test welds to be sure they comply to specifications.

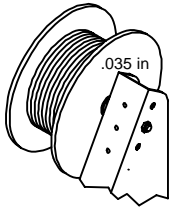
Material thickness determines weld parameters.



Convert Material Thickness to Amperage (A)

(.001 in = 1 ampere)

.125 in = 125 A



| Wire Size | Amperage Range |
|-----------|----------------|
| .030 in | 40 – 145 A |
| .035 in | 50 – 180 A |
| .045 in | 75 – 250 A |

Select Wire Size

| Wire Size | Recommendation | Wire Speed (Approx.) |
|-----------|-------------------|-----------------------|
| .030 in | 2 in per ampere | 2 x 125 A = 250 ipm |
| .035 in | 1.6 in per ampere | 1.6 x 125 A = 200 ipm |
| .045 in | 1 in per ampere | 1 x 125 A = 125 ipm |

Select Wire Speed (Amperage)

125 A based on 1/8 in material thickness

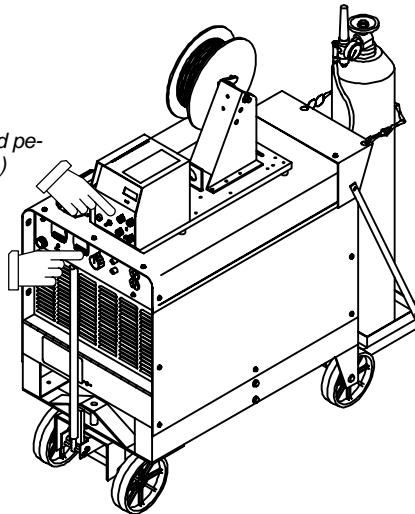
ipm = inch per minute

Low voltage: wire stubs into work
 High voltage: arc is unstable (spatter)
 Set voltage midway between high/low voltage.

Select Voltage

Wire speed (amperage) controls weld penetration (wire speed = burn-off rate)

Voltage controls height and width of weld bead.

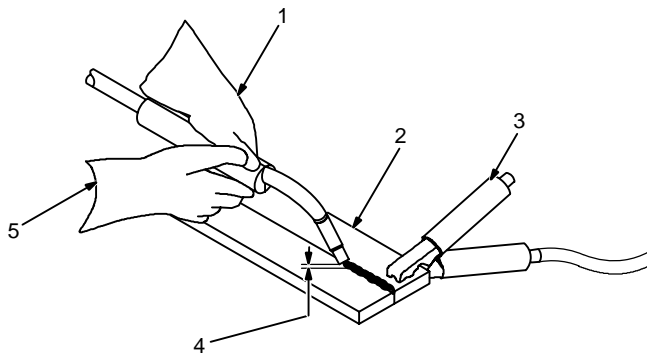


Ref. ST-801 865

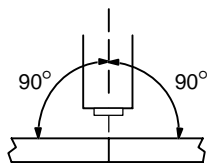
13-3. Holding And Positioning Welding Gun

NOTE

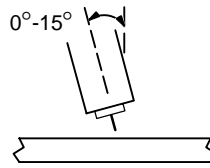
Welding wire is energized when gun trigger is pressed. Before lowering helmet and pressing trigger, be sure wire is no more than 1/2 in (13 mm) past end of nozzle, and tip of wire is positioned correctly on seam.



- 1 Hold Gun and Control Gun Trigger
- 2 Workpiece
- 3 Work Clamp
- 4 Electrode Extension (Stickout) 1/4 to 1/2 in (6 To 13 mm)
- 5 Cradle Gun and Rest Hand on Workpiece

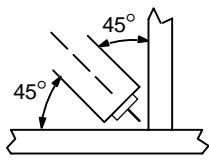


End View Of Work Angle

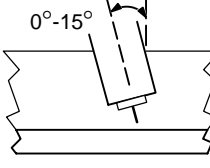


Side View Of Gun Angle

GROOVE WELDS



End View Of Work Angle



Side View Of Gun Angle

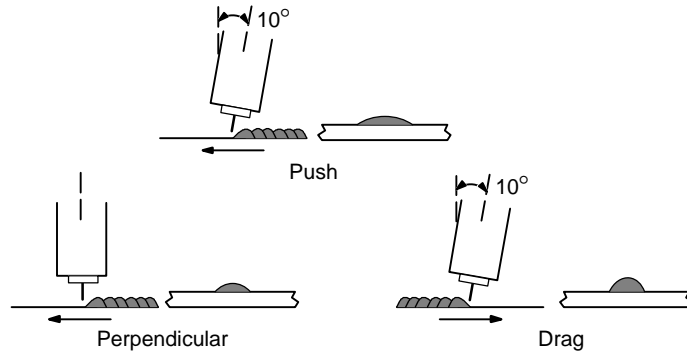
FILLET WELDS

S-0421-A

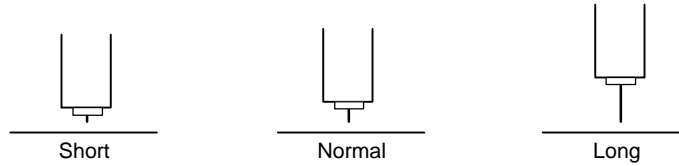
13-4. Conditions That Affect Weld Bead Shape

NOTE

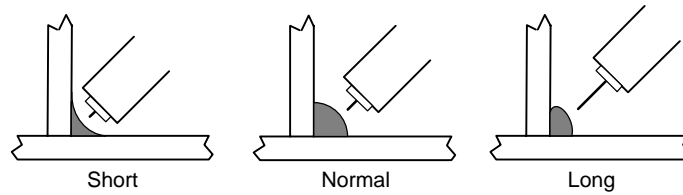
Weld bead shape depends on gun angle, direction of travel, electrode extension (stickout), travel speed, thickness of base metal, wire feed speed (weld current), and voltage.



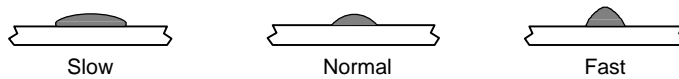
GUN ANGLES AND WELD BEAD PROFILES



ELECTRODE EXTENSIONS (STICKOUT)



FILLET WELD ELECTRODE EXTENSIONS (STICKOUT)



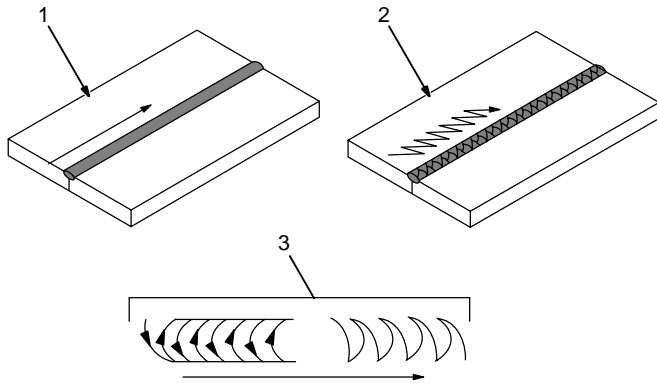
GUN TRAVEL SPEED

S-0634

13-5. Gun Movement During Welding

NOTE

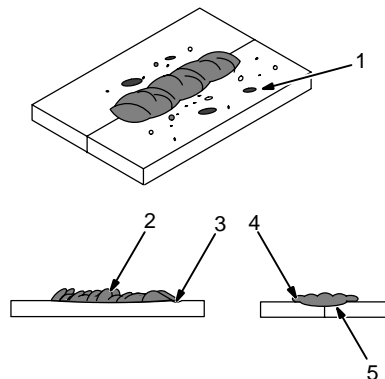
Normally, a single stringer bead is satisfactory for most narrow groove weld joints; however, for wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads works better.



- 1 Stringer Bead – Steady Movement Along Seam
 - 2 Weave Bead – Side To Side Movement Along Seam
 - 3 Weave Patterns
- Use weave patterns to cover a wide area in one pass of the electrode.

S-0054-A

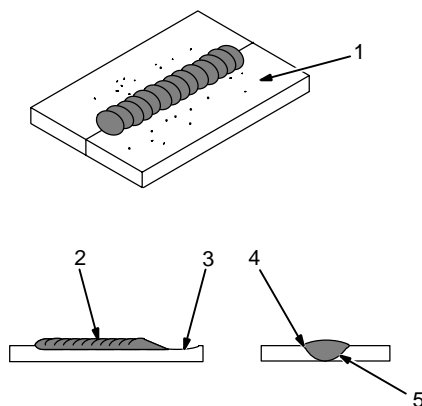
13-6. Poor Weld Bead Characteristics



- 1 Large Spatter Deposits
- 2 Rough, Uneven Bead
- 3 Slight Crater During Welding
- 4 Bad Overlap
- 5 Poor Penetration

S-0053-A

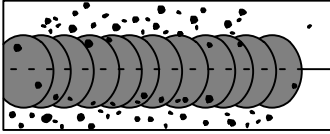
13-7. Good Weld Bead Characteristics



- 1 Fine Spatter
 - 2 Uniform Bead
 - 3 Moderate Crater During Welding
- Weld a new bead or layer for each 1/8 in (3.2 mm) thickness in metals being welded.
- 4 No Overlap
 - 5 Good Penetration into Base Metal

S-0052-B

13-8. Troubleshooting – Excessive Spatter

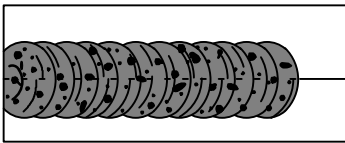


Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.

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. |

13-9. Troubleshooting – Porosity

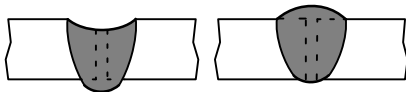


Porosity – small cavities or holes resulting from gas pockets in weld metal.

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. |

13-10. Troubleshooting – Excessive Penetration



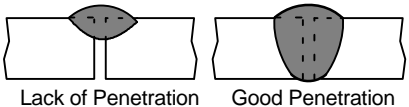
Excessive Penetration Good Penetration

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

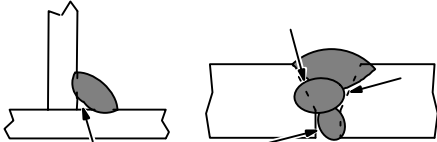
S-0639

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

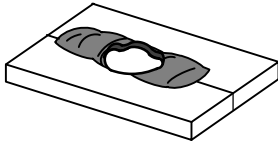
13-11. Troubleshooting – Lack Of Penetration

|  <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. | |

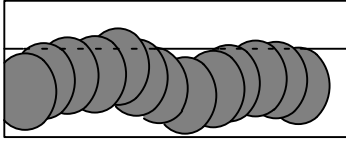
13-12. Troubleshooting – Incomplete Fusion

|  <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. | |

13-13. 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. | |

13-14. Troubleshooting – Waviness Of Bead

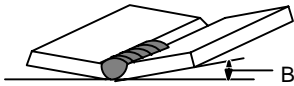


Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.

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. |

13-15. 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. |


13-16. 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% O ₂ | Flat & Horizontal ⁵ Fillet | | Flat & Horizontal ⁵ Fillet | | | |
| Argon + 2% O ₂ | Flat & Horizontal ⁵ Fillet | | Flat & Horizontal ⁵ Fillet | | | |
| Argon + 5% O ₂ | Flat & Horizontal ⁵ Fillet | | | | | |
| Argon + 8% CO ₂ | Flat & Horizontal ⁵ Fillet | All Positions | | | | |
| Argon + 25% CO ₂ | Flat & Horizontal ¹ Fillet | All Positions | | All Positions ³ | | |
| Argon + 50% CO ₂ | | All Positions | | | | |
| CO ₂ | Flat & Horizontal ¹ Fillet | All Positions | | | | |
| Helium | | | | | All Positions ² | |
| Argon + Helium | | | | | All Positions ² | |
| Tri-Mix ⁴ | | | | 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

SECTION 14 – PARTS LIST

 Hardware is common and not available unless listed.

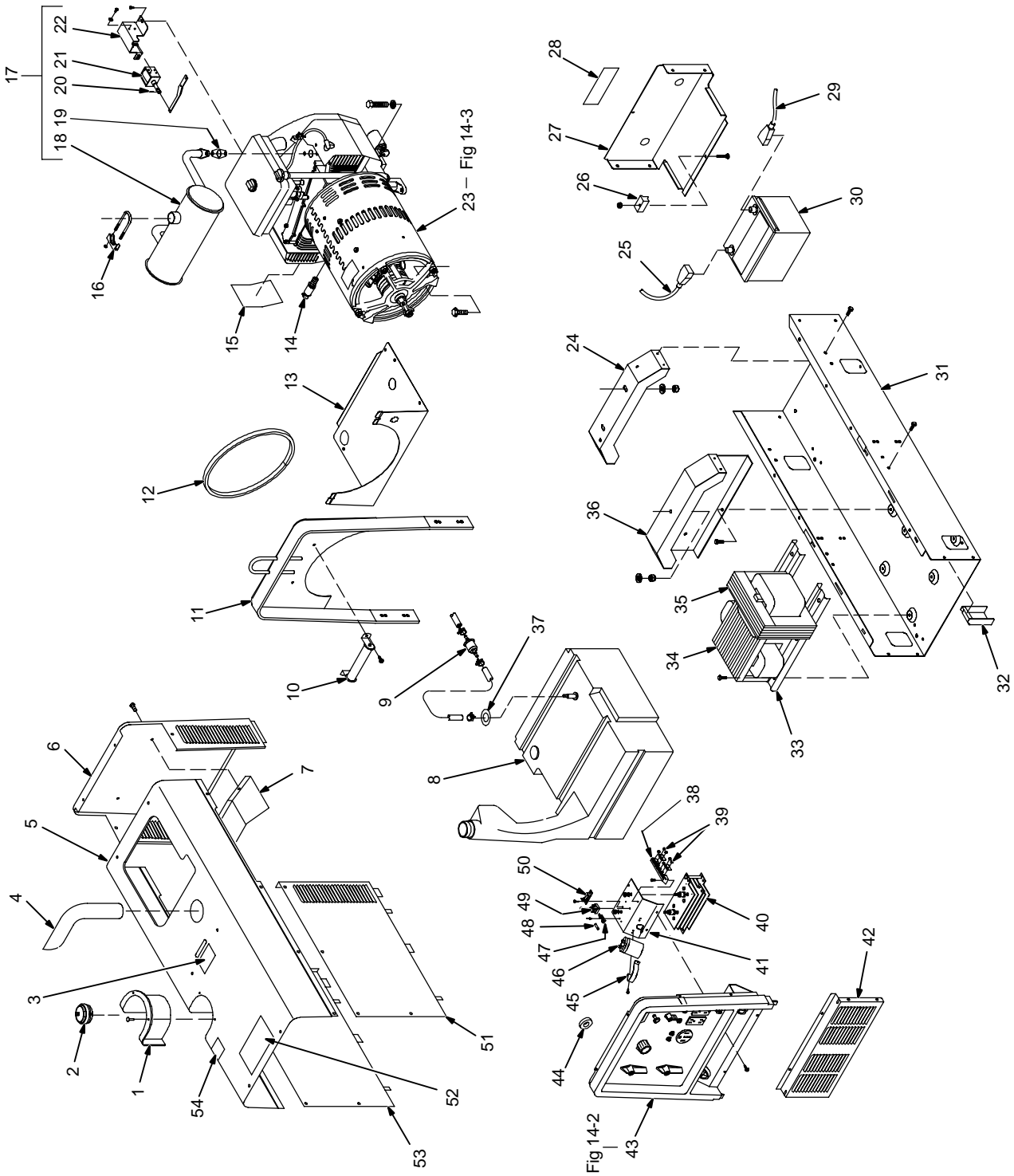


Figure 14-1. Main Assembly (Onan Engine)

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|-----------------------------------|------------|-------------|---|----------|
| Figure 14-1. Main Assembly | | | | |
| ... | | 1 181 881 | GROMMET, neck filler | 1 |
| ... | | 2 147 601 | CAP, tank screw-on w/vent | 1 |
| ... | | 3 108 487 | LABEL, warning: falling equipment | 1 |
| ... | | 4 183 433 | PIPE, exhaust | 1 |
| ... | | 5 +183 221 | COVER, top (Onan) | 1 |
| ... | | 5 +♦185 354 | COVER, top stainless (Onan) | 1 |
| ... | | 5 +183 222 | COVER, top (Kohler) | 1 |
| ... | | 5 +♦185 355 | COVER, top stainless (Kohler) | 1 |
| ... | | 6 182 365 | PANEL, rear upper | 1 |
| ... | | 6 ♦185 351 | PANEL, rear upper stainless | 1 |
| ... | | 7 183 626 | BAFFLE, engine air (Onan) | 1 |
| ... | | 010 493 | BUSHING, snap-in nyl | 1 |
| ... | | 185 323 | SEAL, baffle engine (Onan) | 2 |
| ... | | 8 182 079 | TANK, fuel 10gal | 1 |
| ... | | 178 632 | FITTING, stand pipe hose | 1 |
| ... | | 124 253 | BUSHING, fuel tank | 1 |
| ... | | 182 922 | BUSHING, fuel tank 1.210 ID | 1 |
| ... | | 182 925 | GAUGE, fuel | 1 |
| ... | | 9 121 652 | FILTER KIT, fuel w/clamps | 1 |
| ... | R2 | 10 184 278 | RESISTOR, WW fxd 225W 5 ohm | 1 |
| ... | | 11 159 914 | UPRIGHT, base | 1 |
| ... | | 12 164 928 | SEAL, barrel | 1 |
| ... | | 13 183 166 | PANEL, rear lower | 1 |
| ... | | 14 165 271 | VALVE, oil drain 3/8-18NPTF (included w/engine) | 1 |
| ... | | 15 165 623 | LABEL, engine maintenance (Onan) | 1 |
| ... | | 15 173 088 | LABEL, engine maintenance (Kohler) | 1 |
| ... | | 16 183 314 | CLAMP, muffler | 1 |
| ... | | 17 +182 896 | ENGINE, gas elec start (Onan) | 1 |
| ... | | 18 183 434 | MUFFLER, exhaust engine | 1 |
| ... | | 19 065 313 | MUFFLER GASKET | 2 |
| ... | | 20 059 926 | PIN, spring CS .093 x 1.000 | 1 |
| ... | TS1 | 21 165 810 | SOLENOID, 14VDC .53A | 1 |
| ... | | 22 165 522 | BRACKET, mtg solenoid | 1 |
| ... | | 137 046 | TUNE-UP & FILTER KIT, (Onan) | 1 |
| ... | | 065 251 | OIL FILTER | 1 |
| ... | | 121 652 | FILTER/CLAMPS, fuel | 1 |
| ... | | 064 617 | ELEMENT, air cleaner | 1 |
| ... | | 065 709 | SPARK PLUG | 2 |
| ... | | 17 +183 169 | ENGINE, gas elec start (Kohler) | 1 |
| ... | | 18 183 435 | MUFFLER | 1 |
| ... | | 165 271 | VALVE, oil drain 3/8-18NPFT | 1 |
| ... | TS1 | | SOLENOID, (see engine parts list) | 1 |
| ... | | | BRACKET, mtg solenoid (see engine parts list) | 1 |
| ... | | 180 096 | TUNE UP & FILTER KIT, (Kohler) | 1 |
| ... | | 066 698 | OIL FILTER | 1 |
| ... | | 121 652 | FILTER/CLAMPS, fuel | 1 |
| ... | | 067 272 | ELEMENT, air cleaner | 1 |
| ... | | 067 273 | AIR FILTER, wrapper | 1 |
| ... | | 067 007 | SPARK PLUG | 2 |
| ... | | 147 551 | TOOL, puller rotor | 1 |
| ... | | 177 126 | TOOL, puller rotor (Kohler) | 1 |
| ... | | 23 Fig 14-3 | GENERATOR | 1 |
| ... | | 24 159 905 | BRACKET, mtg engine (Onan) | 1 |
| ... | | 24 173 043 | BRACKET, mtg engine (Kohler) | 1 |
| ... | | 25 167 730 | CABLE, bat neg (Onan) | 1 |

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|------------|----------|--|----------|
| Figure 14-1. Main Assembly (Continued) | | | | |
| | | 165 600 | CABLE, bat neg (Onan) | 1 |
| 25 | | 082 319 | CABLE, bat neg 17.750 (Kohler) | 1 |
| | | 172 669 | CABLE, bat neg 11.000 (Kohler) | 1 |
| 26 | | 182 935 | HOLD DOWN, battery | 1 |
| 27 | | +182 897 | DOOR, access battery | 1 |
| 28 | | 168 385 | LABEL, warning battery | 1 |
| 29 | | 167 731 | CABLE, bat pos (included w/engine) (Onan) | 1 |
| 29 | | 173 921 | CABLE, bat pos 28.000 (Kohler) | 1 |
| 30 | | 168 037 | BATTERY, stor 12V 415crk 95rsv GP58 dry | 1 |
| 31 | | 182 845 | PAN, base | 1 |
| 32 | | 181 057 | COVER, base | 1 |
| 33 | | 176 300 | STAB/REACTOR ASSEMBLY | 1 |
| 34 | AC-Z | 176 301 | REACTOR | 1 |
| 35 | DC-Z | 165 578 | STABILIZER | 1 |
| 36 | | 182 928 | BRACKET, mtg generator | 1 |
| 37 | | 174 001 | SEAL, fuel hose fitting | 1 |
| 38 | 1T | 172 661 | BLOCK, term 20A 8P | 1 |
| 39 | | 173 734 | LINK, jumper | 2 |
| 40 | SR1 | 142 503 | RECTIFIER, si 1 ph 300A 400PIV | 1 |
| 41 | | 172 625 | BRACKET, mtg rec/comp | 1 |
| 42 | | 180 628 | PANEL, front lower | 1 |
| 43 | | Fig 14-2 | PANEL, front w/components | 1 |
| 44 | CT1 | 179 494 | TRANSFORMER, current sensing | 1 |
| 45 | | 177 136 | CLAMP, capacitor 1.375dia clip | 1 |
| 46 | C1 | 176 719 | CAPACITOR, elctlt 100uf 75VDC | 1 |
| 47 | | 172 731 | HOLDER, fuse mintr | 1 |
| 48 | F1 | *169 296 | FUSE, mintr gl 25A 125V | 1 |
| 49 | SR2 | 035 704 | RECTIFIER, integ 40A 800V | 1 |
| 50 | D4 | 135 184 | DIODE BOARD | 1 |
| 51 | | 182 367 | PANEL, side RH | 1 |
| 51 | | ◆185 352 | PANEL, side RH stainless | 1 |
| 52 | | 182 761 | LABEL, warning general precautionary | 1 |
| | RC4 | 116 045 | CONNECTOR & PINS | 1 |
| 53 | | 182 366 | PANEL, side LH | 1 |
| 53 | | ◆185 353 | PANEL, side LH stainless | 1 |
| 54 | | 165 818 | LABEL, warning engine fuel | 1 |
| | | 183 496 | LABEL KIT | 1 |
| | | 167 640 | CONNECTOR, pins/soc | 1 |
| | RC6 | 168 844 | CONNECTOR, rect | 1 |
| | RC7 | | CONNECTOR, part of TS1 (see engine parts list) | 1 |
| | PLG5 | 116 045 | CONNECTOR & PINS | 1 |
| | PLG6 | 136 810 | CONNECTOR & PINS | 1 |
| | PLG7 | | CONNECTOR, (see engine parts list) | 1 |
| | RC5 | | CONNECTOR, (see engine parts list) | 1 |

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

◆ Optional

* Recommended Spare Parts.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|----------|------------|----------|-------------|----------|
|----------|------------|----------|-------------|----------|

Figure 14-2. Panel, Front w/Components (Fig 14-1 Item 43) (Continued)

| | | | | |
|----|-------------|----------|---|---|
| 1 | S1 | 184 754 | SWITCH, polarity | 1 |
| 2 | | | NAMEPLATE | 1 |
| 3 | | 183 171 | PANEL, front | 1 |
| 4 | S3 | 183 148 | SWITCH, selector | 1 |
| 5 | PC1 | 184 731 | MODULE, pull to idle | 1 |
| 6 | R1 | 117 243 | RHEOSTAT, WW 100W 10 ohm | 1 |
| 7 | S2 | 176 606 | SWITCH, ignition | 1 |
| 8 | RC2,3 | 167 657 | RECEPTACLE, str dx grd 2P3W 15A 125V | 2 |
| 8 | GFCI 2,3 | ◆147 939 | RECEPTACLE, str dx grd 2P3W 15A 125V GFCI | 2 |
| 9 | CB1,2 | 117 501 | CIRCUIT BREAKER, 1P 40A 250VAC | 2 |
| 10 | CB3,4 | 093 996 | CIRCUIT BREAKER, 1P 20A 250VAC | 2 |
| 10 | CB3,4 | ◆093 995 | CIRCUIT BREAKER, 1P 15A 250VAC | 2 |
| 11 | HM | 145 247 | METER, hour | 1 |
| 12 | | 182 870 | CONTROL, push/pull | 1 |
| 13 | | 119 014 | LEVER, switch | 1 |
| 14 | R3,VR1 | 046 819 | SUPPRESSOR | 1 |
| 15 | Work, Elect | 099 255 | TERMINAL, pwr output | 2 |
| 16 | | 083 030 | STUD, brs .250-20 x 1.750 | 1 |
| 17 | | 010 915 | WASHER, flat .250 ID brs | 3 |
| 18 | | 601 836 | NUT, .250-20 brs | 3 |
| 19 | | 159 921 | BEZEL | 1 |
| 20 | | 147 195 | NUT, .375-27 nyl | 4 |
| 21 | RC1 | 182 954 | RECEPTACLE, 50A | 1 |
| | | 119 172 | PLUG, str 50A 125/250V | |
| 22 | | 148 956 | HANDLE, switch | 2 |
| 23 | | 097 924 | KNOB, pointer | 1 |

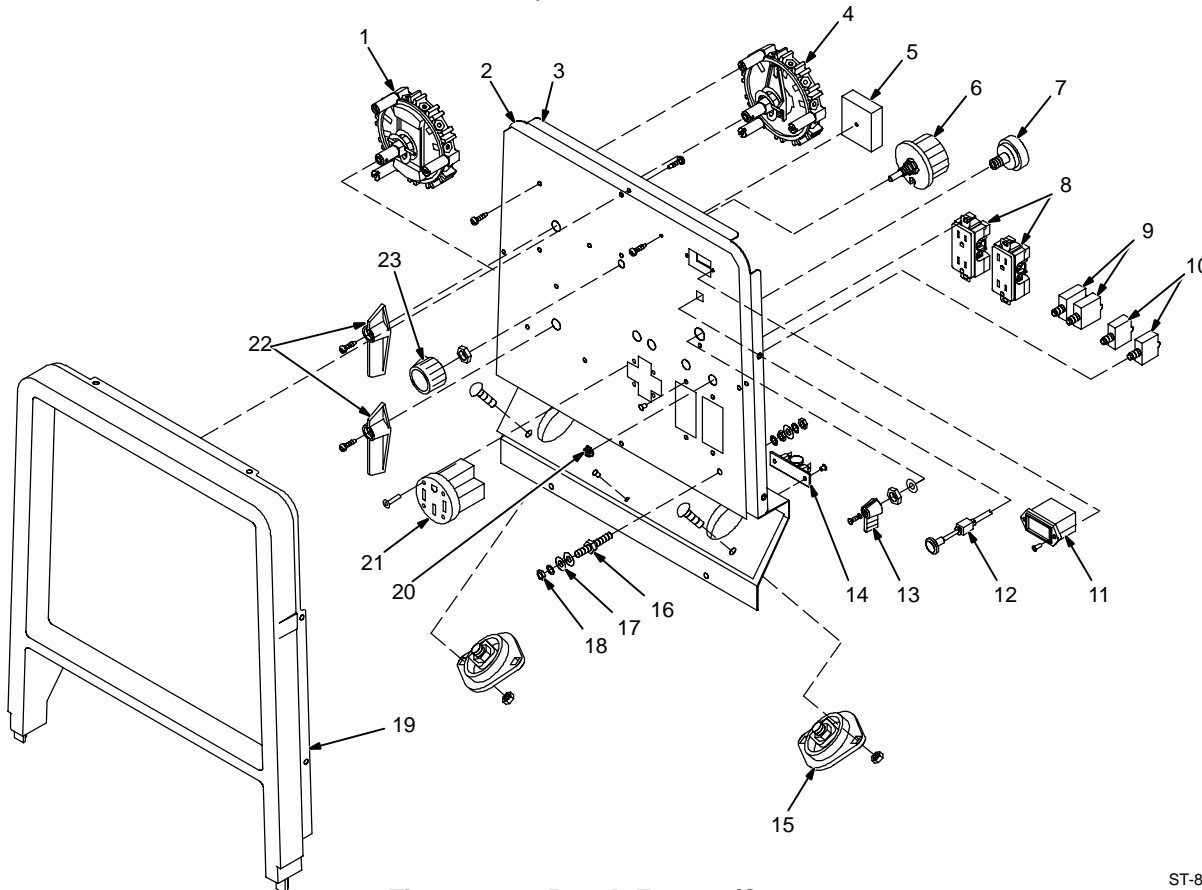


Figure 14-2. Panel, Front w/Components

ST-801 747

◆Optional

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

| Item No. | Part No. | Description | Quantity |
|----------|----------|-------------|----------|
|----------|----------|-------------|----------|

Figure 14-3. Generator (Fig 14-1 Item 23)

| | | | | |
|-----|----|----------|--|---|
| ... | 1 | 013 367 | .. LABEL, warning moving parts | 1 |
| ... | 2 | 165 818 | .. LABEL, warning engine fuel (Onan) | 1 |
| ... | 3 | +183 178 | .. STATOR, generator | 1 |
| ... | 4 | 181 128 | .. ROTOR, generator | 1 |
| ... | 5 | 181 143 | .. BEARING, ball rdl sgl row .984 x 2.047 x .5 | 1 |
| ... | 6 | 160 566 | .. FAN, rotor | 1 |
| ... | 7 | 160 567 | .. ADAPTER, engine (Onan) | 1 |
| ... | 7 | 172 683 | .. ADAPTER, engine (Kohler) | 1 |
| ... | 8 | 142 156 | .. SCREW, .375-16 x 1.750hexhd | 4 |
| ... | 9 | 160 573 | .. STUD, stl .375-16 x 17.125 | 4 |
| ... | 10 | 180 556 | .. BRUSH HOLDER ASSEMBLY | 1 |
| ... | 11 | 010 910 | .. WASHER, flat .406 ID stl | 4 |
| ... | 12 | 010 909 | .. NUT, .375-16 stl | 4 |
| ... | 13 | 183 422 | .. ENDBELL, (consisting of) | 1 |
| ... | 14 | 183 419 | .. O-RING | 1 |

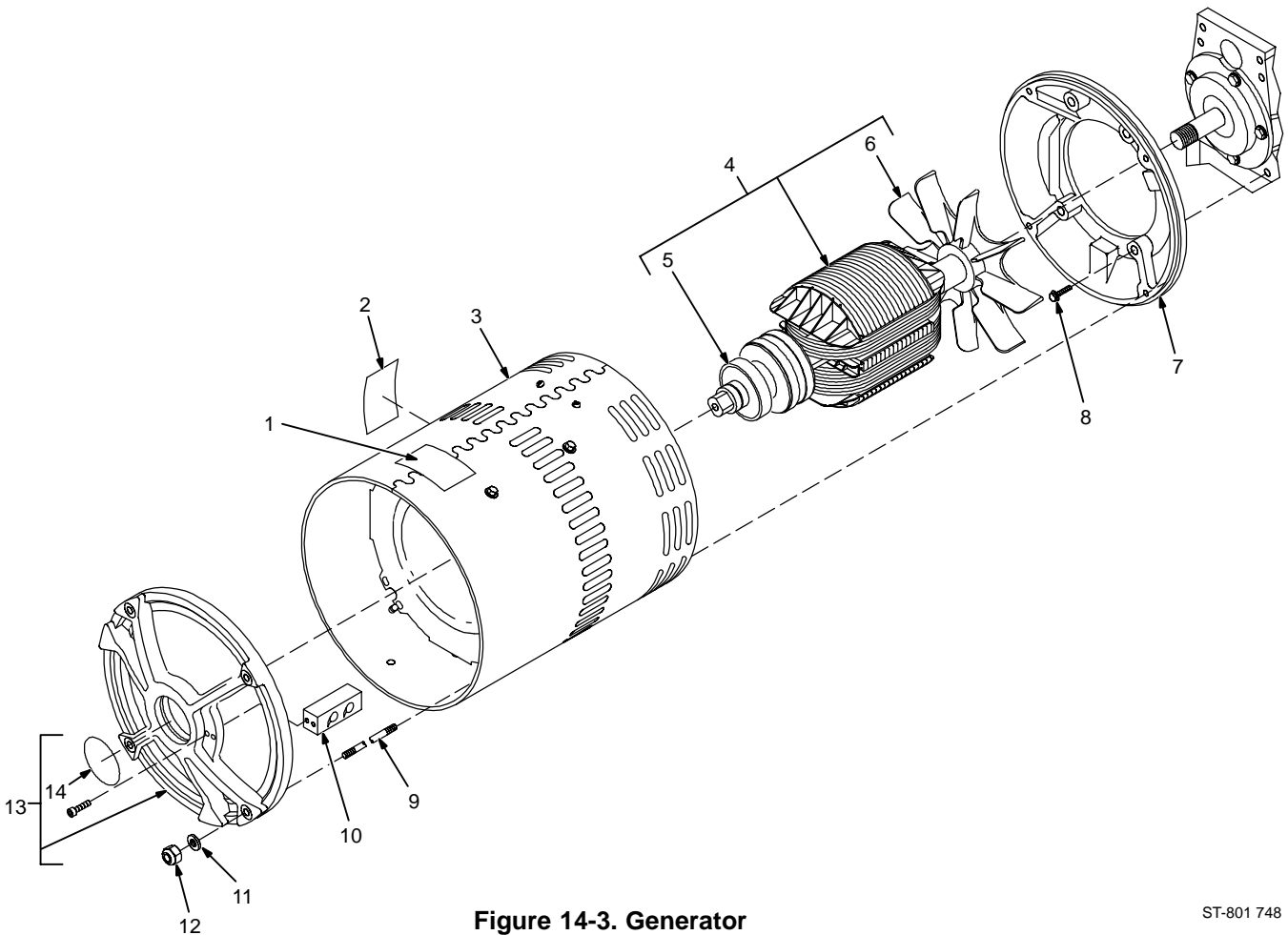


Figure 14-3. Generator

ST-801 748

+When ordering a component originally displaying a precautionary label, the label should also be ordered.
To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.



Effective January 1, 1997
(Equipment with a serial number preface of "KH" or newer)

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

LIMITED WARRANTY - Subject to the terms and conditions below, Miller Electric Mfg. Co., Appleton, Wisconsin, warrants to its original retail purchaser that new Miller equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by Miller. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

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 date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to a North American distributor or eighteen months after the equipment is sent to an International distributor.

- 1. 5 Years Parts - 3 Years Labor
* Original main power rectifiers
* Inverters (input and output rectifiers only)
2. 3 Years - Parts and Labor
* Transformer/Rectifier Power Sources
* Plasma Arc Cutting Power Sources
* Semi-Automatic and Automatic Wire Feeders
* Inverter Power Supplies
* Intelligit
* Robots
* Engine Driven Welding Generators
(NOTE: Engines are warranted separately by the engine manufacturer.)
3. 1 Year - Parts and Labor
* Motor Driven Guns (w/exception of Spoolmate 185)
* Process Controllers
* Positioners and Controllers
* Automatic Motion Devices
* Orbital Weld Heads
* IHPS Power Sources
* Water Coolant Systems
* HF Units
* Grids
* Spot Welders
* Load Banks
* SDX Transformers
* Miller Cyclomatic Equipment
* Running Gear/Trailers
* Plasma Cutting Torches (except APT, ZIPCUT & PLAZCUT Models)
* Deutz Engines (outside North America)
* 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.)
4. 6 Months - Batteries
5. 90 Days - Parts and Labor
* MIG Guns/TIG Torches

- * APT, ZIPCUT & PLAZCUT Model Plasma Cutting Torches
* Remote Controls
* Accessory Kits
* Replacement Parts (No labor)
* Spoolmate 185

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

- 1. 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.
2. Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear.
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.

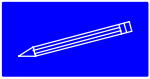
In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller's option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (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.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the U.S.A. do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, so the above limitation or exclusion may not apply to you. This warranty provides specific legal rights, and other rights may be available, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be waived, the limitations and exclusions set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.



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 |



Resources Available

Always provide Model Name and Serial/Style Number.

| | |
|--|---|
| Contact your Distributor for: | Welding Supplies and Consumables |
| To locate distributor nearest you call 1-800-4-A-Miller | Options and Accessories |
| | Personal Safety Equipment |
| | Service and Repair |
| | Replacement Parts |
| | Training (Schools, Videos, Books) |
| | Owner's Manuals |
| | Technical Manuals (Servicing Information and Parts) |
| | Circuit Diagrams |
| | Welding Process Handbooks |

| | |
|--|--|
| Contact the Delivering Carrier for: | File a claim for loss or damage during shipment. |
| For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department. | |

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