EnPak®

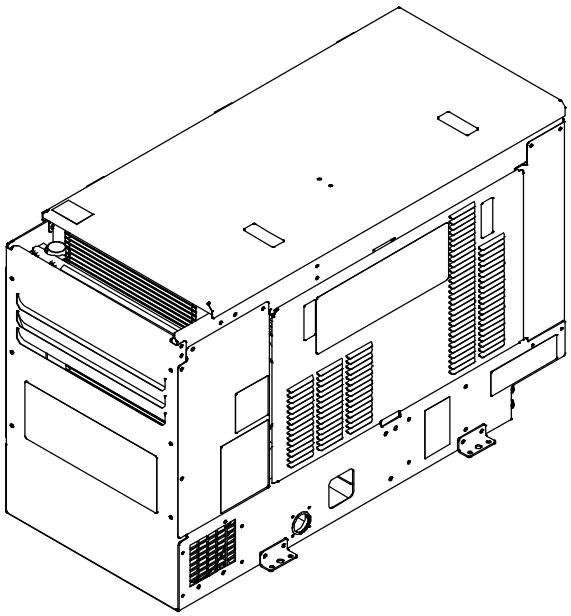
Miller

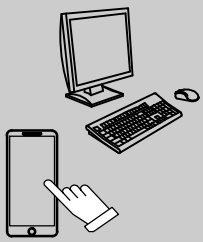
OM-261050J 2017–03

Description

Mobile Utility Unit With Air Compressor, Hydraulic Pump, And Auxiliary Power Capability

EnPak® A60





For product information, Owner's Manual translations, and more, visit

www.MillerWelds.com/EnPak

OWNER'S MANUAL

File: Engine Drive

From Miller to You

Thank you and *congratulations* on choosing EnPak® by 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.

ISO 9001 REGISTERED QUALITY SYSTEM

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

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

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

EnPak Miller

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SECTION 1 – SAFETY PRECAUTIONS – READ BEFORE USING

Protect yourself and others from injury — read, follow, and save these important safety precautions and operating instructions.

1-1. Symbol Usage

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

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

NOTICE *– Indicates statements not related to personal injury.*

☞ *Indicates special instructions.*

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

1-2. Engine Hazards

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

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

During operation, keep everybody, especially children, away.

BATTERY EXPLOSION can injure.

- Always wear a face shield, rubber gloves, and protective clothing when working on a battery.
- Stop engine before disconnecting or connecting battery cables, battery charging cables (if applicable), or servicing battery.
- Do not allow tools to cause sparks when working on a battery.
- Do not use this unit to charge batteries or jump start vehicles unless it has a battery charging feature designed for this purpose.
- Observe correct polarity (+ and –) on batteries.
- Disconnect negative (–) cable first and connect it last.
- Keep sparks, flames, cigarettes, and other ignition sources away from batteries. Batteries produce explosive gases during normal operation and when being charged.
- Follow battery manufacturer's instructions when working on or near a battery.

BATTERY CHARGING OUTPUT can injure.

(Battery charging feature not present on all models.)

- Have only qualified persons do battery charging work.
- Charge lead-acid batteries only. Do not use battery charger to supply power to an extra-low-voltage electrical system or to charge dry cell batteries.
- Do not charge a frozen battery.
- Do not use damaged charging cables.
- Do not charge a battery that has loose terminals or one showing damage such as a cracked case or cover.
- Before charging battery, select correct charger voltage to match battery voltage.
- Set battery charging controls to the Off position before connecting to battery. Do not allow battery charging clips to touch each other.
- Keep charging cables away from vehicle hood, door, or moving parts.

FUEL can cause fire or explosion.

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

MOVING PARTS can injure.

- Keep away from moving parts such as 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 persons remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- To prevent accidental starting during servicing, disconnect negative (–) battery cable from battery.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting engine.
- Before working on generator, remove spark plugs or injectors to keep engine from kicking back or starting.
- Block flywheel so that it will not turn while working on generator components.

EXHAUST SPARKS can cause fire.

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

HOT PARTS can burn.

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

STEAM AND HOT COOLANT can burn.

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

BATTERY ACID can BURN SKIN and EYES.

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

Using a generator indoors CAN KILL YOU IN MINUTES.

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

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.

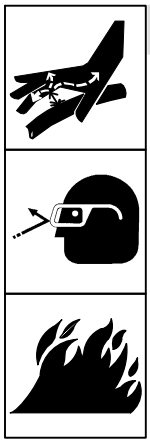
1-3. Hydraulic Hazards

HYDRAULIC EQUIPMENT can injure or kill.

- Incorrect installation or operation of this unit could result in equipment failure and personal injury. Only qualified persons should install, operate, and service this unit according to its Owner's Manual, industry standards, and national, state, and local codes.
- Do not exceed the rated output or capacity of the hydraulic pump or any equipment in the hydraulic system. Design hydraulic system so failure of any hydraulic component will not put people or property at risk.
- Before working on hydraulic system, turn off and lockout/tagout unit, release pressure, and be sure hydraulic pressure cannot be accidentally applied.
- Do not work on hydraulic system with unit running unless you are a qualified person and following the manufacturer's instructions.
- Do not modify or alter hydraulic pump or manufacturer-supplied equipment. Do not disconnect, disable, or override any safety equipment in the hydraulic system.
- Use only components/accessories approved by the manufacturer.
- Keep away from potential pinch points or crush points created by equipment connected to the hydraulic system.
- Do not work under or around any equipment that is supported only by hydraulic pressure. Properly support equipment by mechanical means.

MOVING PARTS can injure.

- Keep away from moving parts such as fans, belts and rotors.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Before working on hydraulic system, turn off and lockout/tagout unit, release pressure, and be sure hydraulic pressure cannot be accidentally applied.
- Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting engine.

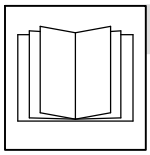


HYDRAULIC FLUID can injure or kill.

- Before working on hydraulic system, turn off and lockout/tagout unit, release pressure, and be sure hydraulic pressure cannot be accidentally applied
- Relieve pressure before disconnecting or connecting hydraulic lines.
- Check hydraulic system components and all connections and hoses for damage, leaks, and wear before operating unit.
- Wear protective equipment such as safety glasses, leather gloves, heavy shirt and trousers high shoes, and a cap when working on hydraulic system.
- Use a piece of paper or cardboard to search for leaks––never use bare hands. Do not use equipment if leaks are found.
- HYDRAULIC FLUID is FLAMMABLE––do not work on hydraulics near sparks or flames; do not smoke near hydraulic fluid.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting unit.
- If ANY fluid is injected into the skin or body seek medical help immediately.

HOT PARTS AND FLUID can burn.

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



READ INSTRUCTIONS.

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform installation, maintenance, and service according to the Owner's Manuals, industry standards, and national, state, and local codes.

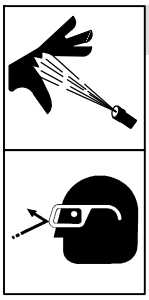
1-4. Compressed Air Hazards

COMPRESSED AIR EQUIPMENT can injure or kill.

- Incorrect installation or operation of this unit could result in equipment failure and personal injury. Only qualified persons should install, operate, and service this unit according to its Owner's Manual, industry standards, and national, state, and local codes.
- Do not exceed the rated output or capacity of the compressor or any equipment in the compressed air system. Design compressed air system so failure of any component will not put people or property at risk.
- Before working on compressed air system, turn off and lockout/tagout unit, release pressure, and be sure air pressure cannot be accidentally applied.
- Do not work on compressed air system with unit running unless you are a qualified person and following the manufacturer's instructions.
- Do not modify or alter compressor or manufacturer-supplied equipment. Do not disconnect, disable, or override any safety equipment in the compressed air system.
- Use only components and accessories approved by the manufacturer.
- Keep away from potential pinch points or crush points created by equipment connected to the compressed air system.
- Do not work under or around any equipment that is supported only by air pressure. Properly support equipment by mechanical means.

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

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



COMPRESSED AIR can injure or kill.

- Before working on compressed air system, turn off and lockout/tagout unit, release pressure, and be sure air pressure cannot be accidentally applied.
- Relieve pressure before disconnecting or connecting air lines.
- Check compressed air system components and all connections and hoses for damage, leaks, and wear before operating unit.
- Do not direct air stream toward self or others.
- Wear protective equipment such as safety glasses, hearing protection, leather gloves, heavy shirt and trousers, high shoes, and a cap when working on compressed air system.
- Use soapy water or an ultrasonic detector to search for leaks−−never use bare hands. Do not use equipment if leaks are found.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting unit.
- If ANY air is injected into the skin or body seek medical help immediately.

BREATHING COMPRESSED AIR can injure or kill.

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

TRAPPED AIR PRESSURE AND WHIPPING HOSES can injure.

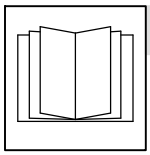
- Release air pressure from tools and system before servicing, adding or changing attachments, or opening compressor oil drain or oil fill cap.

MOVING PARTS can injure.

- Keep away from moving parts such as fans, belts and rotors.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Before working on compressed air system, turn off and lockout/tagout unit, release pressure, and be sure air pressure cannot be accidentally applied.
- Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting engine.

HOT PARTS can burn.

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



READ INSTRUCTIONS.

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform installation, maintenance, and service according to the Owner's Manuals, industry standards, and national, state, and local codes.

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

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. Machine internal circuits are live when power is on. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use GFCI protection when operating auxiliary equipment. Do not test or reset GFCI receptacles at idle speed/low voltage or the GFCI will be damaged and not provide protection from electric shock caused by a ground fault.
- 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, ground, and operate this equipment according to its Owner's Manual and national, state, and local codes.
- Turn off all equipment when not in use.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Keep all panels and covers securely in place.

FIRE OR EXPLOSION hazard.

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

FALLING EQUIPMENT can injure.

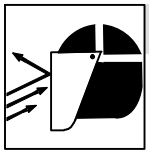
- Use lifting eye to lift unit and properly installed accessories only, NOT gas cylinders. Do not exceed maximum lift eye weight rating (see Specifications).
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94–110) when manually lifting heavy parts or equipment.

HIGH PRESSURE FLUIDS can injure or kill.

- Engine fuel system components can be under high pressure.
- Before working on fuel system, turn off engine to release pressure.
- If ANY fluid is injected into the skin or body seek medical help immediately.

OVERHEATING can damage motors.

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

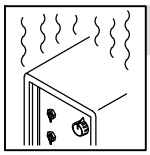


FLYING SPARKS can injure.

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

MOVING PARTS can injure.

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



OVERUSE can cause OVERHEATING.

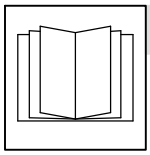
- Allow cooling period; follow rated duty cycle.
- Do not block or filter airflow to unit.

STATIC (ESD) can damage PC boards.

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

TILTING OF TRAILER can injure.

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



READ INSTRUCTIONS.

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform installation, maintenance, and service according to the Owner's Manuals, industry standards, and national, state, and local codes.

1-6. California Proposition 65 Warnings

Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. *Wash hands after handling.*

This product contains chemicals, including lead, known to the state of California to cause cancer, birth defects, or other reproductive harm. *Wash hands after use.*

For Gasoline Engines:

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

For Diesel Engines:

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

1-7. Principal Safety Standards

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org and www. sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151 (phone: 703-788-2700, website: www.cganet.com).

Battery Chargers, CSA Standard C22.2 NO 107.2–01, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csagroup.org).

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

For Standards about hydraulic systems, contact the National Fluid Power Association, Publications Department, 3333 North Mayfair Road, Suite 211, Milwaukee, WI 53222-3219 (phone: (414) 778-3344, website: www.nfpa.com).

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

Portable Generators Safety Alert, U.S. Consumer Product Safety Commission (CPSC), 4330 East West Highway, Bethesda, MD 20814 (phone: 301-504-7923, website: www.cpsc.gov).

Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30329-4027 (phone: 1-800-232-4636, website: www.cdc.gov/NIOSH).

SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

Pour écarter les risques de blessure pour vous–même et pour autrui — lire, appliquer et ranger en lieu sûr ces consignes relatives aux précautions de sécurité et au mode opératoire.

2-1. Signification des symboles

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

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

AVIS *– Indique des déclarations pas en relation avec des blessures personnelles.*

☞ *Indique des instructions spécifiques.*

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

2-2. Dangers existant en relation avec le moteur

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

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

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

L'EXPLOSION DE LA BATTERIE peut provoquer des blessures.

- 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 des câbles de batterie, des câbles de chargeur de batterie (le cas échéant) ou de batterie d'entretien.
- Eviter de provoquer des étincelles avec les outils en travaillant sur la batterie.
- Ne pas utiliser l'appareil pour charger des batteries ou faire démarrer des véhicules à l'aide de câbles de démarrage, sauf si l'appareil dispose d'une fonctionnalité de charge de batterie destinée à cet usage.
- Observer la polarité correcte (+ et –) sur les batteries.
- Débrancher le câble négatif (–) en premier lieu. Le rebrancher en dernier lieu.
- Les sources d'étincelles, flammes nues, cigarettes et autres sources d'inflammation doivent être maintenues à l'écart des batteries. Ces dernières produisent des gaz explosifs en fonctionnement normal et en cours de charge.
- Respecter les consignes du fabricant de la batterie pour travailler sur une batterie ou à proximité.

Le COURANT DE CHARGE DE BATTERIE peut provoquer des blessures (la fonctionnalité de charge de batterie n'est pas disponible sur tous les modèles).

- Les opérations de charge de batterie ne doivent être effectuées que par des personnes qualifiées.
- Ne charger que des batteries plomb–acide. Ne pas utiliser le chargeur de batterie pour alimenter un autre circuit électrique basse tension ou pour charger des batteries sèches.
- Ne pas charger une batterie gelée.
- Ne pas utiliser de câbles de charge endommagés.
- Ne pas charger une batterie dont les bornes sont desserrées ou présentant une détérioration comme par exemple un boîtier ou un couvercle fissuré.
- Avant de charger une batterie, sélectionner la tension de charge correspondant à la tension de la batterie.
- Régler les commandes de charge de batterie sur la position d'arrêt avant de brancher la batterie. Veiller à ce que les pinces de charge ne se touchent pas.
- Ranger les câbles de charge à distance du capot, des portes et des pièces mobiles du véhicule.

LE CARBURANT MOTEUR peut provoquer un incendie ou une explosion.

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

Les PIÈCES MOBILES peuvent causer des blessures.

- S'abstenir de toucher des parties mobiles telles que des ventilateurs, courroies et rotors.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Arrêter le moteur avant d'installer ou brancher l'appareil.
- Lorsque cela est nécessaire pour des travaux d'entretien et de dépannage, faire retirer les portes, panneaux, recouvrements ou dispositifs de protection uniquement par du personnel qualifié.
- 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 portes, panneaux, recouvrements ou dispositifs de protection à la fin des travaux d'entretien et avant de mettre le moteur en marche.
- 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.

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.

LES PIÈCES CHAUDES peuvent provoquer des brûlures.

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

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

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

L'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.

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

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

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.

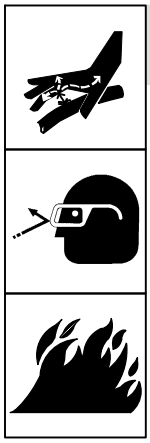
2-3. Dangers liés à l'hydraulique

Les ÉQUIPEMENTS HYDRAULIQUES peuvent provoquer des blessures ou même la mort.

- Une installation ou une utilisation incorrecte de cet appareil pourrait conduire à des dégâts matériels ou corporels. Seul un personnel qualifié est autorisé à installer, faire fonctionner et réparer cet appareil conformément à son manuel d'utilisation, aux normes industrielles et aux codes nationaux, d'état ou locaux.
- Ne pas dépasser le débit nominal ou la capacité de la pompe hydraulique ou de tout équipement du circuit hydraulique. Concevoir le circuit hydraulique de telle sorte que la défaillance d'un composant hydraulique ne risque pas de provoquer un accident matériel ou corporel.
- Avant d'intervenir sur le circuit hydraulique, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit hydraulique ne peut être remis sous pression par inadvertance.
- Ne pas intervenir sur le circuit hydraulique lorsque l'appareil fonctionne. Seul un personnel qualifié et appliquant les consignes du fabricant est autorisé le faire.
- Ne pas modifier ou altérer la pompe hydraulique ou les équipements fournis par le fabricant. Ne pas débrancher, désactiver ou neutraliser les équipements de sécurité du circuit hydraulique.
- Utiliser uniquement des composants et accessoires homologués par le fabricant.
- Se tenir à l'écart de tout point présentant un danger de pincement ou d'écrasement créé par l'équipement raccordé au circuit hydraulique.
- Ne pas intervenir sous ou autour d'un équipement qui n'est soutenu que par la pression hydraulique. Soutenir l'équipement de façon appropriée par un moyen mécanique.

Les PIÈCES MOBILES peuvent causer des blessures.

- S'abstenir de toucher des parties mobiles telles que des ventilateurs, courroies et rotors.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Ne pas approcher les mains, cheveux, vêtements lâches et outils des organes mobiles.
- Avant d'intervenir sur le circuit hydraulique, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit hydraulique ne peut être remis sous pression par inadvertance.
- 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.
- Remettre en place les portes, panneaux, recouvrements ou dispositifs de protection à la fin des travaux d'entretien et avant de mettre le moteur en marche.



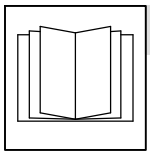
Le LIQUIDE HYDRAULIQUE risque de provoquer des blessures ou même la mort.

- Avant d'intervenir sur le circuit hydraulique, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit hydraulique ne peut être remis sous pression par inadvertance.
- Détendre la pression avant de débrancher ou de brancher des canalisations hydrauliques.
- Avant d'utiliser l'appareil, contrôler les composants du circuit hydraulique, les branchements et les flexibles en recherchant tout signe de détérioration, de fuite et d'usure.

- Pour intervenir sur un circuit hydraulique, porter un équipement de protection tel que des lunettes de sécurité, des gants de cuir, une chemise et un pantalon en tissu résistant, des chaussures montantes et une coiffe.
- Pour rechercher des fuites, utiliser un morceau de papier ou de carton, jamais les mains nues. En cas de détection de fuite, ne pas utiliser l'équipement.
- Le LIQUIDE HYDRAULIQUE est INFLAMMABLE. Ne pas intervenir sur des composants hydrauliques à proximité d'étincelles ou de flammes; ne pas fumer à proximité de liquide hydraulique.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l'entretien est terminé et avant de mettre en marche l'appareil.
- En cas d'injection de tout liquide sous la peau ou dans le corps, solliciter une aide médicale sur le champ.

LES PIÈCES ET LIQUIDES CHAUDS peuvent provoquer des brûlures.

- Ne pas toucher les pièces chaudes à main nue ni laisser des liquides chauds entrer en contact avec la peau.
- Prévoir une période de refroidissement avant d'intervenir sur l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



LIRE LES INSTRUCTIONS.

- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- N'utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l'installation, l'entretien et toute intervention selon les manuels d'utilisateurs, les normes nationales, provinciales et de l'industrie, ainsi que les codes municipaux.

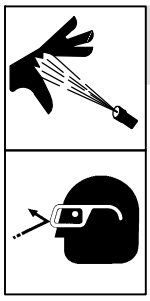
2-4. Dangers liés à l'air comprimé

Un ÉQUIPEMENT PNEUMATIQUE risque de provoquer des blessures ou même la mort.

- Une installation ou une utilisation incorrecte de cet appareil pourrait conduire à des dégâts matériels ou corporels. Seul un personnel qualifié est autorisé à installer, utiliser et entretenir cet appareil conformément à son manuel d'utilisation, aux normes industrielles et aux codes nationaux, d'état ou locaux.
- Ne pas dépasser le débit nominal ou la capacité du compresseur ou de tout équipement du circuit d'air comprimé. Concevoir le circuit d'air comprimé de telle sorte que la défaillance d'un composant ne risque pas de provoquer un accident matériel ou corporel.
- Avant d'intervenir sur le circuit d'air comprimé, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit d'air ne peut être mis sous pression par inadvertance.
- Ne pas intervenir sur le circuit d'air comprimé lorsque l'appareil fonctionne. Seul un personnel qualifié est autorisé, et appliquant les consignes du fabricant.
- Ne pas modifier ou altérer le compresseur ou les équipements fournis par le fabricant. Ne pas débrancher, désactiver ou neutraliser les équipements de sécurité du circuit d'air comprimé.
- Utiliser uniquement des composants et accessoires homologués par le fabricant.
- Se tenir à l'écart de tout point présentant un danger de pincement ou d'écrasement créé par l'équipement raccordé au circuit d'air comprimé.
- Ne pas intervenir sous ou autour d'un équipement qui n'est soutenu que par la pression pneumatique. Soutenir l'équipement de façon appropriée par un moyen mécanique.

MÉTAL CHAUD provenant du découpage ou du gougeage à l'arc risque de provoquer un incendie ou une explosion.

- Ne pas découper ou gouger à proximité de produits inflammables.
- Attention aux risques d'incendie: tenir un extincteur à proximité.



L'AIR COMPRIMÉ risque de provoquer des blessures ou même la mort.

- Avant d'intervenir sur le circuit d'air comprimé, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit d'air ne peut être mis sous pression par inadvertance.
- Détendre la pression avant de débrancher ou de brancher des canalisations d'air.
- Avant d'utiliser l'appareil, contrôler les composants du circuit d'air comprimé, les branchements et les flexibles en recherchant tout signe de détérioration, de fuite et d'usure.
- Ne pas diriger un jet d'air vers soi–même ou vers autrui.
- Pour intervenir sur un circuit d'air comprimé, porter un équipement de protection tel que des lunettes de sécurité, des gants de cuir, une chemise et un pantalon en tissu résistant, des chaussures montantes et une coiffe.
- Pour rechercher des fuites, utiliser de l'eau savonneuse ou un détecteur à ultrasons, jamais les mains nues. En cas de détection de fuite, ne pas utiliser l'équipement.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l'entretien est terminé et avant de mettre en marche l'appareil.
- En cas d'injection d'air dans la peau ou le corps, demander immédiatement une assistance médicale.

L'INHALATION D'AIR COMPRIMÉ risque de provoquer des blessures ou même la mort.

- Ne pas inhaler d'air comprimé.
- Utiliser l'air comprimé uniquement pour découper ou gouger ainsi que pour l'outillage pneumatique.

Une PRESSION D'AIR RÉSIDUELLE ET DES FLEXIBLES QUI FOUETTENT risquent de provoquer des blessures.

- Détendre la pression pneumatique des outils et circuits avant d'entretenir, ajouter ou changer des accessoires et avant d'ouvrir le bouchon de vidange ou de remplissage d'huile du compresseur.

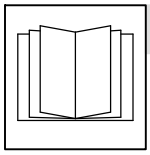
Les PIÈCES MOBILES peuvent causer des blessures.

- S'abstenir de toucher des parties mobiles telles que des ventilateurs, courroies et rotors.

- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Ne pas approcher les mains, cheveux, vêtements lâches et outils des organes mobiles.
- Avant d'intervenir sur le circuit d'air comprimé, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit d'air ne peut être mis sous pression par inadvertance.
- 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.
- Remettre en place les portes, panneaux, recouvrements ou dispositifs de protection à la fin des travaux d'entretien et avant de mettre le moteur en marche.

DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

- Ne pas toucher de pièces chaudes du compresseur ou du circuit d'air.
- Prévoir une période de refroidissement avant d'intervenir sur l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



LIRE LES INSTRUCTIONS.

- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- N'utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l'installation, l'entretien et toute intervention selon les manuels d'utilisateurs, les normes nationales, provinciales et de l'industrie, ainsi que les codes municipaux.

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

UN CHOC ÉLECTRIQUE peut tuer.

Un simple contact avec des pièces électriques peut provoquer une électrocution ou des blessures graves. Les circuits internes de l'appareil sont sous tension à ce moment-là. Des matériels mal installés ou mal mis à la terre présentent un danger.

- Ne jamais toucher les pièces électriques sous tension.
- 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.
- Utiliser une protection différentielle lors de l'utilisation d'un équipement auxiliaire. Ne pas tester ni réarmer les prises femelles avec différentiel au régime de ralenti/en basse tension: cela endommagerait le disjoncteur différentiel, qui ne remplirait plus son rôle de protection contre une électrocution causée par un défaut de masse.
- 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).
- Installez, mettez à la terre et utilisez correctement cet équipement conformément à son Manuel d'Utilisation et aux réglementations nationales, gouvernementales et locales.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- 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.

Risque D'INCENDIE OU D'EXPLOSION.

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

LA CHUTE DE L'ÉQUIPEMENT peut provoquer des blessures.

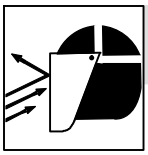
- Utiliser l'anneau de levage pour lever l'appareil et les accessoires correctement installées seuls, PAS les bouteilles de gaz. Ne pas dépasser le poids nominal maximal de l'œilleton (voir les spécifications).
- Utiliser un équipement de levage de capacité suffisante pour lever l'appareil.
- En utilisant des fourches de levage pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.
- Tenir l'équipement (câbles et cordons) à distance des véhicules mobiles lors de toute opération en hauteur.
- Suivre les consignes du Manuel des applications pour l'équation de levage NIOSH révisée (Publication Nº94–110) lors du levage manuelle de pièces ou équipements lourds.

LES LIQUIDES PRESSURISÉS peuvent blesser ou tuer.

- Les composants du système d'alimentation peuvent contenir du carburant sous pression élevée.
- Avant d'intervenir sur le système d'alimentation de carburant, arrêter le moteur pour dépressuriser le système.
- En cas d'injection de tout liquide sous la peau ou dans le corps, solliciter une aide médicale sur le champ.

LE SURCHAUFFEMENT peut endommager le moteur électrique.

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

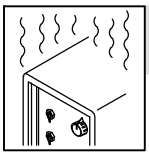


LES ÉTINCELLES PROJETÉES peuvent provoquer des blessures.

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

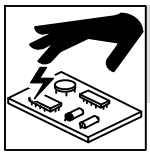
Les PIÈCES MOBILES peuvent causer des blessures.

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



L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Laisser l'équipement refroidir ; respecter le facteur de marche nominal.
- Ne pas obstruer les passages d'air du poste.

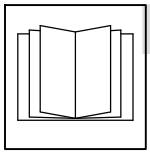


LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

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

UNE REMORQUE QUI BASCULE peut provoquer 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.

- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- N'utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l'installation, l'entretien et toute intervention selon les manuels d'utilisateurs, les normes nationales, provinciales et de l'industrie, ainsi que les codes municipaux.

2-6. Proposition californienne 65 Avertissements

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

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

⚠ **Ce produit contient des produits chimiques, notamment du plomb, dont l'État de Californie reconnaît qu'ils provoquent des cancers, des malformations congénitales ou d'autres problèmes de procréation. *Se laver les mains après utilisation.***

Pour les moteurs à essence :

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

Pour les moteurs diesel :

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

2-7. Principales normes de sécurité

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org and www. sparky.org).

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

Battery Chargers, CSA Standard C22.2 NO 107.2–01, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csagroup.org).

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

For Standards about hydraulic systems, contact the National Fluid Power Association, Publications Department, 3333 North Mayfair Road, Suite 211, Milwaukee, WI 53222-3219 (phone: (414) 778-3344, website: www.nfpa.com).

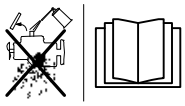
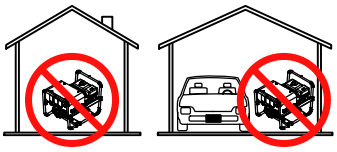
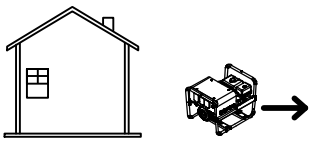
OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (phone: 1-866-512-1800) (there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

U.S. Consumer Product Safety Commission (CPSC), 4330 East West Highway, Bethesda, MD 20814 (phone: 301-504-7923, website: www.cpsc.gov).

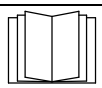
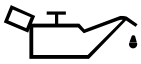
Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30329-4027 (phone: 1-800-232-4636, website: www.cdc.gov/NIOSH).

SECTION 3 – DEFINITIONS

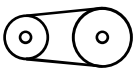
3-1. Additional Safety Symbol Definitions

	Warning! Watch Out! There are possible hazards as shown by the symbols. Safe1 2012-05
	Do not use ether or other starting fluids. Using starting fluids voids warranty. See engine Owner's Manual. Safe89 2015-02
	Moving parts can injure. Safe100 2012-08
	Hot oil and compressed air can injure or kill. Safe 112 2013-03
	Compressed air hazard. If ANY air is injected into the skin or body seek medical help immediately. Safe108 2012-11
	Never use generator inside a home or garage, even if doors and windows are open. Safe87 2012-07
	Only use generator outside and far away from windows, doors, and vents. Safe88 2012-07

3-2. Miscellaneous Symbol Definitions

A	Amperage
V	Voltage
Hz	Hertz
	Single Phase Alternator
	Read Operator's Manual
	Engine Coolant Temperature
	Air Filter
	Engine Oil

	Fuel
	Battery (Engine)
	Glow Plug
	Engine
	Engine RPM
	Direct Current (DC)
	Alternating Current (AC)

	Protective Earth (Ground)
	Air Pressure
	Air Compressor
	Air Compressor
	Hydraulic Pump
	Check Valve Clearance
	Belt Drive

SECTION 4 – SPECIFICATIONS

4-1. Serial Number And Rating Label Location

The serial number and rating information for this product is located on the service side base. Use rating label to determine rated output. For future reference, record serial number.

4-2. Auxiliary Power And Engine Specifications

Standard Generator Power Rating	EnVerter™ AC To AC Converter Power Rating	Engine
Single-Phase, 6 kVA/kW at 3600 RPM 120/240 V AC, 50/25 A, 60 Hz, Continuous	2.4 kVa/kW, 20 A at 2600 to 3600 RPM, 300 Watts at 1800 RPM 120 V AC Pure Sine Wave, Continuous	Kubota D902–E4B, 3–Cylinder, 24.8 HP, Liquid–Cooled, Diesel Engine w/Electronic Governor
Combined Maximum Auxiliary Power Output (Standard Generator And EnVerter) Is 6kVA/kW		

4-3. Air Compressor Specifications

Compressor Type	Air Output At Effective Working Pressure	Pressure	Safety Relief Valve Setting	Air Compressor Oil Capacity
Rotary Screw	58 scfm @ 100 psi (1.13 m^3 min^{-1} @ 689 kPa), 100% Duty Cycle, 3600 RPM 60 CFM Max. Flow	Range: 120–175 psi (827–1206 kPa) Factory set at 120 psi (827 kPa)	Auto Shutoff: 10 psi (69 kPa) Above Set Maximum Pressure Relief: 200 psi (1379 kPa)	4 qt (3.79 L)

4-4. Hydraulic Specifications (Models With Hydraulic Power Source)

Pump Type	Rated Output Open Center	Rated Output Closed Center	Maximum Pressure	Maximum Flow Rate
Variable Displacement Piston	8.0 GPM at 3000 psi at 3200 RPM, 50% Duty Cycle*	7.5 GPM at 2800 psi at 3200 RPM, 50% Duty Cycle*	3500 psi (241.3 bar)	15 GPM (Open Center)† 20 GPM (Closed Center)†

*Dependant on system cooling capacity. †Contact Factory Authorized Service Agent for pump flow rate changes.

4-5. Environmental Specifications

A. Temperature Specifications

Operating Temperature Range*	Storage/Transportation Temperature Range
–40 to 120°F (–40 to 49°C) *Output is derated at temperatures above 104°F (40°C).	–50 to 131°F (–45 to 55°C) Temp_2016-07

B. Cold Weather Specifications

NOTICE *– Components can be damaged and are not warranted for operation at temperatures below –40°F. Contact Miller Electric Mfg. Co. for further information regarding extreme low temperature operation*
Engines should not be started if ambient temperature is below –40°F, unless measures have been taken to ensure all components inside the EnPak and the Remote Panel are at temperatures above –40°F, and correct low temperature fluids are being used per chart below.

☞ *For continuous weekly operation at/or below -40°F, it is recommended that an enclosure, with a heater, be used to heat the EnPak components and recirculate engine heat to keep the EnPak within the operating temperature of the oils being used in the engine, compressor, and hydraulic systems. Engine exhaust would still need to be piped outside the enclosure.*

See Section 6-5 for more cold weather operation information.

4-6. Fluid Specifications

Ambient Temperature								
F	-40	-22	-13	-4	14	32	50	68 (+)
C	-40	-30	-25	-20	-10	0	10	20
Engine								
Oil	0W -20	5W -30	5W -30	10W -30	10W -30	10W -30	10W -30	10W -30
	Full Synthetic	5W -40	5W -40	10W -40	10W -40	10W -40	10W -40	10W -40
Hydraulic (Models With Hydraulic Power Source)								
Oil	ISO 15	ISO 15	ISO 15	ISO 15	ISO 32	ISO 32	ISO 32	ISO 32
Oil Viscosity Index	VI ≥ 160	VI ≥ 140	VI ≥ 140	VI ≥ 140	VI ≥ 120	VI ≥ 120	VI ≥ 120	VI ≥ 120
Compressor								
Oil (Full Synthetic)	Miller 276620	Miller 276620	Miller 276620	Miller 276620	Miller 276620	Miller 276620	Miller 276620	Miller 276620

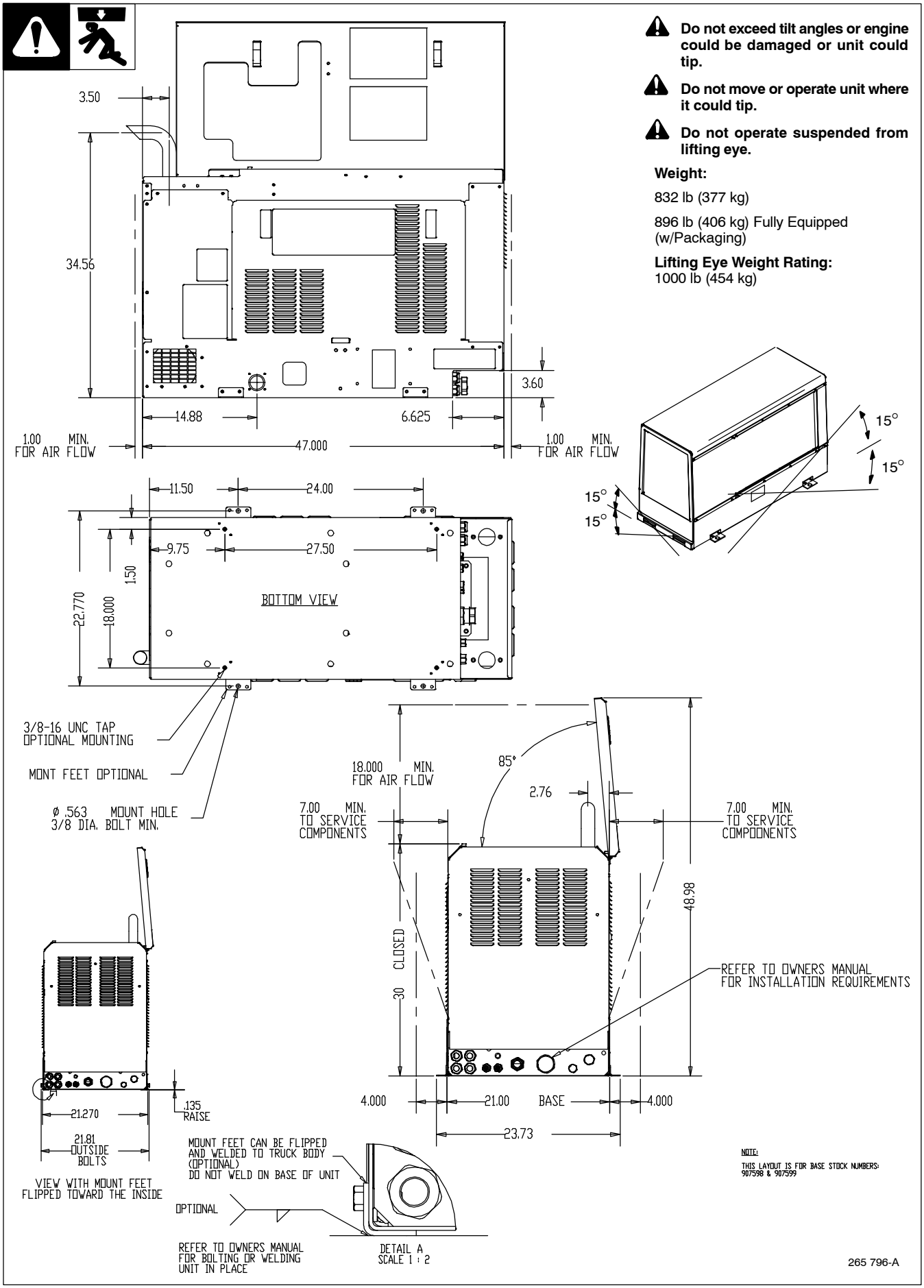
NOTICE *– For extreme cold (<–30°F), consult with the Miller Service department regarding preheating and suitable lubricants.*

** For temperatures below –20°F an oil heater for the compressor is required. Consult with the Miller Service department. Failure to preheat the oil as specified may void the warranty.*

See Section 6-5 for more engine cold weather operation information.

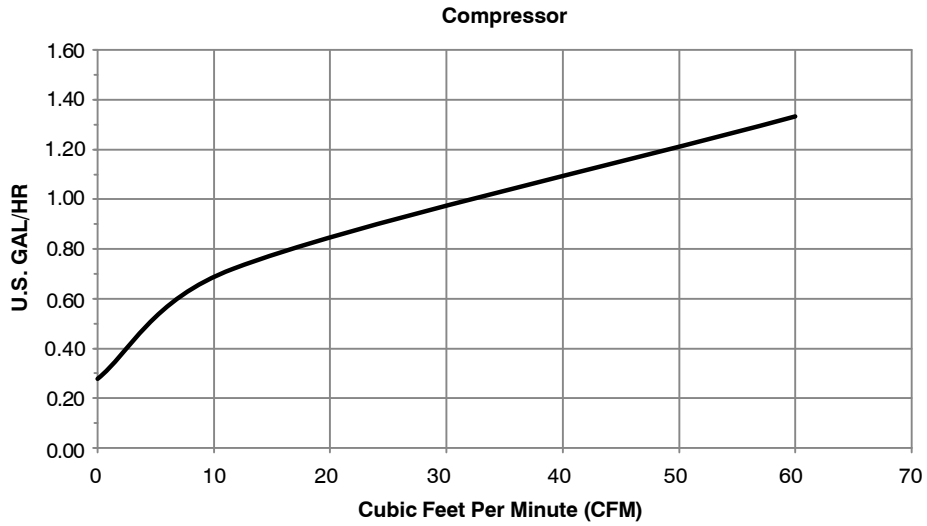
Notes

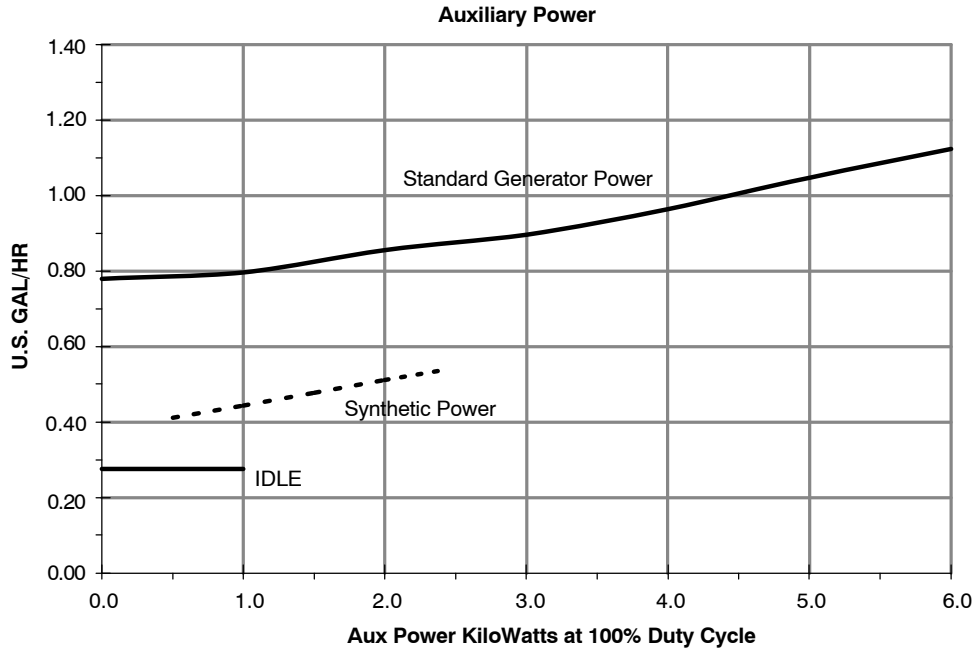
4-7. Dimensions, Weights, and Operating Angles



4-8. Fuel Consumption

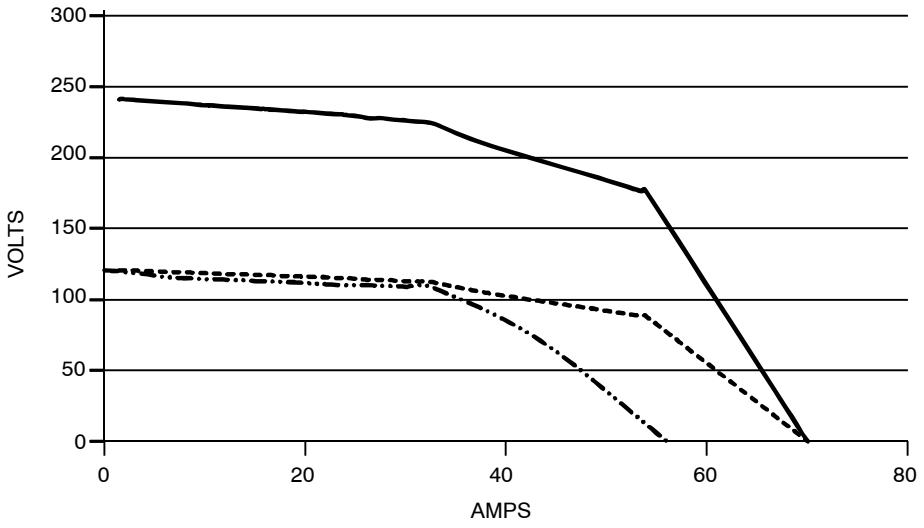
The curve shows typical fuel use under compressor or power loads.





261 042

4-9. Auxiliary Power Curves



☞ *Combined maximum auxiliary power output (standard generator and EnVerter) is 6kVA/kW.*

The AC generator power curves show the generator power available in amperes.

The EnVerter™ power curve shows the power available in amperes.

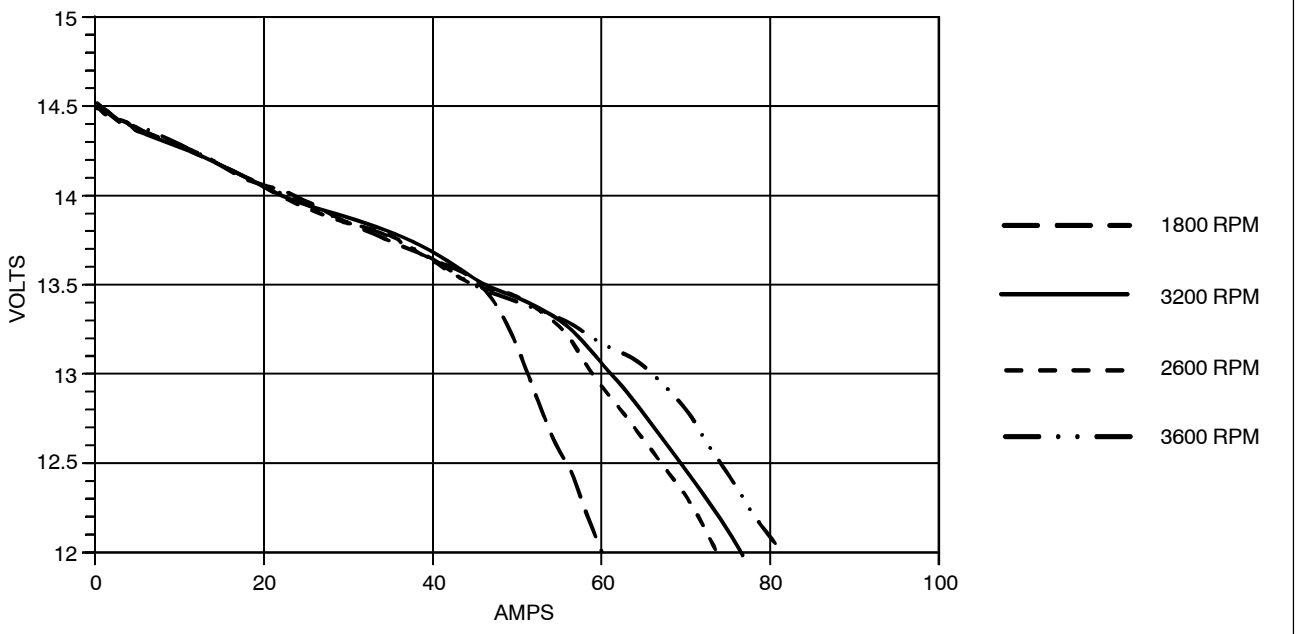
Tools and motors are designed to operate within 10% of 120/240 VAC.

☞ *When the EnPak is running at 1800 RPM, the voltage output of the generator is too low to activate some electric machines that require the full 120 VAC or 240 VAC for operation. If the electric machine that you are using is not recognized as a load by the EnPak, and does not turn on, place the EnPak in high speed. This will bring the output of the generator up to the normal 120 VAC or 240 VAC level, and the machine that is plugged into the generator should work normally. This is for the standard generator power only, and does not apply to the EnVerter power output which is 120 VAC regardless of engine RPM.*

242 594-A

4-10. Alternator Power Curve

The alternator volt–ampere curve shows the available alternator output at various engine RPM.



242 595-A

4-11. Hydraulic Pressure Flow Curves (Models With Hydraulic Power Source)

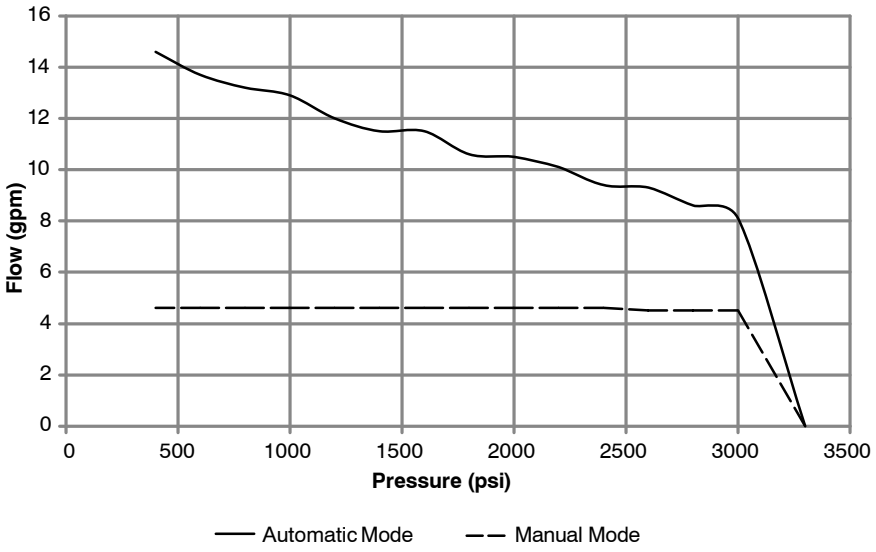
☞ *Curves are typical. Output will vary depending on system pressure losses to load sense pressure location.*

Fluid: ISO 32 Hydraulic Oil

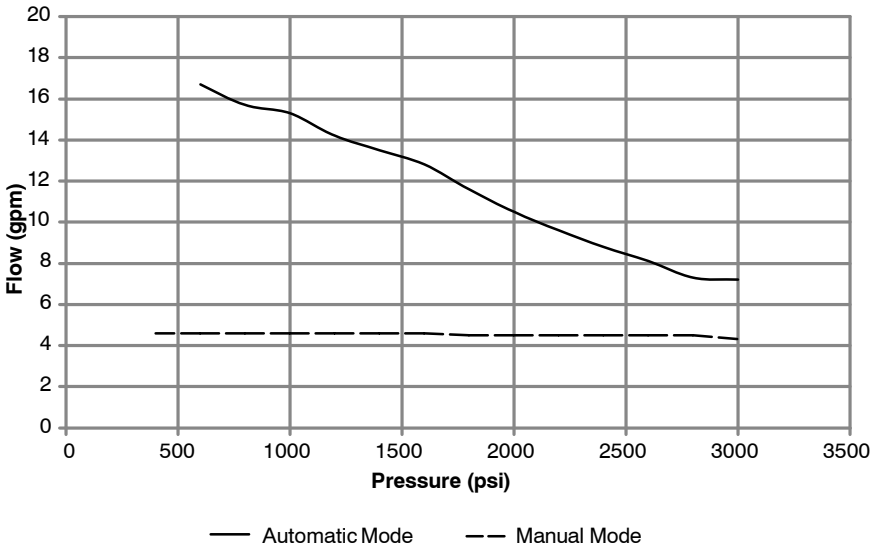
Fluid Temperature: 120° F (49° C)

Load Sense Pressure:
Closed Center – 400 PSID (27.6 bar)
Open Center – 200 PSID (13.8 bar)

Open Center Hydraulic Pressure Flow Curve



Closed Center Hydraulic PressureFlow Curve



261 044-A

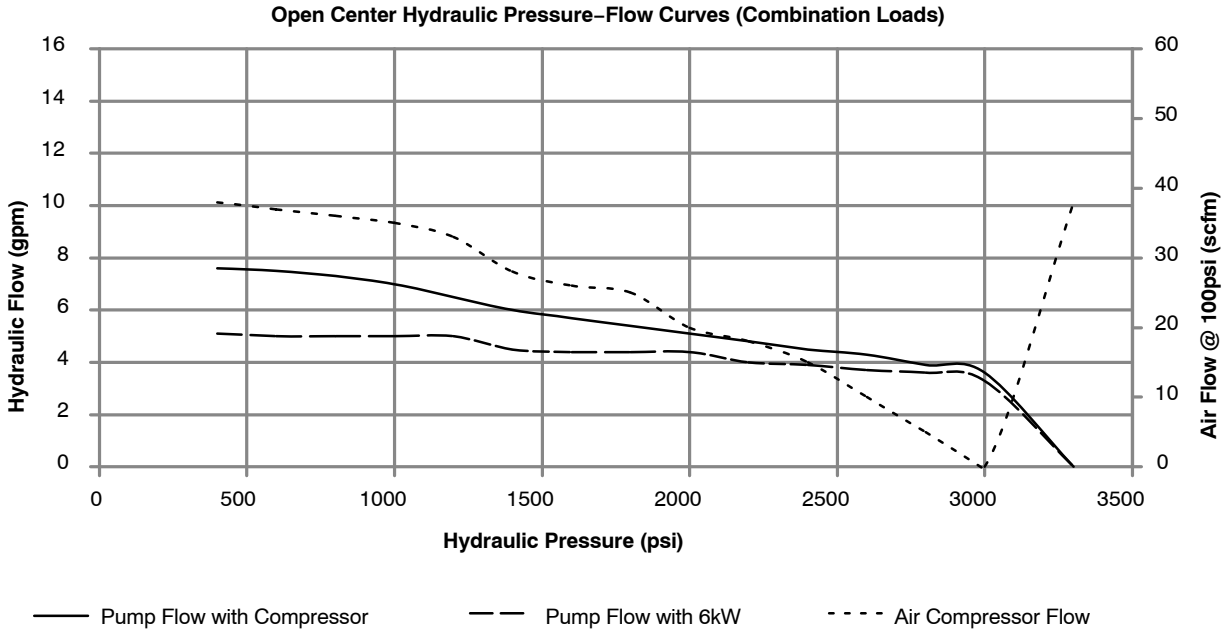
4-12. Hydraulic Pressure Flow Curves – Combination Loads (Models With Hydraulic Power Source)

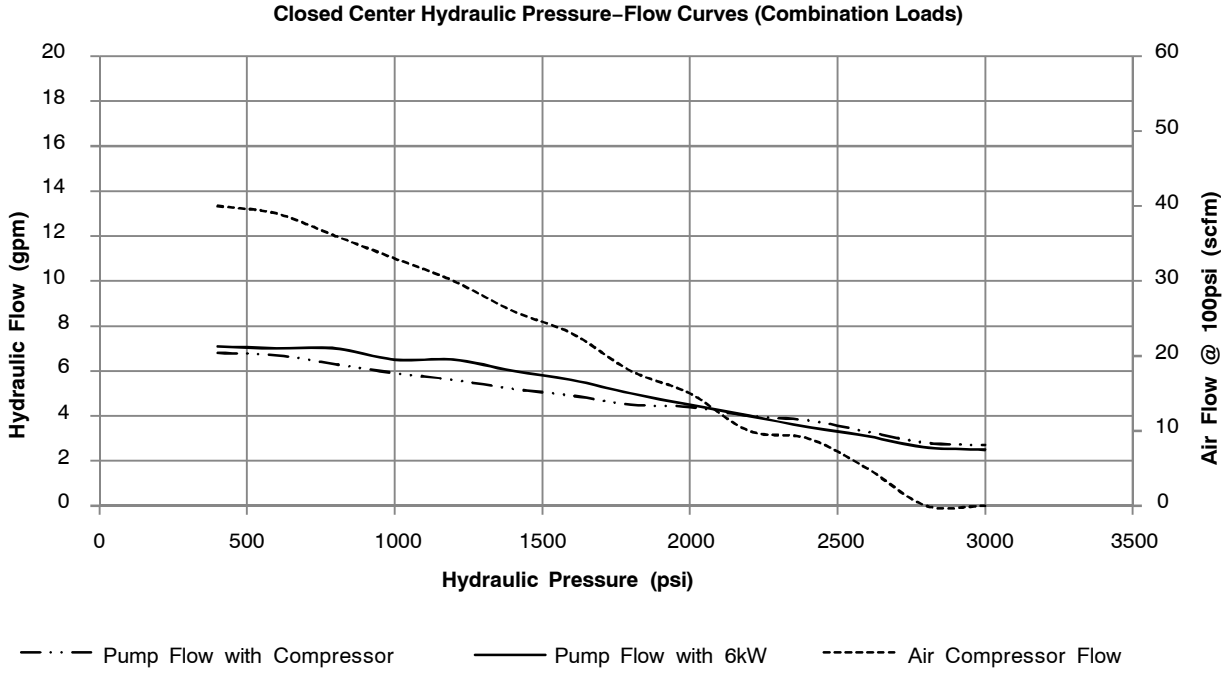
☞ *Curves are typical. Output will vary depending on system pressure losses to load sense pressure location.*

Fluid: ISO 32 Hydraulic Oil

Fluid Temperature: 49° C (120° F)

Load Sense Pressure:
Closed Center – 400 PSID (27.6 bar)
Open Center – 200 PSID (13.8 bar)

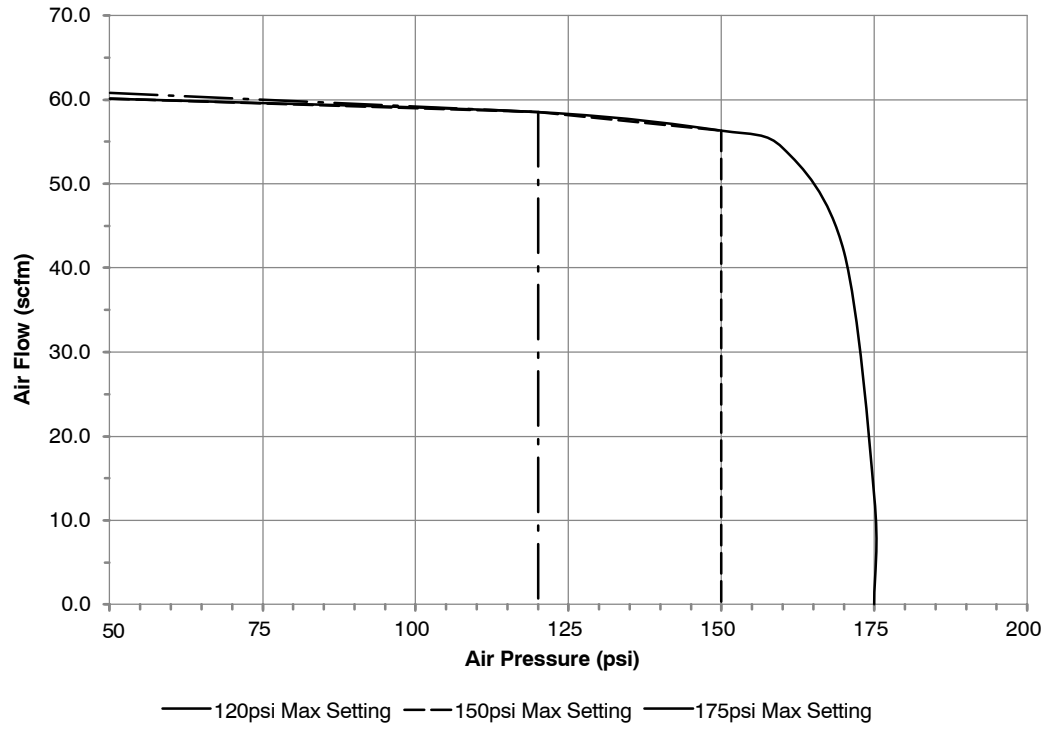




261 044-A

4-13. Air Compressor Curves

☞ *Standard Conditions:*
Pressure = 100 psi (689 kPa)
Temperature = Operating Temperature

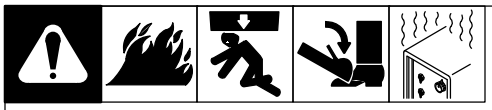


261 043-A

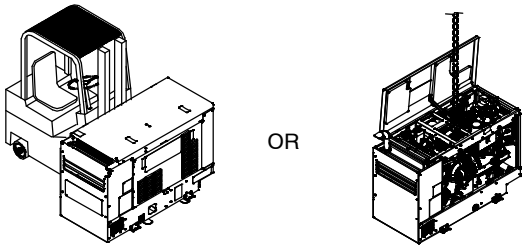
Notes

SECTION 5 – INSTALLATION

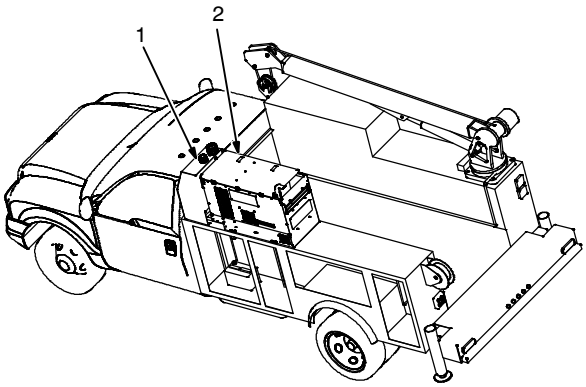
5-1. Installing Unit

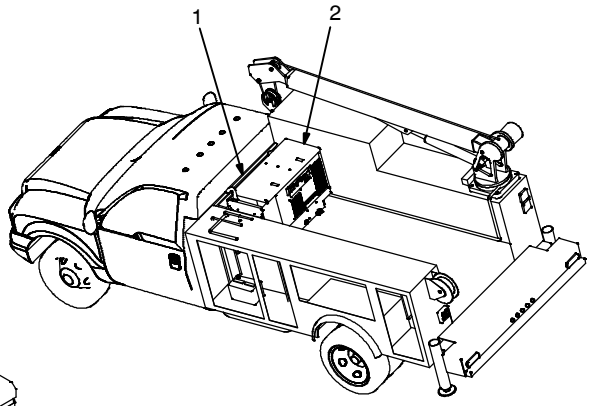


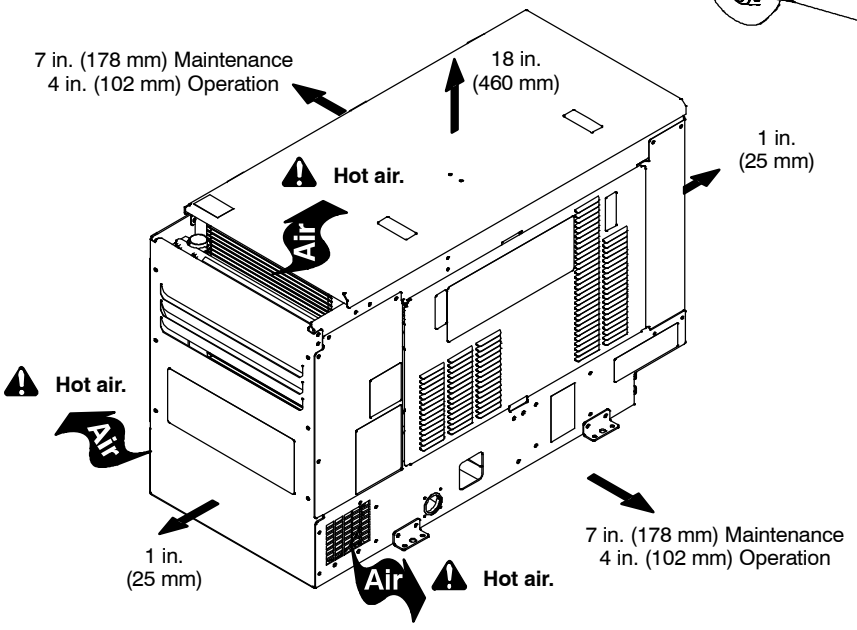
Movement

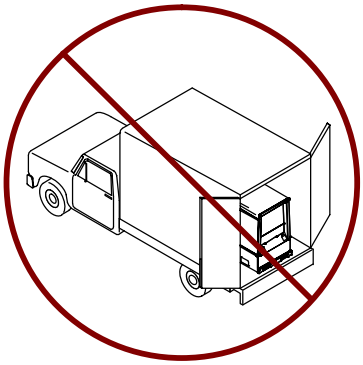


Location/Airflow Clearance









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

⚠ **Always securely fasten unit onto transport vehicle and comply with all DOT and other applicable codes.**

☞ *Go to MillerWelds.com for more information on truck installations.*

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

☞ *See Section 5-2 for mounting information. See Section 4-7 for dimensions.*

☞ *See Section 6 through 9 for specific EnPak systems information.*

1 Hydraulic Reservoir

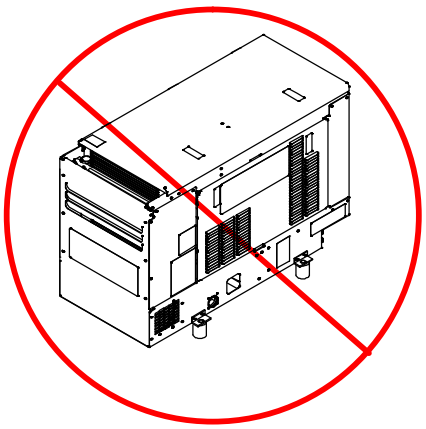
2 EnPak

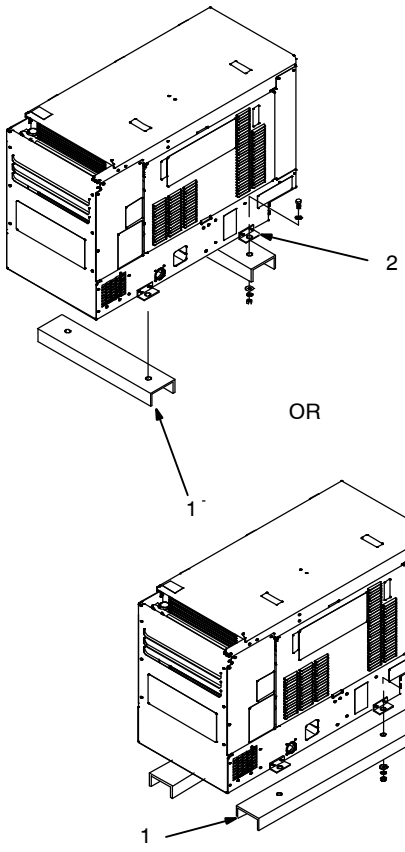
Typical hydraulic reservoir placement in relation to EnPak. See Section 7-1 for complete reservoir requirements.

Ref: install3 2017–03 – 805 454-A / 265 802-A

5-2. Mounting Unit

Supporting The Unit





NOTICE *– Do not mount unit by supporting the base only at the four mounting brackets. Use cross-supports to adequately support unit and prevent damage to base.*

☞ *See Section 4-7 for dimensions.*

Mounting Surface:

1 Cross-Supports

2 Mounting Brackets (Supplied)

Mount unit on flat surface or use cross-supports to support base. Secure unit with mounting brackets.

3 1/2 in Bolt And Washer (Minimum – Not Supplied)

4 5/16-18 x 3/4 in. Screws (Supplied)

To Bolt Unit In Place:

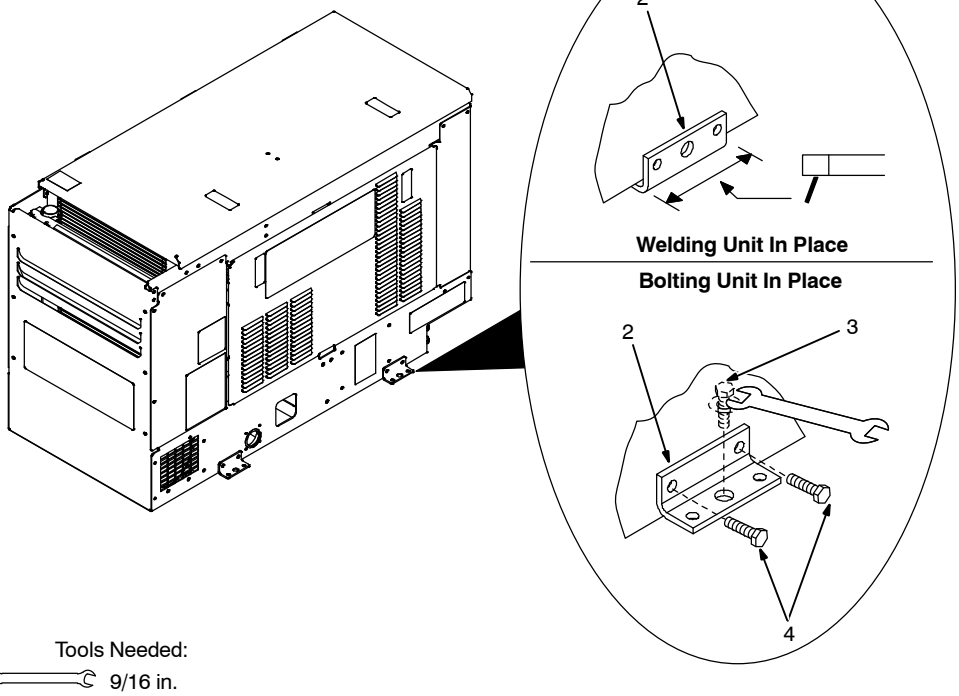
Using brackets attached to the base, mount unit to vehicle with 1/2 in. (12 mm) or larger hardware (not supplied). There are also 3/8 in. weld nuts and mounting holes in the base. See Section 4-7 for mounting dimensions.

To Weld Unit In Place:

Remove hardware securing the four mounting brackets to the base. Reverse brackets and reattach to base with original hardware.

Weld unit to vehicle only at the four mounting brackets.

Using Mounting Brackets



Tools Needed:

9/16 in.

Ref: install3 2017-03 803 274 / 200 864-A / 265 802-A

SECTION 6 – ENGINE PREPARATION

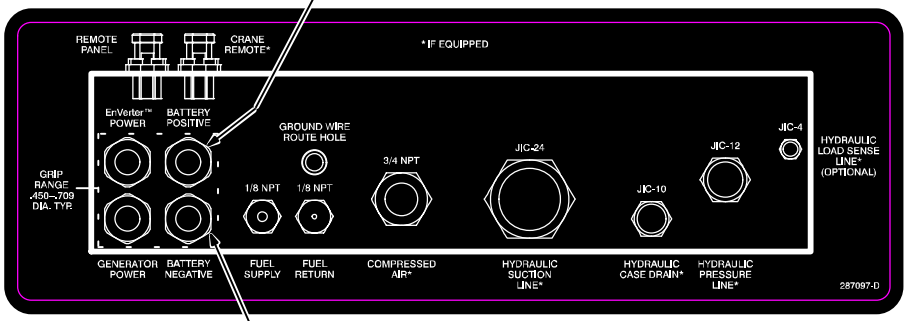
6-1. Connecting the Battery

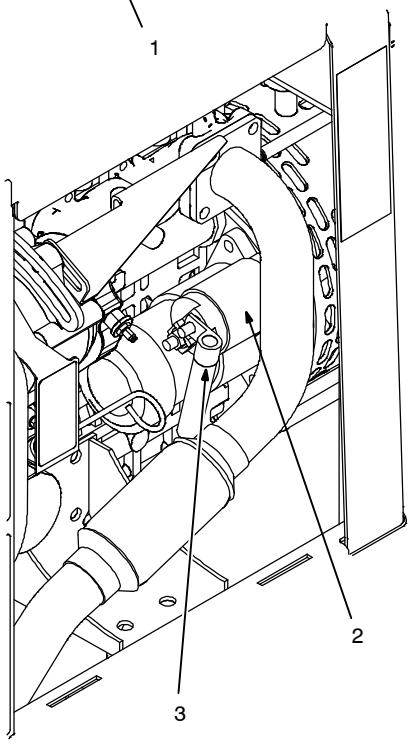
Battery Specification:

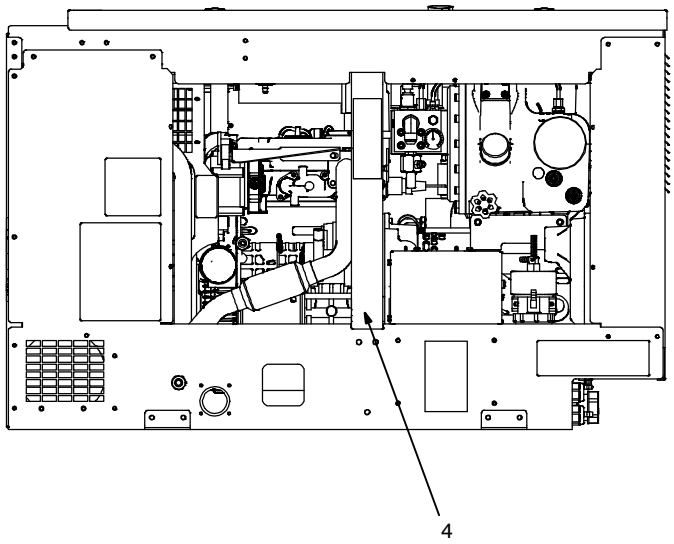
12 V, 650 CCA at 0° F

Battery Cable Specification:

1/0 AWG







Route battery cables away from hot, sharp, or moving parts.

Connect negative (–) cable last.

1 Battery Cable Strain Relief

2 Starter

3 Starter Cable Lug (Supplied)

4 Engine Block

Route cables from vehicle battery through strain relief. Crimp supplied starter cable lug onto positive (+) cable.

Connect positive (+) cable to engine starter.

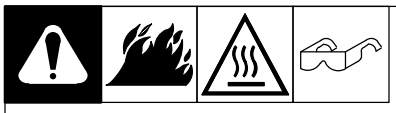
Locate hole in engine block behind unit center upright. Connect negative (–) cable to engine block.

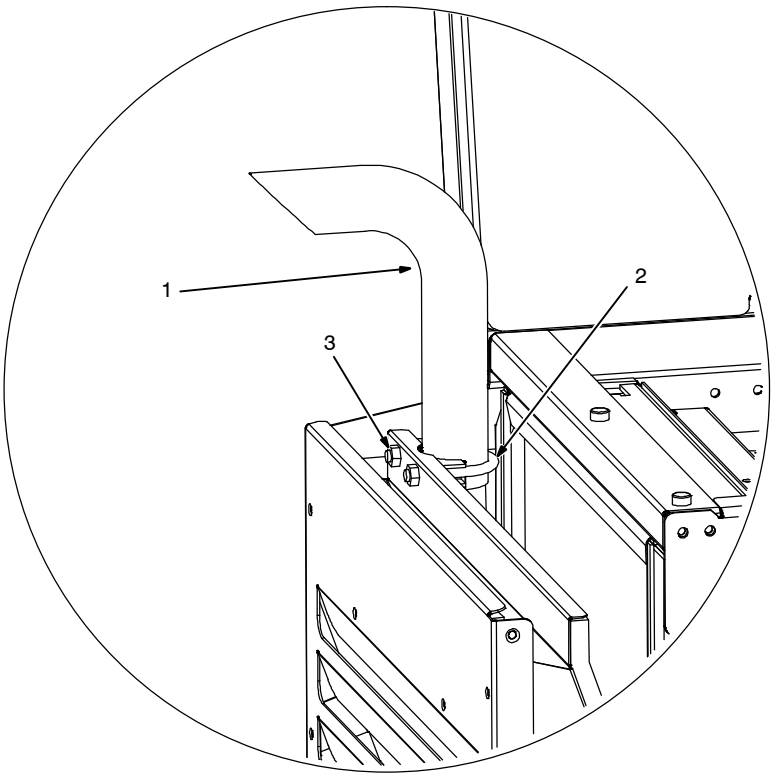
Tools Needed:

1/2 in.

265 802-A / 287 097-B

6-2. Installing Exhaust Pipe





Engine backfire can cause severe burns or other injuries. Keep away from exhaust outlet.

Do not point exhaust pipe toward any compressed gas tank.

☞ *Point exhaust pipe in desired direction but always away from direction of travel.*

1 Exhaust Pipe

2 Clamp

3 Nut

Exhaust pipe, clamp and hardware are shipped separately. Install exhaust pipe as shown.

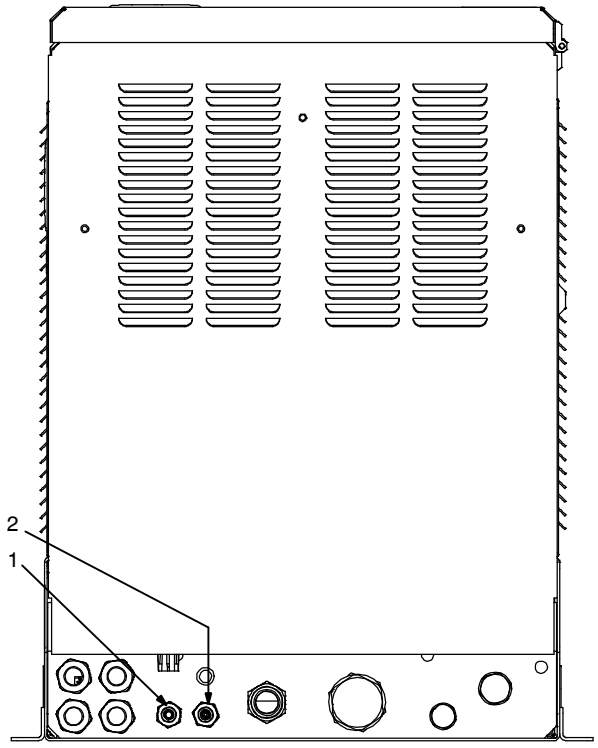
Tools Needed:

1/2 in.

805 445-A

Notes

6-3. Fuel Connections



⚠ **Route all hoses away from hot, sharp or moving parts. Check all connections and hoses for damage, leaks, and wear.**

1 Fuel Pickup Connection

2 Fuel Return Connection

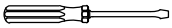
Select hose rated to SAE 30R7, and certified to section 2754 (a)(1)(C) of the California Air Resources Board 2006 Emission Regulations.

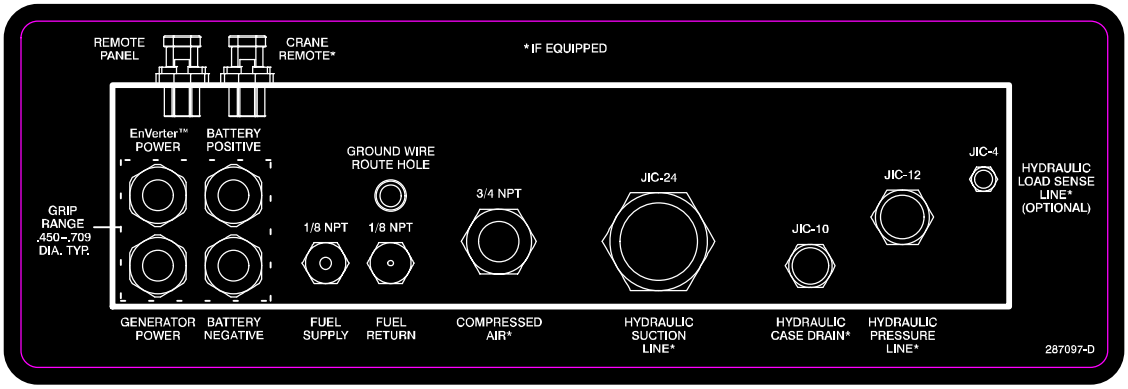
Fuel pickup hose should be 5/16 in. (7.9 mm) ID minimum.

Fuel return hose should be 1/4 in. (6.3 mm) ID minimum.

Connect hoses and secure hose clamps.

Tools Needed:





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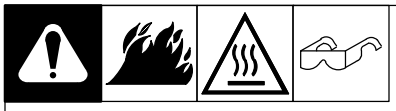
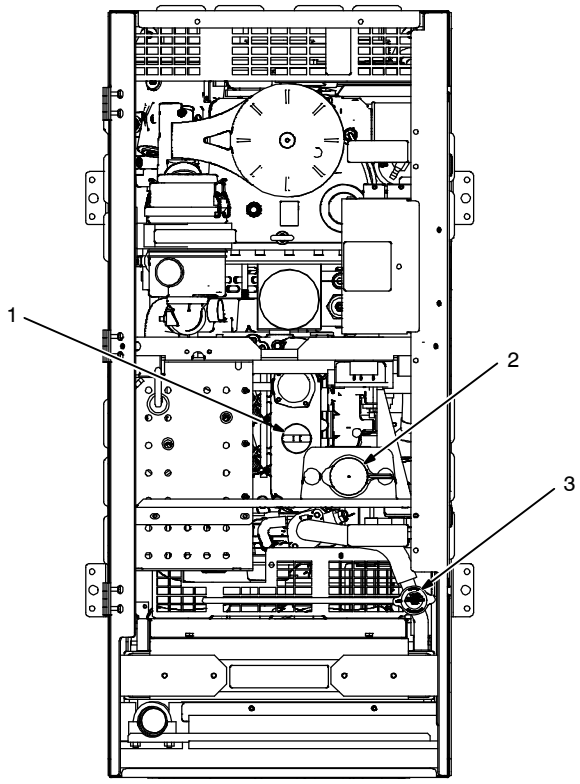
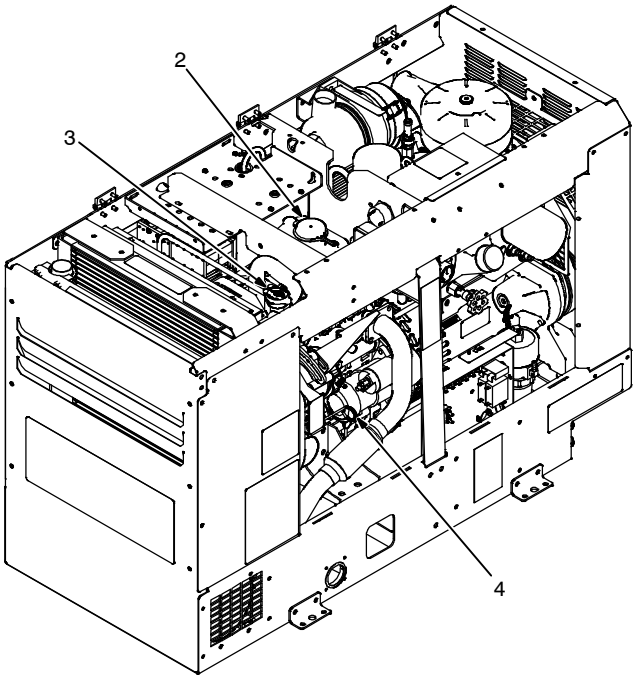
6-4. Engine Prestart Checks







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

☞ *Follow run-in procedure in engine manual.*

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

Open top cover and service side door.

1 Oil Fill

2 Coolant Overflow Bottle

3 Radiator Cap

4 Oil Dipstick

Fuel

Be sure fuel connections are made and tight. Be sure fuel tank utilized for unit operation is full.

Coolant

Check coolant level in radiator and overflow bottle. If coolant is below Low level in overflow bottle, add coolant until level in bottle is between Low and Full levels. If overflow bottle coolant level was low, check coolant level in radiator.

Engine Oil

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

Use remote panel to determine hours until next recommended oil change (see Section 10-2).

☞ *For cold weather starting information, see Section 6-5.*
Keep battery in good condition. Store battery in warm area.
Use correct grade oil for cold weather.

Continue initial system checks, see Sections 7-4 and 8-3.

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6-5. Cold Weather Starting And Operation

Engine Start

☞ *See Operation Section for additional remote panel operating instructions.*

1 Prior to starting the engine verify that all fluids (fuel, engine coolant, engine oil, hydraulic oil, and compressor oil) are to the correct level and grade/specification for the ambient temperature indicated. If the ambient temperature is below 14°F (–10°C) engine coolant block heaters and hydraulic oil heaters may be be required prior to the engine start. See chart below for minimum heater times.

2 When using the Remote Panel or Crane Remote to start the EnPak, turn unit on and initiate starting sequence. The EnPak control system automatically sets the glow plug time for ambient temperature conditions. See chart below when manually starting the unit from the EnPak service panel.

☞ *All external loads on the engine should be off when starting the engine. The air compressor should be off until the engine has been started and warmed up.*

3 Start engine. If engine fails to start after 10 seconds, turn unit off and repeat start sequence.

4 Allow engine to warm up prior to loading engine, See Note 1A. When ambient temperatures are below 50°F (10°C), the EnPak goes to 2600 RPM and remains there until the engine has warmed to 100°F (38°C).

☞ *Be sure to warm up engine, not only in the winter, but also in warmer seasons. An insufficiently warmed–up engine can shorten its service life.*

Ambient Temperature (At or below)								
F	-40	-22	-13	-4	14	32	50	68 (+)
C	-40	-30	-25	-20	-10	0	10	20
Engine								
Glow Plugs	Auto/ 13 sec	Auto/ 13 sec	Auto/ 13 sec	Auto/ 13 sec	Auto/ 10sec	Auto/ 10sec	Auto/ 5 sec	-
Oil	0W -20	5W -30	5W -30	10W -30	10W -30	10W -30	10W -30	10W -30
	Full Synthetic	5W -40	5W -40	10W -40	10W -40	10W -40	10W -40	10W -40
Block Heater	60 min.	40 min.	30 min.	20 min.	-	-	-	-
Engine Warm-up	7 min	5 min.	5 min.	3 min	2 min.	1 min.	1 min.	1 min.
Hydraulic (Models With Hydraulic Power Source)								
Oil	ISO 15	ISO 15	ISO 15	ISO 15	ISO 32	ISO 32	ISO 32	ISO 32
Oil Viscosity Index	VI ≥ 160	VI ≥ 140	VI ≥ 140	VI ≥ 140	VI ≥ 120	VI ≥ 120	VI ≥ 120	VI ≥ 120

Normal stabilized engine coolant temperatures should be in the range of 160 – 220°F (71 – 104°C). In extreme cold conditions it may become necessary to block a portion of intake cooling air. See Engine Troubleshooting Section for trouble shooting over or under coolant temperature.

1 Glow plugs are automatically activated when the unit is turned on from the EnPak remote or crane remote. Times listed are the maximum recommended glow plug times when starting the EnPak using the manual service panel. Extending the glow plug times beyond those listed can cause damage to the glow plugs and system.

2 For additional engine oil specification see Engine Maintenance Label or Engine Operators Manual.

3 Times listed are for the standard Miller Part No. 242954, Engine Block Heater, 120V.

4 Maximum start–up viscosity limited to 2100cSt, minimum intermittent viscosity limited to 6cSt. Use of a high viscosity index (VI) fluid is recommended to attain the ISO fluid recommendations listed. Refer to EnPak Technical Bulletin for further details. Never allow fluid temperatures to exceed 160°F during operation (do not exceed 140°F for handheld tools).

5 Optional, Miler Part No. 300546, Hydraulic Reservoir Oil Heater. Necessitated only when oil exceeds maximum start–up viscosity of 2100cSt."

– Not required.

SECTION 7 – HYDRAULIC SYSTEM (MODELS WITH HYDRAULIC POWER SOURCE)

7-1. Hydraulic System Integration

A. General Information – Minimum Requirements

The system recommendations are intended for operating a crane of a low duty cycle, such as used on a mechanics truck. The system recommendations are based on intermittent use. Auxiliary tools or operations that need continuous or high duty cycle operation will require additional cooling capacity.

For use with a mechanics truck crane, the system should at a minimum include the following items:

1 Reservoir of 20 gal (76 L) or more capacity
2 Pressure relief valve
3 Properly sized hoses and fittings, restrained and protected (see Table 7-1)
4 Return line filter to maintain an ISO 4406:1999 Cleanliness Code of 18/16/13.

B. Reservoir

Minimum reservoir size is 20 gal (76 L) with a minimum fluid height of 24 in. (610 mm) above base of unit. To accommodate changes in volume due to cylinder displacement, a filtered breather must be used and vented to atmosphere. This filter should be 10 micron.

The design of the reservoir must allow for adequate oil circulation to disperse entrapped air and to maintain sufficient cooling through the use of baffles. Changes in oil volume due to cylinder displacement also needs to be accounted for by allowing adequate air space inside the reservoir. The unit must operate properly at up to a 15° angle.

Place reservoir as near as possible to the unit, see Section 5-1. Suction line length greater than 72 in. (1829 mm) is NOT recommended.

The suction port should be at least 3 in. (76 mm) above the bottom of the reservoir to prevent any debris on the bottom of the reservoir from being drawn into the suction line. Also, the suction port should be at least 6 in. (152 mm) below the top level of the fluid to prevent vortexing. Oil volume changes during operation and the 15° maximum operating angle must be considered.

A suction strainer is not recommended by the hydraulic pump manufacturer. If a suction strainer is used, diligent preventive maintenance is required to prevent the strainer from clogging.

System return lines and drain lines should terminate below the minimum fluid level to prevent aeration of the oil. Return lines should be located away from the suction line to prevent interaction.

Allowance for a properly sized immersion heater may be necessary in some climates.

C. Pressure Relief Valve

☞ *With the use of a pressure compensated pump, the use of a relief valve is recommended in the main circuit to suppress hydraulic shock loads and add additional system protection.*

Open–Centered Systems:

The system relief valve should be set according to the crane manufacturer's recommendations. The maximum pressure of the pump should be set 200 psi (1.38 MPa) above the system relief valve to prevent interaction. For settings above 3500 psi (24.1 MPa), consult the factory.

In this configuration, the system relief valve is the primary relief and the pump maximum pressure setting is secondary.

Closed–Centered Systems:

For most closed–centered systems, the pump maximum pressure setting is the primary relief and the system relief valve is secondary. Therefore, the pump maximum pressure setting should be set at a level recommended by the crane manufacturer. The system relief valve should also be set according to the crane manufacturer's recommendations. In general, this will be approximately 200 psi (1.38 MPa) greater than the pump maximum pressure setting.

D. Hoses And Fittings

All hoses should be sized appropriately according to flow capacity and pressure loss. See Table 7-1 as a guide. Higher system pressures may require higher pressure hoses.

For the suction line, use sweep elbows to prevent fluid turbulence and reduce the possibility of cavitation at the pump inlet.

Use of quick disconnects in any line is not recommended. Using quick disconnects will cause higher system losses, result in elevated fluid temperature, and reduced system performance.

Obtain hoses of the proper length and type with appropriate fittings for the installation according to Table 7-1.

Table 7-1. Hydraulic Hoses Specifications

Hydraulic Hoses	System Flow Rate	Hose ID	Minimum Working Pressure	Minimum Burst Pressure	Vacuum Service	Operating Temperature
		in. / mm	psi / MPa	psi / MPa	Inches of Hg / kPa	Degree C
Suction Line[1]	up to 10 gpm	1.25 / 31.76	150 / 1.03	600 / 4.14	28 / 94.82	–40 to 100
	over 10 gpm, up to 20 gpm	1.5 / 38.1				
Pressure Line[2]	up to 10gpm	0.5 / 12.7	3000 / 20.68	12000 / 82.74		–40 to 100
	over 10 gpm, up to 20 gpm	0.75 / 19.05				
Case Drain[3]	All flow rates	0.625 / 15.88	350 / 2.41	1400 / 9.65		–40 to 100
Load Sense (Closed Center)[4]	All flow rates	0.25 / 6.35	3000 / 20.68	12000 / 82.74		–40 to 100
Return Line Less Than 10 gpm[5]	up to 10 gpm	0.625 . 15.88				–40 to 100
	over 10 gpm, up to 20 gpm	0.75 / 19.05				
1 – Based on 2–4 fps velocity. Sweep elbows required. Barbed fittings acceptable with two hose clamps. Connection: JIC (37°)–24, 1-7/8–12 thread, torque 160 ft. lb.						
2 – Based on 15–20 fps velocity. Connection: JIC (37°)–12, 1–1/16 –12, torque 80 ft. lb.						
3 – Based on 2 gpm with a pressure drop of less than 10 psi and length less than 10 ft. Connection: JIC (37°)–10, 7/8–14, torque 60 ft. lb.						
4 – Applicable only to closed–center system. Connection: JIC (37°)–4, 7/16 –20, torque 12 ft. lb.						
5 – Based on 10–15 fps velocity. The line should connect directly back to reservoir through a return filter. Filter cleanliness code: 18/16/13 or better.						

E. Filtration

System filtration requirements are to maintain a cleanliness code of 18/16/13 per ISO 4406:1999.

Filtration should be met with the use of a return line filter. Per the pump manufacturer, the use of suction line strainer is not recommended due to clogging issues.

The filter must be compatible with all petroleum and synthetic hydraulic fluids. The filter should operate in a temperature range of –30°C to 121°C. Consideration should be given to the filter bypass rating. Excessive bypass at low temperatures should be avoided.

F. Hydraulic Fluid

Premium grade petroleum–based fluid that contains anti–wear agents, rust inhibitors, anti–foaming agents, and oxidation inhibitors and has an ISO VG rating as recommended.

Table 7-2. Hydraulic Fluid Specifications

NOTICE – Viscosity Index (VI) greater than 120 is recommended.

Ambient Temperature	Viscosity Grade (Viscosity Index Greater Than 120)
0°F to 90°F (–18°C to 32°C)	ISO 32
Less than 0°F (less than–18°C)	ISO 15
Greater than 90°F (greater than 32°C)	ISO 46

General fluid recommendations:

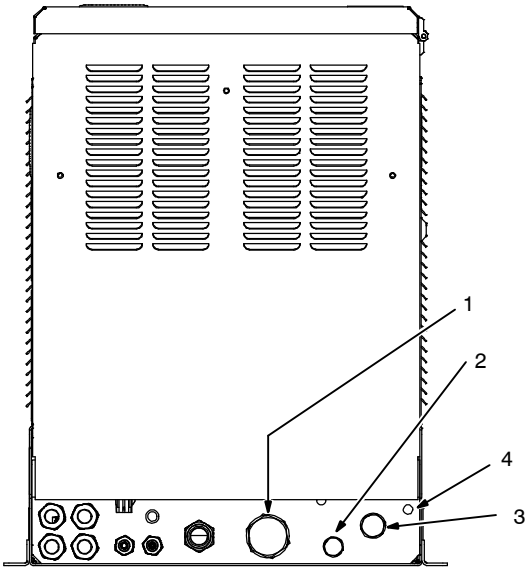
Recommended operating viscosity: 16–40 cSt
Maximum continuous viscosity: 430 cSt
Maximum start–up viscosity: 2100 cSt
Minimum intermittent viscosity: 6 cSt

7-2. Hydraulic Hose Connections

⚠ Hydraulic fluid is flammable. Do not work on hydraulics near sparks or flames; do not smoke near hydraulic fluid. Route all hoses away from hot, sharp or moving parts. Check all connections and hoses for damage, leaks, and wear.

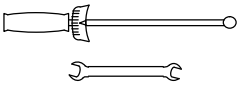
1 Suction Line Connection
2 Case Drain Connection
3 Pressure Line Connection
4 Load Sense Line Connection (If Applicable)

Connect hoses and torque connections.

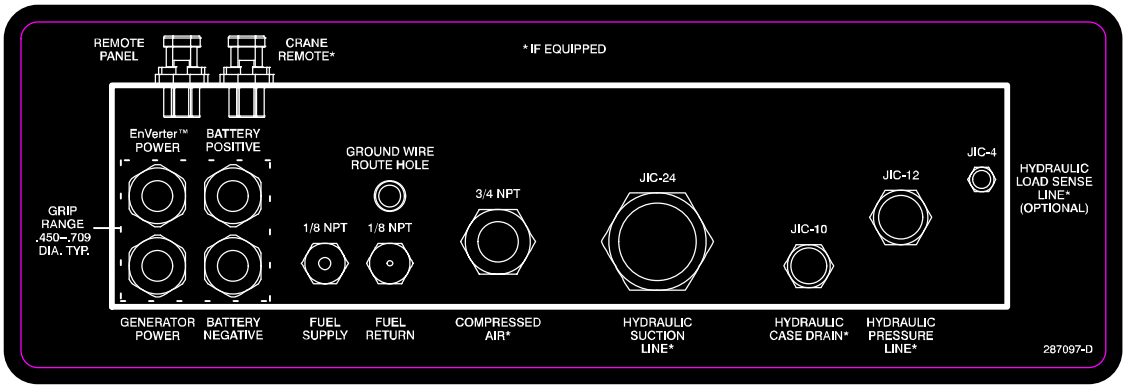


Hose	Torque
Suction	160 ft lb (217 N·m)
Case Drain	60 ft lb (81 N·m)
Pressure Line	80 ft lb (108 N·m)
Load Sense	12 ft lb (16 N·m)

Tools Needed:



2-1/4. 1-1/4. 1, 9/16 in.
(57, 31, 25, 14 mm)



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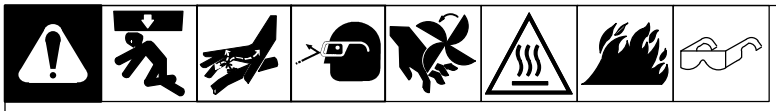
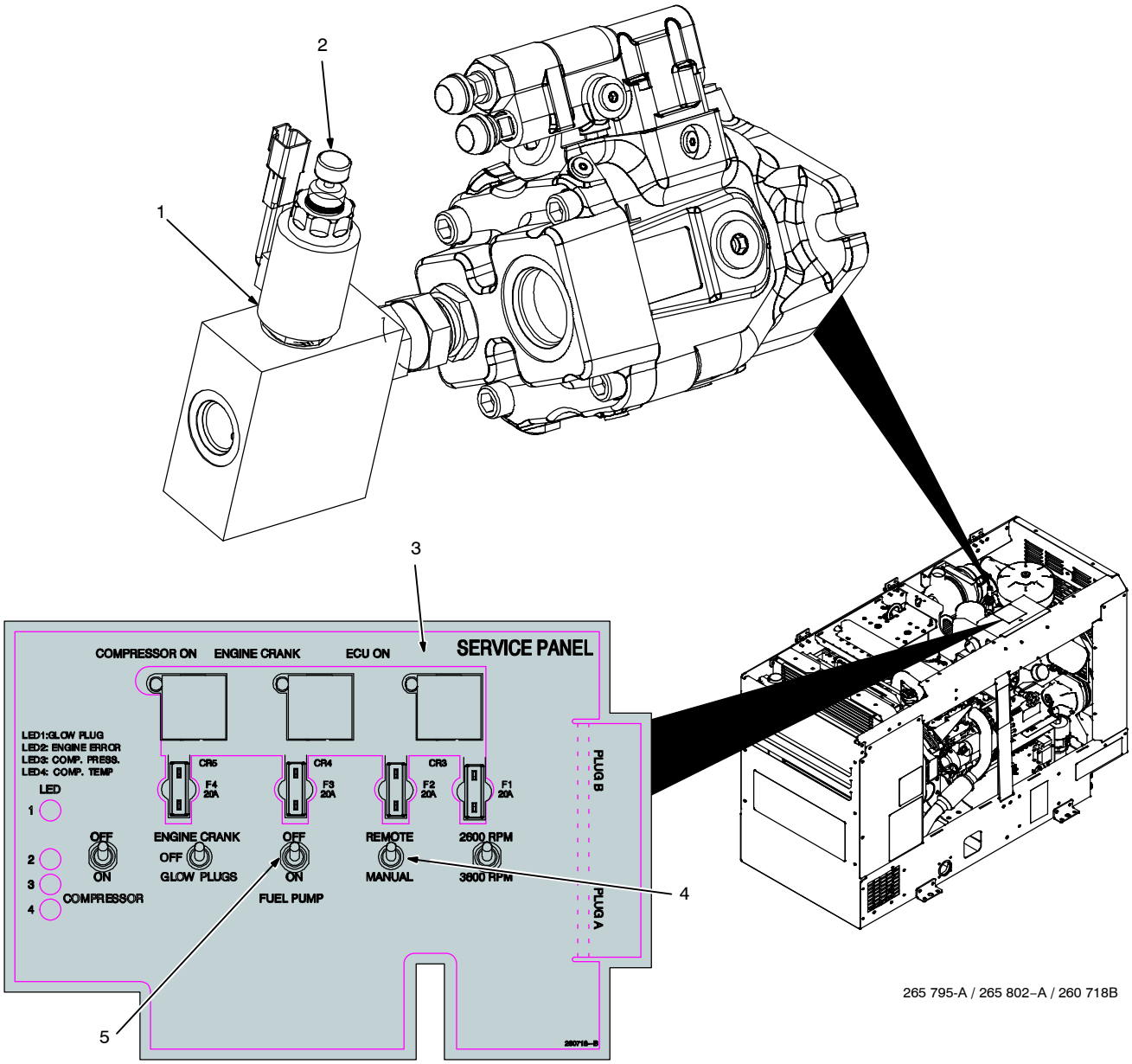
7-3. Priming Hydraulic Pump





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⚠ When working on unit, always move Manual/Remote switch to Manual position to prevent remote starting. See Section 10-7.

1 Proportional Valve Assembly
2 Manual Override Screw Adjust
3 Service Panel
4 Manual/Remote Switch
5 Fuel Pump Switch

Make hydraulic system connections according to Section 7-2.

Check to be sure hydraulic pump case oil is at its highest point.

Fully open suction line valve at the reservoir. Turn manual override screw fully clockwise (fully opens proportional valve).

On Service Panel, place Manual/Remote switch in the Manual position. Place the Fuel Pump switch in the Off position.

Crank the engine for 10 seconds, pause, crank again for 10 seconds, pause and crank for an additional 10 seconds. This should prime the hydraulic pump.

Turn the manual override screw fully counterclockwise.

Place the Service Panel Manual/Remote switch in the Remote position. Place the Fuel Pump switch in the On position.

Start the engine using the remote panel. Let the engine run 5 to 10 minutes with no load.

Pressure and flow rate are set at the factory and should not require initial adjustment. Have Factory Authorized Service Agent correct settings.

7-4. Hydraulic System Prestart Checks

NOTICE *– Ensure hydraulic system is properly connected with valves open before starting unit. Damage will result if unit is run before hydraulic system is complete. Hydraulic pump does not disengage via clutch.*

☞ *Unit is shipped set for 10 GPM. Contact Factory Authorized Service Agent for pump flow rate changes. See Section 10-3.*

7-5. Hydraulic Pump Operation

☞ *Unit is shipped set for 10 GPM. Contact Factory Authorized Service Agent for pump flow rate changes. See Section 10-3.*

There are 3 modes that the EnPak can be placed in to deliver hydraulic output as required. This is done using the crane pendant.

NOTICE *– Check crane manufacturer information to confirm the following operation.*

1 Automatic speed control:

Most crane systems default to automatic speed control when first started. To place the EnPak in automatic speed control, if it is not there already, place the crane pendant speed switch in high speed.

For open center systems, the EnPak will deliver only the required hydraulic output, based on the trigger command from the crane pendant. So for small trigger commands from the crane pendant, the EnPak will go to 2600 RPM and deliver up to 6 GPM of flow from the hydraulic pump. For medium trigger pulls, the EnPak will go to 3200 RPM and deliver up to 10 GPM.

Closed center systems do not have a proportional signal available, so there is no operation at 2600 RPM.

2 Low speed lock:

For both open and closed centered systems: Placing the crane pendant speed switch in the low speed position will lock the EnPak at 2600 RPM for crane loads. If other loads are applied at the same time, the EnPak will go to the required RPM. When the EnPak is locked at 2600 RPM for crane loads, the hydraulic output is limited to a maximum of 6.5 GPM (open center) or 10 GPM (closed center).

3 High speed lock:

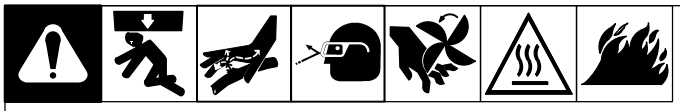
For both open and closed centered systems: The EnPak can still be locked at 3200 RPM on most systems, by toggling the crane pendant speed switch into high, then into low, and then back to high (each switch transition must occur within 3 seconds). The EnPak will then be locked at 3200 RPM and have maximum hydraulic output. The EnPak can still be locked into high speed from the EnPak Remote Panel.

EnPak starting with hydraulic load:

To aid in starting the engine during cold weather, the proportional hydraulic valve on the EnPak pump is turned off until the speed of the engine is greater than 1700 RPM.

Notes

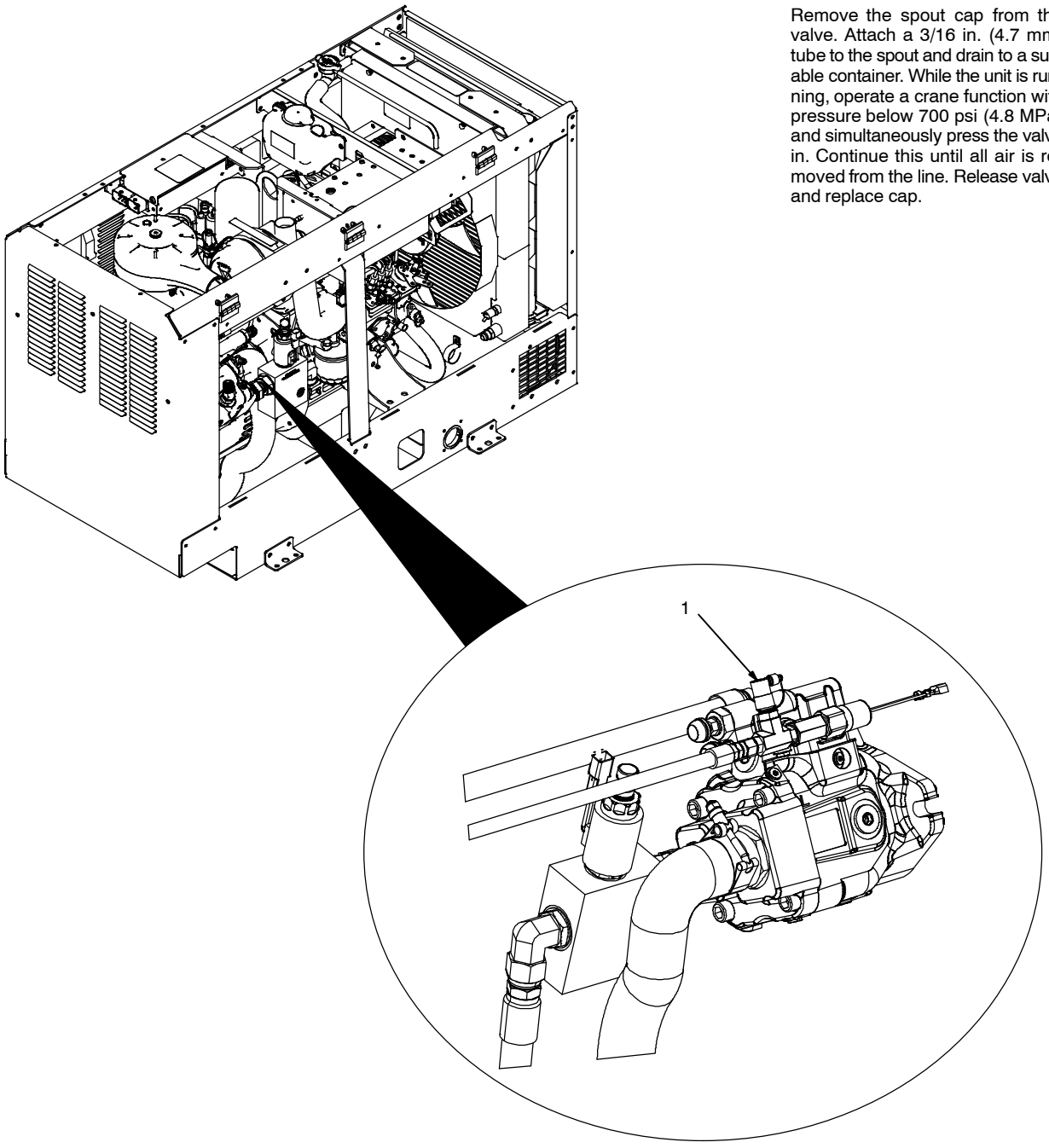
7-6. Load Sense Line Bleeding (Closed Center Systems Only)



1 Load Sense Line Bleeding Valve

For systems utilizing closed−center valving and load sensing, the load sense line must be bled of air near the pump. This is accomplished using the push−activated valve on the load sense line.

Remove the spout cap from the valve. Attach a 3/16 in. (4.7 mm) tube to the spout and drain to a suitable container. While the unit is running, operate a crane function with pressure below 700 psi (4.8 MPa) and simultaneously press the valve in. Continue this until all air is removed from the line. Release valve and replace cap.



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SECTION 8 – COMPRESSOR SYSTEM

8-1. Air Compressor System Integration

A. General Information – Minimum Requirements

For use with a mechanics truck crane, the system should at a minimum include the following items:

1 Reservoir of 20 gal (76 L) or more capacity
2 Safety relief valve
3 Properly sized hoses and fittings, restrained and protected

Depending on the desired compressed air quality, air conditioning components such as separators, filters or dryers may be required.

No check valve should be installed.

B. Reservoir

Required reservoir size is 20 gal (78 L) or larger. Compressor performance may be adversely affected if tank is less than 20 gal (78 L). The addition of an air reservoir provides air delivery capacity and aids in reducing the amount of water and contaminates discharged to the rest of the system by condensing out these contaminants. The reservoir should be ASME Code for 200 psi working pressure. A drain valve should also be installed for draining water and contaminants.

The reservoir must have a safety relief valve installed of appropriate relieving pressure and capacity of the system. Also, relief valve must comply with vessel and code under which the vessel is constructed and inspected.

C. Hoses And Fittings

Obtain hoses of the proper length and type with appropriate fittings for the installation according to Table 8-1.

Table 8-1. Air Compressor Hose Specification

Hose ID	Minimum Working Pressure	Minimum Burst Pressure	Operating Temperature
0.5 in. / 12.7 mm	350 psi / 2.41 MPa	1400 psi / 9.65 MPa	–40 to 100 Degree C

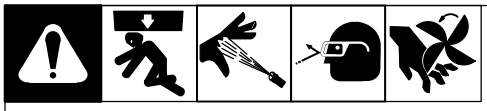
D. Compressor Oil

☞ *Miller 276620 Synthetic ATF is recommended. Do not mix oil types.*

The cooling oil must have high ageing stability, corrosion protection, and dispersive capacity; low emulsification tendency, and minimum foaming. Viscosity class ISO VG 68 is recommended.

Notes

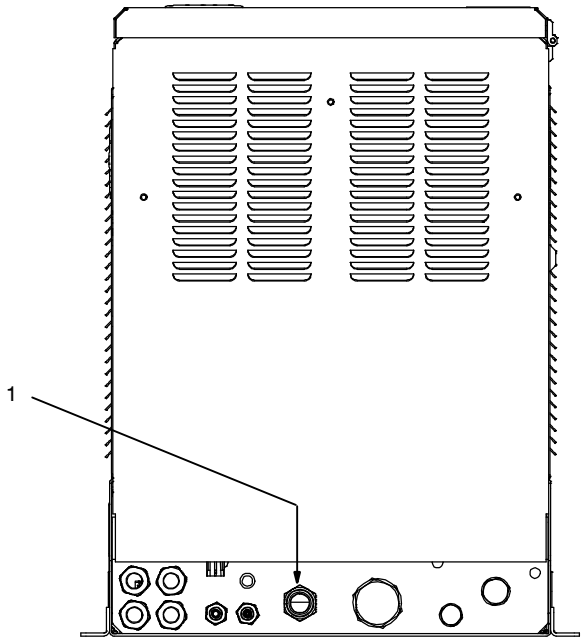
8-2. Compressor Connections



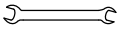
Stop engine, wait 10 minutes, and verify the air pressure gauge reads 0 psi before servicing compressor.

1 Air Compressor Connection

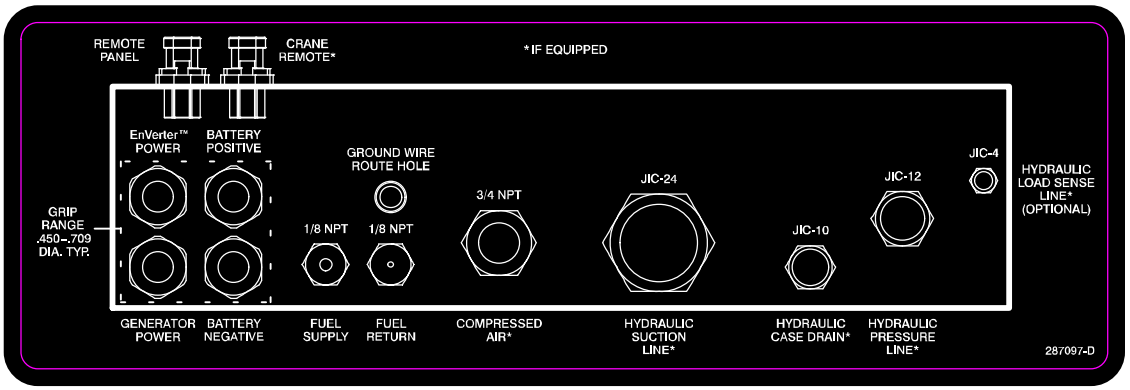
Connect and secure hose. After hand-tightening connections, tighten 2 to 3 full turns.



Tools Needed:



1-1/6 in. (27 mm)



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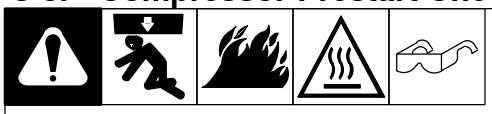
8-3. Compressor Prestart Checks



⚠ **Stop engine, wait 10 minutes, and verify the air pressure gauge reads 0 psi before opening oil cap. Do not open oil fill cap while running.**

☞ *The compressor is equipped with high oil temperature shutdown. High oil temperature can be caused by low oil or hot air recirculation.*

NOTICE *– Do not mix oil types. Do not overfill.*

1 Air Compressor Oil Fill Cap

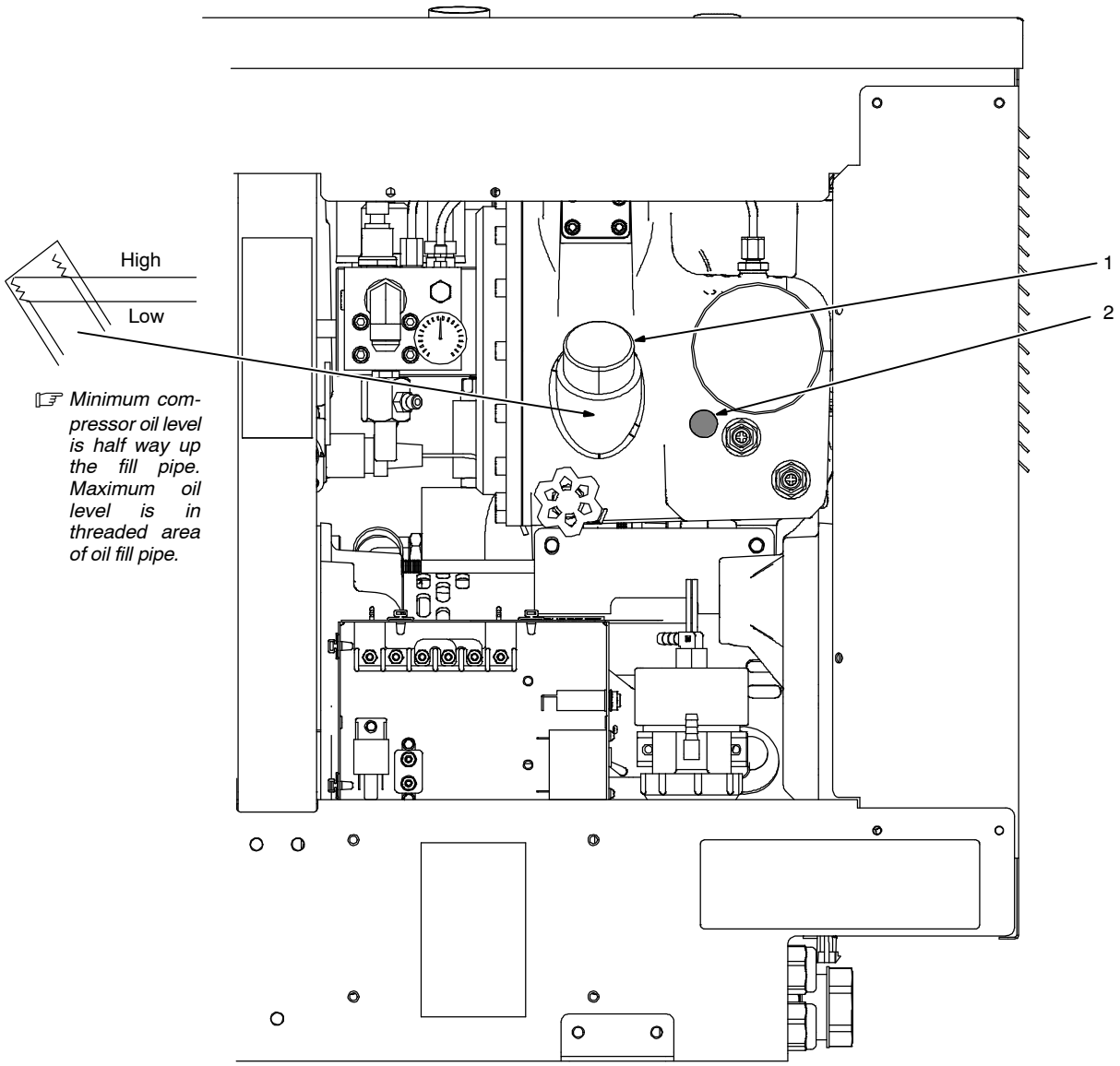
Hand tighten oil fill cap. Using excess force can damage o–ring.

2 Oil Level Sight Gauge

The unit is shipped with oil in the compressor reservoir. Oil level sight gauge shows oil level.

Minimum oil level is half way up the oil fill pipe. Maximum oil level is in threaded area of oil fill pipe.

Check level frequently. If oil needs to be added, be sure unit is off and compressor case pressure is released according to Section 8-5 before removing fill cap.



☞ *Minimum compressor oil level is half way up the fill pipe. Maximum oil level is in threaded area of oil fill pipe.*

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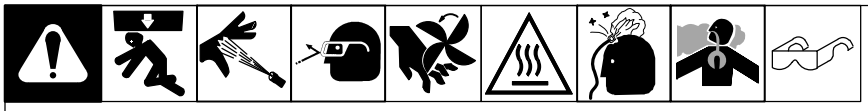
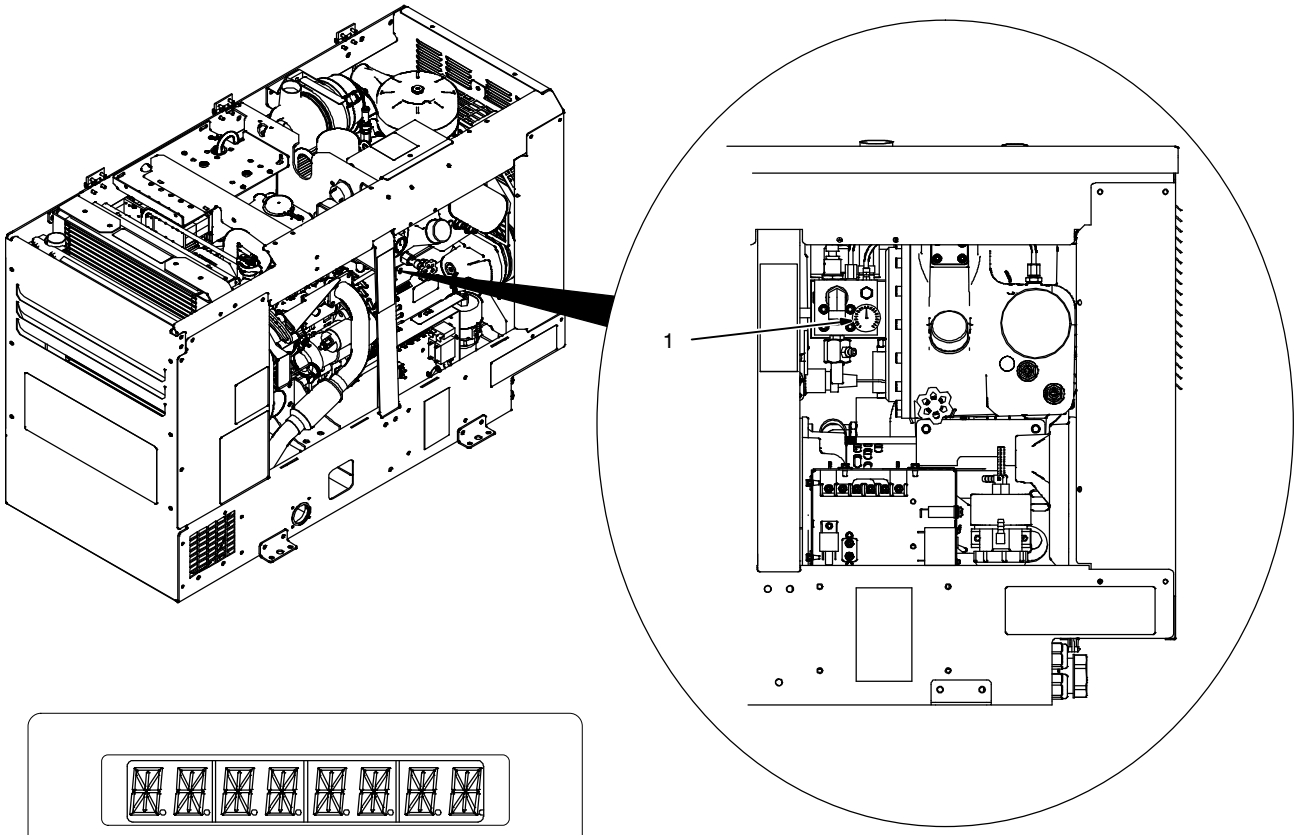
8-4. Air Compressor Controls





☞ *Adjust system maximum pressure and minimum pressure using Remote Panel.*

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⚠ **The air pressure gauge reads the air compressor case pressure. Case pressure can be high even when external reservoir pressure is zero. Always release pressure manually according to Section 8-5 before checking/adding oil or performing maintenance.**

1 Air Compressor Gauge (P−PG)

Adjust system maximum pressure and minimum pressure using Remote Panel. Set at lowest possible pressure for the job to reduce engine loading.

☞ *Pressure is factory set for 120 psi. Maximum pressure setting is 175 psi. Minimum pressure setting is 120 psi. See Section 10-3.*

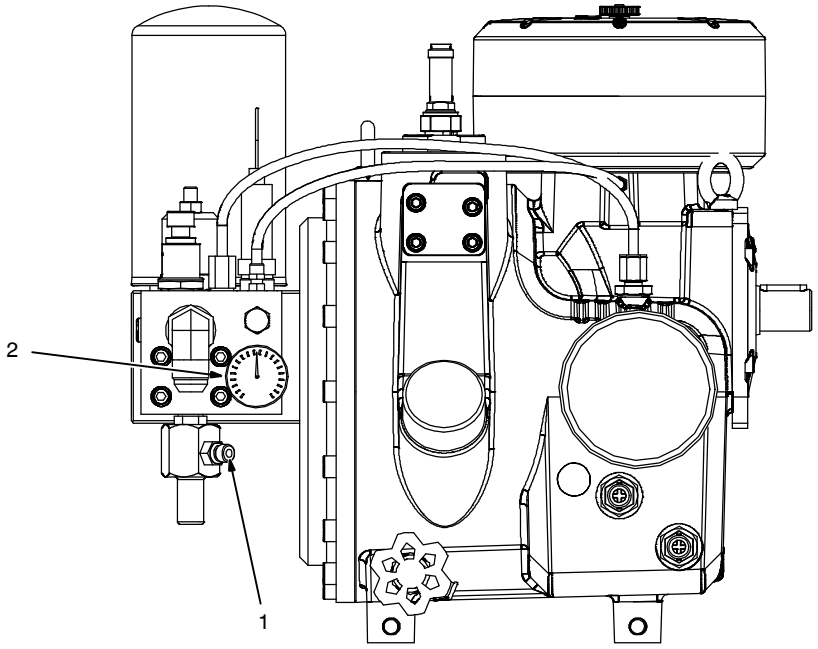
At pressures that are 10 psi above maximum set point, the compressor clutch will temporarily disengage to prevent further pressure build-up, and OVerPRES shows temporarily on the remote panel display. Once the compressor outlet pressure is reduced below the maximum set point, the compressor controls reset and resume normal operation.

The compressor is also equipped with a mechanical safety valve (P−SV) that will open if pressure approaches 200 psi.

If the compressor continues to overpressure and disengage, see Section 12.

If compressor shuts down due to overtemperature, it automatically resets when it cools.

8-5. Compressor Blow Down



Stop engine, wait 10 minutes, and verify the air pressure gauge reads 0 psi before servicing compressor.

To control the release of air in the compressor, the compressor goes through a blow down cycle when it is turned off. Blow down depressurizes the compressor case; this provides safe release of case pressure and allows reduced load at restart.

In ambient temperatures below freezing, compressor unload and blow down time is extended to build up heat in the compressor. This helps increase oil temperature and remove moisture from the compressor oil.

1 Pressure Release Valve

2 Air Compressor Gauge

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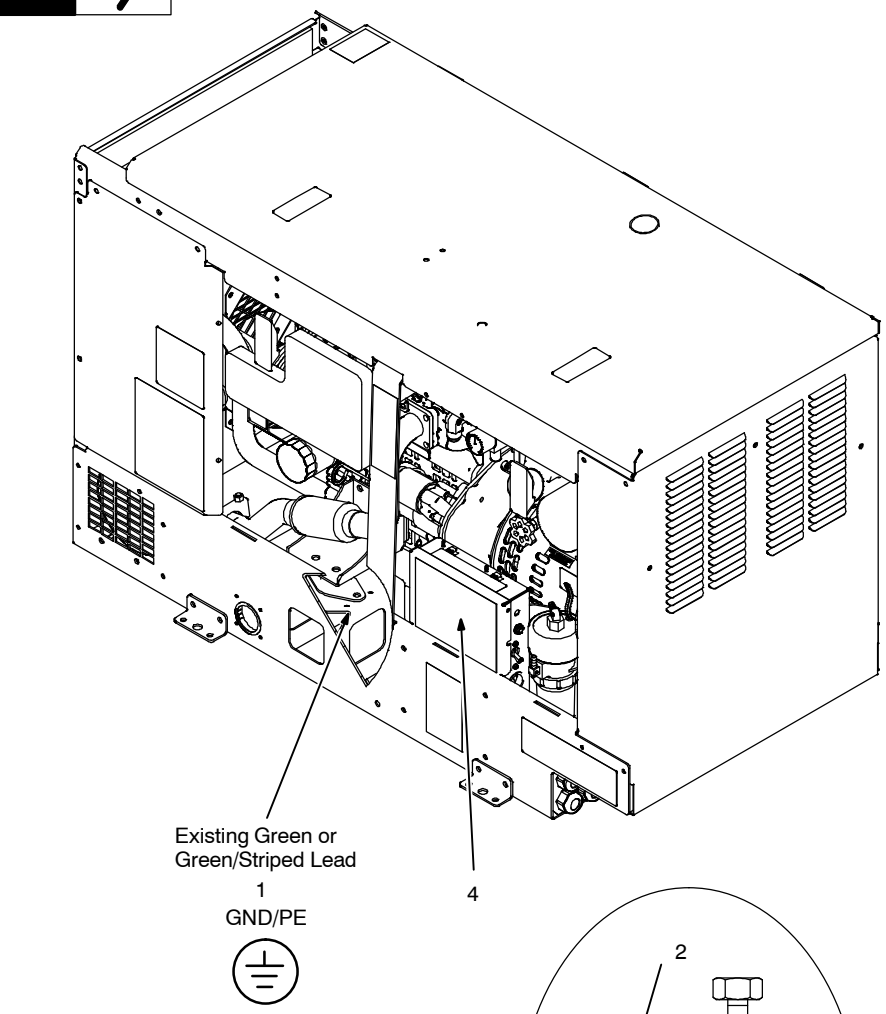
Notes

SECTION 9 – AUXILIARY POWER SYSTEM CONNECTIONS

9-1. Grounding Auxiliary Power System To Truck Frame



Always ground auxiliary power system to vehicle frame to prevent electric shock and static electricity hazards.

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

1 Auxiliary Power System Ground
2 Grounding Cable (Not Supplied)
3 Metal Vehicle Frame
4 Auxiliary Power Box

Connect grounding cable to auxiliary power system ground (ground screw on frame where existing green or green/yellow lead is attached).

Route grounding cable through auxiliary power box and through ground wire route hole, away from hot, sharp or moving parts.

Route grounding cable to appropriate termination point on metal vehicle frame. Use #8 AWG or larger insulated copper wire with green or green striped insulation.

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

Always connect a ground wire from the auxiliary power system ground to bare metal on the vehicle frame as shown.

Use only Miller-recommended GFCI receptacles (see Parts List). The generator does not provide usable power at engine idle speed (1800 RPM). Other GFCI receptacles cannot be used. The low frequency/low voltage may prevent other GFCI receptacles from operating properly.

Test GFCI receptacles at least once a month by running engine at high speed and pressing Test button to verify GFCI receptacles are working properly.

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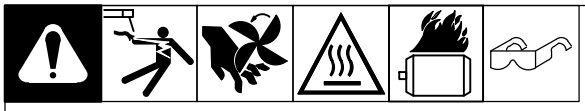
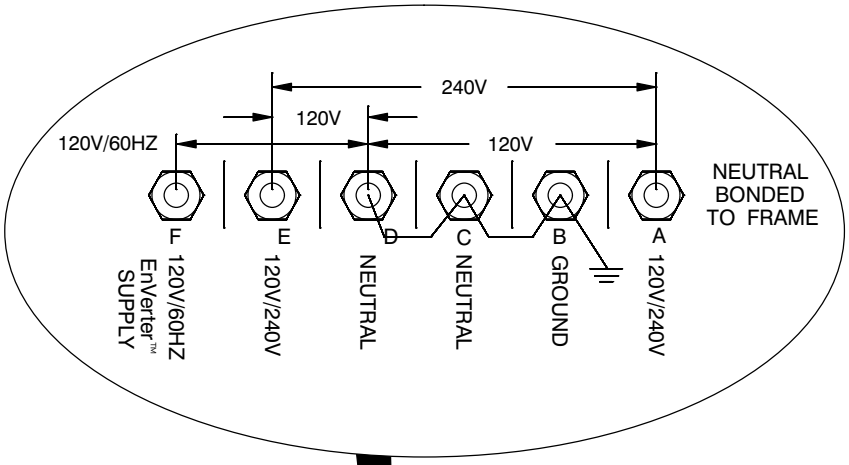
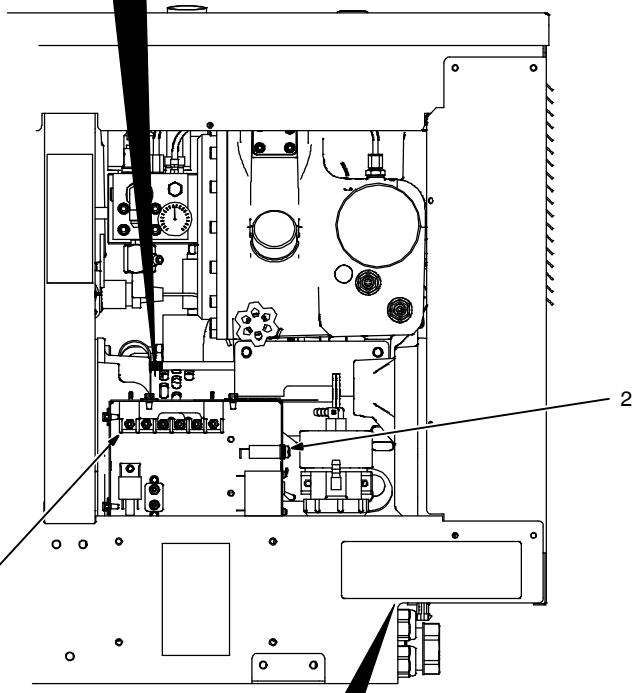
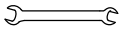
9-2. EnVerter™ Power System Connections And Overload Protection



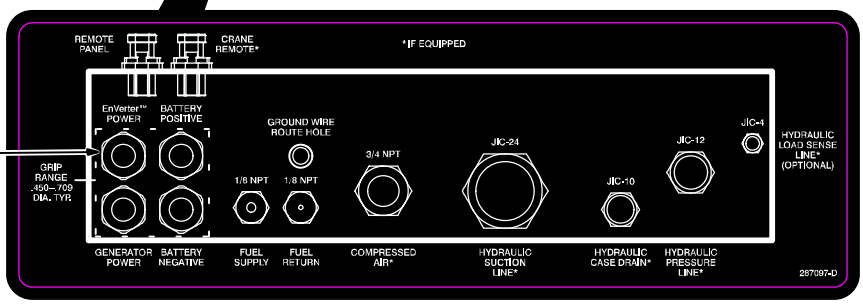




Tools Needed:



☞ *Route leads from EnVerter load through strain relief.*



Stop engine and let cool.

Keep wiring away from hot, sharp, or moving parts.

1 Terminal Block 1T

120 VAC EnVerter™ power is available between 1TF and 1TD.

Combined output of all EnVerter power loads cannot exceed 2.4 kVA/kW. Full EnVerter power is available regardless of engine speed.

Route conductors through strain relief in right side of unit to auxiliary power box for connection.

NOTICE *– There are two options for installing 120 VAC power, see truck wiring diagrams Figure 13-4 and Figure 13-5.*

2 Supplementary Protector CB2

Supplementary protector CB2 protects the EnVerter power supply from overload when a 120 VAC load is connected.

☞ *If supplementary protector continues to open, contact Factory Authorized Service Agent.*

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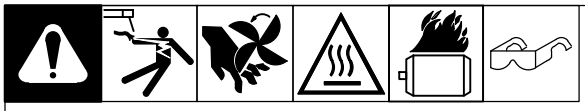
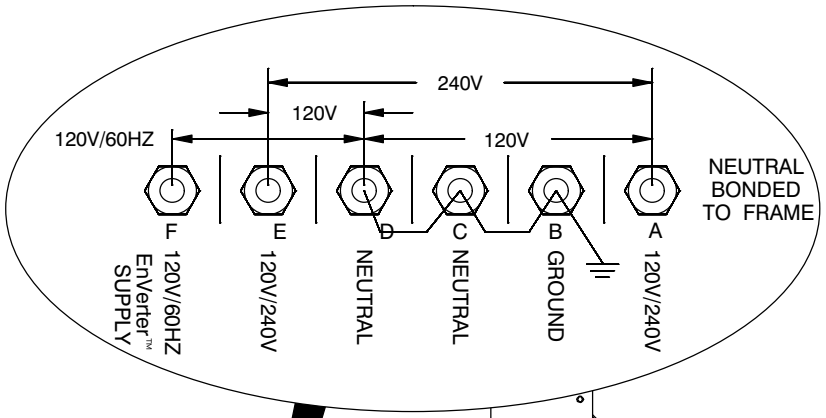
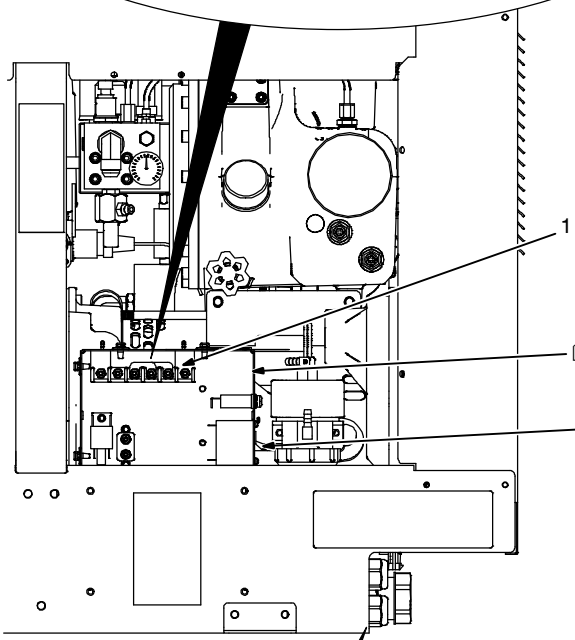
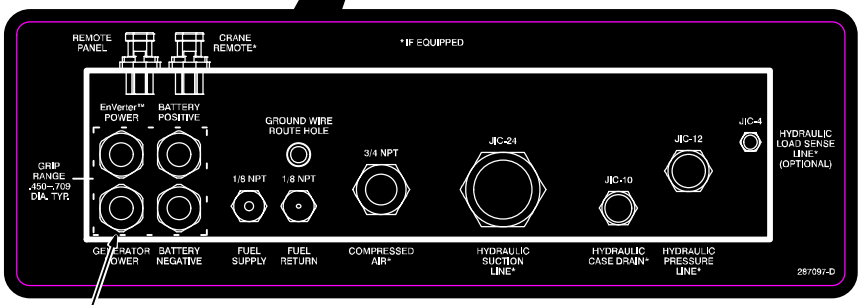
9-3. Generator Power System Connections And Overload Protection







☞ *Circuit Breaker CB3 Location*



☞ *Route leads from generator load through strain relief.*

⚠ **Stop engine and let cool.**

⚠ **Keep wiring away from hot, sharp, or moving parts.**

1 Terminal Block 1T

240 VAC power is available between 1TA and 1TE, with terminal 1TC as neutral.

120 VAC standard generator power is available between 1TA and 1TD or 1TE and 1TD.

Combined output of all generator loads cannot exceed 6 kVA/kW.

2 Supplementary Protector CB1

Supplementary protector CB1 protects the generator winding from overload when a 120/240 VAC load is connected.

NOTICE *– If the standard generator high speed (3600 RPM) 120V/20A circuit is used, supplementary protector CB3 must be installed to match the amperage rating of the receptacle. There are two options for installing 120 VAC power, see truck wiring diagrams Figure 13-4 and Figure 13-5.*

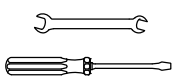
☞ *If supplementary protector continues to open, contact Factory Authorized Service Agent.*

☞ *When the EnPak is running at 1800 RPM, the voltage output of the generator is too low to activate some electric machines that require the full 120 VAC or 240 VAC for operation. If the electric machine that you are using is not recognized as a load by the EnPak, and does not turn on, place the EnPak in high speed. This will bring the output of the generator up to the normal 120 VAC or 240 VAC level, and the machine that is plugged into the generator should work normally. This is for the standard generator power only, and does not apply to the EnVerter power output which is 120 VAC regardless of engine RPM.*

⚠ **Use only Miller-recommended GFCI receptacles (see Parts List). The generator does not provide usable power at engine idle speed (1800 RPM). Other GFCI receptacles cannot be used. The low frequency/low voltage may prevent other GFCI receptacles from operating properly.**

⚠ **Test GFCI receptacles at least once a month by running engine at high speed and pressing Test button to verify GFCI receptacles are working properly.**

Tools Needed:



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SECTION 10 – OPERATION

10-1. Remote Devices Connections

1 EnPak Remote Panel Connection Receptacle RC12

Mount remote panel inside of truck body cabinets where easily accessible. Connect interconnecting cable Part No. 244283 between remote panel and RC12.

2 Crane Remote Connection Receptacle RC13

NOTICE *– Connect to this receptacle only when EnPak is equipped with hydraulic power source used to power a hydraulic crane apparatus.*

Crane remote control provided by crane manufacturer. Connect appropriate harness adapter into the crane harness (see instructions provided with harness adapter kit). Connect interconnecting cable Part No. 244283 between crane remote and RC13.

Contact Factory for list of harness adapters available.

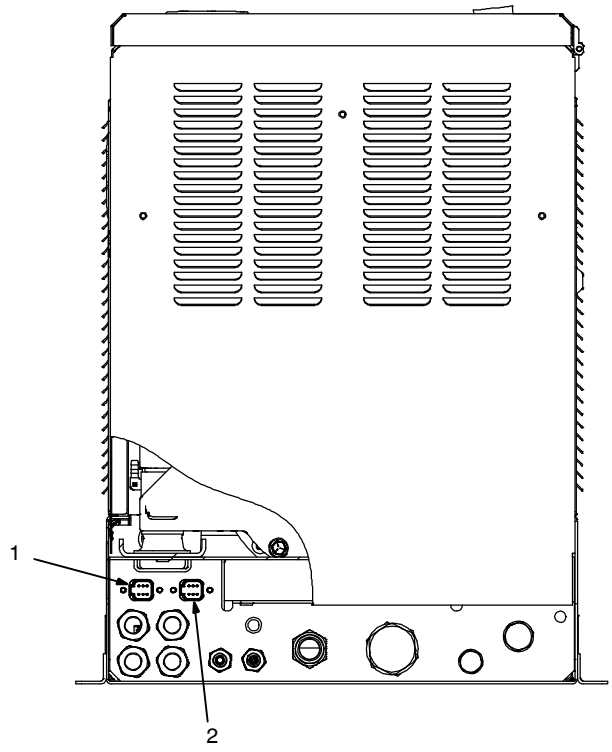
Optional Engine Remote Start/Stop Using Ground Signal

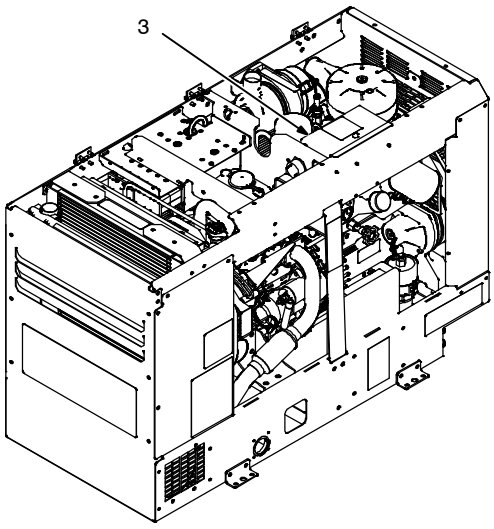
3 Service Panel

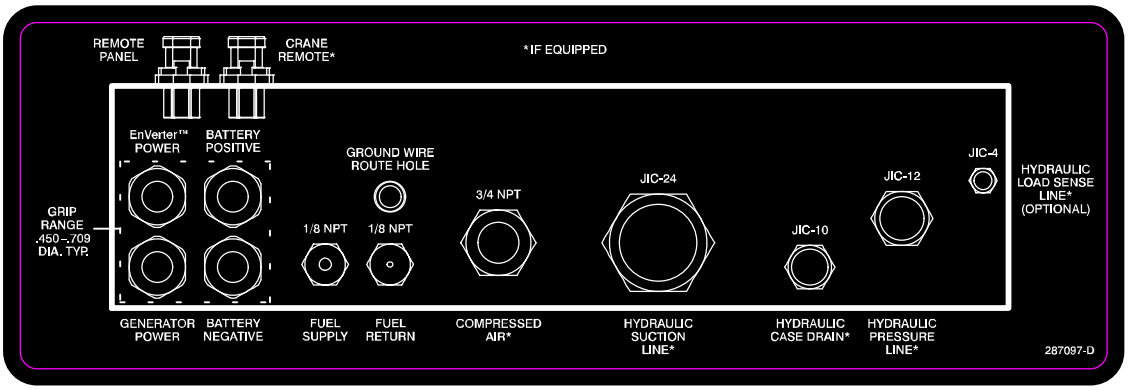
Locate wire 120 in the harness close to the Service Panel control board. It will have a fast on connector on the end of it.

Connect signal wire from start/stop switch to this wire 120 and route the wire out through the base of the unit. The signal from the switch must be a “ground” signal when the switch is activated and no signal when the switch is not activated.

The EnPak control will detect a ground signal and will start the engine if it is not running, or it will stop the engine if it is running.







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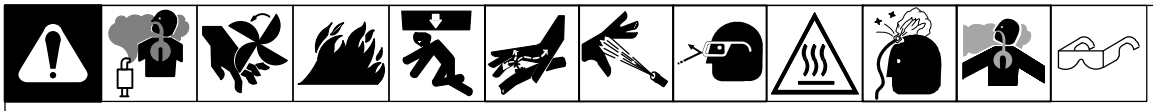
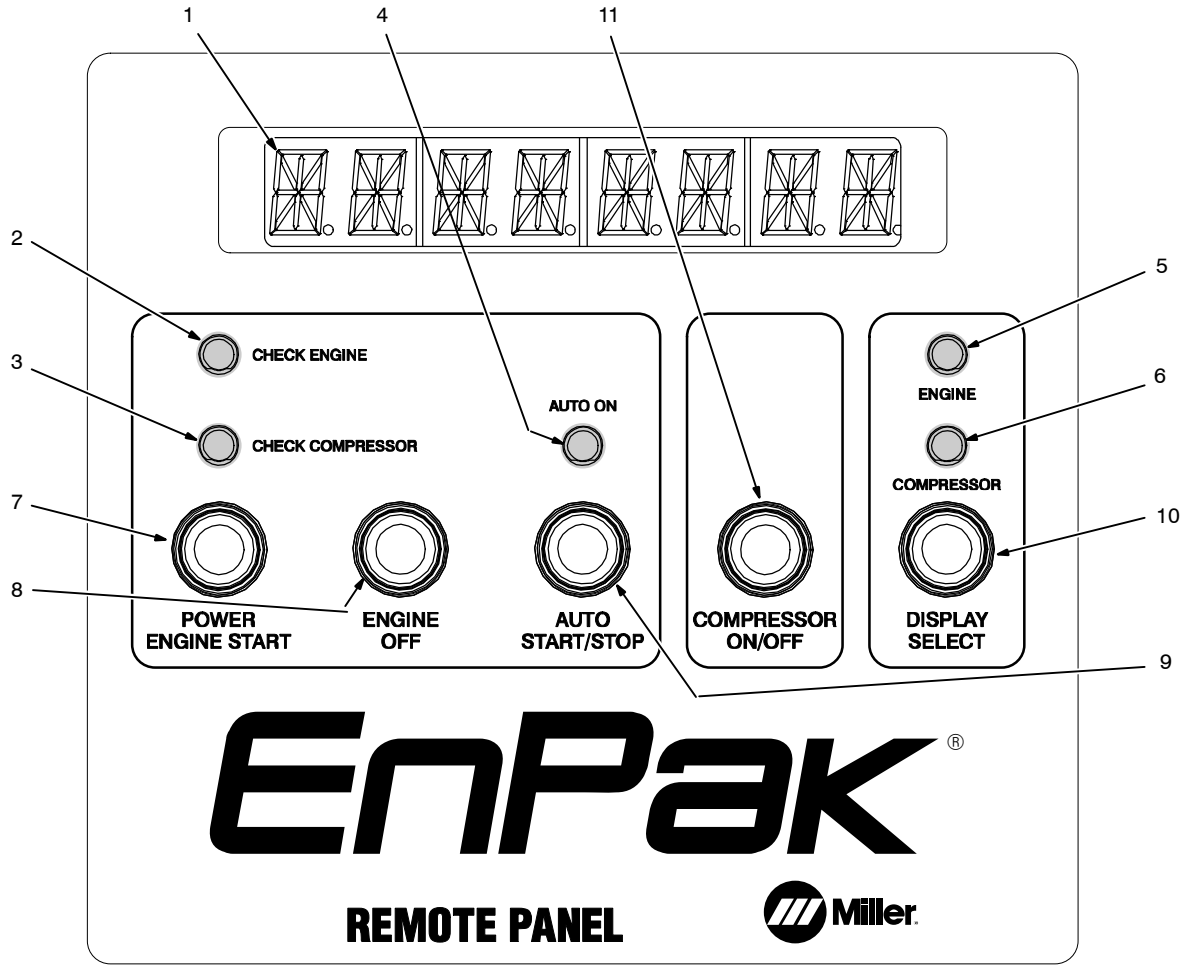
10-2. Remote Panel (Use With Section 10-3)





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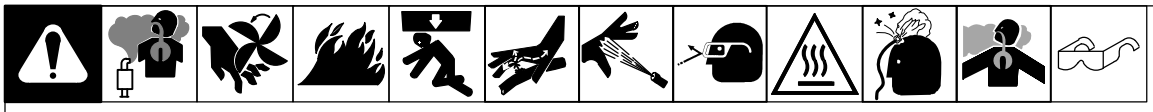
10-3. Remote Panel Operation (Use With Section 10-2)



1 Alpha−Numeric Display

During the start sequence, the following appears:

SYSTEMon
GLOWPLUG
STARTING
CRANKING

☞ *GLOWPLUG only shows on display when ambient temperature is less than 41°F (5°C).*

See Section 10-5 for error messages that appear.

2 Check Engine LED

Lights when display is showing an engine error.

If an engine error occurs and the engine shuts down, the error will be stored in memory. If the display is off, press the Power button once to activate the Remote Panel. The display will read ERROR and after a few seconds will flash the error code. See Section 10-5 for error messages that appear.

To erase the error, press and hold the Display Select push button until the display reads SYSTEMon, and the indicator is off. The display will now cycle normally when the Display Select push button is pushed.

3 Check Compressor LED

Lights when display is showing a compressor error.

4 Auto On LED

Lights when Auto Start/Stop mode is selected.

5 Engine LED

Lights when display is showing engine related information.

6 Compressor LED

Lights when display is showing compressor related information.

7 Power Engine Start Push Button

Press and release to turn on power to the display only. This allows access to the display menu.

To Start: press and release the Power Engine Start push button two times. The first press and release will power up the control system and the second press and release will initiate the automatic starting sequence. The Engine Off push button can be pressed at any time to stop the start sequence.

The starter will disengage at a predetermined RPM based on the ambient temperature.

With engine running, press and release to toggle between low speed and high speed. The display will flash HIGH SPd when engine is locked in high speed.

8 Engine Off Push Button

Press when engine is running to stop engine, or to stop the automatic start sequence.

9 Auto Start/Stop Push Button

Press and release the Auto Start/Stop push button to toggle between automatic and manual control.

When the automatic mode is selected, the Auto On LED lights and display reads ENAbLEd.

While the display shows ENAbLEd, press and hold the push button to change the auto stop timer (range of two to 30 minutes). This time is placed in memory and is remembered the next time the EnPak is started.

When the system is placed in manual mode, the display shows dISAbLEd and the Auto On LED is off.

10 Display Select Push Button

When engine is running: press and release to cycle through the following displays:

RPM
Battery voltage
Current fuel usage (Gallons Per Hour)
Engine hours
Engine maintenance hours (Counts down from 400 hours)
Engine temperature
Compressor hours
Compressor maintenance hours (Counts down from 500 hours)

When engine is not running: press and release to cycle through the following displays:

Battery voltage
Engine hours
Engine maintenance hours (Counts down from 400 hours)
Compressor hours
Compressor maintenance hours (Counts down from 500 hours)

☞ *Maintenance hours initially count down from 50 hours. Complete maintenance required after first 50 hours of operation according to Section 11.*

☞ *Current fuel usage is for reference only. Variables such as ambient temperature, altitude and fuel blend affect actual usage.*

11 Compressor On/Off Push Button

When engine is running, press twice to turn compressor on or off. When turned on, engine will speed up to 2600 RPM. This indicates the compressor is on.

☞ *Compressor maximum and minimum pressure are set using the Remote Display panel.*

When engine is not running, press and release to display SET MAX. When SET MAX is displayed, press and hold to increment maximum pressure setting. From 120 to 175.

To set minimum pressure, when display reads SET MAX, press and release to display SET MIN. When SET MIN is displayed, press and hold to increment minimum pressure setting from 90 to 150.

Compressor minimum pressure automatically remains 20 PSI or more lower than the maximum pressure setting.

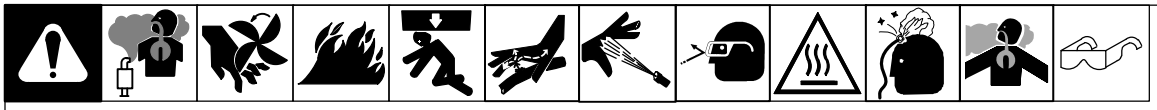
10-4. Safety Interlock

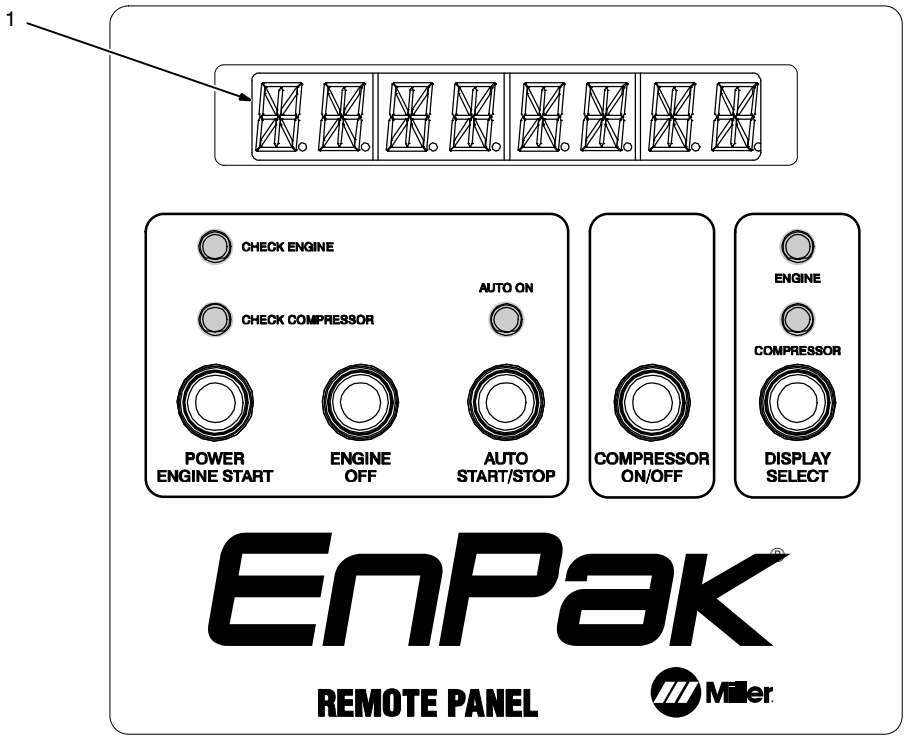
Models With Hydraulic Power Source: The safety interlock system must be engaged before the EnPak engine can be started Contact dealer for detailed description of supplied system.

Models Without Hydraulic Power Source: The safety interlock system requires 12 volts DC be supplied from the accessory position of the truck ignition switch to pin 5 of RC13. Splice into supplied plug and wire.

☞ *Test safety interlock monthly, see Section 11-6.*

10-5. Operation And Error Messages





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1 Alpha–Numeric Display

The following operational messages may appear:

CHNG OIL

Indicates an oil change is needed. This light flashes after the first 50 hours of operation and then at normal oil change intervals thereafter.

If CHECK ENGINE LED is on, engine oil change time interval has counted down to zero, indicating it is time to change engine oil.

To reset display after oil change, see Section 11-4.

If CHECK COMPRESSOR LED is on, compressor oil change time interval has counted down to zero, indicating it is time to change compressor oil.

To reset display after oil change, see Section 11-5.

HIGH SPd

Indicates engine is locked in high speed. With engine running, press Power/Start button to toggle speed.

AUTOSTOP

This will flash briefly when unit is in Auto On mode and the engine stops automatically.

The following error messages may appear:

☞ *If error message appears, consult troubleshooting section for remedial actions.*

Hi TEMP

Indicates high compressor temperature if CHECK COMPRESSOR LED is on.

OVErPRES

Indicates the compressor has an over pressure error.

OVErSPEEd

Indicates an engine over speed error.

LOW OIL

Indicates a low oil pressure condition in the engine.

NoCHARGE

Indicates an alternator problem.

HiTEMP 1

Indicates high engine temperature if CHECK ENGINE LED is on. The temperature switch has indicated high temperature.

HiTEMP 2

Indicates high engine temperature if CHECK ENGINE LED is on. The temperature sensor has indicated high temperature.

SPd SENS

Indicates a problem with the engine speed sensor.

GovCNTRL

Indicates a problem with the engine governor control.

SEN OPEN

Indicates coolant sensor is open.

SENSHORT

Indicates coolant sensor is shorted.

ALTRNATR

Indicates an open condition in the alternator.

HiVOLTiN

Indicates high input voltage from the battery.

LoVOLTiN

Indicates low input voltage from the battery.

ERROR

Indicates an engine error, and the error is stored in memory. If the display is off, press the Power push button once to activate the Remote Panel. The display will read ERROR and after a few seconds will flash an error code. See Table 10-1.

To erase the error, press and hold the Display Select push button until the display reads SYSTEMon, and the indicator is off. The display will now cycle normally when the Display Select push button is pushed.

ERROR1

Indicates problem with crane remote interconnecting cable, plug, receptacle, or adapter harness.

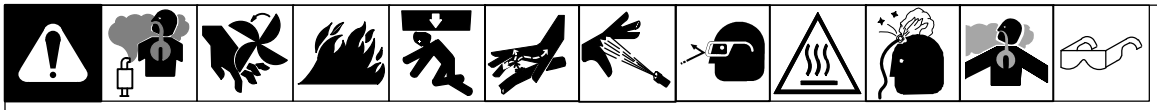
ENVRT hot

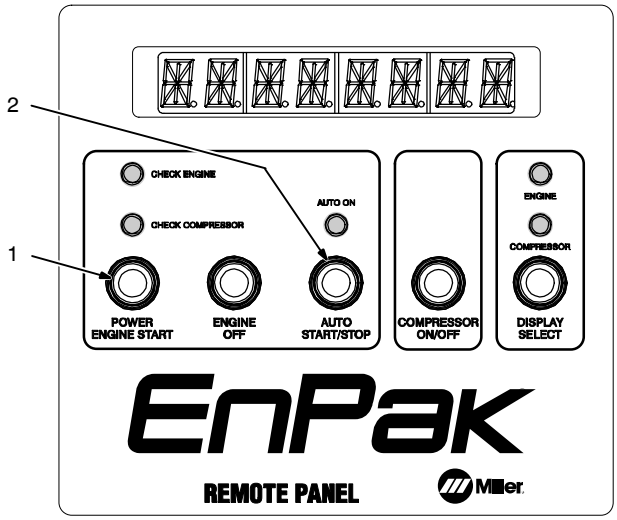
Indicates the EnVerter power system is overheated.

ENVRT ok

Indicates the EnVerter power system is functioning. Press Power/Start button to enable.

10-6. Auto Start/Stop Operation





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1 Power Engine Start Push Button

Press the Power Engine Start push button to turn on the EnPak Remote Panel. The EnPak warning beeper will beep if the EnPak is in auto start/stop mode.

First Start Of The Day –

To start the EnPak using the Remote panel, the first start of the day requires 2 successive push and release operations of the Power Engine Start push button. To start the EnPak using the Crane pendant, the first start of the day requires a press and hold of the Power Engine Start push button, or 2 successive push and release operations of the switch. Once the warning beeper is on, the engine will continue to automatically start unless the process is stopped by pushing the Engine Off button on the Remote Panel or the Engine Stop switch on the crane pendant.

Any time that the engine is started when the ambient temperature is below 50°F and the coolant temperature is below 100°F, the engine will go to 2600 RPM and continue to run at that speed until it reaches an operating temperature of 100°F. Once it has reached that temperature, the auto start/stop feature is activated if it is enabled. The EnPak will then automatically shut down after the specified time the end user sets for an unloaded condition.

Auto Stop Timeout -

To set the time for the automatic shut down, press and release the Auto Start/Stop button until the display shows ENAbLEd. When the display reads ENAbLEd, press and hold the Auto Start/Stop button, and the time to shut down will display. Continue to hold the button and it will increase in steps of 1 minute up to a maximum of 30, and then start over at 2 again. Release the button when the desired time is reached.

Automatic Re-Start Of EnPak

☞ *The system cannot detect a generator load that is applied when the engine is off.*

a) When the engine is turned off automatically, the EnPak control boards are still functioning. This allows the EnPak to sense any loads that are applied, so it will restart the engine when needed. The EnPak will not shut down if there is a load applied to the EnPak.

b) The EnPak can be started with one press and release of the Power Engine Start push button on the EnPak Remote Panel, or with one press and release of the Engine Start switch on the Crane pendant.

c) If the compressor is turned on from the Crane pendant, the EnPak will automatically start and pump up the air tank.

d) If an air tool is used, and the air compressor is in the on condition, the EnPak will sense the load and start the engine to pump up the tank.

e) If a crane switch is toggled, and the proportional trigger pulled, the EnPak will sense that the crane is required, and automatically start the engine. This will work only for open center systems that have the proportional signal available from the crane. Alternately, the start switch could be pushed and released one time to start the engine.

Battery Overload

When there is a load applied to battery and the EnPak shuts down automatically, the EnPak will restart when the battery voltage reaches a level that indicates charging is required. If there is a heavy battery load applied that drags the battery voltage low, the beeper will beep a warning and the display will flash bATTERY OVERLOAD.

2 Auto Start/Stop Push Button

Auto Start/Stop Enable/Disable –

To toggle between Auto Start/Stop ENAbLEd and Auto Start/Stop dISAbLEd, press and release the Auto Start/Stop push button. The Auto On LED lights only when the Auto Start/Stop feature is enabled.

Auto Stop –

If the ambient temperature inside the EnPak is below 0°F, the engine will not automatically shut down.

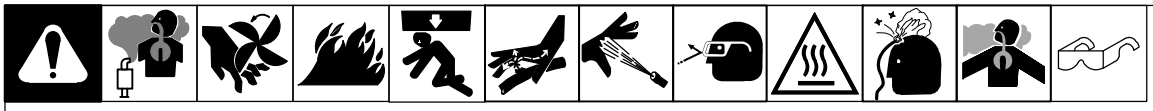
Engine Stop –

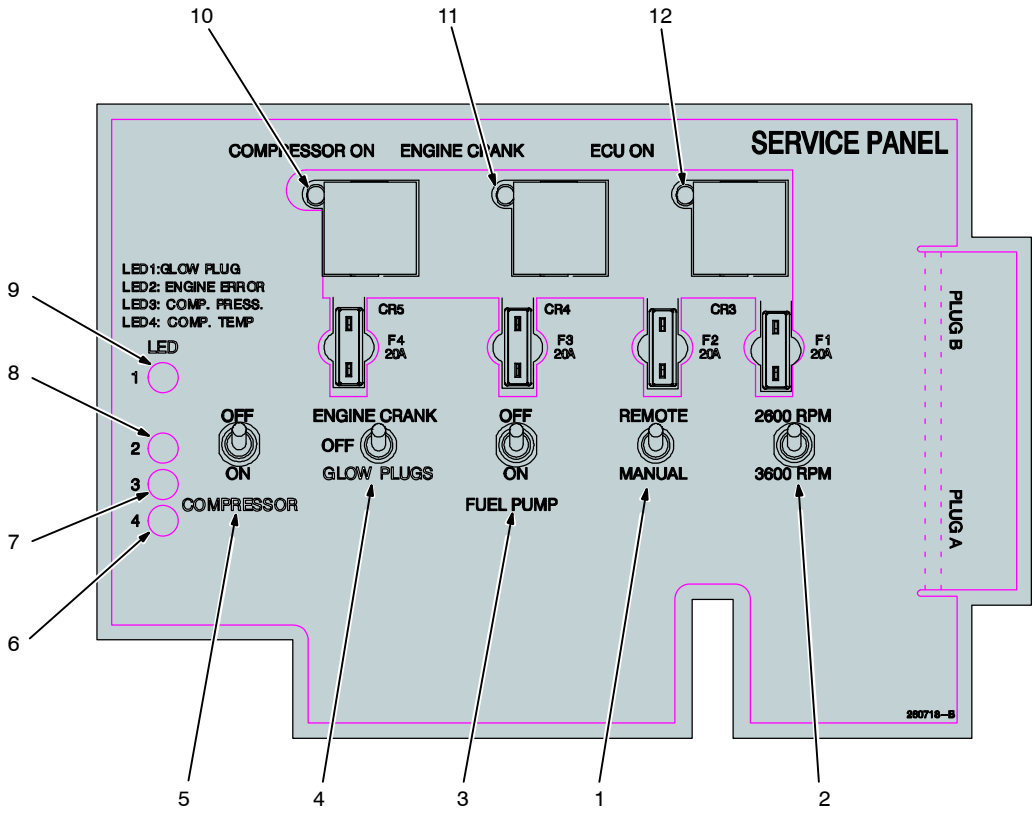
If the EnPak engine is turned off using the Remote Panel Engine Off push button or the Crane pendant Engine Stop switch, the EnPak will not turn back on automatically.

EnVerter Load Less Than 300 W - If there is a load applied to the EnVerter power source, that is less than 300 Watts, the EnPak will not sense it at this time, and will automatically shut down.

Error Reporting / Error Clearing - See Section 10-3 and 10-5.

10-7. Service Panel





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1 Manual/Remote Switch

When working on unit, always move Manual/Remote switch to Manual position to prevent remote or automatic starting.

This unit can be started from a remote location or start automatically when this switch is in the Remote position. Place switch in Manual position when service side panel is open or when Remote Panel is disconnected.

When this switch is in the Remote position, the remaining switches on the service panel do not function.

2 Engine Speed Switch

High position is 3600 RPM and is used when generator power is required or the compressor or hydraulic system will be loaded. Low position is 2600 RPM and is used when light loads are present.

3 Fuel Pump Switch

Use switch to power the engine ECU module and turn fuel pump on.

4 Engine Crank / Glow Plug Switch

See Section 6-5 for appropriate glow plug timing. Push down to activate glow plugs. To crank engine, push up. Once engine has started, allow switch to return to center position.

5 Compressor Switch

Use switch to turn compressor (clutch and valve) on during manual operation.

6 Compressor Temperature LED

Indicates the compressor oil temperature is too high

7 Compressor Pressure LED

Indicates the compressor pressure is too high.

8 Engine Error LED

Indicates an engine error. See Table 10-1 for blink pattern.

9 Glow Plug LED

Indicates the glow plug is on.

10 Compressor On LED

Indicates the compressor is on.

11 Engine Crank LED

Indicates the engine is cranking.

12 Engine On LED

Indicates the engine ECU has power and the fuel pump is active.

10-8. Kubota D902 Engine Fault Code Guide

☞ *If a blink code is present, the engine does not start or starts and then shuts down in 10 seconds.*

Engine errors will cause the engine to shutdown. In Manual mode, the LED will continue to blink until power is turned off and back on. In Remote mode, the LED blinks for approximately 5 seconds; however, the error message associated with the error flashes on the alpha–numeric display for one minute.

☞ *If error message appears, consult troubleshooting section for remedial actions.*
To erase the error message, press and hold the Display Select push button on the Remote Panel until the display reads SYSTEMon and the Engine Error LED is off.

Multiple error codes will display one after the other.

The blink pattern repeats as long as the Engine Control switch is in Run.

☞ *Contact engine Factory Authorized Service Agent if further assistance is required to clear fault.*

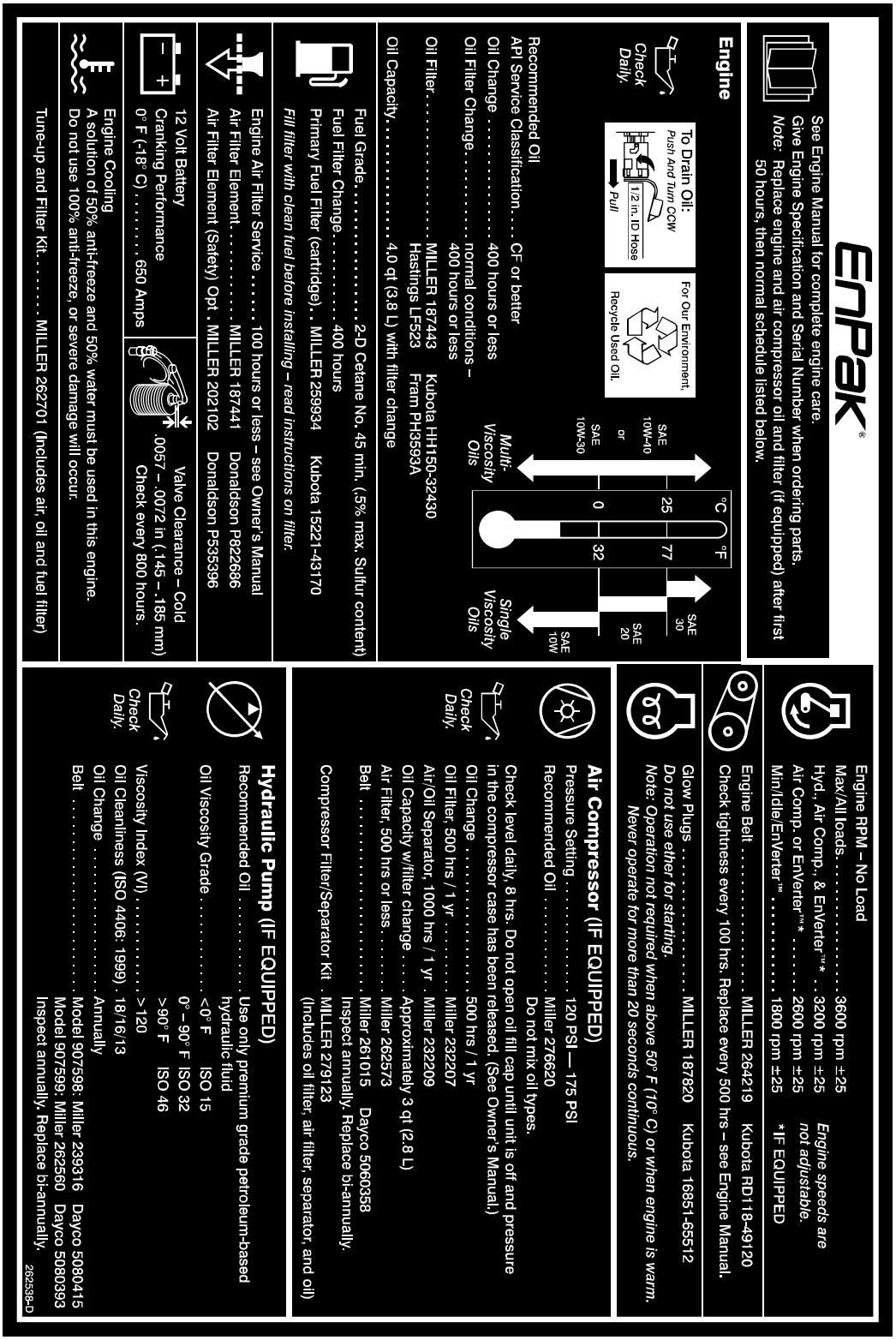
Table 10-1. Engine Error LED Blinking Pattern

Blinking Pattern	Symptom	Error Message	Remedy
— = one long blink ▬ = one short blink			
— ▬	Engine over speed	OVErSPEEd	Check actuator.
— ▬ ▬	Low oil pressure	LOW OIL	Check engine oil level. Check engine oil pressure using pressure gage. Check low oil pressure switch.
— ▬ ▬ ▬	Low battery voltage	NoCHARGE	Check alternator terminal L.
— ▬ ▬ ▬ ▬	High coolant temperature	HiTEMP 1	Check water temperature sender.
— ▬ ▬ ▬ ▬ ▬	High coolant temperature	HiTEMP2	Check water temperature sender.
— — ▬	Abnormal engine speed	SPd SENS	Check engine speed sensor.
— — ▬ ▬	Engine does not run properly	GovCNTRL	Check actuator for current problem.
— — ▬ ▬ ▬	No coolant temperature signal	SEN OPEN	Check water temperature sender for open–circuit.
— — ▬ ▬ ▬ ▬	Coolant temperature signal always on	SENSHORT	Check water temperature sender for short–circuit.
— — ▬ ▬ ▬ ▬ ▬	Connection at alternator terminal L open	ALTRNATR	Alternator disconnected at terminal L.
— — ▬ ▬ ▬ ▬ ▬ ▬	Battery voltage too high	HiVOLTiN	Check alternator.
— — ▬ ▬ ▬ ▬ ▬ ▬ ▬	Battery voltage too low	LOWbATT	Check alternator.

SECTION 11 – MAINTENANCE

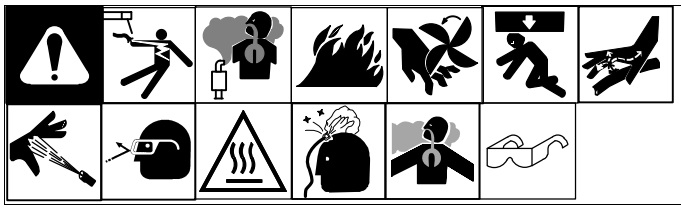
11-1. Maintenance Label

When working on unit, always move Manual Remote switch on Service Panel to Manual position to prevent remote starting.



11-2. Routine Maintenance

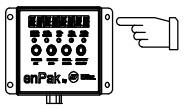
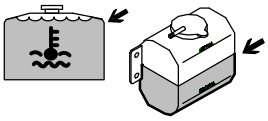
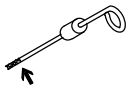
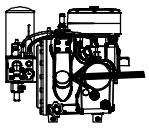
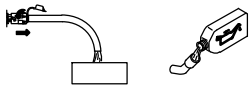
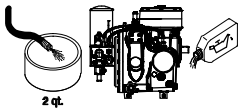
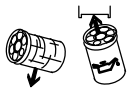
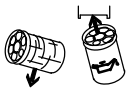
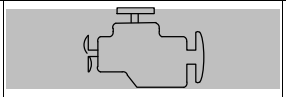
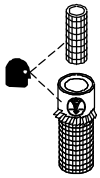
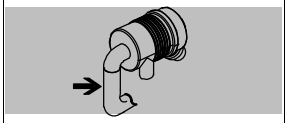
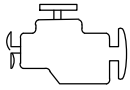
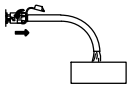
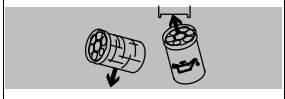
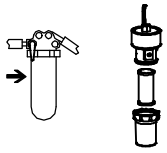
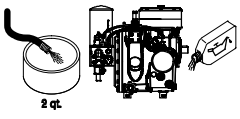
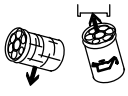
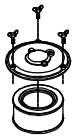
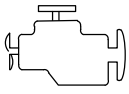
☞ *Replace engine and air compressor oil and filters after the first 50 hours of operation.*
Use information displayed on the Alpha−Numeric display to assist in scheduling maintenance (see Section 10-2).
Engine speed is regulated by an electronic governor. Engine speed adjustments may only be performed by the engine manufacturer's Factory Authorized Service Agent.
Test safety interlock monthly, see Section 11-6.
Follow the storage procedure in the engine owner's manual if the unit will not be used for an extended period.



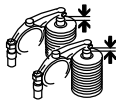
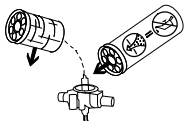
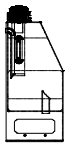
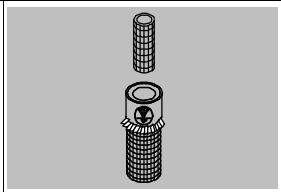
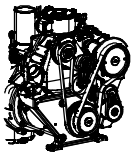
Recycle fluids.

Stop engine before maintaining.

☞ *See equipment manuals and Maintenance Label for important start-up, service, and storage information. Service equipment more often if used in severe conditions.*

	✓ = Check ◇ = Change ◯ = Clean ***** If unit is so equipped				Reference
Every **8** Hours	 ✓ Remote Panel display for maintenance information	 ✓ Coolant Level	 ✓ Engine Oil Level	 ✓ Compressor Oil Level	Sections 10-3, 6-4, 8-3, 11-1
	 ✓ Truck Fuel Tank Level	 ◯ Fluid Spills			
After First **50** Hours	 ◇ Engine Oil	 ◇ Compressor Oil	 ◇ Engine Oil Filter	 ◇ Compressor Oil Filter	Section 11-4, 11-5, Engine Manual
Every **50** Hours	 ✓ Engine Fuel Pipes And Clamps				Engine Manual
Every **100** Hours	 ✓ Air Cleaner Element	 ✓ Air Cleaner Hose At Engine Air Intake	 ✓ Engine Belt Tightness		Section 11-3, Engine Manual
Every **400** Hours	 ◇ Engine Oil	 ◇ Engine Oil Filter	 ◇ or ◯ Fuel Filters		Engine Manual, Section 11-4
Every **500** Hours or **Yearly**	 ◇ Compressor Oil	 ◇ Compressor Oil Filter	 ◇ Compressor Air Filter	 ◇ Engine Belt	Section 11-5, Engine Manual

NOTICE – ▭ *The items highlighted above are registered as emission related critical parts by KUBOTA and the U. S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instructions.*

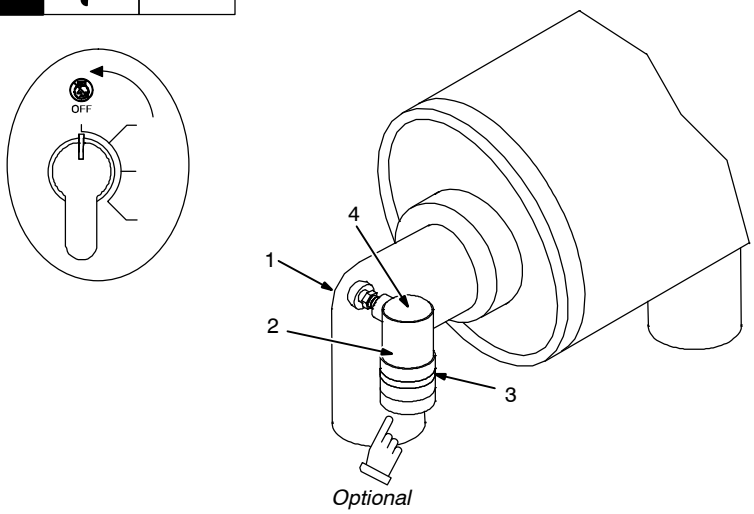
	✓ = Check ◇ = Change ◔ = Clean ***** If unit is so equipped				Reference
Every **800** Hours	 ✓ Valve Clearance				Engine Manual
Every **1000** Hours or **Yearly**	 ◇ Air/Oil Separator	 ◇ Hydraulic Fluid*****	 ◇ Air Cleaner Element		Section 11-5
Every **2000** Hours or **2 Years**	 ◇ Hydraulic Pump***** And Compressor Belts				Section 11-5

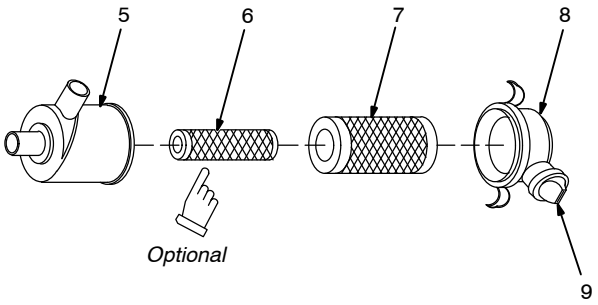
NOTICE – *The items highlighted above are registered as emission related critical parts by KUBOTA and the U. S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instructions.*

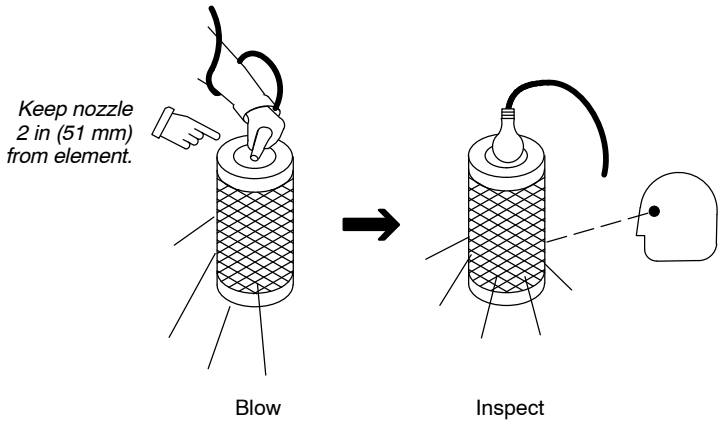
NOTICE – *For extended service interval information, see engine manual.*

Notes

11-3. Servicing Air Cleaner







Stop engine.

NOTICE *– Do not run engine without air cleaner or with dirty element. Engine damage caused by using a damaged element is not covered by the warranty.*

☞ *The air cleaner primary element can be cleaned but the dirt holding capacity of the filter is reduced with each cleaning. The chance of dirt reaching the clean side of the filter while cleaning and the possibility of filter damage makes cleaning a risk. Consider the risk of unwarrantable equipment damage when determining whether to clean or replace the primary element.*

NOTICE *– If you decide to clean the primary element, we strongly recommend installing an optional safety element to provide additional engine protection.* ***Never clean a safety element.*** *Replace the safety element after servicing the primary element three times.*

1 Intake Manifold

2 Service Indicator (Optional, Customer Supplied)

3 Service Indicator Window

4 Service Indicator Reset Button

Service air cleaner element if red band appears in window. A green band means air cleaner is okay. Press button to reset indicator.

Clean or replace primary element if dirty (see note above before cleaning). Replace primary element if damaged. Replace primary element yearly or after six cleanings.

5 Housing

6 Safety Element (Optional)

7 Primary Element

8 Cover

9 Dust Ejector

To clean air filter

Wipe off cover and housing. Remove cover and dump out dust. Remove element(s). Wipe dust from inside cover and housing with damp cloth. Reinstall safety element (if present). Reinstall cover.

Do not clean housing with air hose.

Clean primary element with compressed air only.

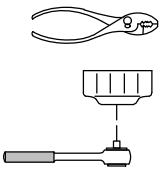
Air pressure must not exceed 100 psi (690 kPa). Use 1/8 in (3 mm) nozzle and keep nozzle at least 2 in (51 mm) from inside of element. Replace primary element if it has holes or damaged gaskets.

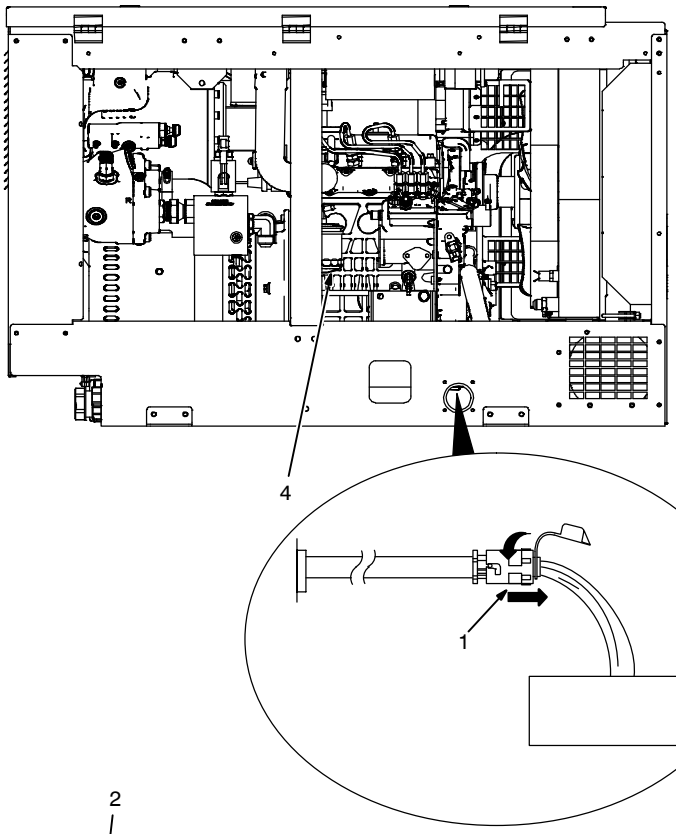
Reinstall primary element and cover (dust ejector down).

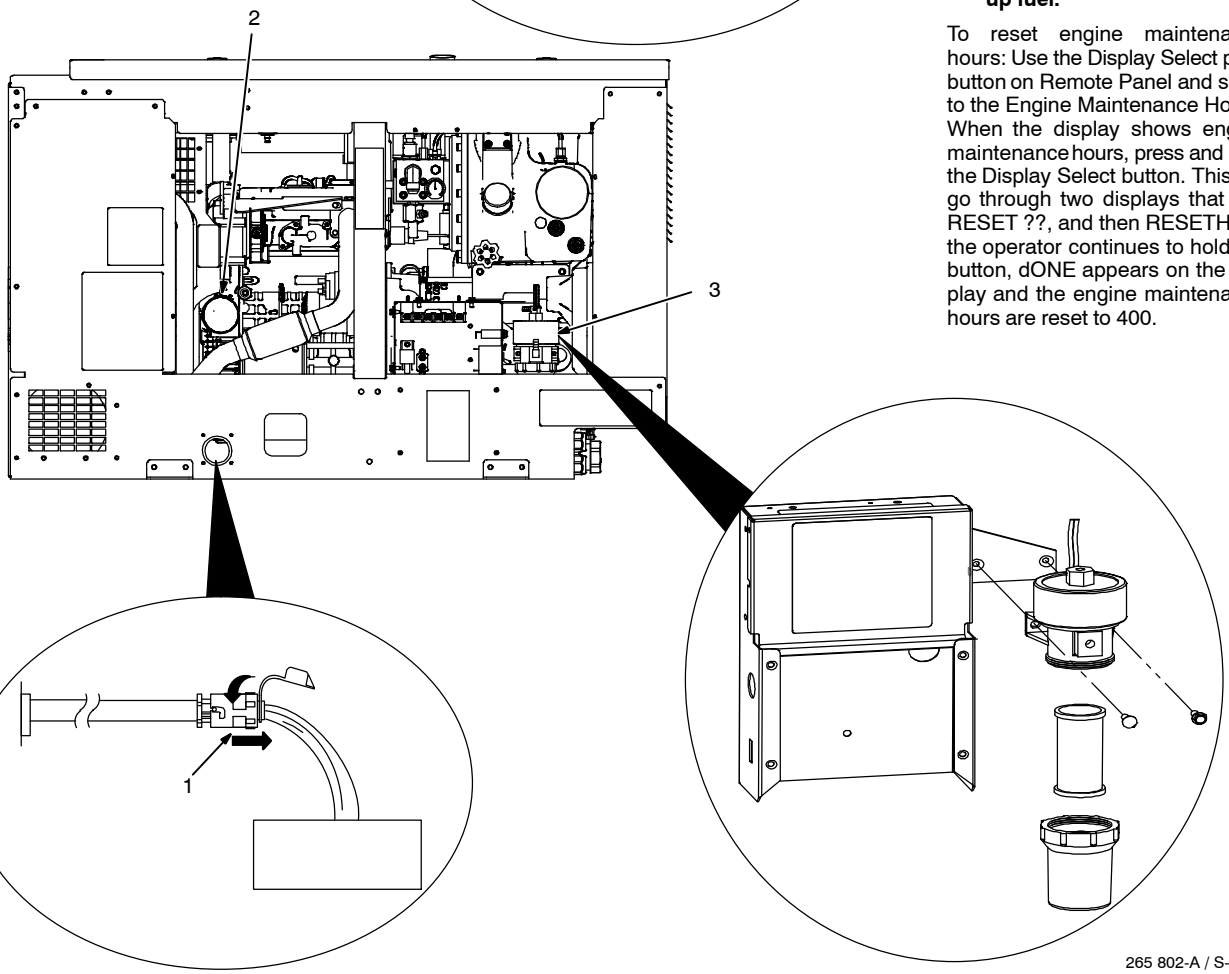
aircleaner1 5/16– ST-153 929-B / ST-153 585 / Ref. S-0698-B

11-4. Changing Engine Oil, Oil Filter, And Fuel Filters

Tools Needed:







⚠ Stop engine and let cool.

1 Oil Drain Valve

Oil drain valve can exit either side of base.

2 Oil Filter

Change engine oil and filter according to engine manual.

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

Fill crankcase with new oil to full mark on dipstick (see Section 6-4).

3 Fuel Pump With Filter

To clean fuel pump filter, the assembly must be removed from the unit base. Remove the screws on either side of the fuel pump and maneuver assembly out of the base without disturbing the fuel line connections. Unscrew the bottom portion of fuel pump from the top to expose the filter. Clean filter and replace.

4 Primary Fuel Filter

Inspect fuel lines and replace line if cracked or worn. Wipe up any spilled fuel.

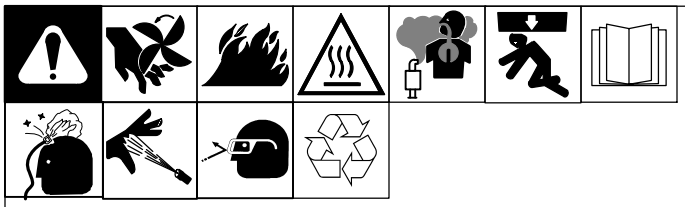
Start engine, and check for fuel leaks.

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

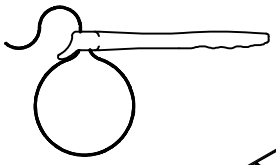
To reset engine maintenance hours: Use the Display Select push button on Remote Panel and scroll to the Engine Maintenance Hours. When the display shows engine maintenance hours, press and hold the Display Select button. This will go through two displays that ask RESET ??, and then RESETHr? If the operator continues to hold the button, dONE appears on the display and the engine maintenance hours are reset to 400.

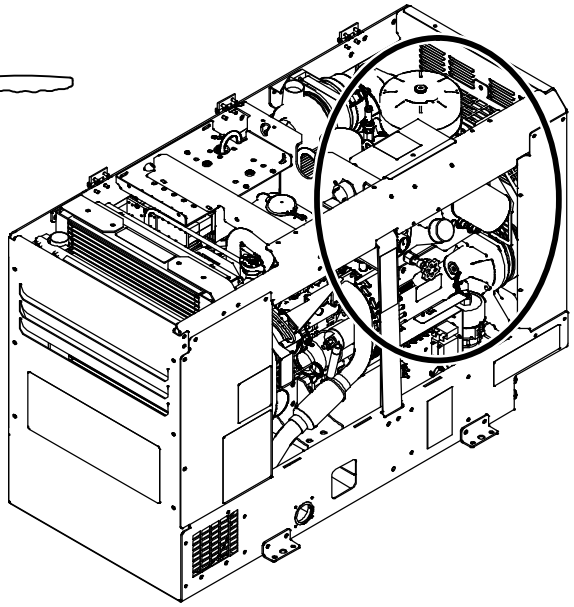
265 802-A / S-0842

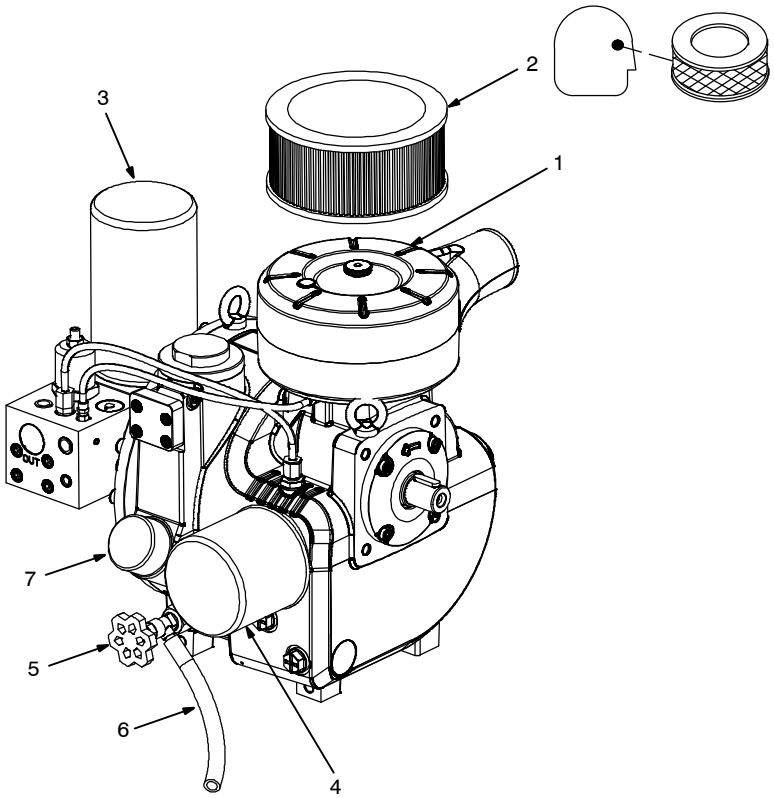
11-5. Changing Compressor Oil, Air Cleaner, And Air/Oil Separator



Tools Needed:







Stop engine.

Do not open oil fill cap until unit has been off for 10 minutes and pressure in the case has been released according to Section 8-5. Do not open while running.

Do not run air compressor without air cleaner or with dirty element. Compressor damage caused by using a damaged element is not covered by the warranty.

1 Compressor Air Cleaner Cover

2 Air Cleaner Element

Wipe off cover. Remove cover and element. Wipe dust from cover and housing with damp cloth. Inspect element and install new element if necessary. Reinstall cover.

Do not clean element with compressed air.

3 Air/Oil Separator

To replace air/oil separator:

Turn filter counterclockwise. Remove filter.

Apply thin coat of oil to gasket on new filter. Install filter and turn clockwise 1/2 to 3/4 turn after gasket contact is made.

4 Air Compressor Oil Filter

5 Air Compressor Oil Drain Knob

6 Customer Supplied Oil Drain Hose

7 Oil Fill Pipe Cap

To change compressor oil and filter:

Drain compressor oil while compressor is still warm.

Attach oil drain hose to fitting by oil drain knob. Open oil drain knob and drain oil into a suitable container. Tighten knob to close oil drain. Remove oil drain hose.

Remove filter by turning filter counterclockwise. Fill new oil filter with oil and apply thin coat of oil to gasket on new filter. Install new filter and turn clockwise 1/2 to 3/4 turn after gasket contact is made.

Add recommended oil until oil level is half way up oil fill pipe (see compressor maintenance label for oil specifications). Reinstall oil fill cap. Hand–tighten cap to prevent pressure release.

Start engine, run air compressor, and check for oil leaks.

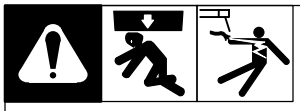
Stop engine.

Check oil level and top off to fill line if necessary.

To reset compressor maintenance hours: Use the Display Select push button on Remote Panel and scroll to the Compressor Maintenance Hours. When the display shows compressor maintenance hours, press and hold the Display Select button. This will go through two displays that ask RESET ??, and then RESETHr? If the operator continues to hold the button, dONE appears on the display and the compressor maintenance hours are reset to 500.

265 802-A / 265 804-A

11-6. Safety Interlock Monthly Check (Models With Hydraulic Power Source)



With the EnPak engine running, turn off +12 volts DC power to the crane system. The EnPak engine should stop.

☞ *Check with dealer for detailed description of system supplied.*
Power to the crane system will be supplied by relays located under the hood of the truck and activated by switches on the parking brake or neutral transmission position; and a truck-mounted console switch if so equipped.

Try to start the EnPak engine from the crane remote pendant or the EnPak remote control panel. The safety interlock is working properly if the EnPak engine does not crank or start, and the remote control panel does not have power to it.

Restore +12 volts DC power to the crane system. The EnPak should start and function properly.

Notes

SECTION 12 – TROUBLESHOOTING

12-1. Generator Power Troubleshooting

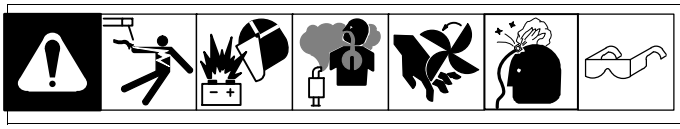
Trouble	Remedy
No power output.	Reset supplementary protectors CB1, CB2 and/or CB3 (if installed) (see Section 9-2).
	Have Factory Authorized Service Agent check generator.
No power output from EnVerter.	Have Factory Authorized Service Agent check EnVerter module and replace if necessary.
Low power output.	Check and clean engine air cleaner as necessary.
	Have Factory Authorized Service Agent check engine speed.
	See engine manual.
High power output.	Have Factory Authorized Service Agent check engine speed.
Erratic power output.	Have Factory Authorized Service Agent check engine speed.
	Check wiring and connections.
GFCI device trips at low speed.	GFCI receptacle is not proper type for application. Replace with Miller approved GFCI device (Contact Factory).
Device using regular generator auxiliary power does not work.	Engine speed too low and load is not recognized. Using crane remote or EnPak remote panel, manually place engine in high speed (see Section 10-2 item 7 for EnPak remote panel).

12-2. Engine Troubleshooting

Trouble	Remedy
Engine will not crank.	Check battery connections and tighten if necessary.
	Check battery voltage.
	Check Manual/Remote switch on Service Panel.
	Check to ensure crane power switch and safety interlock are working (see Section 11-6).
	Have Factory Authorized Service Agent check Remote Panel.
Engine does not start.	Check fuel level.
	Check battery and replace if necessary.
	Check engine charging system according to engine manual.
	Have Factory Authorized Service Agent check fuel pump.
	See engine manual.
Engine starts but stops.	Check oil level (see Section 6-4). Low oil pressure shutdown stops engine if oil pressure is too low.
	Use correct grade oil for operating temperature. (see Section 11-1).
	Check for ERROR codes at the Remote Panel display.
	Have Factory Authorized Service Agent check low oil pressure shutdown switch S2.
Engine stopped during normal operation.	Check fuel level (see Section 6-4).
	Check oil level (see Section 6-4). Low oil pressure shutdown stops engine if oil pressure is too low.
	Check for ERROR codes at the Remote Panel display.
	Have Factory Authorized Service Agent check throttle solenoid TS1 according to engine manual.
	Have Factory Authorized Service Agent check low oil pressure shutdown switch S2.

Trouble	Remedy
Engine does not return to idle speed.	Remove all generator power loads, compressor loads, and hydraulic loads.
	Check remote panel and crane pendant to see if system is locked in high speed.
	Ambient temperature may be below 50°F, and engine temperature may be less than 100°F. Warm up engine to 100°F.
	Have Factory Authorized Service Agent check circuit board PC1 and current transformer CT1.
Engine speed does not remain constant.	GFCI receptacle is not proper type for application. Replace with Miller approved GFCI device (Contact Factory).
Engine overheats.	Check error messages. Check oil and coolant levels.
Engine coolant temperature low.	Have Factory Authorized Service Agent check engine thermostat for proper operation. Replace if necessary.
	During operation in severe cold weather it may be necessary to restrict inlet cooling air by partially blocking unit air inlet louvers. Do not restrict engine combustion air inlet or engine exhaust or exit cooling air. Remove restriction when severe cold weather ends to prevent engine overheating.
Engine does not remain at power speed when a load is applied with crane pendant speed control switch in the Low or Idle position.	For small loads, place crane pendant speed control switch in the High or Fast position, or push Power Start button on remote control panel to lock in high speed.
During operation in severe cold weather, engine starts and goes to idle but stalls after a few minutes.	Normal maximum glow plug time is 3 to 10 seconds for temperatures from 50°F down to 0°F. In ambient temperatures below 0°F, glow plug time is 13 seconds maximum. Check glow plug timing to ensure proper heating before cranking engine.

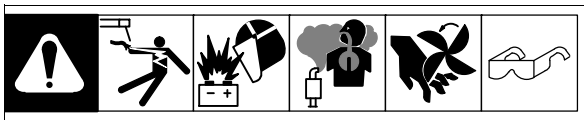
12-3. Compressor Troubleshooting



Trouble	Remedy
Air compressor does not operate; no air pressure on gauge.	Cycle compressor to on position.
	Check compressor belt tension. Be sure correct belt is used and is properly installed.
	Have Factory Authorized Service Agent check inlet valve P-IC1.
	Have Factory Authorized Service Agent check air compressor control circuit and clutch.
Air compressor stops during normal use.	Automatic shutdown stops compressor if compressor temperature is too high or over–pressure condition occurs. Check compressor oil level (see Section 8-3). Check for clogged oil cooler. Clean debris from oil cooler. Recirculation or open covers may cause overheating. Be sure all covers, panels, and doors are in place. Operate in area with proper airflow. Check for over-pressure condition by turning on compressor and monitoring air pressure and remote display for error messages.
Low air pressure.	Check for leaks in air lines and hoses, including control line.
	Adjust compressor air pressure using the EnPak Remote Panel.
	Check air compressor air cleaner (see Section 11-5).
	Have Factory Authorized Service Agent check compressor for rated output.
High air pressure.	Adjust compressor air pressure using the EnPak Remote Panel.
	Be sure control line is connected at valve manifold and Intake Control Valve (P–IC1).
	Check for frozen manifold, Intake Control Valve (P–IC1), and/or Proportional Flow Control Valve (P–FC1).
Oil in air from compressor.	Check compressor oil level (see Section 8-3). If oil level is too high, system becomes saturated with oil.
	Change compressor air/oil separator if close to replacement hours (see Section 11-5).

Trouble	Remedy
Oil in compressor air cleaner.	Have Factory Authorized Service Agent check for blocked separator scavenge check valve/filter orifice.
	Have Factory Authorized Service Agent verify compressor intake valve P-IC is operating properly.
Water in compressor oil.	Change oil and filter. Use only recommended oil.
	Have Factory Authorized Service Agent check thermostat operation.

12-4. Hydraulic Troubleshooting (Models With Hydraulic Power Source)



Trouble	Remedy
No crane operation.	No oil in system. Add oil.
	Suction line valve closed. Open valve.
	Hydraulic system not primed. Prime system (see Section 7-3). Check reservoir height meets requirements (see Section 7-1).
	Flow control valve H−FC1 not functioning. Check to make sure solenoid is plugged in. Check wiring harness to solenoid coil. Have Factory Authorized Service agent check solenoid coil.
	Flow control valve H−FC1 plugged with contaminants. Replace valve and flush system.
	Belt to pump failed. Replace belt.
	Tensioner for belt to pump failed. Replace tensioner.
	Pulleys for pump failed. Replace pulleys and/or keys.
Slow crane operation; unit comes up to higher speed.	Other functions in use and unit is power−managing. Unit functioning correctly.
	Flow control valve H−FC1 is partially plugged with contaminants causing higher pressure drop across the valve. Replace valve and flush system.
	Have Factory Authorized Service Agent check hydraulic flow rate setting and correct as necessary.
	Differential pressure setting of pump (load sense) set too low. Have Factory Authorized Service Agent check setting and correct as necessary.
	Displacement setting of pump set too low. Have Factory Authorized Service Agent check setting and correct as necessary.
	Check crane model hydraulic requirements. Pump may need to be reset (consult Factory Authorized Service Agent).
	Flow being dumped through crane relief valve instead of being directed to system, possibly caused by system contamination. See crane owner's manual.
	Hydraulic oil viscosity too high. See Section 7-1 for correct fluid viscosity recommendations at specific ambient temperatures.
Slow crane operation; unit remains at low speed with crane switch in high speed position.	Open−Center systems: No trigger signal from crane pendant present. Have Factory Authorized Service Agent check for trigger signal.
	Closed−Center systems: Pressure switch H−PS1 not functioning. Have Factory Authorized Service Agent check pressure switch and replace as necessary.
Slow response for unit to come up to higher speed (Closed−Center systems).	Air trapped in load sense line. Bleed load sense line according to Section 7-6.
Fast crane operation.	Differential pressure setting of pump (load sense) set too high. Have Factory Authorized Service Agent check setting and correct as necessary.
	Displacement setting of pump set too high. Have Factory Authorized Service Agent check setting and correct as necessary.
	Check crane model hydraulic requirements. Pump flow may need to be reset (consult Factory Authorized Service Agent).
	Have Factory Authorized Service Agent check hydraulic flow rate setting and correct as necessary.
	Hydraulic oil viscosity too low. Consult Section 7-1 for correct fluid viscosity recommendations at specific ambient temperatures.

Trouble	Remedy
No outrigger operation.	No oil in system. Add oil.
	Suction line valve closed. Open valve.
	Hydraulic system not primed. Prime system (see Section 7-3). Check reservoir height meets requirements of Section 7-1.
	Flow control valve H–FC1 not functioning. Check to make sure solenoid is plugged in. Check wiring harness to solenoid coil. Have Factory Authorized Service Agent check solenoid coil integrity.
	Flow control valve H–FC1 plugged with contaminants. Replace valve and flush system.
	Belt to pump failed. Replace belt.
	Tensioner for belt to pump failed. Replace tensioner.
	Pulleys for pump failed. Replace pulleys and/or keys.
Slow outrigger operation.	Flow control valve H–FC1 is partially plugged with contaminates causing higher pressure drop across the valve. Replace valve and flush system.
	Differential pressure setting of pump (load sense) set too low. Have Factory Authorized Service Agent check setting and correct as necessary.
	Flow being dumped through crane relief valve instead of being directed to system, possibly caused by system contamination. See crane owner's manual.
	Hydraulic oil viscosity too high. Consult Section 7-1 for correct fluid viscosity recommendations at specific ambient temperatures.
Fast outrigger operation.	Differential pressure setting of pump (load sense) set too high. Have Factory Authorized Service Agent check setting and correct as necessary.
	Hydraulic oil viscosity too low. Consult Section 7-1 for correct fluid viscosity recommendations at specific ambient temperatures.
Crane lifting capacity not met (low pressure).	Pump maximum pressure setting too low. Check setting and correct as necessary.
	Check crane model hydraulic requirements. Pump may need to be reset (consult Factory Authorized Service Agent).
	Relief valve in crane system set too low. See crane owner's manual to correct.
	Relief valve in crane system stuck open from contamination. See crane owner's manual to correct.
	Hydraulic pump belt slipping. Replace belt and/or tensioner.

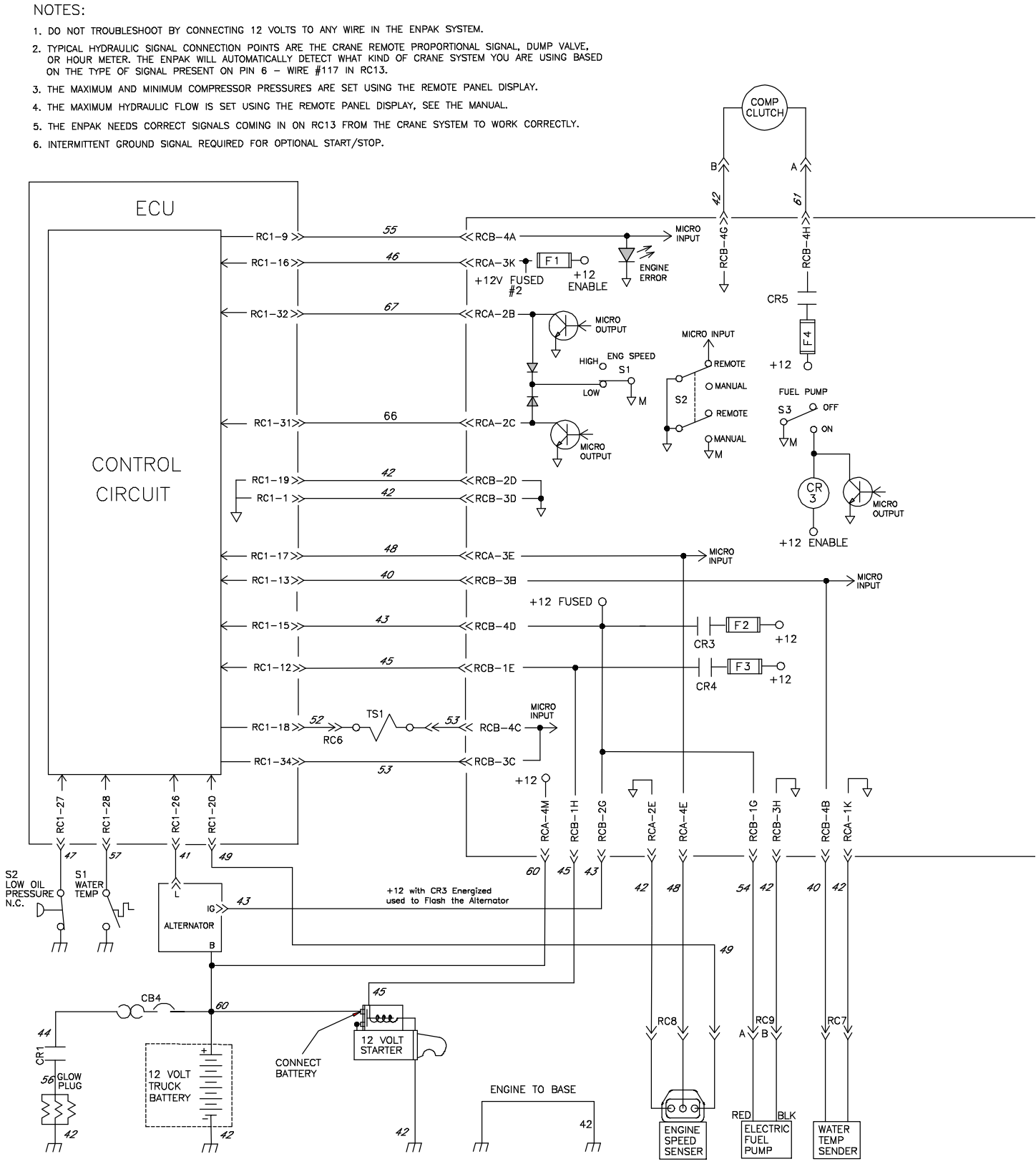
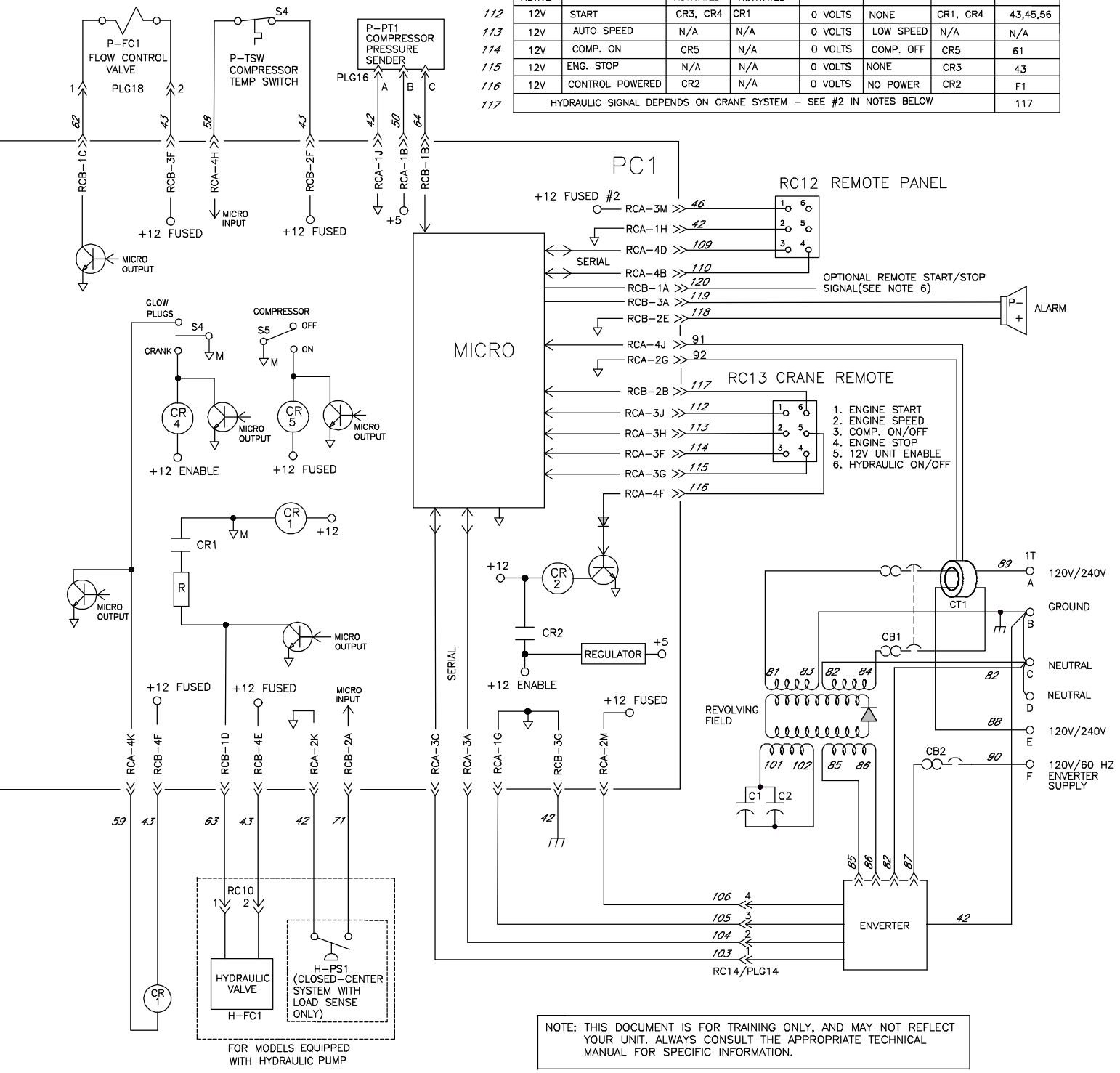


Figure 13-1. Training Circuit Diagram For EnPak

RC13 INPUT FROM CRANE SYSTEM

WIRE #	VOLTAGE WHEN ACTIVE	ENPAK RESPONSE	BOARD RELAYS ACTIVATED	NON-BOARD RELAYS ACTIVATED	VOLTAGE WHEN INACTIVE	ENPAK RESPONSE	RELAYS DISABLED	WIRE # OR FUSE # TO CHECK
112	12V	START	CR3, CR4	CR1	0 VOLTS	NONE	CR1, CR4	43,45,56
113	12V	AUTO SPEED	N/A	N/A	0 VOLTS	LOW SPEED	N/A	N/A
114	12V	COMP. ON	CR5	N/A	0 VOLTS	COMP. OFF	CR5	61
115	12V	ENG. STOP	N/A	N/A	0 VOLTS	NONE	CR3	43
116	12V	CONTROL POWERED	CR2	N/A	0 VOLTS	NO POWER	CR2	F1
117	HYDRAULIC SIGNAL DEPENDS ON CRANE SYSTEM – SEE #2 IN NOTES BELOW							117

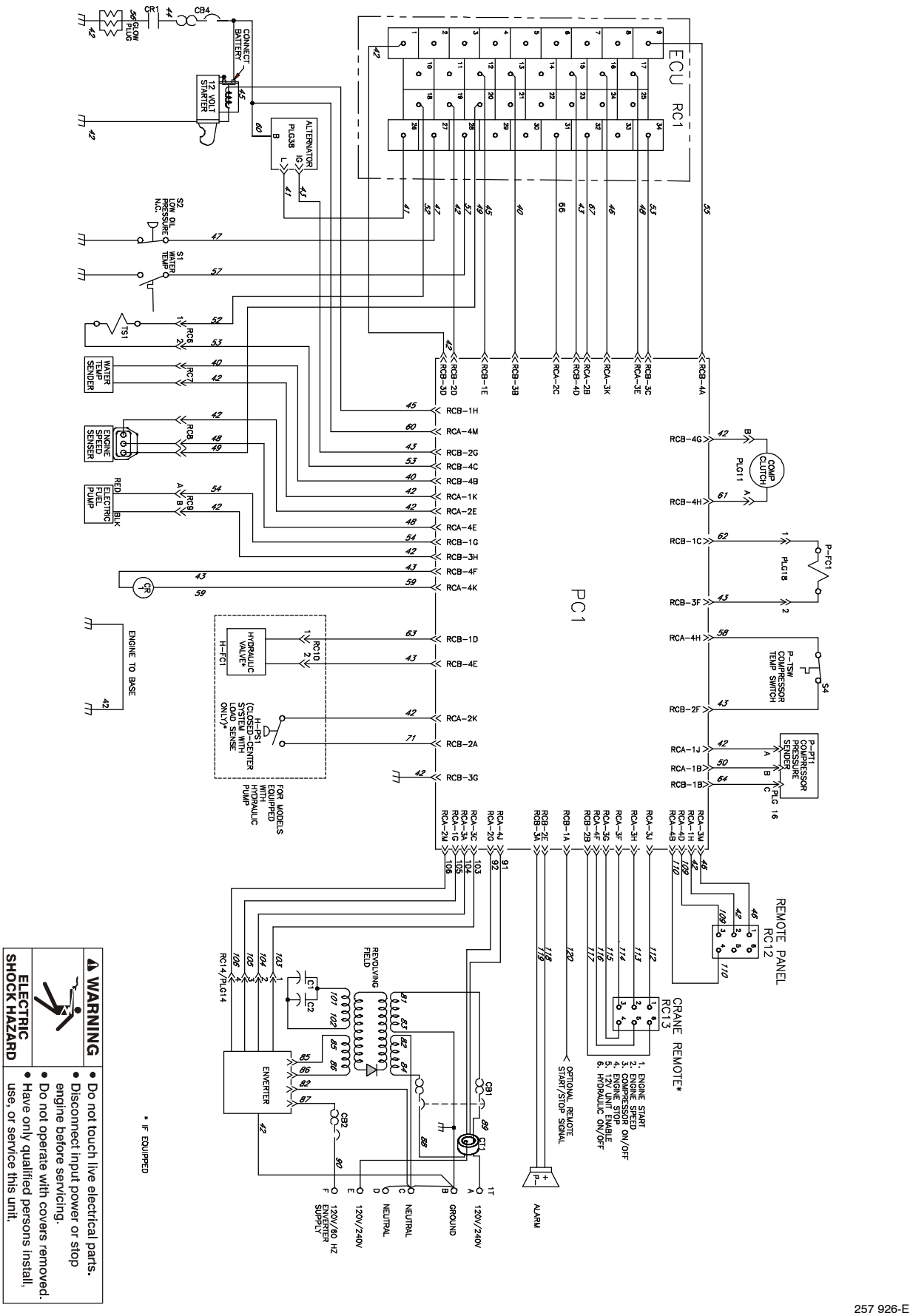


NOTE: THIS DOCUMENT IS FOR TRAINING ONLY, AND MAY NOT REFLECT YOUR UNIT. ALWAYS CONSULT THE APPROPRIATE TECHNICAL MANUAL FOR SPECIFIC INFORMATION.

⚠ WARNING

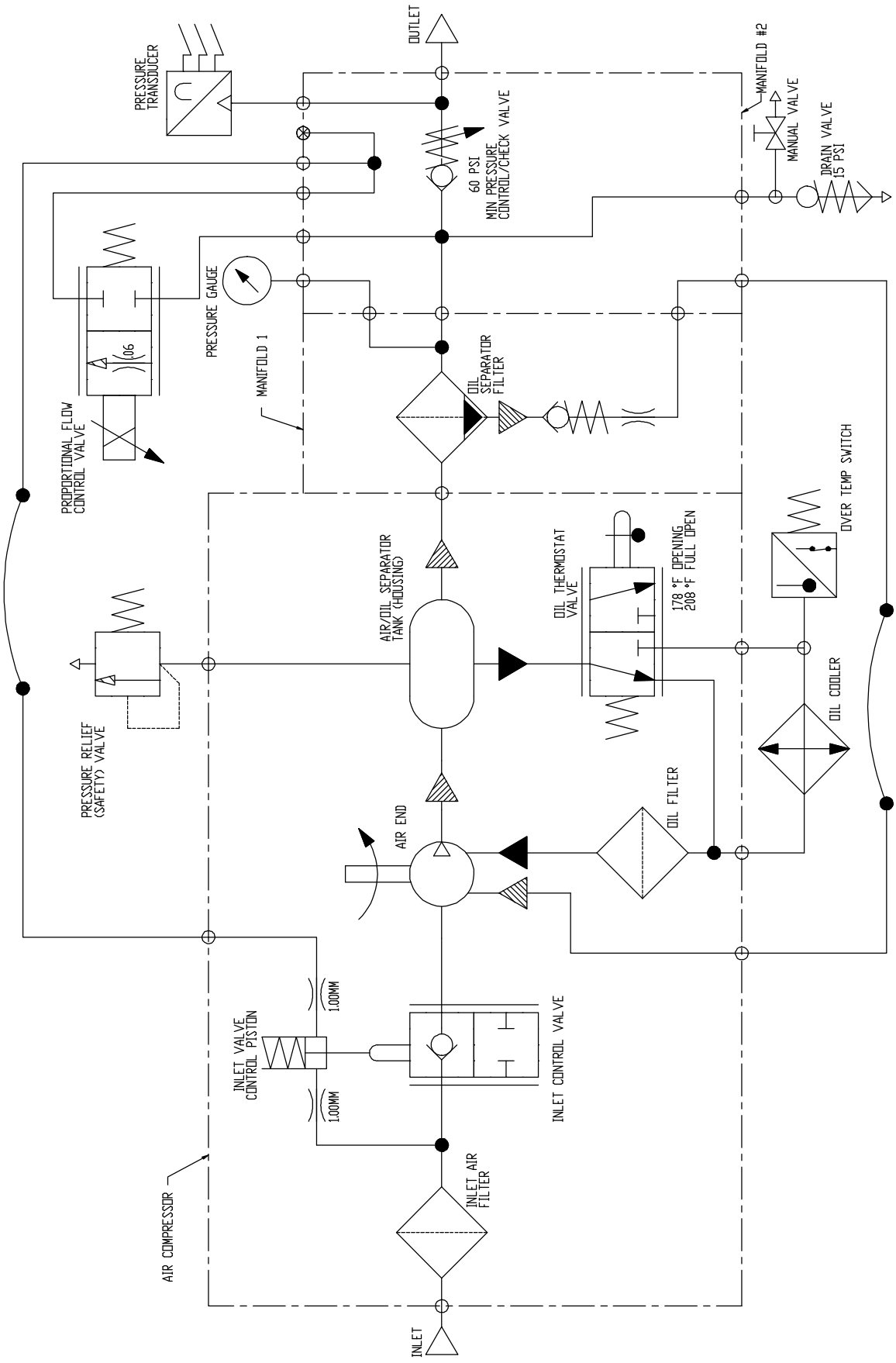
ELECTRIC SHOCK HAZARD

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



257 926-E

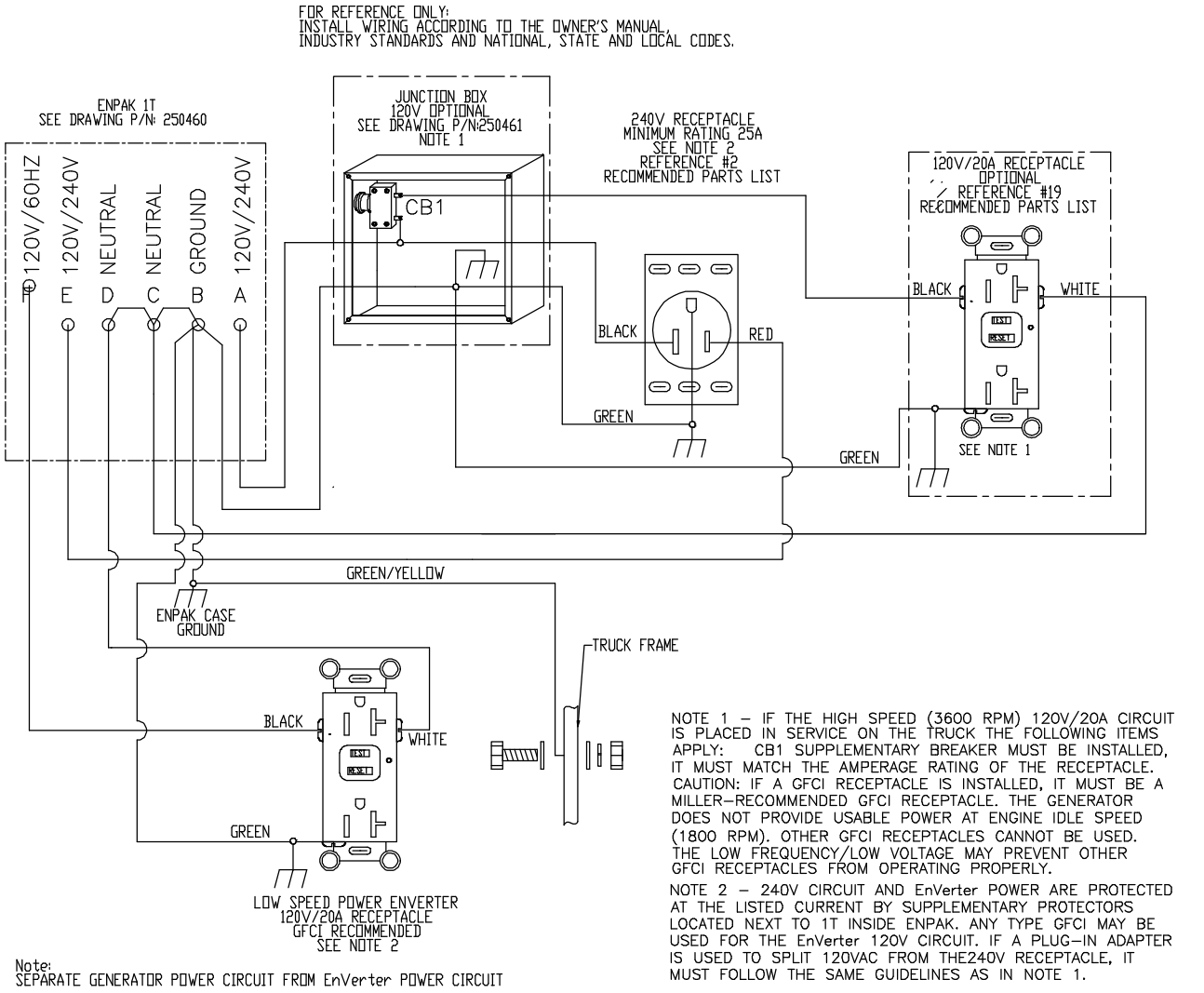
Figure 13-2. EnPak Circuit Diagram



261 045-B

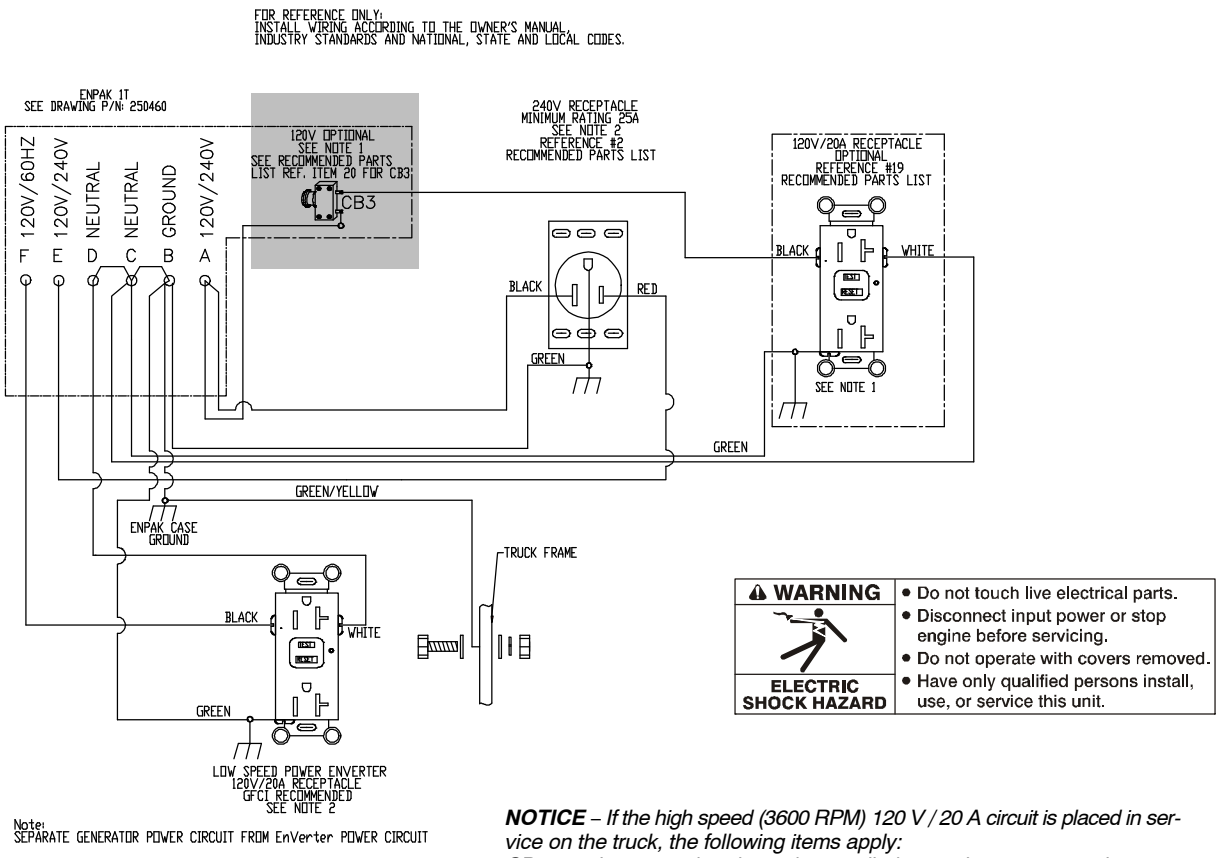
Figure 13-3. Air Compressor Diagram

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



Ref. 242 500-G

Figure 13-4. EnPak Truck Wiring Diagram Option 1

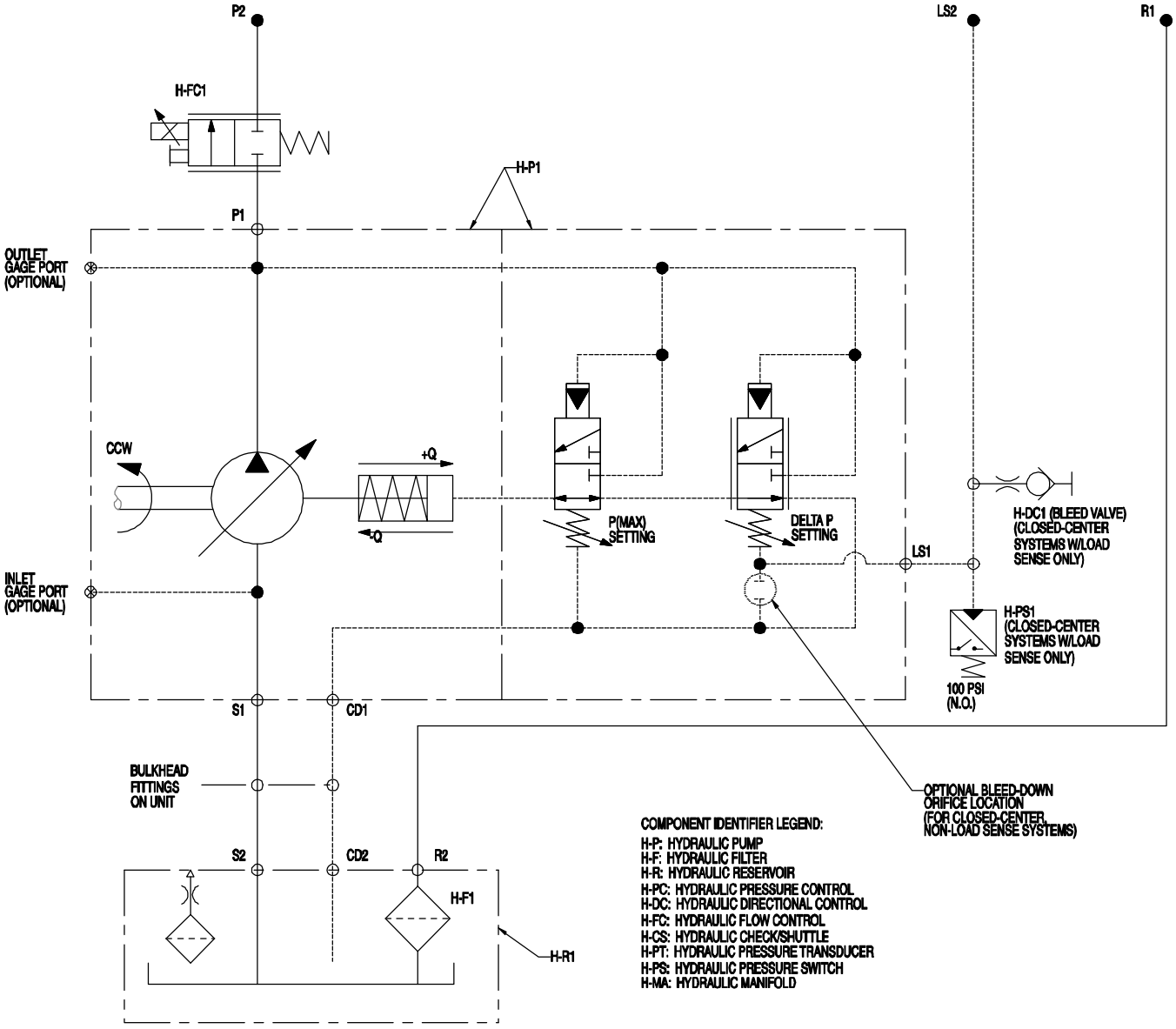


NOTICE *– If the high speed (3600 RPM) 120 V / 20 A circuit is placed in service on the truck, the following items apply:*
CB3 supplementary breaker to be installed in auxiliary power enclosure, it must match the amperage rating of the receptacle. CAUTION: If a GFCI receptacle is installed, it must be a MILLER-recommended GFCI receptacle. The generator does not provide useable power at engine idle speed (1800 RPM). Other GFCI receptacles cannot be used. The low frequency / low voltage may prevent other GFCI receptacles from operating properly.

NOTICE *– 240 V circuit and EnVerter power are protected at the listed current by supplementary protectors located next to 1T inside EnPak. Any type GFCI may be used for the EnVerter 120 V circuit. If a plug-in adapter is used to split 120 VAC from the 240 VAC receptacle, it must follow the same guidelines as Notice above.*

265 533-B

Figure 13-5. EnPak Truck Wiring Diagram Option 2



238 945-B1

Figure 13-6. Hydraulic Circuit Diagram Page 1
(Models With Hydraulic Power Source)

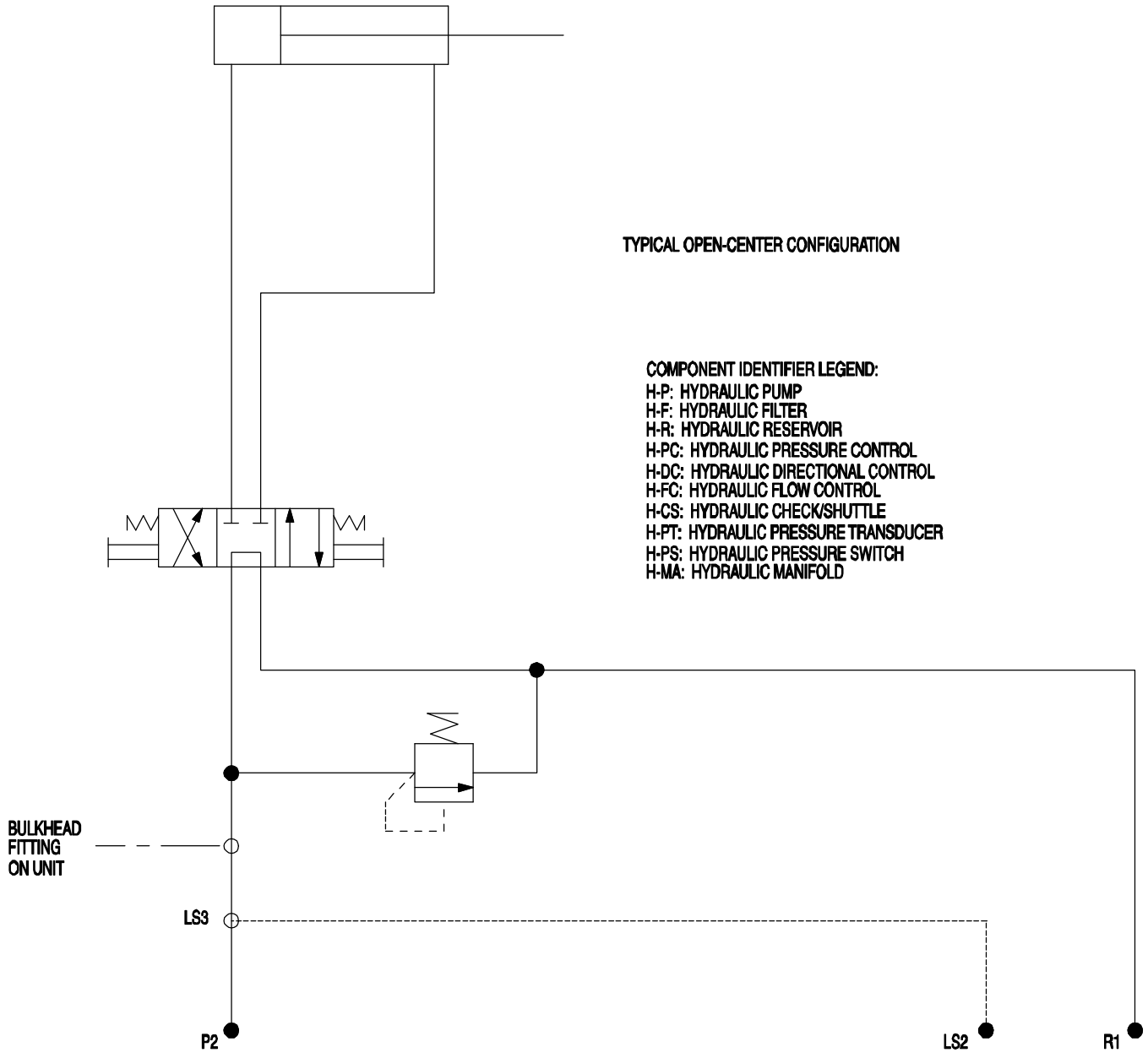


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Figure 13-7. Hydraulic Circuit Diagram Page 2: Typical Open–Center Configuration (Models With Hydraulic Power Source)

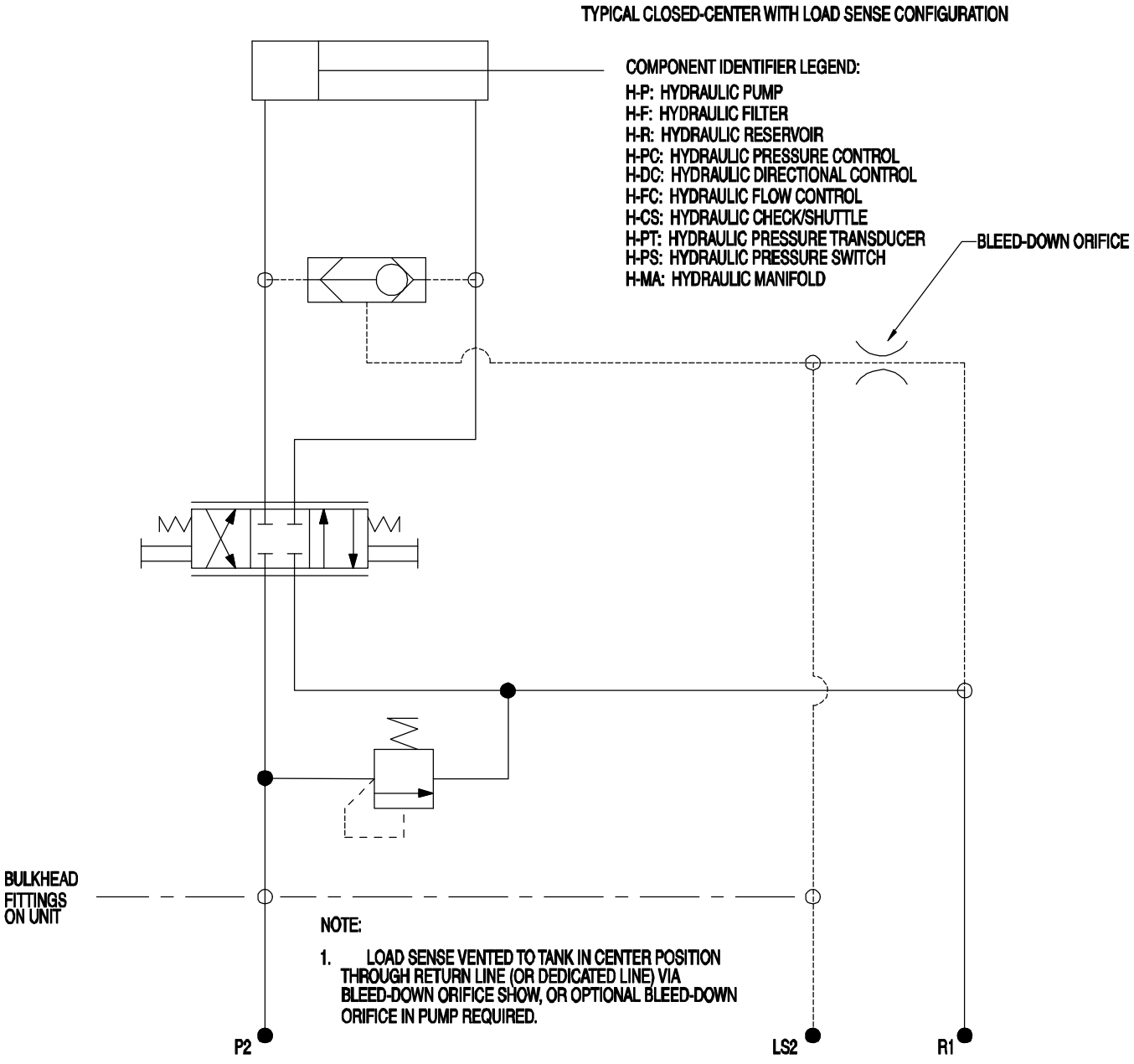
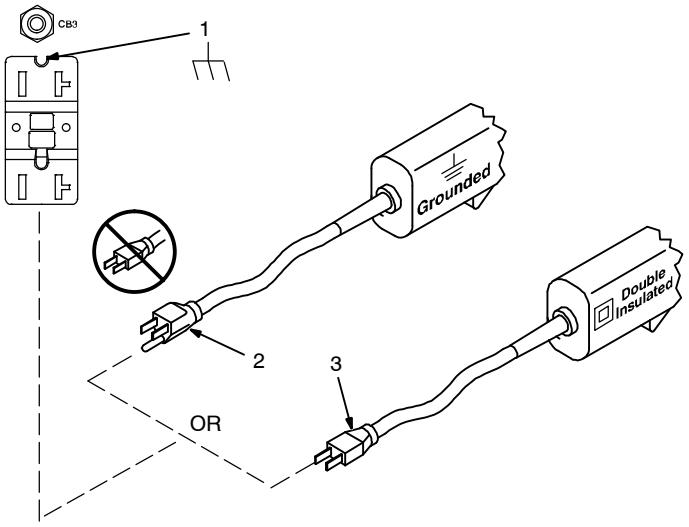


Figure 13-8. Hydraulic Circuit Diagram Page 3: Typical Closed–Center With Load Sense Configuration (Models With Hydraulic Power Source)

SECTION 14 – GENERATOR POWER GUIDELINES

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

14-1. Selecting Equipment



1 Generator Power Receptacles – Neutral Bonded To Frame

2 3-Prong Plug From Case Grounded Equipment

3 2-Prong Plug From Double Insulated Equipment

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

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

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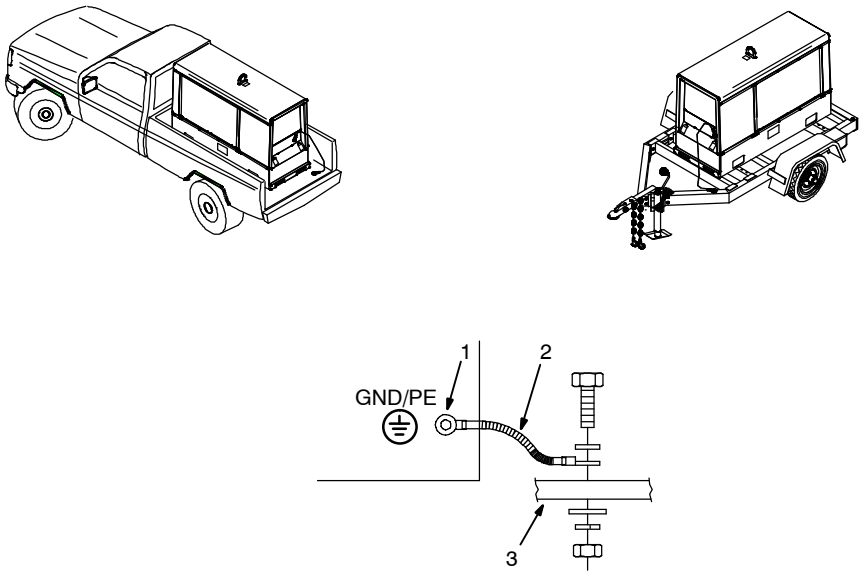
14-2. Grounding Generator To Truck Or Trailer Frame



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

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

1 Equipment Grounding Terminal (On Front Panel)

2 Grounding Cable (Not Supplied)

3 Metal Vehicle Frame

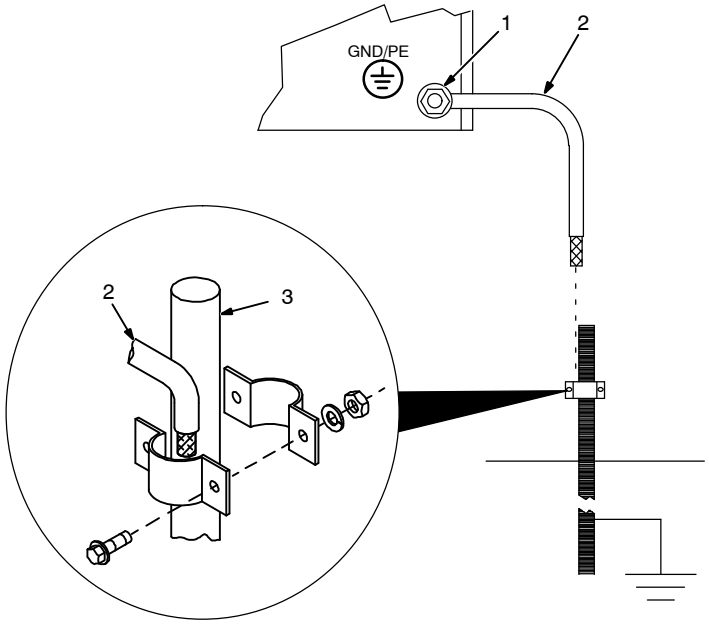
Connect cable from equipment ground terminal to metal vehicle frame. Use #8 AWG or larger insulated copper wire.

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

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

⚠ **Use GFCI protection when operating auxiliary equipment. Do not use GFCI receptacles to power life support equipment.**

14-3. Grounding When Supplying Building Systems



1 Equipment Grounding Terminal

2 Grounding Cable

Use #8 AWG or larger insulated copper wire.

3 Ground Device

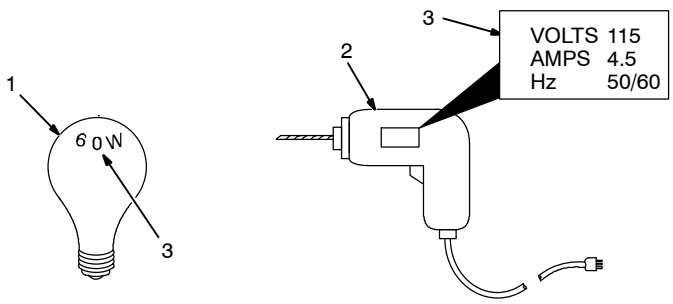
☞ *Use ground device as stated in electrical codes.*

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

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

ST-800 576-B

14-4. 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 14-8).

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 A x 115 V = 520 W

The load applied by the drill is 520 watts.

Example 2: If three 200 watt flood lamps are used with the drill from Example 1, add the individual loads to calculate total load.

(3 x 200W) + 520 W = 1120 W

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

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14-5. 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	10,550	2850
	3 HP	15,900	3900
	5 HP	23,300	6800
Capacitor Start-Capacitor Run	1-1/2 HP	8100	2000
	5 HP	23,300	6000
	7-1/2 HP	35,000	8000
	10 HP	46,700	10,700
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

14-6. Approximate Power Requirements For Farm/Home Equipment

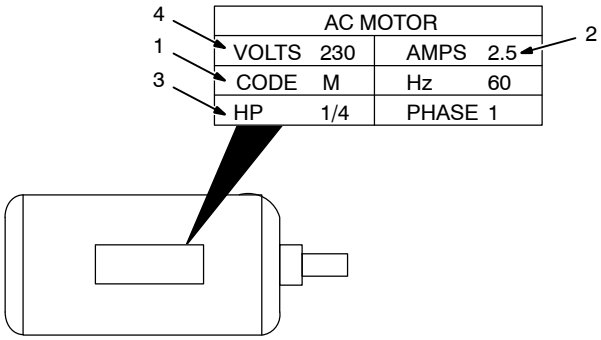
Farm/Home Equipment	Rating	Starting Watts	Running Watts
Stock Tank De-Icer		1000	1000
Grain Cleaner	1/4 HP	1650	650
Portable Conveyor	1/2 HP	3400	1000
Grain Elevator	3/4 HP	4400	1400
Milk Cooler		2900	1100
Milker (Vacuum Pump)	2 HP	10,500	2800
Farm Duty Motors Std. (e.g. Conveyors, Feed Augers, Air Compressors)	1/3 HP	1720	720
	1/2 HP	2575	975
	3/4 HP	4500	1400
	1 HP	6100	1600
	1-1/2 HP	8200	2200
	2 HP	10,550	2850
	3 HP	15,900	3900
	5 HP	23,300	6800
Farm Duty Motors High Torque (e.g. Barn Cleaners, Silo Unloaders, Silo Hoists, Bunk Feeders)	1-1/2 HP	8100	2000
	5 HP	23,300	6000
	7-1/2 HP	35,000	8000
	10 HP	46,700	10,700
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
	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

14-7. Approximate Power Requirements For Contractor Equipment

Contractor Equipment	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	10,500	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	1400	
	Vapor	1250	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

14-8. Power Required To Start Motor

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



1 Motor Start Code

2 Running Amperage

3 Motor HP

4 Motor Voltage

To find starting amperage:

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

Step 2: Find Motor HP and Volts.

Step 3: Determine starting amperage (see example).

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

(kVA/HP x HP x 1000) / Volts = Starting Amperage

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

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

(11.2 x 1/4 x 1000) / 230 = 12.2A

Starting the motor requires 12.2 amperes.

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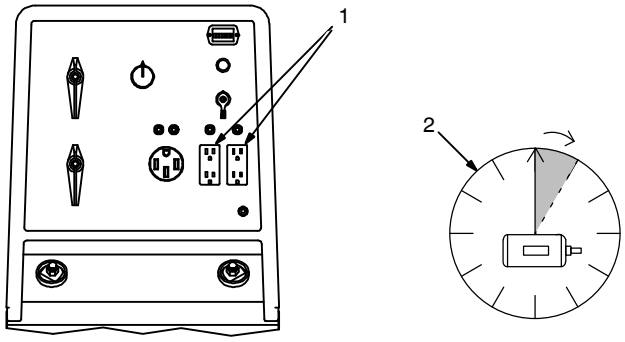
14-9. How Much Power Can Generator Supply?



1 Limit Load To 90% Of Generator Output

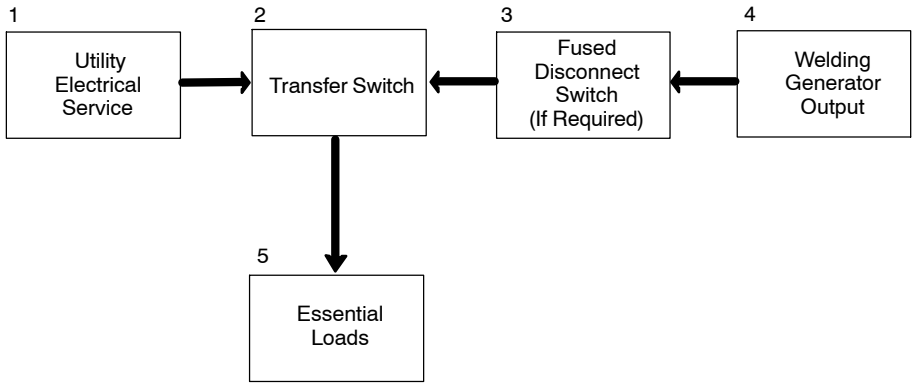
Always start non-resistive (motor) loads in order from largest to smallest, and add resistive loads last.

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

14-10. Typical Connections To Supply Standby Power



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

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

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

1 Utility Electrical Service

2 Transfer Switch (Double-Throw)

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

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

3 Fused Disconnect Switch

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

4 Welder/Generator Output

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

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

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

5 Essential Loads

Generator output may not meet the electrical requirements of the premises. If generator does not produce enough output to meet all requirements, connect only essential loads (pumps, freezers, heaters, etc. – See Section 14-4).

14-11. Selecting Extension Cord (Use Shortest Cord Possible)

Cord Lengths for 120 Volt Loads

Use GFCI protection when operating auxiliary equipment. Do not use GFCI receptacles to power life support equipment.

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

Use GFCI protection when operating auxiliary equipment. Do not use GFCI receptacles to power life support equipment.

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 (84)	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

Notes

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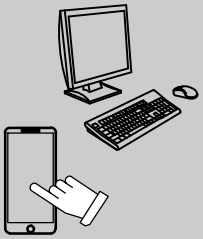
ENPAK® EQUIPMENT LIMITED WARRANTY

Effective January 1, 2017
(Equipment with a serial number preface of MH or newer)

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



Visit our website at
www.MillerWelds.com/EnPak
to locate an EnPak supplier.

LIMITED WARRANTY – Subject to the express terms and conditions set forth below, Miller Electric Mfg. Co. ("Miller"), of Appleton, Wisconsin (USA), warrants to the original retail purchaser of new EnPak equipment (sold after the effective date of this Limited Warranty) that such equipment is free from defects in materials and workmanship when shipped by Miller.

For warranty claims received by Miller within the applicable warranty periods described below, Miller will repair or replace any warranted equipment, parts or components that fail due to defects in material or workmanship or refund the purchase price for the equipment. 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. If notification is submitted as an online warranty claim, the claim must include a detailed description of the fault and the troubleshooting steps taken to identify failed components and the cause of their failure.

Miller shall honor warranty claims on warranted equipment in the event of such failure within the applicable warranty periods. All warranty time periods start on the delivery date of the equipment to the original end–user purchaser, and shall not commence more than twelve months following that date on which the equipment is shipped to a North American distributor, or more than twelve months following that date on which the equipment is shipped to an international distributor.

1. 3 Years — Parts and Labor Unless Otherwise Specified
   * Engine Driven Generators (NOTE: engines are warranted separately by the engine manufacturer.)
   * Field options (NOTE: field options are covered for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
2. 90 Days — Parts
   * Remote Controls
   * Accessory (Kits)
   * Replacement Parts (No labor)
   * Canvas Covers

This Limited Warranty shall not apply to:

(i) consumable components, such as contactors, relays or parts that fail due to normal wear and use; (ii) items furnished by Miller, but manufactured by others, such as engines and trade accessories (these items are covered by the manufacturer's warranty, if any); and (iii) 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 been used and maintained in accordance with Miller's specifications; or equipment which has been operated outside of Miller's 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 industrial equipment.

In the event of a warranty claim covered by this Limited Warranty, the exclusive remedies shall be, at Miller's sole discretion: (i) repair; or (ii) replacement; (iii) where authorized in writing by Miller in appropriate cases, the reasonable cost of repair or replacement at an authorized EnPak service facility; or (iv) payment of (or credit for) the purchase price (less reasonable depreciation based upon actual use) upon return of the equipment at the warranty claimant's risk and expense. Miller's option of repair or replacement will be F.O.B., Appleton, Wisconsin; (USA), or F.O.B. an EnPak authorized service facility designated in writing by Miller. No compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE GREATEST EXTENT PERMITTED BY APPLICABLE LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES APPLICABLE TO THE ENPAK EQUIPMENT. IN NO EVENT SHALL MILLER BECOME LIABLE FOR DIRECT, INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT OR LOST BUSINESS OPPORTUNITY), WHETHER BASED IN CONTRACT, TORT OR ANY OTHER LEGAL THEORY. IN NO EVENT SHALL MILLER BECOME OBLIGATED TO PAY MORE ON ANY WARRANTY CLAIM THAN THE PURCHASE PRICE ACTUALLY PAID BY THE ORIGINAL RETAIL PURCHASER.

THIS LIMITED WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY OR GUARANTEE ARISING BY OPERATION OF LAW. ANY WARRANTY NOT EXPRESSLY PROVIDED HEREIN, IMPLIED WARRANTY, GUARANTY AND ANY OR REPRESENTATION REGARDING THE PERFORMANCE OF THE EQUIPMENT, AND ANY REMEDY FOR BREACH OF CONTRACT, IN 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 ARE EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the United States of America do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, such the above limitations and exclusions may not apply to you. This warranty provides specific legal rights. Other rights may be available to you, 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

Visit www.MillerWelds.com/EnPak to locate an EnPak supplier.

Contact your Truck Equipment Distributor for:

- Options and Accessories
- Service and Repair
- Replacement Parts
- Training (Schools, Videos, Books)
- Technical Manuals (Servicing Information and Parts)
- Circuit Diagrams

Always provide Model Name and Serial/Style Number.

Miller Electric Mfg. Co.
An Illinois Tool Works Company
1635 West Spencer Street
Appleton, WI 54914 USA

Contact the Delivering Carrier to: 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.

EnPak

Miller

ORIGINAL INSTRUCTIONS – PRINTED IN USA

 2017–01