


Operation and Maintenance Manual

Weld-Deck welding package CPW 125-4

S/N CA00600021 – UP (Weld-Deck)

To be used with Cummins 6BT5.9-G6 Operation and Maintenance Manuals, and Parts
Catalogs

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Foreword

Literature Information

This manual contains safety information, operation instructions, transportation information, lubrication information and maintenance information. It also contains supplemental operation and maintenance manuals supplied by the original equipment manufactures that detail specific procedures that must be followed in addition to the information outlined in the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

Machine Description

Vanguard's Continuously Powered Welding (CPW) Package attachment is a modular, self powered design that can be quickly mounted to a variety of carriers—pipelayers, crawler tractors, etc.—or on a self contained skid-mount. It provides clean, stable alternating current (AC) to power a variety of welding power units and auxiliary equipment.

The primary use of this machine is for petroleum-product pipeline construction.

The operator should read, understand, and follow both the carrier's and the CPW's operating and maintenance instructions. The operator must comply with all pipeline-construction procedures, regulations, and safety precautions.

The daily service/inspection procedure should be performed before start-up.

Note: Refer to the specific module's—Compressor, Engine, Generator, Welding Power-unit—operation and maintenance manuals for detailed information on the operation of the respective module.

Safety

This equipment is to be operated and serviced by qualified personnel only. To become familiar with the basic safety precautions and warning sign locations and wording, at a minimum they must read and understand the safety section before operating or performing lubrication, maintenance and repair on this equipment.

Do not attempt to bypass any of the safety equipment or instrumentation on this equipment.

Do not attempt to operate this equipment with any of the safety equipment or instrumentation bypassed.

Certain conditions and precautions are peculiar to pipeline construction operations. The following represents the minimum considerations for safe operation of this equipment.

Operation

The operation section is a reference for the new operator and a refresher for the experienced operator. This section includes a discussion of gauges, switches, machine controls, and transportation information.

Photographs and illustrations guide the operator through correct procedures of checking, starting, operating, and stopping the equipment.

Maintenance

The maintenance section is provided for quick, general reference only. They do not outline all of the inspection and service procedures that **MUST** be performed to the various modules. Refer to the specific module's—Compressor, Engine, Generator, Welding Power-unit—operation and maintenance manuals for complete and detailed information on the care of the respective module.

Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) can be used instead of service hour meter intervals if they provide more convenient servicing schedules and approximate the indicated service hour meter reading. Recommended service should always be performed at the interval that occurs first.

Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the maintenance intervals charts might be necessary.

Perform service on items at multiples of the original requirement. For example, at every 500 service hours or 3 months, also service those items listed under every 250 service hours or monthly and every 10 service hours or daily.

California Proposition 65

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

Safety Section

Safety Signs and Labels

There are several specific safety signs on this equipment. The exact location of the hazard and the description are reviewed in this section. Please become familiarized with all safety signs.

DANGER Indicates imminently hazardous situations that, if not avoided, will result in serious injury or death.

WARNING Indicates potentially hazardous situations that, if not avoided, could result in serious injury or death.

CAUTION Indicates potentially hazardous situations that, if not avoided, may result in minor or moderate injury. May also be used to alert against unsafe practices.

Make sure that all of the safety signs are legible. Clean or replace the safety signs if you cannot read the words. Replace the illustrations if the illustrations are not visible. Use a cloth, water, and mild soap to clean the safety signs. Do not use solvent, gasoline, or other harsh chemicals to clean the safety signs. Do not use pressure washers to clean the safety signs.

Replace any safety sign that is damaged, or missing. If a safety sign is attached to a part that is replaced, install a safety sign on the replacement part. Vanguard Equipment can provide new safety signs.



High voltage poses an electrocution hazard; this equipment must be operated by qualified personnel only.

Control/Distribution Center labels

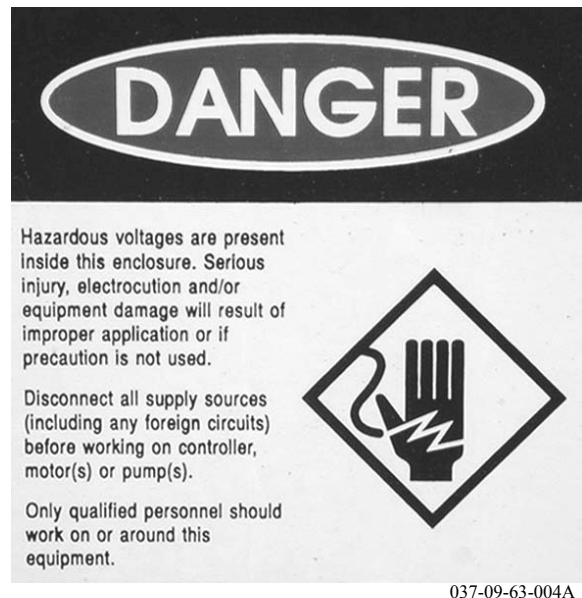


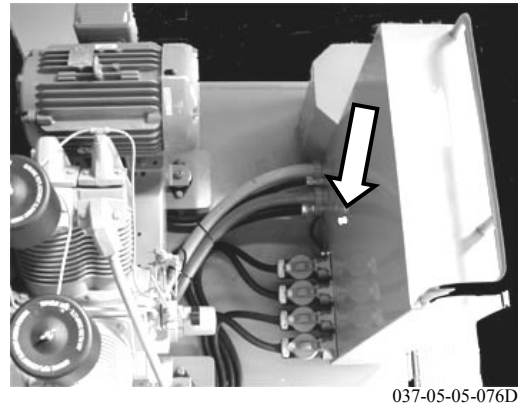
Figure 1: Danger, hazardous voltage, qualified personnel only; located on main door—control/distribution center.



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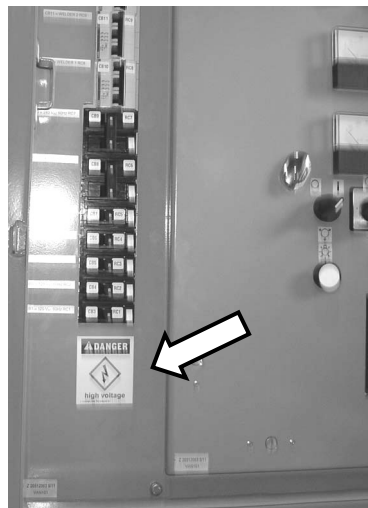


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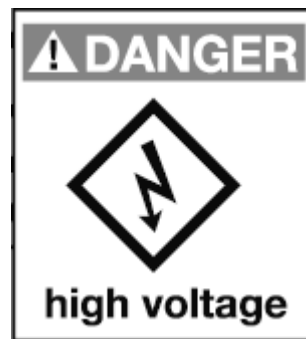


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Figure 2: Warning, high voltage electrocution hazard; located on main door control/distribution center, and on rear of control/distribution center.



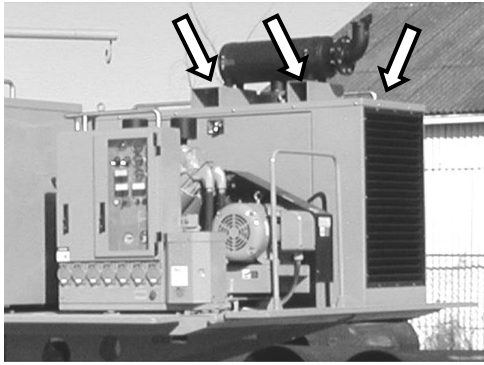
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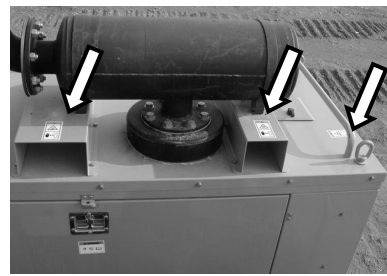
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Figure 3: Danger high voltage; located behind main door on circuit breaker panel—control/distribution center.

Genset enclosure labels



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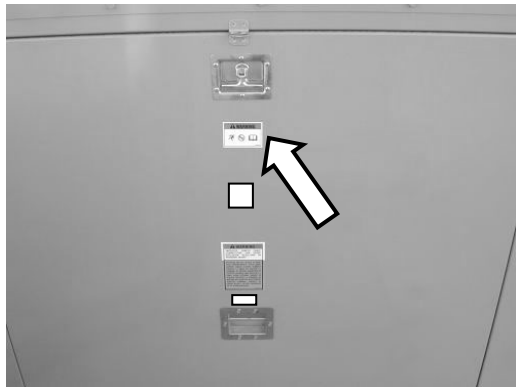


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Figure 4: Warning, hot surface; located close to exhaust muffler (three places) on top of genset enclosure.



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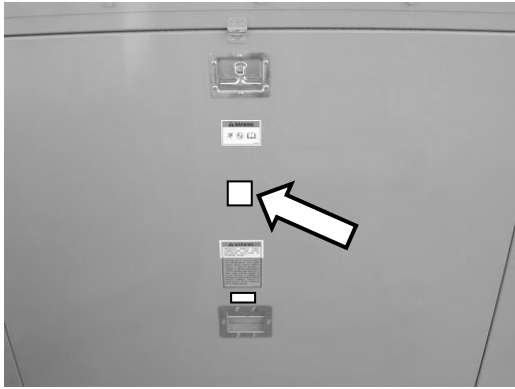


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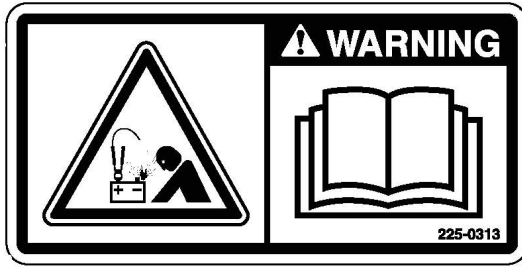


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Figure 5: Warning, electrocution hazard, -do not service, read the manual; located beside latches on the main door and on the service panel—genset enclosure.

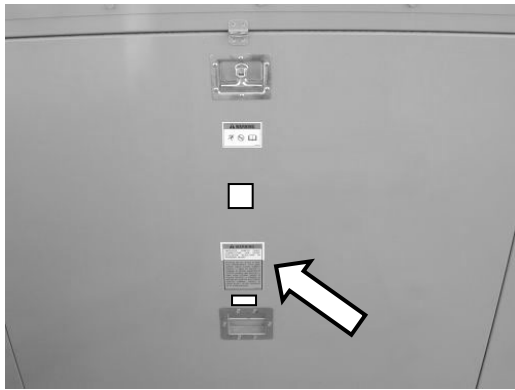


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225-0313A

Figure 6: Warning, Jump Start; located on the service panel—genest enclosure.



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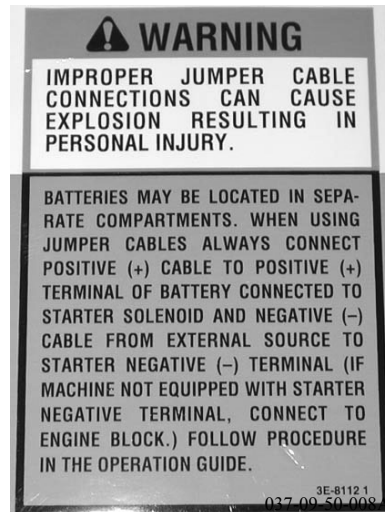
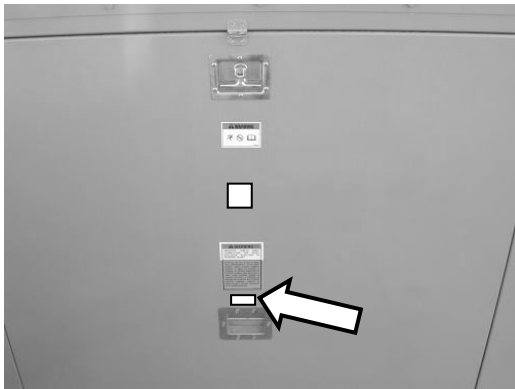


Figure 7: Warning, improper jumper cable connections; located on service panel—genest enclosure

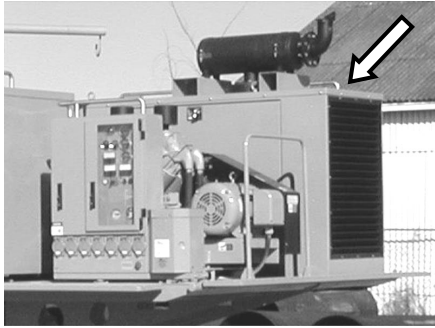


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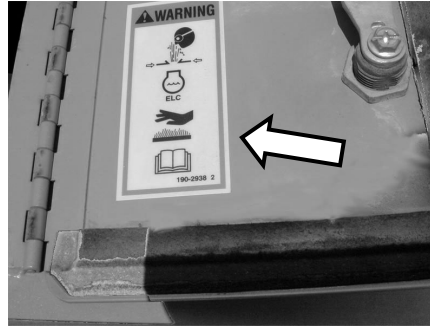
Figure 8: Film - 24 Volt system; located on the service panel—genest enclosure.



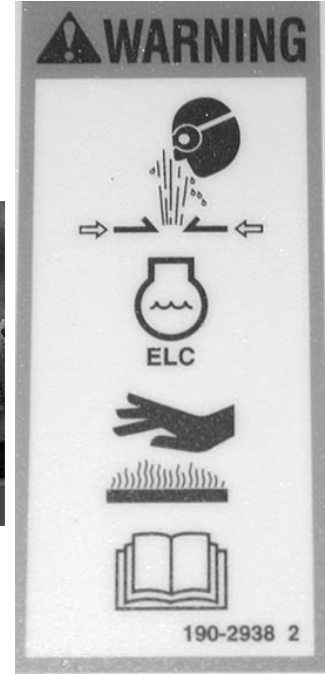
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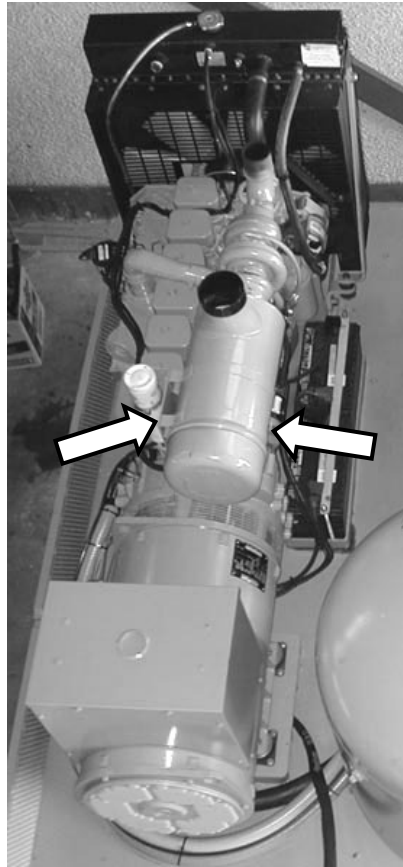
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Figure 9: Warning, pressurized coolant, hot surface, read the manual; located on underside of radiator fill door—genset

Genset labels



Ether cylinder present, do not smoke inside the genset compartment. Do not smoke while changing ether cylinders.

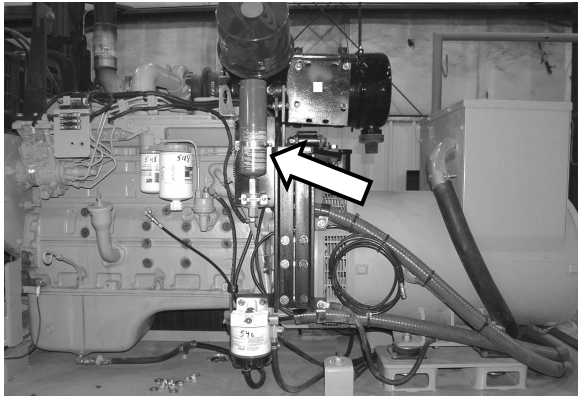


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037-05-09-002

Figure 10: No smoking: located on air filter bracket (fuel pump side) near ether bottle and on air filter (turbo side)—genset.



037-05-50-148C

! DANGER

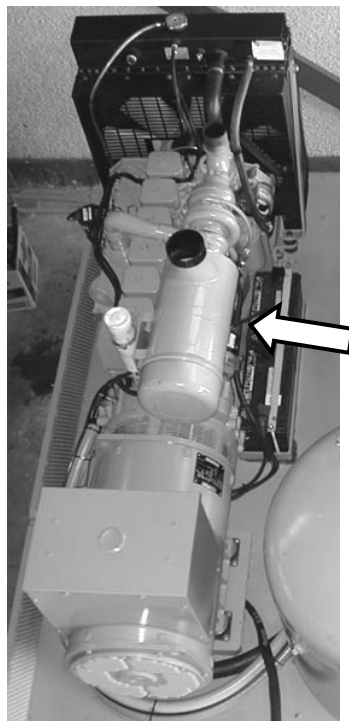
WHEN MAINTAINING OR TROUBLESHOOTING THESE SYSTEMS, ALWAYS MAKE SURE THAT YOU ARE IN A WELL VENTILATED AREA AWAY FROM HEAT, OPEN FLAMES, OR SPARKES. WEAR GOGGLES WHEN TESTING TO AVOID EYE INJURY. MAKE SURE THAT OPENINGS OF THE CALVE, TUBE, OR ATOMIZER ARE POINTED AWAY FROM YOURSELF WHILE TESTING.

THE ETHYL ETHER USED IN THIS STARTING FUEL FOR THESE SYSTEMS IS EXTREMELY FLAMMABLE, TOXIC, HARMFUL, OR FATAL IF SWALLOWED, **DO NOT INDUCE VOMITING**. CALL PHYSICIAN IMMEDIATELY.

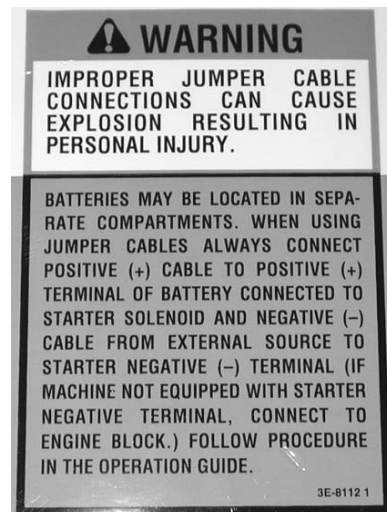
IF FUEL ENTERES EYES OR FUMES IRRITATE EYES, THEY SHOULD BE WASHED WITH LARGE QUANTITES OF CLEAN WATER FOR 15 MINUTES. A PHYSICIAN, PREFERABLY AN EYAN EYE SPECIALIST, SHOULD BE CONTACTED.

DO NOT STORE CYLINDERS IN TEMPERATURES ABOVE 160 °F. CONTENTS ARE UNDER PRESSURE. DO NOT INCIERATE, PUNCTURE, OR ATTEMPT TO REMOVE CENTER CORE VALVE OR SIDE SAFETY VALVE FROM CYLINDER.

Figure 11: Danger, ether cylinder; typical note on ether cylinder—genset.

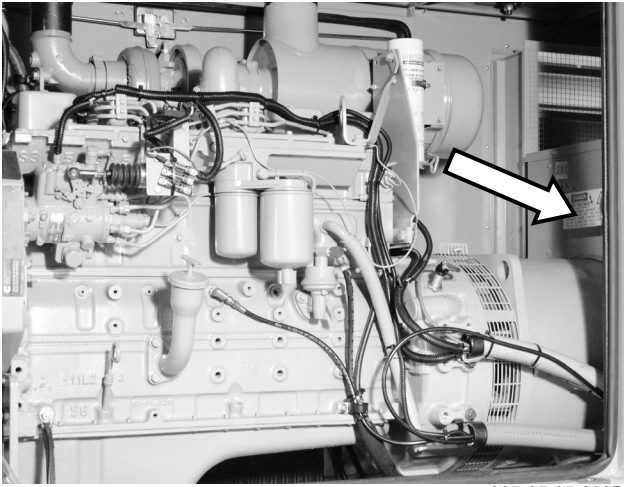


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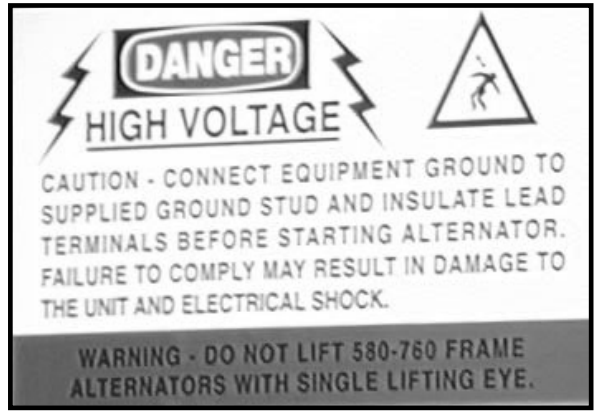


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Figure 12: Warning, improper jumper cable connections; located on air filter (turbo side)—genset.

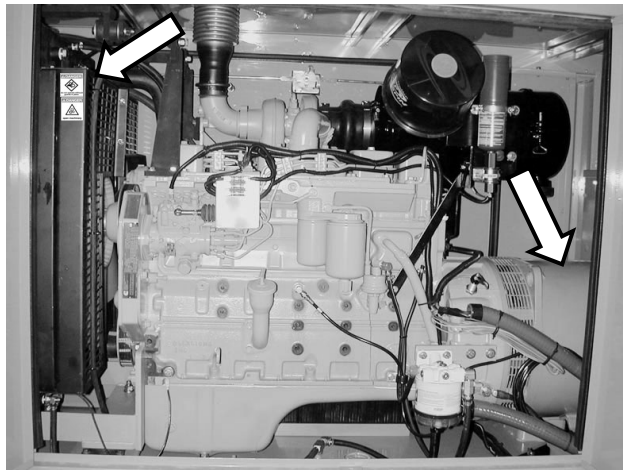


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037-05-50-142B

Figure 13: Danger, high voltage; located on main power alternator connection housing—genset.

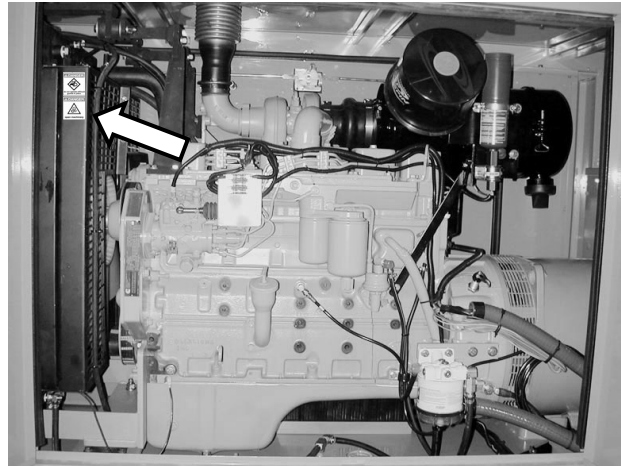


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037-05-09-006

Figure 14: Danger, do not operate without guards in place; located on fuel pump and turbo sides (fuel pump side shown) of radiator guard, and on main power alternator casing—genset

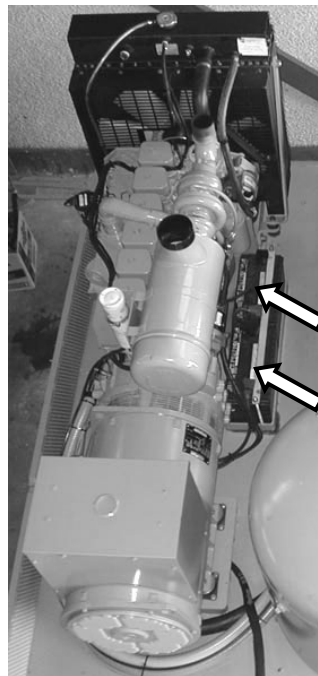


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Figure 15: Danger, open machinery; located on fuel pump and turbo sides (fuel pump side shown) of radiator guard—genset



037-40-50-099A

DANGER/POISON

Keep out of reach of children.

Do not tip

Shield eyes. Explosive gases can cause blindness or injury.

No sparks, flames or smoking.

Sulfuric Acid can cause blindness or severe burns.

Keep vent caps tight and level.

FLUSH EYES IMMEDIATELY WITH WATER. Get medical help fast.

CAUTION: For safe jumpstarting, follow instructions in owners manual or if not available, see assistance.

Contains lead: return, recycle.

Figure 16: Danger/Poison; typical note located on both batteries—genset.

General Hazard Information

Before you service the equipment or before you repair the equipment, attach a “Do Not Operate” tag or similar tag to the start switch or controls.

Know the width of your equipment in order to maintain proper clearance near fences, boundary obstacles, etc.

This attachment adds significant rearward length to the carrier, be especially aware of the additional length when turning and maneuvering the machine.

This attachment adds significant weight to the rear of the machine, which will change the weight-balance point (center of gravity). Be especially aware of the additional weight when climbing steep slopes or loading for transport. Additional front-mounted counter weight is available from Vanguard Equipment.

Follow all safety regulations, procedures and precautions that govern the work site, including: wearing a hard hat, protective glasses and other protective equipment in order to accommodate job conditions.

Do not wear loose clothing or jewelry that can catch on controls or other parts of the equipment.

Keep all equipment free from foreign material. Check the deck, walkways and any steps. Remove debris, oil, tools and other items.

Secure all loose items that are not part of the machine; tools, lunchboxes, water bottles, etc.

Know the appropriate work site hand signals. Also, know the personnel that are authorized to give the hand signals. Accept signals from one person only.

Never put maintenance fluids into glass containers. Drain all liquids into a suitable container.

When you discard liquids, obey all local regulations; take all used fluid and service materials to a recycling depot whenever possible.

Use all cleaning solutions with care.

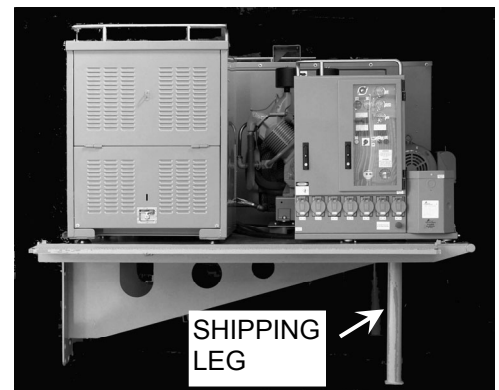
Report all necessary repairs.

Do not allow unauthorized personnel on the machine.

Unless you are instructed otherwise, perform the maintenance with the following conditions:

- The carrier is parked on level ground as per the manufacture’s instructions. If the equipment is not installed onto a carrier, the shipping legs are installed and the weld-deck is on stable, level ground.
- All walkways are extended.
- The genset-engine is stopped.
- The genset-engine start switch is in the OFF position.
- The disconnect switch is in the OFF position and the key is removed.
- The air tank, if present, is fully drained.

Note: The shipping legs must be removed prior to moving the carrier.



037-05-05-001A

Figure 17: Shipping leg

Pressure Air

Pressure air can cause personal injury. When pressure air is used for cleaning, wear a protective face shield, protective clothing and protective shoes.

The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Trapped Pressure

Pressure can be trapped in a hydraulic system. Trapped pressure can cause sudden equipment movement. Use caution if you disconnect hydraulic lines or fittings. High pressure oil that is released can cause a hose to whip. High pressure oil that is released can cause oil to spray. Fluid penetration can cause serious injury and possible death.

Fluid Penetration

When you check for a leak, use a board or cardboard. Leaking fluid that is under pressure can penetrate body tissue. Fluid penetration can cause serious injury and possible death. A pin hole leak can cause severe injury. If fluid is injected into your skin, you must obtain treatment immediately. Seek treatment from a doctor that is familiar with this type of injury.

Asbestos Information

The CPW equipment shipped from VEI is asbestos free. Use only genuine OEM replacement parts. If any replacement parts that contain asbestos are used, follow the manufacturer's handling guidelines and procedures as outlined in their instruction documentation.

Burn prevention

Coolant

At operating temperature, the engine coolant is hot and the engine coolant is under pressure. The radiator and all lines to the engine contain hot coolant or steam. Any contact can cause severe burns.

Steam can cause personal injury.

Only check the coolant level after the engine has been stopped; use the sight gauge on the radiator. Make sure that the radiator filler cap is cool. In order to remove the radiator cap with the bare hand, the radiator cap must be cool. In order to relieve pressure, remove the radiator filler cap slowly.

Cooling system additive contains alkali. Alkali can cause personal injury. Do not allow alkali to contact the skin, the eyes, or the mouth.

Allow cooling system components to cool before you drain the cooling system.

Oils

Hot oil and hot components can cause personal injury. Do not allow hot oil to contact the skin. Also do not allow hot components to contact the skin.

Relieve all pressure in the air system, in the oil system, in the fuel system or in the cooling system. Relieve the pressure before any lines, any fittings or any related items are disconnected or removed.

Batteries

Batteries give off flammable fumes which can explode.

Do not smoke when you observe the battery electrolyte levels.

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact the skin or the eyes.

Always wear protective glasses when you work with batteries.

Fire Prevention and Explosion Prevention

All fuels, most lubricants, and some coolant mixtures are flammable.

Fuel that is leaking, fuel that is spilled onto electrical components can cause a fire.

Do not smoke in battery charging areas or in areas that are used to store flammable material.

Batteries can be installed in separate compartments. When you use jump start cables, always connect the positive "(+)" cable to the positive "(+)" terminal of the battery that is connected to the starter solenoid. Connect the negative "(—)" cable from the external source to the negative "(—)" terminal of the starter.

Note: If the starter is not equipped with a negative "(—)" terminal, connect the cable to the engine block.

See the Operation Section of this manual for specific starting instructions.

Clean all electrical connections and tighten all electrical connections. Check the electrical wires daily for loose wires or for frayed wires. Tighten all loose wires before you operate the machine. Repair all frayed wires before you operate the machine.

Store all fuels and lubricants in properly marked containers and away from all unauthorized persons.

Store all oily rags or other flammable material in a protective container.

Do not weld pipes that contain flammable fluids or tubes that contain flammable fluids. Do not flame cut pipes that contain flammable fluids or tubes that contain flammable fluids. Clean the pipes or tubes thoroughly with nonflammable solvent before you weld the pipes or tubes or you flame cut the pipes or tubes.

Remove all flammable materials (fuel, oil, debris, etc.) before the flammable materials accumulate on the machine.

Do not expose the machine to the flames or to brush that is burning.

Fire Extinguisher

A fire extinguisher is typically carried on the carrier. Make sure that a fire extinguisher is on the machine. Make sure that you are familiar with the operation of the fire extinguisher. Inspect the fire extinguisher and service the fire extinguisher. Obey the recommendations on the fire extinguisher's instruction-plate.

Note: Keep access and walkway clear; do not mount any accessory equipment in a manner that obstructs the access or walkways.

If an additional extinguisher is required on the weld-deck, mount one in a convenient and readily accessible location, such as the free deck-space to the rear of the control/distribution center beside the transformer, or in the space between the tractor and the welding power-unit enclosure.

Ether

Ether is poisonous and flammable. Inhaling ether vapors can cause personal injury. Do not allow ether to contact your skin repeatedly. Use ether only in well ventilated areas. Do not smoke while you replace ether cylinders. Use ether carefully to avoid fires. Do not store ether cylinders in living areas or in the operator's compartment.

Do not store ether cylinders above 40°C (102°F). Discard ether cylinders in an approved place. Do not puncture ether cylinders. Do not burn ether cylinders. Keep ether cylinders out of the reach of unauthorized personnel.

Lines, Tubes and Hoses

Do not bend high pressure lines. Do not strike high pressure lines. Do not install bent lines, bent tubes, or bent hoses. Do not install damaged lines, damaged tubes, or damaged hoses.

Repair loose lines, loose tubes, and loose hoses. Repair damaged lines, damaged tubes, and damaged hoses. Leaks can cause fires. Contact VEI for replacement parts.

Check lines, tubes and hoses carefully. Do not use your bare hands to check for leaks. Use a board or cardboard to check for leaks. See Operation and Maintenance Manual, "Fluid Penetration" for more details. Tighten all connections to the recommended torque; rubber vibration isolators require special attention, refer to the Parts Manual for special instructions and torques.

Replace the parts if any of the following conditions are present:

- The end fittings are damaged or leaking.
- The outer covering is chafed or cut.
- The wire shield is exposed.
- The outer covering is ballooning locally.
- The flexible part of the hose is kinked or crushed.
- The armoring is embedded in the outer cover.
- The end fittings are displaced.

Make sure that all clamps, guards, and heat shields are installed correctly. During operation, this will help prevent vibration, rubbing against other parts, and excessive heat.

Electrical cables and wire-harnesses

Do not bend electrical cables or wire-harnesses to a tighter radius than already installed. Do not strike electrical cables or wire-harnesses. Do not kink electrical cables or wire-harnesses. Do not install kinked electrical cables or wire-harnesses. Do not install damaged electrical cables or wire-harnesses.

Note: Only qualified personnel should work on electrical equipment, including electrical cables or wire-harnesses. Follow established safety procedures when working on electrical equipment, including stopping the genset and locking out operator controls as described above.

Replace electrical cables or wire-harnesses with the same electrical rating, properties, and specifications as the original. Contact VEI for replacement parts.

Replace electrical cables or wire-harnesses if any of the following conditions are present:

- The outer covering is chafed or cut.
- The insulation is chafed, cut, or damaged in any way.
- Signs of burning or arcing through the outer covering/insulation are present.
- The electrical cable or wire-harness has been crushed by a heavy object.

Make sure that all clamps and guards are installed correctly. During operation, this will help prevent vibration and rubbing against other parts.

Electrical Storm Injury Prevention

When lightning is striking or threatening to strike near the vicinity of the machine, the operator should **never** attempt the following procedures:

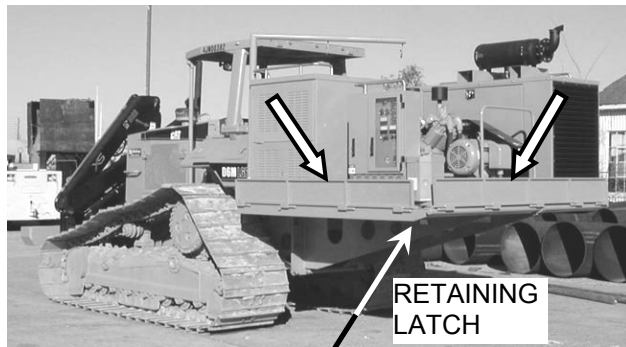
- Mount the machine.
- Dismount the machine.

If you are in the operator's station during an electrical storm, stay in the operator's station. If you are on the ground during an electrical storm, stay away from the vicinity of the machine.

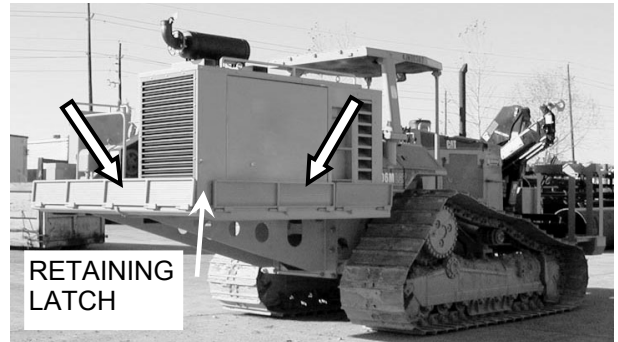
Mounting and Dismounting

! WARNING

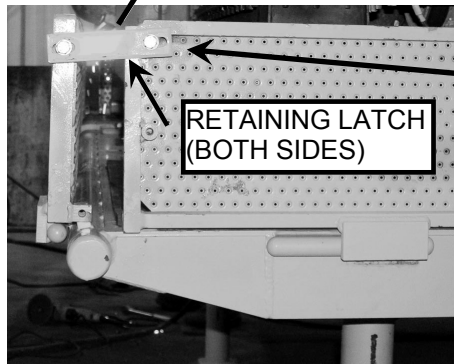
Do not attempt to mount or dismount the machine between the machine and any object that may move.



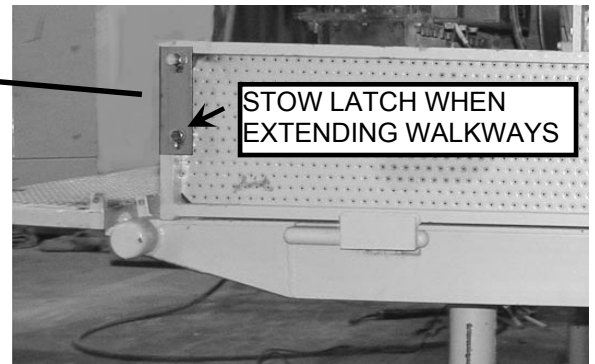
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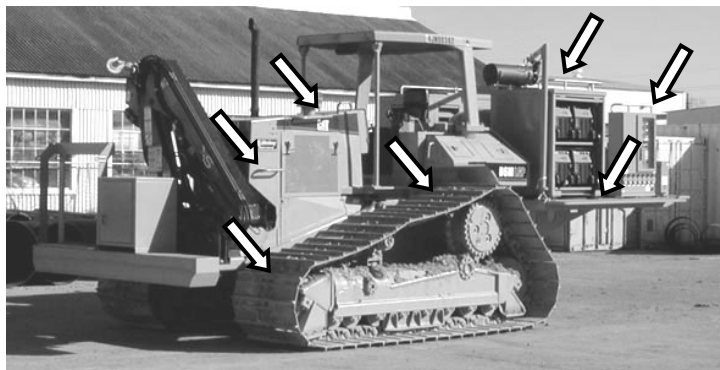
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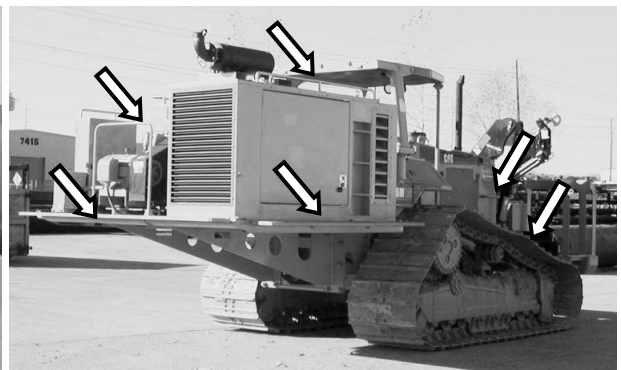
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Figure 18: Walkway retaining latches.

Extend all walkways before mounting the machine. The walkways are latched together for transport; unbolt the retaining latches from the rear walkway, and bolt in the stowing position on each of the side walkways.



037-05-05-109A



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Figure 19: Typical welding package access: Walkways extended.

Get on the machine only at locations that have steps and/or handholds. Get off the machine only at locations that have steps and/or handholds. Before getting on the machine, clean the steps and handholds. Inspect the steps, handholds, and walkways. Make all necessary repairs.

Face the machine whenever getting on, off, or moving around the machine. Maintain three-point contact with the steps/walkways and with the handholds.

Note: Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands.

Do not get onto or off a moving machine. Never jump off the machine. Do not try to get onto or off of the machine while carrying tools or supplies. Use a hand line to pull equipment onto the platform. Do not use any controls as handholds when entering or exiting the operator compartment.

Ground personnel must be kept clear at all times and only approach the machine when signaled to do so by the operator.

Before Starting Genset-Engine

Start the engine only from the control/distribution center's control panel. Do not short across the battery terminals and do not short across the batteries; serious damage to the electrical system could result.

Before you move the equipment, make sure that no personnel are underneath the machine, around the machine, or on the machine. Make sure the area is free of personnel.

Genset-Engine Starting

If a warning tag is attached to the start switch or to the other controls, do not start the genset-engine. Also, do not move any other controls.

Check that all of the louvers on the genset compartment are free of obstructions and debris.

Move all hydraulic controls, if present, to the HOLD position before you start the engine.

Diesel engine exhaust contains products of combustion which can be harmful to your health. Always start the genset-engine in a well ventilated area. If you are in an enclosed area, vent the exhaust to the outside.

Note: If starting engine after an oil change, or if the engine has been shut down for more than 30 days, refer to *Starting Procedure After Extended Shutdown or Oil Change* section of this manual.

Before Operating Equipment

Note: The shipping legs must be removed prior to moving the carrier.

Clear all personnel from the equipment and from the area.

Check for obvious signs of damage, loose bolts, loose equipment, and foreign objects or debris on and under the deck.

Ensure all service panels and enclosure doors are secured in their working positions: genset enclosure doors and panels closed and latched, control-distribution center doors closed and latched, and welder doghouse doors fully open or fully closed and latched.

Connect trailing equipment to a drawbar or to a hitch on the carrier only. Do not connect trailing equipment to the deck structure.

Equipment Information Section

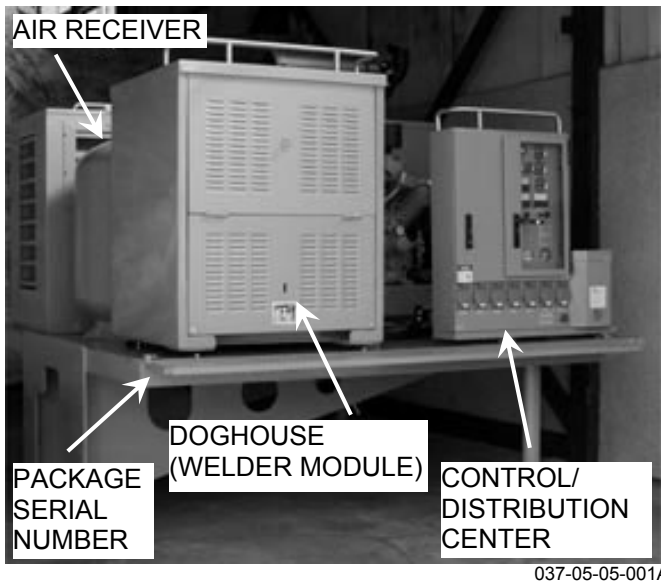


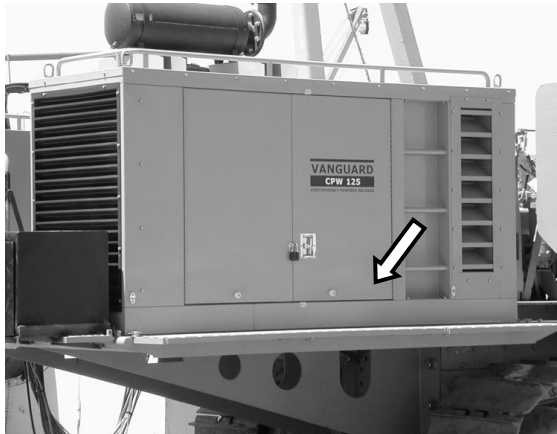
Figure 20: Equipment modules

CPW 125-4 Welder Package Specification (All values approximate)		
Transport width (catwalks stowed)	2737 mm	107.75 in
Working width (catwalks extended)	3188 mm	125.5 in
Welding package height exhaust (transport) to ground (no carrier)	2596 mm	102.2 in
Welding package height exhaust (working) to ground (no carrier)	2713 mm	106.8 in
Additional height to ground, typical carrier installation	+455 mm	+17.9 in
Overall length Welding package alone (catwalks stowed)	2642 mm	104 in
Overall length Welding package alone (catwalks extended)	2875 mm	113.2 in
Additional length Welding package bolt-on front catwalks	+358 mm	+14.1 in
Additional length D6M/N LGP mounted Welder Package with front mount Knuckle-boom crane ("Hiab") platform	+4838 mm	+190.5 in
Weight Welding package alone (includes 4 x 456MP welders, Whoser pole, Compressed air system) D6M/N adapter plate).	2785 kg	8140 lb
Weight less Compressed air system	-667 kg	-1471 lb
D6M/N rear connector plate	+209 kg	+460 lb
Weight D6M/N front mount Knuckle-boom crane platform	2132 kg	4700 lb
Genset module power rating	125 kVA @ 50 Hz	156 kVA @ 60Hz
Voltage output (200 Amp total service)	240/ 415/ 50Hz	120/ 240/ 480/ 60Hz
Compressed air supply (If installed)		
20 hp (15 kW) electric motor	1815.1 l/min; 1.724 MPa	64.1 cfm; 250 psi
25 hp (19 kW) electric motor	2174.7 l/min; 1.724 MPa	76.8 cfm; 250 psi
30 hp (22 kW) electric motor	2548.5 l/min; 1.724 MPa	90 cfm; 250 psi

Operation Section

Battery Disconnect Switch

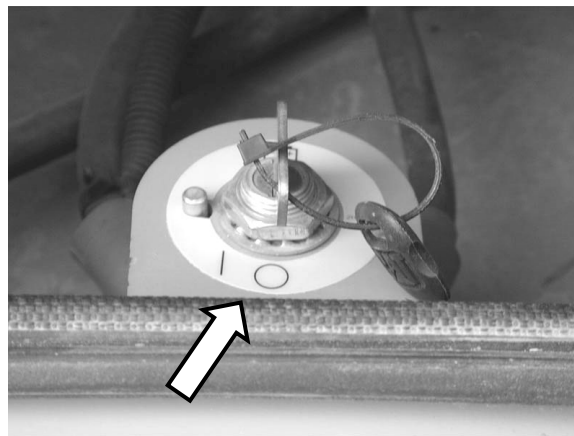
The battery disconnect switch is in the genset enclosure behind the main door on the right (fuel pump) side of the weld-deck.



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Figure 21: Battery Disconnect Switch

I ON — Insert the battery disconnect switch key, and turn the battery disconnect switch key clockwise in order to activate the electrical system. The switch must be ON before you start the engine.

O OFF — Turn the battery disconnect switch key counterclockwise in order to shut off the entire electrical system.

The battery disconnect switch and the engine start switch serve different functions. When the battery disconnect switch is turned off, the entire electrical system is disabled. When only the engine start switch is turned off, the battery remains connected to the electrical system.

Turn the battery disconnect switch key to the off position and remove the battery disconnect switch key when you service the electrical system or you service any other components on the equipment.

Turn the battery disconnect switch key to the off position and remove the battery disconnect switch key when the equipment is left for an extended period of one month or longer. This procedure will prevent a short circuit from draining the battery. This procedure will also prevent the components from draining the battery. This procedure will also prevent the battery from being drained by vandalism.

Emergency Stop

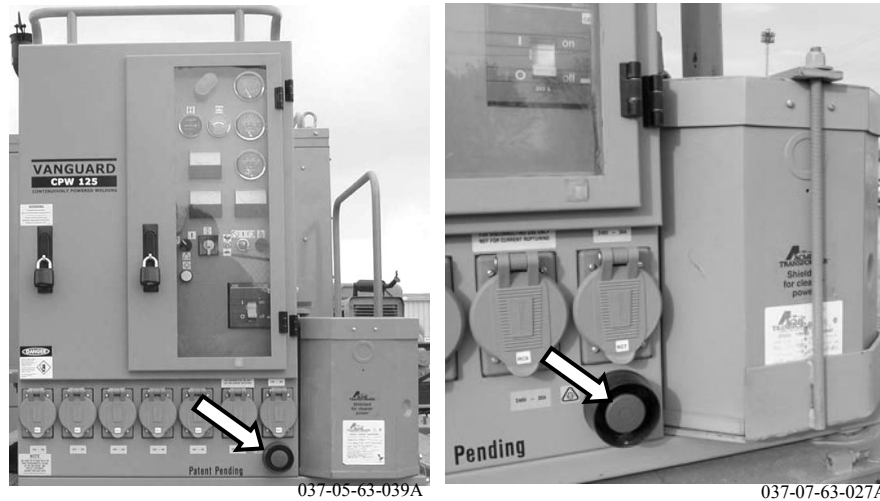



Figure 22: Emergency Stop Button

 **Genset Emergency Stop** — Located on the Control/Distribution Center. Push the RED emergency stop button to **IMMEDIATELY** trip the main breaker to cut the genset electrical power and to stop the genset, if any type of emergency condition exists. The RED emergency stop button must be pulled out to reset.
Note: The emergency stop button cuts all 24 VDC voltage, including engine cranking. Ensure that the emergency stop button is fully pulled out prior to genset starting.

Control Panel Illumination Button

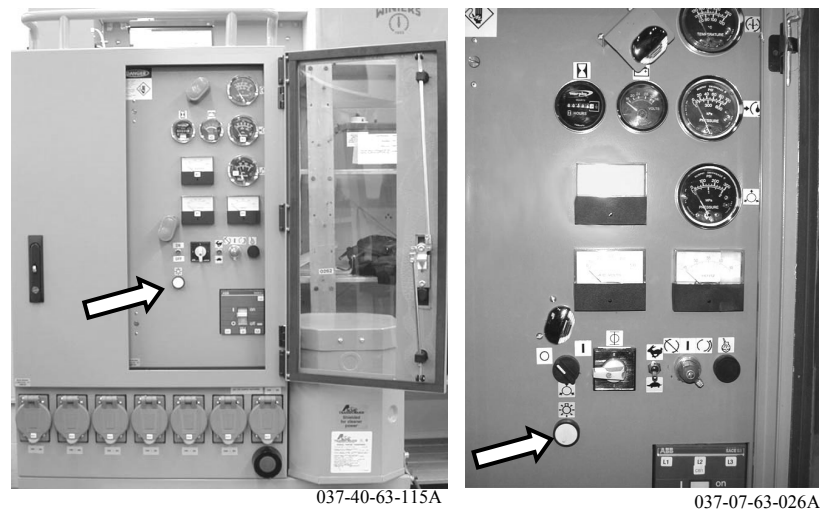






Figure 23: Control Panel Illumination

 Press and hold the WHITE control panel illumination button in dark lighting conditions to turn on the panel display lights and illuminate the controls when the genset is stopped; the lights automatically turn on whenever the genset is running. Gauge lights include: DC voltmeter, AC voltmeter, AC ammeter, AC frequency meter. Two display LEDs illuminate the remaining gauges and the control switches.

Genset Stop/Run/Start Switch

 **STOP** — Turn the genset stop/run/start switch to the STOP position in order to stop the genset; the main breaker—if set—will automatically trip as the Genset slows to a stop.

 **START** — Turn the Genset stop/run/start switch all the way clockwise to the START position in order to crank the Genset. Crank the Genset until the engine catches; this should take no more than 10 seconds. **Note:** Special cold start precautions must be taken for ambient temperatures below 0 °C (32 °F), refer to the *Cold Weather* section in this manual.

 **Run** — Release the stop/run/start switch as soon as the engine catches; the switch will self-return to the Run position.

Note: If the engine fails to start, the genset stop/run/start switch must be returned to the STOP position in order to attempt to start the engine again; the stop/run/start switch has an anti-restart feature built into it.

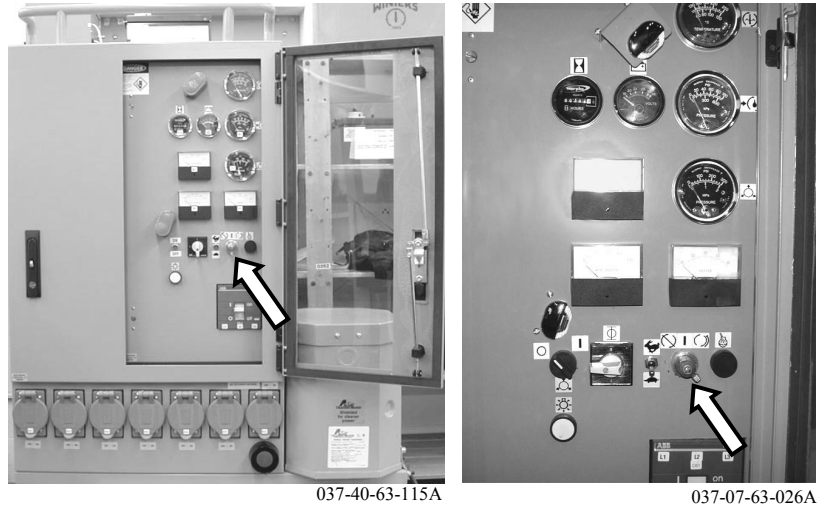




Figure 24: Genset Stop/Run/Start

Rated/Idle Switch

 **IDLE** — With the rated/idle switch in this position, the genset engine runs at an idle speed of approximately 1000RPM. Use this position for start-up, warm-up, and during extended periods of running with no load. **Note:** Do not operate the engine at idle for long periods with the engine coolant temperature below CUMMINS Minimum Recommended Operating Temperature of 71°C (160°F), refer to *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01)*; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

 **RATED** — With the rated/idle switch in this position, the genset engine runs at full or rated speed. Use this position when working.

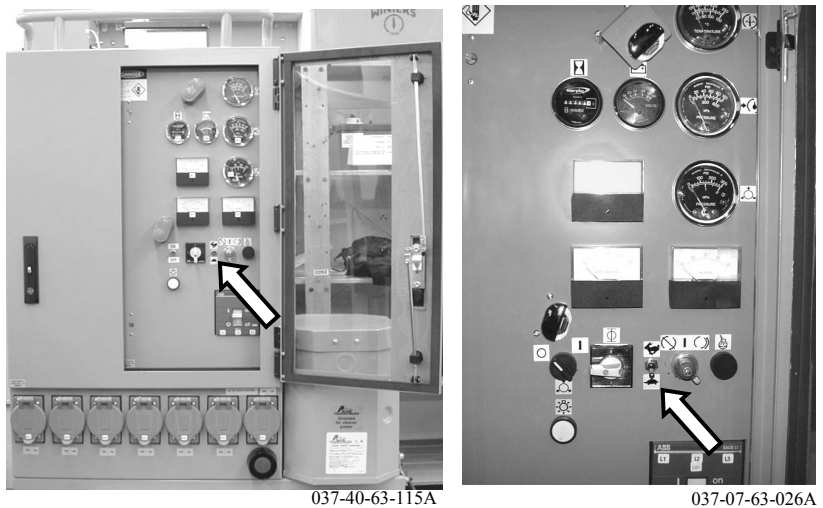


Figure 25: Genset Rated/Idle Switch

Note: The main breaker will only set when the genset rated/idle switch is in the RATED position.

Ether Starting Aid

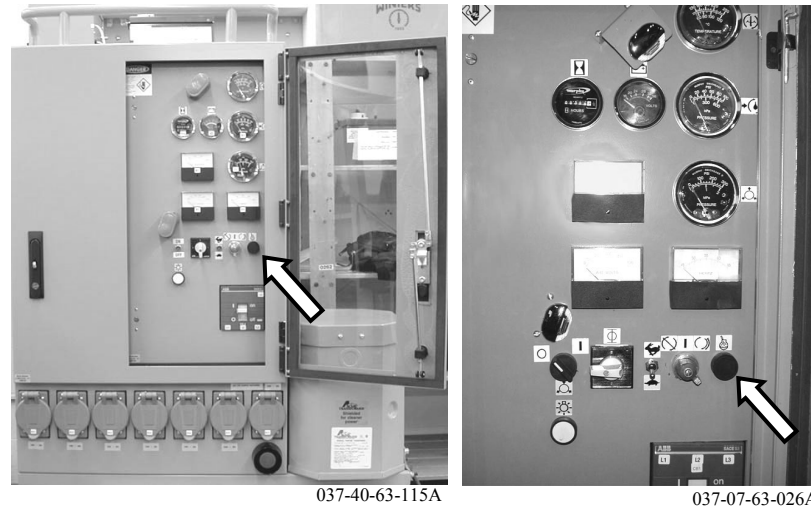


Figure 26: Genset Ether Starting Aid



Ether Starting Aid — At temperatures below 0°C (32°F), a metered amount of ether will be injected into the intake when the ether starting aid button is released. Push and release the ether starting aid button while cranking the engine.
Note: Never hold the ether starting aid button in for more than five seconds.

Note: Refer to the *Ether Starting Aid Cylinder – Replace* section of this manual in order to change the ether starting aid cylinder.

Genset Engine Gauges

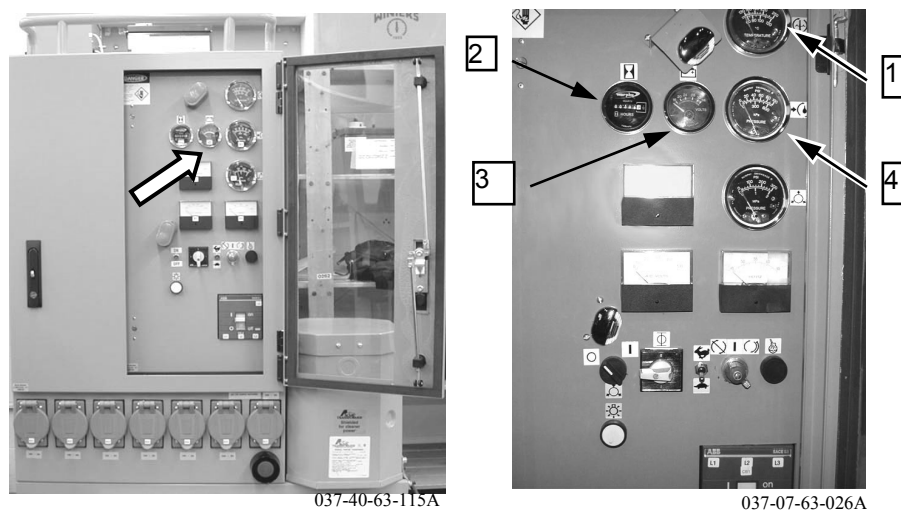


Figure 27: Genset Engine Gauges




Genset Engine Coolant (1) — This gauge indicates the temperature of the genset engine coolant.

Note: The genset engine will automatically shutdown if the coolant temperature reaches 100 °C (210 °F).



Service Hour Meter (2) — This gauge indicates the total operating hours of the genset. The service hour meter should be used to determine service hour maintenance intervals.



Battery Charge Meter (3) — This gauge indicates the charge state of the 24 Volt-DC batteries whenever the genset is running, or by pressing the WHITE control panel illumination button  when the genset is stopped.



Genset Engine Oil Pressure (4) — This gauge indicates the oil pressure of the genset engine.

Note: The genset engine will automatically shutdown if the oil pressure drops below 138 kPa (20 psi).

Main Supply AC Circuit Breaker



DANGER HIGH VOLTAGE: DO NOT OPEN the inner main panel door unless you are a qualified service technician, and are familiar with the dangers of high voltage. The main electrical lines coming into the bottom of the main supply AC circuit breaker (CB1) from the genset are LIVE, and HIGH VOLTAGE is present on the main incoming lines WHENEVER the genset is running, EVEN WHEN THE MAIN CIRCUIT BREAKER (CB1) IS DE-ENERGIZED (O).

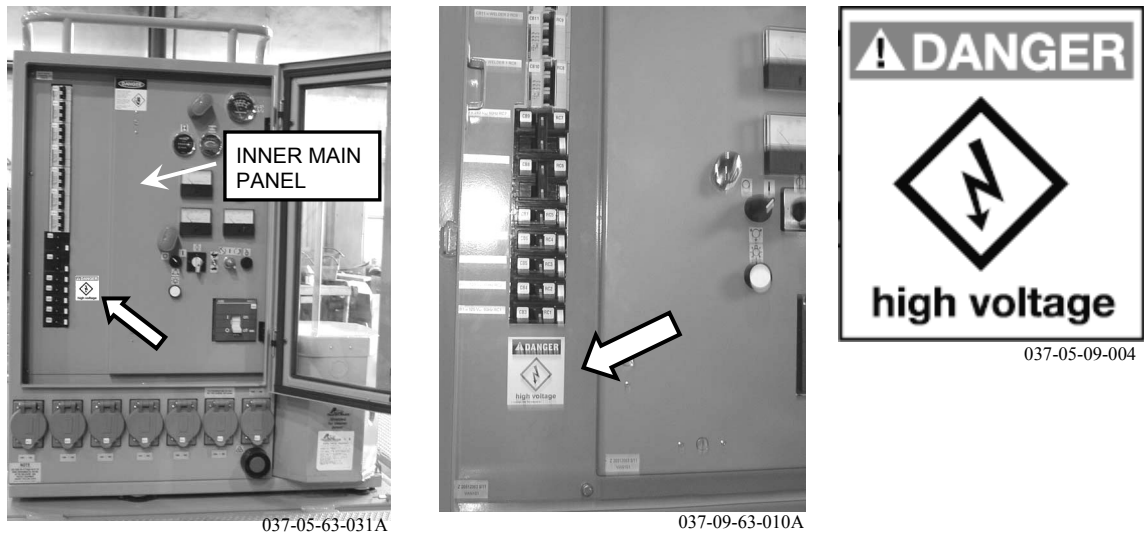


Figure 28: Danger high voltage when inner main panel door is open

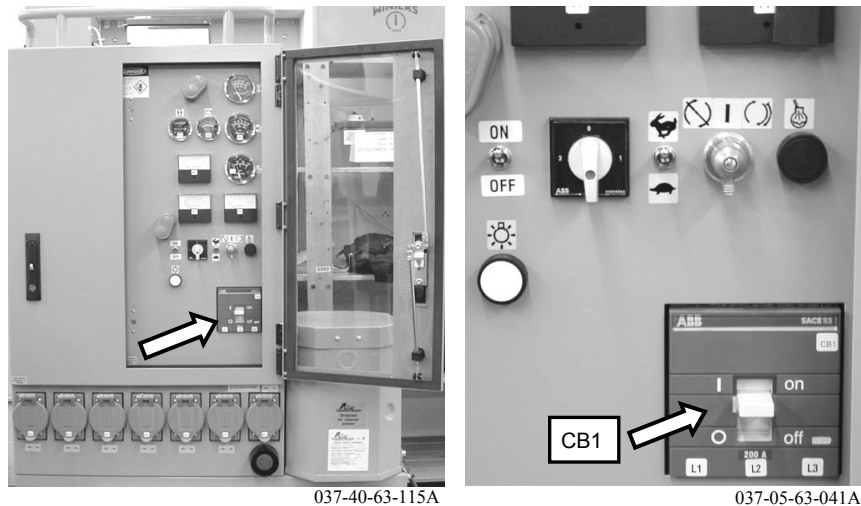


Figure 29: Main Supply AC Circuit Breaker

CB1 Main Supply AC Circuit Breaker — Use this circuit breaker to energize (I) or to de-energize (O) the main AC supply circuit. No power is available to the other AC circuits until this breaker is set (I). In order to reset the breaker, it must first be switched to (O) and then to (I).

Note: The main supply AC circuit breaker can only be set when the genset is running at rated speed.

Main Supply AC Meters' Phase Selector Switch

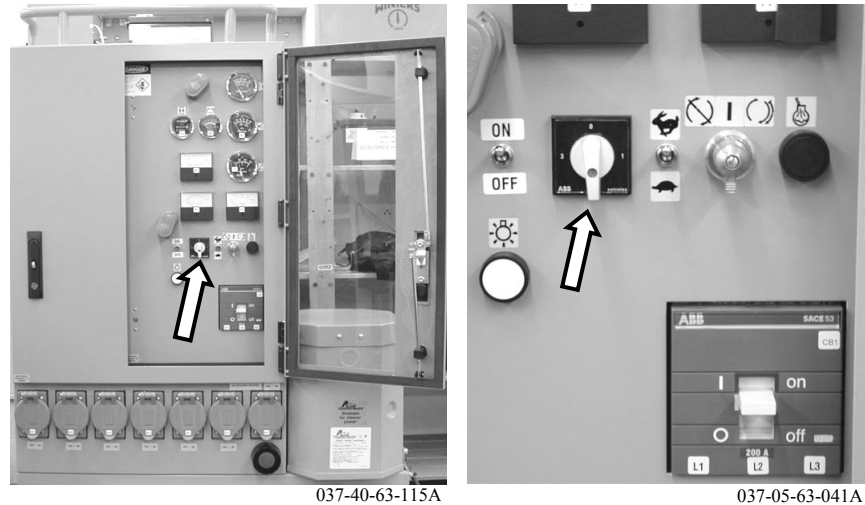


Figure 30: Main Supply AC Meters' Phase Selector Switch

Φ Main Supply AC Meters' Phase Selector Switch — Use this switch to select which leg of the incoming three-phase (3Φ) is displayed on the main supply AC meters. The positions 1, 2, 3 correspond to each leg of the three-phase voltage, while position 0 turns the meters off.

Note: Turning the main supply AC meters' phase selector switch to 0 only turns the main supply AC meters off, it dose NOT turn the main supply power off. See the description for the main supply AC circuit breaker (CB1) above.

Main Supply AC Meters

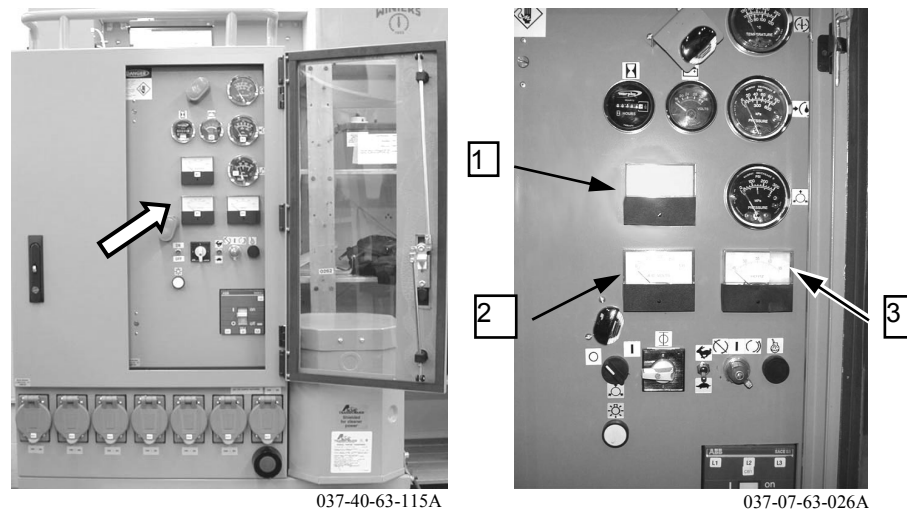


Figure 31: Main Supply AC Meters

Note: The main supply AC meters display only one phase of the incoming 3Φ supply at a time. The phase displayed is selected by main supply meters' phase selector switch (Φ)

A1 Ammeter (1) — This meter displays the load current, in Amps, being drawn by the various components (welding power units, air compressor, and auxiliary equipment).

Note: The displayed current is dependant on the load; if there is no load (all components are off) then the current will be zero.

V1 Voltmeter (2) — This meter displays the main incoming supply voltage, in Volts, being supplied to the load by the genset; 480 Volts @ 60Hz or 415 @ 50Hz.

F1 Frequency Meter (3) — This meter displays the frequency, in Hertz, of the incoming main supply power.

Three Phase Equipment Circuit Breakers and Receptacles

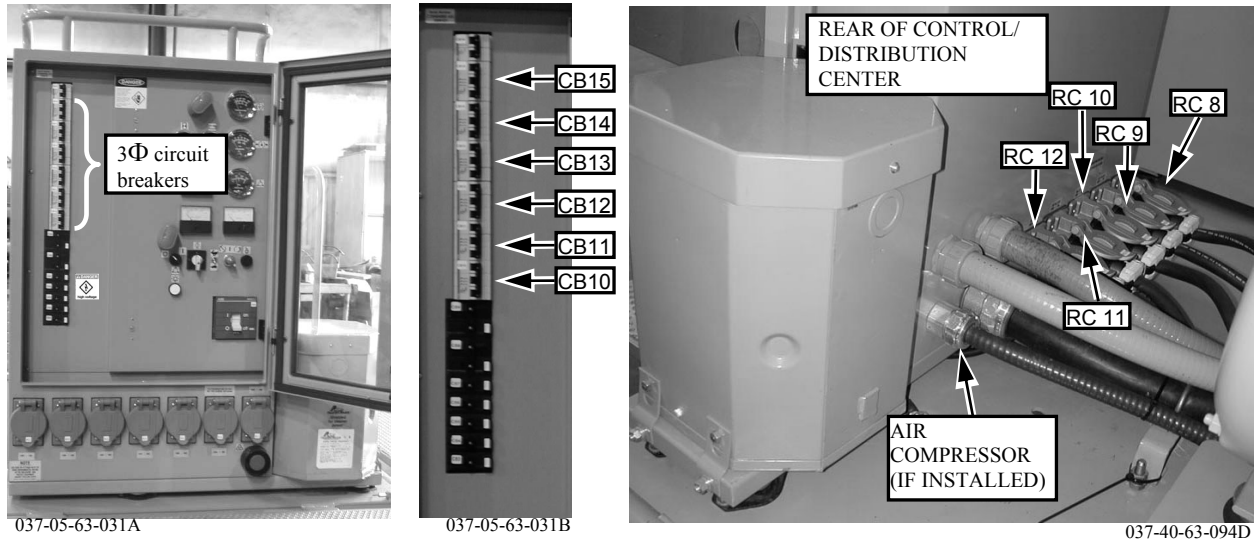


Figure 32: Three Phase Equipment Circuit Breakers and Receptacles

Each of the three phase equipment circuit breakers energizes one of the three phase sub-circuits that exit the rear of the control/distribution center; in most cases a dedicated receptacle for one of the welding power units. Each circuit breaker will independently trip, if an overload condition arises in its dedicated circuit.

Move each of the three phase equipment circuit breakers to the ON position to energize its corresponding receptacle. Move each of the three phase equipment circuit breakers to the OFF position to de-energize its corresponding receptacle

CB 10 — Energizes receptacle **RC 8** “Welder 1”.

CB 11 — Energizes receptacle **RC 9** “Welder 2”.

CB 12 — Energizes receptacle **RC 10** “Welder 3”.

CB 13 — Energizes receptacle **RC 11** “Welder 4”.

CB 14 — Energizes receptacle **RC 12** “Welder 5”.

CB 15 — Energizes the compressor circuit (the compressor may not be installed).

Note: Welding power unit receptacles **RC 8** through **RC 12** require a specific plug-type. Contact VEI or refer to the *Parts Manual, Weld-Deck Welding Package CPW 125-4* for more information.

Single Phase Front-Mounted Equipment Receptacles and Circuit Breakers with Ground Fault Circuit Interrupters (GFCI)

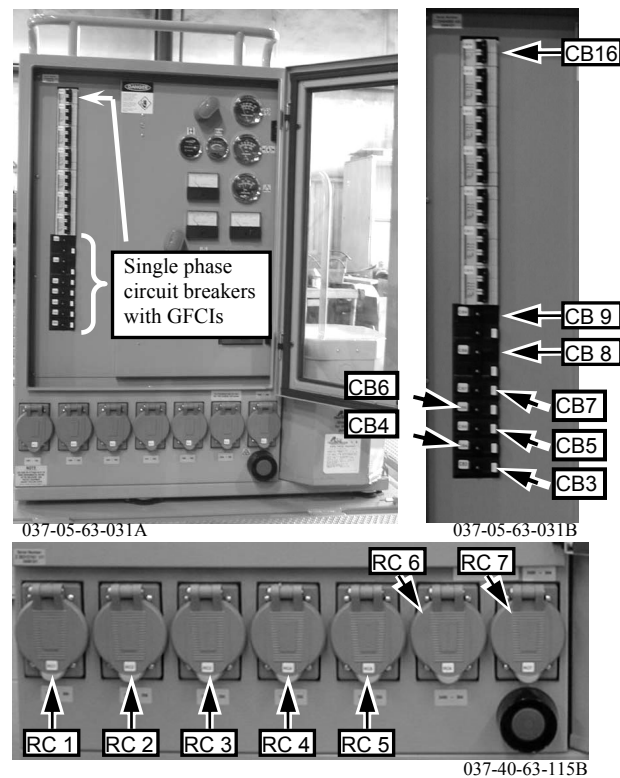


Figure 33: Single Phase Front-Mounted Equipment Receptacles and Circuit Breakers with Ground Fault Circuit Interrupters (GFCI)

Each of the single phase equipment circuit breakers energizes one of the dedicated single phase receptacles on the front of the control/distribution center. Each circuit breaker will independently trip if an over current condition arises in its dedicated circuit.

Each of the single phase equipment circuit breakers incorporates a Ground Fault Circuit Interrupter (GFCI). A GFCI is a device whose function is to interrupt the electric circuit to a load when a fault current to ground exceeds a predetermined value, that is less than that required to operate the over current protective device of the supply circuit.

GFCIs are designed to shut off electric power when the current going into the electric equipment does not equal the amount of current returning to the receptacle. A GFCI interrupts the unbalanced current flow in a fraction of a second, to prevent electrocution. GFCIs only protect against unbalanced current flow type faults, some current must be returned through another path for the GFCI to trip. GFCIs do not protect against line to line or line to neutral contact hazards such as result from bare connectors or terminals, etc. **Note:** GFCI should be tested daily, refer to the *Ground Fault Circuit Interrupters (GFCI)—Test Daily* section of this manual.

Move each of the single phase equipment circuit breakers to the ON position to energize its corresponding receptacle. Move each of the single phase equipment circuit breakers to the OFF position to de-energize its corresponding receptacle, if required.

RC 1 — 120V/20A/60Hz supply. **CB 3** — Energizes receptacle **RC 1**.

RC 2 — 120V/20A/60Hz supply. **CB 4** — Energizes receptacle **RC 2**.

RC 3 — 120V/20A/60Hz supply. **CB 5** — Energizes receptacle **RC 3**.

RC 4 — 120V/20A/60Hz supply. **CB 6** — Energizes receptacle **RC 4**.

RC 5 — 120V/20A/60Hz supply. **CB 7** — Energizes receptacle **RC 5**.

RC 6 — 240V/30A/60Hz supply. **CB 8** — Energizes receptacle **RC 6**.

RC 7 — 240V/30A/60Hz supply. **CB 9** — Energizes receptacle **RC 7**.

CB 16 — Energizes the transformer which supplies the above sub-circuits (CB 3 through CB 9).

Note: Both **CB 16** and the sub-circuit breakers (**CB 3** through **CB 9**) must be energized in order to obtain voltage through receptacles **RC 1** through **RC 7**.

Single Phase Equipment Ground Fault Circuit Interrupters (GFCI)—Connecting To

Notice

All electrical sub-circuits connected to the single phase front-mounted equipment receptacles should be made by a qualified electrician. Failure to make correctly wired connections to the GFCI could result in the inability to set the GFCI due to a perceived ground fault by the GFCI.

The single phase equipment circuit breakers CB 3 through CB 9 are equipped with ground fault circuit interrupters (GFCI). Electrical connections to any of the front-mounted receptacles must not cause current to flow back through an alternate ground path:

- Equipment or circuits connected to receptacles RC 1 through RC 5 must have the neutral connected through the corresponding receptacles' neutral.
- Equipment or circuits connected to receptacles RC 6 and RC 7 must have the neutrals connected through the corresponding receptacles' neutral AND they must be grounded through the receptacle, DO NOT use a separate grounding path.

Air Compressor

Note: A compressor may not be installed, check the specific weld-deck.

Note: Refer to the *CHAMPION Operation/Maintenance Manual & Parts List* for detailed operation and maintenance instructions; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

Air Compressor Start/Stop Switch

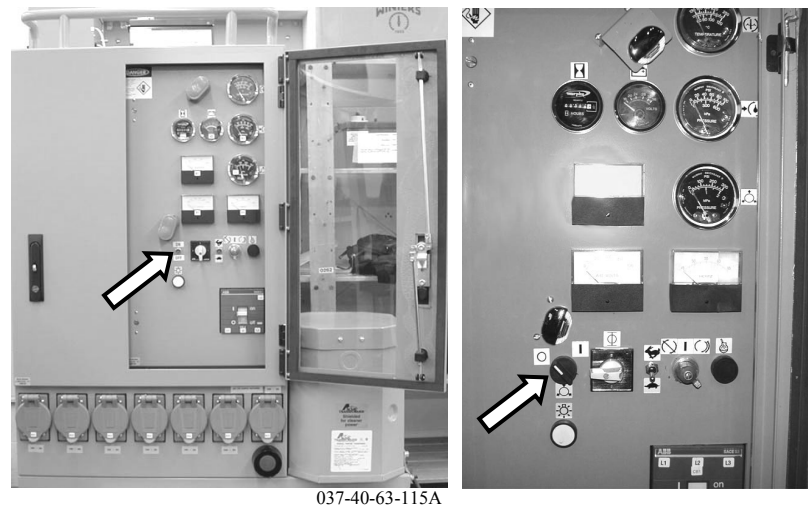


Figure 34: Air Compressor Start/Stop Switch

Air Compressor Start/Stop Switch — Turn the air compressor start/stop switch to ON (I) to start the air compressor and leave the switch in this position for normal work. Turn the air compressor start/stop switch to OFF (O) to stop the compressor when not in use. The air compressor start/stop switch can be left in the on (I) for the duration of a job when the compressor is in use; it will automatically start-up as soon as the main supply AC circuit breaker (CB 1) is set.

Note: Depending on the compressor run-mode, the compressor will automatically unload or shut-off once the set air-receiver pressure has been reached; consult the *Equipment Operation* section of this manual.

Compressed Air Pressure Gauge

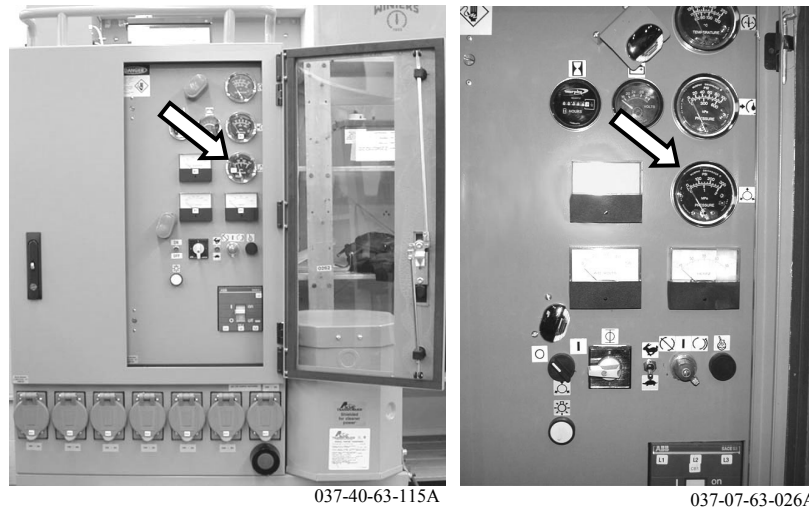


Figure 35: Compressed Air Pressure Gauge – located in Control/Distribution Center on TYPE I Control/Distribution Center

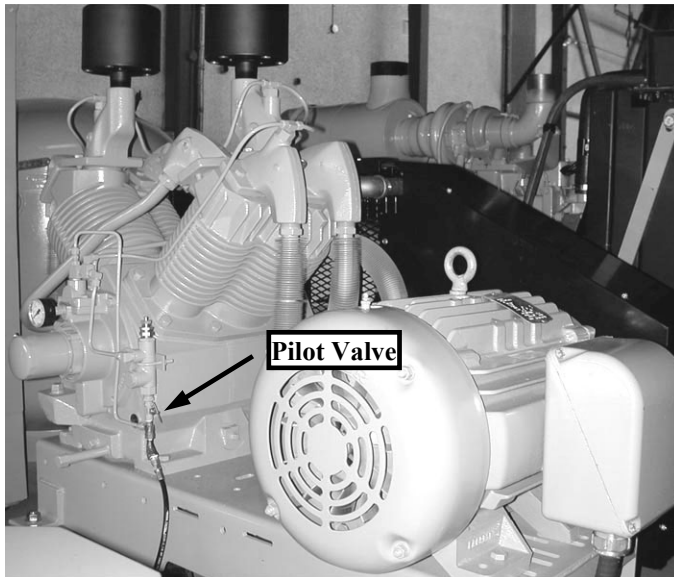


Figure 36: Compressed Air Pressure Gauge –Tank mounted on TYPE II Control/Distribution Center

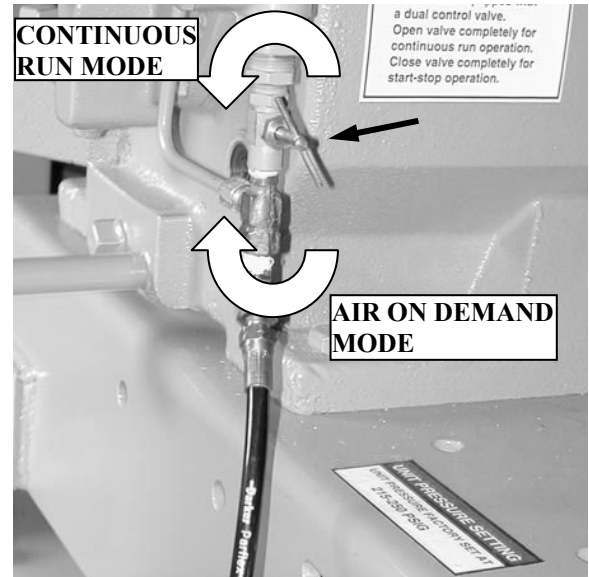
- ☉ Compressed Air Pressure Gauge — This gauge displays the compressed air pressure, in PSI and in MPa, stored in the air receiver.

Air Compressor Run Mode Valve – OPTIONAL

Note: If this option is not installed, the air compressor's electric motor will run continuously, but the air compressor will only supply air as required and will unload (stops pumping air) once the set air pressure—1.724 MP (250 psi)—is reached. DO NOT READJUST.



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Figure 37: Air Compressor Run Mode Valve - OPTIONAL

If the optional Run Mode Valve is installed, the air compressor can operate in two distinct modes: Continuous, or Air-On-Demand. The pilot valve T-handle controls the mode of operation.

Continuous Run Mode — Open the pilot valve fully by turning T-handle counter clockwise. The compressor's electric motor constantly runs, while the compressor unloads (stops pumping air) once the set air pressure—1.724 MP (250 psi)—is reached. DO NOT READJUST.

Air-On-Demand Mode — Close the pilot valve fully by turning T-handle clockwise. The compressor's electric motor automatically stops the compressor once the set pressure is reached, and restarts once the pressure drops below the trip point of approximately 1.482 MPa (215 psi). DO NOT READJUST.

Note: Continuous is the preferred operating mode as it provides the most stable electric power to the welding system, and gives the best diesel-fuel economy, since the large power spikes associated with the electric motor start-up are avoided during equipment operation. Air-on-demand mode may be required when operating on steep slopes for an extended period of time.

Compressed Air Receiver Drain Valve

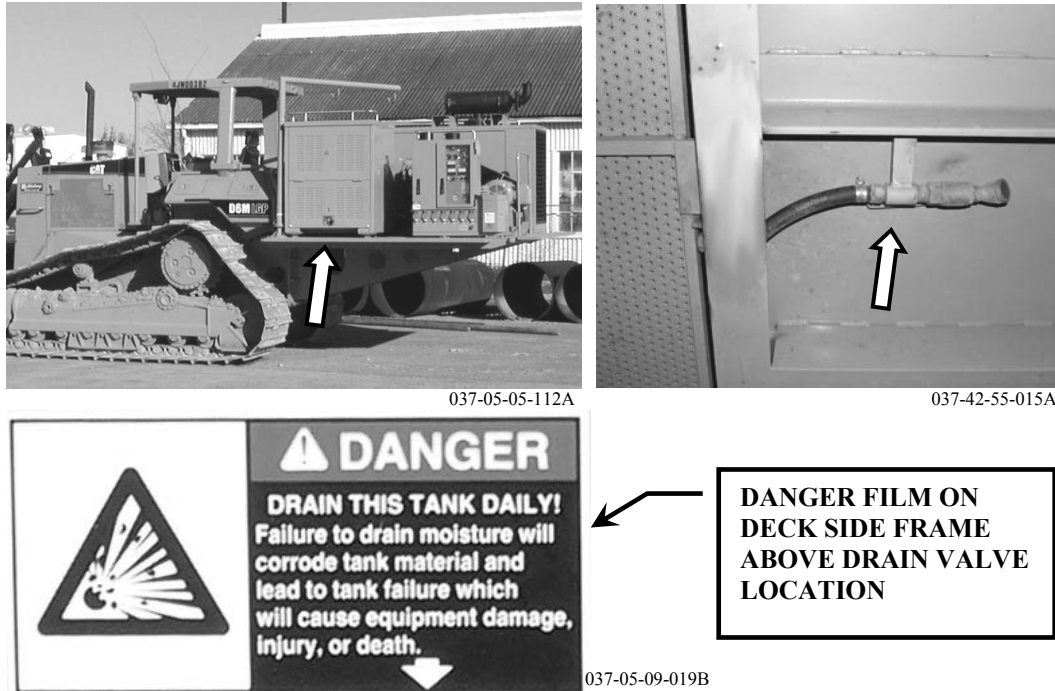


Figure 38: Compressed Air Receiver Drain Valve (shown open)

Compressed Air Receiver Drain Valve — The compressed air receiver is fitted with a drain valve on the underside of the deck. The compressed air receiver drain valve is used to drain water from the air receiver that accumulates during normal use. The compressed air receiver drain valve is also used to drain the compressed air from the receiver when not in use. Ensure that compressed air receiver drain valve is closed prior to starting the air compressor.

Note: The compressed air receiver should be fully drained of air at the end of each work day.

Compressed Air Supply Line Tee

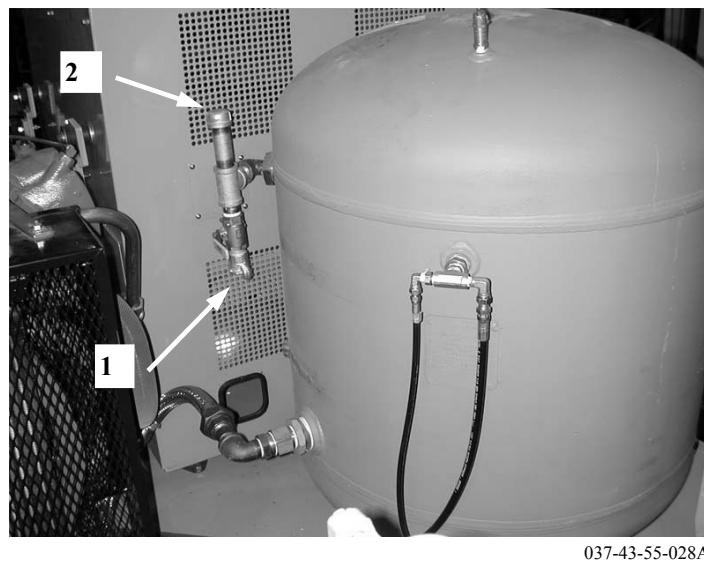


Figure 39: Compressed Air Supply Line Tee

Compressed Air Supply Line Tee — Two 1-inch NPT pipe connections are provided for air supply to outboard auxiliary equipment. (1) A 1-inch NPT ball valve. (2) a 1-inch straight connection (capped).

Note: Use appropriate lines and fittings that have adequate pressure ratings to carry the 1.724 MPa (250 psi) working pressure of the compressed air supply.

Air Receiver Relief Valve



037-43-55-026A

Figure 40: Air Receiver Relief Valve

Air Receiver Relief Valve — To guard against over pressure, the air receiver is fitted with a relief valve. The air receiver relief valve is located on top of the air receiver. The air receiver relief valve is set to vent the air receiver if the compressed air pressure reaches 1.9 MPa (275 psi); no operator intervention is required. **Note:** If the air receiver relief valve does vent, it will be necessary to drain all of the air out of the air receiver—using the compressed air receiver drain valve—in order to fully reset the air receiver relief valve.

Welder Doghouse Enclosure



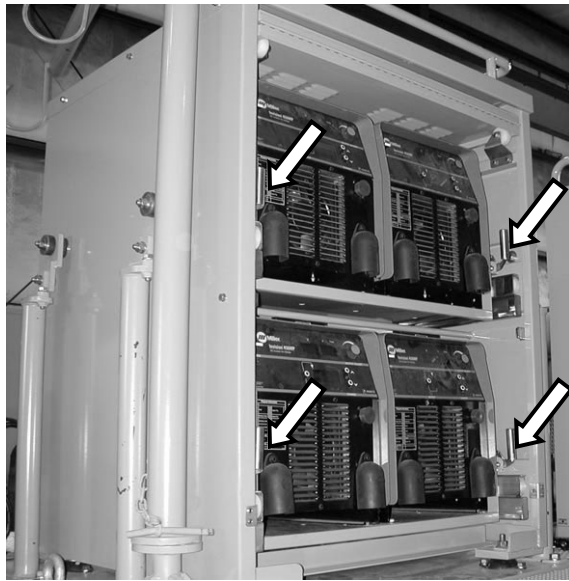
037-11-35-025A



037-11-35-015A

Figure 41: Welder Doghouse Enclosure, door latched open, door latched closed

The Welder Doghouse Enclosure houses up to four welding power units. The welder doghouse enclosure's door folds up and slides back into the top of the doghouse enclosure. The doghouse enclosure's door latches in place in either the open or the closed position. The welding power units can be operated with the door of the welder doghouse enclosure in either the open or closed position; ensure the door is secured in either the open or closed position when working.



037-11-35-025A



037-05-05-006A

Figure 42: Welder Power Units on extendable trays with latches

The welding power units are secured to extendable trays in the welder doghouse enclosure. The trays latch in place in the retracted position. Unlatch the trays and slide the trays completely out to service the welder power units. Ensure the trays are fully retracted and securely latched whenever the equipment is in use.

NOTE: Do not move or operate the weld-deck with the welder doghouse enclosure's trays in the extended position.

Before Starting Genset-Engine

Make a thorough walk-around inspection and specific module checks:

Welding deck

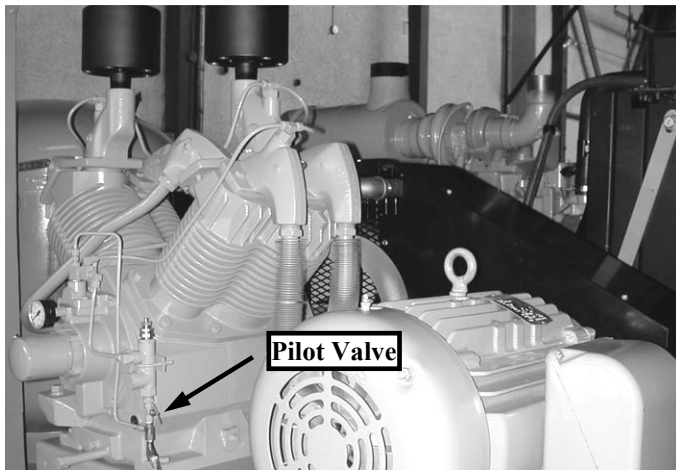
1. Fully extend the catwalks all around the deck.
2. Check for obvious signs of damage, loose bolts, loose equipment, and foreign objects or debris on and under the deck.

Welder Doghouse

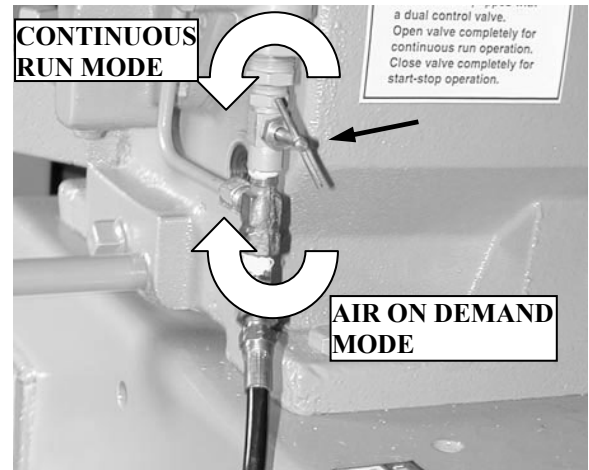
1. Open up the folding door on the Doghouse and slide it all the way back, pushing it firmly into its spring latch; ensure that it latches securely.
2. Ensure that the two slide-out trays holding the welding machines are securely latched in the retracted position.
3. Check that the rubber isolators on the Doghouse are undamaged and that all the bolts are tight.

Air Compressor and tank

1. Check the compressor's oil level through the sight gauge; add oil if required. Note: The compressor automatically shuts down in the event of low oil pressure.
2. Ensure the pilot valve T-handle control—OPTIONAL, if fitted—is adjusted for the correct operating mode: continuous, or air-on-demand. **Note:** Continuous mode is recommended for most job sites.



037-05-55-010B



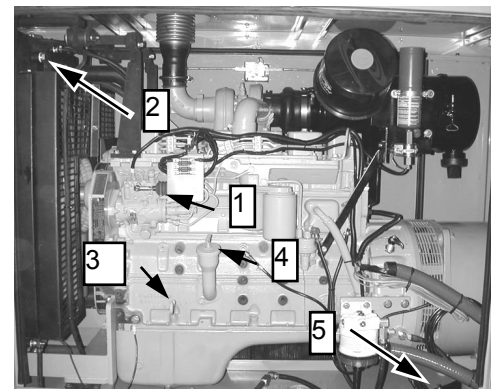
037-43-55-018A

Figure 43: Air Compressor Run Mode Valve - OPTIONAL

3. Check that the air-vent valve on the air tank is closed.
4. The air tank is fitted with drain valve on the underside of the deck, check that it closed.

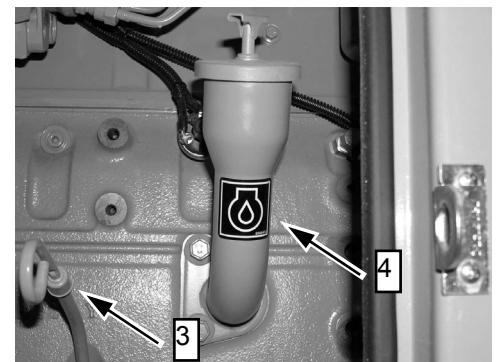
Genset

1. The Genset is fuelled by the carrier's fuel tank, and in some instances from an auxiliary fuel tank; check that there is adequate fuel to run the Genset and carrier for the intended operation (a full tank per day).
2. Check all of the louvers on the Genset compartment to ensure that they are free of obstructions and debris.
3. Open the main service doors on the right hand side (genset side) and check the general appearance of the Genset. Perform a visual inspection, checking for obvious signs of damaged or loose components and wires, loose or worn radiator hoses, worn or damaged isolators, etc. Check that there are no foreign objects such as rags, tools, etc., present in the compartment. Check the rubber isolators on the feet of the engine and alternator, and at the base of the radiator are undamaged and that all the bolts are tight. Check that the radiator cooling fins are free from dirt and debris, blow out with compressed air if necessary. **Note:** The access panel on the left or turbo side of the engine should be removed to perform a complete visual inspection.
4. Check that the throttle run/idle solenoid (1) is fully retracted (rated position), move the solenoid by hand to ensure that it smoothly retracts and extends. **Note:** Service attention is required if either of these two conditions is not met.
5. Using the sight-gauge (2) on the radiator, check that the coolant level fully covers the sight gauge; top up the radiator via its fill cap through the small access door. **Note:** Low coolant level or high coolant temperature will result in an engine fault condition, automatically shutting down the engine.



037-05-50-119A

Figure 44: Genset prestart checks



037-05-09-021A

Figure 45: Genset oil level and fill

Caution: Only remove the radiator cap when the engine is cool, then loosen cap slowly to relieve the pressure; do not remove the cap on a hot

engine to prevent the possibility of personal injury.

6. Check the engine oil level using the dipstick (3), top up as required via the oil fill (4). **Note:** Low engine oil pressure will result in an engine alarm condition, automatically shutting down the engine.
7. Turn the battery switch (5) to the ON (I) position; in the ON position, the switch key will not be able to be removed.

Control/Distribution Center

1. Ensure that the Emergency stop button (1) is fully pulled out.
2. Open the full main door and ensure that all of the circuit breakers (CB3 to CB17) are set. Close the main door.
3. Open the window-door on the control/distribution center to access the operator controls. Push the WHITE LAMP button (2). The two LED lamps (3), the AC power meters (4) and the DC voltmeter (5) should light-up. The DC voltmeter (5) should indicate approximately 24VDC. If the lights do not work, and no voltage is shown on the DC voltmeter, then recheck that the RED emergency stop button (1) is pulled out fully and that the battery switch in the engine compartment is in the ON (I) position. If DC voltage is still not present, check the DC fuses as described in the *Troubleshooting* section in this manual.

4. Check that the Rated/Idle switch (6)—Hare/Turtle—is in the Idle position (🐢). Move the genset Stop/Run/Start switch (7) to the run position (I) DO NOT CRANK the engine at this time. Return to the engine compartment and turn the battery switch to off (O). Verify that the solenoid retracts fully (Run). Return the battery switch to the on (I) position ensure that the throttle solenoid is fully extended (Idle); if it does not extend, turn the battery switch to off (O) and check the solenoid fuses as described below in the *Troubleshooting* section. **Note:** Do not operate the battery switch repeatedly in short succession, as this action WILL blow the solenoid fuse.

Note: 24VDC battery power will be shut off after 15 seconds due to low oil pressure reading, and the throttle solenoid will de-energize and retract to the run position. This is normal.

Note: Do not operate the Rated/Idle switch repeatedly in short succession, as this action WILL blow the solenoid fuse.

5. Close the genset's main service doors.
6. Return to the control/distribution center and move the genset Stop/Run/Start switch (7) to the stop position (⏏).

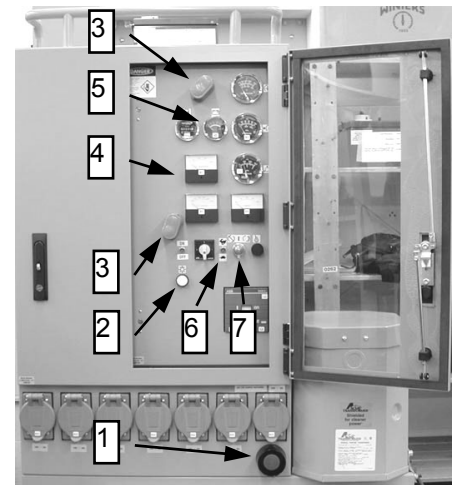
Genset Cold Weather Operation

It is possible to operate the genset-engine in extremely cold environments, if properly prepared and maintained. Satisfactory performance of the genset-engine in low ambient temperature conditions requires modification of the engine, the surrounding equipment, operating practices, and maintenance procedures.

The correct engine coolant lubricating oil and fuels **must** be used for the cold weather range in which the engine is being operated. Refer to *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01)*, *Cold Weather* section for recommendations for critical engine fluids; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

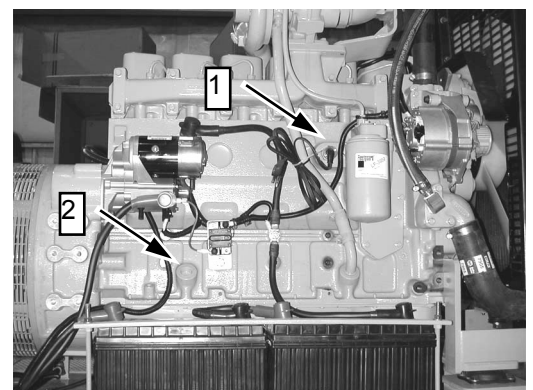
A coolant heater (1) is standard, and there is provision for an oil heater (2). Both plug into an external 120VAC power source.

Other provisions for operating cold weather must also be taken into account, such as but not limited to: battery heaters, fuel heater, etc. Refer to *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01) Cold Weather* section for complete details.



037-40-63-115A

Figure 46: Control/Distribution Center prestart checks



037-40-50-113A

Figure 47: Genset Fluid Heaters

Winterfronts

The genset enclosure can be fitted with Winter-fronts, contact Vanguard Equipment, Inc.

Winterfronts can be used on the genset enclosure to reduce air flow through the radiator core. This can reduce the time required to warm the engine and help maintain the engine coolant temperature. The engine coolant temperature specifications are in the Maintenance Specification section of the *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01)*; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

Adjust the Winterfronts to maintain the engine coolant temperature above the CUMMINS Minimum Recommended Operating Temperature of 71°C (160°F); do not exceed the maximum operating temperature. **Note:** The genset automatically shuts down if the engine coolant exceeds 99°C (210°F).

Genset-Engine Starting

Starting Above 0°C (32°F)

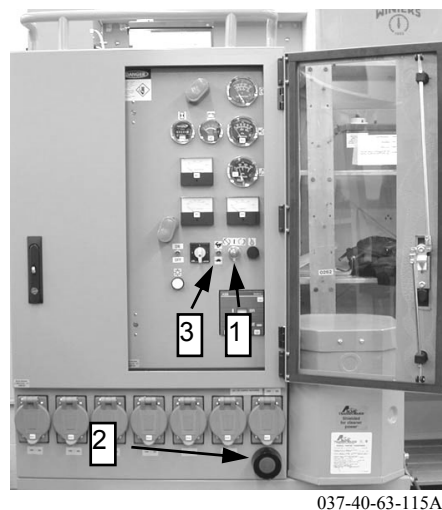


Figure 48: Genset-Engine Starting

1. To stop the Genset, once it has been started, turn the Stop/Run/Start switch **(1)** to the stop position (⏏); Use the RED emergency stop button **(2)** to IMMEDIATELY trip the main breaker to cut the genset electrical power and to stop the genset, if any type of emergency condition exists.
2. Ensure that all of the pre-startup checks in the *Before Starting Genset-Engine* section of this manual have been made.
3. Ensure that the main service doors on genset are closed.
4. With the Rated/Idle switch **(3)** is at idle (⏏) move the genset Stop/Run/Start switch **(1)** to start (⏏). Release the Stop/Run/Start switch after the engine starts. **Note:** Refer to the *Troubleshooting* section if the engine does not start within 15 seconds, and no oil pressure is indicated by the oil pressure gauge. **Note:** Return the Stop/Run/Start switch to stop (⏏) after cranking the engine for 15 seconds, and then retry starting. **Note:** After every 30 seconds of engine cranking, allow the starter-motor to cool for two minutes. **Note:** The genset engine will automatically shutdown if the oil pressure drops below 138 kPa (20 psi).
5. Idle the engine three to five minutes before switching the Rated/Idle switch **(3)** to rated (⏏). **Note:** Do not operate the engine at idle for long periods with the engine coolant temperature below CUMMINS Minimum Recommended Operating Temperature of 71°C (160°F), refer to *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01)*; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.
6. Observe the coolant temperature to ensure that it is not too high. **Note:** The Genset will automatically shutdown if the coolant temperature reaches 100 °C (210 °F).
7. Listen for any unusual noises and IMMEDIATELY stop the genset and investigate if any are present. Walk completely around the machine and check for unusual operation—unusual noises or vibration, coolant or oil leaks—including inside the Genset compartment. Stop the Genset and correct any deficiencies as required.

8. Close the Genset compartment doors and ensure the handle is securely latched. **Note:** Use caution when closing the main service doors while the Genset is running, as the cooling air flowing into the compartment will tend to suck the doors in when being closed.

Cold Weather Starting Below 0°C (32°F) with Ether Starting Aid

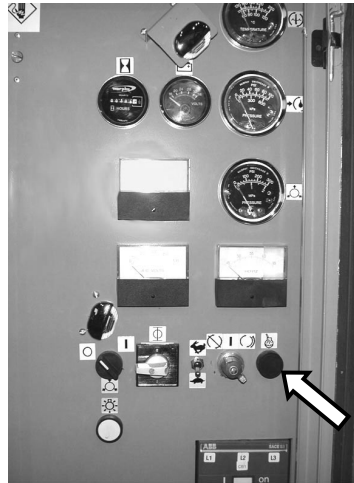



Figure 49: Ether Starting Aid

1. Follow the procedure outlined in the *Starting Above 0°C (32°F)* section of this manual.
2. While cranking the engine, push the Ether Starting Aid button () to inject metered amounts of starting fluid. **Note:** Do not use excessive amounts of starting fluid when starting the engine; too much fluid will cause damage to the engine. **Note:** Never hold the Ether Starting Aid button in for more than five seconds.
3. Release the Stop/Run/Start switch after the engine starts.

Starting with Jump Start Cables



Batteries give off flammable fumes that can explode resulting in personal injury.

Prevent sparks near the batteries; they could cause vapors to explode. Do not allow the jump start cable ends to contact each other or the machine.

Do not smoke when checking battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear eye protection when starting a machine with jump start cables.

Improper jump start procedures can cause an explosion resulting in personal injury.

Always connect the battery positive (+) to battery positive (+), and battery negative (—) to battery negative (—).

Jump start only with an energy source with the same voltage as the stalled machine.

Notice

When starting from another machine, make sure that the machines do not touch. This could prevent damage to the engine bearings and electrical circuits.

Severely discharged maintenance free batteries do not fully recharge from the alternator after jump starting. The batteries must be charged to proper voltage with a battery charger. Many batteries though to be unusable are still rechargeable.

This machine has a 24 volt starting system. Use only the same voltage for jump starting. Use of a welder or higher voltage damages the electrical system.

Use of Jump Start Cables


1. Determine the failure of the engine to start.
2. On a stalled machine, turn the Stop/Run/Start switch to the stop position. Turn off any accessories.
3. Move the machines together in order for the cables to reach. **DO NOT ALLOW THE MACHINES TO CONTACT.**
4. Stop the engine on the machine that is the electrical source. When you use an auxiliary power source, turn off the charging system.
5. The batteries on this machine are located inside the genset enclosure, on the turbo-side (starter-side) of the engine, and are accessible via the genset service-panel on the inner deck-side of the enclosure.
6. Check the battery caps for correct placement and for correct tightness. Make these checks on both machines. Make sure the batteries in the stalled machine are not frozen. Check the batteries for low electrolyte.
7. Connect the positive jump start cable to the positive cable terminal of the discharged battery.
8. Connect the positive jump start cable to the positive cable terminal of the discharge battery. Do not allow positive cable clamps to contact any metal except for battery terminals.
9. Batteries in series may be in separate compartments. Use the terminal that is connected to the starter solenoid. This battery is normally on the same side of the machine as the starter.
10. Connect the positive jump start cable to the positive terminal of the electrical source. Use the procedure from step 8 in order to determine the correct terminal.
11. Connect one end of the negative jump start cable to the negative terminal of the electrical source.
12. Make the final connection. Connect the negative cable to the frame of the stalled machine. Make this connection away from the battery, the fuel, the hydraulic lines, and moving parts.
13. Start the engine on the machine that is the electrical source. Also you can energize the charging system on the auxiliary power source.
14. Allow the electrical source to charge the batteries for two minutes.

15. Attempt to start the stalled engine. Refer to the *Operation and Maintenance Manual, Engine Starting* section.
16. Immediately after the stalled engine starts, disconnect the jump start cables in reverse order.
17. Conclude with a failure analysis on the starting charging system. Check the stalled machine, as required. Check the machine when the engine is running and the charging system is in operation.




Starting Procedure After Extended Shutdown or Oil Change

Refer to the procedure outlined in *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01)*; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

Complete the following steps after each oil change, or after the engine has been shut down for more than 30 days to make sure the engine receives the correct oil flow through the lubricating oil system.

1. Disconnect the electrical wire from the fuel pump solenoid.
2. Rotate the crankshaft using the starting motor—turn the genset Stop/Run/Start switch to start ()—until oil pressure appears on the gage. **Note:** Return the Stop/Run/Start switch to Stop after cranking the engine for 15 seconds, and then retry starting. **Note:** After every 30 seconds of engine cranking, allow the starter-motor to cool for two minutes.
3. Connect the electrical wire to the fuel pump solenoid valve.
4. Start the engine in the normal manner as the *Genset-Engine Starting* section of this manual.

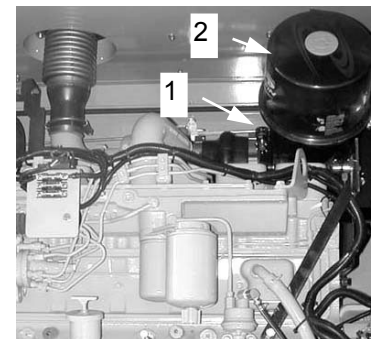
After Starting the Engine

1. Observe the oil pressure gauge to ensure that adequate oil pressure is achieved; greater than 138 kPa (20 psi).
2. Allow the oil pressure to stabilize before switching the Stop/Run/Start switch to run (). The Genset can be left in the idle () mode to conserve fuel; in extremely cold temperatures, it may be desirable to allow the Genset to warm up at idle. **Note:** Do not operate the engine at idle for long periods with the engine coolant temperature below CUMMINS Minimum Recommended Operating Temperature of 71°C (160°F), refer to *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01)*; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.
3. Check the genset-engine's oil level after the engine has warmed up. Add or remove oil as required.
4. Check the air filter's service indicator (**1**), located just upstream of the turbo air inlet.
5. Check the operation of the Top Spin air pre-cleaner (**2**) when the genset-engine is running at rated speed (), the spinner-blades must turn freely while the housing-body remains stationary.



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Figure 50: Monitor genset oil pressure



037-05-50-135B

Figure 51: Monitor genset air filter

Notice

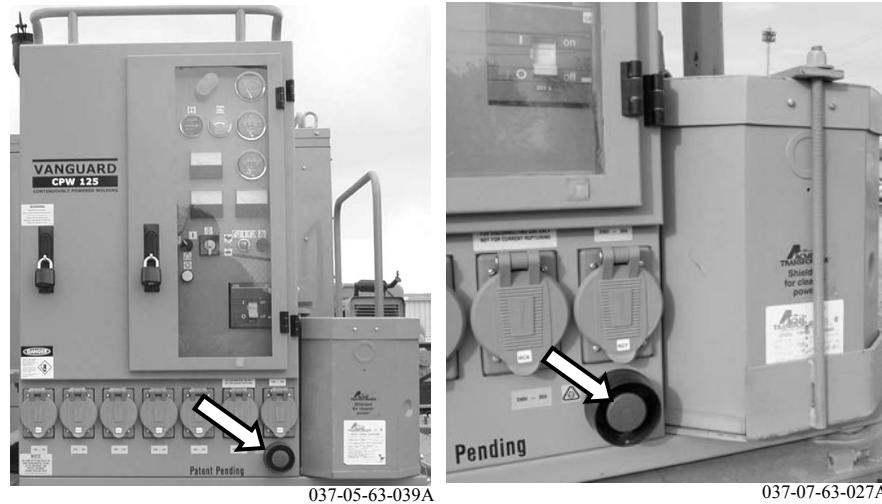


Figure 52: Emergency Stop

Push the RED emergency stop button to IMMEDIATELY trip the main breaker and stop the Genset if any type of emergency condition exists.

The emergency stop button can be used with the control door open or closed.

It must be manually pulled out to reset before the engine can be restarted.

Refer to the *Emergency Stop* section of this manual.

1. Once the Genset is warmed up and no deficiencies have been observed, the genset can be switched to rated speed. However, if the Welding Deck is not to be set to work immediately, the Genset can be left in the idle mode to conserve fuel; in extremely cold temperatures, it may be desirable to allow the Genset to warm up at idle. **Note:** Do not operate the engine at idle for long periods with the engine coolant temperature below CUMMINS Minimum Recommended Operating Temperature of 71°C (160°F), refer to *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01)*; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

2. Move the Rated/Idle switch (1) to the Rated (🐾) position. The speed at which the genset is turning will immediately increase; if it does not, check the operation of the run/idle solenoid as per the *Troubleshooting* section below.

3. Move the main AC breaker—CB 1—(2) to the set (I) position, and observe the white AC meters for correct voltage and frequency (480 VAC @ 60 Hz); there will be no AC current (AMPS) indicated unless the compressor or welding machines are running. If the main breaker does not set, refer to the *Troubleshooting* section below.

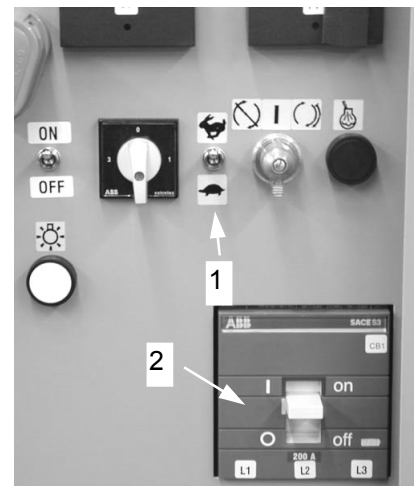


Figure 53: AC Power Up

4. Turn the black compressor run switch to run (I) to start the compressor (if installed) if required; turn it to off (O) to stop the compressor. Close and latch the window door.

5. Test the Ground Fault Circuit Interrupters (GFCI) as outlined in the *Ground Fault Circuit Interrupters (GFCI)—Test Daily* section below.

6. The CPW is now ready for work, and requires no further operator involvement under normal circumstances. However, it is recommended to routinely check the system gauges—every hour or so—to ensure normal functionality.

Ground Fault Circuit Interrupters (GFCI)—Test Daily

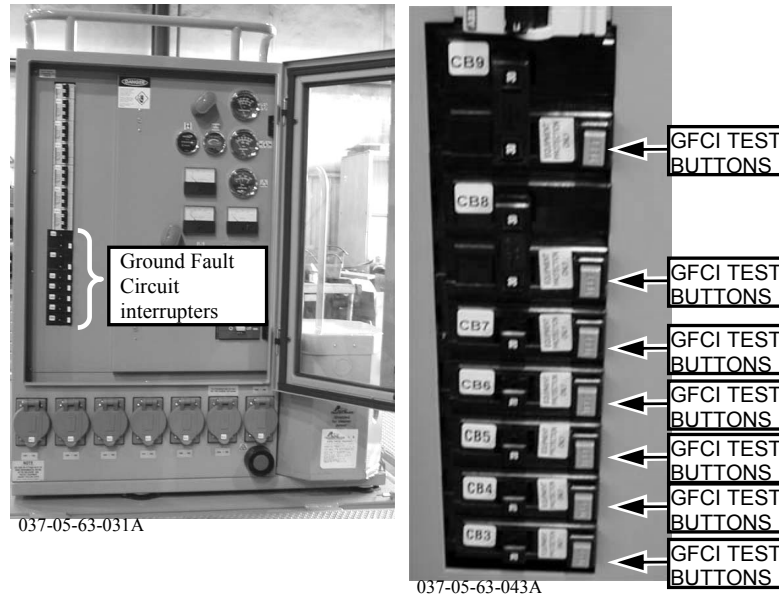


Figure 54: GFCI test buttons

To ensure that they are functioning properly, the ground fault circuit interrupters (GFCI) must be tested at the start of each working day, or whenever there is an unusual occurrence such as a severe electrical storm.

1. With the genset running and the main breaker (CB1) set, ensure that all of the auxiliary-supply circuit breakers (CB3 through CB9, and CB16) are set.
2. With a load—such as a light—connected to the circuit and turned on, press the GFCI test button. The GFCI circuit breaker should trip and the light must go out. If the light does not go out, then there is a problem with the GFCI and it must be replaced by a qualified electrician. **Note:** Replace GFCIs using only the same style and current rating; contact VEI or refer to the *Parts Manual, Weld-Deck Welding Package CPW 125-4* for suitable replacement parts information.
3. Reset the GFCI by turning the circuit breaker's switch to ON.
4. Repeat the test for each front-mounted receptacle.

Note: If a GFCI trips without pressing its test button with any type of load—test-load or normal operating load—plugged into its corresponding receptacle, then there is a problem with the load or the connected circuit which must be checked and corrected by a qualified electrician.

Genset shutdown

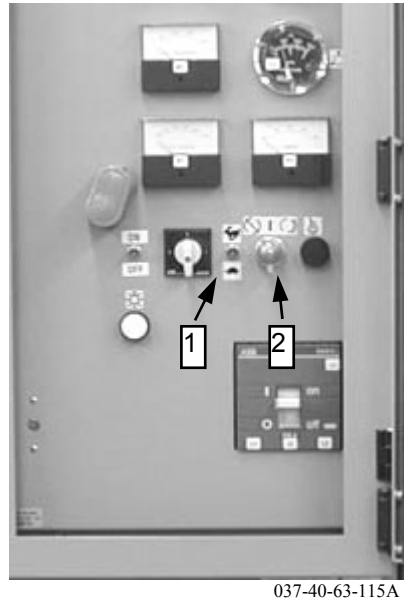




Figure 55: Genset-Engine Shutdown

1. Switch the Rated/Idle switch (1) to idle (). Allow the engine to idle 3 to 5 minutes to cool down before shutting it off after a full-load operation. This allows adequate cool down of engine pistons, cylinders, bearings, and turbocharger components.
2. After the cool down period, move the genset Stop/Run/Start switch (2) to stop ()

Machine Parking

Refer to the carrier's Operation and Maintenance Manual for specific machine parking instructions.

! WARNING

Do not transport the machine with the walkways extended.

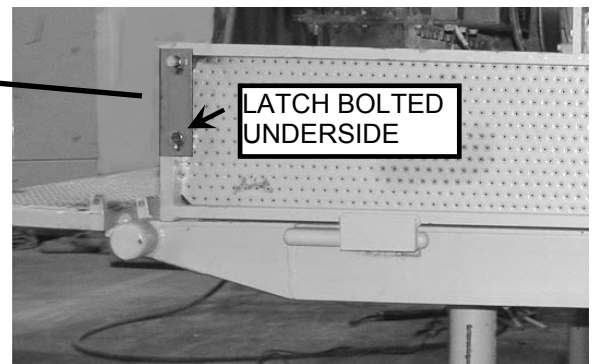
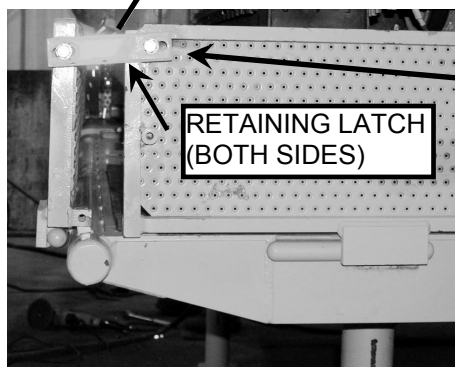
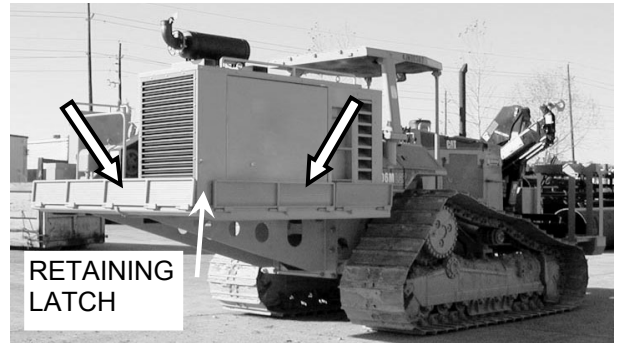
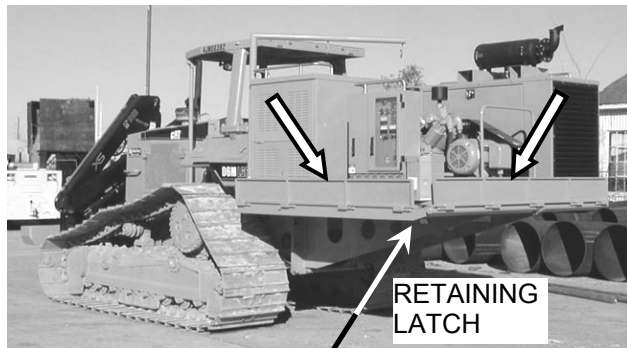


Figure 56: Secure walkway using retaining latches.

1. Fold the walkways up, and secure using the retaining latches that are bolted to the underside of the left- and right-hand side walkways. The rear walkway is latched to the two side walkways.
2. Obey all jurisdictional transportation laws that apply. Refer to the *Equipment Information Section* of the Weld-Deck's *Operation and Maintenance Manual* for Weld-deck weights and dimensions.

Shipping the Carrier-Mounted Weld-Deck

Ship the carrier-mounted machine as per the instructions in the carrier's *Operation and Maintenance Manual*, keeping in mind the additional weight of the weld-deck. **Note:** Refer to the *Equipment Information Section* of the Weld-Deck's *Operation and Maintenance Manual* for Weld-deck weights and dimensions.

Towing the Carrier

Note: DO NOT connect to any part of the weld-deck for towing purposes of any kind. DO NOT connect trailing equipment to the weld-deck structure.

Refer to the carrier's *Operation and Maintenance Manual* for correct towing procedures. Connect any trailing equipment to a drawbar or to a hitch on the carrier only.

Shipping the Weld-Deck Uninstalled

Note: Refer to the *Equipment Information Section* of the Weld-Deck's *Operation and Maintenance Manual* for Weld-deck weights and dimensions.

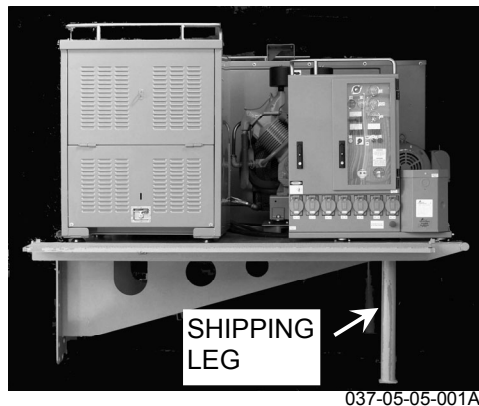


Figure 57: Shipping leg

1. If transporting the weld-deck separate from the carrier (uninstalled), install the weld-deck's two shipping legs.

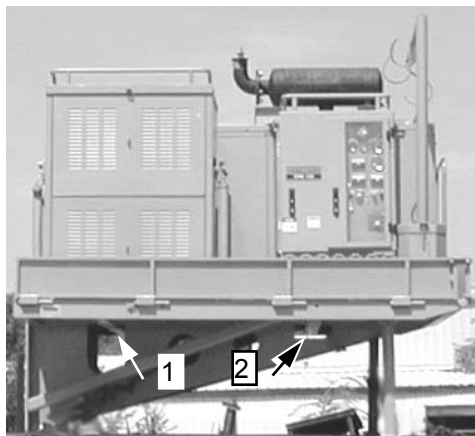


Figure 58: Forklift access

2. A forklift can be used to load the weld-deck. Forklift access is provided at the transport beams (1, 2).

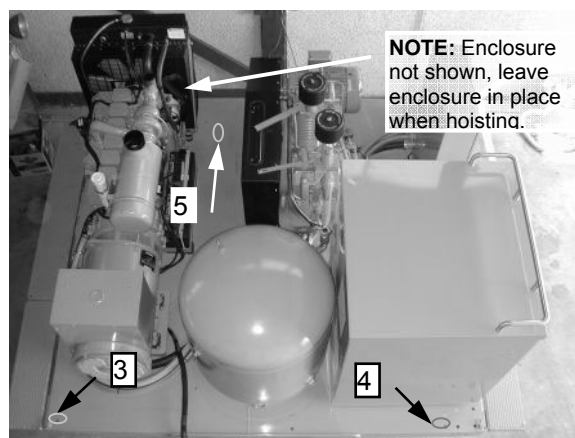


Figure 59: Hoisting strong points

3. Alternatively, the weld-deck can be hoisted using the deck strong points (3, 4, 5) and a spreader bar to evenly distribute the weight. **Note:** A spreader bar **MUST** be used to hoist the weld-deck to prevent serious damage to the genset and welder-doghouse modules. Contact Vanguard Equipment, Inc. to order an appropriate spreader bar.

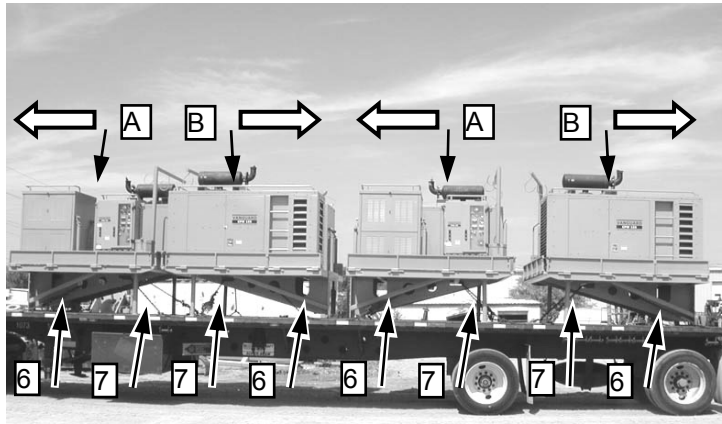


Figure 60: Weld-deck shipping—distribute and secure the load 037-05-05-113A

4. Evenly distribute the load by alternating the direction of consecutive weld-decks. One faces forward, the next faces rearward (**A, B**) and repeat.
5. Secure the weld-deck(s) to the transport deck with appropriately sized chains (**6, 7**), etc. **Note:** Refer to the *Equipment Information Section* of the Weld-Deck's *Operation and Maintenance Manual* for Weld-deck weights and dimensions.

Maintenance Section

Torque Specifications

Notice

Be very careful never to mix metric with U.S. customary (standard) fasteners.

Mismatched or incorrect fasteners causes machine damage or malfunction and can result in personal injury.

When replacing nuts, bolts, or hardware in general, always use the same measurement and strength type as the original.

Note: The information listed below is for general layout fasteners only. Consult the specific modules'—Compressor, Engine, Generator, Welding Power-unit—operation and maintenance manuals for detailed information on the fasteners used in the respective module.

Note: The center mounting bolt and nut on the vibration isolators have specific torque values which are different than the torques for standard fastener. Refer to the *Torques for Vibration Isolator Mounts* table in this section of this manual.

Torques for Standard Fasteners

The following tables show general torques for bolts, and for nuts. The components have a rating of at least SAE Grade 5.

Torques for Bolts and for Nuts.		
Tread Size	Standard Torques	
	N·m	lb-ft
1/4 inch	12 ± 3	9 ± 2
5/16 inch	25 ± 6	18 ± 4.5
3/8 inch	47 ± 9	35 ± 7
7/16 inch	70 ± 15	50 ± 11
1/2 inch	105 ± 20	75 ± 15
9/16 inch	160 ± 30	120 ± 20
5/8 inch	215 ± 40	160 ± 30
3/4 inch	370 ± 50	275 ± 37
7/8 inch	620 ± 80	460 ± 60
1 inch	900 ± 100	660 ± 75
1-1/8 inch	1300 ± 150	950 ± 100
1-3/8 inch	2400 ± 300	1800 ± 225
1-1/2 inch	3100 ± 350	2300 ± 250

Torques for Metric Fasteners

The following tables show general torques for bolts, and for nuts. The components have a rating of at least SAE Grade 8.8.

Torques for Metric Thread Bolts and Nuts.		
Metric Tread Size	Standard Torques	
	N·m	lb-ft
M6	12 ± 3	9 ± 2
M8	28 ± 7	20 ± 5
M10	55 ± 10	40 ± 7
M12	100 ± 20	75 ± 15
M14	160 ± 30	120 ± 22
M16	240 ± 40	120 ± 22
M20	460 ± 60	340 ± 44
M24	800 ± 100	600 ± 75
M30	1600 ± 200	1200 ± 150
M36	2700 ± 300	2000 ± 225

Torques for Vibration Isolator Mounts

Note: The following tables show the required torque values for the nuts and for the bolts that mount the equipment modules to the vibration isolator (the center mounting bolt and nut). Refer to the *Torques for Standard Fasteners* tables for the values required to secure the vibration isolators to the weld-deck.

Torques for Vibration Isolator Mounts.		
Equipment Module Isolator Location (Center Bolt and Nut Tread Size)	Isolator Mounts' Torques	
	N·m	lb-ft
Genset-Engine (5/8 inch)	135	99.6
Radiator Mount, Control/Distribution Center (5/8 inch). ¹	50	36.9
Stabilizer Mount: Radiator, Control/Distribution Center, Welder Doghouse (1/2 inch). ¹	40	29.5
Air Compressor, Welder Doghouse (5/8 inch). ¹	135	99.6
Genset Roll Link Bushing (5/8 inch). ¹	129-136	95-100

¹**Note:** Special installation procedure required; refer to the *Parts Manual* for correct replacement instructions.

Maintenance Welding to the Weld-deck

Notice

Do not use the welding power units on a weld-deck to perform any welding on the same weld-deck. The use of welding power units on one weld-deck to perform welding on a different weld-deck is permissible.

Always completely disconnect and isolate the main ground at the rear of the control/distribution center—at point “A” or at point “B”—prior to welding on the equipment. Ensure that all of the precautions covered in the *Fire Prevention and Explosion Prevention* section of this manual have been followed. Take adequate precautions to ensure that a fire will not occur as a result of welding. Always have an appropriate, fully charged fire extinguisher at hand when performing any welding.

Ensure that the main ground at the rear of the control/distribution center has been reconnected after completion of welding on the machine.

Note: Do not attempt to start or run the weld-deck genset with the main ground at the rear of the control/distribution center disconnected

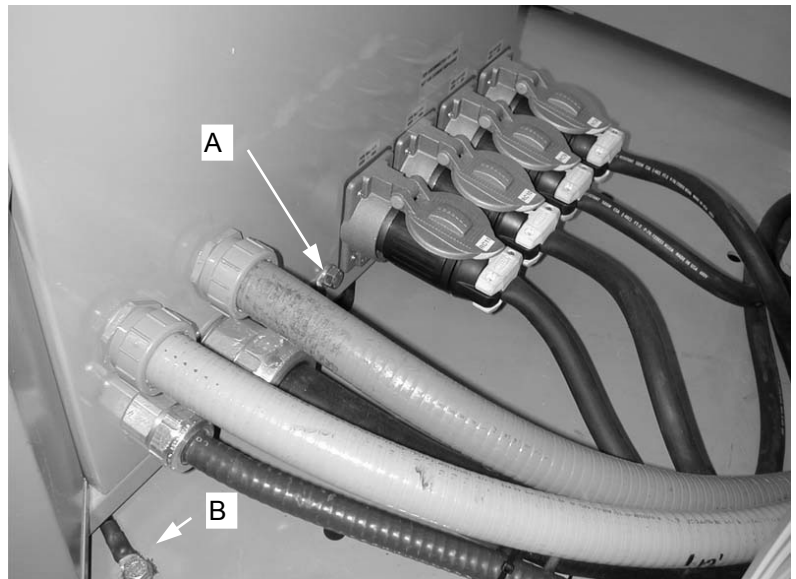


Figure 61: main ground at the rear of the control/distribution center

037-40-63-093A

Recommended Service Intervals—Minimum Service

Notice

The procedures listed below are provided for quick, general reference only. They do not outline all of the inspection and service procedures that **MUST** be performed to the various modules. Refer to the specific module's—Compressor, Engine, Generator, Welding Power-unit—operation and maintenance manuals for complete and detailed information on the care of the respective module.

Daily

Note: Refer also to the *Before Starting Genset-Engine* section of this manual.

Note: Refer also to the *Ground Fault Circuit Interrupters (GFCI)—Test Daily* section of this manual.

DONALDSON AIR FILTER Check condition (service indicator on filter), and replace as required.		
PRIMARY AIR ELEMENT	P601790	1
SAFETY AIR ELEMENT	P777639	1
AIR SPINNER (Check with engine running at Run speed. Spinner must be turning freely; body stationary)	HOO2427	1
Fluid levels: Check fluid levels for each piece of installed equipment. Refer to the Operation section for each component for instructions on checking fluid levels (Genset, Air Compressor).		

250 HOURS

CUMMINS DIESEL ENGINE 6BT5.9-G6		
Description	OEM Part Number	Quantity
ENGINE OIL	Refer to the Engine OEM's operation and maintenance manual in the appendices of Weld-Deck's Operation and Maintenance Manual for oil specification.	4.0 US GALLONS
ENGINE OIL FILTER	LF3894	1
ENGINE COOLANT	Refer to the Engine OEM's operation and maintenance manual in the appendices of Weld-Deck's Operation and Maintenance Manual for coolant specification.	7.5 US GALLONS
FUEL FILTER	FF5052	1
WATER SEPERATOR	FS1280	1
FAN BELT	3288768	1
RACOR FILTER		
RACOR FUEL FILTER	RACOR #R45P FILTER – 30 MICRON	1

500 HOURS

GARDNER-DENVER/CHAMPION AIR COMPRESSOR		
Description	OEM Part Number	Quantity
OIL	P09479A	6-1/3 QUARTS
COMPRESSOR BELTS	B100	3

Troubleshooting

Notice

This equipment is to be operated and serviced by qualified personnel only. Refer to the *Safety* section of this manual.

Do not attempt to bypass any of the safety equipment or instrumentation on this equipment.

Do not attempt to operate this equipment with any of the safety equipment or instrumentation bypassed.

General Information

The following faults are some of the typical problems that can be anticipated during normal operation of the Weld-Deck. The solutions listed are some of the acceptable corrections to those problems

Engine Faults

Note: See also the *CUMMINS Operation and Maintenance Manual Industrial B3.9, B4.5, and B5.9 Series Engines (Bulletin 4021389-01)*; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

Engine Won't Crank

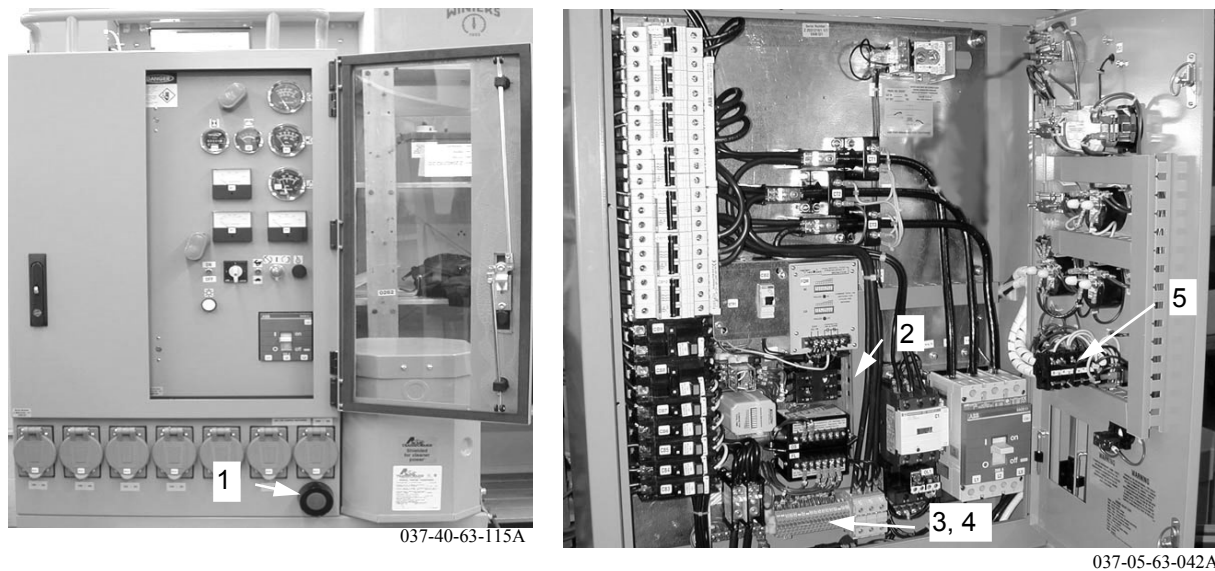
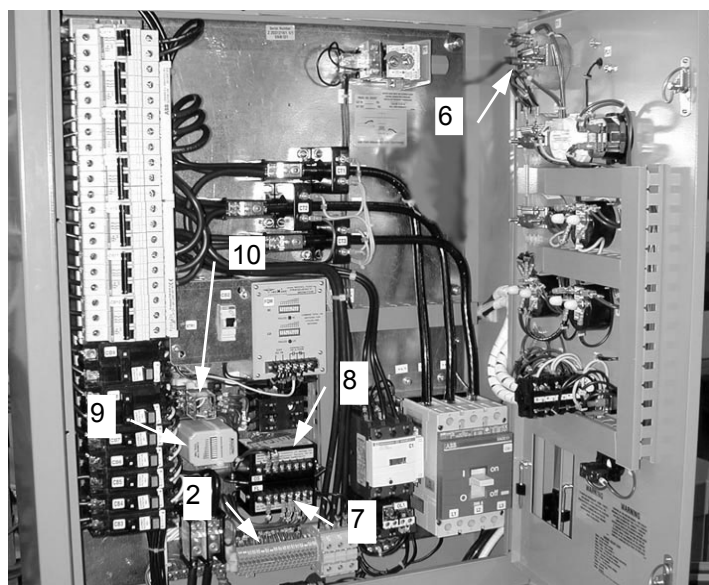


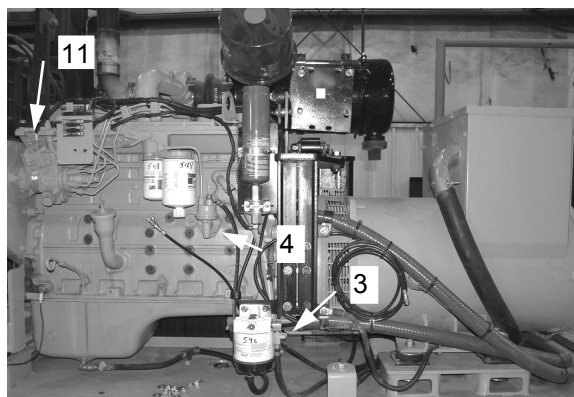
Figure 62: Engine Won't Crank Troubleshooting—numbered callouts reference numbered problem list below

	Possible cause	Solution
1	Red emergency stop button (PB1) NOT pulled all the way out.	Pull the red emergency stop button (PB1) all the way out
2	Automotive style fuse (FU3) blown.	Replace with spare fuse of same rating
3	Jumper (1J1) on blue terminal strip between terminals #49 and #50 loose or missing.	Replace missing jumper.
4	Loose wires.	Check wire numbers: #49, #50, #51, #52; the white (WHT) wire at the starter solenoid on the turbo-side of the genset engine and at terminal #54. Note: The same wire number can be used on more than one wire in the same circuit.
5	Faulty Stop/Run/Start switch (SS2).	Replace defective switch.
6	Bad starter motor or starter solenoid	Replace genset engine's starter motor.
7	Engine fault.	Refer to genset engine's <i>Operation and Maintenance Manual</i> .

Engine Won't Start



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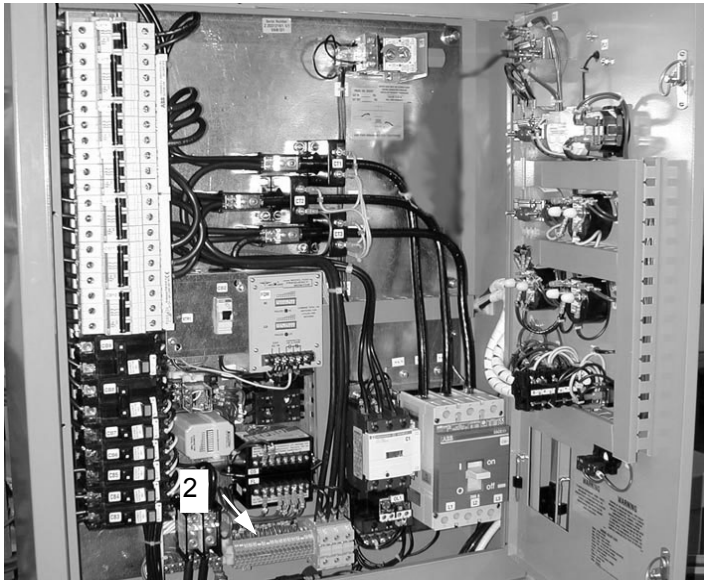


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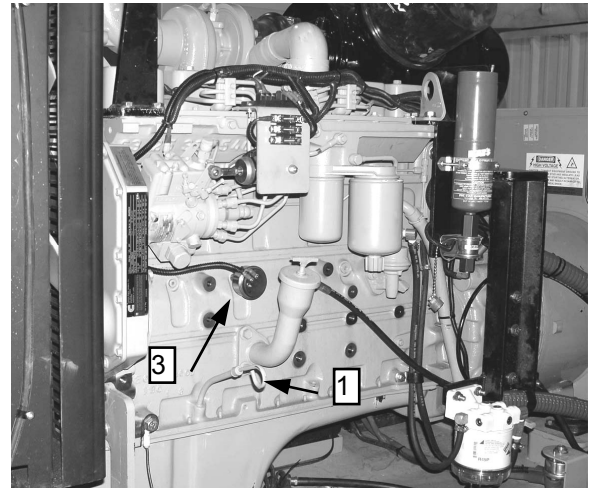
Figure 63: Engine Won't Start Troubleshooting—numbered callouts reference numbered problem list below

	Possible cause	Solution
1	No fuel	Fill fuel tank (carrier's or pony). Refer to genset engine's <i>Operation and Maintenance Manual</i> for instructions on priming (see fuel filter replacement section).
2	Loose wiring	Check wire #53, #54 in control box; green (GRN) wire on fuel-solenoid on genset engine. Note: The same wire number can be used on more than one wire in the same circuit.
3	Raccor fuel filter shut off closed.	Open orange valve on Raccor fuel filter on fuel pump side of genset engine.
4	Fuel line not primed.	Prime fuel with lift pump lever; refer to genset engine's <i>Operation and Maintenance Manual</i> for instructions on priming (see fuel filter replacement section).
5	High coolant temperature (T1).	Allow coolant temperature to cool below 99°C (210°F); investigate cause of overheating: blocked louvers, plugged radiator core, etc.
6	Faulty coolant switch-gauge (T1).	Check operation of coolant switch-gauge (T1)—normally closed logic—and replace if required.
7	Faulty coolant level detector (FL).	Check operation of coolant level detector (FL)—normally closed logic—and replace if required.
8	Faulty overspeed detector (OS).	Check operation of overspeed detector (OS)—normally closed logic—and replace if required.
9	Faulty oil pressure bypass timer (TR1).	Check operation of oil pressure bypass timer (TR1)—normally closed logic—and replace if required.
10	Faulty control relay (CR2).	Replace control relay (CR2) module.
11	Faulty fuel solenoid.	Replace fuel pump's fuel solenoid on genset engine.
12	Engine fault.	Refer to genset engine's <i>Operation and Maintenance Manual</i> .

Engine Shuts Down after 15 Seconds



037-05-63-042A



037-40-50-129A

Figure 64: Engine Shuts Down after 15 Seconds Troubleshooting—numbered callouts reference numbered problem list below

	Possible cause	Solution
1	Low oil level	Check genset engine oil level.
2	Loose wires.	Check wires #61 and #62—control/distribution center—for loose connections.
3	Faulty oil pressure switch (P1).	Check operation of pressure switch- (P1) on engine—normally opened logic—and replace if required.
4	Engine fault.	Refer to genset engine's <i>Operation and Maintenance Manual</i> .

Engine Shuts Down after 30 Seconds

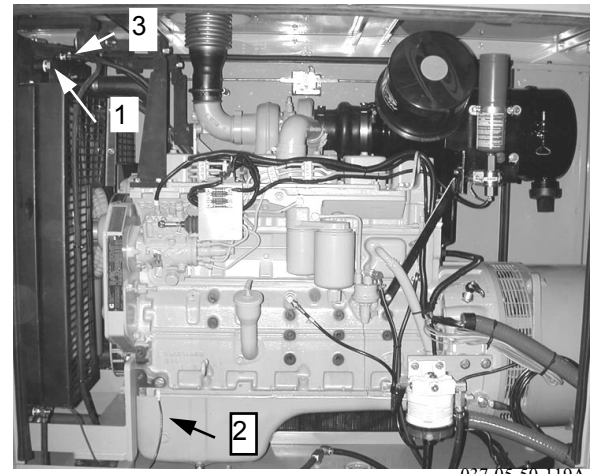
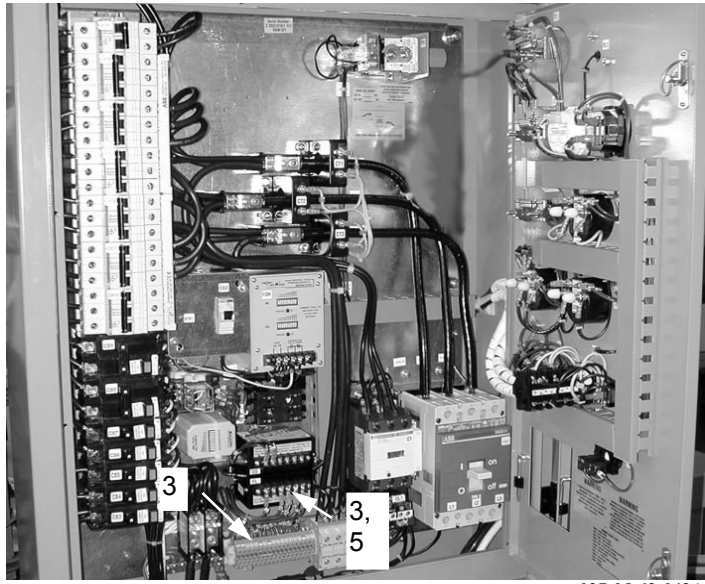
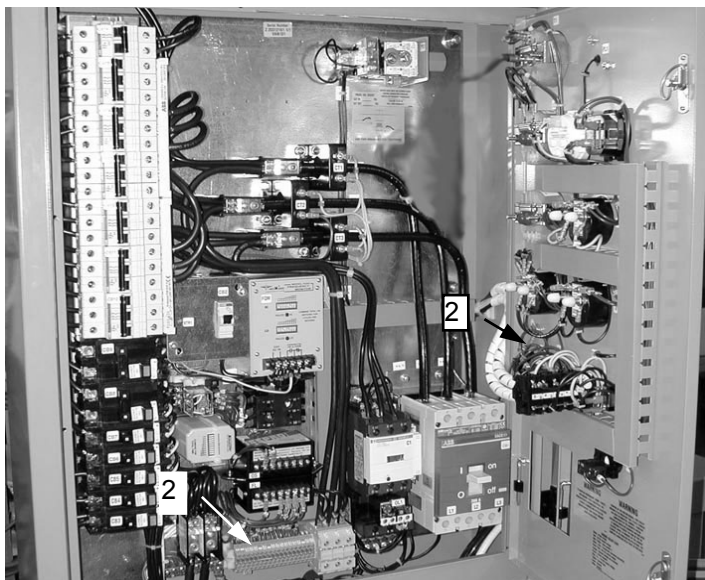


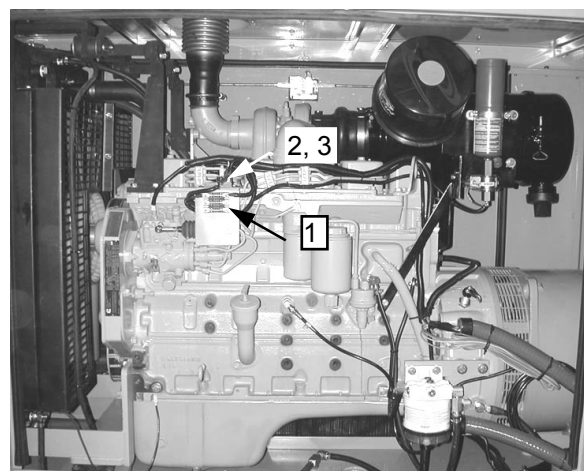
Figure 65: Engine Shuts Down after 30 Seconds Troubleshooting—numbered callouts reference numbered problem list below

	Possible cause	Solution
1	Low coolant level	Check genset engine coolant level. Note: See the <i>Safety</i> section of this manual.
2	Faulty radiator electrical ground.	Check grounding wire between radiator and engine at bottom of radiator on turbo-side of genset engine.
3	Loose wires.	Check the connection of blue (BLU) wire to the sensor probe located at top of radiator. Check the connection of the blue (BLU) wire at terminal 55 in the control/distribution center. Check the connection of wire #55 at terminal 55 and at terminal “P” on the coolant level detector (FL).
4	Faulty coolant level sensor probe.	Replace coolant level sensor probe at top of radiator. Note: Drain enough coolant from radiator to prevent spilling any coolant. Inspect port on radiator and clean the threads to ensure good electrical contact. Inspect coolant level sensor probe and clean or replace as required; correctly fill radiator once coolant level sensor probe has been installed.
5	Faulty coolant level detector (FL).	Replace coolant level detector (FL) in control/distribution center. Note the connections prior to removing defective unit (normally closed logic).

Engine Will Not Idle



037-05-63-042A



037-05-50-119A

Figure 66: Engine Will Not Idle Troubleshooting—numbered callouts reference numbered problem list below

	Possible cause	Solution
1	Blown run/idle solenoid fuse.	Note: Disconnect 24VDC first. Check fuse on run/idle solenoid bracket on fuel pump side of genset engine (FU9). Replace with spare MDL5 (5A @ 24VDC SLOW-BLOW) or equivalent. See the pre-start checks in the <i>Operation Section, Before Starting Genset-Engine - Genset</i> section of this manual to verify operation.
2	Loose wires.	Note: Disconnect 24VDC first. In the control/distribution center: check the connection of: wire #54 and wire #64 on the run/idle switch (SS3), wire #64 and the red/white (RED/WHT) wire on terminal 64. On the run/idle solenoid control unit on fuel pump side of genset engine, check the connections of the red/white (RED/WHT) wire on the “+ AUX” terminal, check all wires on the solenoid control unit.
3	Faulty solenoid control module.	Note: Disconnect 24VDC first. Replace solenoid control module located on top of solenoid bracket on fuel pump side of genset engine,

Engine Will Not Go to Full Speed (Run)

	Possible cause	Solution
1	Incorrect run/idle solenoid-linkage adjustment.	With run/idle switch set to run and genset running, adjust linkage length to obtain 63Hz on AC frequency meter (See Figure 66 above)
2	Engine fault.	Refer to genset engine’s <i>Operation and Maintenance Manual</i> .

24 VDC Electrical Faults

Batteries fail to charge (low DC voltage)

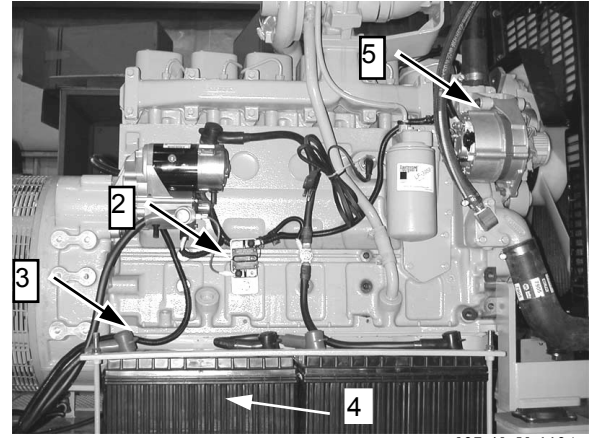
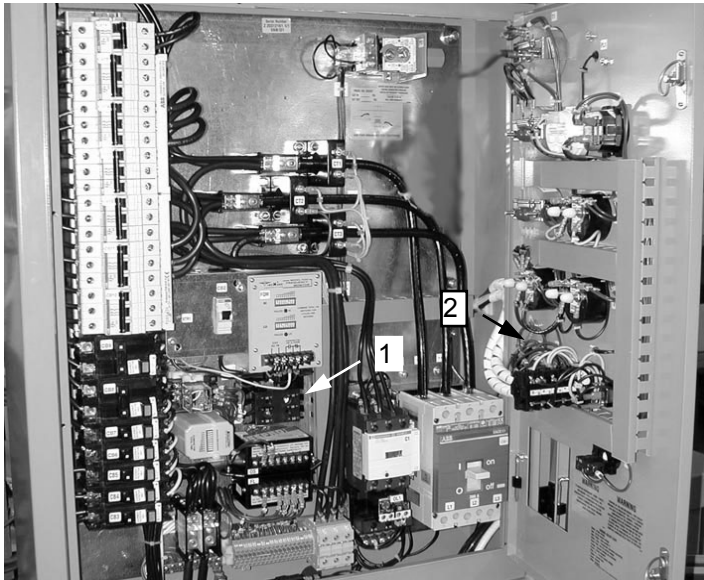
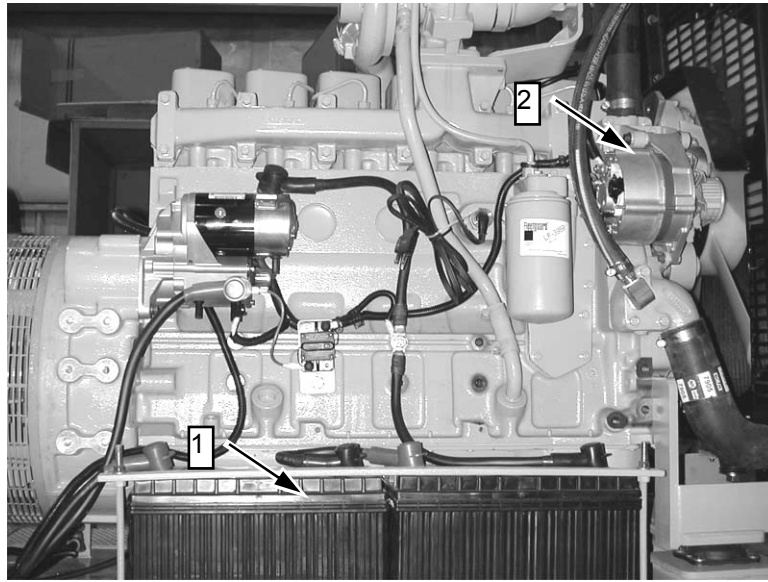


Figure 67: Batteries fail to charge (low DC voltage) Troubleshooting—numbered callouts reference numbered problem list below

	Possible cause	Solution
1	Automotive style fuse (FU4) blown.	In the control/distribution center, check fuse (FU4) and replace with spare fuse of same rating if necessary. On turbo side of genset engine: check 24VDC alternator circuit breaker (CB30) located besides 24VDC alternator and starter; reset lever must be in. Improper jump starting possible cause.
2	24VDC alternator not charging.	Check 24VDC alternator circuit breaker (CB30) located besides 24VDC alternator and starter on turbo side of genset engine; reset lever must be in. Improper jump starting possible cause.
3	Faulty or loose battery connections or cables.	Check all battery cables and connections.
4	Faulty batteries.	Replace batteries. Maintenance free batteries are originally supplied, and require no maintenance or inspection. Refer to documentation accompanying other battery types for maintenance instructions. Note: Always recycle a battery, never discard a battery.
5	Faulty 24VDC alternator.	If 24VDC alternator circuit breaker (CB30) not tripped, possible faulty alternator, refer to genset engine's <i>Operation and Maintenance Manual</i> .

24VDC Alternator Overcharging (High DC voltage)



037-40-50-113A

Figure 68: 24VDC Alternator Overcharging (High DC voltage) Troubleshooting—numbered callouts reference numbered problem list below

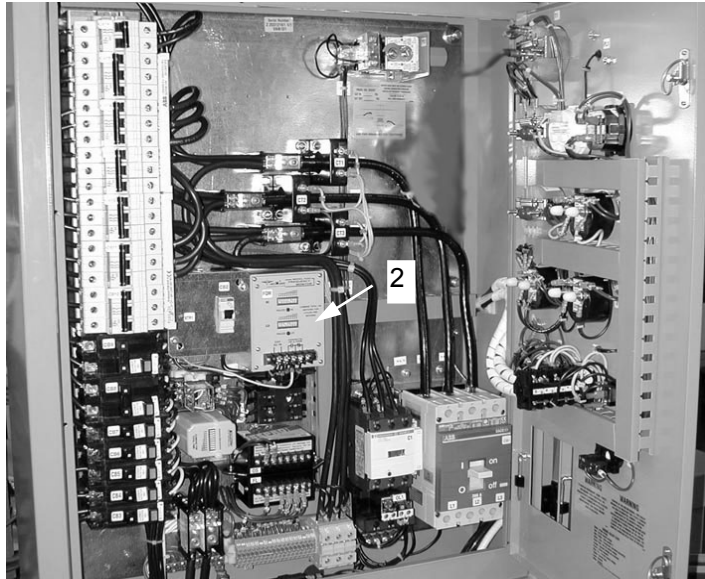
	Possible cause	Solution
1	Batteries have failed.	Check condition of batteries, replace batteries if required. Maintenance free batteries are originally supplied, and require no maintenance or inspection. Refer to documentation accompanying other battery types for maintenance instructions. Note: Always recycle a battery, never discard a battery.
2	Faulty 24VDC alternator.	Refer to genset engine's <i>Operation and Maintenance Manual</i> .

Main AC Power Electrical Faults

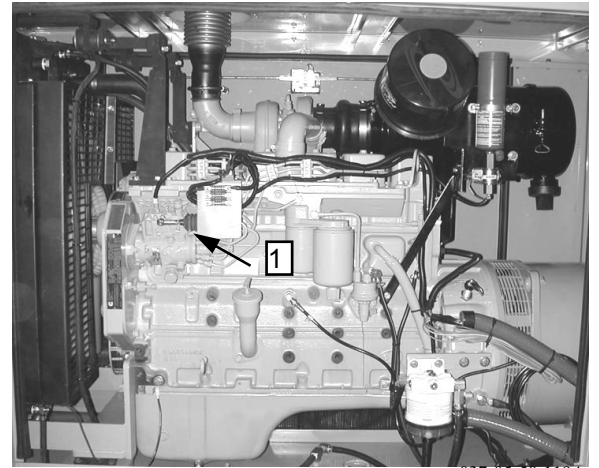
No or Low 480 VAC Three Phase Supply Voltage

Refer to the *Operation and Maintenance Manual — Generator* for troubleshooting information; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

Main Breaker Will Not Set



037-05-63-042A



037-05-50-119A

Figure 69: Main Breaker Will Not Set Troubleshooting—numbered callouts reference numbered problem list below

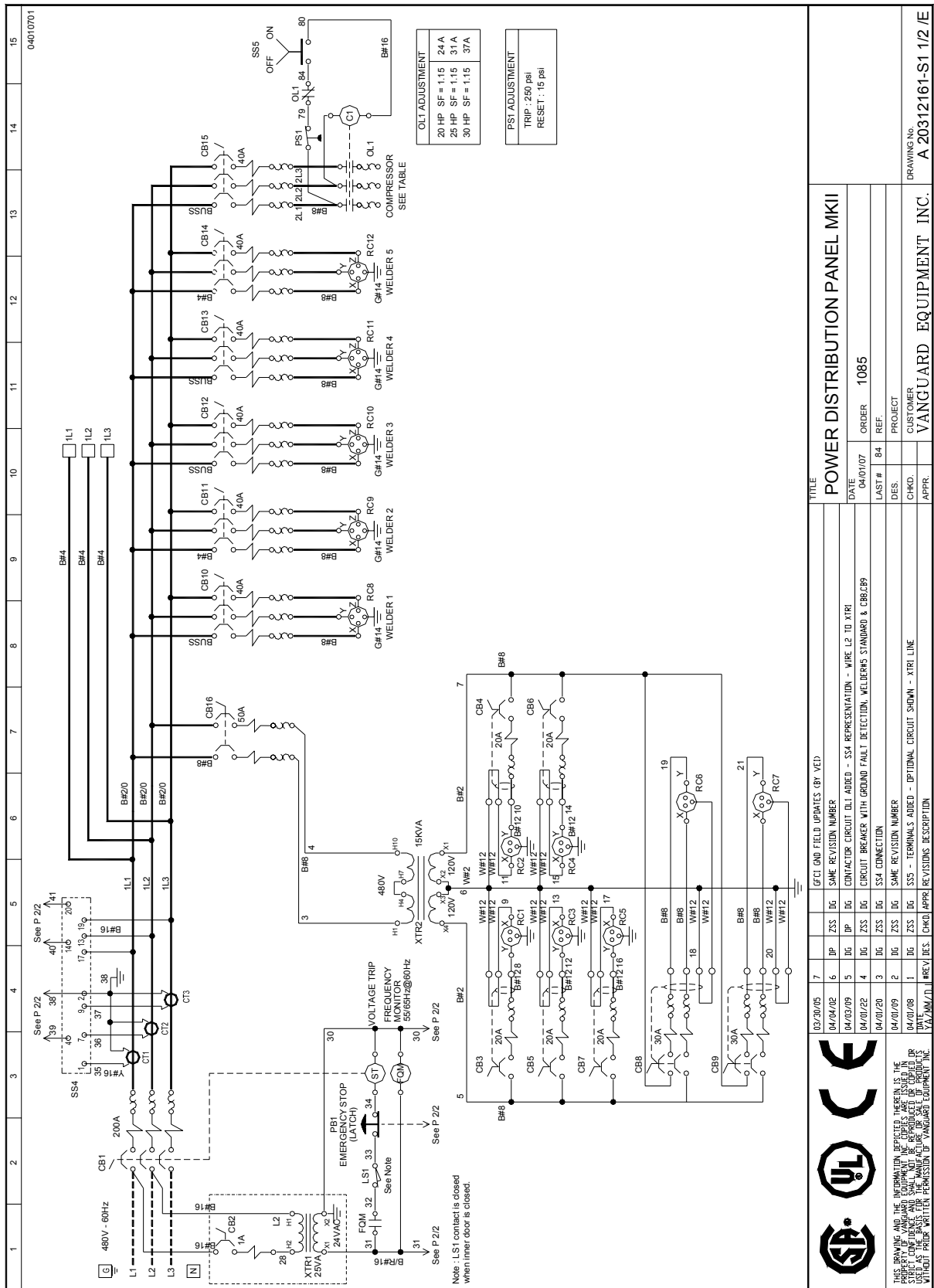
	Possible cause	Solution
1	Incorrect run/idle solenoid-linkage adjustment.	With run/idle switch set to run and genset running, adjust linkage length to obtain 63Hz on AC frequency meter
2	Frequency monitor's trip points incorrectly set.	Adjust frequency monitor DIP switches to achieve HI trip of 65 Hz and LO trip of 55 Hz @ 60 Hz. Operation.

120 VAC or 240 VAC Ground Fault Interrupter (GFCI) Circuit Breakers Will Not Set

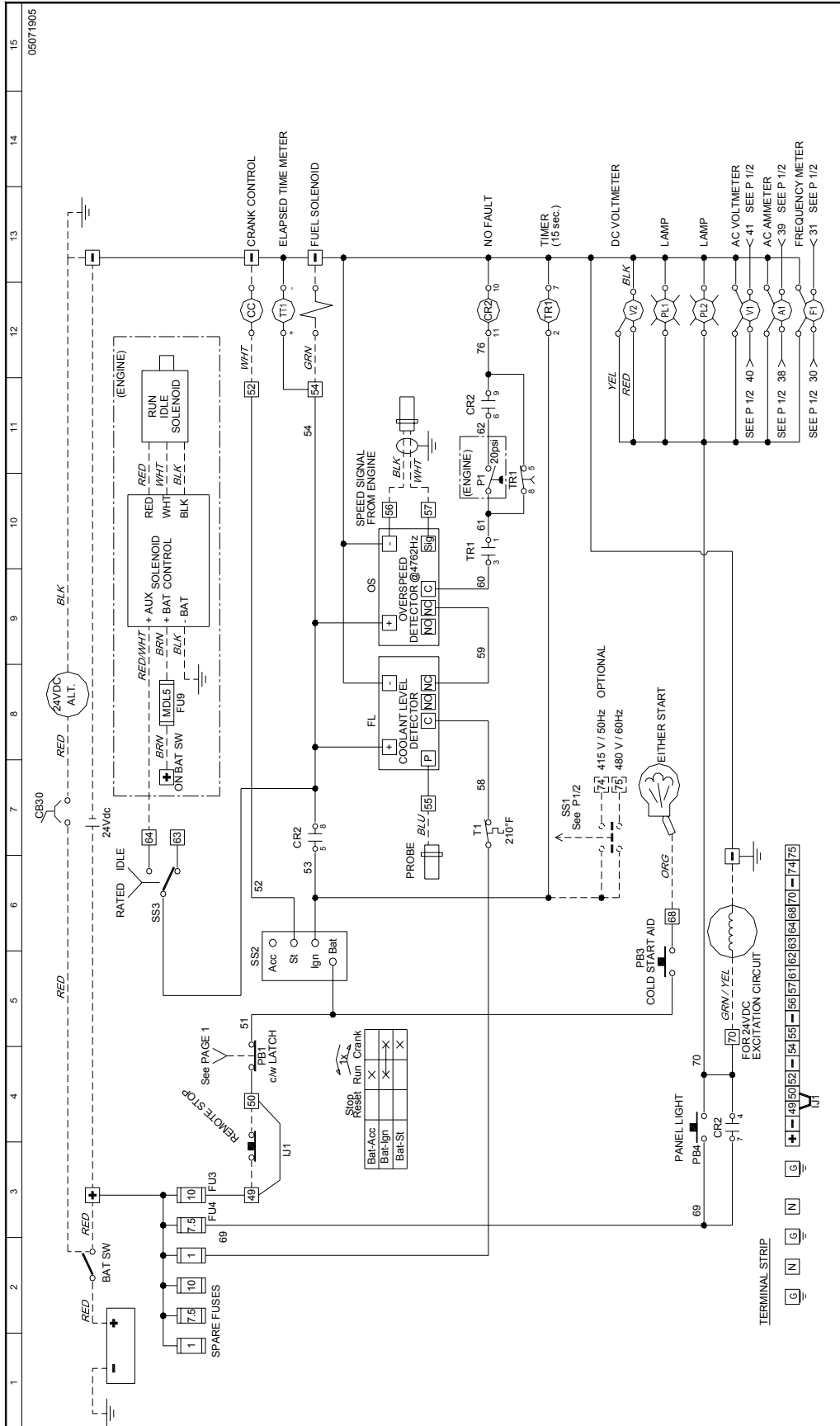
	Possible cause	Solution
1	Connected device or external circuitry has a grounding fault.	Unplug the device or external circuit from the corresponding receptacle, if the GFCI now sets then the problem is in the load or external circuit and must be checked by a qualified electrician; all neutral connections must be made through the corresponding receptacle. See also <i>Single Phase Equipment Ground Fault Circuit Interrupters (GFCI)—Connecting To</i> , and <i>Ground Fault Circuit Interrupters (GFCI)—Test Daily</i> sections of this manual.
2	Faulty GFCI Circuit Breaker module.	If the GFCI does not set when the device or external circuit has been unplugged from the corresponding receptacle, then the GFCI breaker module must be replaced by a qualified electrician.

Electrical Schematics

480VAC, 60 Hz Supply Schematic



24VDC Controls Schematic



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TITLE
POWER DISTRIBUTION PANEL MK3-2

DATE	050611	ORDER	
LAST No.	85	REF.	
DES.		PROJECT	
CHKD.		CUSTOMER	VANGUARD EQUIPMENT INC.
APPR.		PROJECT NO.	A 26604264-S1 2/2 (E (VE))

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DATE: 05/07/28
L. DG. PC
DATE: 05/07/28
L. DG. PC
DATE: 05/07/28
L. DG. PC

Compressor Faults

Refer to the *Operation and Maintenance Manual — Compressor* for troubleshooting information; see the appendices at the end of the *Weld-Deck Operation and Maintenance Manual, Weld-Deck welding package CPW 125-4*.

Appendices: Equipment Modules' Operation and Maintenance Manuals

- A) Air Compressor
- B) AC Generator and Voltage Regulator
- C) Welding Power Unit
- D) Genset Engine

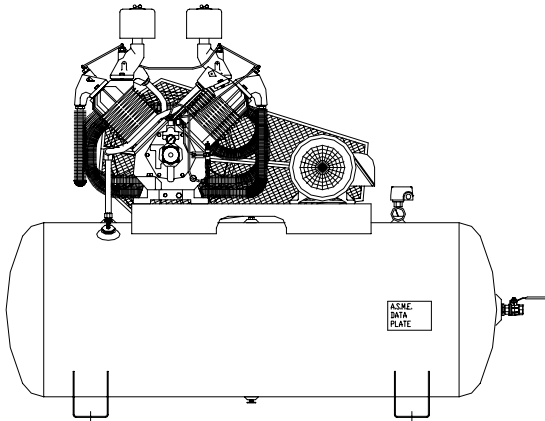
Appendix A — Air Compressor

The following pages are taken from information published by the original equipment manufacturer (OEM), and are subject to change without notice.

PL Series 2-Stage Pressure Lubricated Air Compressor & Units Featuring the PL70A Pump

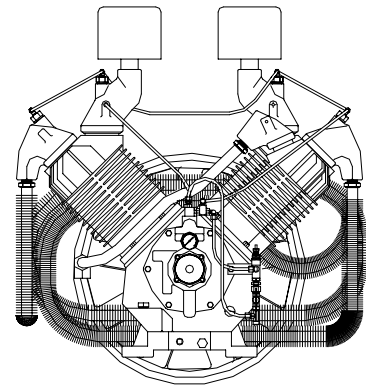
⚠ WARNING

THIS MANUAL CONTAINS IMPORTANT SAFETY INFORMATION AND SHOULD ALWAYS BE AVAILABLE TO THOSE PERSONNEL OPERATING THIS UNIT. READ, UNDERSTAND AND RETAIN ALL INSTRUCTIONS BEFORE OPERATING THIS EQUIPMENT TO PREVENT INJURY OR EQUIPMENT DAMAGE.



**C370-A
(Ref. Drawing)**

MODEL HPL25-25 UNIT



**C330-A
(Ref. Drawing)**

MODEL PL70A COMPRESSOR

MAINTAIN COMPRESSOR RELIABILITY AND PERFORMANCE WITH GENUINE CHAMPION COMPRESSOR PARTS AND SUPPORT SERVICES

Champion Compressor genuine parts, manufactured to design tolerances, are developed for optimum dependability – specifically for Champion compressor systems. Design and material innovations are the result of years of experience with hundreds of different compressor applications. Reliability in materials and quality assurance are incorporated in our genuine replacement parts.

Your authorized Champion Compressor distributor offers all the backup you'll need. A worldwide network of authorized distributors provides the finest product support in the air compressor industry. Your authorized distributor can support your Champion air compressor with these services:

1. Trained parts specialists to assist you in selecting the correct replacement parts.
2. A full line of factory tested CHAMPLUB™ compressor lubricants specifically formulated for use in Champion compressors.
3. Repair and maintenance kits designed with the necessary parts to simplify servicing your compressor.

Authorized distributor service technicians are factory trained and skilled in compressor maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair services.

For the location of your local authorized Champion Air Compressor distributor, refer to the yellow pages of your phone directory or contact:

Factory:

Champion
1301 North Euclid Avenue
Princeton, IL 61356

Phone: (815) 875-3321

Fax: (815) 872-0421

E-Mail: [Champion@Championpneumatic . com](mailto:Champion@Championpneumatic.com)

INSTRUCTIONS FOR ORDERING REPAIR PARTS

When ordering parts, specify Compressor MODEL, HORSEPOWER and SERIAL NUMBER (see nameplate on unit). All orders for Parts should be placed with the nearest authorized distributor.

Order by part number and description. Reference numbers are for your convenience only.

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Installation	8, 9 & 10
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Record Of Maintenance Service	29, 30 & 31


SAFETY AND OPERATION PRECAUTIONS

Because an air compressor is a piece of machinery with moving and rotating parts, the same precautions should be observed as with any piece of machinery of this type where carelessness in operation or maintenance is hazardous to personnel. In addition to the many obvious safety rules that should be followed with this type of machinery, the additional safety precautions as listed below must be observed:


1. Read all instructions completely before operating air compressor or unit.
2. For installation, follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
3. Electric motors must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system to the starter; by using a separate ground wire connected to the bare metal of the motor frame; or other suitable means.
4. Protect the power cable from coming in contact with sharp objects. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals.
5. Make certain that the power source conforms to the requirements of your equipment.
6. Pull main electrical disconnect switch and disconnect any separate control lines, if used, before attempting to work or perform maintenance on the air compressor or unit. "Tag Out" or "Lock Out" all power sources.
7. Do not attempt to remove any compressor parts without first relieving the entire system of pressure.
8. Do not attempt to service any part while machine is in an operational mode.
9. Do not operate the compressor at pressures in excess of its rating.
10. Do not operate compressor at speeds in excess of its rating.
11. Periodically check all safety devices for proper operation. Do not change pressure setting or restrict operation in any way.
12. Be sure no tools, or rags or loose parts are left on the compressor or drive parts.
13. Do not use flammable solvents for cleaning the air inlet filter or element and other parts.
14. Exercise cleanliness during maintenance and when making repairs. Keep dirt away from parts by covering parts and exposed openings with clean cloth or Kraft paper.
15. Do not operate the compressor without guards, shields and screens in place.
16. Do not install a shut-off valve in the discharge line, unless a pressure relief valve, of proper design and size, is installed in the line between the compressor unit and shut-off valve.
17. Do not operate compressor in areas where there is a possibility of ingesting flammable or toxic fumes.
18. Be careful when touching the exterior of a recently run motor - it may be hot enough to be painful or cause injury. With modern motors this condition is normal if operated at rated load - modern motors are built to operate at higher temperatures.
19. Inspect unit daily to observe and correct any unsafe operating conditions found.
20. Do not "play around" with compressed air, nor direct air stream at body, because this can cause injuries.
21. Compressed air from this machine absolutely must not be used for food processing or breathing air without adequate downstream filters, purifiers and controls.
22. Always use an air pressure regulating device at the point of use, and do not use air pressure greater than marked maximum pressure of attachment.
23. Check hoses for weak or worn condition before each use and make certain that all connections are secure.
24. Always wear safety glasses when using a compressed air blow gun.

The user of any air compressor package manufactured by Champion is hereby warned that failure to follow the preceding Safety and Operation Precautions can result in injuries or equipment damage. However, Champion does not state as fact or does not mean to imply that the preceding list of Safety and Operating Precautions is all inclusive, and further that the observance of this list will prevent all injuries or equipment damage.

EXPLANATION OF SAFETY INSTRUCTION SYMBOLS AND DECALS

 DANGER
Indicates immediate hazards which <u>will</u> result in severe injury or death.

 WARNING
Indicates hazards or unsafe practice which could result in severe injury or death.


 CAUTION
Indicates hazards or unsafe practice which could result in damage to the Champion compressor or minor injury.


NOTICE
Notice is used to notify people of installation, operation or maintenance information which is important but not hazard-related.

SAFETY AND OPERATION PRECAUTIONS

OBSERVE, UNDERSTAND AND RETAIN THE INFORMATION GIVEN IN THE SAFETY PRECAUTION DECALS AS SHOWN IN THE PARTS LIST SECTION
--

 DANGER
This reciprocating compressor must not be used for breathing air. To do so will cause serious injury whether air is supplied direct from the compressor source or to breathing tanks for later use. Any and all liabilities for damage or loss due to injury, death and/or property damage including consequential damages stemming from the use of this compressor to supply breathing air, will be disclaimed by the manufacturer.

 WARNING
The use of this compressor as a booster pump and/or to compress a medium other than atmospheric air is strictly non-approved and can result in equipment damage and/or injury.

 CAUTION
This unit may be equipped with special options which may not be included in this manual. User must read, understand and retain all information sent with special options.

INTRODUCTION

Champion PL Series compressors are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

WARRANTY

Champion Five Year Warranty "PL" Series Compressors

CHAMPION warrants each new compressor pump manufactured by **CHAMPION**, mounted on a factory assembled unit, to be free from defects in material and workmanship under normal use and service for a period of sixty (60) months from date of installation or sixty-six (66) months from date of shipment by **CHAMPION** or **CHAMPION** distributor, whichever may occur first. **Applies to the compressor pump only, excluding head valves. Valves, controls and accessories are warranted for the first year only.** Compressor pumps purchased separately would carry a one year warranty.

This five year extended warranty will be prorated over the 5 years as follows:

First Year	-	100% Allowance, Parts and Labor
Second Year	-	90% Allowance, Parts and Labor
Third Year	-	80% Allowance, Parts and Labor
Fourth Year	-	70% Allowance, Parts and Labor
Fifth Year	-	60% Allowance, Parts and Labor

Applies to CHAMPION logo, tank or base mounted complete compressors only.

Express Limited Warranty

CHAMPION warrants each new air compressor unit manufactured by **CHAMPION** to be free from defects in material and workmanship under normal use and service for a period of twelve (12) months from date of installation or eighteen (18) months from date of shipment by **CHAMPION** or **CHAMPION** distributor, whichever may occur first.

CHAMPION makes no warranty in respect to components and accessories furnished to **CHAMPION** by third parties, such as **ELECTRIC MOTORS, GASOLINE ENGINES** and **CONTROLS**, which are warranted only to the extent of the original manufacturer's warranty to **CHAMPION**. To have warranty consideration, electric motors must be equipped with thermal overload protection.

The extended five year warranty will apply to ASME air receivers provided they are installed on rubber vibro isolator pads or approved equivalent.

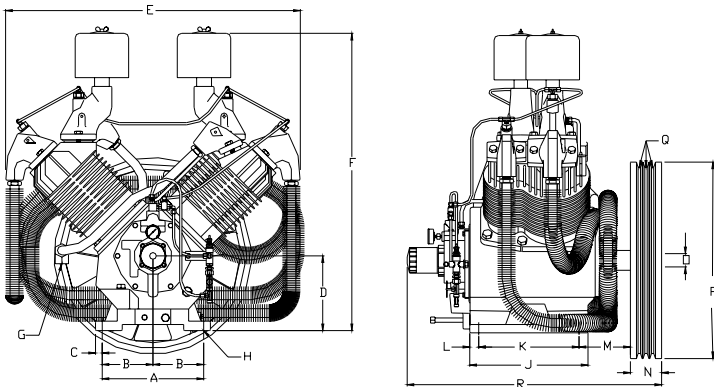
When a compressor pump, or component is changed or replaced during the warranty period, the new/replaced item is warranted for only the remainder of the original warranty period.

Repair, replacement or refund in the manner and within the time provided shall constitute **CHAMPION'S** sole liability and your exclusive remedy resulting from any nonconformity or defect. **CHAMPION SHALL NOT IN ANY EVENT BE LIABLE FOR ANY DAMAGES, WHETHER BASED ON CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES, ARISING WITH RESPECT TO THE EQUIPMENT OR ITS FAILURE TO OPERATE, EVEN IF CHAMPION HAS BEEN ADVISED OF THE POSSIBILITY THEREOF.**

CHAMPION MAKES NO OTHER WARRANTY OR REPRESENTATION OF ANY KIND, EXCEPT THAT OF TITLE, AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXPRESSLY DISCLAIMED. NO SALESMAN OR OTHER REPRESENTATIVE OF CHAMPION HAS AUTHORITY TO MAKE ANY WARRANTIES

TWO STAGE AIR COMPRESSORS - MODEL PL70A

DIMENSIONS



C-331-A
(Ref. Drawing)

	ITEM	PL70A
A	Base-Width	12-7/8"
B	Bolt Down-Width (from center line)	5-11/16"
C	Bolt Down to Edge	3/4"
D	Base to Crank Ctr	8-3/16"
E	Overall Width	33"
F	Overall Height	33-9/16"
G	HP Exhaust Opening	1-1/4NPT
H	Bolt Down Hole Dia.	9/16"
J	Base-Depth	13-1/4"
K	Bolt Down Depth	11-1/4"
L	Bolt Down to Edge	1"
M	Bolt Hole to Wheel (Max.)	5-3/4"
N	Flywheel Width	3-1/2"
O	Crank Diameter	2-1/4"
P	Flywheel Diameter	22"
Q	Flywheel Grooves	3VB
R	Overall Depth	28-9/16"

NOTE:

Flywheel Rotation – Clockwise when viewed from front, flywheel to rear.

SPECIFICATIONS

MODEL	BORE & STROKE (INCH)	NO. of CYLINDERS	OIL CAPACITY (QTS)	WEIGHT (LBS)	MAXIMUM PRESSURE (PSIG)	CU FT./REV.	MIN./MAX. RPM.
PL70A	6-1/4" & 3-1/4" x 4"	4	6-1/3	450	250	.142	425/1000

Standard units are set up for 175 PSIG operation. High pressure units are set for the higher 250 PSIG range and come with the special tanks, pressure switches, pressure relief valves, pulleys and pilot valves. To determine the pressure setting of a particular compressor check the pressure setting decal located on the air tank.

Note that 175 PSIG units cannot be converted to safely operate at pressures above 200 PSIG unless all the above mentioned components including the air tank are replaced with 250 PSIG rated items. Refer to parts list for applicable part numbers.

PERFORMANCE

PUMP	OUTPUT PRESS. PSIG	MOTOR H.P.	PUMP RPM	DISPL. CFM	COOLING AIR FLOW CFM	HEAT REJECTION BTU/HR	APPROX. PULLEY O.D., INCHES
PL70A	175	20	655	93.0	2195	44,700	8.35
PL70A	175	25	770	109.4	2580	55,970	9.75
PL70A	175	30	890	127.8	2980	67,160	11.35
PL70A	250	20	545	77.4	1825	44,700	6.75
PL70A	250	25	660	93.7	2195	55,970	8.35
PL70A	250	30	770	109.4	2580	67,160	9.75

All data is based on 1725 RPM electric motors as a power source.

$$\text{Pulley Dia. (approx.)} = \frac{\text{Compressor RPM} \times \text{Flywheel Dia.}}{\text{Motor or Engine RPM}}$$

INSTALLATION



WARNING

Do not operate unit if damaged during shipping, handling or use. Operating unit if damaged may result in injury.

1. Permanently installed compressors must be located in a clean, well ventilated dry room so compressor receives adequate supply of fresh, clean, cool and dry air. It is recommended that a compressor, used for painting, be located in a separate room from that area wherein body sanding and painting is done. Abrasive particles or paint, found to have clogged the air intake filters and intake valves, shall automatically void warranty.
2. Compressors should never be located so close to a wall or other obstruction that flow of air through the fan blade flywheel, which cools the compressor, is impeded. Permanently mounted units should have flywheel at least 12" from wall.
3. Place stationary compressors on firm level ground or flooring. Permanent installations require bolting to floor. Bolt holes in tank or base feet are provided. Before bolting or lagging down, shim compressor level. Avoid putting a stress on a tank foot by pulling it down to floor. This will only result in abnormal vibration, and possible cracking of air receiver. It is recommended that unit be set on optional vibro-isolator pads. Tanks bolted directly to a concrete floor without isolators will not be warranted against cracking. Champion vibro-isolators or approved equivalent must be installed for extended warranty to apply to ASME receivers.
4. If installing a bare pump, or base mounted unit, make certain the pressure limiting controls are properly installed and operational. The PL model pump is supplied with a pilot valve, but a pressure switch must be provided by customer for start/stop operation. The hydraulic unloading system requires a control air pressure line from the air receiver to be connected to the pilot valve fitting on the pump.
5. A properly sized air check valve must be installed in the discharge piping between the compressor outlet and the inlet of any receiver tank(s) in the system.



DANGER

Do not install isolating valves between compressor outlet and air receiver. This will cause excessive pressure if valve is closed and cause injury and equipment damage.



WARNING

Always use an air pressure regulating device at the point of use. Failure to do so can result in injury or equipment damage.



CAUTION

- **Do not install in an area where ambient temperature is below 32 degrees F or above 100 degrees F.**
- **Do not install unit in an area where air is dirty and/or chemical laden.**
- **Unit is not to be installed outdoors.**

INSTALLATION (CONT'D)

ELECTRICAL POWER SUPPLY

It is essential that the power supply and the supply wiring are adequately sized and that the voltage correspond to the unit specifications. Branch circuit protection must be provided at installation as specified in the National Electrical Code.

All wiring should be performed by a licensed electrician or electrical contractor. Wiring must meet applicable codes for area of installation. The table gives recommended wire sizes based on the 1999 NEC.

WIRE SIZE (AWG) – 75°C COPPER – 30°C AMBIENT

MOTOR HP	3 PHASE			
	200/208V	230V	460V	575V
20	3 (0)	4 (1)	8 (6)	10 (6)
25	1 (000)	2 (00)	6 (4)	8 (6)
30	0 (0000)	1 (000)	6 (3)	8 (4)

Values in () for Duplex Unit w/one incoming power line to both motors.

All models require a properly sized magnetic starter as specified in the National Electric Code (NEC). See Figure 1-1 for simplex wiring diagram and Figure 1-2 for duplex wiring diagram.

If ordered with a factory mounted magnetic starter, compressor is wired at factory. It is necessary only to bring lines from a properly sized disconnect switch to the magnetic starter mounted on the unit.

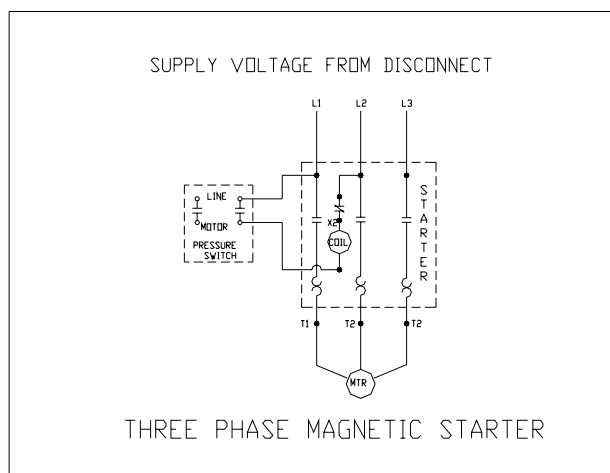


Figure 1-1 Simplex Wiring Diagram

ELECTRICAL POWER SUPPLY (CONT'D)

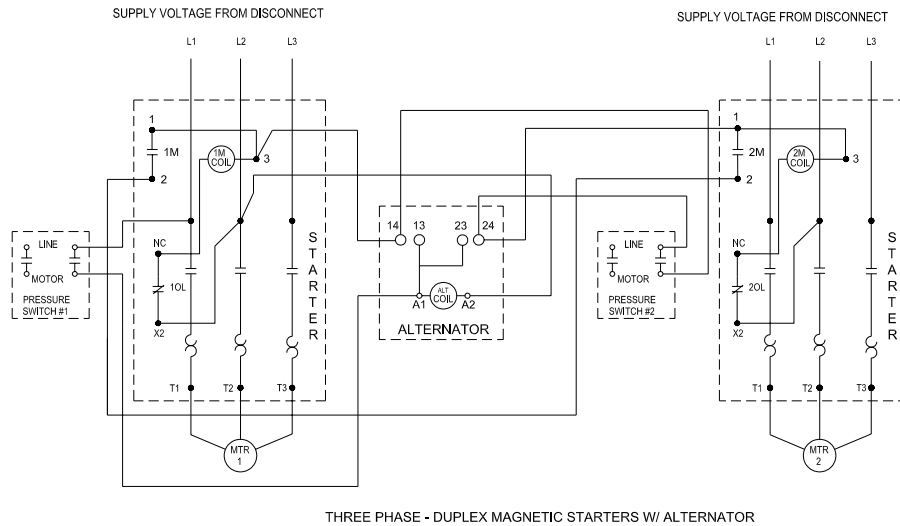


Figure 1-2 Duplex Wiring Diagram

B1258-A
(Ref. Drawing)



CAUTION

Wiring must be such that when viewing compressor from opposite shaft end, rotation of shaft is clockwise as shown by arrow on guard. Wrong direction rotation for any length of time will result in damage to compressor.

GROUNDING INSTRUCTIONS

This product should be connected to a grounded, metallic, permanent wiring system, or an equipment-grounding terminal or lead on the product.

AIR LINE PIPING

Connection to air system should be of the same size, or larger, than discharge pipe out of unit. The table gives recommended minimum pipe sizes. A union connection to the unit and water drop leg is recommended. Install a flexible connector between the discharge of the unit and the plant air piping. Plant air piping should be periodically inspected for leaks using a soap and water solution for detection on all pipe joints. Air leaks waste energy and are expensive.

Minimum Pipe Sizes For Compressor Air Lines (Based on clean Smooth Schedule 40 Pipe)

MODEL	25'	50'	100'	200'	300'
PL70A	1-1/4" (1-1/2")	1-1/4" (1-1/2")	1-1/4" (1-1/2")	1-1/2" (2")	1-1/2" (2")

Values in () are for duplex unit.



WARNING

Never use plastic pipe or improperly rated metal pipe. Improper piping material can burst and cause injury or property damage.

OPERATION

This compressor has been inspected, thoroughly tested and approved at the factory. For this unit to give long satisfactory service it must be installed and operated properly.

Simplex units have a pressure switch that senses changes in receiver pressure and automatically starts and stops the compressor at preset pressure limits. If the receiver pressure falls below the cut-in pressure setting of the pressure switch the compressor will run until the cut-out pressure setting of the pressure switch has been reached.

Duplex units have lead and lag pressure switches and an automatic alternating system to evenly distribute the load between the two compressors. The pressure switches sense changes in receiver pressure and automatically start and stop the compressor at preset pressure levels. If the receiver pressure falls below the cut-in pressure setting of the lead pressure switch but remains above the cut-in pressure setting of the lag pressure switch, only one compressor will run until receiver pressure reaches the cut-out pressure of the lead pressure switch. The next time the pressure in the receiver drops, the system automatically starts the compressor that was idle. If the receiver pressure falls below the cut-in pressure setting of the lag pressure switch, both compressors run until receiver pressure reaches the cut-out pressure setting of the lead pressure switch.

PL70A models are equipped with a needle valve, pilot valve and head unloaders to provide continuous run capabilities. The pilot valve acts as an automatic air switch allowing air to flow from the receiver to the head unloader mechanism, thus actuating it. To operate unit in continuous run, open needle valve located next to pilot valve. The pilot valve is now able to sense receiver pressure. When the receiver pressure reaches the cut-out pressure setting of the pilot valve, the pilot valve opens and air is released to the unloader mechanism. The compressor stops compressing air and runs unloaded until the cut-in pressure setting of the pilot valve has been reached. At this time air released from the unloader mechanism and the compressor starts compressing again. Continuous run is recommended if motor starts exceed 8 starts/hour.

Initial Start Up

1. Inspect unit for any visible signs of damage that would have occurred in shipment or during installation.
2. Pull main disconnect switch to unit to assure that no power is coming into the unit. "Lock Out" or "Tag Out" switch. Connect power leads to start.



WARNING

Do not attempt to operate compressor on voltage other than that specified on order or on compressor motor.

3. Check compressor oil level. Add oil as required. See "Compressor Oil Specifications" Section.
NOTE: Do not mix oil type, weights or brands.
4. Activate main disconnect switch.
6. "Jog" motor and check for proper rotation by direction arrow. If rotation is wrong, reverse input connections on the magnetic starter.
7. Close receiver outlet hand valve and start.
8. With receiver hand valve closed, let machine pump up to operating pressure. At this stage the automatic controls will take over. Check for proper cycling operation.
9. This compressor is equipped with a pressure lubrication system. The oil pressure gauge is located on the bearing housing on the front of the crankcase. During operation oil pressure should normally be between 15 PSIG and 30 PSIG. Oil pressure can drop to 10 PSIG with no adverse operation. Oil pressure is maintained internally in the oil pump, so no adjustment is required.
10. Check for proper operation of any options. Refer to individual option instruction sheet.
11. When the initial run period has shown no operating problems, shut unit down and recheck oil level.
12. Open receiver hand valve. The air compressor unit is now ready for use.



WARNING

This unit can start automatically without warning.

GUIDE TO MAINTENANCE

For Service contact an authorized Champion distributor. All requests should include model number and serial number. To obtain reliable and satisfactory service, this unit requires a consistent preventive maintenance schedule. Maintenance schedule form is included to aid in keeping the proper records.



WARNING

Before performing any maintenance function, switch main disconnect switch to "off" position to assure no power is entering unit. "Lock Out" or "Tag Out" all sources of power. Be sure all air pressure in unit is relieved. Failure to do this may result in injury or equipment damage.

DAILY MAINTENANCE

1. Check oil level of compressor. Add Champlub recip lubricant as required. See "Compressor Oil Specifications" Section. **NOTE:** Do not mix oil type, weight, or brands.
2. Drain moisture from tank by opening tank drain cock located in bottom of tank. Do not open drain valve if tank pressure exceeds 25 PSIG.
3. Turn off compressor at the end of each day's operation. Turn off power supply at wall switch.

WEEKLY MAINTENANCE

1. Clean dust and foreign matter from cylinder head, motor, fan blade, air lines, intercooler and tank.
2. Remove and clean intake air filters.



WARNING

Do not exceed 15 PSIG nozzle pressure when cleaning element parts with compressed air. Do not direct compressed air against human skin. Serious injury could result. Never wash elements in fuel oil, gasoline or flammable solvent.

3. Check V-belts for tightness. The V-belts must be tight enough to transmit the necessary power to the compressor. Adjust the V-belts as follows:
 - a. Remove bolts and guard to access compressor drive.
 - b. Loosen mounting hardware which secures motor to base. Slide motor within slots of baseplate to desired position.
 - c. Apply pressure with finger to one belt at midpoint span. Tension is correct if top of belt aligns with bottom of adjacent belt. Make further adjustments if necessary.
 - d. Check the alignment of pulleys. Adjust if necessary.
 - e. Tighten mounting hardware to secure motor on base.
 - f. Re-install guard and secure bolts.



WARNING

Never operate unit without belt guard in place. Removal will expose rotating parts which can cause injury or equipment damage.

EVERY 90 DAYS OR 500 HOURS MAINTENANCE

1. Change crankcase oil and oil filter. Use only Champlub recip lubricant.
2. Check entire system for air leakage around fittings, connections, and gaskets, using soap solution and brush.
3. Tighten nuts and cap screws as required.
4. Check and clean compressor valves as required. Replace when worn or damaged parts.



CAUTION

Valves must be replaced in original position. Valve gaskets should be replaced each time valves are serviced.

5. Pull ring on all pressure relief valves to assure proper operation.

GENERAL MAINTENANCE NOTES

PRESSURE RELIEF VALVE: The pressure relief valve is an automatic pop valve. Each valve is properly adjusted for the maximum pressure of the unit on which it is installed. If it should pop, it will be necessary to drain all the air out of the tank in order to reseal properly, or drop pressure in line. Do not readjust.

PRESSURE SWITCH: The pressure switch is automatic and will start compressor at the low pressure and stop when the maximum pressure is reached. It is adjusted to start and stop compressor at the proper pressure for the unit on which it is installed. Do not readjust.

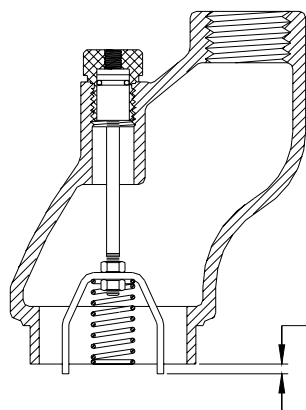
BELTS: Drive belts must be kept tight enough to prevent slipping. If belts slip or squeak, see V-belt maintenance in preceding section.



CAUTION

If belts are too tight, overload will be put on motor and motor bearings.

COMPRESSOR VALVES: If compressor fails to pump air or seems slow in filling up tank, disconnect unit from power source and remove valves and clean thoroughly, using compressed air and a soft wire brush. After cleaning exceptional care must be taken that all parts are replaced in exactly the same position and all joints must be tight or the compressor will not function properly. See instructions below for manifold assembly. When all valves are replaced and connections tight, close hand valve at tank outlet for final test. Valve gaskets should be replaced each time valves are removed from pump.



WHEN INSTALLING HEAD UNLOADER MAINFOLD ASSEMBLY, BE CERTAIN THAT THE ACTUATING CLAW PROTRUDES 3/16" BELOW THE BOTTOM OF THE MANIFOLD. CLAW MUST BE POSITIONED SO THAT IT WILL ENTER TWO SLOTS IN THE COMPRESSOR VALVE. FAILURE TO FOLLOW THIS PROCEDURE WILL RESULT IN AN INOPERATIVE HEAD UNLOADER.

C374-A
(Ref. Drawing)

3/16" WHEN PISTON IS UP

TYPICAL MANIFOLD ASSEMBLY

GENERAL MAINTENANCE (Cont'd.)

HYDRAULIC UNLOADER: This compressor is equipped with an unloading device operated by oil pressure. When the compressor is turned off, the unloader will open resulting in a short burst of air from the unloader (released through the intake filter.). When the compressor is restarted, as soon as oil pressure reaches normal operation range (between 15 and 30 PSIG) the unloader valve closes and the compressor begins to pump air. This unloader system provides loadless starting for longer motor life, and has the added feature of preventing the compression of air should the oil pump fail. In the event of loss of oil pressure, the compressor would run in an "unloaded" state only, until correction of the oil pressure is made.

NOTE: If after the compressor shuts off air escapes from the hydraulic unloader for more than a couple of seconds, it indicates the tank check valve is leaking. See "Check Valve" below.

CHECK VALVE: The check valve closes when the compressor stops operating, preventing air from flowing out of the tank through the pressure release. After the compressor stops operating, if air continues to escape through the release valve, it is an indication that the check valve is leaking. This can be corrected by removing check valve and cleaning disc and seat. If check valve is worn badly, replace same.



WARNING

Before removing check valve be sure all air is drained out of tank and power is disconnected. Failure to do so may result in injury or equipment damage.

THE INTERSTAGE PRESSURE RELIEF VALVE is provided to protect against interstage over pressure and is factory set for maximum pressure of 75 PSIG. **DO NOT RESET**
If the pressure relief valve pops, it indicates trouble. Shut down the unit immediately and determine and correct the malfunction. Inspect the head valves. Serious damage can result if not corrected and can lead to complete destruction of the unit. Tampering with the interstage pressure relief valve, or plugging the opening destroys the protection provided and voids all warranty.

COMPRESSOR LUBRICATION: Fill crankcase to proper level as indicated by oil sight gauge. Keep crankcase filled as required by usage. It is recommended that only Champlub recip lubricant be used. This is a 30-weight, non-detergent industrial oil with rust and oxidation inhibitors specially formulated for reciprocating compressors. Do not mix oil types, weights or brands.

MOTOR LUBRICATION: Long time satisfactory operation of an electric motor depends in large measure on proper lubrication of the bearings. Bearing grease will lose its lubricating ability overtime, not suddenly. Refer to the motor manufacturer's instructions for the type of grease and lubrication intervals.

PILOT VALVE: The pilot valve actuates the head unloader mechanism to provide a means of stopping or starting the compression of air by the compressor without stopping or starting the electric motor.

COMPRESSOR PILOT VALVE PRESSURE ADJUSTMENT

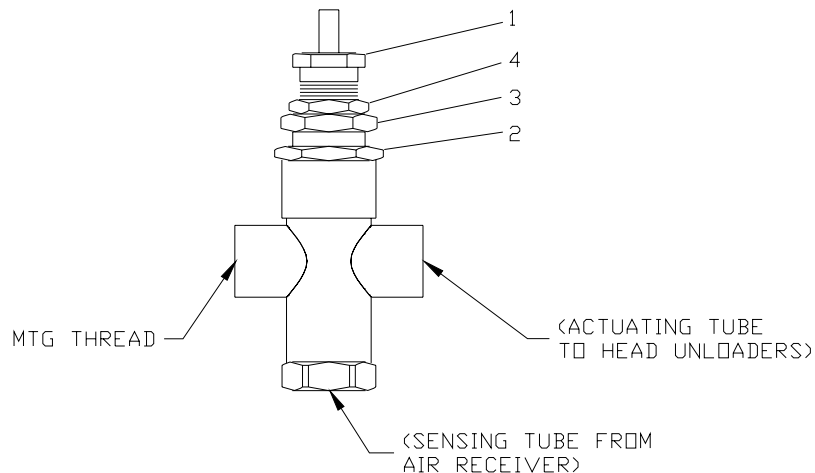
Proceed with the following instructions while compressor is running:

1. Loosen locknut (4) and back off several turns. Do not turn differential pressure adjustment nut (3).
2. Check reading on the tank pressure gauge. Set the compressor maximum pressure by turning threaded cap (1) clockwise to increase pressure or counter clockwise to decrease pressure. Pressure setting must be 5 psig less than setting of pressure switch.
3. After pressure is set, tighten locknut (4). Be careful not to move threaded cap (1).

COMPRESSOR PILOT VALVE DIFFERENTIAL PRESSURE ADJUSTMENT

Proceed with the following instructions while compressor is running.

1. Loosen locknut (2) and back off several turns.
2. Check reading on the tank pressure gauge. Set the pressure to 30 psig differential (unload at 170 psig, reload at 140 psig). Turn nut (3) clockwise to increase differential pressure or counter clockwise to decrease differential pressure.
3. After pressure is set, tighten locknut (2). Be careful not to move nut (3).



B980-B
(Ref. Drawing)

COMPRESSOR OIL SPECIFICATIONS

Compressors are factory filled with CHAMPLUB hydrocarbon based recip lubricant. This is an ISO 100 non-detergent industrial lubricant with rust and oxidation inhibitors specially formulated for reciprocating compressors. It is recommended this compressor be maintained using this oil for ambient temperatures above 32°F.

CHAMPLUB synthetic is a premium grade diester based synthetic lubricant providing excellent performance in high temperature applications.



CAUTION

Do not mix oil types, weights or brands.

NOTES:

1. Normal break-in period of Champion air compressors is 25 hours.
2. For the first 100 hours of compressor operation, a careful and regular check of the oil level should be made. Maintain oil level at the full line.

CHANGING TO SYNTHETIC LUBRICANT

(Applies to diester based synthetic lubricant only)

1. Compressor must run for a 25 hour break-in period using ChampLub ISO 100 oil
2. Thoroughly drain existing oil from crankcase.
3. Fill crankcase with a full charge of synthetic lubricant.
4. Run compressor for 200 hours.
5. Stop compressor and thoroughly drain the synthetic lubricant.
6. Add a full charge of synthetic lubricant.
7. Compressor now ready to run for extended period before next lubricant change.

LUBRICANT

CHAMPLUB	
DESCRIPTION	PART NUMBER
1 – Quart Case (12/case)	P12612A
1 – Gallon Case (4/case)	P12613A
5 – Gallon Pail	P12614A
55 – Gallon Drum	P12615A

CHAMPLUB SYNTHETIC	
DESCRIPTION	PART NUMBER
1 – Quart Case (12/case)	P13179A
1 – Gallon Case (4/case)	P13180A
5 – Gallon Pail	P11506A
55 – Gallon Drum	P13181A

TORQUE VALVES

SPECIFIC APPLICATION	FASTENER SIZE & THREAD	TORQUE	INCH-POUNDS
BEARING HOUSING BOLT	7/16 – 20		540
CYLINDER FLANGE BOLT	1/2 – 13		900
CONNECTING ROD BOLT	7/16 – 20		400
MANIFOLD BOLT	7/14 – 14		230
FLYWHEEL BOLT	7/16 – 20		600

TROUBLE SHOOTING CHART FOR COMPRESSOR



WARNING

Always disconnect unit from power supply and relieve all pressure from air tank before performing any maintenance. “Tag Out” or “Lock Out” all power sources. Failure to do so may result in equipment damage or injury.

Never operate unit without belt guard in place.

Never use gasoline or flammable solvent on or around compressor unit. Explosion may result.

Troubleshooting Chart

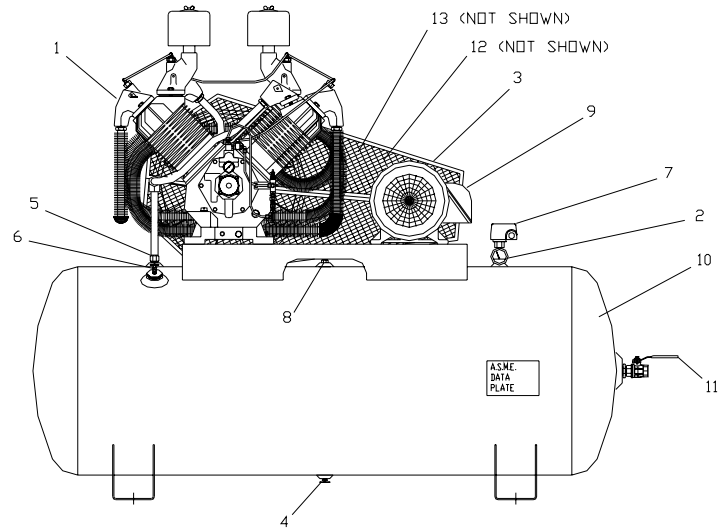
Symptom	Possible Cause(s)	Corrective Action
Motor will not start.	<ol style="list-style-type: none"> 1. Main switch and fuses open. 2. Starter heater coils open. 3. Starter tripped 4. Defective pressure switch-contacts will not close 5. Low voltage. 	<ol style="list-style-type: none"> 1. Check all fuses and switches. Check for loose or faulty wires. 2. Check overload relay in starter. Reset starter. 3. Reset starter. If starter trips repeatedly, have electrical system inspected by an electrician. 4. Repair or replace pressure switch. Warning – Relieve tank pressure before servicing. 5. Check with voltmeter. Be sure voltage corresponds to unit specifications.
Starter trips repeatedly.	<ol style="list-style-type: none"> 1. Improperly adjusted pressure switch. 2. Faulty check valve. 3. Incorrect fuse size or magnetic starter heaters. 4. Low voltage. 5. Defective motor. 	<ol style="list-style-type: none"> 1. Adjust or replace. Warning – Relieve tank pressure before servicing. 2. Clean or replace Warning – Relieve tank pressure before servicing. 3. Be sure that fuses and heaters are properly rated. 4. Check with voltmeter. Be sure voltage corresponds to unit specifications. 5. Replace motor.
Tank pressure builds up slowly.	<ol style="list-style-type: none"> 1. Air leaks. 2. Dirty air filter. 3. Defective compressor valves 	<ol style="list-style-type: none"> 1. Tighten fittings. 2. Clean or replace. 3. Install new valve plate assembly.
Tank pressure builds up quickly.	<ol style="list-style-type: none"> 1. Excessive water in tank. 	<ol style="list-style-type: none"> 1. Drain tank.
Discharge pressure relief valve pops off while compressor is running.	<ol style="list-style-type: none"> 1. Wrong pressure switch setting. 2. Defective ASME relief valve. 	<ol style="list-style-type: none"> 1. Adjust to correct setting. 2. Replace valve. Warning – Relieve tank pressure before servicing.
Compressor will not unload	<ol style="list-style-type: none"> 1. Wrong pilot valve setting. 2. Defective pilot valve. 3. Lack of air to pilot valve.. 	<ol style="list-style-type: none"> 1. Adjust to correct stting 2. Replace pilot valve. 3. Open needle valve to pilot valve.
Excessive belt wear.	<ol style="list-style-type: none"> 1. Pulley out of alignment. 2. Belts too tight or too loose. 	<ol style="list-style-type: none"> 1. Realign motor pulley. 2. Adjust belt tension.
Compressor runs hot.	<ol style="list-style-type: none"> 1. Improper flywheel rotation 2. Defective compressor valves. 3. Dirty air filter. 4. Dirty cylinder and/or intercooler. 	<ol style="list-style-type: none"> 1. Check for correct rotation. (Counter clockwise when viewed from drive side.) 2. Install new valve plate assembly. 3. Clean or replace. 4. Clean cylinder fins and/or intercooler.
Interstage pressure relief valve pops off.	<ol style="list-style-type: none"> 1. Defective compressor valves. 	<ol style="list-style-type: none"> 1. Install new valves.
Excessive oil consumption.	<ol style="list-style-type: none"> 1. Dirty air filter. 2. Wrong oil viscosity. 3. Oil leaks. 4. Worn piston rings. 5. Scored cylinder 	<ol style="list-style-type: none"> 1. Clean or replace. 2. Refill with proper viscosity oil. 3. Tighten bolts. Replace gaskets. 4. Replace rings. 5. Replace cylinder.

Troubleshooting Chart (cont'd)

Symptom	Possible Cause(s)	Corrective Action
Low or loss of oil pressure	<ol style="list-style-type: none"> 1. Low crankcase level. 2. Oil pickup screen clogged. 3. Faulty oil pump.. 	<ol style="list-style-type: none"> 1. Check oil level. Add oil if required. 2. Drain oil from crankcase. Remove oil pickup screen and clean. Reinstall screen and all clean oil to crankcase. 3. Replace oil pump.
System does not alternate (Duplex units only)	<ol style="list-style-type: none"> 1. Starter tripped. 2. Loose wiring in alternator. 3. Defective alternator. 4. Defective motor. 	<ol style="list-style-type: none"> 1. Reset starter. If starter trips repeatedly, have electrical system inspected by an electrician. 2. Check and tighten all wiring connections. 3. Replace alternator. 4. Replace motor.

UNIT REPAIR PARTS ILLUSTRATION

MODELS: HPL20-12, HPL20-25, HPL25-12, HPL25-25, HPL30-12, & HPL30-25



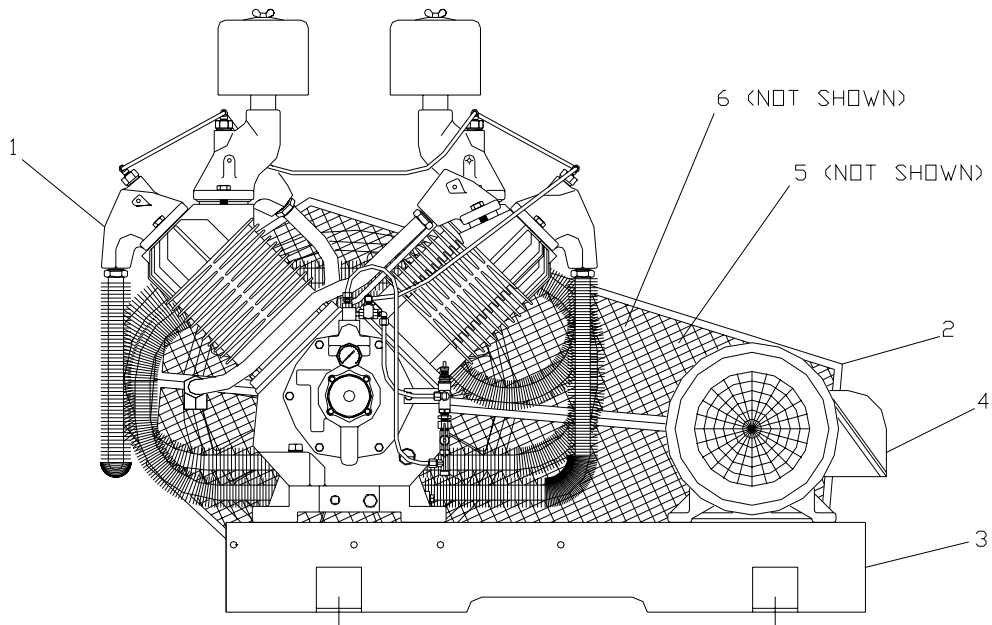
C371-A
(Ref. Drawing)

REPAIR PARTS LIST

		MODEL						
		HPL20-12	HPL20-25	HPL25-12	HPL25-25	HPL30-12	HPL30-25	
1	Pump	PL70A	PL70A	PL70A	PL70A	PL70A	PL70A	
2	Pressure Gauge	M519C	M519C	M519C	M519C	M519C	M519C	
3	Belt Guard	Z674	Z674	Z674	Z674	Z674	Z674	
4	Drain Valve	M2684	M2684	M2684	M2684	M2684	M2684	
5	Check Valve	P03590A	P03590A	P03590A	P03590A	P03590A	P03590A	
6	Bucket High Drain	Z1542	Z1542	Z1542	Z1542	Z1542	Z1542	
7	Pressure Switch	175 PSIG	P14202A	P14202A	P14202A	P14202A	P14202A	
		250 PSIG	P07422A	P07422A	P07422A	P07422A	P07422A	
8	Pressure Relief Valve	175 PSIG	M2843	M2843	M2843	M2843	M2843	
		250 PSIG	M2845	M2845	M2845	M2845	M2845	
9	Motor	20 HP	20 HP	25 HP	25 HP	30 HP	30 HP	
10	Tank	175 PSIG	P03665D	P03564D	P03665D	P03564D	P03665D	P03564D
		250 PSIG	P07433D	P07432D	P07433D	P07432D	P07433D	P07432D
11	Isolation Valve	M2688	M2688	M2688	M2688	M2688	M2688	
12	Pulley	175 PSIG	P05634A PULLEY	P05634A PULLEY	P09311B	P09311B	P03710A PULLEY	P03710A PULLEY
			P05622A BUSHING	P05622A BUSHING			P05621A BUSHING	P05621A BUSHING
12	Pulley	250 PSIG	P07813A PULLEY	P07813A PULLEY	P05634A PULLEY	P05634A PULLEY	P09311B	P09311B
			P12157A BUSHING	P12157A BUSHING	P05621A BUSHING	P05621A BUSHING		
13	Belts	175 PSIG	B100 (3)	B100 (3)	B100 (3)	B100 (3)	B103 (3)	B103 (3)
		250 PSIG	B100 (3)	B100 (3)	B100 (3)	B100 (3)	B100 (3)	B100 (3)

UNIT REPAIR PARTS ILLUSTRATION

MODELS: BPL-20, BPL-25, & BPL-30

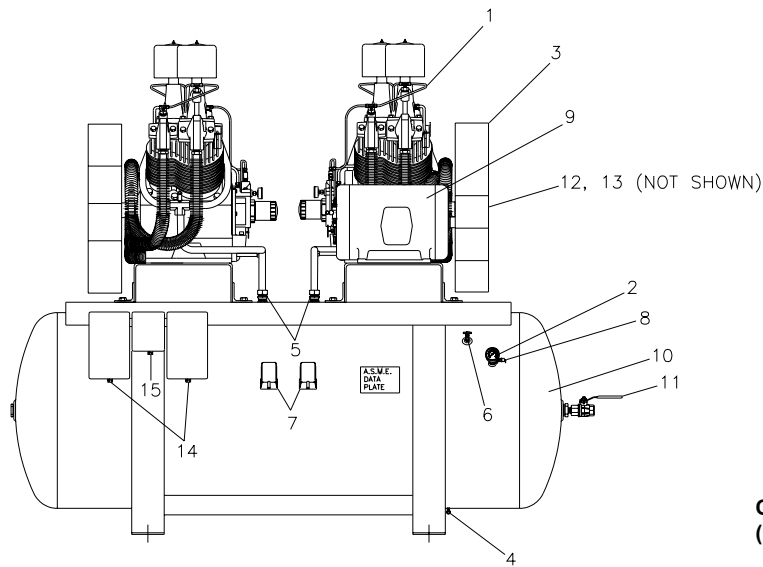


C372-A
(Ref. Drawing)

REPAIR PARTS LIST

		MODEL		
		BPL-20	BPL-25	BPL-30
1	Pump	PL70A	PL70A	PL70A
2	Belt Guard	Z674	Z674	Z674
3	Base Plate	P03538C	P03538C	P03538C
4	Motor	20 HP	25 HP	30 HP
5	Pulley 175 PSIG	P05634A	P09311B	P03710A
		Pulley P05622A Bushing		Pulley P05621A Bushing
5	Pulley 250 PSIG	P07813A	P05634A	P09311B
		Pulley P12157A Bushing	Pulley P05621A Bushing	
6	Belts	175 PSIG	B100 (3)	B100 (3)
		250 PSIG	B100 (3)	B100 (3)

UNIT REPAIR PARTS ILLUSTRATION
MODELS: HPL20D-25, HPL25D-25, & HPL30D-25



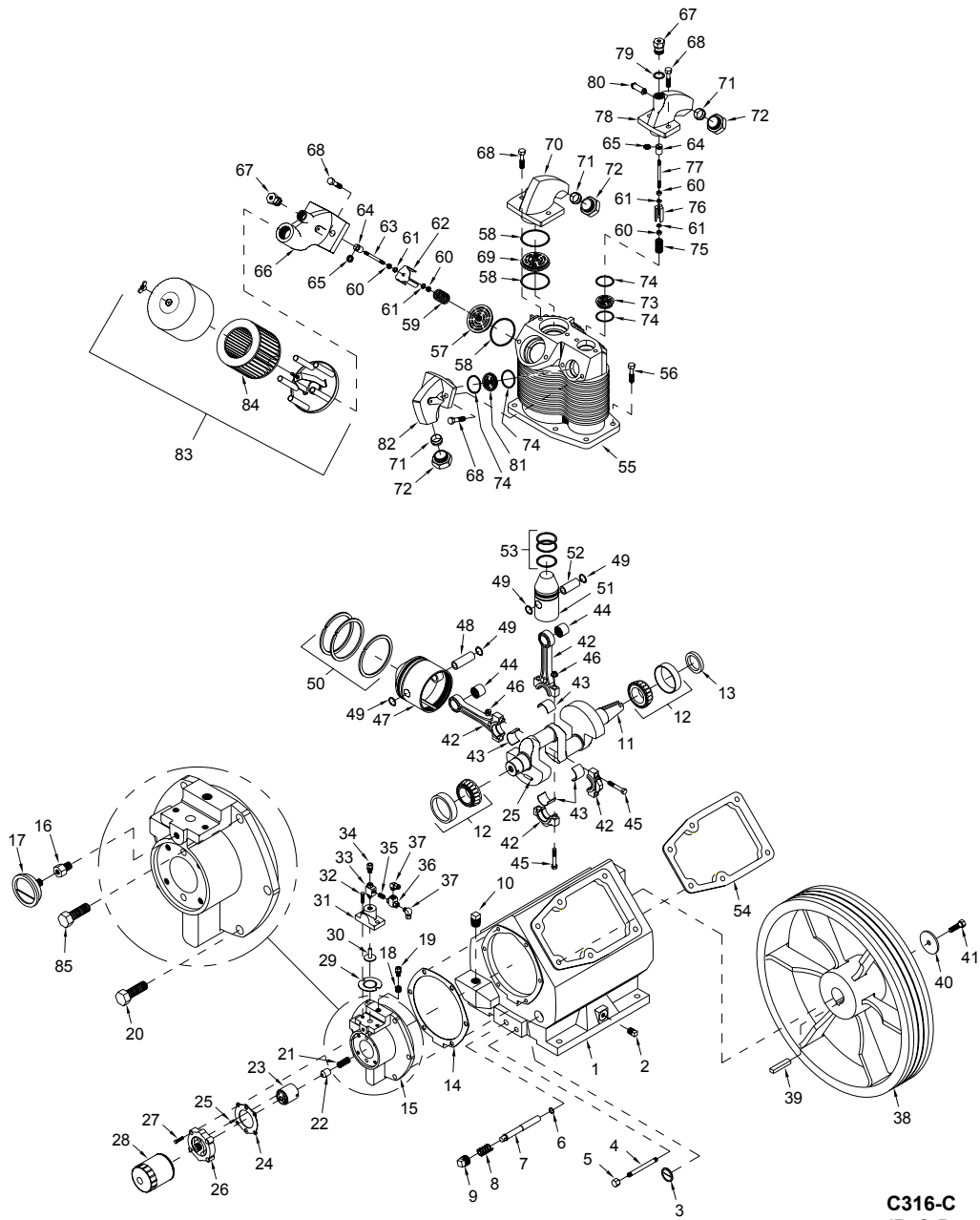
C373-A
(Ref. Drawing)

REPAIR PARTS LIST

			MODEL		
			HPL20D-25	HPL25D-25	HPL30D-25
1	Pump		PL70A	PL70A	PL70A
2	Pressure Gauge		M519C	M519C	M519C
3	Belt Guard		Z674	Z674	Z674
4	Drain Valve		M2684	M2684	M2684
5	Check Valve		P03590A	P03590A	P03590A
6	Bucket High Drain		Z1542	Z1542	Z1542
7	Pressure Switch	175 PSIG	P14202A	P14202A	P14202A
		250 PSIG	P07422A	P07422A	P07422A
8	Pressure Relief Valve	175 PSIG	M2847	M2487	M2487
		250 PSIG	M2845	M2845	M2845
9	Motor		20 HP	25 HP	30 HP
10	Tank	175 PSIG	P12127D	P12127D	P12127D
		250 PSIG	P12422D	P12422D	P12422D
11	Isolation Valve		M2688	M2688	M2688
12	Pulley	175 PSIG	P05634A	P09311B (2)	P03710A
			Pullev (2) P05622A Bushing (2)		Pullev (2) P05621A Bushing (2)
12	Pulley	250 PSIG	P07813A	P05634A	P09311B (2)
			Pulley (2) P12157A Bushing (2)	Pulley (2) P05621A Bushing (2)	
13	Belts	175 PSIG	B100 (6)	B100 (6)	B103 (6)
		250 PSIG	B100 (6)	B100 (6)	B100 (6)
14	Starter		Consult Factory		
15	Alternator		Consult Factory		

COMPRESSOR REPAIR PARTS ILLUSTRATION

Models: PL70A



C316-C
(Ref. Drawing)

Repair Parts List
Compressor Model PL70A

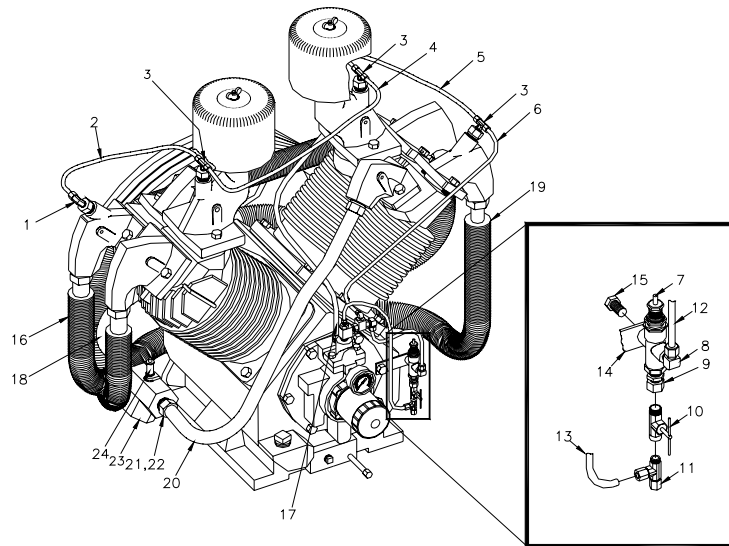
Ref. No.	Description	Part Number	Qty.
1	Crankcase	P07393D	1
2	Pipe plug	64AA5	1
3	Oil level gauge	RE714	1
4	Pipe nipple	M492	1
5	Pipe cap	M461	1
6	O-Ring	P07428A	1
7	Oil screen	P07381B	1
8	Spring	P07427A	1
9	Pipe plug	M998B	1
10	Pipe plug	64A5	1
11	Crankshaft	P11547C	1
12	Main bearing	Z6506	2
13	Oil seal	P03433A	1
14	Bearing housing gasket set	Z12120	1
15	Bearing housing	P11545D	1
16	Adaptor	P11513A	1
17	Oil pressure gauge	P07430A	1
18	Pipe bushing	M1318	1
19	3/8 x 1/4" NPT Straight compression fitting	M2864	1
20	Hex head cap screw	M2345	4
21	Oil pump spring	P10071A	1
22	Oil pump plunger	P10072A	1
23	Oil pump	P10070A	1
24	Oil pump cover gasket	P11512A	1
25	Coiled spring pin	M3426	2
26	Oil pump cover	P10957C	1
27	Hex head cap screw	M3274	4
28	Oil filter	P10066A	1
29	Diaphragm	P07585A	1
30	Plunger	P07586A	1
31	Unloader housing	P07386B	1
32	Hex head cap screw	M2596	2
33	Control valve	P08691A	1
34	1/4 x 1/8" NPT Straight compression fitting	M2863	1
35	Close pipe nipple	M1012B	1
36	Shuttle valve	P08692A	1
37	1/4 x 1/8" NPT 90 Compression fitting	M2868	2
38	Flywheel	P05723C	1
39	Key	M1506	1
40	Flywheel washer	M1394	1
41	Hex head cap screw	M2265	1
42	Connecting rod assembly (includes items 43,44,45 & 46)	Z12121	4
43	Bearing insert (sold in pairs)	Z3255	4
44	Piston pin bearing	P03430A	4
45	Connecting rod bolt	P03458A	8
46	Connecting rod nut	P03459A	8
47	Low pressure piston with pin	ZM1906	2
48	Low pressure piston pin	M1395	2
49	Piston pin retaining ring	P03434A	8
50	Low pressure piston ring set	Z9087	2

**Repair Parts List
Compressor Model PL70A**

Ref. No.	Description	Part Number	Qty.
51	High pressure piston with pin	ZM1393	2
52	High pressure piston pin	M1383	2
53	High pressure piston ring set	Z9088	2
54	Cylinder flange gasket	M1391	2
55	Cylinder	P05863D	2
56	Hex head cap screw	M3461	12
57	Low pressure intake valve assembly	Z273	2
58	Low pressure valve gasket	P07352A	6
59	Spring	M1449	2
60	Hex nut	M926A	8
61	Lock washer	M919A	8
62	Unloader finger	M1815	2
63	Unloader piston rod	M1448	2
64	Unloader piston	P02287A	4
65	O-Ring	P02547A	4
66	Low pressure intake manifold	P09712D	2
67	Unloader cylinder	P02306A	4
68	Hex head cap screw	P04779A	16
69	Low pressure discharge valve assembly	Z274	2
70	Low pressure discharge manifold	M1423	2
71	Ferrule	P06064A	6
72	Compression nut	M1418	6
73	High pressure intake valve assembly	Z784	2
74	High pressure valve gasket	P07353A	8
75	Spring	M1450	2
76	Unloader finger	M1447	2
77	Unloader piston rod	M1452	2
78	High pressure intake manifold	M1426	2
79	Unloader cylinder gasket	P00746A	2
80	Interstage pressure relief valve	M3685	2
81	High pressure discharge valve assembly	Z785	2
82	High pressure discharge manifold	M1508	2
83	Intake filter	P07447A	2
84	Intake filter element	P05051A	2
85	Hex head cap screw	SE594	2
	Complete compressor pump gasket set (items 6,14,24 & 54)	Z9122	1
	Low pressure piston kit (items 47 & 50)	Z9108	2
	High pressure piston kit (items 51 & 53)	Z9107	2
	Complete compressor pump ring set (items 50 & 53)	Z9123	1
	Valve set with gaskets (items 57, 58, 69,73, 74 & 81)	Z614	1
	Valve gasket kit (items 58 & 74)	Z615	1

COMPRESSOR REPAIR PARTS ILLUSTRATION

Model: PL70A



C317-A
(Ref. Drawing)

Repair Parts List Models PL70A

Ref. No.	Description	Part Number	Qty.
1	1/4 x 1/8" NPT 90 Compression fitting	M2868	1
2	Manifold tube	M1510	1
3	1/4 x 1/4 x 1/8" NPT Tee compression fitting	M2879	3
4	Intermediate tube	M1512	1
5	Manifold tube	M1511	1
6	Head unloader tube	P10829A	1
7	Pilot valve (see VEI drawing 037-43-006)		1
8	1/4 x 1/4 x 1/8" NPT Tee compression fitting	M2868	1
9	Pipe bushing	M947B	1
10	Needle valve	P07717A	1
11	Tee fitting (see VEI drawing 037-43-006)		1
12	Shuttle valve tube	P10839A	1
13	Control valve tube	P10830A	1
14	Pilot valve bracket	M807	1
15	Hex head cap screw	M3465	1
16	Left intercooler (includes compression fittings)	ZM1432	1
17	Breather tube	P10828A	1
18	Left discharge tube (includes compression fittings)	ZM1533	1
19	Right intercooler (includes compression fittings)	ZM1433	1
20	Right discharge tube (includes compression fittings)	ZM1532	1
21	Ferrule	P06064A	2
22	Compression nut	M1418	2
23	Discharge tee	M1516	1
24	Pressure relief valve (175 psi)	P09704A	1
24	Pressure relief valve (250 psi)	P12078A	1
	Intercooler clamp (not shown)	M1537	1
	Intercooler clamp (not shown)	M1538	1
	Hex head cap screw (not shown)	M3471	2
	Speednut (not shown)	P03699A	2
	3/8 X 1/4" NPT 90 Compression fitting (Breather tube, not shown)	M2869	1

UNIT HAZARD DECAL LISTING

<u>PAGE</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
27	PRODUCT LIABILITY DECAL SHEET - MASTER	P10157A
	Unit Pressure Setting	1
	NOT USED	2
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	DANGER – Drain Tank Daily	4
	WARNING – Pressure/Safety Valve	5
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	WARNING – Hot Surfaces	9
	WARNING – Do Not Remove Fan Guard	10
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	NOT USED	11b
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	NOT USED	13
	DECAL – Pressure Setting: 140-175PSIG	14
	DECAL – Pressure Setting: 215-250PSIG	14
	NOTICE – Read and Retain Manuals	15
	INSTRUCTIONS – Dual Control	16
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	NOT USED	18
	DECAL – Pressure Switch	P14677A

PUMP HAZARD DECAL LISTING

<u>PAGE</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
28	PUMP DECAL SHEET – MASTER	P13805A
	NOT USED	A1
	NOTICE - Lubricants	A2
	DECAL – Rotation Direction	B
	NOTICE – Read and Retain Manuals	C
	DANGER – Breathing Air	D
	DECAL – Made in the United States of America	E
	IMPORTANT NOTICE – Motor Burn-outs	F

**DO NOT CONNECT
INCOMING POWER
SUPPLY TO PRESSURE
SWITCH.**

P14677A

UNIT HAZARD DECALS

1

UNIT PRESSURE SETTING

UNIT PRESSURE FACTORY SET AT

1

UNIT PRESSURE SETTING

UNIT PRESSURE FACTORY SET AT

2

⚠ WARNING

DO NOT START ENGINE UNLESS TANK PRESSURE IS BELOW 130 PSIG. TO REDUCE TANK PRESSURE, OPEN VALVE ADJACENT TO THIS DECAL.

3

⚠ DANGER

Air from this compressor must not be used for food processing or breathing without adequate filtering. Failure to comply will result in injury or death.

4

⚠ DANGER

DRAIN THIS TANK DAILY!
Failure to drain moisture will corrode tank material and lead to tank failure which will cause equipment damage, injury, or death.

5

⚠ WARNING

• **RELIEVE TANK PRESSURE BEFORE SERVICING.** Failure to do so can result in injury.
• **DO NOT ADJUST PRESSURE SWITCH, PILOT VALVE, OR SAFETY VALVES.** Exceeding factory settings can cause equipment damage and injury.

6

MODEL:

SERIAL NO:

12

FOOD GRADE

SYNTHETIC

11a

⚠ NOTICE

YOUR COMPRESSOR HAS BEEN TESTED AND SHIPPED WITH **Champion** LUBRICANT.

FOR OPTIMUM PERFORMANCE USE ONLY GENUINE CHAMPION PARTS AND OIL. CONTACT LOCAL CHAMPION DISTRIBUTOR FOR ADDITIONAL LUBRICANT AND REPLACEMENT PARTS.

11b

⚠ NOTICE

YOUR COMPRESSOR HAS BEEN TESTED AND SHIPPED WITH **AEON** LUBRICANT.

FOR OPTIMUM PERFORMANCE USE ONLY GENUINE AEON DENVER PARTS AND OIL. CONTACT LOCAL AEON DISTRIBUTOR FOR ADDITIONAL LUBRICANT AND REPLACEMENT PARTS.

13

AC-SY

AC-HC

14

85-115 PSIG

95-125 PSIG

130-165 PSIG

140-170 PSIG

140-175 PSIG

215-250 PSIG

20-40 PSIG

60-80 PSIG

60-90 PSIG

70-90 PSIG

70-100 PSIG

80-100 PSIG

14

85-115 PSIG

95-125 PSIG

130-165 PSIG

140-170 PSIG

140-175 PSIG

215-250 PSIG

20-40 PSIG

60-80 PSIG

60-90 PSIG

70-90 PSIG

70-100 PSIG

80-100 PSIG

18

RESET

RESET

18

RESET

RESET

7

⚠ DANGER

Valves must be replaced in original position. Failure to do this will result in equipment damage, injury, or death. Do not disassemble valves.

9

⚠ WARNING

Do not touch hot surfaces! Contact with these surfaces can cause injury.

10

⚠ WARNING

DO NOT REMOVE BELT OR FAN GUARD. Removal will expose rotating parts which can cause severe injury and/or property damage.

8

⚠ DANGER

HIGH VOLTAGE. DISCONNECT POWER SOURCE BEFORE SERVICING.

9

⚠ WARNING

Do not touch hot surfaces! Contact with these surfaces can cause injury.

10

⚠ WARNING

DO NOT REMOVE BELT OR FAN GUARD. Removal will expose rotating parts which can cause severe injury and/or property damage.

15

⚠ NOTICE

Read, understand and retain all labels and Owners Manuals before using this equipment.
IMPORTANT: Please keep the operating Instructions with this compressor unit.

Master Decal Set
P/N P10157A

16

INSTRUCTIONS
DUAL CONTROL

This unit is equipped with a dual control valve. Open valve completely for continuous run operation. Close valve completely for start-stop operation.

17

ROTATION IN DIRECTION OF ARROW

ROTATION IN DIRECTION OF ARROW

ROTATION IN DIRECTION OF ARROW

ROTATION IN DIRECTION OF ARROW

PUMP HAZARD DECALS

A1

⚠ NOTICE

THIS COMPRESSOR HAS BEEN
FACTORY FILLED WITH **AEDM**

AC-SY AC-FG

AC-HC

DO NOT MIX OIL TYPES OR BRANDS.

A2

⚠ NOTICE

THIS COMPRESSOR HAS BEEN
FACTORY FILLED WITH *PlumbLife*


SYNTHETIC FOOD GRADE

MINERAL

DO NOT MIX OIL TYPES OR BRANDS.

B

ROTATION IN DIRECTION OF ARROW



ROTATION IN DIRECTION OF ARROW

C

⚠ NOTICE


Read, understand, & retain all
Labels and Owners Manuals
before using this equipment.

D

⚠ DANGER

AIR FROM THIS COMPRESSOR
MUST NOT BE USED FOR FOOD
PROCESSING OR BREATHING
WITHOUT ADEQUATE FILTERING.


E



Master Decal Set
P/N P13805A

F **IMPORTANT NOTICE!**

THIS UNIT IS WIRED FOR AN AC CIRCUIT OF




<input type="checkbox"/> 115 VOLT	<input type="checkbox"/> 60 CYCLE	<input type="checkbox"/> 1 PHASE
<input type="checkbox"/> 230 VOLT	<input type="checkbox"/> OTHER	<input type="checkbox"/> 3 PHASE
<input type="checkbox"/> 460 VOLT		

OTHER ELECTRICAL SPECS _____

P05257A

IMPORTANT



MOTOR BURN-OUTS ARE NOT COVERED BY
WARRANTY - Unless Motor is Equipped with
Factory Installed thermal overload protection
(in either motor or starting device)

P05257A

RECORD OF MAINTENANCE SERVICE

DAILY <ul style="list-style-type: none">• CHECK OIL LEVEL• DRAIN MOISTURE FROM TANK							
WEEKLY <ul style="list-style-type: none">• CLEAN FILTER• CLEAN COMPRESSOR• CHECK V-BELTS				MONTHLY <ul style="list-style-type: none">• INSPECT AIR SYSTEM		EVERY 3 MONTHS <ul style="list-style-type: none">• CHANGE OIL & OIL FILTER• INSPECT VALVE ASSEMBLIES• TIGHTEN ALL FASTENERS• TEST PRESSURE RELIEF VALVE	

RECORD OF MAINTENANCE SERVICE

DAILY • CHECK OIL LEVEL • DRAIN MOISTURE FROM TANK							
WEEKLY • CLEAN FILTER • CLEAN COMPRESSOR • CHECK V-BELTS				MONTHLY • INSPECT AIR SYSTEM		EVERY 3 MONTHS • CHANGE OIL & OIL FILTER • INSPECT VALVE ASSEMBLIES • TIGHTEN ALL FASTENERS • TEST PRESSURE RELIEF VALVE	

RECORD OF MAINTENANCE SERVICE

DAILY <ul style="list-style-type: none"> • CHECK OIL LEVEL • DRAIN MOISTURE FROM TANK 							
WEEKLY <ul style="list-style-type: none"> • CLEAN FILTER • CLEAN COMPRESSOR • CHECK V-BELTS 				MONTHLY <ul style="list-style-type: none"> • INSPECT AIR SYSTEM 		EVERY 3 MONTHS <ul style="list-style-type: none"> • CHANGE OIL & OIL FILTER • INSPECT VALVE ASSEMBLIES • TIGHTEN ALL FASTENERS • TEST PRESSURE RELIEF VALVE 	

**FOR PARTS: REFER TO PARTS DEPOT LIST
ACCOMPANYING THIS MANUAL.**

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A Gardner Denver Product

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E-mail: champion@championpneumatic.com

Plants in Princeton, IL, and Manteca, CA

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specifications and materials are subject to change without notice or
obligation

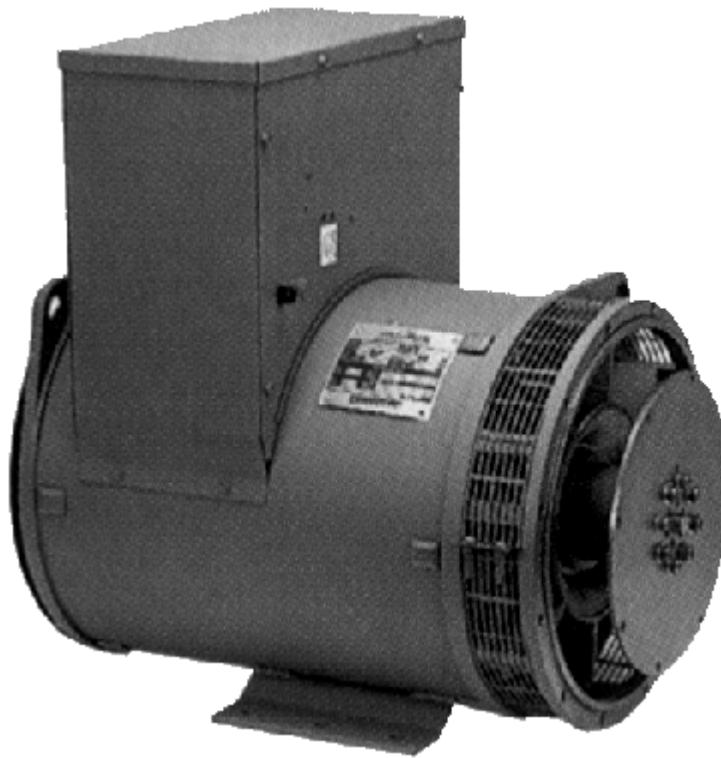


Appendix B — AC Generator and Voltage Regulator

The following pages are taken from information published by the original equipment manufacturer (OEM), and are subject to change without notice.

MAGNAPLUS GENERATOR

280 -- 430 Frame Installation, Operation and Maintenance Manual



Marathon Electric
A Subsidiary of Regal-Beloit Corp.
100 East Randolph Street
P.O. Box 8003
Wausau, WI 54402-8003
Phone: (715) 675 3311
Fax: (715) 675 6361

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SAFETY

PLEASE REMEMBER SAFETY FIRST. If you are not sure of the instructions or procedures contained herein, seek qualified help before continuing.

This service manual emphasizes the safety precautions necessary during the installation, operation, and maintenance of your MagnaPLUS generator. Each section of this manual has caution and warning messages. These messages are for your safety, and the safety of the equipment involved. If any of these cautions or warnings is not readily understood, seek clarification from qualified personnel before proceeding.

Before any service work is done, disconnect all power sources and lock out all controls to prevent an unexpected start-up of the generator set driver. Proper grounding (earthing) of the generator frame and distribution system in compliance with local and national electrical codes and specific site requirements must be provided. These safety precautions are necessary to prevent potential serious personal injury, or even death.

The hazards associated with lifting or moving your MagnaPLUS generator are pointed out in the installation and maintenance sections. Incorrect lifting or moving can result in personal injury or damage to the unit.

Prior to start-up of the unit ensure that all generator leads are properly connected to the generator link board located inside the connection box. Always assume that there will be voltage present at the generator terminals whenever the generator's shaft is rotating, and proceed accordingly. Residual voltage is present at the generator terminals and at the automatic voltage regulator panel connections even with the regulator fuse removed. Caution must be exercised, or serious injury or death can result.

This manual is not intended to be a substitute for properly trained personnel. Installation and repairs should only be attempted by qualified, trained people. The cautions and warnings point out known conditions and situations that are potentially hazardous. Each installation may well create its own set of hazards

When in doubt, ask. Questions are much easier to handle than mistakes caused by a misunderstanding of the information presented in this manual.

RECEIVING AND STORAGE

RECEIVING AND STORAGE

Upon receipt of the generator, it is recommended that it be carefully examined for possible shipping damage. The generator was given to the freight carrier in good condition; thus, the carrier is responsible for the product from the factory dock to the destination. Any damage should be noted on the freight bill before accepting the shipment. Any claims for damage must be promptly filed with the delivering carrier.

UNPACKING AND HANDLING

Carefully read all instruction tags shipped with the unit. When lifting, attach an overhead crane to the lifting lug(s) on the generator frame. Apply lifting forces in a vertical direction. When transporting single bearing generators, the generator's rotor must be adequately supported to prevent damage.

WARNING

THE LIFTING LUG (S) ON THE GENERATOR ARE DESIGNED TO SUPPORT THE GENERATOR ONLY. DO NOT LIFT A COMPLETE GENERATOR AND DRIVER ASSEMBLY BY MEANS OF LIFTING LUG (S) ON THE GENERATOR. PERSONAL INJURY OR EQUIPMENT DAMAGE MAY RESULT.

STORAGE

In the event that the generator is not immediately installed on its prime mover, it is recommended that the unit be stored indoors in a clean, dry area, which is not subject to rapid changes in temperature and humidity. If the generator is stored for a long period of time, the generator should be tested, cleaned and dried as required before being put into service. See the maintenance section of this manual for further information. If the unit has been stored in an area where it has been subject to vibration, it is recommended that the bearing(s) be inspected and replaced as necessary.

PRINCIPLES OF OPERATION

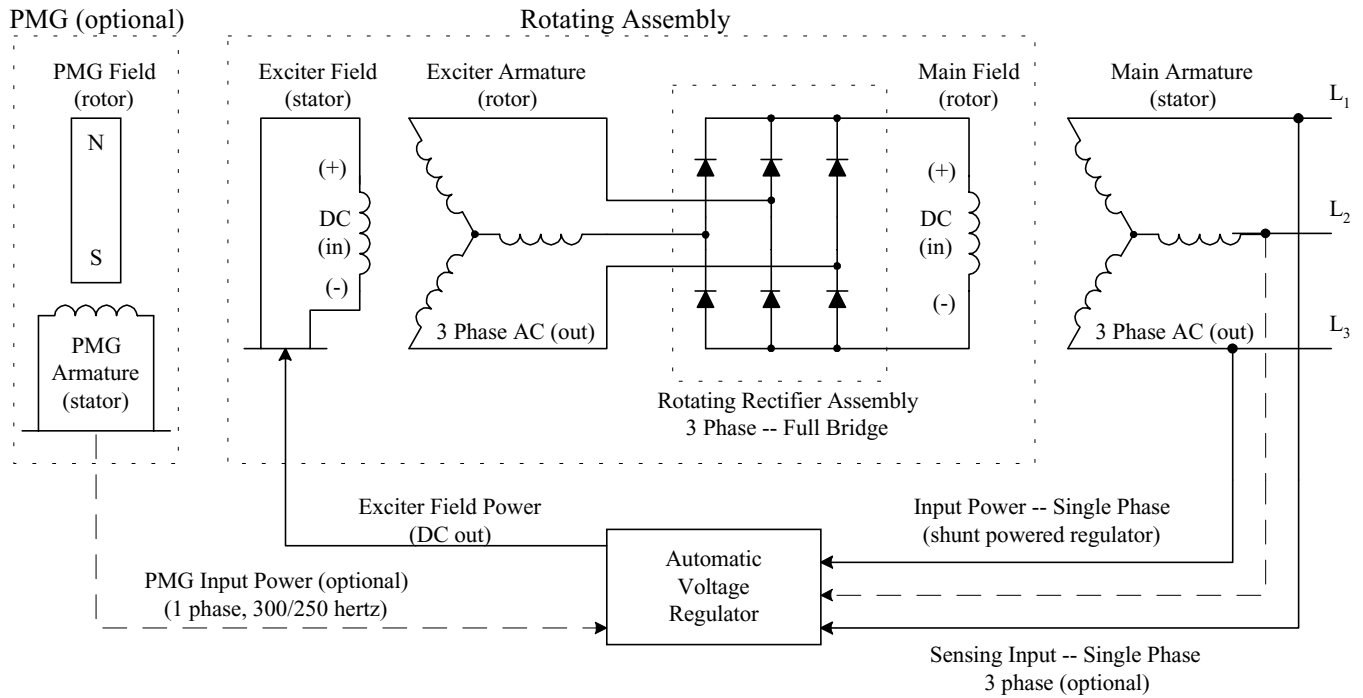


FIGURE 1 -- MagnaPLUS Circuit Diagram

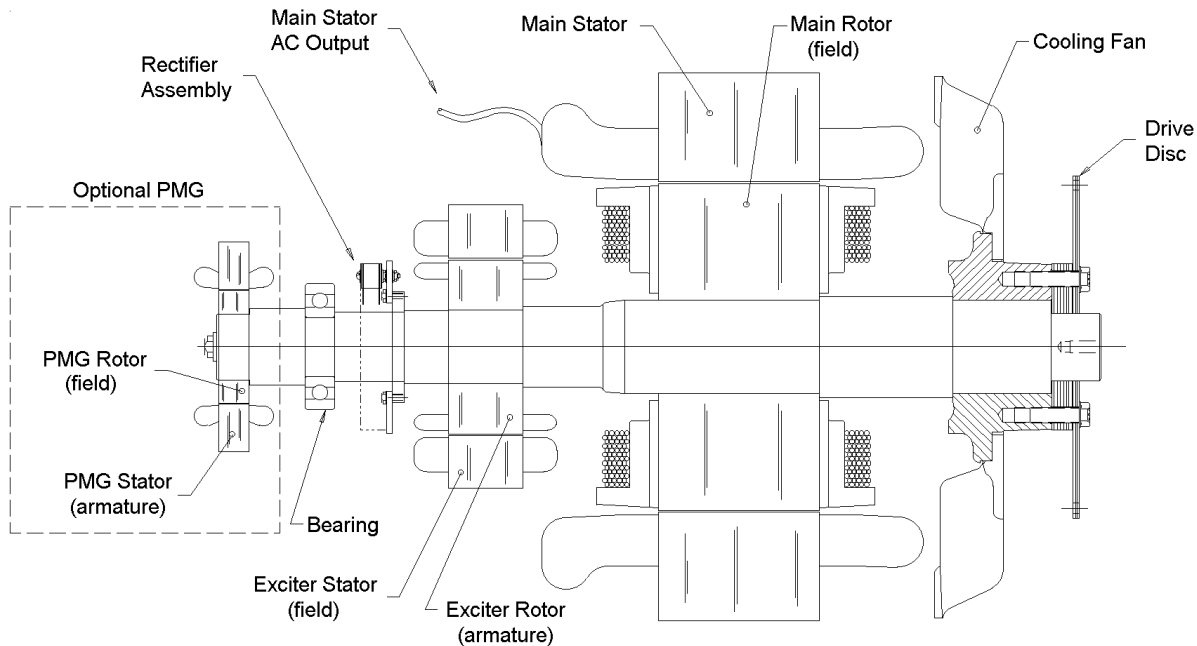


FIGURE 2 -- Typical MagnaPLUS Layout Diagram

PRINCIPLE OF OPERATION

MagnaPLUS generators are a brushless, self excited, and externally voltage regulated, synchronous AC generator. The generator is made up of six major components: main stator (armature), main rotor (field), exciter stator (field), exciter rotor (armature), rectifier assembly, and voltage regulator. In understanding the above terminology, note the following: stators are stationary, rotors rotate, a field is an electrical input, and an armature is an electrical output. These system components are electrically interconnected as shown in figure 1 and physically located as shown in figure 2.

The generator's exciter consists of a stationary field and a rotating armature. The stationary field (exciter stator) is designed to be the primary source of the generator's residual magnetism. This residual magnetism allows the exciter rotor (armature) to produce AC voltage even when the exciter stator (field) is not powered. This AC voltage is rectified to DC by the rotating rectifier assembly and fed directly to the main rotor (field). As the generator shaft continues to rotate, the main rotor (field) induces a voltage into the generator's main stator (armature). At rated speed, the main stator's voltage produced by the residual magnetism of the exciter allows the automatic voltage regulator to function. The regulator provides voltage to the exciter resulting in a build-up of generator terminal voltage. This system of using residual magnetism eliminates the need for a special field flashing circuit in the regulator. After the generator has established the initial residual voltage, the regulator provides a controlled DC field voltage to the exciter stator resulting in a controlled generator terminal voltage.

Voltage Regulation

In the standard configuration (shunt excited), the automatic voltage regulator receives both its input power and voltage sensing from the generator's output terminals (See Figure 1). With the optional PMG configuration, the regulator receives input power from the PMG. The regulator automatically monitors the generator's output voltage against an internal reference set point and provides the necessary DC output voltage to the exciter field required to maintain constant generator terminal voltage. Adjusting the regulator's reference set point changes the generator's terminal voltage. Consult the regulator manual for specific adjustment and operating instructions.

MOTOR STARTING

When a motor is started, the motor draws a large surge of current. This starting current is equivalent to the motors locked rotor or stall current and is 5 to 10 times' normal full load current. When the generator supplies this in-rush of starting current, the generator voltage dips temporarily. If the motor is too large for the generator, the generator's voltage dips greater than 30 percent. This may result in the motor starter de-energizing or the motor stalling. MagnaPlus

generators generally supply .3 to .4 horsepower per generator kW in motor starting capability. For specific data contact Marathon Electric.

PARALLEL OPERATION

All MagnaPlus generators are built with 2/3 pitch main stator windings and full amortisseur (damper) windings. These features make the MagnaPlus generators suitable for parallel operation when equipped with the proper voltage regulators and voltage regulator accessories. Consult with the factory for further information relative to parallel operations.

NONLINEAR LOADING

Solid state electronic control devices (variable frequency drives, precision motor controls, battery chargers, etc.) utilize electronic switching circuits (thyristors, SCRs, Diodes, etc.). These switching circuits introduce high frequency harmonics, which distort the normal waveform of the generator. This creates additional heat in the generator windings and may cause the generator to over-heat. Problems that can occur are not limited to the generator. Poor wave shape may adversely effect various loads connected to the generator. Consult Marathon Electric for further information relative to nonlinear loads.

INSTALLATION

PREPARATION FOR USE

Although the generator has been carefully inspected and tested in operation prior to shipment from the factory, it is recommended that the generator be thoroughly inspected. Check all bolts for tightness and examine the insulation on lead wires for chafing prior to proceeding with installation. Remove all shipping tapes, bags, skids and rotor support blocking. For two bearing units, rotate the shaft by hand to ensure that it rotates smoothly without binding.

WARNING

DISABLE AND LOCKOUT ANY ENGINE CRANKING DEVICES BEFORE ATTEMPTING TO INSTALL OR SERVICE THE GENERATOR. FOR ELECTRIC START SETS, DISCONNECT THE CRANKING BATTERY. FOR AIR START, DISCONNECT THE AIR SUPPLY. FOR MOTOR GENERATOR SETS, OPEN THE POWER SUPPLY TO THE DRIVE MOTOR. FAILURE TO COMPLY WITH THESE SAFETY PROCEDURES COULD RESULT IN SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE.

NEVER "BAR OVER" THE ENGINE GENERATOR SET USING THE GENERATOR'S FAN. THE FAN IS NOT DESIGNED FOR THIS PURPOSE. BARRING OVER THE SET WITH THE FAN COULD DAMAGE THE FAN AND RESULT IN PERSONAL INJURY OR EQUIPMENT DAMAGE.

GENERATOR MOUNTING

Single Bearing Units.

Single bearing units are provided with an SAE flywheel housing adapter flange and flexible drive discs. Coupling the generator's shaft to the engine flywheel is accomplished with special steel drive discs bolted to the shaft. In addition to the drive discs, there may be a hub spacer, spacer discs, or a combination of hub spacer and spacer discs inserted between the drive discs and the shaft to achieve the proper shaft extension ("G" dimension per SAE J620c). Holes are provided in the periphery of the coupling discs, which correspond to tapped holes in the prime mover's flywheel. The outside diameter of the drive discs fit in a rabbet in the flywheel so that concentricity is assured.

Grade 8 place bolts and hardened washers are recommended to mount the drive discs to the flywheel. DO NOT USE SPLIT TYPE LOCK WASHERS. Split lock washers when biting into the drive disc cause stress risers, which may result in the disc fracturing.

The SAE flywheel housing adapter ring and the engine flywheel housing are designed to match each other with no further alignment necessary. Use grade 5 or greater mounting bolts. MagnaPLUS generator frames are constructed with two or three boltholes per foot. The feet should be shimmed where necessary to obtain solid contact with the sub-base. With the frame securely bolted to the engine flywheel housing, there is no side thrust or pull on the generator frame, thus no real need to secure the feet with more than one bolt per foot.

GENERATOR MOUNTING

Two Bearing Generators -- Direct Drive

Two bearing generators are provided with a keyed shaft extension. For direct drive generators, the assembler furnishes a flexible coupling, which is installed between the

driver and the generator's shaft. Aligning the generator and its driver as accurately as possible will reduce vibration, increase bearing life, and ensure minimum coupling wear. It may be necessary to shim the generator feet for proper support and alignment. Secure the feet of the generator with grade 5 or greater bolts through the holes provided in the mounting feet. Consult the coupling manufacturer's instructions for alignment specifications and procedures.

GENERATOR MOUNTING

Two Bearing Units -- Belt Driven

Two bearing MagnaPLUS generators can be belt driven provided belts are sized and applied correctly. Please refer to your supplier of belts and sheaves for correct sizing and tensioning specifications. A bearing life calculation should be performed. Marathon Electric recommends a minimum B-10 life of 40,000 hours. If cog type belts are used, a vibration may be introduced which could lead to premature failure of the bearings.

END PLAY TESTING

Refer to the engine manual for recommended endplay specifications and measurement procedures. If endplay is not to specification, it is an indication that the generator shaft is not moving freely in the assembly, and normal life of the thrust bearing could be impaired. Probable causes of this problem are:

1. Improper seating of drive discs in the flywheel resulting in misalignment.
2. Improper mating of generator frame to engine flywheel housing resulting in misalignment.
3. Improper "G" dimension per SAE J620c on either the engine or generator.

TORSIONAL VIBRATION

Torsional vibrations are generated in all rotating shaft systems. In some cases, the amplitude of these vibrations at critical speeds may cause damage to the generator, its driver, or both. It is therefore necessary to examine the torsional vibration effect on the entire rotating system. IT IS THE RESPONSIBILITY OF THE GENERATOR SET ASSEMBLER TO ASSURE THE TORSIONAL COMPATIBILITY OF THE GENERATOR AND ITS DRIVER. Drawings showing pertinent dimensions and weights of the rotating assembly will be supplied by Marathon Electric upon request.

ENVIRONMENTAL CONSIDERATIONS

The MagnaPLUS generator is designed for heavy-duty industrial applications; however, dirt, moisture, heat and vibrations are enemies of rotating electrical machinery. Excessive exposure to the elements may shorten generator life. The temperature of the cooling air entering the intake openings of the generator should not exceed the ambient temperature shown on the generator's nameplate. Generators intended for outdoor application should be protected with housings having adequate ventilation. Although the standard insulation systems are moisture and humidity resistant, space heaters are recommended for extreme conditions. If the generator is to be installed in an area where blowing sand and dust are present, the enclosure should be fitted with filters. Filters reduce erosion on the generator's insulation by blocking high velocity abrasive particles generated by the flow of cooling air through the generator. Consult the factory for appropriate filters and generator deratings required.

WIRING CONNECTIONS

Wiring of the generator and accessories should be done in accordance with good electrical practices. Follow government, industry and association standards.

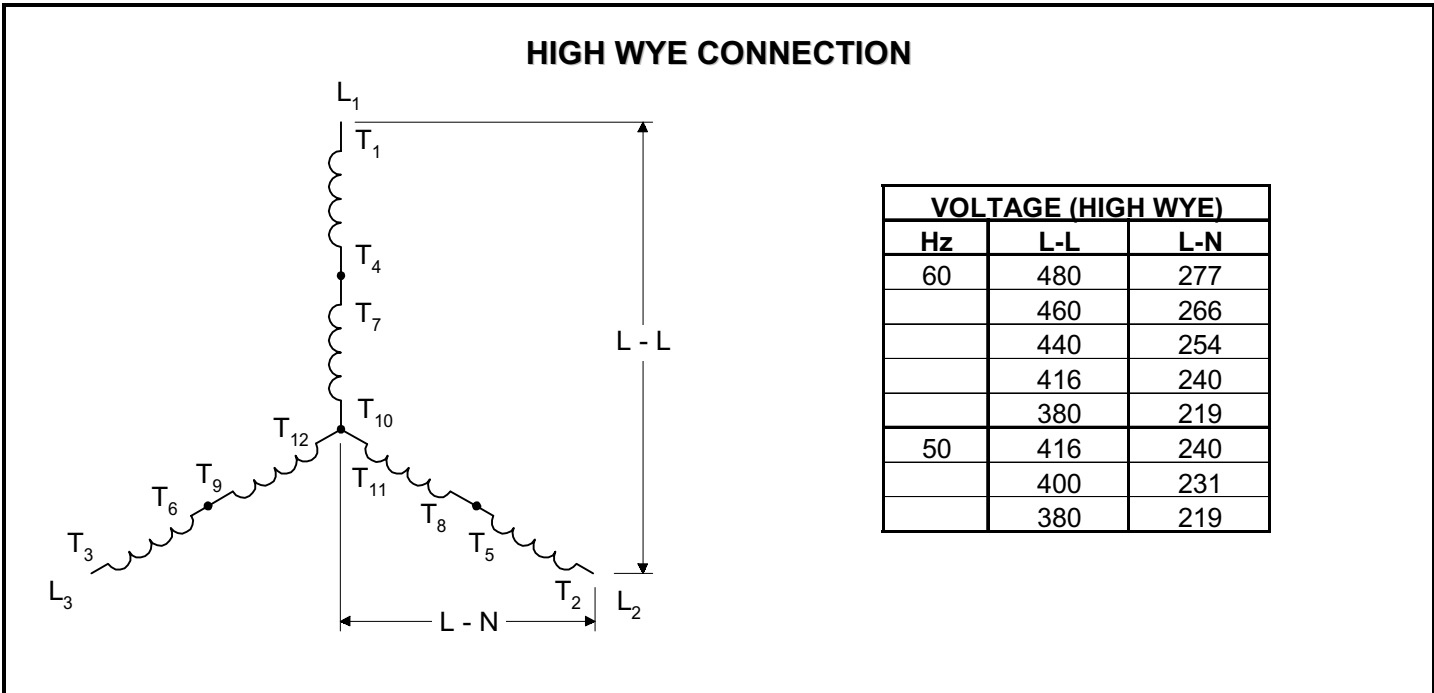
The generator conduit box construction allows cable entry from multiple sides. A hole saw or other appropriate tool may be used to provide for conduit entrance. Protect the interior of the generator from shavings when drilling or sawing. An approved connector must be used in conjunction

with the conduit. To minimize the transmission of vibration, it is essential that flexible conduit be used for all electrical entrance to the generator conduit box.

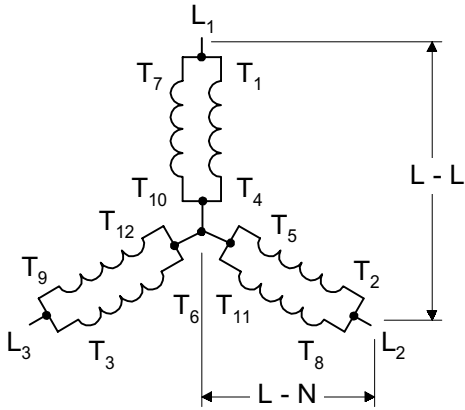
All MagnaPLUS generators are equipped with link boards (terminal strips) for both internal and external connections. All connections made to the studs of the link board should be made with high quality ring terminals. Ring terminal sizes are 6 mm (280 Series Frames) and 10 mm (360 and 430 Series Frames). Torque link board connections to the following specifications: 280 frame -- 5.4 NM (4 Ft LB); 360 & 430 frame -- 27 NM (20 Ft LB).

Refer to the connection diagram supplied with the generator and / or the proper diagrams shown in this manual. Install all inter-component and external wiring in accordance with national and local electrical codes. The neutral in the following connection diagrams shown below may be either grounded (earthed) or left above ground potential (floating). See national and local codes and / or the system distribution wiring schematic diagram for the proper connection of the neutral.

The following connection diagrams are shown for twelve lead generators. Ten lead generators have the same terminal designations except for leads T10, T11, and T12. These three leads are internally connected inside the generator and brought out as a single lead (T0). Ten lead generators can only be connected in a wye configuration

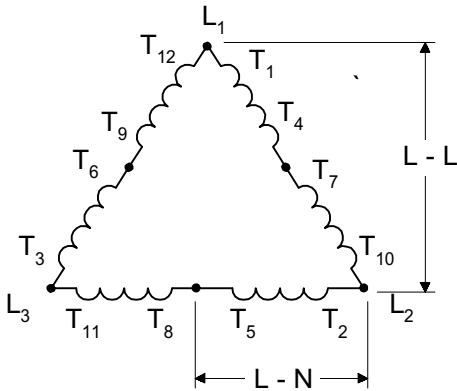


LOW WYE CONNECTION



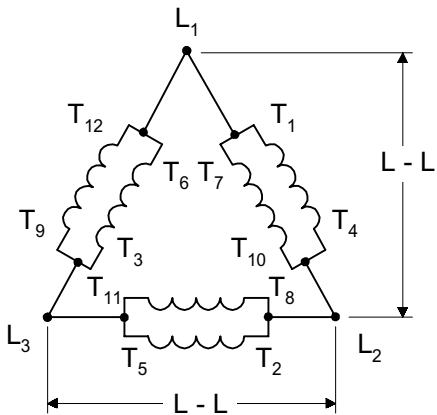
VOLTAGE (LOW WYE)		
Hz	L-L	L-N
60	240	139
	230	133
	220	127
	208	120
	190	110
50	208	120
	200	115
	190	110

HIGH DELTA CONNECTION



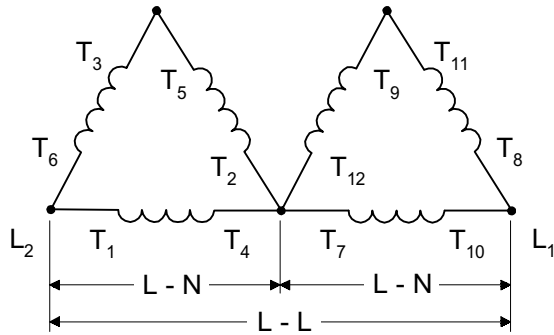
VOLTAGE (HIGH DELTA)		
Hz	L-L	L-N
60	277	139
	240	120
50	240	120
	220	110
	200	100

LOW DELTA CONNECTION



VOLTAGE (LOW DELTA)		
Hz	L-L	L-N
60	120	NA
	110	NA
50	110	NA
	100	NA

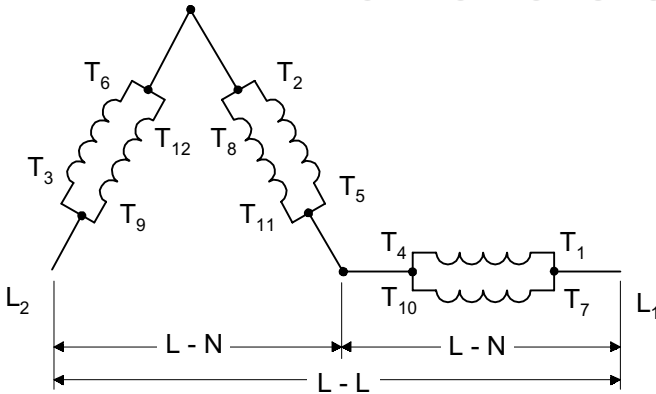
DOUBLE DELTA -- SINGLE PHASE CONNECTION



VOLTAGE (DOUBLE DELTA)		
Hz	L-L	L-N
60	240	120
	220	110
50	220	110

Note: Single-phase KW/KVA ratings are approximately equal to 50% of the generator's three phase ratings.

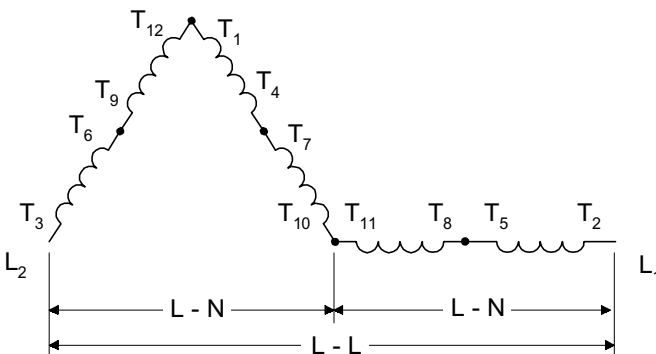
LOW ZIG ZAG -- SINGLE PHASE CONNECTION



VOLTAGE (LOW ZIGZAG)		
Hz	L-L	L-N
60	240	120
	220	110
50	220	110
	200	100

Note: Single-phase KW/KVA ratings are approximately equal to 50% of the generator's three phase ratings.

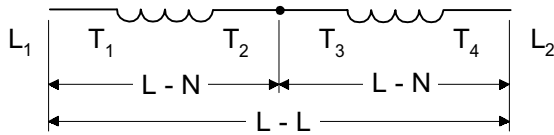
HIGH ZIG ZAG -- SINGLE PHASE CONNECTION



VOLTAGE (HIGH ZIGZAG)		
Hz	L-L	L-N
60	480	240
	460	220
50	415	208
	380	190

Note: Single-phase KW/KVA ratings are approximately equal to 50% of the generator's three phase ratings.

DEDICATED SINGLE PHASE CONNECTION



VOLTAGE (DEDICATED)		
Hz	L-L	L-N
60	240	120
	220	110
50	220	110
	200	100

OPERATION

PRE-START INSPECTION

Before starting the generator for the first time, the following inspection checks are recommended:

1. A visual inspection should be made for any loose parts, bad connections, or foreign materials.
2. Bar the set over by hand for at least 2 revolutions to be sure that there is no interference and that the set turns freely. If the set does not turn freely, check for clearance in the generator and exciter air gap.
3. Check all wiring against the proper connection diagrams, and ensure that all connections and terminations are tight and properly insulated.

WARNING

MAGNAPLUS GENERATORS MAY HAVE VOLTAGE PRESENT AT THE LEAD TERMINALS WHEN THE SHAFT IS ROTATING. DO NOT PERMIT OPERATION OF THE GENERATOR UNTIL ALL LEADS HAVE BEEN CONNECTED AND INSULATED. FAILURE TO DO THIS MAY RESULT IN PERSONAL INJURY OR EQUIPMENT DAMAGE

4. Verify that all equipment is properly grounded (earthed).
5. Clear the surrounding area of any materials that could be drawn into the generator.
6. Check all fasteners for tightness.
7. Check all access plates, covers, screens and guards. If they have been removed for assembly or inspection, reinstall and check for security.

8. Review all prime mover prestart-up instructions, and ensure that all recommended steps and procedures have been followed.
9. Remove any masking materials affixed during painting. Inspect the generator, prime mover, and any accessory equipment to ensure that nameplates, and all safety warning / caution signs and decals provided with the equipment are in place and clearly visible.

Note: It is strongly recommended that the authority having jurisdiction over the installation site be consulted to determine if any additional warning or caution notices, or additional safety devices are required by local codes / standards. Any such required notices or devices should be installed prior to initial startup.

START-UP

The following procedure should be followed when starting the generator set for the first time.

1. The generator output must be disconnected from the load. Be sure that the main circuit breaker or fused disconnect is in the open position.
2. Open the input power to the automatic voltage regulator. Remove the fuse or disconnect and insulate one of the regulator input power leads. (See separate regulator manual)
3. Verify that all prime mover start-up procedures have been followed.
4. If the unit is provided with space heaters, ensure that they are de-energized. In some installations, a set of auxiliary contacts on the main circuit breaker or transfer switch will automatically open the space heater circuit when the generator is connected to the load.
5. Start the prime mover, and adjust it for proper speed. See generator nameplate.

6. The purpose of this initial test with the regulator out of the circuit is to detect any wiring mistakes without exposing the unit to undue risk. Check all line to line and line to neutral voltages for balanced voltage. If voltages are balanced shut down the set and reconnect the regulator. If voltages are unbalanced, shut down the equipment and check for improper wiring. If the problem persists, consult the factory.

With the regulator de-energized, the residual voltage should be 10 - 25% of rated value. It is recommended that this residual voltage and driver RPM be recorded for use as a future troubleshooting benchmark.

WARNING

QUALIFIED ELECTRICAL PERSONNEL MUST CONDUCT THE FOLLOWING TEST. LETHAL VOLTAGE MAY BE PRESENT AT BOTH THE GENERATOR AND VOLTAGE REGULATOR TERMINALS DURING THIS PROCEDURE. CAUTION MUST BE EXERCISED NOT TO COME INTO PERSONAL CONTACT WITH LIVE TERMINALS, LINKS, OR STUDS. SERIOUS INJURY OR DEATH COULD RESULT.

7. Start the set and adjust the terminal voltage to the desired value by means of the regulator voltage adjustment. If the regulator is equipped with a stability adjustment, follow the instructions in the regulator manual to adjust the stability. Again, check all line to line and line to neutral voltages for balance. It is recommended practice to record the no load excitation (DC voltage to the exciter stator), generator terminal voltage, and driver speed as a benchmark for future troubleshooting.
8. Close the main circuit breaker to the load.
9. Monitor the generator output current to verify that it is at or below nameplate value.
10. Check generator speed (frequency) under load. Adjust as necessary. (Refer to prime mover or governor manuals)

SHUTDOWN PROCEDURE

There are no specific instructions for shutting down the generator; however, several good practices should be observed to prolong equipment life.

1. It is advisable to disconnect all loads (open main circuit breaker or disconnect) prior to shutdown. This is especially important if loads can be damaged by low voltage or low frequency conditions during generator "coast down".
2. Isolate all conditions that could apply voltage to the generator terminals while the generator is at rest. Failure to comply could result in personnel injury or equipment damage.

3. If the unit is equipped with space heaters, verify that the heater circuit is energized.

MAINTENANCE

The following maintenance procedures should be followed to ensure long equipment life and satisfactory performance. Maintenance intervals will depend upon operating conditions.

1. Routinely check intake and exhaust air screens to ensure that they are clean and free of debris. Clogged intake air screens will reduce cooling airflow and result in higher operating temperatures. This will reduce generator life and may result in generator damage.
2. All MagnaPLUS generators are equipped with double shielded ball bearings lubricated for the life of the bearing. Every 1,000 hours check the bearing(s) for smooth, quiet operation. For continuous duty generators, recommended practice is to replace the bearing during major overhauls of the engine.
3. Periodically inspect the unit for any buildup of contamination (dirt, oil, etc.) on the windings. If the wound components have become coated with heavy concentrations of oil and grime, the unit should be disassembled and thoroughly cleaned. This operation is not one that can be accomplished effectively on site, but rather one that should be conducted by an authorized service center equipped with the appropriate apparatus and solvents necessary to properly clean and dry the generator.

WARNING

QUALIFIED ELECTRICAL PERSONNEL MUST CONDUCT THE FOLLOWING TEST. LETHAL VOLTAGE MAY BE PRESENT AT BOTH THE GENERATOR AND VOLTAGE REGULATOR TERMINALS DURING THIS PROCEDURE. CAUTION MUST BE EXERCISED NOT TO COME INTO PERSONAL CONTACT WITH LIVE TERMINALS, LINKS, OR STUDS. SERIOUS INJURY OR DEATH COULD RESULT.

4. Every 2,000 operating hours or in conjunction with scheduled engine maintenance check the DC no load excitation voltage per item #7 in the startup procedure. Compare this voltage with the value recorded during initial startup. If this value of no load excitation voltage is markedly higher than the benchmark reading, it is an indication of problems in the exciter, main field, or the rotating rectifier assembly. Ensure that RPM is the same as initial test.
5. Monitor and record insulation resistance with a 500 volt mega-ohm meter. The minimum acceptable reading is 2 mega-ohms. If the reading drops below the minimum, the generator should be cleaned and dried at an authorized service shop. Consult Marathon Electric for more information.

DRYING WINDINGS

Generators in service may inadvertently have their windings exposed to splashing or sprayed water. Units that have been in transit or storage for long periods of time may be subjected to extreme temperature and moisture changes causing excessive condensation. Regardless of the source of moisture, wet windings should be thoroughly dried out before operating the unit. If this precaution is not taken, serious damage to the generator can result. The following procedures may be utilized in drying the generator's windings. Winding wetness and situation limitations will influence the method selected.

Space Heaters

An electric heater may have been supplied with the generator. When energized from a power source other than the generator, the heater will gradually dry the generator. Enclosing the unit with covering and inserting additional heating units can accelerate this process. A hole should be left at the top of the covering to permit the escape of moisture. Care should be taken not to overheat various accessory equipment mounted with the generator.

Forced Air

Another method to dry the generator is to run the set with no excitation (see startup procedure item #2). The natural flow of ambient air through the generator will tend to dry the windings. This method can be accelerated by adding a source of heat at the air intake to the generator. Heat at point of entry should not exceed 80 C (180 F).

TESTING

Visual Inspection

Remove covers and look for any obvious problems: burnt windings, loose connections, broken wires, frayed insulation, cracked brackets, missing hardware, etc. Check for foreign objects that may have been drawn into the generator. Verify that the generator's air gaps (main rotor and exciter) are free from obstructions. If possible, rotate the generator manually to ensure free rotation. Never "bar over" the engine generator set using the generator fan.

WARNING

QUALIFIED ELECTRICAL PERSONNEL MUST CONDUCT THE FOLLOWING TEST. LETHAL VOLTAGE MAY BE PRESENT AT BOTH THE GENERATOR AND VOLTAGE REGULATOR TERMINALS DURING THIS PROCEDURE. CAUTION MUST BE EXERCISED NOT TO COME INTO PERSONAL CONTACT WITH LIVE TERMINALS, LINKS, OR STUDS. SERIOUS INJURY OR DEATH COULD RESULT.

Constant Excitation Test (12V BATTERY TEST)

The generator "no load" voltage is dependent on exciter input voltage and generator speed. With the generator operating at rated speed and 12 volts dc applied to the exciter field, the generator's terminal voltage will be near rated value.

1. Shutdown the generator set and connect a voltmeter on the generator terminals.
2. Disconnect the regulator's F+ (F1) and F- (F2) leads and connect them to a 12V battery. Caution should be taken to ensure that the battery is not exposed to any potential arcing.
3. With no load on the generator (main breaker open) run the generator at rated speed. Measure the generator's terminal voltage and compare this value with values recorded during installation.

If voltage readings are normal, the main generator and excitation are operating properly. Troubleshooting should continue with the regulator. If readings are not normal the problem is in the generator. Continue testing diodes, surge suppressor, and windings.

Continuity / Resistance Test

The generator has four components that can be checked using an ohmmeter: exciter stator, exciter rotor, main stator and main rotor. Each of these components is comprised of various windings that form a complete electrical path of relatively low resistance. Using an ohm meter measure the loop resistance of each component. Compare these measured values with the values listed in the specification section of this manual. Note that very small resistance values require precision equipment to make accurate measurements; however, a standard ohmmeter will provide a good indication of winding continuity.

Insulation Test

Insulation resistance is a measure of the integrity of the insulating materials that separate the electrical windings from the generator's steel core. This resistance can degrade over time or be degraded by contaminants: dust, dirt, oil, grease, and especially moisture. Most winding failures are due to a breakdown in the insulation system. In many cases, low insulation resistance is caused by moisture collected when the generator is shutdown

Insulation resistance is measured with a megger (mega-ohm meter). A megger measures insulation resistance by placing 500 volts between the winding and the frame of the generator. Caution must be taken to remove all electronic devices (regulators, diodes, surge protectors, capacitors, protective relays, etc.) from the winding circuit before checking the insulation. Winding insulation can be checked on the main stator, main rotor, exciter stator, and exciter rotor. Minimum resistance is 2 mega-ohms. If the winding resistance is low it must be dried (see maintenance section) or repaired.

DIODE TESTING

If the generator is close coupled to an engine, it may be necessary to "bar over" the engine in order to gain access to a given area of the rectifier assembly. **NEVER** use the generator's fan as a fulcrum to accomplish this. Use the engine manufacturer's recommended practice to manually turn over the engine. To prevent possible injury to personnel, and damage to the equipment, ensure that the engine cannot start during this procedure.

Remove the two main rotor leads and the three exciter rotor leads from the rectifier assembly (figure 4). The rectifier assembly is now electrically isolated from the generator. The diodes remain mounted and the diode leads remain connected to the terminal posts. Using an ohmmeter or a battery light continuity tester, place one test probe on the diode lead terminal post. In succession, touch the other test probe to the lead screw hole in each heat sink. Reverse the probes and repeat the procedure. You have now tested the three diodes connected to this terminal post in both the forward and reverse direction. Repeat the procedure using the other diode terminal post.

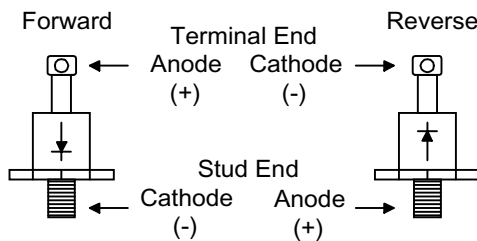


FIGURE 3: DIODE POLARITY

When the positive test probe is connected to the diode's anode and the negative test probe is connected to the diode's cathode (forward biased), the diode will switch on and conduct electricity (figure 3). This is observed by a low resistance reading when using an ohm meter or the lighting of the bulb when using a battery light continuity tester. Reversing the test leads (reverse biased) will result in the diode switching off and no electricity will be conducted. The results of these tests should indicate one of three conditions:

1. **Good diode:** Will have a much greater resistance in one direction than the other. Typical reverse biased resistance will be 30,000 ohms or greater, while forward biased resistance will be less than 10 ohms. The battery-light tester will have the light "on" in one direction and "off" in the other.
2. **Shorted condition:** Ohmmeter reading will be zero, or very low in both directions. The continuity tester will have the light "on" in both directions.
3. **Open condition:** Ohmmeter will have a maximum (infinity) reading in both directions. Continuity tester light will be off in both directions.

Diode failure after a 25 hour "run-in" period is generally traceable to external causes such as a lightning strike, reverse current, line voltage spikes, etc. All 6 diodes are essentially in the same circuit. When a diode is stressed to failure, there is no easy method to determine remaining life in the other diodes. To avoid possible continued failures, it is recommended that the entire rectifier assembly be replaced rather than replacing individual diodes.

SERVICE

GENERAL

The service procedures given in this section are those which can reasonably be conducted on-site with a minimum number of special tools and equipment. Qualified maintenance personnel should conduct all service procedures. Replacement parts may be ordered through an authorized service center or directly from the factory.

FIELD FLASHING

Restoring Residual Magnetism (not applicable on PMG equipped generators)

To restore residual magnetism to the generator, connect a 12 volt battery to the exciter field while the generator using the following procedure:

1. **Shutdown the generator set.** Remove the exciter field leads F+ and F- from the regulator.

CAUTION:

Failure to remove the exciter field leads from the automatic voltage regulator during flashing procedures may destroy the regulator.

2. Connect the F+ and F- leads to the battery's corresponding positive and negative terminals. This should be done using an appropriate length of lead wire to separate the battery from the point of connection (batteries may explode when exposed to an electric arc). After 3 to 5 seconds, remove the F- lead. An inductive arc should result. If no arc is drawn, repeat the procedure.
3. Reconnect the F+ and F- leads to the regulator. Restart the generator and verify that terminal voltage is developed. If terminal voltage does not develop, repeat the field flashing procedure and / or consult the trouble shooting section.

Bearing Removal

Prior to performing this operation, it is suggested that the alternator's shaft be rotated until two of the main rotor poles are in a vertical position. Once the bearing bracket is backed out, the rotor will drop on the main stator core. Having the rotor in this position will limit the amount of rotor drop to that of the air gap. Visually inspect the bearing bore for damage or wear. If worn or damaged, replace prior to reassemble.

Opposite Drive End Bearing Bracket Removal.

Prior to proceeding with bracket removal, disconnect exciter field leads F+ and F- from the automatic voltage regulator and ensure that they are free to move when the bearing bracket is removed. Remove the bearing bracket retaining bolts. Using a pair of screw drivers, wedge the bracket off the frame. After approximately 1/8 inch, the bracket will clear the locating register on the frame and will drop until the rotor is resting on the main stator core. Continue to pull the bracket free from the bearing. Visually inspect the bearing bore and o-ring (if equipped) for damage or wear. If worn or damaged, repair or replace prior to reassembly.

Drive End Bearing Bracket Removal, Two Bearing Units.

Remove any drive arrangement from the generator shaft extension. Remove the bearing lock ring retaining screws. There is no o-ring in the drive end bearing bracket. The shaft extension must be supported before proceeding further. A hoist and sling, jack, or some other means of support with a capacity of 2 tons should be used.

Remove the bearing bracket retaining cap screws. Using a flat bladed screw driver or chisel, pry the bracket back from the frame. After approximately 1/8 inch, the bracket will clear the locating register on the frame. Lower the shaft extension until the rotor is resting on the main stator core.

Continue to pull the bracket free from the bearing. Visually inspect the bearing bore for damage or wear. If worn or damaged, sleeve or replace prior to reassembly.

Reassembly note: Before the bearing bracket is seated against the frame, a threaded rod may be used to help align the inner bearing cap with the bearing bracket.

BEARING REPLACEMENT

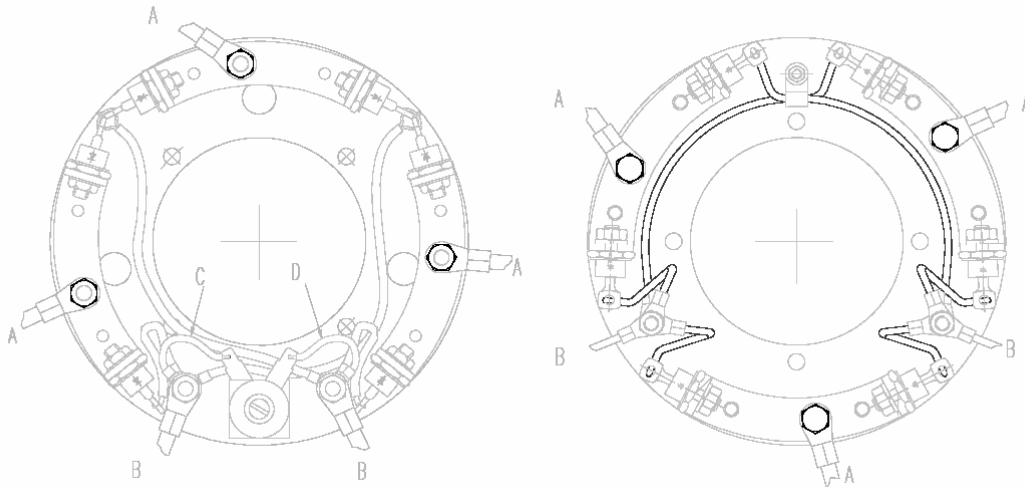
Using a bearing puller, remove the existing bearing. It is strongly recommended that the bearing be replaced any time it is removed from the shaft. **ALWAYS** install the same type and size bearing that was supplied as original equipment. Order by part number from the parts list, and include the unit serial number and part number when ordering. Heat the bearing to a maximum of 100°C (212°F) in an oven. Apply a thin coat of clean lubricating oil to the press-fit area of the rotor shaft. Using suitable heat resistant gloves, install the bearing over the end of the shaft until it seats against the shaft shoulder. The bearing should slide on the shaft and be seated without excessive force. Should the bearing bind on the shaft prior to being seated against the shoulder, a piece of tubing slightly larger than the press fit area can be used to drive the bearing to its final position. Using light taps with a soft mallet, apply pressure to the inner race only.

Rectifier Assembly Removal

The rectifier assembly cannot be removed until the opposite drive end bearing bracket and bearing have been removed (see bearing removal procedure). Remove the three exciter rotor leads from the heat sinks and the two main rotor leads from the main rotor posts (see Figures 4). Remove the screws securing the rectifier assembly and pull the assembly free from the shaft.

Diode Replacement

Prior to installing a replacement diode on the heat sink, apply a thin film of conductive heat sink compound around the base of the diode (do not coat the threads). When installing a diode on the heat sink, care should be taken not to over torque the retaining nut, which could cause damage to the device. Torque to 28 pound-inches. If not damaged, the existing diode lead wire may be unsoldered from the failed diode, and resoldered on the replacement.



430 FRAME

280 / 360 FRAME

A - Exciter Rotor Lead, B - Main Rotor Lead, C - Red (+) Suppressor Lead, D - Black (-) Suppressor Lead

FIGURE 4: ROTATING RECTIFIER ASSEMBLY

RETURNED GOODS

Contact Marathon Electric Manufacturing Corporation for authorization before returning any product. We can not be responsible for any items returned without authorization.

CAUTION

Single bearing generators must have their rotor assembly properly secured to prevent damage during transit to the factory, or to an authorized service center.

TROUBLESHOOTING

This section is intended to suggest a systematic approach to locating and correcting generator malfunctions. The section is arranged according to the symptoms of the problem. The steps have been arranged in an attempt to do the easy

checks first and prevent further damage when troubleshooting a disabled machine.

The first step of troubleshooting is to gather as much information as is possible from operating personnel and individuals present during the failure. Typical information includes: how long the unit had been operating; what loads were on line; weather conditions; protective equipment that did or did not function. In addition, information as to the operating condition of the generator's prime mover is vital. Has the prime mover been maintaining constant speed? If not, have there been extended periods of under speed operation? Has the prime mover experienced an over-speed condition? If yes, what was the maximum speed, and how long did the unit operate at that elevated speed?

The generator speed should be maintained at rated nameplate value during all operating tests. The frequency of the generator depends upon rotational speed. Most regulators used with MagnaPLUS generators have built in under frequency protection such that if the speed is reduced more than 5%, the voltage will drop off rather rapidly with further reductions in speed.

WARNING

HIGH VOLTAGES MAY BE PRESENT AT THE GENERATOR'S TERMINALS WHEN THE UNIT IS RUNNING. SOME ACCESSORY EQUIPMENT SUCH AS SPACE HEATERS MAY BE ENERGIZED FROM AN OUTSIDE POWER SOURCE WHEN THE UNIT IS AT REST. TOOLS, EQUIPMENT, CLOTHING AND YOUR BODY MUST BE KEPT CLEAR OF ROTATING PARTS AND ELECTRICAL CONNECTIONS. SPECIAL PRECAUTIONS MUST BE TAKEN DURING TROUBLESHOOTING SINCE PROTECTIVE COVERS AND SAFETY DEVICES MAY BE REMOVED OR DISABLED TO GAIN ACCESS AND PERFORM TESTS. BE CAREFUL. SERIOUS PERSONAL INJURY OR DEATH CAN RESULT FROM THESE HAZARDS. CONSULT QUALIFIED PERSONNEL WITH ANY QUESTIONS.

GENERATOR PRODUCES NO VOLTAGE

CAUSE	CHECK AND REMEDY
Voltmeter off or defective	Check voltage with a separate meter at the generator terminals.
Incorrect or defective connections	Verify generator connections. See drawings supplied with the generator or lead connection diagrams in this manual. Inspect all wiring for loose connections, open circuits, grounds, and short circuits.
Loss of residual	Flash the field. Refer to field flashing in the service section. If the generator is equipped with a PMG, field flashing is not necessary -- check regulator fuse and input power from the PMG.
Defective diodes, suppressor, or windings	Test the generator using the 12 volt battery test as specified in the testing section. If the results indicate generator problems, perform insulation, continuity, and diode tests as specified in the testing section.
Regulator protection operating	Adjust regulator. Consult regulator manual.
Regulator inoperative	Adjust or replace regulator. Consult regulator manual.

GENERATOR PRODUCES LOW VOLTAGE, NO LOAD

CAUSE	CHECK AND REMEDY
Underspeed operation	Check speed using a tachometer or frequency meter.
Voltmeter off or defective	Check voltage with a separate meter at the generator terminals.
Incorrect or defective connections	Verify generator connections. See drawings supplied with the generator or lead connection diagrams in this manual. Inspect all wiring for grounds, open circuits and short circuits.
Loss of regulator power	Check regulator fuse and input power. Input power is produced by the generator's residual voltage or from an optional PMG.
Regulator adjustment	Adjust regulator settings. Consult regulator manual.
Regulator incorrectly connected	Review the generator connection diagram or reference the regulator manual.
Defective diodes, suppressor, or windings	Test the generator using the 12 volt battery test as specified in the testing section. If the results indicate generator problems, perform insulation, continuity, and diode tests as specified in the testing section.
Regulator inoperative	Adjust or replace regulator. Consult regulator manual.

GENERATOR PRODUCES LOW VOLTAGE WHEN LOAD APPLIED

CAUSE	CHECK AND REMEDY
Excessive load	Reduce load. The load on each leg should be evenly balanced, and rated current should not be exceeded on any leg.
Large motor starting or low load power factor	Motor starting currents are too large for the generator. When starting multiple motors, sequence the motors and start the largest motors first. Reduce lagging power factor load.
Driver speed droop or belt slip	Check driver. If belt driven, check belt tension. Check under frequency setting on regulator. Under frequency voltage roll-off may be activated.
Reactive droop	If the generator is equipped for parallel operation, some droop is normal as reactive load increases. When operating as a single unit, the parallel CT can be shorted to eliminate this effect. Refer to Regulator manual.
Line drop	If voltage is proper at generator terminals but low at load terminals, increase external wire size.
Defective diodes, suppressor, or windings	Test the generator using the 12 volt battery test as specified in the testing section. If the results indicate generator problems, perform insulation, continuity, and diode tests as specified in the testing section.

GENERATOR PRODUCES FLUCTUATING VOLTAGE

CAUSE	CHECK AND REMEDY
Fluctuating engine speed	Check engine and governor systems for malfunctions. Check load for fluctuation.
Regulator stability	Adjust Regulator stability. Refer to Regulator manual.
Regulator external rheostat	Replace defective or worn rheostat. Use shielded cable to minimize electrical noise.
Defective rectifier assembly	Check assembly for loose connections. Test the diodes as specified in the test section.
Loose terminal or load connections	Improve connections both mechanically and electrically.
Defective regulator	Replace regulator.

GENERATOR PRODUCES HIGH VOLTAGE

CAUSE	CHECK AND REMEDY
Faulty metering	Check voltage with separate meter at generator terminals.
Incorrect connections	Verify generator connections. Refer to drawings supplied with the generator or connection diagrams in this manual.
Regulator adjustments	Adjust regulator. Consult regulator manual.
Leading power factor	Check the power factor of the load. If power factor is leading, change load configuration. Excessive leading power factor (capacitors) can cause voltage to climb out of control.
Incorrect regulator connection	Verify regulator voltage sensing is connected correctly. Consult regulator manual.
Defective regulator	Replace regulator.

GENERATOR BUILDS VOLTAGE FROM STARTUP, THEN GOES TO LOW (RESIDUAL) VOLTAGE

CAUSE	CHECK AND REMEDY
Regulator protective circuit operating	Check indicators on regulator. Correct problems and adjust regulator as is required. Refer to regulator manual.

GENERATOR IS OVERHEATING

CAUSE	CHECK AND REMEDY
Generator is overloaded	Reduce load. Check with ammeter and compare with nameplate rating.
Clogged ventilating screens	Clean air passages.
High room temperature or altitude	Improve ventilation or reduce load.
Insufficient circulation of cooling air	Generator location and enclosure design must provide adequate airflow and minimize recirculation of hot air.
Unbalanced load	The load on each leg should be as evenly balanced as possible and should not exceed rated current on any one leg.

GENERATOR PRODUCES MECHANICAL NOISE

CAUSE	CHECK AND REMEDY
Defective bearing	Replace bearing.
Loose or misaligned coupling	Tighten, realign, or replace coupling.
Belt slap or loose guards	Check belt tensioning. Check belt guard fasteners.

EQUIPMENT RUNS NORMALLY ON UTILITY POWER, BUT WILL NOT RUN ON GENERATOR

CAUSE	CHECK AND REMEDY
Distorted voltage waveform	Analyze load. Excessive SCR (thyristor) loading will cause distortion. Some equipment may be sensitive to distorted waveforms. Refer to Marathon Electric.
Improper generator voltage or frequency	Check nameplates of devices comprising the load. Compare required voltage and frequency with that of the generator. Adjust driver speed and/or generator voltage as necessary to match generator output to load requirements.

CAUTION: Compare required voltage, frequency, and kVA with generator nameplate to ensure adequate generator capacity. If in doubt, consult Marathon Electric for information regarding generator capacity.

SPECIFICATIONS

MODEL / FRAME SIZE	EXCITER RESISTANCE	
	STATOR	ROTOR
281, 282, 283, 284	23.0	.120
361, 362, 363 -- three phase	23.5	.120
361, 362, 363 -- dedicated single phase	23.0	.135
431, 432, 433 -- three phase	20.33	.076
431, 432 -- dedicated single phase	18.0	.105

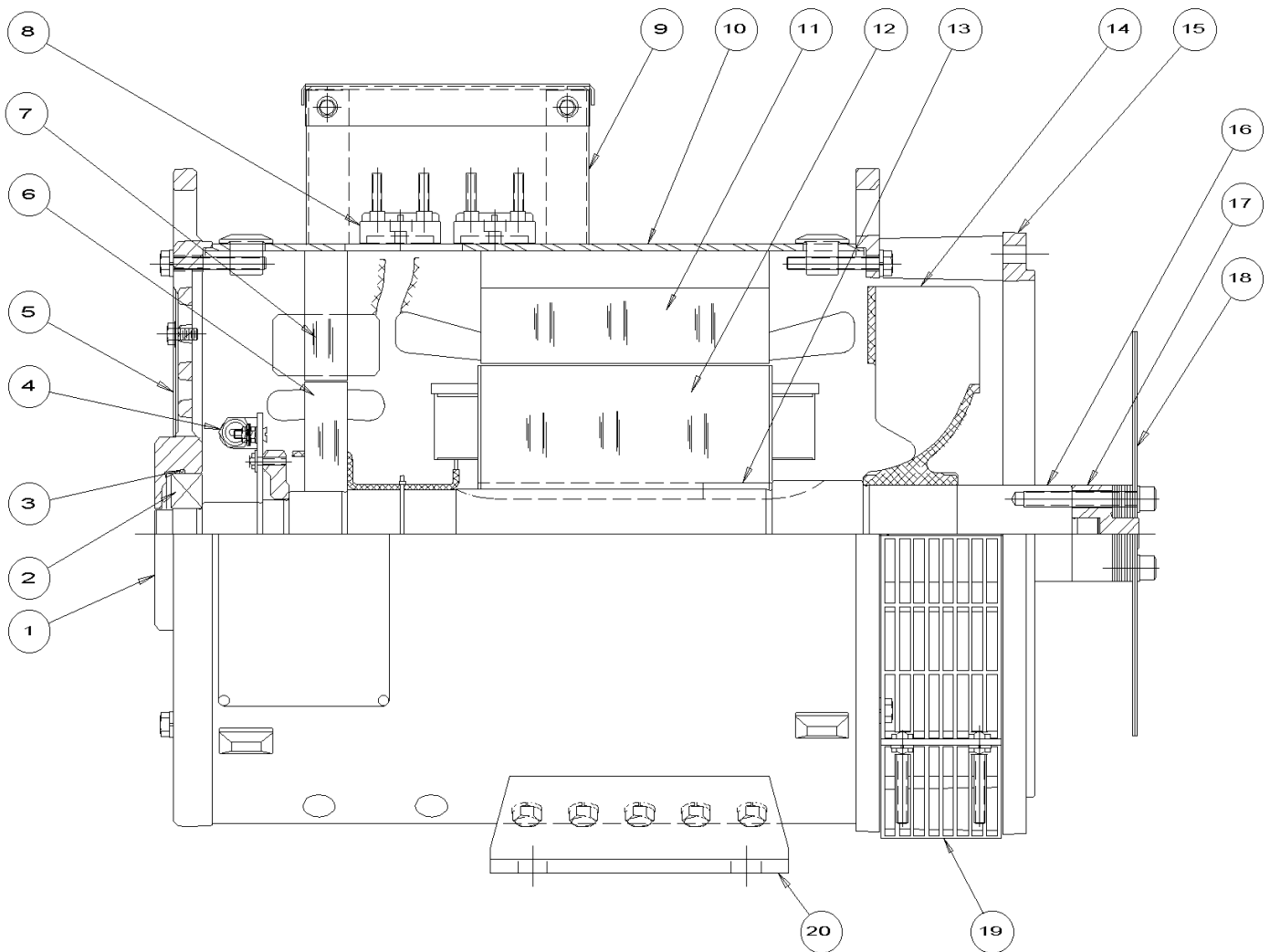
MODEL	GENERATOR RESISTANCE		EXCITER FIELD NO LOAD VOLTS 480 V / 60 HZ	NO LOAD TERMINAL VOLTAGE WITH 12 VDC FIXED EXCITATION	
	STATOR*	ROTOR		HIGH WYE / 60 HZ	HIGH WYE / 50 HZ
281PSL1500	4.20	.400	11.0	485	400
281PSL1501	4.15	.400	11.0	490	404
281PSL1502	3.20	.439	9.0	528	435
282PSL1503	2.00	.470	10.4	500	415
282PSL1504	1.51	.512	11.3	490	400
282PSL1505	1.00	.575	10.1	515	415
283PSL1506	.681	.654	11.0	495	400
283PSL1507	.480	.758	12.0	480	390
284PSL1508	.346	.875	12.0	480	375
361PSL1600	.381	.750	11.8	485	400
361PSL1601	.264	.810	12.5	475	385
361PSL1602	.181	.990	14.1	460	370
362PSL1604	.138	1.05	12.2	480	380
362PSL1606	.0980	1.20	10.8	500	405
363PSL1607	.0692	1.37	12.2	475	380
431PSL6202	.0214	.8114	15.1	440	360
431PSL6204	.0477	.6373	13.6	455	385
431PSL6206	.0371	.6793	13.82	455	370
431PSL6208	.0133	.715	12.20	475	390
432PSL6210	.0214	.8114	15.1	440	360
432PSL6212	.0226	.8656	14.1	445	385
433PSL6216	.01215	1.0672	16.2	425	345
433PSL6220	.01214	.9743	15.6	430	350

* Stator resistance measured line to line in a high wye connection.

DEDICATED SINGLE PHASE	GENERATOR RESISTANCE		EXCITER FIELD NO LOAD VOLTS / 60 HZ
	STATOR	ROTOR	
281PSL1511	1.420	.381	8.3
281PSL1512	1.106	.395	8.1
281PSL1513	.632	.430	8.7
282PSL1514	.436	.450	9.2
282PSL1515	.240	.520	9.7
283PSL1516	.160	.620	13.3
284PSL1517	.0918	.760	12.2
284PSL1518	.0610	.857	16.6
361PSL1611	.0695	.750	17.5
361PSL1612	.0434	.857	16.1
361PSL1613	.0369	.926	13.6
362PSL1615	.0191	1.20	17.0
363PSL1617	.0119	1.35	23.0
431PSL1811	.0248	.516	9.9
431PSL1813	.0129	.615	13.8
432PSL1814	.00931	.643	15.1
432PSL1815	.00723	.852	11.2

PARTS LIST – SINGLE BEARING

Typical Generator Cross Section

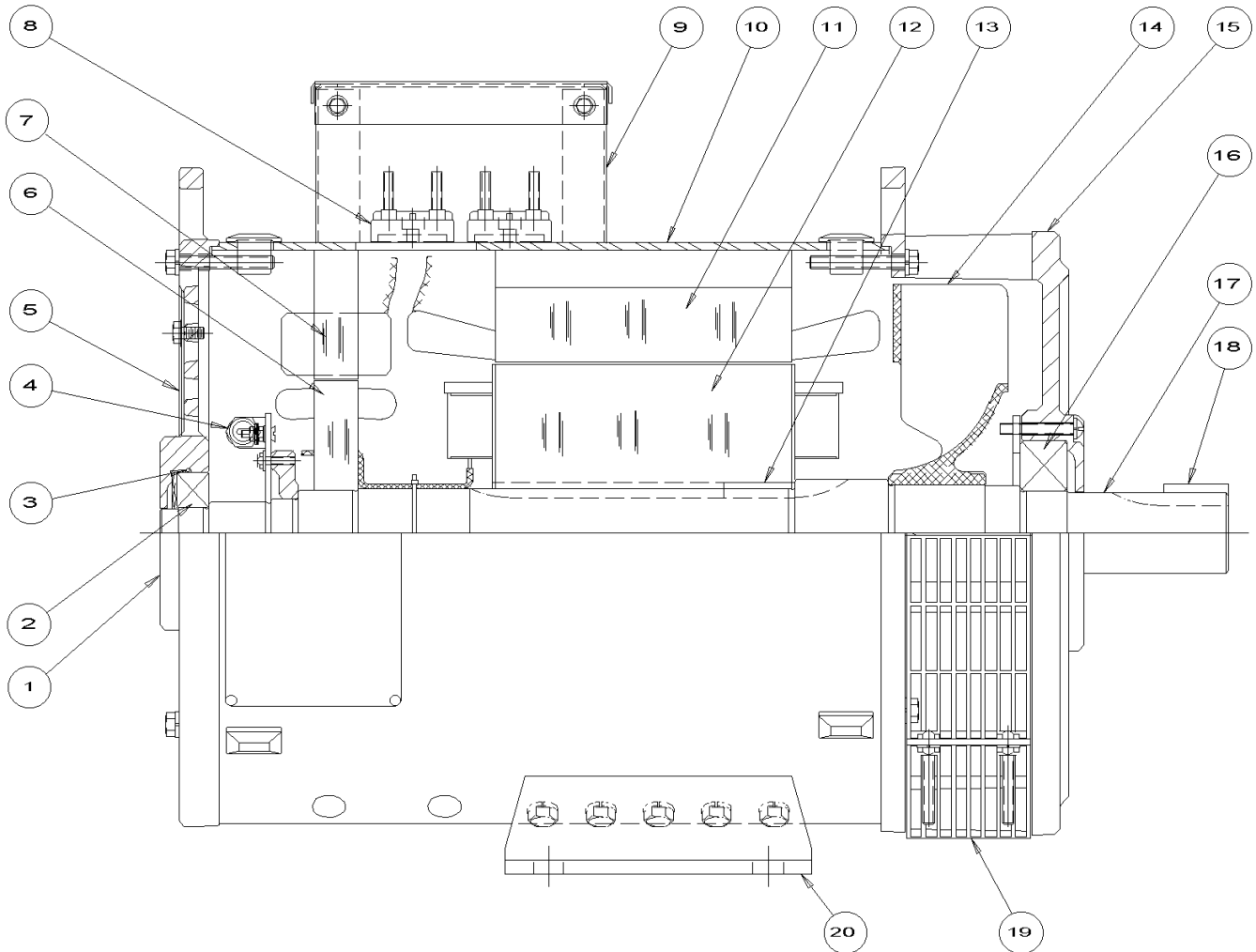


Reference Number	Part Name	Reference Number	Part Name
1	End Bracket (under end cover 360 & 430 frames)	11	Main Stator
2	Bearing	12	Main Rotor
3	O-ring (280 frame only)	13	Rotor Integral Keyway
4	Rectifier Assembly	14	Fan
5	Air Intake Screen (280 frame only)	15	Mounting Adapter (SAE)
6	Exciter Rotor	16	Shaft
7	Exciter Stator	17	Drive Hub
8	Link Board (terminal block)	18	Drive Disk (SAE)
9	Conduit Box	19	Exhaust Screen (drip cover not shown)
10	Generator Frame	20	Mounting Base

Note: Illustration above is a 280 frame MagnaPlus. Other Frame sizes are typical. Optional PMG not shown. The generator model and serial numbers are required when ordering parts.

PARTS LIST – DUAL BEARING

Typical Generator Cross Section



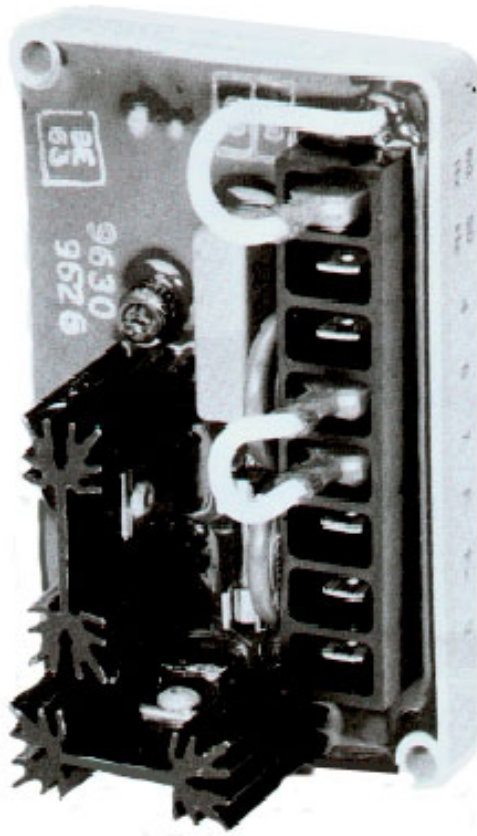
Reference Number	Part Name	Reference Number	Part Name
1	End Bracket (under end cover 360 & 430 frames)	11	Main Stator
2	Bearing (nondrive end)	12	Main Rotor
3	O-ring (280 frame only)	13	Rotor Integral Keyway
4	Rectifier Assembly	14	Fan
5	Air Intake Screen (280 frame only)	15	End Bracket (drive end)
6	Exciter Rotor	16	Bearing (drive end)
7	Exciter Stator	17	Shaft
8	Link Board (terminal block)	18	Key
9	Conduit Box	19	Exhaust Screen (drip cover not shown)
10	Generator Frame	20	Mounting Base

Note: Illustration above is a 280 frame MagnaPlus. Other Frame sizes are typical. Optional PMG not shown. The generator model and serial numbers are required when ordering parts.

SE350

VOLTAGE REGULATOR

INSTRUCTION MANUAL



INTRODUCTION

The SE350 voltage regulator is an encapsulated electronic voltage regulator that controls the output of a brushless AC generator by regulating the current into the exciter field.

SPECIFICATION	SE350 REGULATOR
Sensing & Power Input	190-240 Vac
Burden	500 VA
Output Power- Continuous	73 Vdc at 3.5 Adc (255w)
Output Power - Forcing(240 Vac Input Power)	105 Vdc at 5 Adc (525w)
Regulation	1 .0%
Remote Voltage Adjustment Range	± 10% with 2000 ohm rheostat ± 5% with 1000 ohm rheostat
Frequency Compensation	Adjustable
Roll off frequency	54-61 Hz for 60 Hz 45-51 Hz for 50 Hz
Operation	Weight6.5 oz.
Operating Temperature	- 40°C to + 60°C
Storage Temperature	- 65°C to + 85°C
Power Dissipation	8 watts maximum
Size	3.94" L X 2.66" W X 2.20: H
Voltage Buildup	Internal provisions for automatic voltage build up from generator residual voltage as low as 10 Vac.
EMI Suppression	Internal Electromagnetic Interference Filter (EMI Filter)

WARNING

**TO PREVENT PERSONAL INJURY OR EQUIPMENT DAMAGE
ONLY QUALIFIED PERSONNEL SHOULD
INSTALL, OPERATE, OR SERVICE THIS DEVICE.**

**CAUTION: DO NOT megger or high-pot the generator with the regulator connected.
DO NOT high-pot the regulator.**

The SE350 voltage regulator can be mounted in any plane, following are mounting dimensions.

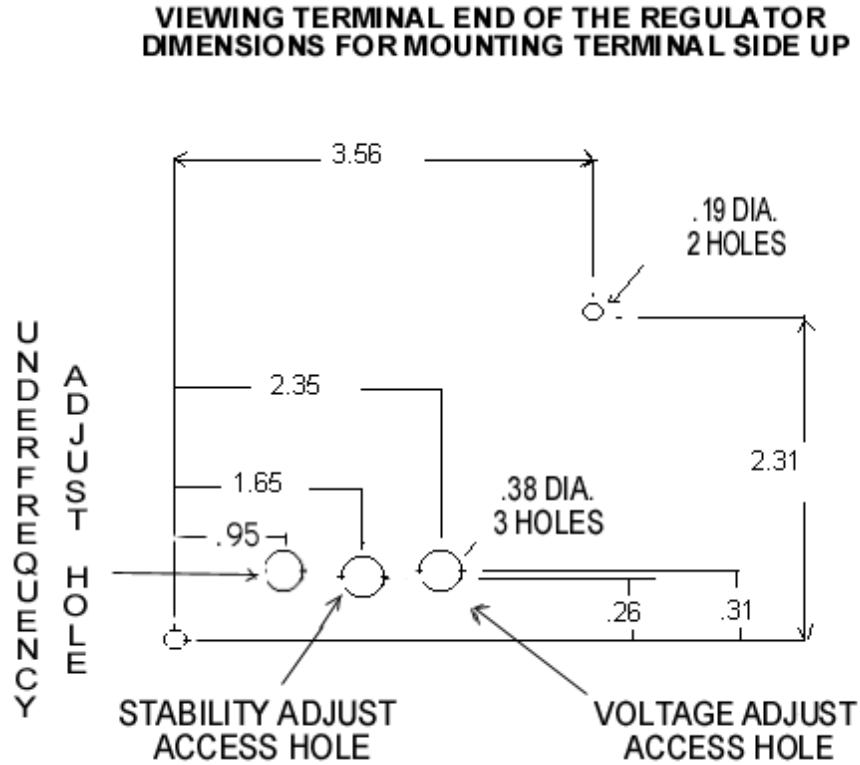


FIGURE 1

FUSE

A 4 Amp, 250 V, 5 X 20 mm fuse is supplied with the regulator (Part A-527066). It can be located on the rear face of the voltage regulator.

EXCITER POWER CIRCUIT

Connect the regulator wire F+ to the generator F+ or F1 field terminal.
Connect the regulator wire F- to the generator F- or F2 field terminal.
See Figure 2 for typical connection diagram

SENSING/POWER INPUT CIRCUIT

Input power and sensing is achieved through terminals 3 and 4.
The voltage input requirement of the SE350 is 190 to 240 Vac. See Figure 2

**INTERCONNECTION DIAGRAM
FOR 416-480 VOLT OR 208-240 VOLT
WYE CONNECTED GENERATOR**

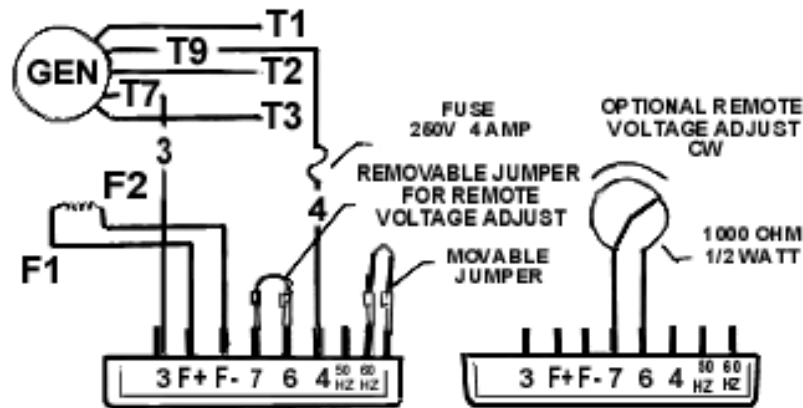


FIGURE 2

VOLTAGE ADJUST

The screwdriver adjustable potentiometer adjusts the generator output voltage. Adjustment clockwise increases the generator output voltage.

When using a remote voltage adjust rheostat, remove the jumper wire across terminals 6 and 7 and install a 2000 ohm 1/2 watt (minimum) rheostat. This will give $\pm 10\%$ voltage variation from the nominal. (For $\pm 5\%$ voltage variation use a 1000 ohm 1/2 watt rheostat). See Figure 2.

STABILITY ADJUST

System stability is the ability of the generator to respond to load transients. Decreasing the stability makes the generator less sluggish and faster to respond to load transients. If the stability of the regulator is decreased too much, the generator will tend to hunt under steady state conditions.

The screwdriver adjustable potentiometer adjusts the system stability. Adjustment clockwise increases the stability. Increasing the stability increases the response time of the generator. Conversely, decreasing the stability decreases the response time of the generator.

V/HZ ROLL-OFF FREQUENCY SELECTION

The roll off point is the frequency where the generator voltage starts to decrease. This reduces the Kilowatt load to the engine, which allows the engine to recover in speed under any load transient condition. Use jumper to select 50 HZ or 60 Hz. The screwdriver adjustable potentiometer sets the roll-off frequency from 54-61 Hz in the 60 Hz setting or from 45-51 Hz in the 50 Hz setting.

The SE350 has the roll-off point preset to 58 Hz in the 60 Hz mode and 48 Hz in the 50 Hz mode. To change the roll-off point, adjust engine speed to the desired rated speed. (50 or 60 Hz). Set the voltage to the desired setting at rated speed. Adjust engine speed to the desired roll-off point. Turn the potentiometer counterclockwise until the voltage starts to drop off. Then adjust the potentiometer clockwise until the voltage returns to rated voltage. Re-adjust engine speed to rated speed.

PRELIMINARY SET-UP

Ensure the voltage regulator is correctly connected to the generator. Refer to the specific connection diagram supplied with the generator.

Set the regulator voltage adjust to full counter-clockwise (minimum voltage level).

Set the remote voltage adjust (if used) to the center position.

Set the stability control full clockwise (maximum stability level).

Connect the positive lead of a 100 V D.C. voltmeter to F1 and the negative lead of the voltmeter to F2 or use an appropriate AC voltmeter on the generator output leads.

SYSTEM START-UP

Start and run the generator at no load and rated speed. The generator voltage should build up to a minimum level. (Actual level is dependent upon connection). If it does not build up, refer to field flashing section in generator manual.

Slowly adjust the voltage control until the generator voltage reaches the nominal value. If used, adjust the remote voltage rheostat to set the generator voltage to the exact value desired.

Turn the stability adjust counter-clockwise until instability is shown on either of the voltmeters mentioned in the "PRELIMINARY SET-UP" section. With the system operating in an unstable condition, slowly adjust the stability control clockwise until generator stability is reached.

Interrupt regulator power for a short time (approximately 1-2 seconds).

If the generator remains stable, no further adjustment is necessary. If the generator does not remain stable, increase the stability slightly and interrupt regulator power again.

This procedure should be repeated until system stability is reached and maintained.

TROUBLESHOOTING

Symptom	Cause	Action
Residual Voltage -No Output	Residual voltage at regulator power input wires 3 & 4 below 10 V ac.	Check wiring diagram for proper connections. Flash generator field. Refer to field flashing section in generator manual.
	Acceleration time to rated speed too long.	Reduce acceleration time. Interrupt power input to regulator after achieving rated speed.
	Field leads F1, F2 not connected.	Connect field leads F1, F2.
	Power input leads not connected.	Connect power-input leads 3,4.
	Blown or missing fuse.	Replace fuse.
	Defective regulator.	Replace regulator.
Output Voltage Low	Defective generator.	Consult generator manual.
	Incorrect connections.	Check wiring diagram for proper connections.
	Voltages adjust turned down.	Rotate voltages adjust CW until desired voltage is reached.
	Remote voltage adjust is turned down.	Rotate remote voltages adjust CW until desired voltage is reached.
Output Voltage High	Defective regulator.	Replace regulator.
	Voltages adjust turned too high.	Rotate voltages adjust CCW until desired voltage is reached.
Output Voltage High - No Adjustment	Remote voltage adjust is turned too high.	Rotate remote voltages adjust CCW until desired voltage is reached.
	Defective regulator.	Replace regulator.
Remote Voltage Adjust Operates Backwards	Voltages adjust wire backwards.	Reverse the wiring of the remote voltage adjust.
Generator Output Voltage Hunting	Stability adjusts not set properly.	Rotate the stability adjusts in a CW direction until hunting stops.
Poor Regulation	Defective regulator.	Replace regulator.

Appendix C — Welding Power Units

- Miller Invision 456MP
- Miller XMT 304

The following pages are taken from information published by the original equipment manufacturer (OEM), and are subject to change without notice.



OM-193 267H

February 2002

Processes



MIG (GMAW) and Pulsed MIG (GMAW-P) Welding

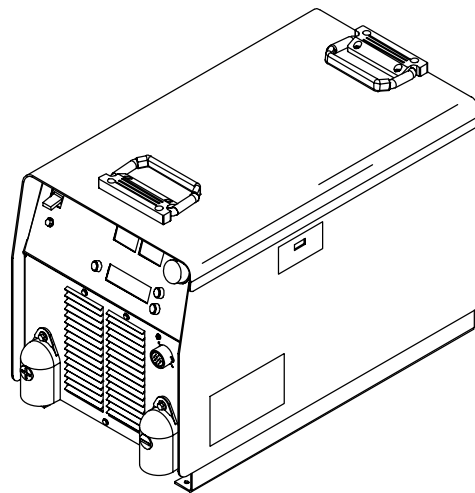
Flux Cored (FCAW) Welding

Description

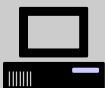


Invision[®] 456MP

(230/460 And 575 Volt Models)



OWNER'S MANUAL



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www.MillerWelds.com

From Miller to You

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

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

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

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

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



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

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



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

Miller offers a Technical Manual which provides more detailed service and parts information for your unit. To obtain a Technical Manual, contact your local distributor. Your distributor can also supply you with Welding Process Manuals such as SMAW, GTAW, GMAW, and GMAW-P.



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WARNING

This product, when used for welding or cutting, 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.)

The following terms are used interchangeably throughout this manual:
Stick = SMAW

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SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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1-1. Symbol Usage



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

▲ Marks a special safety message.

☞ Means "Note"; not safety related.



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

1-2. Arc Welding Hazards

▲ The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-4. Read and follow all Safety Standards.

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

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



ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also

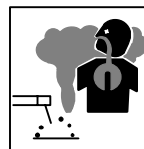
live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.

- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.



FUMES AND GASES can be hazardous.

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

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



ARC RAYS can burn eyes and skin.

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

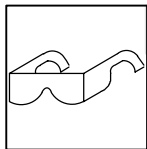
- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash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



WELDING can cause fire or explosion.

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

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.



FLYING METAL can injure eyes.

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



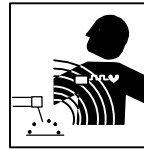
BUILDUP OF GAS can injure or kill.

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



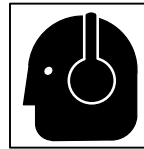
HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.



MAGNETIC FIELDS can affect pacemakers.

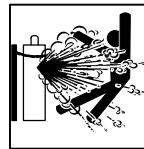
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



CYLINDERS can explode if damaged.

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

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

1-3. Additional Symbols For Installation, Operation, And Maintenance



FIRE OR EXPLOSION hazard.

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



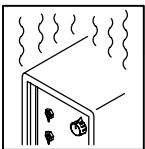
MOVING PARTS can cause injury.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.



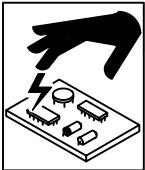
FALLING UNIT can cause injury.

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



OVERUSE can cause OVERHEATING

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



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.



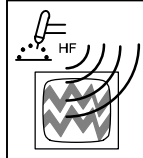
MOVING PARTS can cause injury.

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



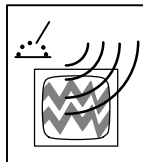
WELDING WIRE can cause injury.

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



H.F. RADIATION can cause interference.

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



ARC WELDING can cause interference.

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

1-4. Principal Safety Standards

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

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

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

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

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

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

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

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

1-5. EMF Information

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

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

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

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

About Pacemakers:

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

SECTION 1 – CONSIGNES DE SECURITE – LIRE AVANT UTILISATION

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1-1. Signification des symboles



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

▲ Identifie un message de sécurité particulier.

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



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

1-2. Dangers relatifs au soudage à l'arc

▲ Les symboles présentés ci-après sont utilisés tout au long du présent manuel pour attirer votre attention et identifier les risques de danger. Lorsque vous voyez un symbole, soyez vigilant et suivez les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité présentées ci-après ne font que résumer l'information contenue dans les normes de sécurité énumérées à la section 1-4. Veuillez lire et respecter toutes ces normes de sécurité.

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

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



UN CHOC ÉLECTRIQUE peut tuer.

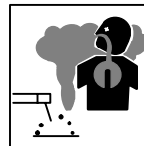
Un simple contact avec des pièces électriques peut provoquer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension dès que l'appareil est sur ON. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension à ce moment-là. En soudage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

- Ne jamais toucher les pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs ne comportant pas de trous.
- S'isoler de la pièce et de la terre au moyen de tapis ou d'autres moyens isolants suffisamment grands pour empêcher le contact physique éventuel avec la pièce ou la terre.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installer et mettre à la terre correctement cet appareil conformément à son manuel d'utilisation et aux codes nationaux, provinciaux et municipaux.
- Toujours vérifier la terre du cordon d'alimentation – Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Vérifier fréquemment le cordon d'alimentation pour voir s'il n'est pas endommagé ou dénudé – remplacer le cordon immédiatement s'il est endommagé – un câble dénudé peut provoquer une électrocution.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.

- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretien l'appareil conformément à ce manuel.
- Porter un harnais de sécurité quand on travaille en hauteur.
- Maintenir solidement en place tous les panneaux et capots.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.

Il y a DU COURANT CONTINU IMPORTANT dans les convertisseurs après la suppression de l'alimentation électrique.

- Arrêter les convertisseurs, débrancher le courant électrique, et décharger les condensateurs d'alimentation selon les instructions indiquées dans la partie entretien avant de toucher les pièces.



LES FUMÉES ET LES GAZ peuvent être dangereux.

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

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



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

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

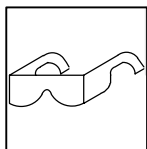
- Porter un casque de soudage muni d'un écran de filtre approprié pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des protections approuvés pour les oreilles si le niveau sonore est trop élevé.
- Utiliser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



LE SOUDAGE peut provoquer un incendie ou une explosion.

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

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



DES PARTICULES VOLANTES peuvent blesser les yeux.

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



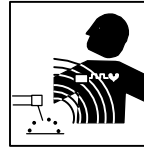
LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

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



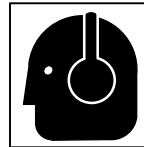
DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

- Ne pas toucher des parties chaudes à mains nues
- Prévoir une période de refroidissement avant d'utiliser le pistolet ou la torche.



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

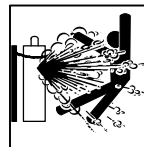
- Porteurs de stimulateur cardiaque, restez à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.



LE BRUIT peut affecter l'ouïe.

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

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



Si des BOUTEILLES sont endommagées, elles pourront exploser.

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

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

1-3. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance



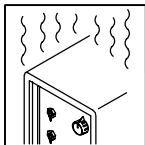
Risque D'INCENDIE OU D'EXPLOSION.

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



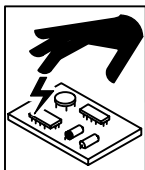
LA CHUTE DE L'APPAREIL peut blesser.

- Utiliser l'anneau de levage uniquement pour soulever l'appareil, NON PAS les chariot, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un engin d'une capacité appropriée pour soulever 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.



L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Prévoir une période de refroidissement, respecter le cycle opératoire nominal.
- Réduire le courant ou le cycle opératoire avant de recommencer le soudage.
- Ne pas obstruer les passages d'air du poste.



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

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



DES ORGANES MOBILES peuvent provoquer des blessures.

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



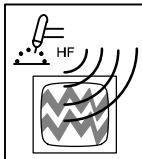
LES FILS DE SOUDAGE peuvent provoquer des blessures.

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



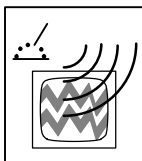
DES ORGANES MOBILES peuvent provoquer des blessures.

- Rester à l'écart des organes mobiles comme le ventilateur.
- Maintenir fermés et fixement en place les portes, panneaux, recouvrements et dispositifs de protection.



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

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



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

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



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

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

1-4. Principales normes de sécurité

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

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

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

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

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

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

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

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

1-5. Information sur les champs électromagnétiques

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

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

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

- 1 Garder les câbles ensemble en les torsadant ou en les attachant avec du ruban adhésif.
- 2 Mettre tous les câbles du côté opposé de l'opérateur.
- 3 Ne pas courber pas et ne pas entourer pas les câbles autour de votre corps.
- 4 Garder le poste de soudage et les câbles le plus loin possible de vous.
- 5 Relier la pince de masse le plus près possible de la zone de soudure.

Consignes relatives aux stimulateurs cardiaques :

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



SECTION 2 – INSTALLATION

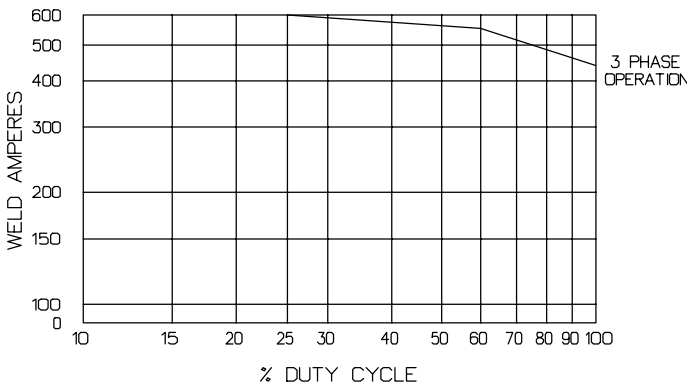
2-1. Specifications

Input Power	Rated Welding Output	Voltage Range	Maximum Open-Circuit Voltage DC	Amperes Input At Rated Load Output 60 Hz, Three-Phase			KVA		KW	
				230 V	460 V	575 V	230/460	575	230/460	575
Three Phase	450 A @ 38 Volts DC, 100% Duty Cycle; 565 A @ 43 Volts DC, 60% Duty Cycle	10 – 38	95	50.8 (0.14*)	27.8 (0.09*)	24.4 (0.12*)	21.2 (0.06*)	24.3 (0.12*)	19.2 (0.04*)	19.0 (0.07*)

*While idling

2-2. Duty Cycle and Overheating



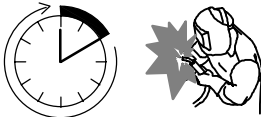
3 PHASE OPERATION

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

If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

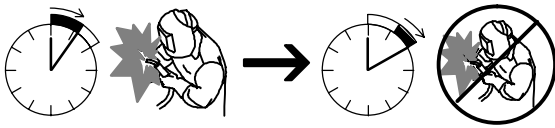
▲ Exceeding duty cycle can damage unit and void warranty.

100% Duty Cycle At 450 Amperes



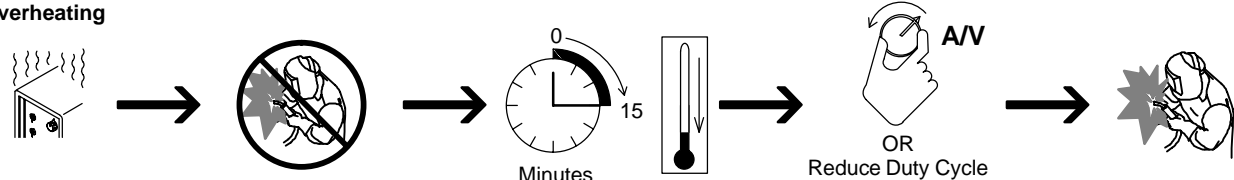
Continuous Welding

60% Duty Cycle At 565 Amperes



6 Minutes Welding 4 Minutes Resting

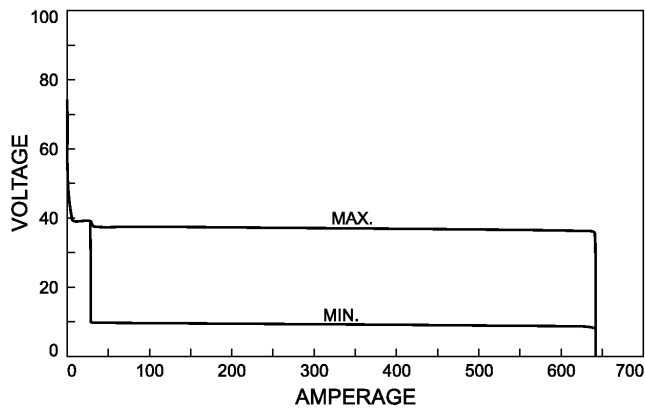
Overheating



Minutes OR Reduce Duty Cycle

duty1 4/95 – SA-181 560

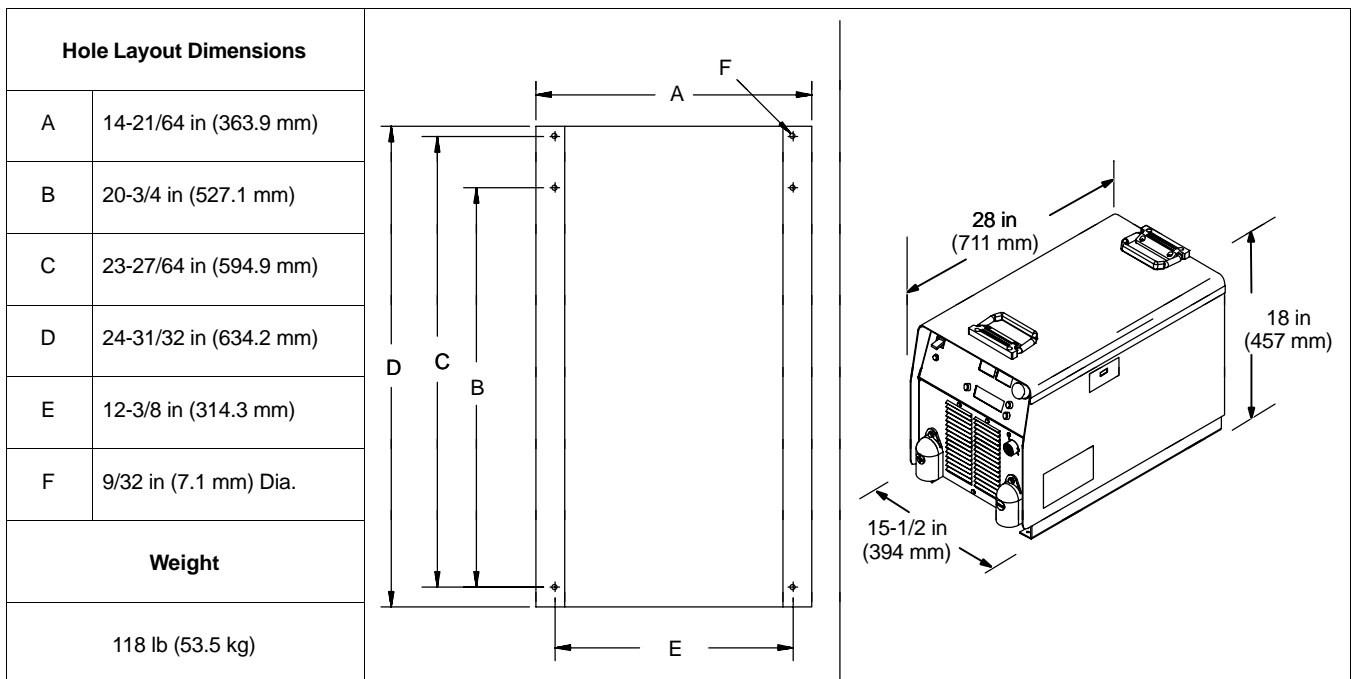
2-3. Volt-Ampere Curves



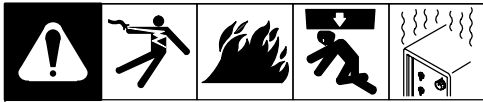
Volt-ampere curves show minimum and maximum voltage and amperage output capabilities of unit. Curves of other settings fall between curves shown.

va_curve1 4/95 - SA-181 561

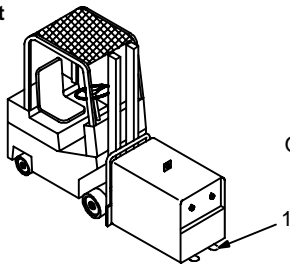
2-4. Dimensions and Weight



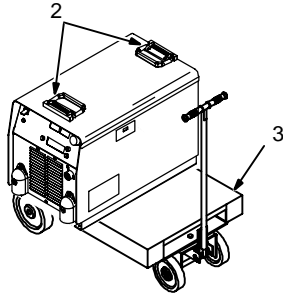
2-5. Selecting a Location



Movement

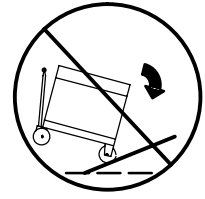
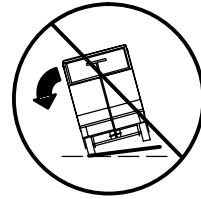


OR

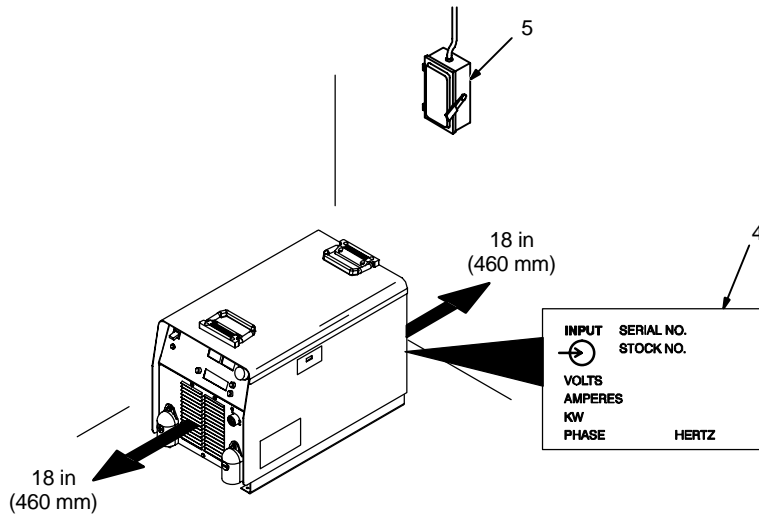


Tipping

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



Location

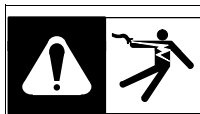


- 1 Lifting Forks
Use lifting forks to move unit.
Extend forks beyond opposite side of unit.
- 2 Lifting Handles
Use handles to lift unit.
- 3 Hand Cart
Use cart or similar device to move unit.
- 4 Rating Label
Use rating label to determine input power needs.
- 5 Line Disconnect Device
Locate unit near correct input power supply.

▲ **Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.**

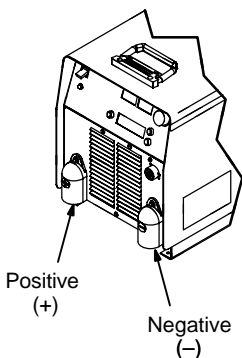
loc_2 3/96 - Ref. 151 556 / 800 611 / 802 314

2-6. Weld Output Terminals and Selecting Cable Sizes



Weld Output Terminals

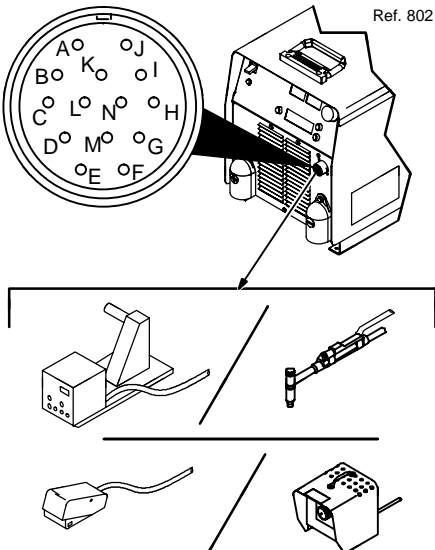

Welding Amperes	Total Cable (Copper) Length In Weld Circuit Not Exceeding							
	100 ft (30 m) Or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	10 – 60% Duty Cycle	60 – 100% Duty Cycle	10 – 100% Duty Cycle					
100	4	4	4	3	2	1	1/0	1/0
150	3	3	2	1	1/0	2/0	3/0	3/0
200	3	2	1	1/0	2/0	3/0	4/0	4/0
250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0
300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0
350	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0
400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0
500	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-3/0
600	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-4/0	3-4/0



Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere.

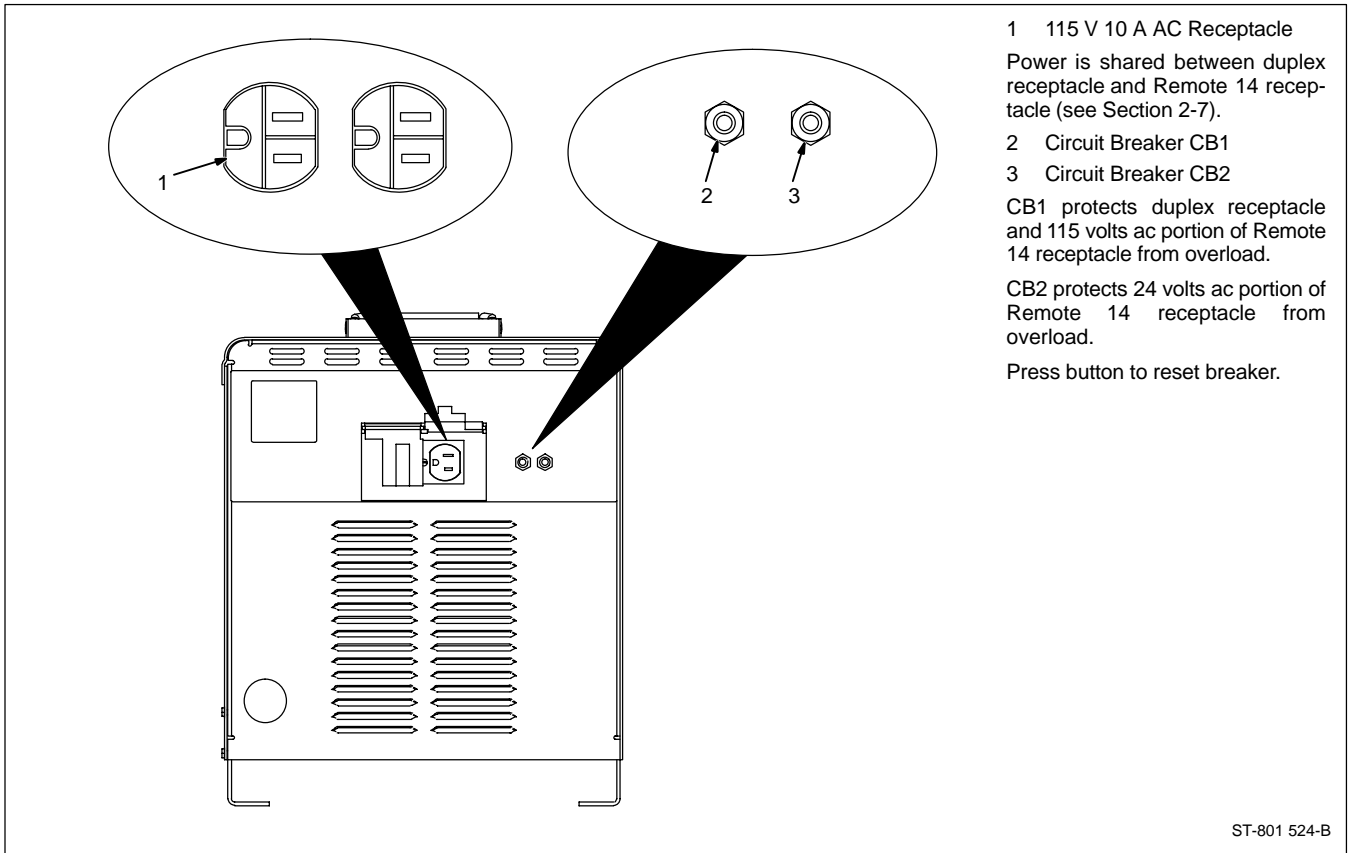
S-0007-D

2-7. Remote 14 Receptacle Information

 <p>Ref. 802 314</p>	 REMOTE 14	Socket*	Socket Information
	24 VOLTS AC OUTPUT (CONTACTOR)	A	24 volts ac. Protected by circuit breaker CB2.
B		Contact closure to A completes 24 volts ac contactor control circuit.	
115 VOLTS AC OUTPUT (CONTACTOR)	I	115 volts ac. Protected by circuit breaker CB1.	
	J	Contact closure to I completes 115 volts ac contactor control circuit.	
REMOTE CONTROL	C	Output to remote control; +10 volts dc in MIG mode.	
	D	Remote control circuit common.	
	E	0 to +10 volts dc input command signal from remote control.	
	M	Mode select.	
A/V AMPERAGE VOLTAGE	F	Current feedback; +1 volt dc per 100 amperes.	
	H	Voltage feedback; +1 volt dc per 10 arc volts.	
GND	G	Circuit common for 24 and 115 volts ac circuits.	
	K	Chassis common.	

*The remaining sockets are not used.

2-8. 115 Volts AC Duplex Receptacle and Circuit Breakers



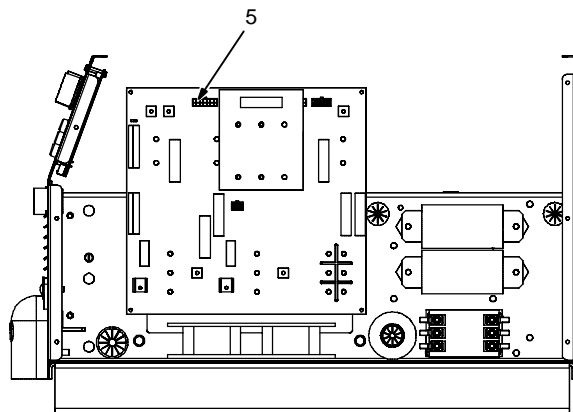
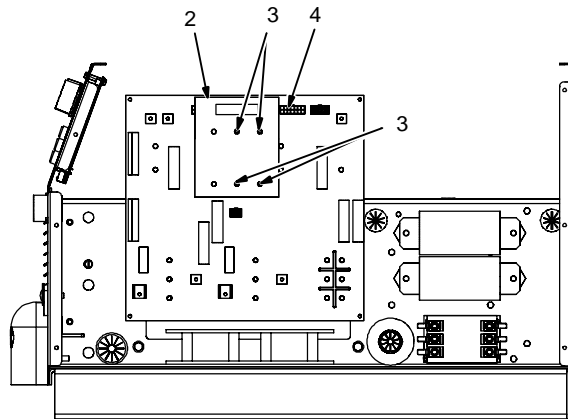
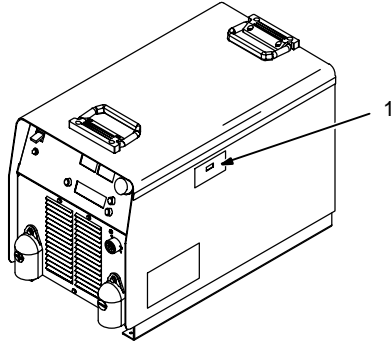
2-9. Electrical Service Guide

	Three-Phase		
	230	460	575
Input Voltage	230	460	575
Input Amperes At Rated Output	50.8	27.8	24.4
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes	80	40	35
Min Input Conductor Size In AWG/Kcmil	6	10	10
Max Recommended Input Conductor Length In Feet (Meters)	138 (42)	233 (71)	371 (113)
Min Grounding Conductor Size In AWG/Kcmil	8	10	10
Reference: 1993 National Electrical Code (NEC).			
			S-0092J

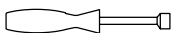
2-10. Selecting Input Voltage



☞ Be sure to reinstall all four screws securing relinking board in place.



Tools Needed:



5/16 in

▲ Turn Off welding power source, disconnect input power, and check voltage on input capacitors according to Section 5-3 before proceeding.

Check input voltage available at site.

1 Voltage Selection View Window

Check voltage selected in unit. Changing selection is only necessary if selected value does not match available input voltage.

2 Relinking Board PC6

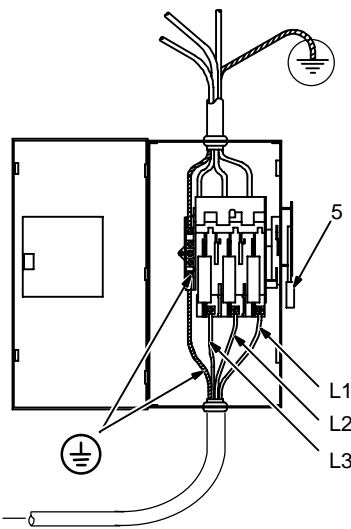
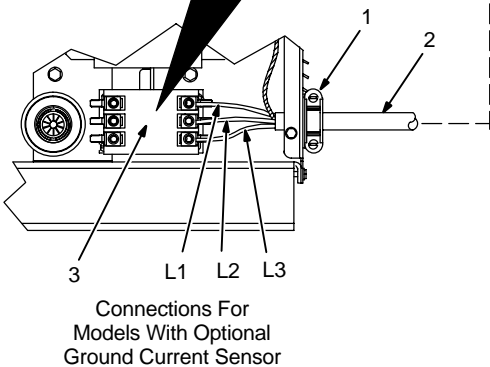
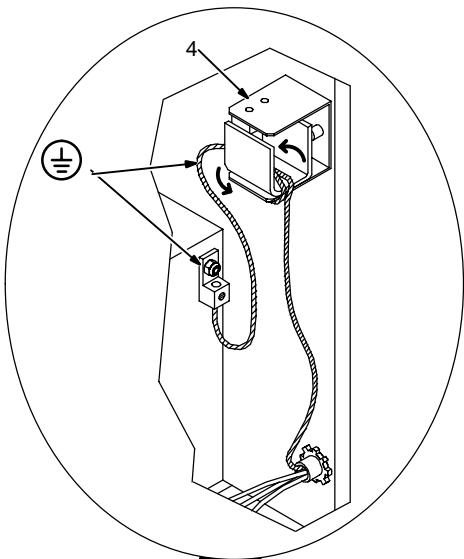
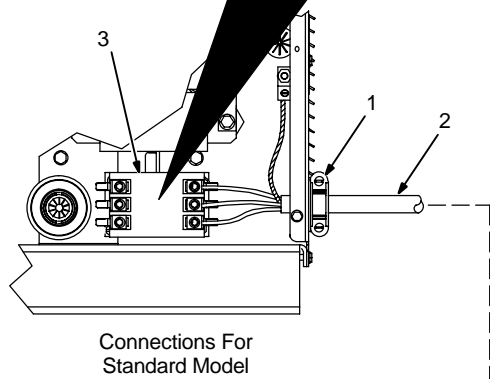
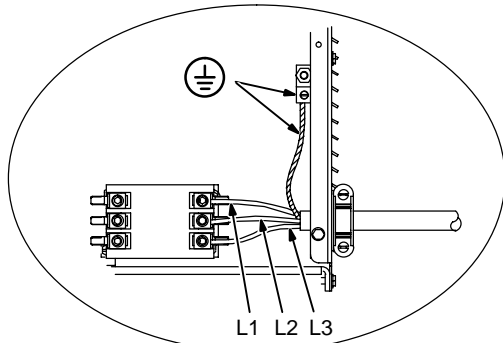
3 Mounting Screws


4 Receptacle RC8 (Connection For 230 VAC Input Power)

5 Receptacle RC7 (Connection For 460 VAC Input Power)

Move relinking board as needed and connect plug PLG4 (in unit) to RC8 or RC7 according to input power voltage.

2-11. Connecting Input Power



 = GND/PE

▲ Always connect grounding conductor first.

▲ Turn Off welding power source, and check voltage on input capacitors according to Section 5-3 before proceeding.

1 Strain Relief Connector Clamp
Obtain and install proper connector.

2 Input And Grounding Conductors

3 Contactor W1

Select size and length using Section 2-9. Connect as shown in illustration.

For Models With Optional Ground Current Sensor:

4 Ground Current Sensor

When cutting input and ground conductors to length, ground conductor must be 26 inches (660 mm) long to wrap around ground current sensor. Note that ground conductor must be insulated between strain relief and ground terminal.

Insert input and grounding conductors through strain relief. Route grounding conductor through reed switch from right side of unit, under switch, and through reed switch again (two turns total) before connecting to ground terminal.

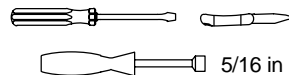
For All Models:

5 Line Disconnect Device

See Section 2-9.

Reinstall right side panel.


Tools Needed:



SECTION 3 – OPERATION

3-1. Front Panel Controls

1 Power Switch

 The fan motor is thermostatically controlled and only runs when cooling is needed.

2 Voltmeter (see Section 3-2)

3 Ammeter/Trim Indicator (see Section 3-2)

4 Ammeter Light

Lights when display beneath is indicating

amperage.

5 Trim Indicator Light

Lights when display beneath is indicating trim.

6 Output Adjust Control

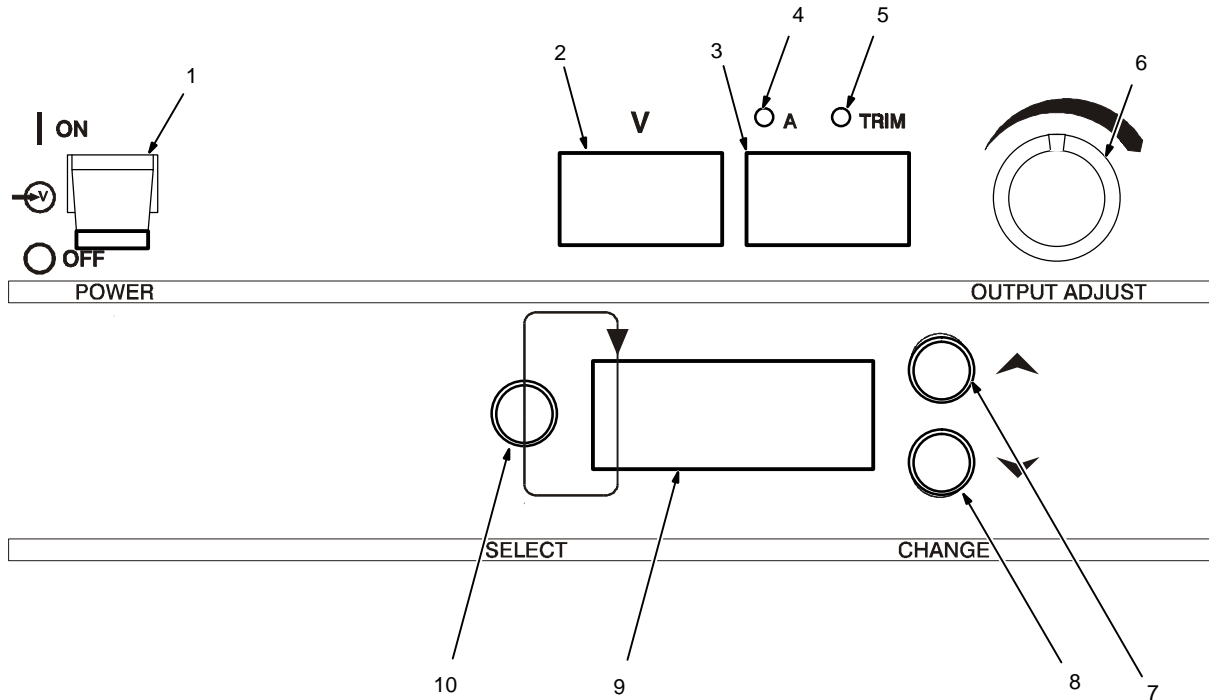
Controls various output values, depending on mode being used.

7 Increment Push Button (see Section 3-4)

8 Decrement Push Button (see Section 3-4)

9 Display (see Section 3-4)

10 Select Push Button (see Section 3-4)



Ref. 192 057

3-2. Meter Functions

NOTE


The meters display the actual weld output values for approximately three seconds after the arc is broken.

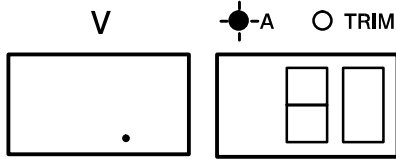
Mode	Meter Reading At Idle		Meter Reading While Welding	
MIG	V 24.5 Preset Volts	A Blank	V 24.5 Actual Volts	A 250 Actual Amps
Pulsed MIG	V Blank	Trim 50 Pulse Display	V 24.5 Actual Volts	A 250 Actual Amps
Stick- Contactor Remote	V Blank	A 85 Preset Amps	V 24.5 Actual Volts	A 85 Actual Amps
Stick- Contactor ON	V 80.0 Actual Volts (OCV)	A 85 Preset Amps	V 24.5 Actual Volts	A 85 Actual Amps
Manual Pulse	V PPS Pulses Per Second	A 200	V 24.5 Actual Volts	A 85 Actual Amps

NOTE

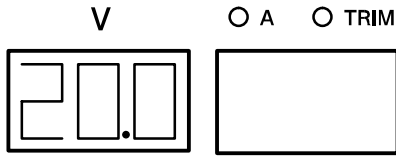
The Stick mode provides the Adaptive Hot Start™ feature, which automatically increases the output amperage at the start of a weld should the start require it. This eliminates electrode sticking at arc start.

3-3. Example Displays

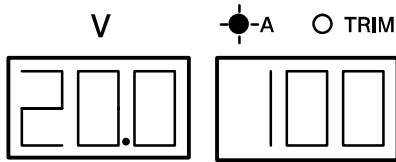
 Values shown are hypothetical.
The "A" (Amperage) and "Trim" lights illuminate as shown.



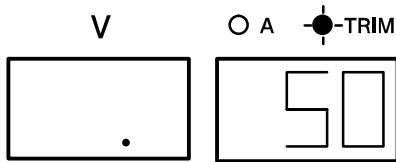
Amperage preset display for Stick welding mode.



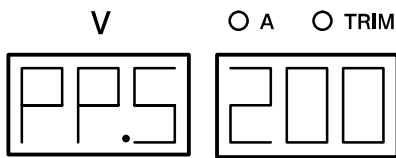
Voltage preset display for MIG welding mode.



Display while welding.

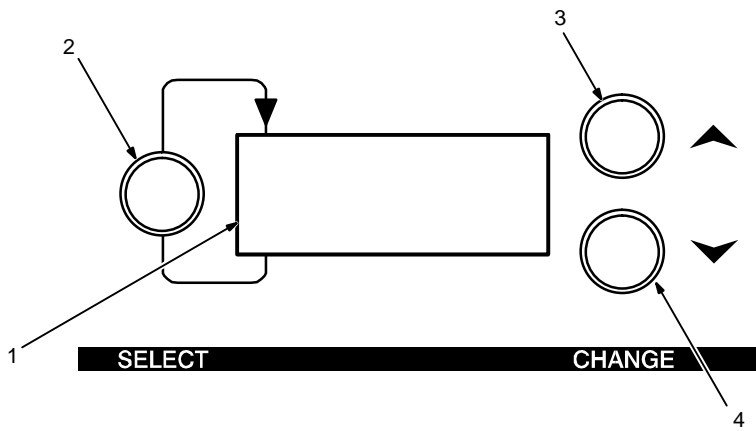


Preset trim display for Pulse welding mode.



Preset pulses per second (PPS) display for Manual Pulse welding mode.

3-4. Synergic Controls and Overview



Controls

- 1 Display
- 2 Parameter Select Push Button
Press button to move > on display. The parameter indicated by > is selected.
- 3 Increment Push Button
Press increment button to increase selected parameter.
- 4 Decrement Push Button
Press decrement button to decrease selected parameter.
See example at left.

Overview

The built-in synergic control provides four modes of operation:

Manual Pulse MIG – control functions as a discrete pulsed MIG CC control.

Mig – control functions as a remote voltage control.

Stick – unit is placed in CC mode for SMAW welding.

Synergic Pulser – programs that use factory-entered values are used to control process.

Setup screens (see Section 3-6) allow programs or modes to be made inaccessible (locked out) to the operator, and the language used in the displays (English, French, etc.) to be defined.

Example

To select Program 7, set to Non Adaptive, and set Arc Length to 36, proceed as follows:

Select top line by pressing Select push button until > is on top line. Press Increment button until Program 7 appears.



```
> P r g 7 0 3 5 A l 4 0 4 3 A r
  A d a p t i v e
```


Press Select push button to select second line, and press Increment or Decrement button so Non Adaptive appears.



```
P r g 7 0 3 5 A l 4 0 4 3 A r
> N o n A d a p t i v e
```

Turn Output Adjust control to set arc length to 36.



O A  TRIM

36

3-5. Initial Display, Manual Pulse MIG Mode, MIG Mode, and Stick Mode



```

I N V I S I O N   4 5 6 M P
C O P Y R I G H T   ( C )   1 9 9 8
M I L L E R   E l e c t r i c
M f g   C o   X X X X X X
    
```

1

With > on top line, press Increment or Decrement button until Manual Pulse MIG appears.

2

```

> P r g 1 6   M a n u a l   P u l s e
3 4 6   A m p s   P e a k
7 8   A m p s   B a c k g r o u n d
1 . 7 3   m s   P u l s e   W i d t h
    
```

Display scrolls to show line 5.

```

3 4 6   A m p s   P e a k
7 8   A m p s   B a c k g r o u n d
1 . 7 3   m s   P u l s e   W i d t h
4 0 0   A m p s   S t a r t
    
```

With > on top line, press Increment or Decrement button until MIG appears.

3

```

> P r g 1 7   M I G
3 0 %   I n d u c t a n c e
    
```

With > on top line, press Increment or Decrement button until STICK appears.

4

```

> P r g 1 8   S T I C K
C o n t a c t o r   R E M O T E
2 5 %   D I G
    
```

1 Software Program Number

When power is applied, initial display with software number appears momentarily, and then last program to be viewed before control was shut down appears.

2 Manual Pulse MIG Mode

The synergic control functions as a discrete pulsed MIG CC control in this mode.

Select top line of display, and press Increment or Decrement button until Manual Pulse MIG is displayed.

Select Amps Peak line, and use Increment or Decrement button to set peak amperage from 100–400 amps, but always at least 1 amp more than background amperage.

Select Amps Background line, and use Increment or Decrement button to set background amperage (min: 10 amps; max: 300 amps, but always at least 1 amp less than peak setting).

Select ms Pulse Width line, and use Increment or Decrement button to set pulse width (1 - 5 ms, but max setting may be less depending on Frequency setting).

Select Amps Start line, and use Increment or Decrement button to set starting amperage (150 - 530 amperes). This amperage value is used at the start of the weld or when an arc is restarted.

Use Output Adjust control to set pulse frequency. The range is 30 - 300 pulses per second, but max setting may be less depending on Pulse Width setting.

3 MIG Mode

The synergic control provides voltage control.

Select top line of display, and press Increment or Decrement button until MIG is displayed. Select Inductance line, and use Increment or Decrement button to set inductance (0–100% in increments of one). Use Output Adjust control to set voltage value (10–35 volts).

4 Stick Mode

In the Stick mode, the user can select contactor control (remote or On) and the Dig value.

Select contactor control line and press Increment or Decrement button to select Remote contactor control or On. The contactor is On at all times when On is selected.

Select Dig line, and use Increment or Decrement button to set Dig value (min: 0%; max: 100%). Dig helps arc starting and reduces sticking while welding. The higher the dig value defined, the more the short-circuit amperage increases at low arc voltage.

3-6. Setup Screens



1 →

```
S e t u p
  A c c e s s i b l e   P r o g r a m s
  M a n u a l   P u l s e   M i g
> O f f
```

2 →

```
S e t u p
  L a n g u a g e
> E n g l i s h
```

To access Setup screens: turn welding power source Off, press and hold Select push button, turn unit On, and hold push button down until initial screen leaves.

To exit Setup screens, turn welding power source Off and then On again. Parameters that are displayed when the Setup screens are exited are active.

1 Accessible Programs Screen
Select second line of display, and press Increment or Decrement button until Accessible Programs is displayed.

Select third line of display and press Increment or Decrement button to access each program and the three modes as desired. Select the fourth line and press Increment or Decrement button to define each option On (accessible) or Off (not accessible).

Programs and modes that are defined Off are not shown when the operator scrolls through the displays in normal operation.

2 Language Screen
Select second line of display, and press Increment or Decrement button until Language is displayed. Select third line of display and press Increment or Decrement button until desired language is shown. The choices are English, French, Italian, Spanish, and German.

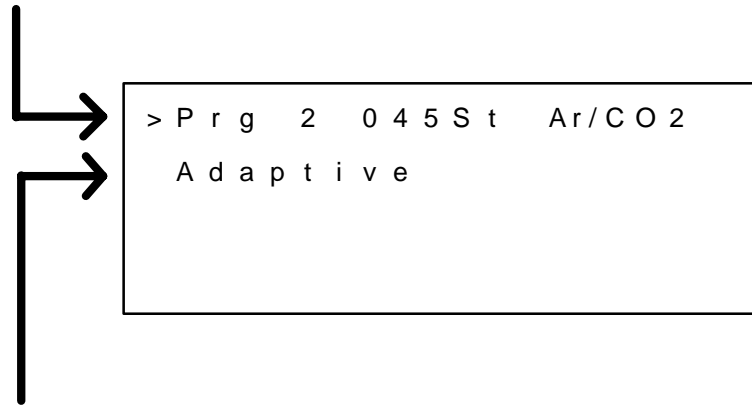
3-7. Choosing Pulse Programs and Setting Parameters



Choosing Pulse Program:

Pulse programs are pre-written and cannot be changed by the user. See Section 4 for program parameters and recommended gas mixtures.

Choose program depending on the type and size of wire, and type of shielding gas used. For example, the program shown below is for .045 steel wire using Ar – CO₂ gas.



Choosing Adaptive Or Non Adaptive:

Adaptive: Pulse frequency is automatically regulated to maintain a constant arc length, regardless of changes in wire stickout.

Non Adaptive: Constant pulse frequency is maintained, regardless of the arc length.

Choose mode which best applies to your application.

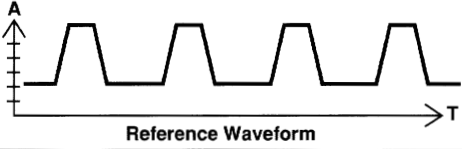
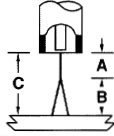
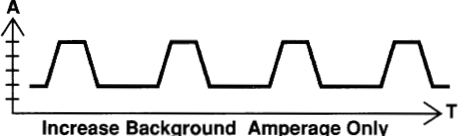

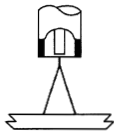
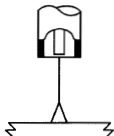
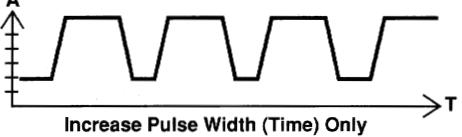
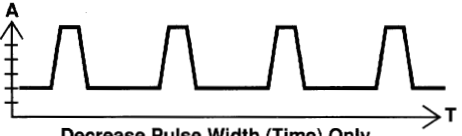
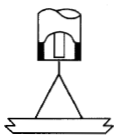
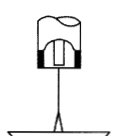
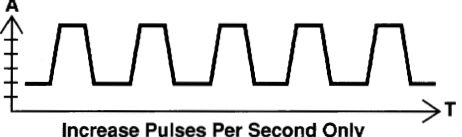
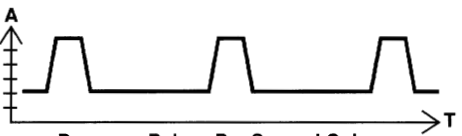
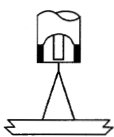
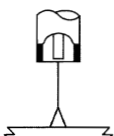


Setting Arc Length:

Arc length is adjusted with the Output Adjust control. Displayed preset Trim values (0 – 100) are for reference only.

Adjustment normally needed if wire feed speed or type of weld joint is changed.

Set arc length that best applies to your application.

3-8. How Manual Pulsed MIG Waveform Components Affect Arc and Burn-Off Rate

	CHANGES TO ARC	COMMENTS
 <p>Reference Waveform</p>		<p>A Electrode extension (stickout) B Arc length C Contact tube-to-work distance should be 3/8 in. to 3/4 in. Recommended gun angle is 10° to 20° from vertical.</p>
 <p>Increase Peak Amperage Only</p>  <p>Decrease Peak Amperage Only</p>	 	<p>Increasing peak amperage only: Increases burn-off rate, which directly affects arc length Increases average amperage slightly Increases heat input slightly</p> <p><i>Note: A good fine tuning parameter for arc length. Assuming a constant pulse width (peak time), peak amperage should be high enough to achieve a spray transfer. Too low of a peak current often results in a globular transfer. High peak amperages result in smaller droplets, and a more forceful or driving arc.</i></p>
 <p>Increase Background Amperage Only</p>  <p>Decrease Background Amperage Only</p>	 	<p>Increasing background amperage only: Increases arc length Increases average amperage Increases heat input and penetration Increases puddle fluidity</p> <p><i>Note: This current level is largely responsible for arc stabilization, and must be high enough to maintain the arc between peak current pulses.</i></p>
 <p>Increase Pulse Width (Time) Only</p>  <p>Decrease Pulse Width (Time) Only</p>	 	<p>Increasing pulse width (time) only: Increases arc length Increases heat input and penetration Increases arc cone width Increases average amperage</p>
 <p>Increase Pulses Per Second Only</p> <p>Decrease Pulses Per Second Only</p>		<p>Increasing pulses per second only: Increases arc length Increases average amperage Increases heat input</p> <p><i>Note: A good fine tuning parameter for arc length. Typically, this variable is adjusted to control the Burn-off rate of the wire as it is fed into the arc.</i></p>

SECTION 4 – PROGRAMS

NOTE 

Section 4-1 provides basic information on each of the fifteen programs in the unit's memory. See Section 4-2 for more detailed information on each of the programs.

NOTE 

Synergic Information: The manufacturer makes no warranties, express or implied, that welds made using the synergic parameters of this equipment will meet the requirements of the application.

The synergic parameters contained in this equipment are intended only to be a general guideline. The choice and use of any synergic setting must be tested as to its suitability for the application.

4-1. Overview of Programs

Program #	Wire Type	Wire Size	Shielding Gas	IPM: Min	IPM: Max
1	Steel	.035 in	Ar/CO ₂	80	750
2	Steel	.045 in	Ar/CO ₂	80	750
3	Steel	.052 in	Ar/CO ₂	70	750
4	Steel	.062 in	Ar/CO ₂	60	400
5	Stainless	.035 in	98Ar/2CO ₂	100	750
6	Stainless	.045 in	98Ar/2CO ₂	90	750
7	4043AL	.035 in	Argon	240	840
8	4043AL	.047 in	Argon	150	750
9	4043AL	.062 in	Argon	120	520
10	5356AL	.035 in	Argon	350	850
11	5356AL	.047 in	Argon	200	750
12	5356AL	.062 in	Argon	180	580
13	Nickel	.035 in	75Ar/25He	120	670
14	Nickel	.045 in	75Ar/25He	100	600
15	Silicon Bronze	.035 in	Argon	120	750
16	Metal Core	.045 in	Ar/CO ₂	100	750
17	Metal Core	.052 in	Ar/CO ₂	50	750
18	Metal Core	.062 in	Ar/CO ₂	50	500

4-2. Programs

Program 1 — .035 ER70S-3 Mild Steel — Recommended Gases: Argon/CO₂ Gases: Argon/CO₂ mixes up to 10% CO₂; Argon/O₂ mixes up to 5% O₂						
IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
80	0	291	37	33	1.48	292
147	10	315	65	59	1.62	314
214	20	345	82	85	1.75	345
281	30	385	96	100	1.87	384
348	40	421	101	110	1.95	420
415	50	442	110	120	1.98	441
482	60	458	120	130	2.10	458
549	70	472	124	140	2.20	472
616	80	487	129	150	2.26	487
683	90	501	134	160	2.32	501
750	100	510	138	165	2.37	511

Program 2 — .045 ER70S-3 Mild Steel — Recommended Gases: Argon/CO₂ Gases: Argon/CO₂ mixes up to 10% CO₂; Argon/O₂ mixes up to 5% O₂						
IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
80	0	381	37	50	2.00	550
147	10	404	56	80	2.20	600
214	20	435	70	110	2.35	652
281	30	461	84	130	2.50	698
348	40	487	91	145	2.70	698
415	50	498	98	155	2.80	698
482	60	512	105	165	2.90	698
549	70	522	110	175	3.00	698
616	80	534	115	185	3.10	698
683	90	545	120	195	3.20	698
750	100	555	124	205	3.30	698

Program 3 — .052 ER70S-3 Mild Steel — Recommended Gases: Argon/CO₂
Gases: Argon/CO₂ mixes up to 10% CO₂;
Argon/O₂ mixes up to 5% O₂

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
70	0	369	44	57	2.30	600
138	10	449	68	94	2.43	600
206	20	484	89	125	2.58	624
274	30	512	117	150	2.70	652
342	40	538	138	170	2.80	674
410	50	562	162	191	2.90	698
478	60	574	174	212	3.00	727
546	70	585	185	235	3.10	755
614	80	595	195	248	3.15	780
682	90	600	200	253	3.18	801
750	100	600	204	256	3.20	801

Program 4 — .062 ER70S-3 Mild Steel — Recommended Gases: Argon/CO₂
Gases: Argon/CO₂ mixes up to 10% CO₂;
Argon/O₂ mixes up to 5% O₂

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
60	0	458	51	60	2.42	674
94	10	489	82	81	2.62	688
128	20	512	110	102	2.80	702
162	30	527	134	120	2.92	716
196	40	541	155	138	3.04	730
230	50	557	176	156	3.17	748
264	60	569	197	174	3.30	762
298	70	581	218	192	3.43	776
332	80	590	240	210	3.56	790
366	90	600	251	220	3.62	801
400	100	600	261	228	3.68	801

Program 5 — .035 309L Stainless Steel — Recommended Gases: 98 Argon/2 CO₂
Alternative Gases: Argon/CO₂ mixes up to 10% CO₂;
Argon/O₂ mixes up to 5% O₂

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
100	0	272	40	44	1.52	402
165	10	298	49	77	1.67	420
230	20	310	72	88	1.79	441
295	30	322	96	100	1.91	458
360	40	334	108	112	2.03	480
425	50	348	115	125	2.14	494
490	60	362	122	138	2.22	501
555	70	374	129	151	2.29	508
620	80	388	136	164	2.35	515
685	90	400	143	177	2.40	522
750	100	411	150	190	2.45	529

**Program 6 — .045 309L Stainless Steel — Recommended Gases: 98 Argon/2 CO₂
Alternative Gases: Argon/CO₂ mixes up to 10% CO₂;
Argon/O₂ mixes up to 5% O₂**

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
90	0	320	47	60	1.50	441
156	10	345	70	90	1.65	472
222	20	371	89	120	1.75	511
288	30	402	103	145	1.85	550
354	40	430	117	155	1.97	589
420	50	454	129	165	2.09	631
486	60	470	138	175	2.20	663
552	70	484	145	185	2.30	695
618	80	498	152	195	2.40	727
684	90	512	157	210	2.50	762
750	100	527	162	225	2.60	801

Program 7 — .035 Aluminum 4043 — Argon

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
240	0	157	42	35	2.05	402
300	10	160	61	40	2.10	451
360	20	181	80	60	2.17	451
420	30	218	101	75	2.30	451
480	40	244	112	90	2.40	501
540	50	256	120	104	2.50	501
600	60	268	131	117	2.60	501
660	70	280	141	127	2.70	550
720	80	291	152	138	2.80	550
780	90	301	162	148	2.90	550
840	100	312	174	158	3.00	550

Program 8 — .047 Aluminum 4043 — Argon

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
150	0	200	40	54	2.00	501
210	10	218	68	80	2.16	600
270	20	270	82	96	2.42	600
330	30	320	94	110	2.55	600
390	40	360	112	120	2.68	600
450	50	385	127	131	2.81	652
510	60	407	138	141	2.92	652
570	70	428	148	151	3.02	702
630	80	451	160	160	3.12	702
690	90	470	171	170	3.26	751
750	100	491	181	180	3.38	751

Program 9 — 1/16 .062 Aluminum 4043 — Argon

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
120	0	258	56	40	2.15	550
160	10	270	89	60	2.40	649
200	20	298	115	80	2.60	649
240	30	336	134	106	2.89	702
280	40	367	148	122	3.15	720
320	50	400	157	134	3.35	737
360	60	421	169	144	3.55	748
400	70	440	181	154	3.70	758
440	80	461	192	164	3.90	772
480	90	480	204	174	4.05	787
520	100	498	216	180	4.18	801

Program 10 — .035 Aluminum 5356 — Argon

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
350	0	200	65	54	1.90	451
400	10	216	72	66	1.95	451
450	20	230	80	78	2.00	451
500	30	242	87	88	2.05	501
550	40	251	94	96	2.10	501
600	50	261	101	104	2.17	501
650	60	272	108	112	2.24	501
700	70	284	117	121	2.32	501
750	80	296	127	130	2.40	550
800	90	301	131	137	2.45	550
850	100	303	134	140	2.48	550

Program 11 — .047 Aluminum 5356 — Argon

IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
200	0	240	47	55	2.10	501
255	10	270	58	80	2.20	600
310	20	301	65	98	2.30	600
365	30	320	72	110	2.40	652
420	40	341	80	120	2.50	652
475	50	350	91	130	2.60	652
530	60	388	101	140	2.70	652
585	70	411	110	153	2.80	702
640	80	421	120	163	2.90	702
695	90	440	131	168	2.95	702
750	100	461	141	170	3.00	702

Program 12 — .062 Aluminum 5356 — Argon						
IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
180	0	291	82	50	2.25	652
220	10	312	98	62	2.38	663
260	20	338	120	77	2.55	705
300	30	362	136	90	2.69	723
340	40	383	148	100	2.80	748
380	50	404	160	110	2.91	772
420	60	428	176	122	3.04	783
460	70	451	192	134	3.19	794
500	80	484	207	146	3.34	801
540	90	501	216	156	3.42	801
580	100	517	225	165	3.50	801

Program 13 — .035 Nickel — 75 Argon/25 Helium						
IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
120	0	254	37	40	2.85	501
175	10	287	49	54	2.96	501
230	20	312	61	68	3.08	511
285	30	331	72	77	3.20	522
340	40	348	84	89	3.32	532
395	50	360	91	99	3.40	543
450	60	374	98	108	3.48	554
505	70	390	105	117	3.55	564
560	80	404	112	126	3.62	575
615	90	418	120	135	3.69	585
670	100	432	127	144	3.76	596

Program 14 — .045 Nickel — 75 Argon/25 Helium						
IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
100	0	289	56	56	3.00	600
150	10	315	75	76	3.22	600
200	20	345	89	100	3.34	600
250	30	364	103	116	3.50	628
300	40	385	117	129	3.62	645
350	50	404	134	142	3.72	660
400	60	423	150	155	3.82	670
450	70	440	164	168	3.92	677
500	80	458	176	180	4.02	688
550	90	475	188	192	4.12	702
600	100	491	197	204	4.20	712

Program 15 — .035 Silicon Bronze — Argon						
IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
120	0	280	37	42	1.30	501
183	10	331	54	57	1.40	540
246	20	371	68	72	1.50	582
309	30	402	77	93	1.60	610
372	40	421	87	108	1.70	642
435	50	442	96	119	1.80	663
498	60	463	108	130	1.90	684
561	70	482	115	140	2.00	705
624	80	496	122	150	2.10	720
687	90	508	127	160	2.20	730
750	100	520	131	170	2.30	737

Program 16 — .045 Metal Core — Recommended Gases: Argon/CO₂ Gases: Argon/CO₂ mixes up to 20% CO₂						
IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
100	0	376	42	60	1.70	476
165	10	409	51	95	1.80	511
230	20	440	65	115	1.90	540
295	30	465	75	140	1.95	568
360	40	480	82	155	2.00	582
425	50	496	89	170	2.10	596
490	60	512	96	185	2.20	614
555	70	527	101	195	2.25	628
620	80	543	105	205	2.30	645
685	90	560	112	217	2.40	660
750	100	576	120	230	2.50	677





Program 17 — .052 Metal Core — Recommended Gases: Argon/CO₂ Gases: Argon/CO₂ mixes up to 20% CO₂						
IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
50	0	360	30	35	1.90	600
120	10	421	54	75	2.00	649
190	20	461	72	105	2.10	698
260	30	491	91	125	2.25	751
330	40	512	105	145	2.40	800
400	50	531	120	165	2.50	800
470	60	545	127	180	2.60	800
540	70	564	138	190	2.70	800
610	80	576	143	202	2.80	800
680	90	588	148	214	2.90	800
750	100	600	150	225	3.00	800


**Program 18 — .062 Metal Core — Recommended Gases: Argon/CO₂
Gases: Argon/CO₂ mixes up to 20% CO₂**



IPM	Trim	Peak Amp	Background Amp	Freq.	Pulse Width	Starting Amps
50	0	451	37	38	2.10	674
95	10	498	70	68	2.30	705
140	20	515	91	90	2.40	741
185	30	527	120	112	2.50	772
230	40	541	150	132	2.60	800
275	50	552	171	150	2.75	800
320	60	562	190	168	2.90	800
365	70	571	209	185	3.05	800
410	80	581	225	202	3.20	800
455	90	590	244	220	3.35	800
500	100	600	261	238	3.50	800


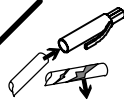
SECTION 5 – MAINTENANCE AND TROUBLESHOOTING

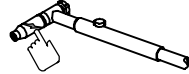
5-1. Routine Maintenance



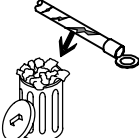

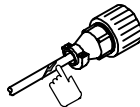

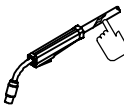




▲ Disconnect power before maintaining.
☞ Maintain more often during severe conditions.


3 Months

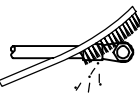
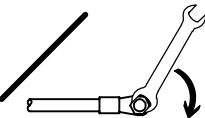
Replace damaged or unreadable label.
 


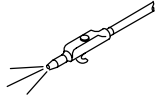
Repair or replace cracked cables.
 


Replace cracked torch body.
 

Repair or replace cracked cables and cords.
 







6 Months

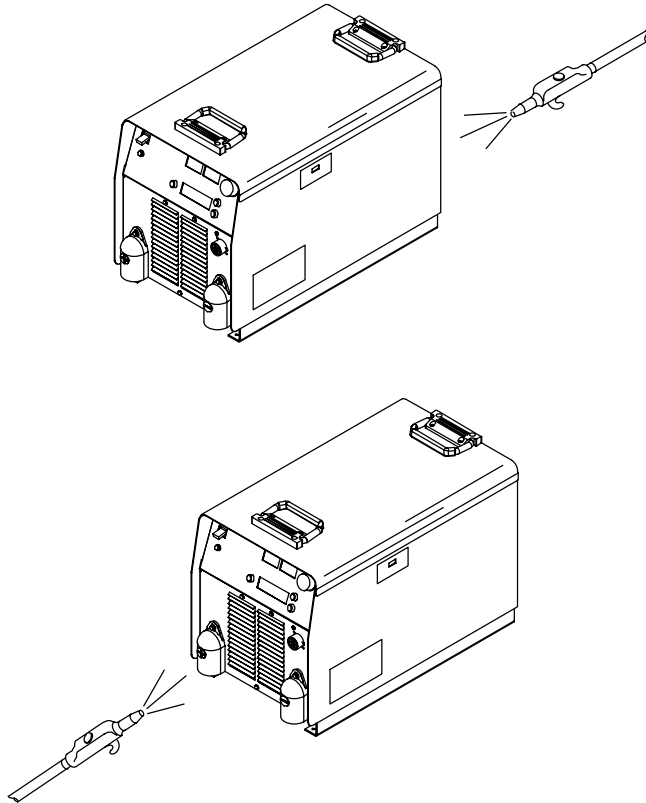
Clean and tighten weld terminals.
 


Blow out inside.
 

5-2. Blowing Out Inside of Unit

▲ Do not remove case when blowing out inside of unit.

To blow out unit, direct airflow through front and back louvers as shown.

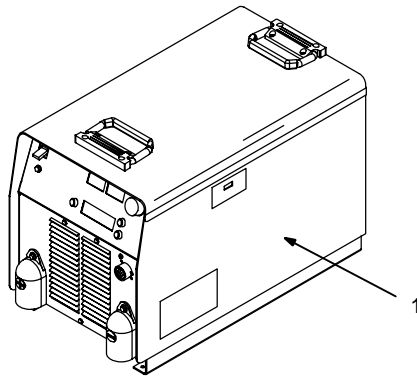


802 314

5-3. Removing Right Side Panel and Measuring Input Capacitor Voltage in 230/460 Volt Models



▲ Significant DC voltage can remain on capacitors after unit is Off. Always check the voltage as shown to be sure the input capacitors have discharged before working on unit.



Turn Off welding power source, and disconnect input power.

1 Right Side Panel

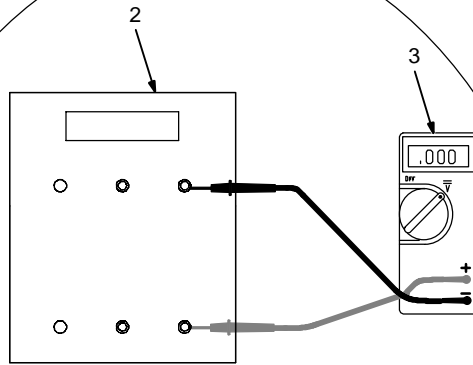
To remove panel, remove screws securing panel to unit.

2 Relinking Board PC6

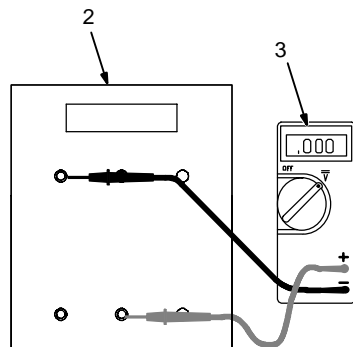
3 Voltmeter

Measure the dc voltage across the screw terminals on PC6 as shown until voltage drops to near 0 (zero) volts.

Proceed with job inside unit. Reinstall right side panel when finished.

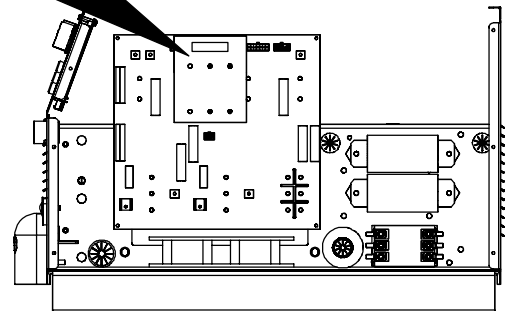
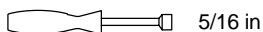


230 VAC input:
+ lead to lower terminal, - lead to upper terminal



460 VAC input:
+ lead to lower right terminal, - lead to upper left terminal

Tools Needed:



5-4. Removing Right Side Panel and Measuring Input Capacitor Voltage in 575 Volt Models



▲ Significant DC voltage can remain on capacitors after unit is Off. Always check the voltage as shown to be sure the input capacitors have discharged before working on unit.

Turn Off welding power source, and disconnect input power.

1 Right Side Panel

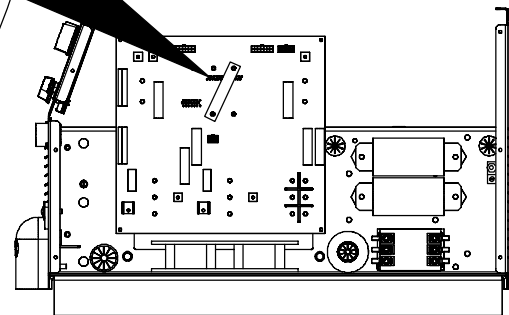
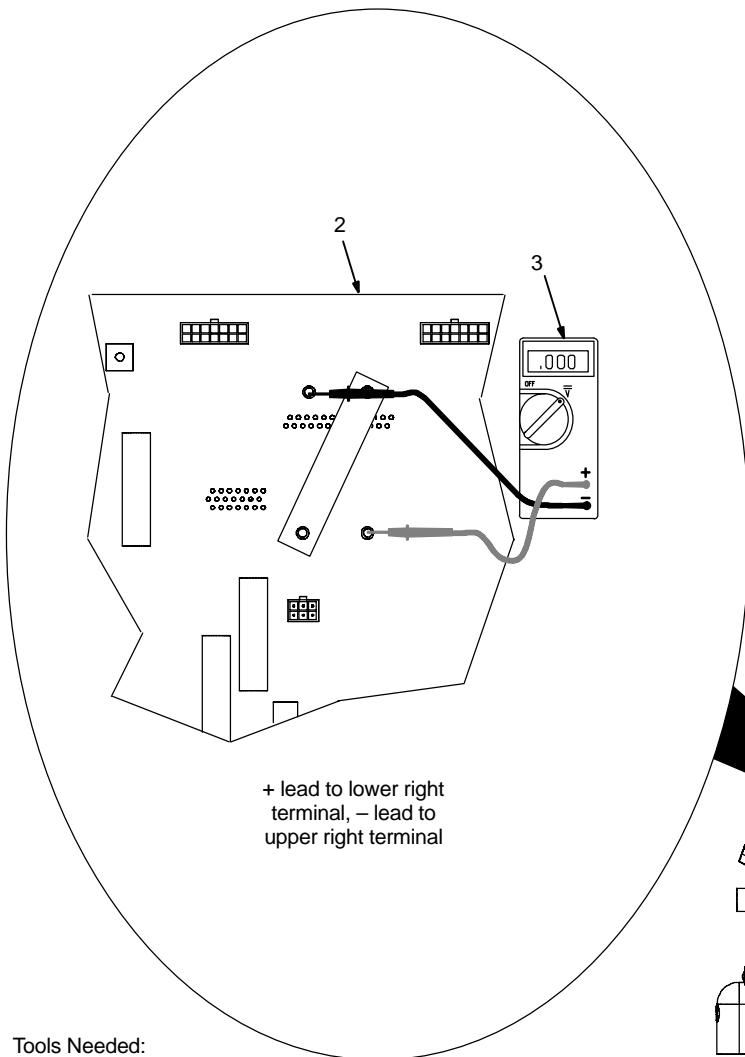
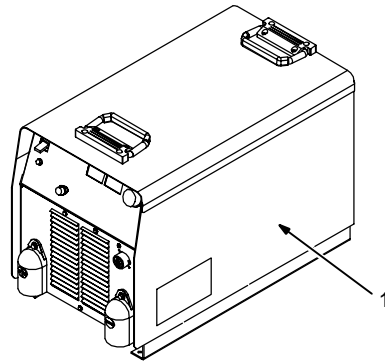
To remove panel, remove screws securing panel to unit.

2 Interconnect Board PC2

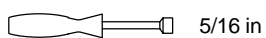
3 Voltmeter

Measure the dc voltage across the screw terminals on PC2 as shown until voltage drops to near 0 (zero) volts.

Proceed with job inside unit. Reinstall right side panel when finished.



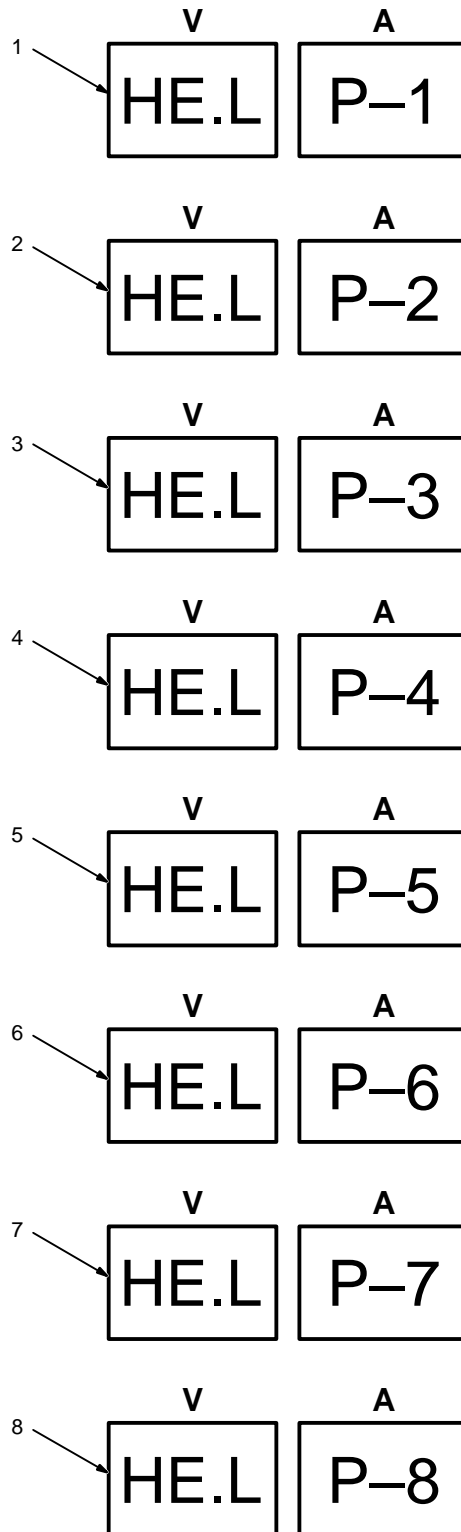
Tools Needed:



5/16 in

Ref. ST-801 718 / Ref. ST-801 536-A

5-5. Voltmeter/Ammeter Help Displays



All directions are in reference to the front of the unit. All circuitry referred to is located inside the unit.

1 Help 1 Display

Indicates a malfunction in the primary power circuit. If this display is shown, contact a Factory Authorized Service Agent.

2 Help 2 Display

Indicates a malfunction in the thermal protection circuitry located on the left side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

3 Help 3 Display

Indicates the left side of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 2-2). Operation will continue when the unit has cooled.

4 Help 4 Display

Indicates a malfunction in the thermal protection circuitry located on the right side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

5 Help 5 Display

Indicates the right side of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 2-2). Operation will continue when the unit has cooled.

6 Help 6 Display

Indicates that the input voltage is too low and the unit has automatically shut down. Operation will continue when the voltage is within $\pm 15\%$ of the operating range. If this display is shown, have an electrician check the input voltage.

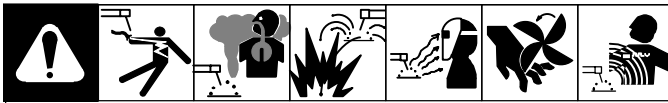
7 Help 7 Display

Indicates that the input voltage is too high and the unit has automatically shut down. Operation will continue when the voltage is within $\pm 15\%$ of the operating range. If this display is shown, have an electrician check the input voltage.

8 Help 8 Display

Indicates a malfunction in the secondary power circuit of the unit. If this display is shown, contact a Factory Authorized Service Agent. In addition, when the optional ground current sensor is installed, this display indicates weld current in the ground conductor. When this occurs, have an electrician check the primary and secondary connections.

5-6. Error Codes



- 1 Program CRC Error
- 2 Program Range Error

If either error code appears, reset the display to factory settings as follows:

Press Parameter Select push button or turn welding power source Off and back On. Change settings and continue.

1

ERROR

Program CRC

Memory Will Be Reset

Press Parm. Select

2

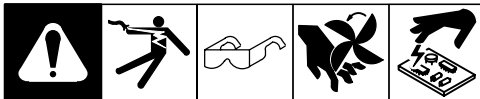
ERROR

Program Range

Memory Will Be Reset

Press Parm. Select

5-7. Troubleshooting



Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 2-11).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 2-11).
	Check for proper input power connections (see Section 2-11).
No weld output; meter display On.	Check, repair, or replace remote control.
	Unit overheated. Allow unit to cool with fan On (see Section 2-2).
	Check voltmeter/ammeter Help displays.
Erratic or improper weld output.	Check to make sure correct program is selected for welding wire and shielding gas used.
	Use proper size and type of weld cable (see Section 2-9).
	Clean and tighten all weld connections.
No 115 volts ac output at duplex receptacle, Remote 14 receptacle.	Reset circuit breaker CB1 (see Section 2-8).
No 24 volts ac output at Remote 14 receptacle.	Reset circuit breaker CB2 (see Section 2-8).

SECTION 6 – ELECTRICAL DIAGRAM

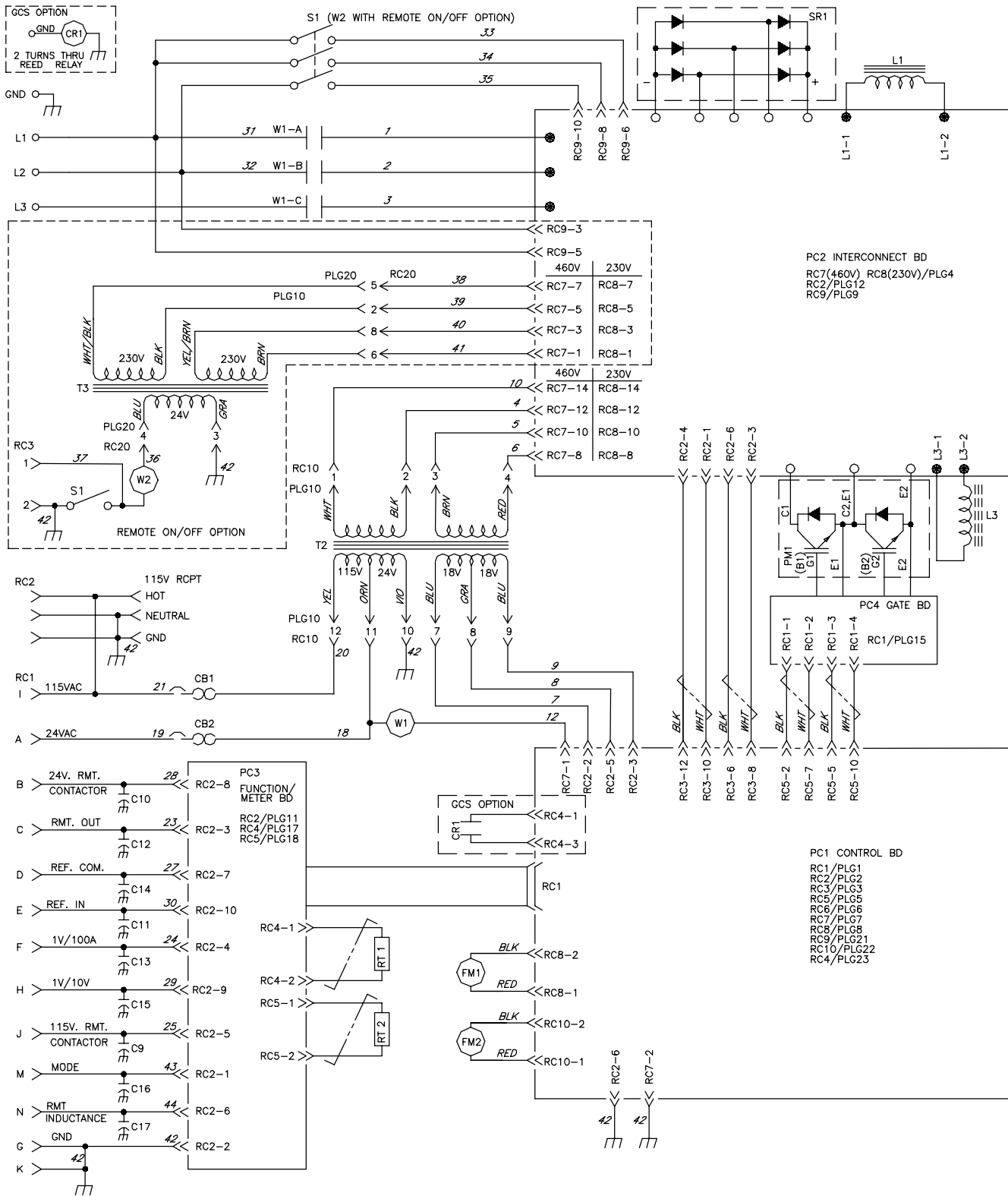


Figure 6-1. Circuit Diagram For Welding Power Source (230/460 Volt Models)

PC6 RELINK BD

RC3
RC4
RC5
RC6
RC10
RC11

+C3
+C4

+C5
+C6

C1/C2

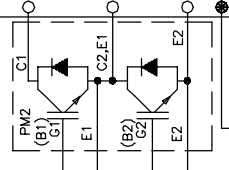
T1B
T1A

CT1

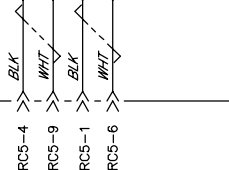
T1

L4-1
L4-2

L4



PC5 GATE BD
RC1-1
RC1-2
RC1-3
RC1-4
RC1/PLG16



RC5-4
RC5-9
RC5-1
RC5-6

RC6-1

RC6-2

BLK

RC3-4

WHT

RC2-7

14/BARE

RC2-1

15/CLEAR

RC2-8

16/BLACK

RC2-4

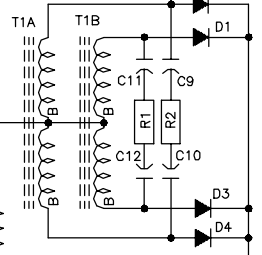
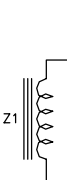
17/RED

RC9-3

WHT

RC9-1

BLK



PLG19

4

2

3

1

HD1

22

POSITIVE

42

NEGATIVE

26

C7

42

C8

42

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.

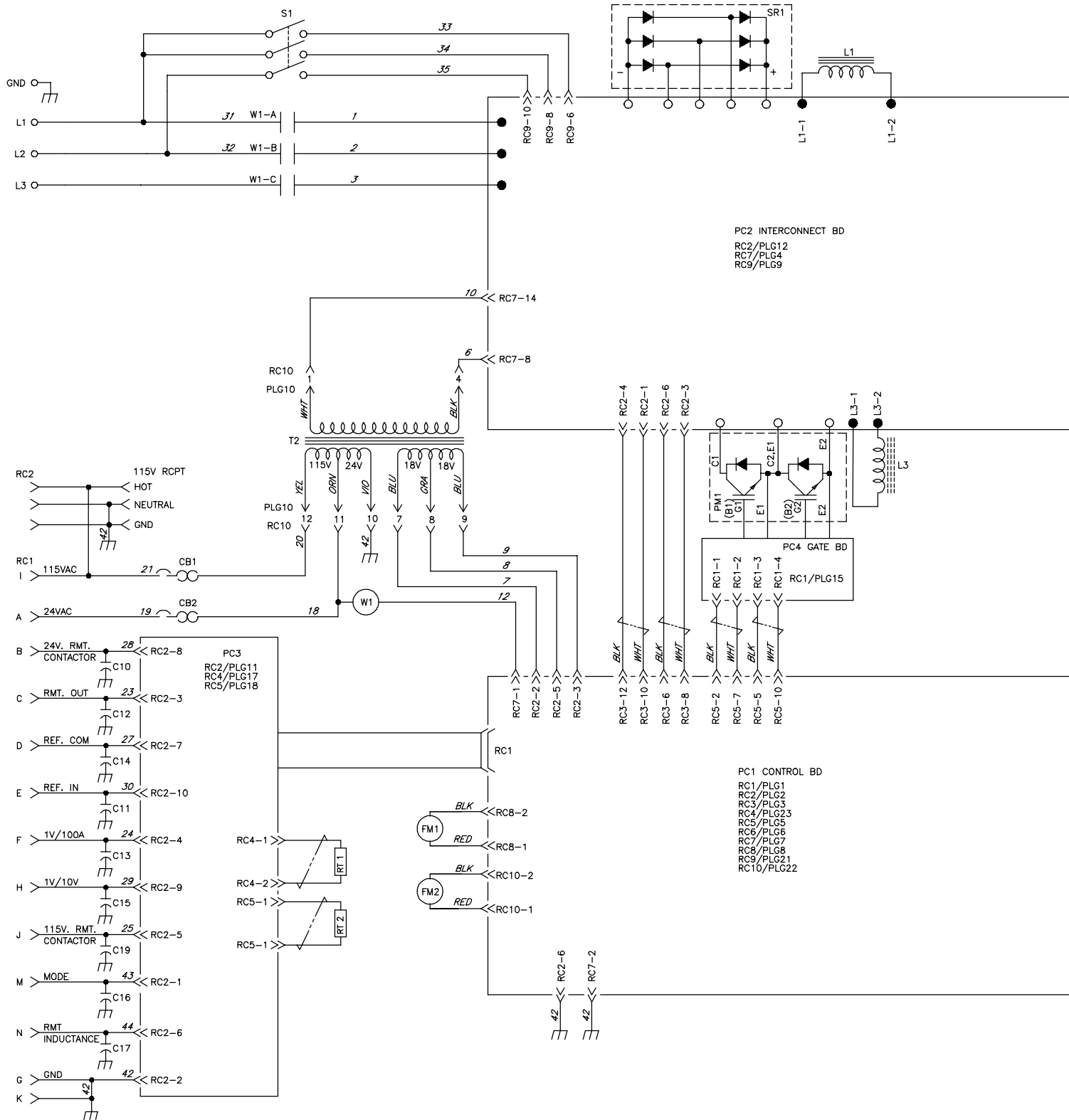
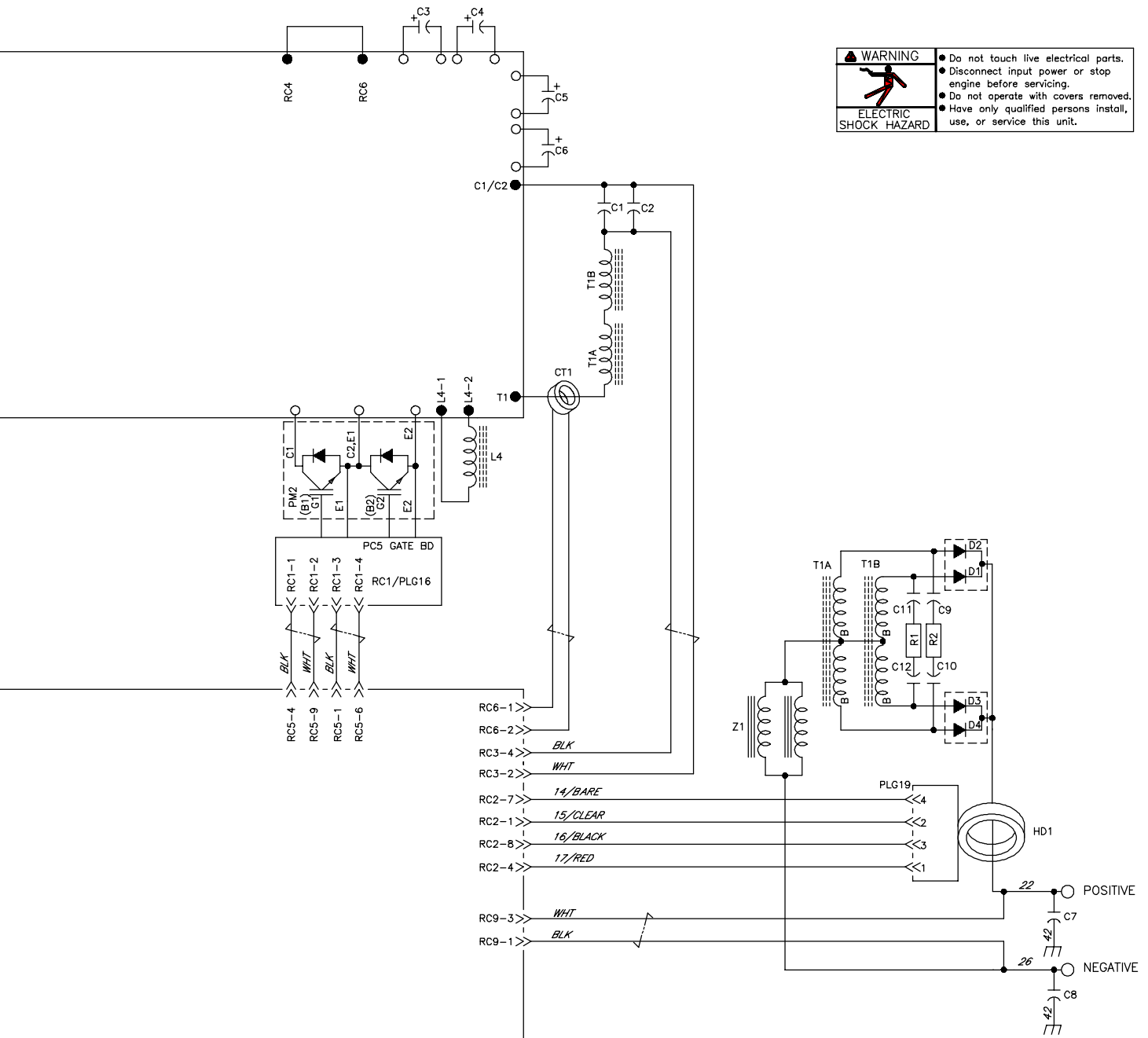



Figure 6-2. Circuit Diagram For Welding Power Source (575 Volt Models)



SECTION 7 – PARTS LIST

 Hardware is common and not available unless listed.

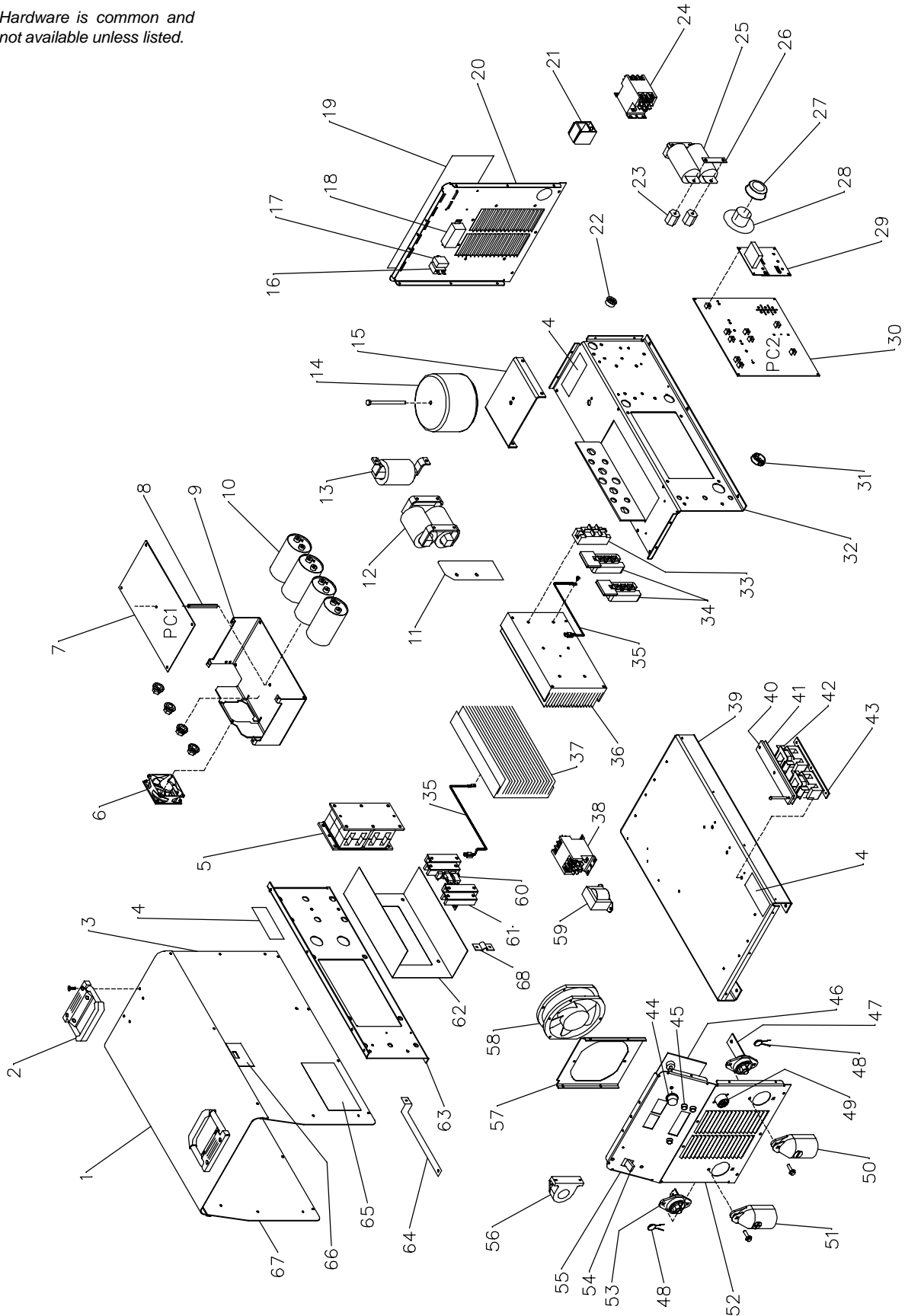


Figure 7-1. Complete Assembly

802 316-B

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 7-1. Complete Assembly				
1		187 234	COVER, top	1
2		195 585	HANDLE	2
3		+190 270	PANEL, side RH (230/460)	1
3		+190 373	PANEL, side RH (575)	1
		178 551	INSULATOR, side	1
4		185 835	LABEL, warning electric shock	3
5	T1	179 933	TRANSFORMER, HF (230/460)	1
5	T1	186 984	TRANSFORMER, HF (575)	1
6	FM2	183 918	MOTOR, fan 24VDC 3000RPM 43CFM w/10 ohm resistor	1
7	PC1	202 767	CIRCUIT CARD ASSEMBLY, control (230/460)	1
7	PC1	203 307	CIRCUIT CARD ASSEMBLY, control (575)	1
8		194 371	SPACER, al 3.500 lg	1
9		194 450	BRACKET, mtg capacitor/PC board/fan	1
10	C3-6	192 935	CAPACITOR, elcltlt 2700uf 420 (230/460)	4
10	C3-6	193 738	CAPACITOR, elcltlt 1800uf 500 VDC (575)	4
11		181 925	INSULATOR, stabilizer lead	1
12	Z1	180 029	STABILIZER, output	1
13	L1	180 026	INDUCTOR, input	1
14	T2	183 192	TRANSFORMER, control 230/460 VAC	1
14	T2	185232	TRANSFORMER, control 575 VAC	1
15		180 105	BRACKET, mtg transformer aux	1
16	CB2	093 995	CIRCUIT BREAKER, man reset 15A	1
17	CB1	083 432	CIRCUIT BREAKER, man reset 10A	1
18	RC2	604 176	RECEPTACLE, str dx grd 3W 15A 120V	1
19		179 847	PLATE, identification (order by model & serial number)	1
		175 282	COVER, receptacle weatherproof	1
20		+179 899	PANEL, rear	1
		181 181	LABEL, warning electric shock	1
21		◆185 373	SWITCH, reed (230/460 only)	1
22		153 403	BUSHING, snap-in nyl .750 ID x 1.000mtg hole	2
23		025 248	STAND-OFF, insul .250–20 x 1.250 lg	4
24	W1	180 270	CONTACTOR, def prp 40A 3P 24VAC	1
25	C1,2	186 015	CAPACITOR, polyp film .34uf 1000VAC (230/460)	2
25	C1,2	195 939	CAPACITOR, polyp film .22uf 1000VAC (575)	2
26		185 992	BUS BAR, capacitor	2
27	CT1	181 271	TRANSFORMER, current 500 turns	1
28		177 547	BUSHING, snap-in nyl CT–MT 1.125mtg hole	1
29	PC6	180 131	CIRCUIT CARD ASSEMBLY, relink (230/460 only)	1
30	PC2	187 243	CIRCUIT CARD ASSEMBLY, interconnect (230/460)	1
30	PC2	187 244	CIRCUIT CARD ASSEMBLY, interconnect (575)	1
30		185 214	BUS BAR, interconnecting (575 only)	1
31		179 276	BUSHING, snap-in nyl 1.000 x 1.375mtg hole	1
32		+194 449	WINDTUNNEL, RH	1
33	SR1	184 260	KIT, diode power module	1
34	PM1,2	184 258	KIT, transistor IGBT module	1
35	RT1,2	173 632	THERMISTOR, NTC 30K ohm @ 25deg C	2
36		179 930	HEAT SINK, power module	1
37		204 165	HEAT SINK, rect quad diode	1
38	W2	◆180 270	CONTACTOR, def prp 40A 3P 24VAC (230/460 only)	1
39		190 272	BASE	1
40		180 271	BRACKET, mtg choke	1
41		182 654	GASKET, DI–DT rubber	1
42	L3,4	180 103	COIL, DI–DT	2
43		176 844	CORE, ferrite	2
44		174 715	KNOB, round 1.250 dia x .250 ID	1
		167 633	WASHER, shldr .612 ID x 1.060 OD x .062 T	1
		010 291	WASHER, flat .625 ID x 1.25 OD x .125 T	1
		159 264	RING, rtng ext .625 shaft x .042 thk	1

...	45	.....	153 169	...	ACTUATOR, switch	.....	3
...	46	PC3	203 276	...	CIRCUIT CARD ASSEMBLY, front panel	1
...	47	.....	182 707	...	TERMINAL, power output black	.....	1
...	48	C7,8	186 543	...	CAPACITOR	2
...	49	.....	190 470	...	RECEPTACLE, w/leads-cap-plug	.....	1
...	50	.....	180 732	...	BOOT, neg output stud	.....	1
...	51	.....	179 848	...	BOOT, pos output stud	.....	1
...	52	.....	191 760	...	PANEL, front	.....	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 7-1. Complete Assembly (Continued)				
53		181 245	TERMINAL, power output red	1
54	S1	128 756	SWITCH, tgl 3PST 40A 600VAC scr	1
		176 226	INSULATOR, switch power	1
55			NAMEPLATE, (order by model and serial number)	1
56	HD1	168 829	TRANSDUCER, current 1000A max	1
57		179 928	SHROUD, fan	1
58	FM1	175 084	MOTOR, fan 24VDC 3000RPM	1
59	T3	◆181 042	TRANSFORMER (230/460 only)	1
60	R1,2			
	C9,10,11,12	175 194	RESISTOR/CAPACITOR	2
61	D1-4	201 531	KIT, diode ultra fast recovery	4
62		179 826	INSULATOR, rectifier	1
63		+179 902	WINDTUNNEL, LH	1
		179 276	BUSHING, snap-in nyl 1.000 x 1.375mtg hole	2
64		183 827	BUS BAR, output	1
65		134 327	LABEL, warning general precautionary	2
66		180 994	LABEL, warning match input power	1
	PLG4	131 056	HOUSING RECEPTACLE & SOCKETS	1
	RC10	166 679	HOUSING RECEPTACLE PINS & SOCKETS	1
	PLG2	115 092	HOUSING PLUG & SOCKETS	1
	PLG7,19	115 094	HOUSING PLUG & SOCKETS	1
	PLG9,11	115 091	HOUSING PLUG & SOCKETS	1
		◆143 976	RECEPTACLE w/SOCKETS (230/460 only)	1
		◆135 409	HOUSING PLUG & PINS (230/460 only)	1
	PLG3,12	180 776	PLUG, w/leads voltage feedback	1
	PLG5,15,16	175 026	PLUG, w/leads	1
	PLG21	181 410	PLUG, w/leads	1
		◆172 565	CABLE, power 21 in 18ga (230/460 only)	1
67		190 271	PANEL, side LH	1
68		199 840	BUS BAR, diode	4

◆OPTIONAL

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

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

TRUE BLUE[®]

WARRANTY

Effective January 1, 2001

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

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

Warranty Questions?

Call
1-800-4-A-MILLER
for your local
Miller distributor.

Your distributor also gives
you ...

Service

You always get the fast,
reliable response you
need. Most replacement
parts can be in your
hands in 24 hours.

Support

Need fast answers to the
tough welding questions?
Contact your distributor.
The expertise of the
distributor and Miller is
there to help you, every
step of the way.

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

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

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to a North American distributor or eighteen months after the equipment is sent to an International distributor.

1. 5 Years Parts – 3 Years Labor
 - * Original main power rectifiers
 - * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
 - * Transformer/Rectifier Power Sources
 - * Plasma Arc Cutting Power Sources
 - * Semi-Automatic and Automatic Wire Feeders
 - * Inverter Power Supplies
 - * Intelligig
 - * Engine Driven Welding Generators
(NOTE: Engines are warranted separately by the engine manufacturer.)
3. 1 Year — Parts and Labor
 - * DS-2 Wire Feeder
 - * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
 - * Process Controllers
 - * Positioners and Controllers
 - * Automatic Motion Devices
 - * RFCS Foot Controls
 - * Induction Heating Power Sources
 - * Water Coolant Systems
 - * HF Units
 - * Grids
 - * Maxstar 140
 - * Spot Welders
 - * Load Banks
 - * Miller Cyclomatic Equipment
 - * Running Gear/Trailers
 - * Plasma Cutting Torches (except APT & SAF Models)
 - * Field Options
(NOTE: Field options are covered under True Blue[®] for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts
 - * MIG Guns/TIG Torches
 - * Induction Heating Coils and Blankets

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

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

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

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

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

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

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

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

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





Owner's Record

Please complete and retain with your personal records.

Model Name Serial/Style Number

Purchase Date (Date which equipment was delivered to original customer.)

Distributor

Address

City

State Zip



For Service

Call 1-800-4-A-Miller or see our website at www.MillerWelds.com to locate a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

-
- | | |
|-------------------------------|--|
| Contact your Distributor for: | <ul style="list-style-type: none"> Welding Supplies and Consumables Options and Accessories Personal Safety Equipment Service and Repair Replacement Parts Training (Schools, Videos, Books) Technical Manuals (Servicing Information and Parts) Circuit Diagrams Welding Process Handbooks |
|-------------------------------|--|

Contact the Delivering Carrier for: File a claim for loss or damage during shipment.

For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

Miller Electric Mfg. Co.

An Illinois Tool Works Company
1635 West Spencer Street
Appleton, WI 54914 USA

International Headquarters—USA

USA Phone: 920-735-4505 Auto-Attended
USA & Canada FAX: 920-735-4134
International FAX: 920-735-4125

European Headquarters – United Kingdom

Phone: 44 (0) 1204-593493
FAX: 44 (0) 1204-598066

www.MillerWelds.com





OM-2208

175 493X

September 2002

Processes



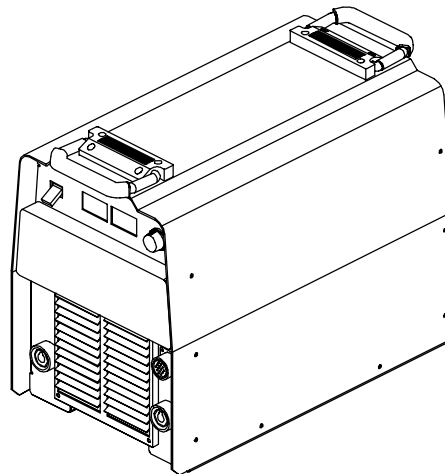
Multiprocess Welding

Description



Arc Welding Power Source

XMT[®] 304 (230/460 And 460/575 Volt Models)



CC/CV and CC Models



Visit our website at
www.MillerWelds.com

OWNER'S MANUAL

From Miller to You

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

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

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

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

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



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

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



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

Miller offers a Technical Manual which provides more detailed service and parts information for your unit. To obtain a Technical Manual, contact your local distributor. Your distributor can also supply you with Welding Process Manuals such as SMAW, GTAW, GMAW, and GMAW-P.



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WARNING

This product, when used for welding or cutting, 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.)

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

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SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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1-1. Symbol Usage



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

▲ Marks a special safety message.

☞ Means "Note"; not safety related.



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

1-2. Arc Welding Hazards

▲ The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-4. Read and follow all Safety Standards.

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

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



ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also

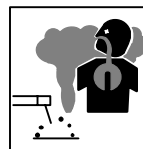
live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.

- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.



FUMES AND GASES can be hazardous.

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

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



ARC RAYS can burn eyes and skin.

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

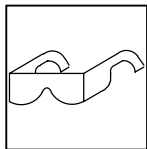
- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash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



WELDING can cause fire or explosion.

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

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.



FLYING METAL can injure eyes.

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



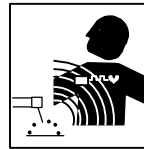
BUILDUP OF GAS can injure or kill.

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



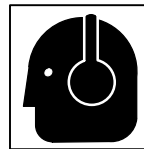
HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.



MAGNETIC FIELDS can affect pacemakers.

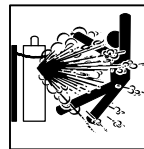
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



CYLINDERS can explode if damaged.

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

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

1-3. Additional Symbols For Installation, Operation, And Maintenance



FIRE OR EXPLOSION hazard.

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



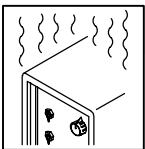
MOVING PARTS can cause injury.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.



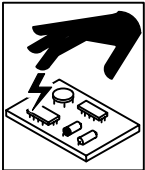
FALLING UNIT can cause injury.

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



OVERUSE can cause OVERHEATING

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



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.



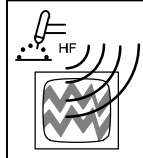
MOVING PARTS can cause injury.

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



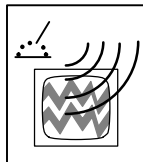
WELDING WIRE can cause injury.

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



H.F. RADIATION can cause interference.

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



ARC WELDING can cause interference.

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

1-4. Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126 (phone: 305-443-9353, website: www.aws.org).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126 (phone: 305-443-9353, website: www.aws.org).

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1-5. EMF Information

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

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

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

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

About Pacemakers:

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

SECTION 1 – CONSIGNES DE SECURITE – LIRE AVANT UTILISATION

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1-1. Signification des symboles



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

▲ Identifie un message de sécurité particulier.

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



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

1-2. Dangers relatifs au soudage à l'arc

▲ Les symboles présentés ci-après sont utilisés tout au long du présent manuel pour attirer votre attention et identifier les risques de danger. Lorsque vous voyez un symbole, soyez vigilant et suivez les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité présentées ci-après ne font que résumer l'information contenue dans les normes de sécurité énumérées à la section 1-4. Veuillez lire et respecter toutes ces normes de sécurité.

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

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



UN CHOC ÉLECTRIQUE peut tuer.

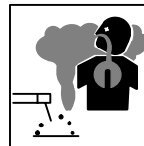
Un simple contact avec des pièces électriques peut provoquer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension dès que l'appareil est sur ON. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension à ce moment-là. En soudage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

- Ne jamais toucher les pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs ne comportant pas de trous.
- S'isoler de la pièce et de la terre au moyen de tapis ou d'autres moyens isolants suffisamment grands pour empêcher le contact physique éventuel avec la pièce ou la terre.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installer et mettre à la terre correctement cet appareil conformément à son manuel d'utilisation et aux codes nationaux, provinciaux et municipaux.
- Toujours vérifier la terre du cordon d'alimentation – Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Vérifier fréquemment le cordon d'alimentation pour voir s'il n'est pas endommagé ou dénudé – remplacer le cordon immédiatement s'il est endommagé – un câble dénudé peut provoquer une électrocution.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.

- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretien l'appareil conformément à ce manuel.
- Porter un harnais de sécurité quand on travaille en hauteur.
- Maintenir solidement en place tous les panneaux et capots.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.

Il y a DU COURANT CONTINU IMPORTANT dans les convertisseurs après la suppression de l'alimentation électrique.

- Arrêter les convertisseurs, débrancher le courant électrique, et décharger les condensateurs d'alimentation selon les instructions indiquées dans la partie entretien avant de toucher les pièces.



LES FUMÉES ET LES GAZ peuvent être dangereux.

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

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



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

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

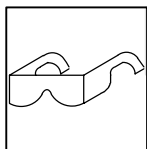
- Porter un casque de soudage muni d'un écran de filtre approprié pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des protections approuvés pour les oreilles si le niveau sonore est trop élevé.
- Utiliser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



LE SOUDAGE peut provoquer un incendie ou une explosion.

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

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



DES PARTICULES VOLANTES peuvent blesser les yeux.

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



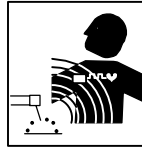
LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

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



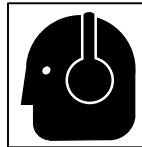
DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

- Ne pas toucher des parties chaudes à mains nues
- Prévoir une période de refroidissement avant d'utiliser le pistolet ou la torche.



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

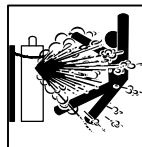
- Porteurs de stimulateur cardiaque, restez à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.



LE BRUIT peut affecter l'ouïe.

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

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



Si des BOUTEILLES sont endommagées, elles pourront exploser.

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

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

1-3. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance



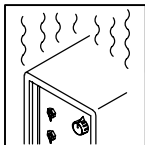
Risque D'INCENDIE OU D'EXPLOSION.

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



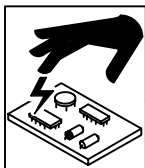
LA CHUTE DE L'APPAREIL peut blesser.

- Utiliser l'anneau de levage uniquement pour soulever l'appareil, NON PAS les chariot, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un engin d'une capacité appropriée pour soulever 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.



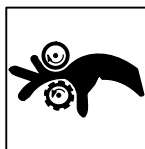
L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Prévoir une période de refroidissement, respecter le cycle opératoire nominal.
- Réduire le courant ou le cycle opératoire avant de recommencer le soudage.
- Ne pas obstruer les passages d'air du poste.



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

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



DES ORGANES MOBILES peuvent provoquer des blessures.

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



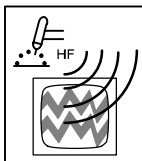
LES FILS DE SOUDAGE peuvent provoquer des blessures.

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



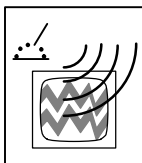
DES ORGANES MOBILES peuvent provoquer des blessures.

- Rester à l'écart des organes mobiles comme le ventilateur.
- Maintenir fermés et fixement en place les portes, panneaux, recouvrements et dispositifs de protection.



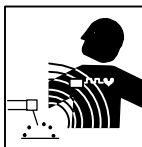
LE RAYONNEMENT HAUTE FRÉQUENCE (H.F.) risque de provoquer des interférences.

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



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

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



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

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

1-4. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126 (phone: 305-443-9353, website: www.aws.org).

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1-5. Information sur les champs électromagnétiques

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

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

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

- 1 Garder les câbles ensemble en les torsadant ou en les attachant avec du ruban adhésif.
- 2 Mettre tous les câbles du côté opposé de l'opérateur.
- 3 Ne pas courber pas et ne pas entourer pas les câbles autour de votre corps.
- 4 Garder le poste de soudage et les câbles le plus loin possible de vous.
- 5 Relier la pince de masse le plus près possible de la zone de soudure.

Consignes relatives aux stimulateurs cardiaques :

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


SECTION 2 – INTRODUCTION

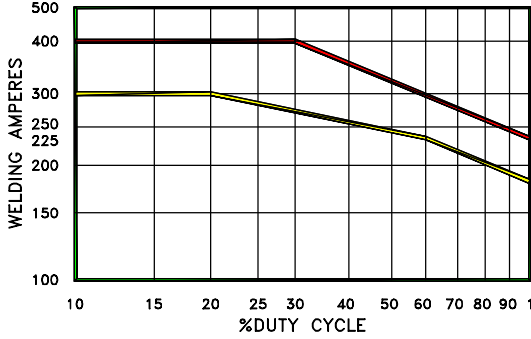
2-1. Specifications

Rated Output at 60% Duty Cycle	Voltage Range in CV Mode	Amperage Range in CC Mode	Max. Open-Circuit Voltage	RMS Amps Input at Rated Load Output, 60 Hz 3-Phase at NEMA Load Voltages and Class I Rating			KVA	KW
				230 V	460 V	575 V		
300 A at 32 VDC, 3-Phase	10–35 V	5–400 A	90 VDC	30.5 (0.21*)	18.9 (0.10*)	15.2 (0.08*)	12.2 (0.09*)	11.6 (0.04*)
225 A at 29 VDC, 1-Phase				47.4 (0.34*)	24.5 (0.14*)	--	11.3 (0.09*)	7.6 (0.04*)

*While idling
**See Section 3-5 for additional information.

2-2. Duty Cycle And Overheating





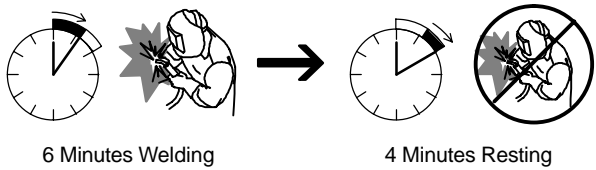
3 PHASE & 460VAC SINGLE PHASE OPERATION
230VAC SINGLE PHASE OPERATION

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

If unit overheats, output stops, a Help message is displayed (see Section 5-2), and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or voltage, or duty cycle before welding.

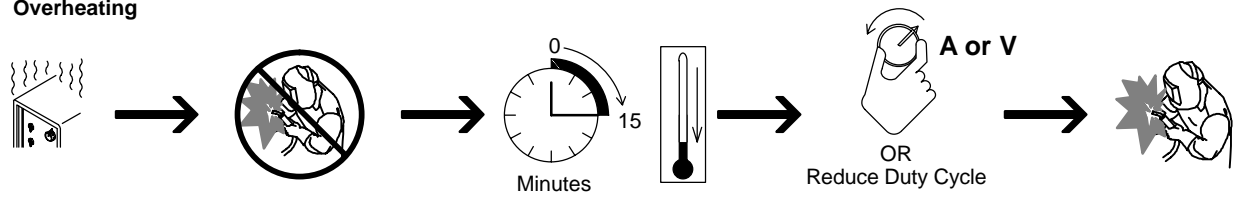
▲ Exceeding duty cycle can damage unit and void warranty.

60% Duty Cycle



6 Minutes Welding 4 Minutes Resting

Overheating

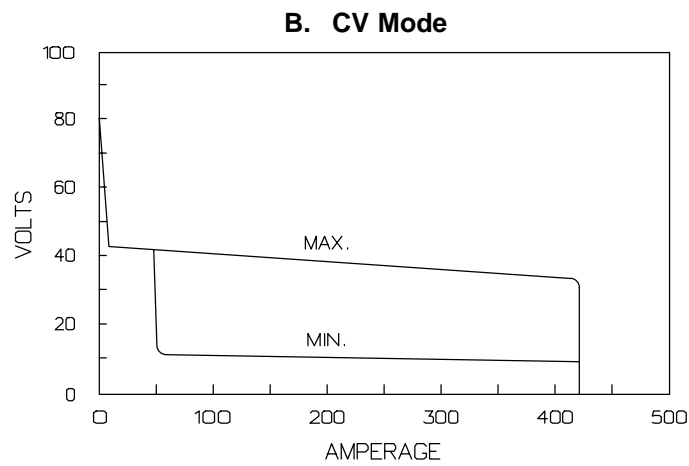
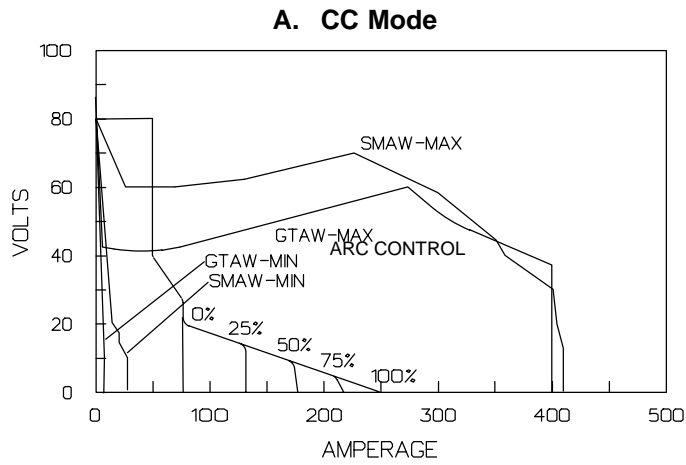


Minutes OR Reduce Duty Cycle

sduty1 5/95 / SA-207 877

2-3. Volt-Ampere Curves

Volt-ampere curves show minimum and maximum voltage and amperage output capabilities of unit. Curves of other settings fall between curves shown.



va_curve1 4/95 - SA-178 652 / SA-178 653

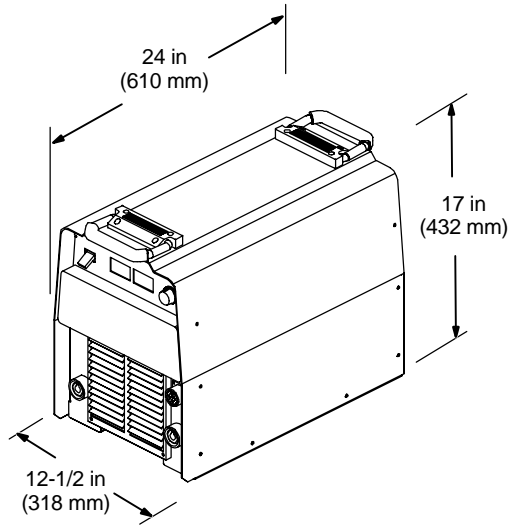
SECTION 3 – INSTALLATION

3-1. Selecting a Location

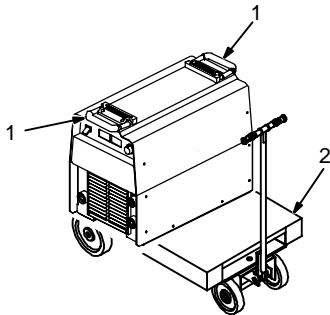


Dimensions And Weight

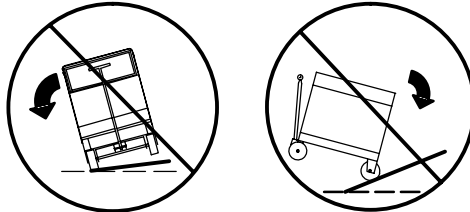
76 lb (34.6 kg)



Movement



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



1 Lifting Handles

Use handles to lift unit.

2 Hand Cart

Use cart or similar device to move unit.

3 Rating Label

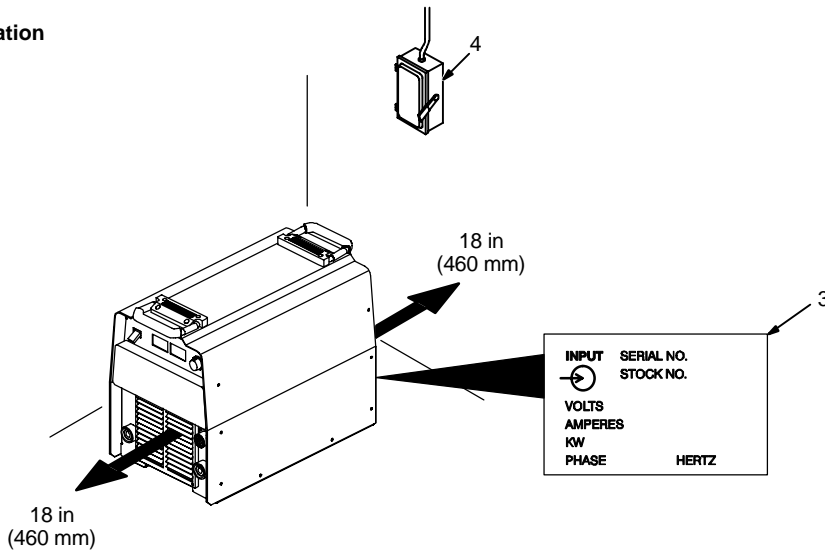
Use rating label to determine input power needs.

4 Line Disconnect Device

Locate unit near correct input power supply.

▲ Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.

Location




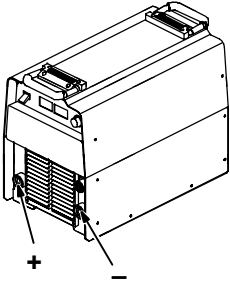
loc_2 3/96 - Ref. ST-151 556 / ST-801 192

3-2. Weld Output Receptacles And Selecting Cable Sizes



▲ ARC WELDING can cause Electromagnetic Interference.

To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor. Locate welding operation 100 meters from any sensitive electronic equipment. Be sure this welding machine is installed and grounded according to this manual. If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

 <p>Weld Output Terminals</p> <p>▲ Turn off power before connecting to weld output terminals.</p> <p>▲ Do not use worn, damaged, undersized, or poorly spliced cables.</p>	Welding Amperes	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding***							
		100 ft (30 m) or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
		10 – 60% Duty Cycle	60 – 100% Duty Cycle	10 – 100% Duty Cycle					
 <p>Output Receptacles</p>	100	4 (20)	4 (20)	4 (20)	3 (30)	2 (35)	1 (50)	1/0 (60)	1/0 (60)
	150	3 (30)	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	3/0 (95)
	200	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	4/0 (120)
	250	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 2/0 (2x70)
	300	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 3/0 (2x95)
	350	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 3/0 (2x95)	2 ea. 4/0 (2x120)
	400	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 4/0 (2x120)	2 ea. 4/0 (2x120)
	500	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 4/0 (2x120)	3 ea. 3/0 (3x95)	3 ea. 3/0 (3x95)
600	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 4/0 (2x120)	3 ea. 3/0 (3x95)	3 ea. 4/0 (3x120)	3 ea. 4/0 (3x120)	

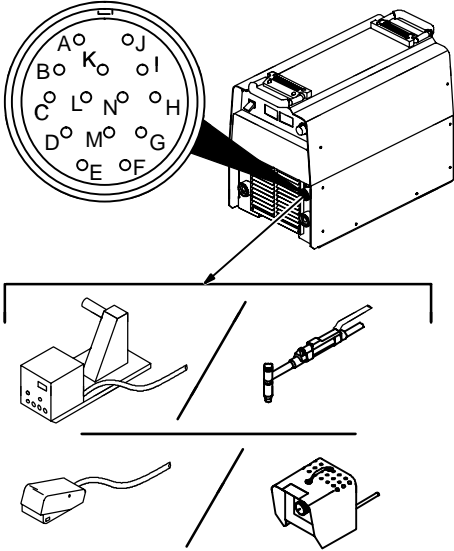
* This chart is a general guideline and may not suit all applications. If cable overheating occurs (normally you can smell it), use next size larger cable.

**Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere.
() = mm² for metric use




S-0007-E-

***For distances longer than those shown in this guide, call a factory applications representative at 920-735-4505.

3-3. Remote 14 Receptacle Information

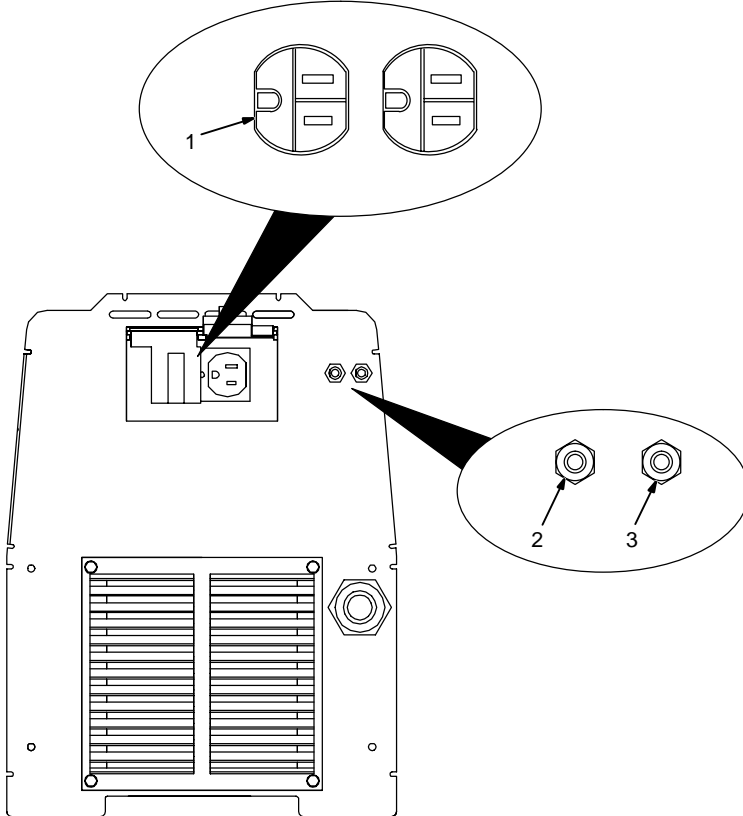


The diagram shows a circular terminal block with terminals labeled A through K. Below it, a 3D view of the Remote 14 receptacle is shown with callouts to terminals A, B, C, D, E, M, F, H, G, and K. Further down, four connection diagrams are shown: 1) A terminal block connected to a power source. 2) A terminal block connected to a power source and a remote control unit. 3) A terminal block connected to a power source and a remote control unit with a different wiring configuration. 4) A terminal block connected to a power source and a remote control unit with a different wiring configuration.

 REMOTE 14	Socket*	Socket Information
24 VOLTS AC  OUTPUT (CONTACTOR)	A	24 volts ac. Protected by circuit breaker CB2.
	B	Contact closure to A completes 24 volts ac contactor control circuit.
115 VOLTS AC  OUTPUT (CONTACTOR)	I	115 volts ac. Protected by circuit breaker CB1.
	J	Contact closure to I completes 115 volts ac contactor control circuit.
REMOTE OUTPUT CONTROL	C	Output to remote control; 0 to +10 volts dc, +10 volts dc in MIG mode.
	D	Remote control circuit common.
	E	0 to +10 volts dc input command signal from remote control.
A/V AMPERAGE VOLTAGE	M	CC/CV select (CC/CV models).
	F	Current feedback; +1 volt dc per 100 amperes.
GND	H	Voltage feedback; +1 volt dc per 10 output receptacle volts.
	G	Circuit common for 24 and 115 volts ac circuits.
	K	Chassis common.

*The remaining sockets are not used.

3-4. Optional 115 Volts AC Duplex Receptacle And Circuit Breakers



The diagram shows the internal components of a 115V AC duplex receptacle and circuit breakers. A callout labeled '1' points to the duplex receptacle. Two callouts labeled '2' and '3' point to circuit breakers CB1 and CB2 respectively. The diagram shows the receptacle and circuit breakers mounted on a panel with a large vented area below.

- 115 V 10 A AC Receptacle
Power is shared between duplex receptacle and Remote 14 receptacle (see Section 3-3).
- Circuit Breaker CB1
- Circuit Breaker CB2

CB1 protects duplex receptacle and 115 volts ac portion of Remote 14 receptacle from overload.

CB2 protects 24 volts ac portion of Remote 14 receptacle from overload.

Press button to reset breaker.

ST-801 245-A

3-6. Connecting Input Power



Check input voltage available at site.

The Auto-Link circuitry in this unit automatically links the power source to the primary voltage being applied. A 230/460 unit can be connected to either 230 or 460 VAC input power. A 460/575 model can be connected to either 460 or 575 VAC input power.

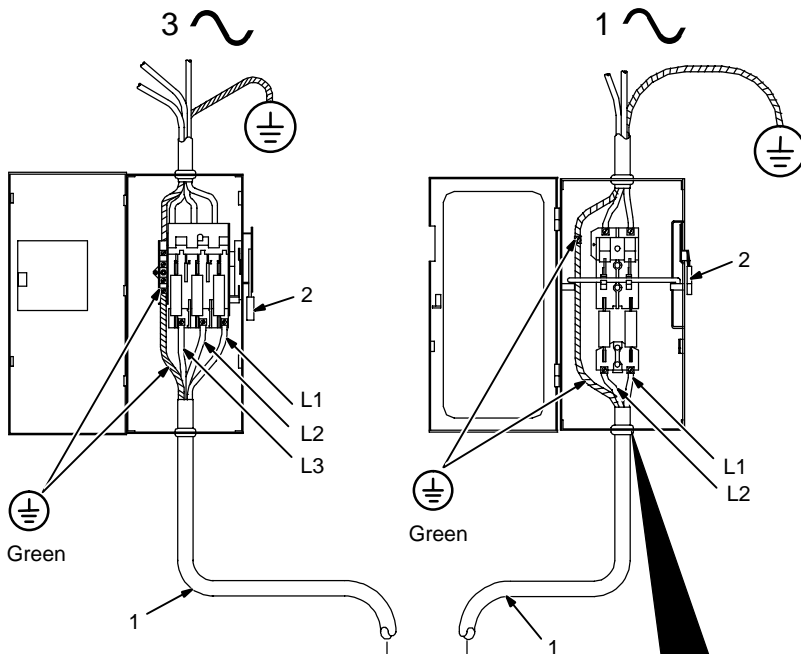
- 1 Input And Grounding Conductors
 - 2 Line Disconnect Device
- See Section 3-5.

For single-phase operation:

- 3 Black And White Input Conductor
- 4 Red Input Conductor
- 5 Insulation Sleeving
- 6 Electrical Tape

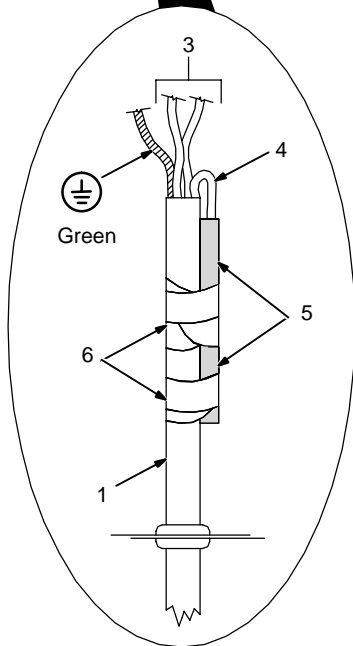
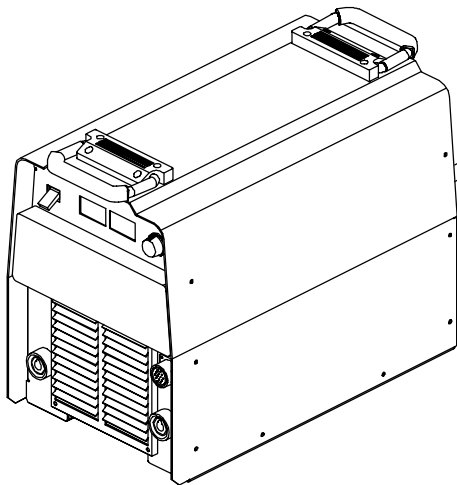
Insulate and isolate red conductor as shown.

▲ Always connect green wire to supply grounding terminal, never to a line terminal. Connect black, white, and red wires (L1, L2, L3) to line terminals.



▲ Always connect grounding conductor first.

= GND/PE




Tools Needed:



SECTION 4 – OPERATION

4-1. Front Panel Controls For CC/CV Model

1 Power Switch

 The fan motor is thermostatically controlled and only runs when cooling is needed.

2 Voltmeter (see Section 4-3)

3 Ammeter (see Section 4-3)

4 V/A (Voltage/Amperage) Adjustment Control

5 Mode Switch

The Mode switch setting determines both the process and output On/Off control (see Section 4-4). Source of control (panel or remote) for the amount of output is selected on the V/A Control switch.

For Air Carbon Arc (CAC-A) cutting and gouging, place switch in Stick position. For

best results, place Inductance/Dig control in the maximum position.

6 V/A (Voltage/Amperage) Control Switch

For front panel control, place switch in Panel position and use the V/A Adjust control.

For remote control, make connections to Remote 14 receptacle, and place switch in Remote position. In most modes, remote control is a percent of V/A Adjust control setting (value selected on V/A Adjust is maximum available on remote). In the MIG mode, remote control provides full range of unit output regardless of V/A Adjust control setting

7 Inductance/Dig Control

Control adjusts Dig when Stick or CC mode is selected on mode switch. When set to-

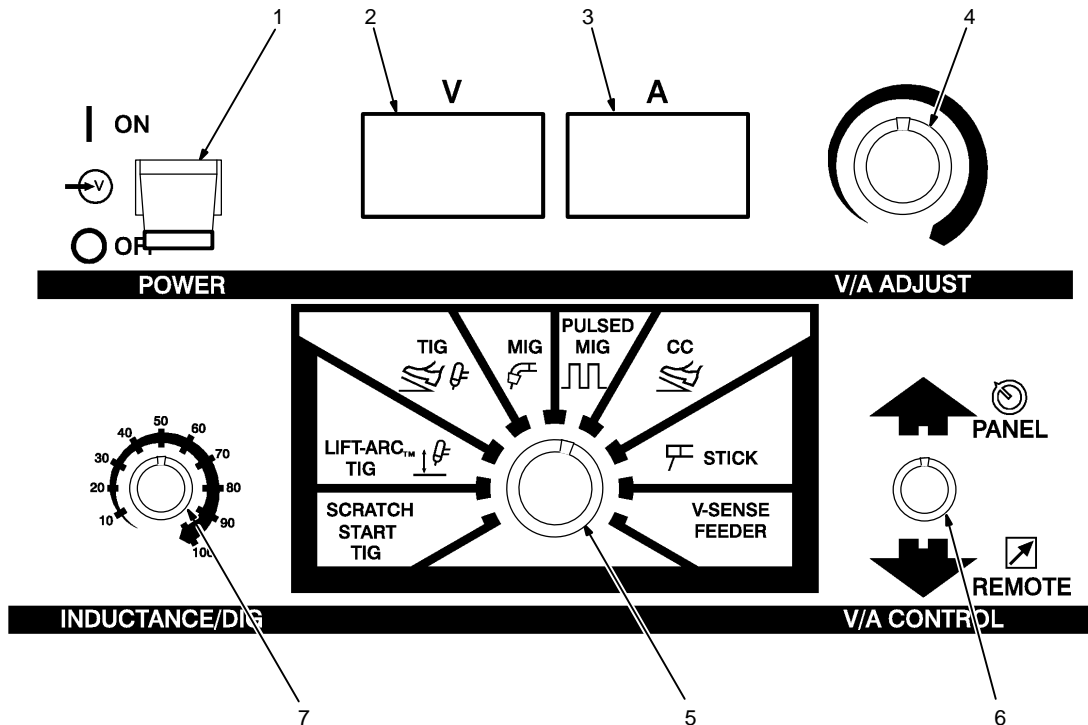
wards minimum, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When set towards maximum, short-circuit amperage is increased at low arc voltage to assist with arc starts as well as reduce sticking while welding (see volt-ampere curves in Section 2-3).

Select setting best suited for application.

Control adjusts inductance when MIG or V-Sense Feeder position is selected on the mode switch. Inductance determines the “wetness” of the weld puddle. When set towards maximum, “wetness” (puddle fluidity) increases.


When Pulsed MIG or one of the TIG modes is selected, this control is not functional.



Ref. ST-175 086

4-2. Front Panel Controls For CC Model

1 Power Switch

 The fan motor is thermostatically controlled and only runs when cooling is needed.

2 Voltmeter (see Section 4-5)

3 Ammeter (see Section 4-5)

4 V/A (Voltage/Amperage) Adjustment Control

5 Mode Switch

The Mode switch setting determines both the process and output On/Off control (see Section 4-6). Source of control (panel or remote) for the amount of output is selected on the

V/A Control switch.

For Air Carbon Arc (CAC-A) cutting and gouging, place switch in one of the Stick positions. For best results, place Dig control in the maximum position.

6 V/A (Voltage/Amperage) Control Switch

For front panel control, place switch in Panel position and use the V/A Adjust control.

For remote control, make connections to Remote 14 receptacle, and place switch in Remote position. Remote control is a percent of V/A Adjust control setting. Value selected on V/A Adjust is maximum available on remote.

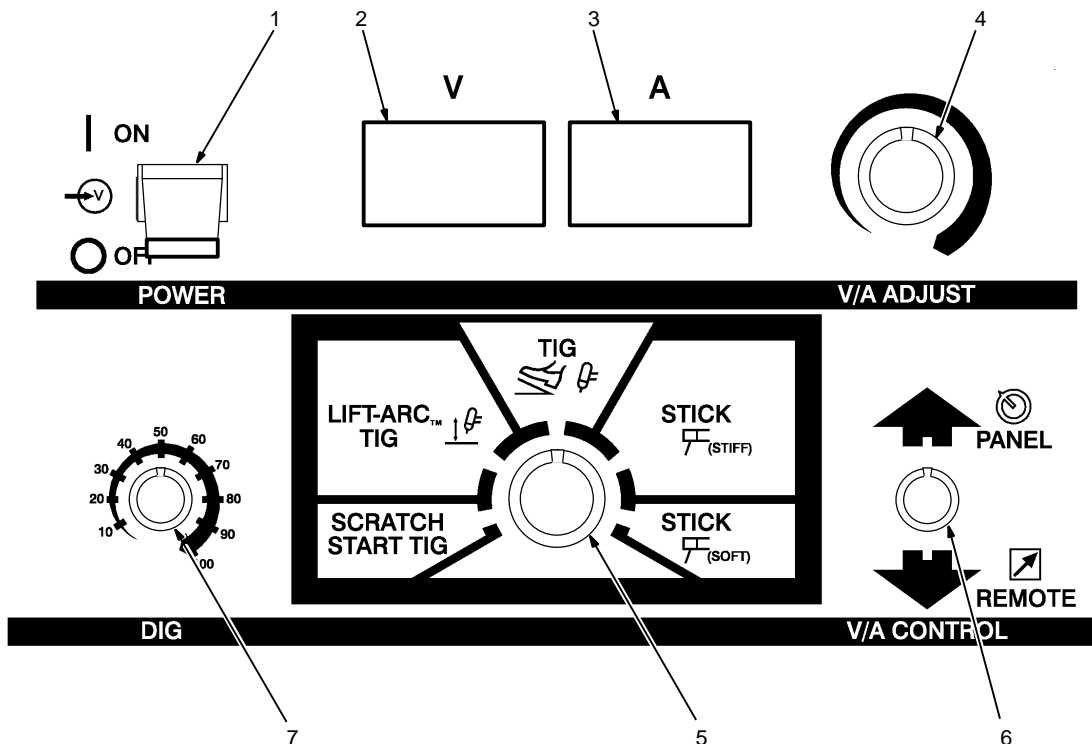
7 Dig Control

When set towards minimum, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When set towards maximum, short-circuit amperage is increased at low arc voltage to assist with arc starts as well as reduce sticking while welding (see volt-ampere curves in Section 2-3).

Select setting best suited for application.

When a TIG process is selected on the mode switch, this control is not functional.



Ref. ST-175 500

4-3. Meter Functions For CC/CV Model

NOTE

The meters display the actual weld output values for approximately three seconds after the arc is broken.

Mode	Meter Reading At Idle		Meter Reading While Welding	
Scratch Start TIG	V 80.0 Actual Volts (OCV)	A 85 Preset Amps	V 10.3 Actual Volts	A 85 Actual Amps
Lift-Arc TIG	V 7.0 Actual Volts	A 85 Preset Amps	V 10.3 Actual Volts	A 85 Actual Amps
TIG	V Blank	A 85 Preset Amps	V 10.3 Actual Volts	A 85 Actual Amps
MIG	V 24.5 Preset Volts	A Blank	V 24.5 Actual Volts	A 250 Actual Amps
Pulsed MIG	V PPP Pulse Display	A PPP Pulse Display	V 24.5 Actual Volts	A 250 Actual Amps
CC	V Blank	A 85 Preset Amps	V 24.5 Actual Volts	A 85 Actual Amps
Stick	V 80.0 Actual Volts (OCV)	A 85 Preset Amps	V 24.5 Actual Volts	A 85 Actual Amps
V-Sense Feeder	V 80.0 Flashes OCV And Preset	A Blank	V 24.5 Actual Volts	A 250 Actual Amps

4-4. Mode Switch Settings For CC/CV Model

NOTE

The Stick and CC modes provide the Adaptive Hot Start™ feature, which automatically increases the output amperage at the start of a weld should the start require it. This eliminates electrode sticking at arc start.

Mode Switch Setting	Process	Output On/Off Control
Scratch Start TIG	GTAW	Electrode Hot
Lift-Arc TIG	GTAW – See Section 4-7	Electrode Hot
TIG	GTAW With HF Unit, Pulsing Device, Or Remote Control	At Remote 14
MIG	GMAW	At Remote 14
Pulsed MIG	GMAW-P (Requires an external pulsing device.)	At Remote 14
CC	Stick (SMAW) With Remote On/Off	At Remote 14
Stick	SMAW	Electrode Hot
V-Sense Feeder	MIG (GMAW) With Voltage Sensing Wire Feeder	Electrode Hot

4-5. Meter Functions For CC Model

NOTE

The meters display the actual weld output values for approximately three seconds after the arc is broken.

Mode	Meter Reading At Idle		Meter Reading While Welding	
Scratch Start TIG	V 80.0 Actual Volts (OCV)	A 85 Preset Amps	V 10.3 Actual Volts	A 85 Actual Amps
Lift-Arc TIG	V 7.0 Actual Volts	A 85 Preset Amps	V 10.3 Actual Volts	A 85 Actual Amps
TIG	V Blank	A 85 Preset Amps	V 10.3 Actual Volts	A 85 Actual Amps
Stick (Stiff Or Soft)	V 80.0 Actual Volts (OCV)	A 85 Preset Amps	V 24.5 Actual Volts	A 85 Actual Amps

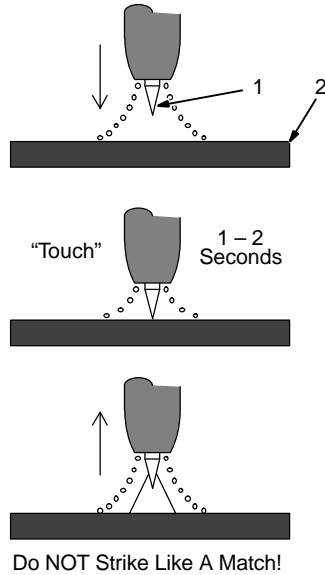
4-6. Mode Switch Settings For CC Model

NOTE

The Stick modes provide the Adaptive Hot Start™ feature, which automatically increases the output amperage at the start of a weld should the start require it. This eliminates electrode sticking at arc start.

Mode Switch Setting	Process	Output On/Off Control
Scratch Start TIG	GTAW	Electrode Hot
Lift-Arc TIG	GTAW With Lift-Arc Start – See Section 4-7	Electrode Hot
TIG	GTAW With HF Unit, Pulsing Device, Or Remote Control	At Remote 14
Stick (Stiff)	SMAW When A Stiff Arc Characteristic Is Desired	Electrode Hot
Stick (Soft)	SMAW When A Soft Arc Characteristic Is Desired	Electrode Hot

4-7. Lift-Arc TIG Procedure



With Process Switch in the Lift-Arc TIG position, start an arc as follows:

- 1 TIG Electrode
- 2 Workpiece

Touch tungsten electrode to workpiece at weld start point, **hold electrode to workpiece for 1-2 seconds**, and slowly lift electrode. An arc will form when electrode is lifted.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece. The solid-state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

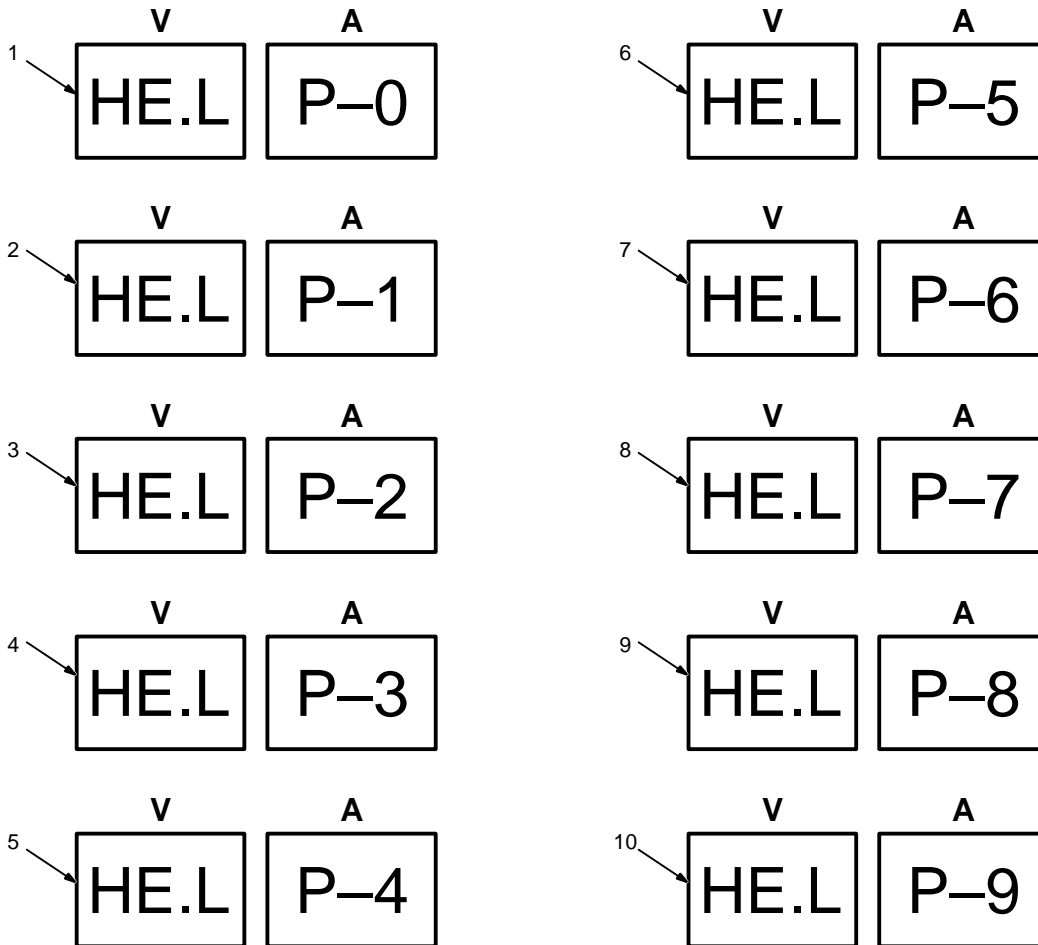
Ref. S-156 279


SECTION 5 – MAINTENANCE & TROUBLESHOOTING

5-1. Routine Maintenance

	<p>▲ Disconnect power before maintaining.</p>	<p>☞ Maintain more often during severe conditions.</p>
<p> 3 Months</p>		
<p>Replace Damaged Or Unreadable Labels</p>	<p>Repair Or Replace Cracked Cables</p>	<p>Replace Cracked Torch Body</p>
<p>Repair Or Replace Cracked Cables And Cords</p>		
<p>Clean And Tighten Weld Connections</p>		
<p> 6 Months</p>		
<p> Blow Out Inside</p>		

5-2. Voltmeter/Ammeter Help Displays



 All directions are in reference to the front of the unit. All circuitry referred to is located inside the unit.

1 Help 0 Display

Indicates a shorted thermistor RT2 on the left side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

2 Help 1 Display

Indicates a malfunction in the primary power circuit. If this display is shown, contact a Factory Authorized Service Agent.

3 Help 2 Display

Indicates a malfunction in the thermal protection circuitry located on the left side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

4 Help 3 Display

Indicates the left side of the unit has overheated. The unit has shut down to allow the

fan to cool it (see Section 2-2). Operation will continue when the unit has cooled.

5 Help 4 Display

Indicates a malfunction in the thermal protection circuitry located on the right side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

6 Help 5 Display

Indicates the right side of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 2-2). Operation will continue when the unit has cooled.

7 Help 6 Display

Indicates that the input voltage is too low and the unit has automatically shut down. Operation will continue when the voltage is within the acceptable lower range limit (15% below the applicable input voltage). If this display is

shown, have an electrician check the input voltage.

8 Help 7 Display

Indicates that the input voltage is too high and the unit has automatically shut down. Operation will continue when the voltage is within the acceptable upper range limit (15% above the applicable input voltage). If this display is shown, have an electrician check the input voltage. Help 7 can also indicate a bus voltage imbalance.

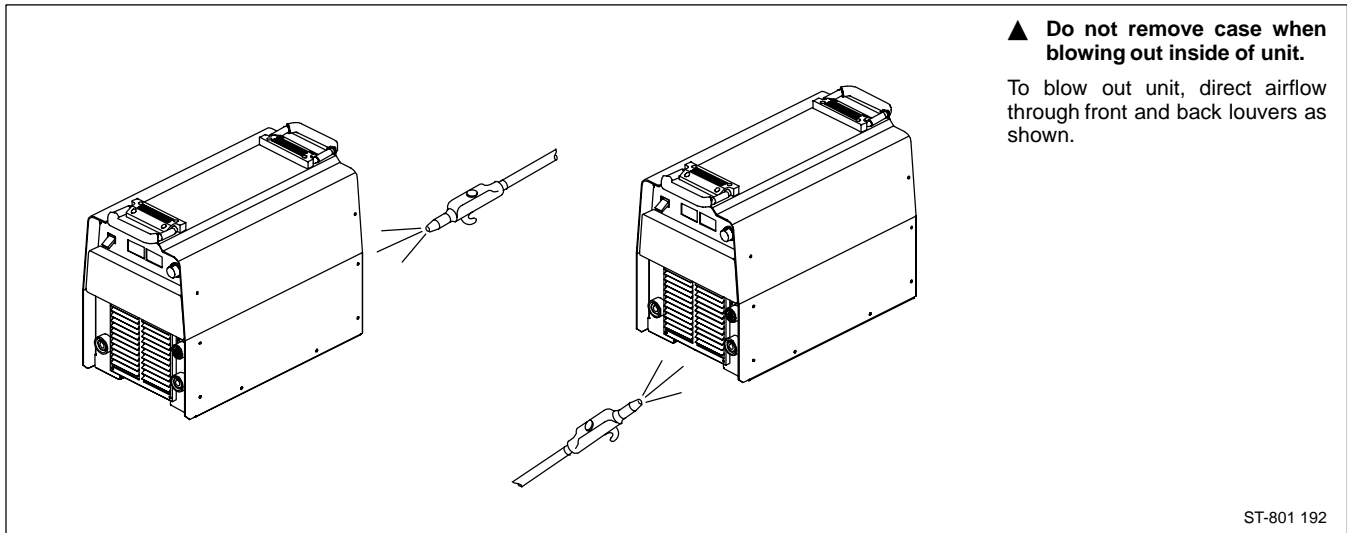
9 Help 8 Display

Indicates a malfunction in the secondary power circuit of the unit. If this display is shown, contact a Factory Authorized Service Agent.






10 Help 9 Display

Indicates a shorted thermistor RT1 on the right side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

5-3. Blowing Out Inside Of Unit



5-4. Troubleshooting

    	
Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 3-6).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 3-6).
	Check for proper input power connections (see Section 3-6).
No weld output; meter display On.	If using remote control, be sure mode switch is in a position that provides output control at Remote 14 receptacle (see Section 4-4 or 4-6 as applicable).
	Input voltage outside acceptable range of variation (see Section 3-5).
	Check, repair, or replace remote control.
	Unit overheated. Allow unit to cool with fan On (see Section 2-2).
	If unit contains optional ground current sensor, excessive current in the ground circuit may have been detected. Have electrician check input power circuit.
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 3-2).
	Clean and tighten all weld connections.
No 115 volts ac output at duplex receptacle, Remote 14 receptacle.	Reset circuit breaker CB1 (see Section 3-4).
No 24 volts ac output at Remote 14 receptacle.	Reset circuit breaker CB2 (see Section 3-4).

SECTION 6 – ELECTRICAL DIAGRAMS

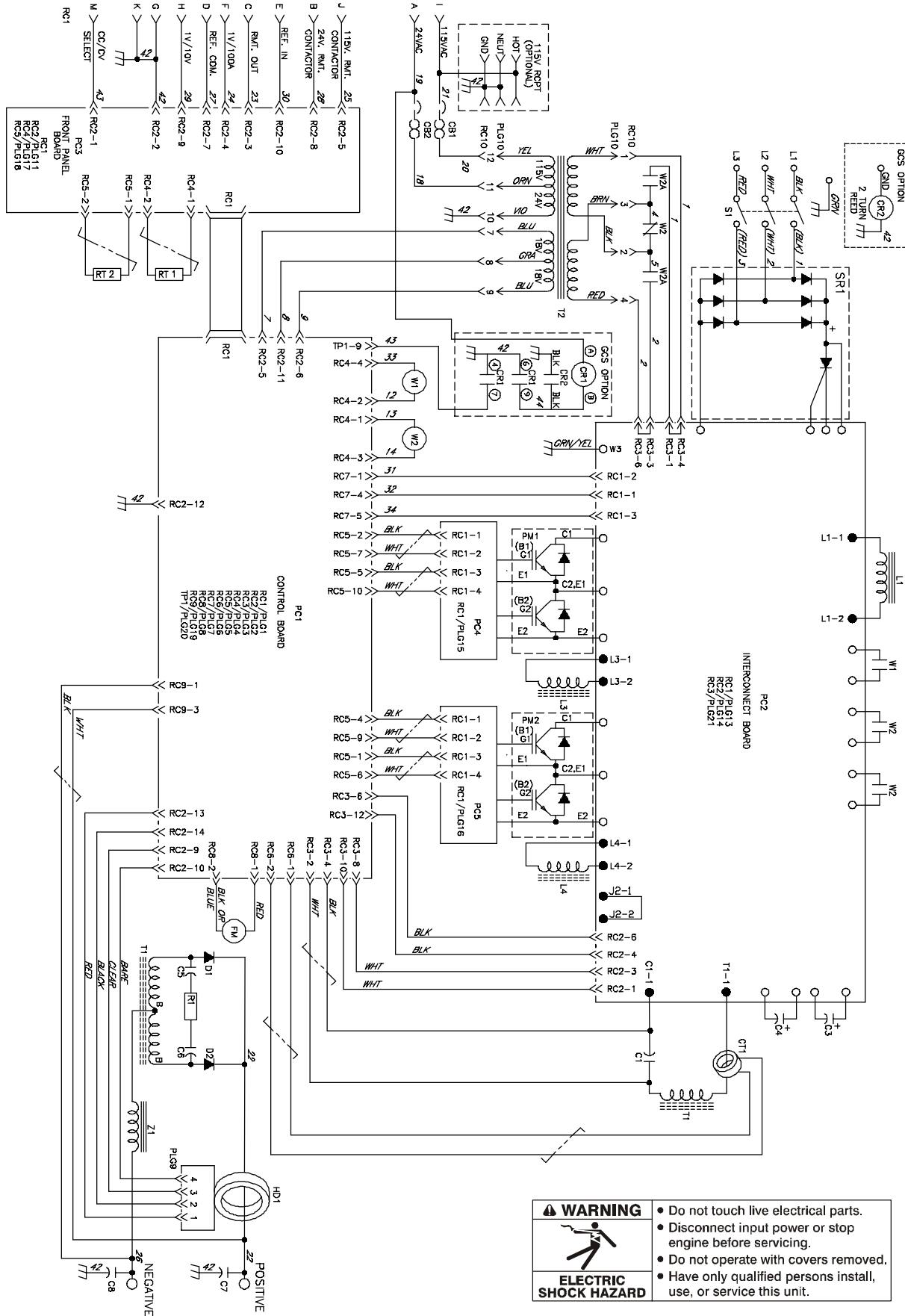
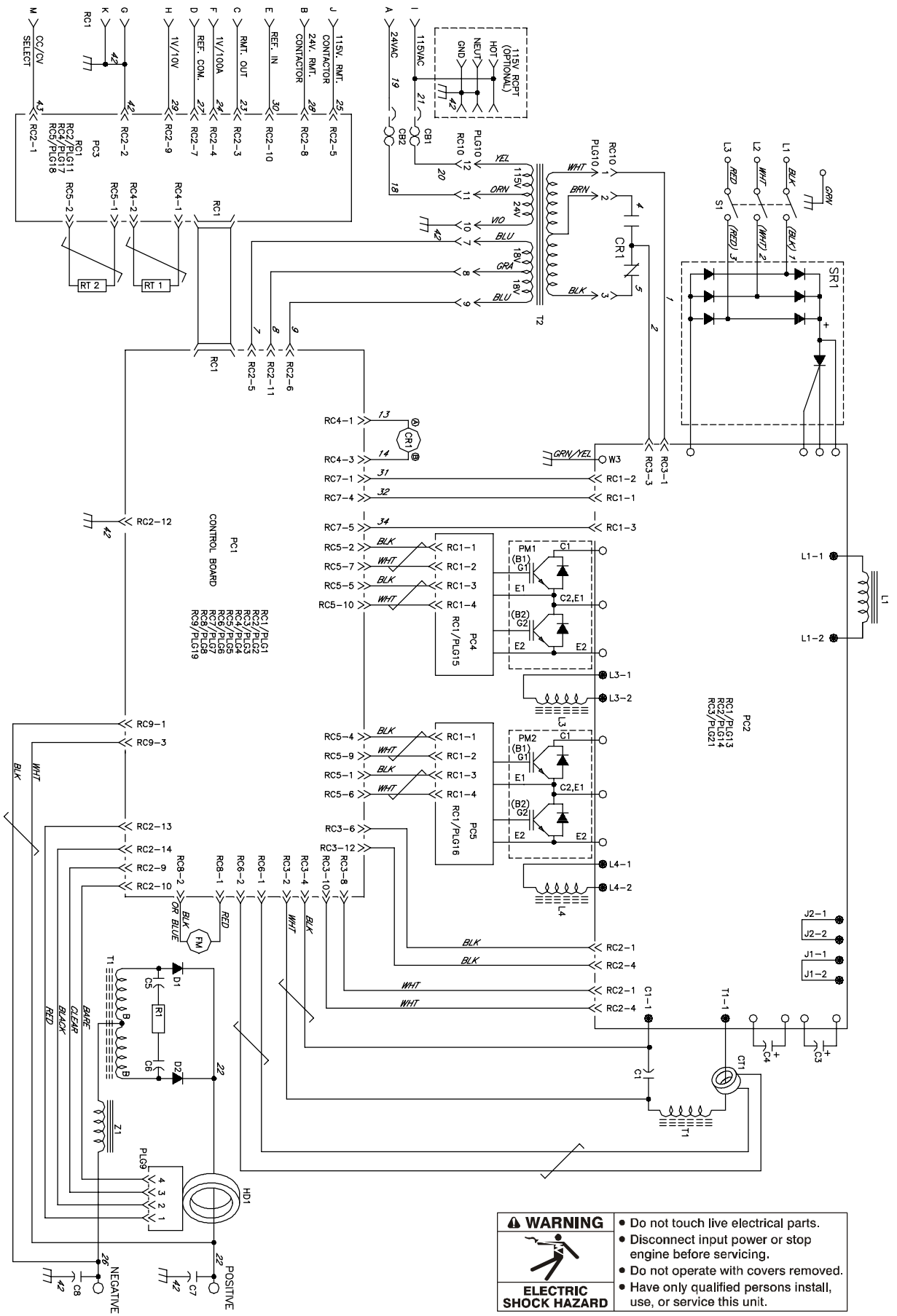


Figure 6-1. Circuit Diagram For 230/460 Volt Models




⚠ 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.

Figure 6-2. Circuit Diagram For 460/575 Volt Models

SECTION 7 – PARTS LIST

 Hardware is common and not available unless listed.

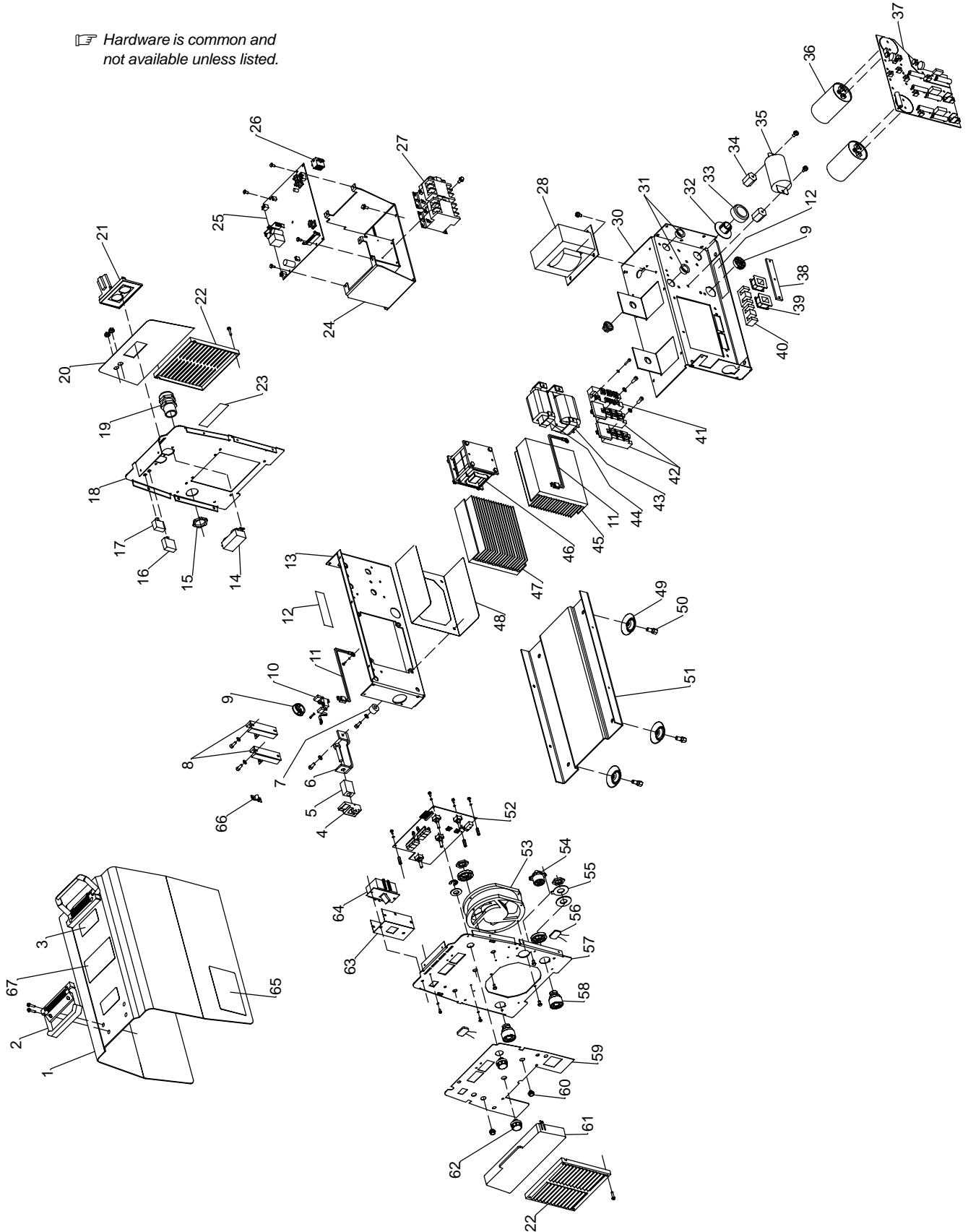


Figure 7-1. Parts Assembly

ST-801 428-F

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 7-1. Parts Assembly				
...	1	..	+175 148 .. WRAPPER ..	1
..	..	..	178 551 .. INSULATOR, side LH ..	1
..	..	..	175 256 .. INSULATOR, side RH ..	1
...	2	..	195 585 .. HANDLE ..	2
...	3	..	138 442 .. LABEL, caution falling equipment ..	2
...	4	..	HD1 .. 189 567 .. TRANSDUCER, current 300A ..	1
..	..	..	PLG9 .. 130 204 .. CONNECTOR & PINS ..	1
...	5	..	194 546 .. BUS BAR, lem ..	1
...	6	..	175 139 .. BUS BAR, output rectifier ..	1
...	7	..	181 853 .. INSULATOR, screw ..	1
...	8	..	D1,2 .. 201 531 .. KIT, diode power module ..	2
...	9	..	179 276 .. BUSHING, snap-in nyl 1.000 ID x 1.375mtg hole ..	2
...	10	..	C5,6 R1 .. 175 194 .. RESISTOR/CAPACITOR ..	1
...	11	..	RT1,2 .. 173 632 .. THERMISTOR, NTC 30K ohm ..	2
...	12	..	185 835 .. LABEL, warning exploding parts ..	2
...	13	..	+183 551 .. WINDTUNNEL, LH ..	1
...	14	..	◆604 176 .. RECEPTACLE, str dx grd 2P3W 15A 125V ..	1
...	15	..	182 445 .. NUT, 1.000NPT ..	1
...	16	..	CB1 .. 089 807 .. CIRCUIT BREAKER, man reset 1P 2.5A 250VAC ..	1
...	16	..	CB1 .. ◆083 432 .. CIRCUIT BREAKER, man reset 1P 10A 250VAC ..	1
...	17	..	CB2 .. 083 432 .. CIRCUIT BREAKER, man reset 1P 10A 250VAC ..	1
...	18	..	206 460 .. PANEL, rear ..	1
...	18	..	◆175 147 .. PANEL, rear (w/aux power) ..	1
...	19	..	186 441 .. BUSHING, strain relief .710-.980 ID x 1.375 ..	1
..	..	..	206 060 .. CABLE, power ..	1
...	20	..	.. PLATE, ident rear (order by model and serial number) ..	1
...	21	..	◆175 282 .. COVER, receptacle ..	1
...	22	..	175 138 .. BOX, louver ..	2
...	23	..	148 329 .. LABEL, caution incorrect voltage (230/460) ..	1
...	23	..	182 227 .. LABEL, caution incorrect voltage (460/575) ..	1
...	24	..	192 853 .. BRACKET, mtg contactor/capacitor/PC Board ..	1
...	25	..	PC1 .. 202 763 .. CIRCUIT CARD, control (230/460) ..	1
...	25	..	PC1 .. 203 322 .. CIRCUIT CARD, control (460/575) ..	1
..	..	..	PLG2 .. 131 056 .. CONNECTOR & SOCKETS (RC2) ..	1
..	..	..	PLG3 .. 130 203 .. CONNECTOR & SOCKETS (RC3) ..	1
..	..	..	PLG4 .. 115 094 .. CONNECTOR & SOCKETS (RC4) ..	1
..	..	..	PLG5 .. 115 091 .. CONNECTOR & SOCKETS (RC5) ..	1
..	..	..	PLG7 .. 115 093 .. CONNECTOR & SOCKETS (RC7) ..	1
...	26	..	RC10 .. 166 679 .. CONNECTOR & SOCKETS ..	1
...	27	..	W1,2 .. 175 082 .. CONTACTOR, def prp 40A 24VAC coil (230/460 only) ..	1
..	..	..	173 763 .. STAND-OFF, No. 10-32 x 1.418 (230/460 only) ..	7
...	28	..	T2 .. 201 684 .. TRANSFORMER, control (230/460) ..	1
...	28	..	T2 .. ◆193 774 .. TRANSFORMER, control (230/460) ..	1
..	..	..	◆183 549 .. BRACKET, mtg aux transformer ..	1
...	28	..	T2 .. 204 256 .. TRANSFORMER, control (460/575) ..	1
...	30	..	207 727 .. WINDTUNNEL, RH ..	1
...	31	..	153 403 .. BUSHING, snap-in nyl .750 ID x 1.000mtg ..	2
...	32	..	177 547 .. BUSHING, snap-in nyl 1.125mtg ..	1
...	33	..	CT1 .. 175 199 .. TRANSFORMER, current ..	1
...	34	..	025 248 .. STAND-OFF, insul ..	2
...	35	..	C1 .. 186 015 .. CAPACITOR, polyp film .34uf 1000VAC (230/460) ..	1
...	35	..	C1 .. 186 549 .. CAPACITOR, polyp film .27uf 1000VAC (460/575) ..	1

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

◆Part of 043 302 115V Aux Power Option (230/460) or 043 303 115V Aux Power Option (460/575).

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 7-1. Parts Assembly (Continued)				
... 36	C3,4	192 935	.. CAPACITOR, elctlt 2700uf 450VDC (230/460)	2
... 36	C3,4	193 738	.. CAPACITOR, elctlt 1800uf 500VDV (460/575)	2
... 37	PC2	+197 585	.. CIRCUIT CARD, interconnect (230/460)	1
... 37	PC2	+197 586	.. CIRCUIT CARD, interconnect (460/575)	1
.....	PLG13	131 204	.. CONNECTOR & SOCKETS (RC13)	1
.....	PLG14,21	115 093	.. CONNECTOR & SOCKETS (RC14) (RC21)	2
.....		126 026	.. LABEL, warning electric shock	1
... 38		175 140	.. BRACKET, DI/DT	1
... 39		175 482	.. COIL, DI/DT	2
... 40		109 056	.. CORE	2
... 41	SR1	179 629	.. KIT DIODE, power module	1
... 42	PM1,2	180 110	.. KIT, transistor IGBT module	1
... 43	Z1	173 570	.. STABILIZER	1
... 44	L1	173 563	.. INDUCTOR, input	1
... 45		207 725	.. HEAT SINK, power module	1
... 46	T1	173 811	.. TRANSFORMER, HF (230/460)	1
... 46	T1	180 952	.. TRANSFORMER, HF (460/575)	1
... 47		207 467	.. HEAT SINK, rect	1
... 48		175 255	.. INSULATOR, rectifier	1
.....		110 386	.. RELAY, 24VAC (460/575 only)	1
... 49		173 693	.. FOOT, mtg unit	4
... 50		176 736	.. SCREW, mtg foot	4
... 51		175 132	.. BASE	1
... 52	PC3	190 704	.. CIRCUIT CARD, front panel display (CC model)	1
... 52	PC3	190 700	.. CIRCUIT CARD, front panel display (CC/CV model)	1
.....	PLG11	115 091	.. CONNECTOR & SOCKETS (RC2)	1
... 53	FM	175 084	.. MOTOR, fan 24VDC 3000RPM	1
... 54	RC1	185 730	.. RECEPTACLE, w/leads & plug	1
... 55		178 548	.. TERMINAL, connector friction	2
... 56	C7,8	186 543	.. CAPACITOR	2
... 57		185 732	.. PANEL, front	1
... 58		129 525	.. RECEPTACLE, twlk insul fem	2
... 58		◆209 219	.. RECEPTACLE, twlk insul fem (Tweco)	2
... 59			.. NAMEPLATE, (order by model and serial number)	1
... 60		174 992	.. KNOB, pointer .840	2
... 61		175 855	.. DOOR, front	1
... 62		174 991	.. KNOB, pointer 1.250	2
... 63		176 226	.. INSULATOR, switch power	1
... 64	S1	128 756	.. SWITCH, tgl 3PST 40A 600VAC	1
... 65		134 327	.. LABEL, warning general precautionary	2
... 66		199 840	.. BUS BAR, diode	2
... 67		190 125	.. LABEL, warning electric shock power cord	1

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

◆Part of 195 181 Tweco Connector Option

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

TRUE BLUE® WARRANTY

Effective January 1, 2002

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

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

Warranty Questions?

Call
1-800-4-A-MILLER
for your local
Miller distributor.

Your distributor also gives
you ...

Service

You always get the fast,
reliable response you
need. Most replacement
parts can be in your
hands in 24 hours.

Support

Need fast answers to the
tough welding questions?
Contact your distributor.
The expertise of the
distributor and Miller is
there to help you, every
step of the way.

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

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

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to a North American distributor or eighteen months after the equipment is sent to an International distributor.

1. 5 Years Parts – 3 Years Labor
 - * Original main power rectifiers
 - * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
 - * Transformer/Rectifier Power Sources
 - * Plasma Arc Cutting Power Sources
 - * Semi-Automatic and Automatic Wire Feeders
 - * Inverter Power Supplies
 - * Intelligig
 - * Engine Driven Welding Generators
(NOTE: Engines are warranted separately by the engine manufacturer.)
3. 1 Year — Parts and Labor Unless Specified
 - * DS-2 Wire Feeder
 - * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
 - * Process Controllers
 - * Positioners and Controllers
 - * Automatic Motion Devices
 - * RFCS Foot Controls
 - * Induction Heating Power Sources
 - * Water Coolant Systems
 - * Flowgauge and Flowmeter Regulators (No Labor)
 - * HF Units
 - * Grids
 - * Maxstar 85, 140
 - * Spot Welders
 - * Load Banks
 - * Racks
 - * Running Gear/Trailers
 - * Plasma Cutting Torches (except APT & SAF Models)
 - * Field Options
(NOTE: Field options are covered under True Blue® for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts
 - * MIG Guns/TIG Torches
 - * Induction Heating Coils and Blankets

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

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

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

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

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

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

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

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

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





Owner's Record

Please complete and retain with your personal records.

Model Name	Serial/Style Number
Purchase Date	(Date which equipment was delivered to original customer.)
Distributor	
Address	
City	
State	Zip



For Service

Call 1-800-4-A-Miller or see our website at www.MillerWelds.com to locate a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:

- Welding Supplies and Consumables
- Options and Accessories
- Personal Safety Equipment
- Service and Repair
- Replacement Parts
- Training (Schools, Videos, Books)
- Technical Manuals (Servicing Information and Parts)
- Circuit Diagrams
- Welding Process Handbooks

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.

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www.MillerWelds.com



Appendix D — Genset Engine

- Cummins 6BT5.9-G6

The following pages are taken from information published by the original equipment manufacturer (OEM), and are subject to change without notice.

