

Manual do Equipamento

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TM-217 454G

2006-11

Eff. w/LF314257

Processes



Stick (SMAW) Welding



MIG (GMAW) Welding
Flux Cored (FCAW) Welding



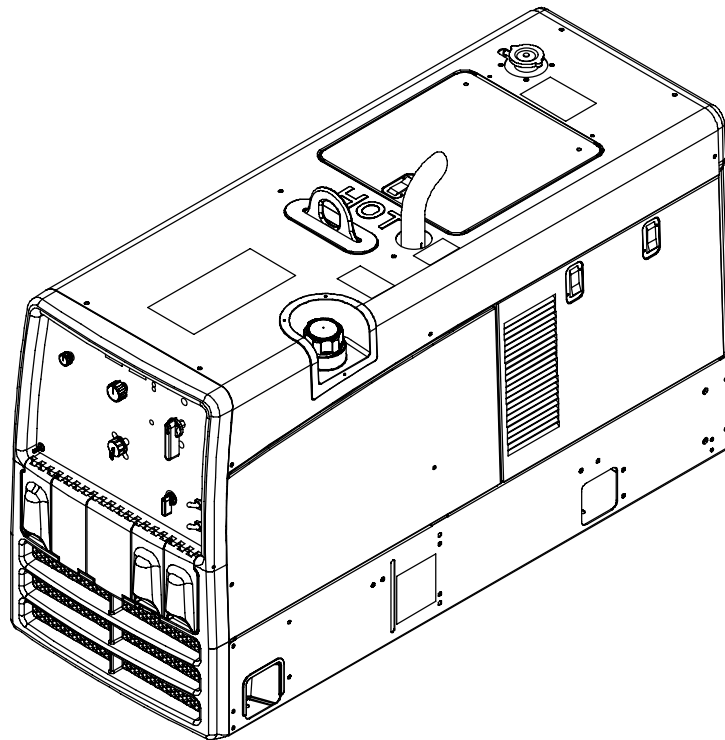
TIG (GTAW) Welding

Description



Engine Driven Welding Generator

Trailblazer™ 302 Diesel



Visit our website at
www.MillerWelds.com

TECHNICAL MANUAL

File: Engine Drive



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SECTION 1 – SAFETY PRECAUTIONS FOR SERVICING

▲ **Warning: Protect yourself and others from injury — read and follow these precautions.**

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.



OM-217 454G - 2006-10, safety_rtm 3/06

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. Servicing 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.**

▲ **Only qualified persons should test, maintain, and repair this unit.**

▲ **During servicing, keep everybody, especially children, away.**



ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Stop engine before testing or repairing unit unless the procedure specifically requires an energized unit.
- Insulate yourself from ground by standing or working on dry insulating mats big enough to prevent contact with the ground.
- Do not leave live unit unattended.
- When testing live unit, use the one-hand method. Do not put both hands inside unit. Keep one hand free.

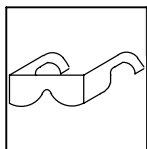
SIGNIFICANT DC VOLTAGE exists after stopping engine on inverters.

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



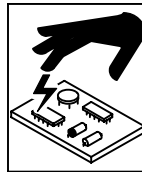
MOVING PARTS can cause injury.

- Keep away from moving parts such as fans, belts, and rotors.
- Have only qualified people remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Before working on generator, remove spark plugs or injectors to keep engine from kicking back or starting.
- Block flywheel so that it will not turn while working on generator components.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting engine.



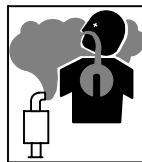
FLYING METAL or DIRT can injure eyes.

- Wear safety glasses with side shields or face shield during servicing.
- Be careful not to short metal tools, parts, or wires together during testing and servicing.



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.



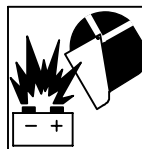
ENGINE EXHAUST GASES can kill.

- Do not breathe exhaust fumes.
- Use in open, well-ventilated areas, or vent exhaust outside and away from any building air intakes.



FUEL can cause fire or explosion.

- Stop engine and let it cool off before checking or adding fuel.
- Do not add fuel while smoking or if unit is near any sparks or open flames.
- Do not overfill tank; clean up any spilled fuel.



BATTERY EXPLOSION can BLIND.

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



BATTERY ACID can BURN SKIN and EYES.

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



STEAM AND HOT COOLANT can burn.

- If possible, check coolant level when engine is cold to avoid scalding.
- Always check coolant level at overflow tank, if present on unit, instead of radiator.
- If the engine is warm, checking is needed, and there is no overflow tank, follow the next two statements.

- Wear safety glasses and gloves and put a rag over radiator cap.
- Turn cap slightly and let pressure escape slowly before completely removing cap.



MAGNETIC FIELDS can affect pacemakers.

- Pacemaker wearers keep away from servicing areas until consulting your doctor.



FALLING UNIT can cause injury.

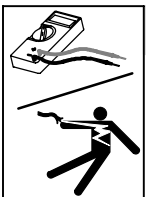
- Use lifting eye to lift unit and properly installed accessories only. Do not exceed maximum lift eye weight rating (see Specifications).
- Lift and support unit only with proper equipment and correct procedures.
- Securely attach components to lifting equipment.

- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



HOT PARTS can cause severe burns.

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



SHOCK HAZARD from testing.

- Stop engine before making or changing meter lead connections.
- Use at least one meter lead that has a self-retaining spring clip such as an alligator clip.
- Read instructions for test equipment.

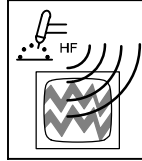


TILTING OR TIPPING can cause injury.

- Do not put any body part under unit while lifting.
- Always use proper equipment (hoists, slings, chains, blocks, etc.) of adequate capacity to lift and support components (stator, rotor, engine, etc.) as needed during job.

PINCH POINTS can injure.

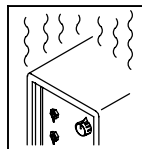
- Be careful when working on stator and rotor assemblies.



H.F. RADIATION can cause interference.

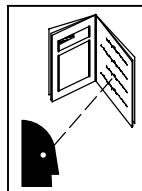
- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.

- 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.



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.



READ INSTRUCTIONS.

- Use Testing Booklet (Part No. 150 853) when servicing this unit.
- Consult the Owner's Manual for welding safety precautions.
- Use only genuine replacement parts from the manufacturer.

- Reinstall injectors and bleed air from fuel system according to engine manual.

1-3. California Proposition 65 Warnings

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

1-4. 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:

For Gasoline Engines:

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

For Diesel Engines:

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
























1. 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 before welding or going near welding operations. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – DEFINITIONS

2-1. Symbol Definitions

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

SECTION 3 – SPECIFICATIONS

3-1. Weld, Power, and Engine Specifications

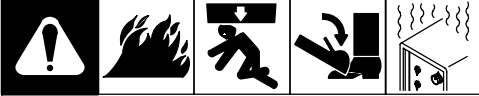
NOTE

Also see Performance Data in Section 13.

Welding Mode	Rated Welding Output	Maximum Open-Circuit Voltage	Weld Output Range	Generator Power Rating	Fuel Capacity	Engine
CC/DC	280 A, 25 V, 100% Duty Cycle	50	20 – 300 A	Continuous: 9.5 kVA/ kW, 80/40 A, 120/240 V AC, 60 Hz, Single-Phase, Peak: 10.5 kVA/kW (w/Weld Contactor Off)	12 gal (45 L) Tank	Kubota D722 Water-Cooled, Three-Cylinder, Four-Cycle, 18.8 HP Diesel Engine
CV/DC	300 A, 25 V, 100% Duty Cycle	35	13 – 35 V			
CC/AC	200 A, 25 V, 60% Duty Cycle	60	35 – 225 A			

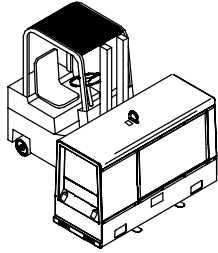
SECTION 4 – INSTALLATION

4-1. Installing Welding Generator

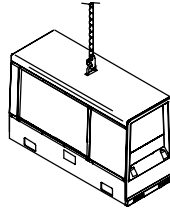


Movement

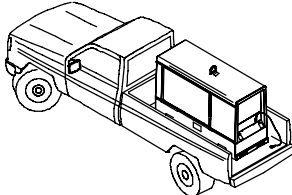
▲ Do not lift unit from end.



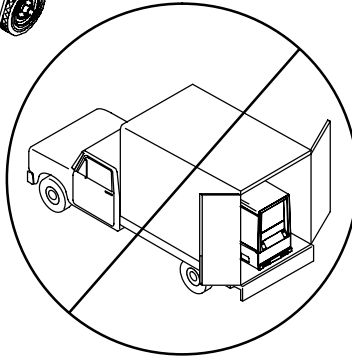
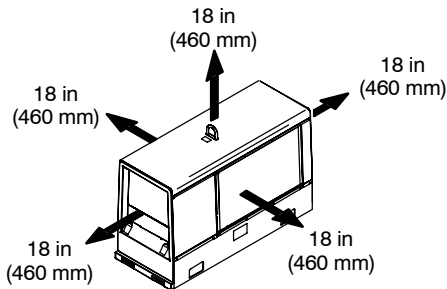
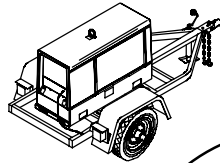
OR



Location / Airflow Clearance



OR



- ▲ Do not weld on base. Welding on base can cause fuel tank fire or explosion. Bolt unit down using holes provided in base.
- ▲ Always securely fasten welding generator onto transport vehicle or trailer and comply with all DOT and other applicable codes.
- ▲ Do not mount unit by supporting the base only at the four mounting holes. Use cross-supports to adequately support unit and prevent damage to base.
- ▲ Always ground generator frame to vehicle frame to prevent electric shock and static electricity hazards.
- ▲ If unit does not have GFCI receptacles, use GFCI-protected extension cord.
- ▲ Do not install unit where air flow is restricted or engine may overheat.

Mounting:

- 1 Cross-Supports

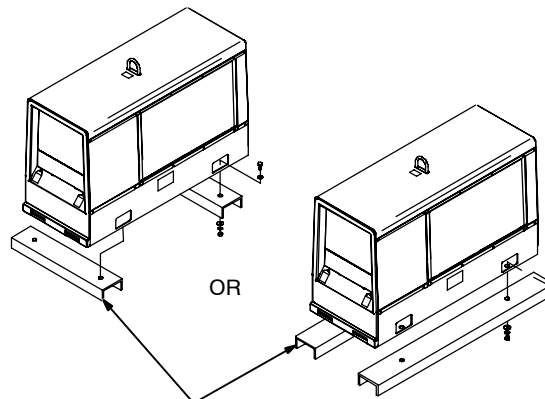
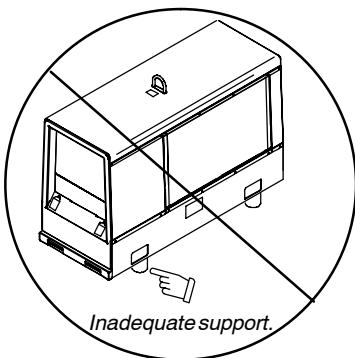
Mount unit on flat surface or use cross-supports to support base.

Grounding:

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

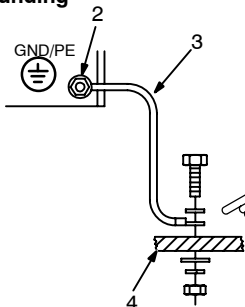
Connect cable from equipment ground terminal to metal vehicle frame. Use #10 AWG or larger insulated copper wire.

Mounting



▲ Do not use flexible mounts.

Grounding



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

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

4-2. Dimensions, Weights, and Operating Angles

Dimensions	
Height	35-1/2 in (902 mm) (To Top Of Exhaust)
Width	20 in (508 mm)
Depth	53 in (1346 mm)
A	20 in (508 mm)
B	16-1/2 in (419 mm)
C	1-3/4 in (44 mm)
D	6-1/16 in (154 mm)
E	32-3/4 in (832 mm)
F	51-3/8 in (1305 mm)
G	13/32 in (10 mm) Dia.
Weight	
720 lb (363 kg)	
Lifting Eye Weight Rating	
1280lb (580 kg)	

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

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

800 426

804 195-A

4-3. Installing Exhaust Pipe

▲ Stop engine and let cool.

⚠ Do not blow exhaust toward right side of unit where air inlet is or air cleaner may require frequent service. Point exhaust pipe in desired direction but always away from front panel and direction of travel.

Tools Needed:

1/2 in

804 196-A / Ref 216 171-B

4-4. Activating The Dry Charge Battery (If Applicable)

▲ Always wear a face shield, rubber gloves and protective clothing when working on a battery.

Remove battery from unit.

- 1 Vent Caps
- 2 Sulfuric Acid Electrolyte (1.265 Specific Gravity)
- 3 Well

Fill each cell with electrolyte to **bottom** of well (maximum).

▲ Do not overfill battery cells.

Wait ten minutes and check electrolyte level. If necessary, add electrolyte to raise to proper level. Reinstall vent caps.

- 4 Battery Charger

▲ Read and follow all instructions supplied with battery charger.

Charge battery for 12 minutes at 30 amperes or 30 minutes at 5 amperes. Disconnect charging cables and install battery.

When electrolyte is low, add only distilled water to cells to maintain proper level.

Tools Needed:

5 A For 30 Minutes
 OR
 30 A For 12 Minutes

drybatt1 6/05 - S-0886

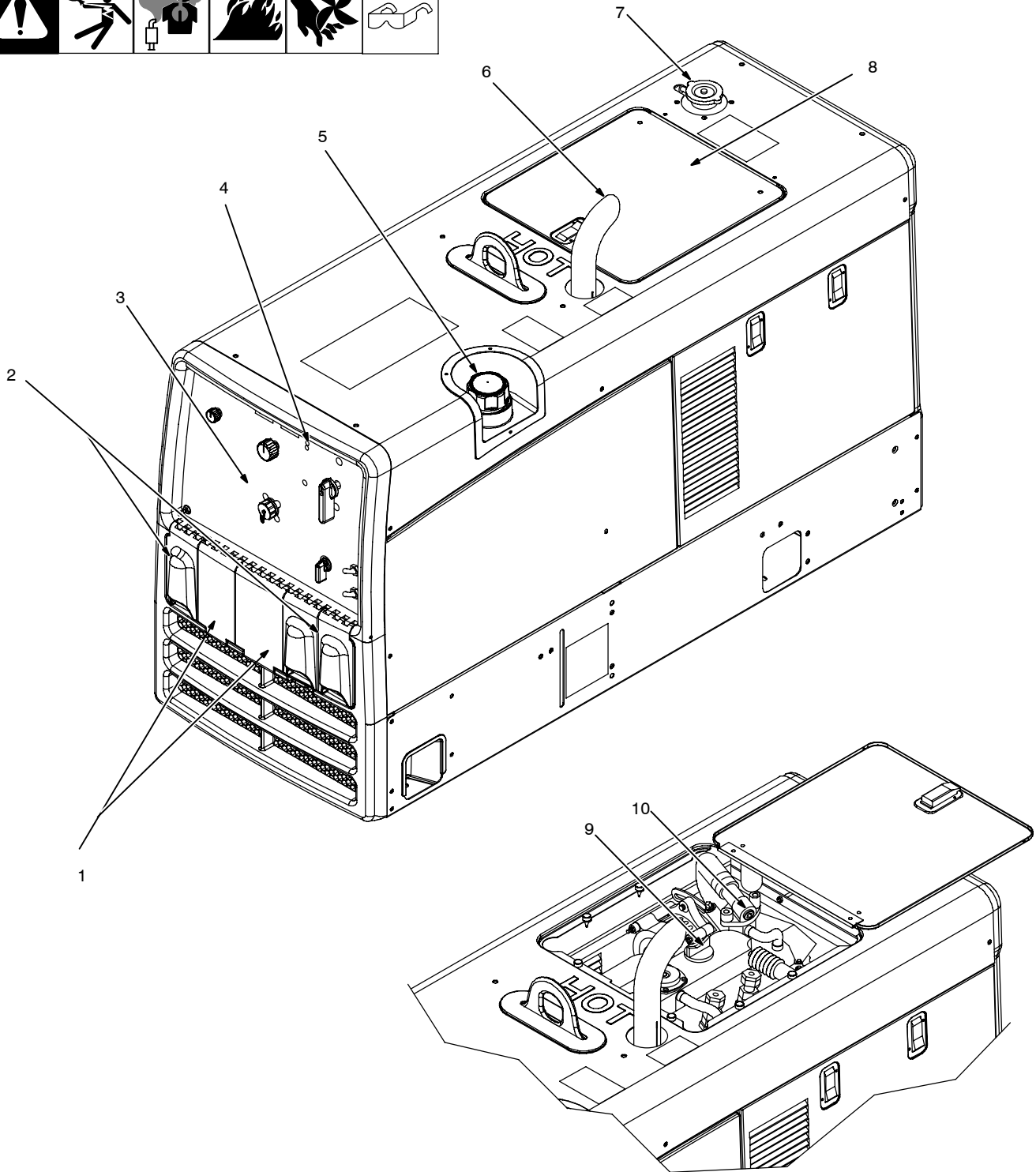
4-5. Connecting the Battery

▲ Connect negative (-) cable last.

Tools Needed:
 1/2 in

804 197-A / Ref 216 171 / Ref. S-0756-D

4-6. Overview And Engine Prestart Checks

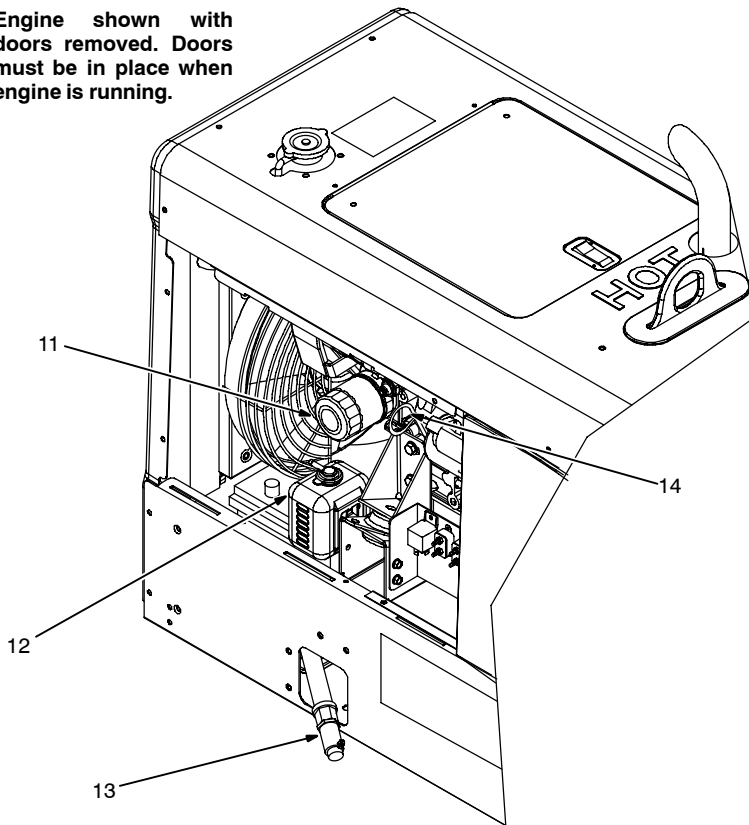


- 1 Generator Power Receptacles (see Section 6)
- 2 Weld Output Terminals (see Section 4-7)
- 3 Operator Controls (see Section 5)
- 4 Fuel Level Indicators
- 5 Fuel Filler Cap
- 6 Exhaust Pipe

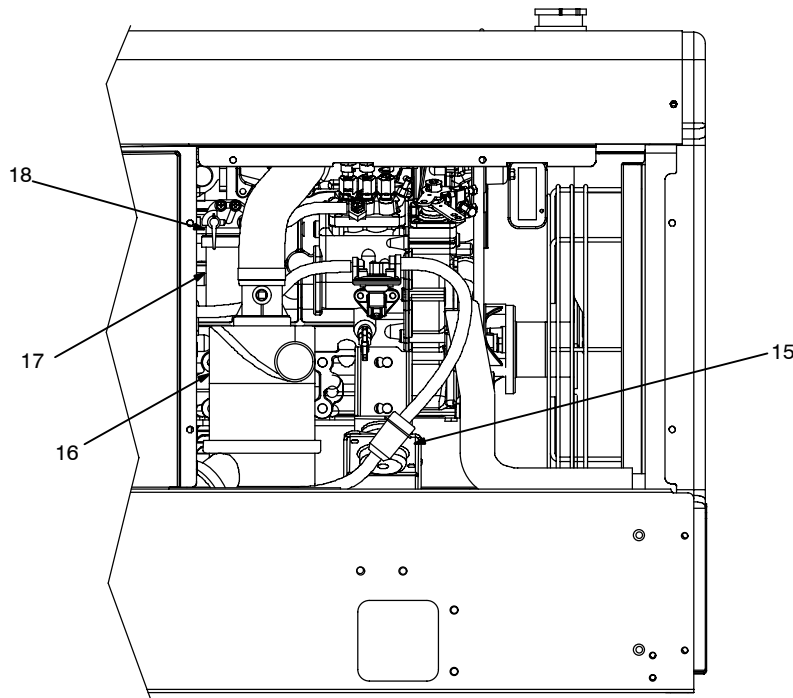
- 7 Radiator Cap
- 8 Engine Maintenance Label (Inside Door)
- 9 Oil Fill Cap
- 10 Thermostat Housing Plug
- 11 Oil Filter
- 12 Coolant Overflow Bottle

- 13 Oil Drain
- 14 Oil Dipstick
- 15 Inline Fuel Strainer
- 16 Air Cleaner
- 17 Fuel Filter
- 18 Fuel Shut Off Valve

▲ Engine shown with doors removed. Doors must be in place when engine is running.



Engine Left Side



Engine Right Side

Engine must be cold and on a level surface. See maintenance label (Section 7-2) for fluid specifications.

Starting engine for the first time:

Add fresh fuel to bottom of filler neck. Open fuel shut-off valve.

If coolant level is below bottom of radiator filler neck, add coolant to overflow bottle.

Run-in period (first 100 hours):

Engine may use oil and wetstacking may occur during run-in (see Section 12). Check oil several times daily during run-in.

Daily pre-start checks:

Add fresh fuel to bottom of filler neck.

Check oil. If oil is not up to full mark on dipstick, add oil. Unit is shipped with 10W30 engine oil.

Check coolant level in overflow bottle. If coolant is below Low level, add coolant until level in bottle is between Low and Full levels. If overflow bottle coolant level was low, check coolant level in radiator (see Section 7-2).

Engine damage can result from:

- Low oil level
- High engine temperature
- Incorrect coolant mixture
- Running out of fuel (air in fuel lines)
- Using gasoline
- Using ether to start engine
- Wetstacking

Engine stops if oil pressure is low, engine coolant temperature is high, or fuel level is low. Some conditions may cause engine damage before the engine shuts down.

Oil: Check oil level often and do not use the oil pressure shutdown system to monitor oil level.

Engine Temperature: Incorrect engine temperature can damage engine. Do not run engine without a properly working thermostat and radiator cap.

Keep radiator and air intake clean.

Coolant: A solution of 50% ethylene glycol base antifreeze and 50% water must be used in this engine. Do not use 100% antifreeze or severe damage will occur.

Fuel: Engine will shut down if fuel level is low. Air in fuel system causes starting problems.

Do not use gasoline. Using ether voids warranty.

Wetstacking: If unburned fuel and oil collect in exhaust pipe during run-in, see Section 12.

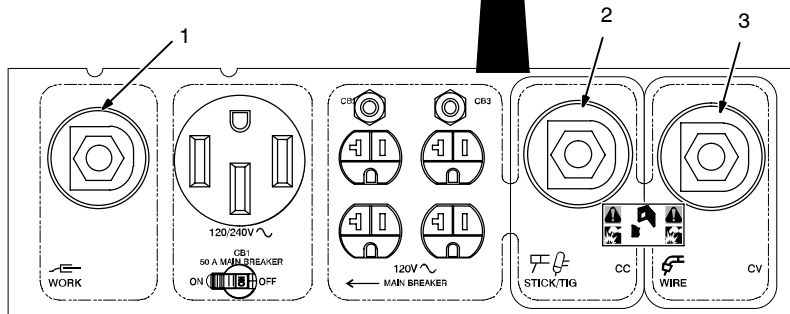
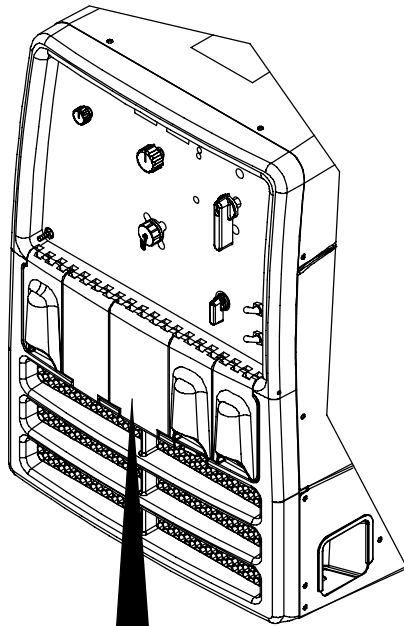
To improve cold weather starting:

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

Use fuel formulated for cold weather (diesel fuel can gel in cold weather). Contact local fuel supplier for fuel information.

Use correct grade oil for cold weather.

4-7. Connecting to Weld Output Terminals



▲ **Do not connect to CC and CV terminals at the same time.**

- 1 Work Weld Output Terminal
- 2 Stick/TIG (CC) Weld Output Terminal
- 3 Wire /CV Weld Output Terminal

For MIG welding, connect work cable to Work terminal and wire feeder cable to Wire (CV) terminal.

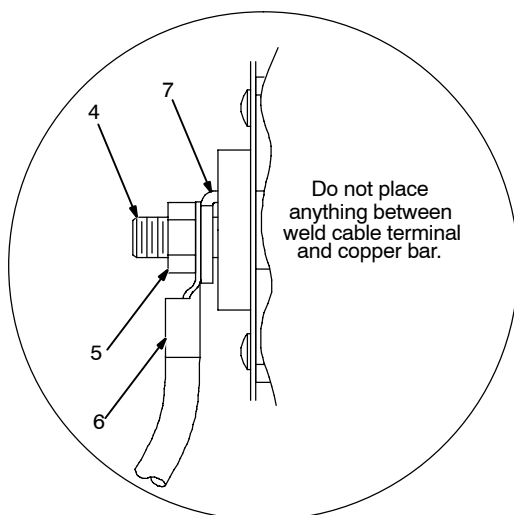
For Stick/TIG welding, connect work cable to Work terminal and electrode holder/TIG torch cable to Stick/TIG (CC) terminal.

Use Process Selector switch to select type of weld output (see Section 5-3).

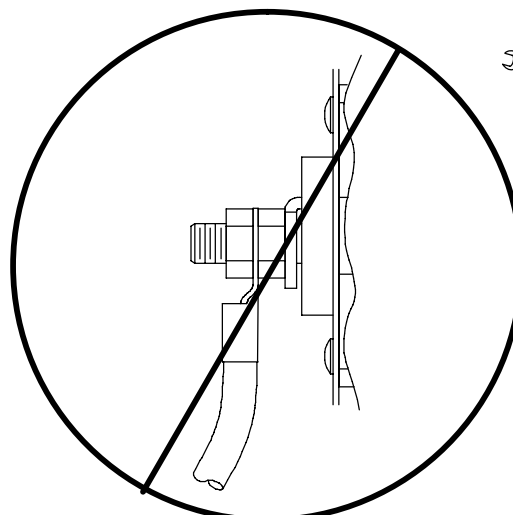
▲ **Failure to properly connect weld cables may cause excessive heat and start a fire, or damage your machine.**

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

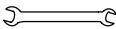
Remove supplied nut from weld output terminal. Slide weld cable terminal onto weld output terminal and secure with nut so that weld cable terminal is tight against copper bar. **Do not place anything between weld cable terminal and copper bar. Make sure that the surfaces of the weld cable terminal and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



Correct Installation




Incorrect Installation

Tools Needed:
 3/4 in

804 195-A / Ref. 216 171-B/ 803 778-A

4-8. Selecting Weld Cable Sizes*

	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						
Weld Output Terminals ▲ Turn off power before connecting to weld output terminals. ▲ Do not use worn, damaged, undersized, or poorly spliced cables.	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)

* This chart is a general guideline and may not suit all applications. If cables overheat, 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

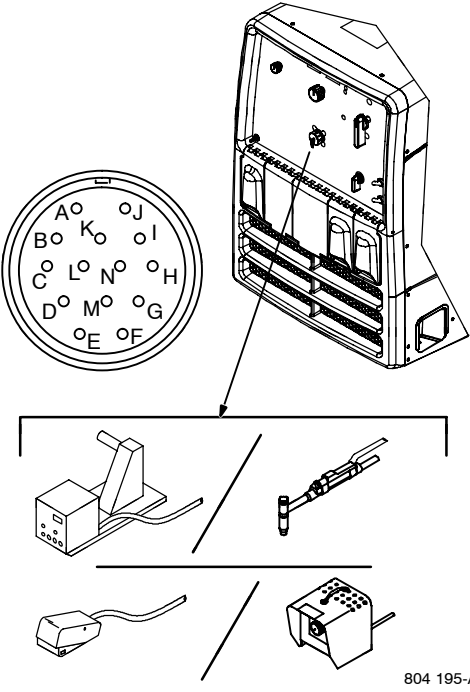

S-0007-F

***For distances longer than those shown in this guide, call a factory applications representative at 920-735-4505.

4-9. Remote Receptacle Information

NOTE

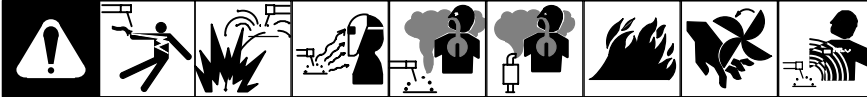
Engine runs at weld/power speed whenever a device connected to the remote receptacle is running.

	 REMOTE 14	Socket*	Socket Information
	24 VOLTS AC OUTPUT (CONTACTOR)	A	24 volts ac.
		B	Contact closure to A completes 24 volt ac contactor control circuit and keeps engine at Run speed in MIG mode. Protected by circuit breaker CB4.
	115 VOLTS AC OUTPUT (CONTACTOR)	I	115 volts ac. Protected by circuit breaker CB3.
		J	Contact closure to I completes 115 volts ac contactor control circuit.
	REMOTE OUTPUT CONTROL	C	+10 volts dc output to remote control.
		D	Remote control circuit common.
		E	0 to +10 volts dc input command signal from remote control.
	A/V AMPERAGE VOLTAGE	F	Current feedback: 1 volt per 100 amperes.
		H	Voltage feedback: 1 volt per 10 arc volts.
GND	G	Circuit common for 24 and 115 volts ac circuits.	
	K	Chassis common.	

*The remaining sockets are not used.

SECTION 5 – OPERATING THE WELDING GENERATOR

5-1. Engine Control Switches

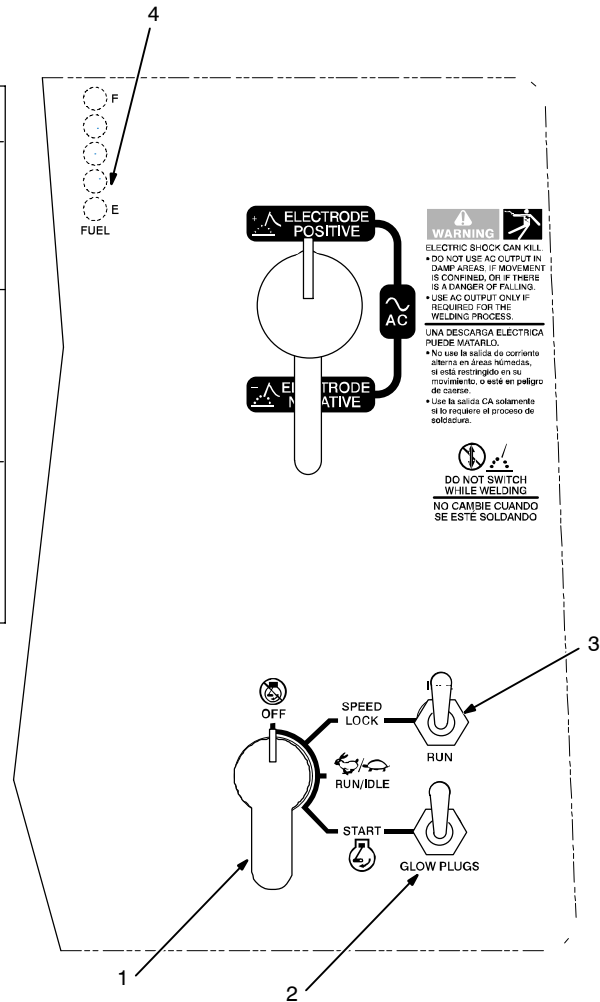


Controlling Engine Speed

		2450 rpm (Idle Speed) Continuous
		3750 rpm max (Weld/Power Speed) Continuous. Use in welding applications where high speed is needed for better arc starting and in TIG applications using a high frequency arc starter.
		No Load: 2450 rpm (Idle Speed) Load: 3750 rpm max (weld/Power Speed)

Glow Plug Time	
70°F (21°C)	0 seconds
32°F (0°C)	10 seconds
-4°F (-20°C)	20 seconds

Do not use glow plugs longer than 20 seconds.
Do not use ether to start engine. Using ether voids warranty.



Ref. 216 171-B

1 Engine Control Switch

Use switch to start engine, select speed, and stop engine. In Run/Idle position, engine runs at idle speed at no load, and weld/power speed under load. In Speed Lock position, engine speed is determined by position of Speed Lock switch (see item 2 and engine speed table above).

☞ Place Engine Control switch in Speed Lock position and Speed Lock switch in Run position for TIG (GTAW) welding using a high frequency device.

☞ In MIG mode, the unit will not return to idle speed when the remote contactor is on (closure between pins A and B or I and J on remote receptacle).

2 Speed Lock Switch

Use switch to lock engine in idle or weld/power speed when Engine Control switch is in the Speed Lock position. The Speed Lock switch is not needed at start-up. The engine always starts at idle speed.

With switch in the Idle position and Engine Control switch in Speed Lock, the engine runs at idle speed. With switch in Run position and Engine Control switch in Speed Lock, engine runs at weld/power speed.

Speed Lock switch does not affect engine speed when Engine Control switch is in Run/Idle position. (Engine speed changes with load.)

3 Glow Plug Switch

If necessary, push switch down before start-up to activate glow plug. See glow plug table above for operating information.

To Start: Use glow plug switch if necessary (see item 3 and glow plug table). Turn engine control switch to Start. Release engine control switch when engine starts.

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

To Stop: Turn Engine Control switch to Off position.

☞ Close fuel valve to stop engine if Engine Control switch does not work (see Section 4-6).

4 Fuel Level Indicator

With Engine Control switch in the Speed Lock or Run/Idle position, LED's indicate fuel level left in tank.

5-2. Weld Output Controls

MILLER ELECTRIC MFG. CO., APPLETON, WI 54912
Manufactured Under One or More of the Following US Patents: 5,991,139; 5,987,508; 6,820,698; 6,959,537; 6,174,347; 6,172,635.
Other Patents Pending.

1 Process/Contactor Switch
2 And **3** Displays
4 Voltage/Amperage Control
5 Remote Receptacle
6 DC Polarity/AC Switch

MAINTENANCE DISPLAYS

- **ENGINE HOURS:** with engine off, place Engine Control switch in SPEED LOCK position to view engine hours.
- **OIL CHANGE INDICATOR:** with engine off, place Engine Control switch into the RUN/IDLE position to see hours before next oil change. Oil hours start at 100 and count down to 0 (oil change due).
NOTE: Negative hours indicate when past recommended oil change interval.
TO RESET: Cycle Engine Control switch from the RUN/IDLE to SPEED LOCK position 3 times.
- **LOW FUEL SHUTDOWN:** Engine will shut off prior to running out of fuel to prevent loss of fuel in the system. Display will read: noFUEL. Turn the machine off, add fuel, and restart.
- **HIGH COOLANT TEMPERATURE SHUTDOWN:** Engine will shut off and display will read: HI H2O. See Owner's Manual for coolant information. Turn Engine Control switch OFF to reset shutdown.
- **LOW OIL PRESSURE SHUTDOWN:** Engine will shut off and display will read: LO OIL. Turn Engine Control switch OFF to reset shutdown.
- **ENGINE RPM's:** With engine running and the Process Selector switch in any Stick HOT position, cycle Engine Control switch from the RUN/IDLE to SPEED LOCK position 3 times and meters will display Engine RPM's. Use to check and set both idle and run speed RPM's. Accuracy is ± 16 RPM's. Turn machine off to reset display.

WARNING
 ELECTRIC SHOCK CAN KILL.
 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.
 UNA DESCARGA ELÉCTRICA PUEDE MATARLO.
 No use la salida de corriente alterna en áreas húmedas, si está restringido en su movimiento, o si existe un peligro de caídas.
 Use la salida CA solamente si lo requiere el proceso de soldadura.
 DO NOT SWITCH WHILE WELDING
 NO CAMBIE CUANDO SE ESTE SOLDANDO

1 Process/Contactor Switch
 See Section 5-3 for Process/Contactor switch information.

2 And **3** Displays
 Displays can show weld process information (voltage and amperage) or engine and maintenance information.
Meter Weld Functions: In Wire modes, Voltmeter displays preset weld voltage when not welding. Meters display actual voltage and amperage when welding and for five seconds after welding has stopped.
 In Stick and TIG modes, Voltmeter reads ON and Ammeter displays preset amperage when the contactor is on and not welding. The Voltmeter reads 0 (zero) when in remote with the contactor off. Meters display actual voltage and amperage when welding and for five seconds after welding has stopped.
Meter Engine And Maintenance Functions: See inset from maintenance label.

If displays read: HLP_001, and engine does not return to idle, check throttle solenoid. Turn Engine Control switch to OFF to reset shutdown.

4 Voltage/Amperage Control
 Use control to select weld voltage or amperage. Control may be adjusted while welding.
 With Process/Contactor switch in any Stick or TIG setting, use control to adjust amperage. With Process/Contactor switch in any Wire position, use control to adjust voltage. When a remote voltage/amperage control is connected to Remote receptacle RC4, control sets the maximum amperage in Stick and TIG modes, but has no effect in MIG modes.

5 Remote Receptacle
 Use receptacle to connect remote control or wire feeder.

When a remote voltage/amperage control is connected to the Remote receptacle, the Auto Sense Remote feature automatically switches voltage/amperage control to the remote control (see Sections 4-9 and 5-7).

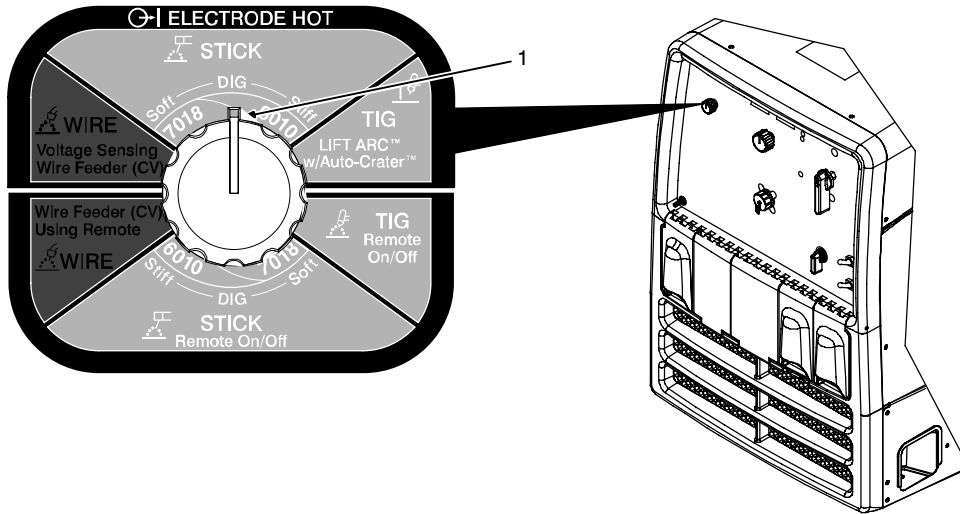
With remote voltage/amperage control connected, weld output in CC mode is determined by a combination of front panel and remote control voltage/amperage settings. In CV mode, weld output is controlled through remote control only.

If no remote voltage/amperage control is connected to the Remote receptacle, the front panel Voltage/Amperage control adjusts voltage and amperage.

6 DC Polarity/AC Switch
 Do not switch while welding.
 Use switch to select AC weld output or polarity of DC weld output.

Ref. 216 171-B / Ref. 225 915-A

5-3. Process/Contactor Switch



Ref. 804 195-A / Ref 216 171

1 Process/Contactor Switch

▲ Weld output terminals are energized when Process/Contactor switch is in an Electrode Hot position and the engine is running.

The unit will not return to idle speed when Process/Contactor switch is in a Wire position and the remote contactor is on (closure between pins A and B on remote receptacle).

Use switch to select weld process and weld output on/off control (see table below and Section 4-9).

Place switch in Remote positions to turn weld output on and off with a device connected to the remote receptacle.

Place switch in Electrode Hot positions for weld output to be on whenever the engine is running.

Wire Positions:

Use Wire positions for MIG welding using a voltage sensing wire feeder (Electrode Hot) or wire feeder using remote control.

Stick Positions:

Use Stick positions for stick (SMAW) and air carbon arc (CAC-A) cutting and gouging.

When switch is in a Stick mode, select one of four dig settings to provide additional amperage during short arc length conditions and help prevent electrodes from “sticking”. See Stick position descriptions following (reading L to R):

Soft Arc (E 7018) (Position 1) - This setting provides a low dig/arc force setting for smooth weld performance. A stable weld puddle with little arc “snap” gives excellent weld bead appearance with minimal spatter.

Medium Soft Arc (Position 2) - This setting provides a low to medium dig/arc force that gives a slightly more fluid weld puddle, more arc “snap”, and reduces the potential for electrode sticking at shorter arc lengths.

Medium Stiff Arc (Position 3) - This setting provides medium dig/arc force for open root

vertical up joints or joints that do not require additional current for fit up inconsistencies.

Stiff Arc (E6010) (Position 4) - This setting provides a high dig/arc force for open root vertical down joints where additional current is needed to compensate for tight joint fit up without the need to increase overall welding current. This setting is recommended for those who prefer a very stiff arc with 6010 electrodes.

TIG Positions:

TIG - Remote On/Off - Use this position for TIG welding using remote on/off control.

Electrode Hot - Lift-Arc™ w/Auto Crater™ TIG (DC only) - With switch in this position, normal open-circuit voltage is not present between the electrode and workpiece. A solid-state contactor energizes after the electrode touches the workpiece, preventing overheating, sticking, or contamination of the electrode (see Sections 5-4 and 5-5).

End the arc using either the Auto-Crater or Auto-Stop feature (see Section 5-6).

Process/Contactor Switch Settings

Switch Setting	Process	Output On/Off Control
Electrode Hot - Wire	MIG (GMAW)	Electrode Hot
Electrode Hot - Stick	Stick (SMAW) Select Preferred Dig	Electrode Hot
Electrode Hot - Stick	Air Carbon Arc (CAC-A) Cutting And Gouging Select Any Dig	Electrode Hot
Electrode Hot - Lift Arc w/ Auto-Crater	TIG (GTAW) Lift Arc w/Auto-Crater (GTAW) (DC Only)	Electrode Hot
Remote - TIG	GTAW With HF Unit, Pulsing Device, Or Remote Control	At Remote Receptacle
Remote - Stick	Stick (SMAW) With Remote On/Off	At Remote Receptacle
Remote - Wire	MIG (GMAW)	At Remote Receptacle

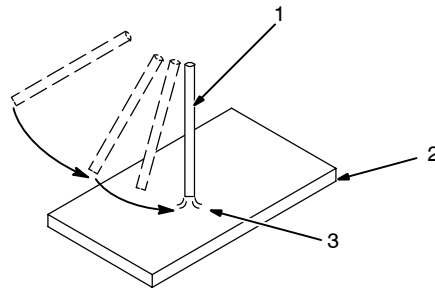
5-4. Stick Start Procedure – Scratch Start Technique



With Stick selected, start arc as follows:

- 1 Electrode
- 2 Workpiece
- 3 Arc

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



5-5. TIG Lift-Arc™ Start Procedure



Select Lift-Arc™/Scratch Start TIG at Process/Contactor switch to achieve great arc starts with either procedure. Perform Lift-Arc starting method as follows:

Lift-Arc™ TIG

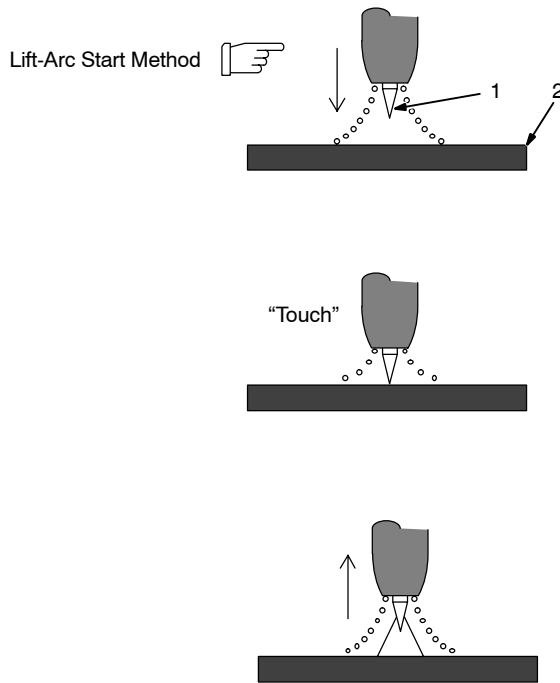
- 1 TIG Electrode
- 2 Workpiece

Turn gas on. Touch tungsten electrode to workpiece at weld start point, and lift electrode. Arc is started 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.

Application:

Lift-Arc is used for the DCEN GTAW process when HF Start method is not permitted.



5-6. Ending The TIG Arc With Auto-Crater™ And Auto-Stop™



Maintain shielding gas coverage and eliminate tungsten and work-piece contamination by using Auto-Crater or Auto-Stop to end the arc.

Using Auto-Crater:

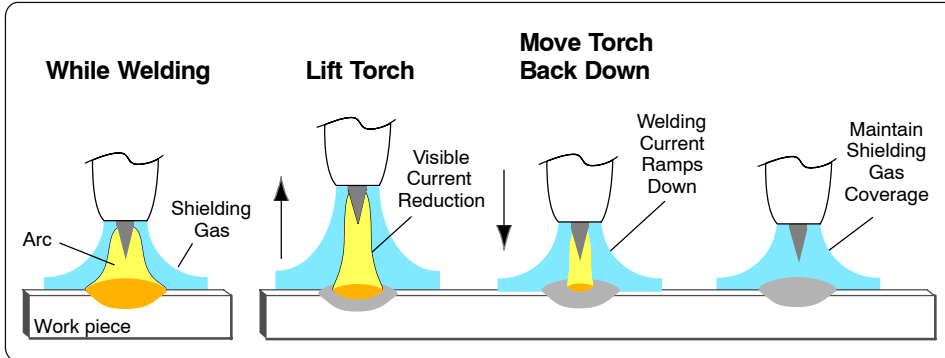
☞ Remote control is not needed when using Auto-Crater.

- Lift torch slightly to start Auto-Crater end (current is reduced).
- Lower torch. Shielding gas continues until shut off.

Using Auto-Stop:

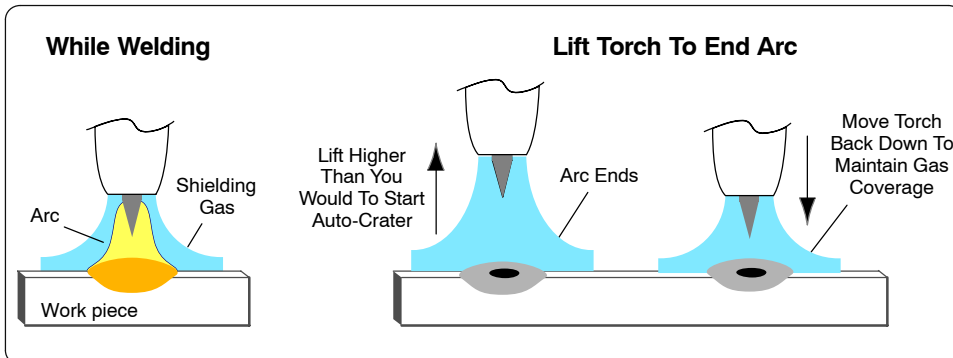
- Lift torch slightly to start Auto-Stop. (Lift higher than that needed to start Auto-Crater.)
- Arc stops.
- Move torch back down to maintain gas coverage and prevent contamination.

Ending Arc Using Auto-Crater

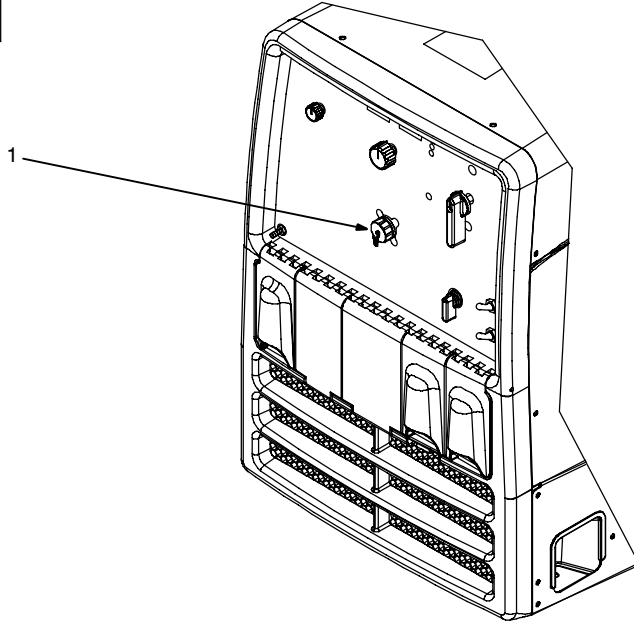


OR

Ending Arc Using Auto-Stop



5-7. Remote Amperage Control



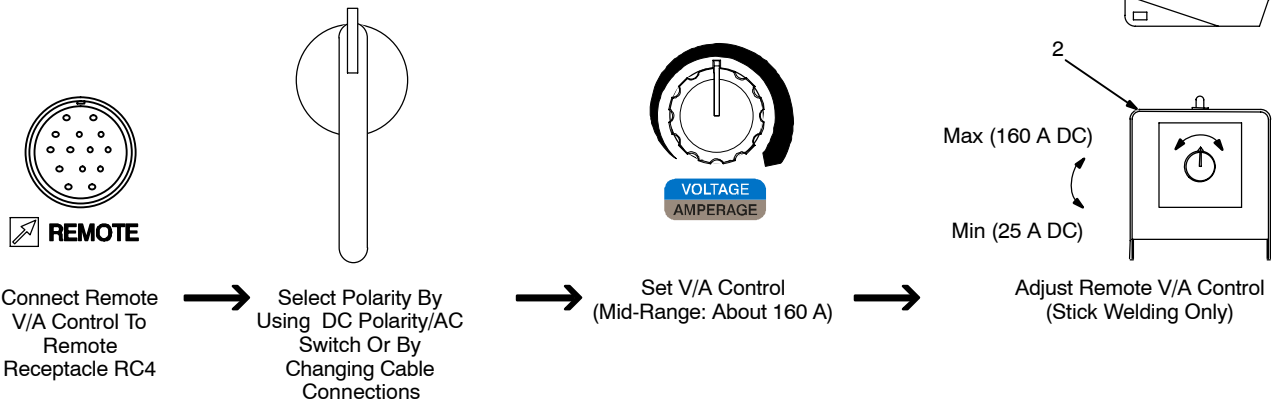
1 Remote Receptacle RC4
Connect optional remote voltage/ amperage (V/A) control to RC4 (see Section 4-9).

With remote control connected, weld output in a CC mode (Stick, TIG) is determined by a combination of front panel and remote control voltage/amperage settings. In CV mode (Wire), weld output is controlled through remote control only.

- 2 Remote Hand Control (Optional)
- 3 Remote Foot Control (Optional)

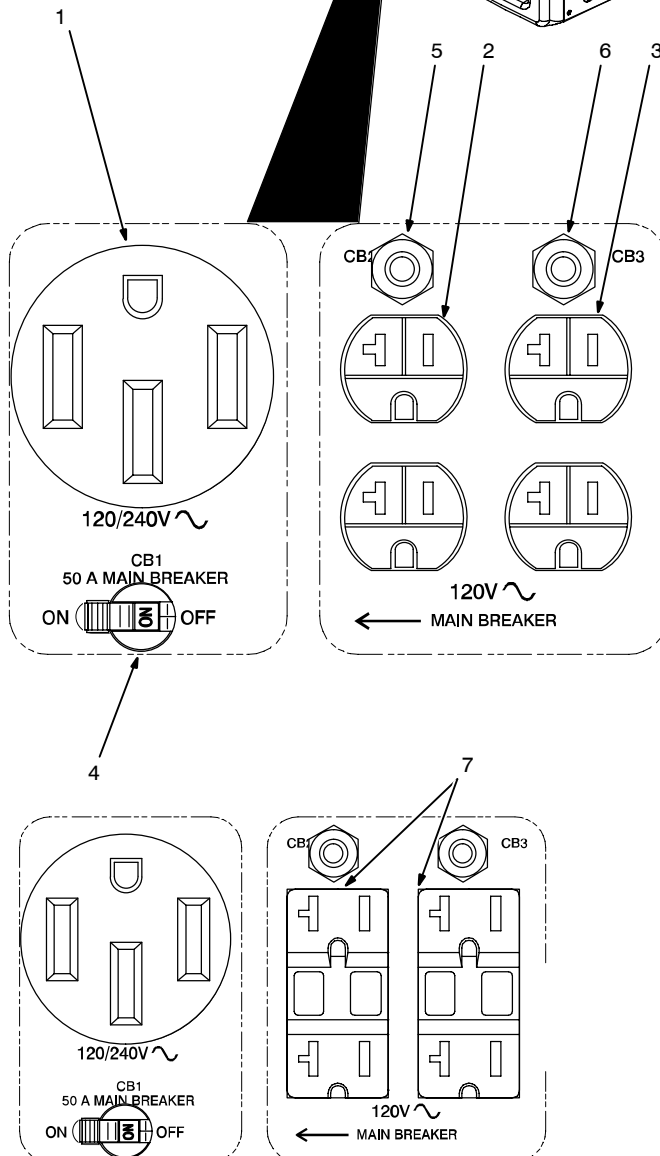
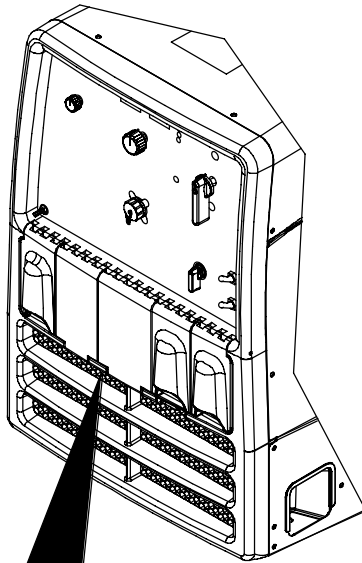
Engine runs at weld/power speed in Wire mode whenever a device connected to the remote receptacle makes closure between pins A and B. In all other modes, the engine runs at idle speed until a load is applied.

In Example:
Process = Stick (Using Remote On/Off)
Min = 25 A CC/DC
Max = 160 A CC/DC



SECTION 6 – OPERATING AUXILIARY EQUIPMENT

6-1. Generator Power Receptacles



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

☞ Generator power decreases as weld current increases.

1 240 V 50 A AC Receptacle RC1

RC1 supplies 60 Hz single-phase power at weld/power speed. Maximum output is 10 kVA/kW. See Section 6-3 for information on wiring optional 240 V single-phase plug.

2 120 V 20 A AC Duplex Receptacle RC2

3 120 V 20 A AC Duplex Receptacle RC3

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

4 Supplementary Protector CB1

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

5 Supplementary Protector CB2

6 Supplementary Protector CB3

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

☞ Press button to reset.

▲ Power is still present at the 240 volt receptacle when CB2 and/or CB3 trips. Unplug power cord before attempting to service accessories or tools.

7 Optional 120 V 20 A AC GFCI Receptacles GFCI-2 and GFCI-3

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

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

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

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


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

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

6-2. Simultaneous Weld And Power

Weld Current in Amperes	Total Power in Watts	120 V Full kVA Receptacle Amperes	240 V Full kVA Receptacle Amperes
300	1000	10	5
250	3500	31	15
200	5200	46	23
150	6700	60	30
100	8000	70	35
0	10,500 (Peak)	88	44

6-3. Wiring Optional 240 Volt Plug



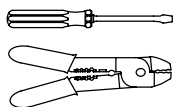
The plug can be wired for a 240 V, 2-wire load or a 120/240V, 3-wire load. See circuit diagram.

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

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

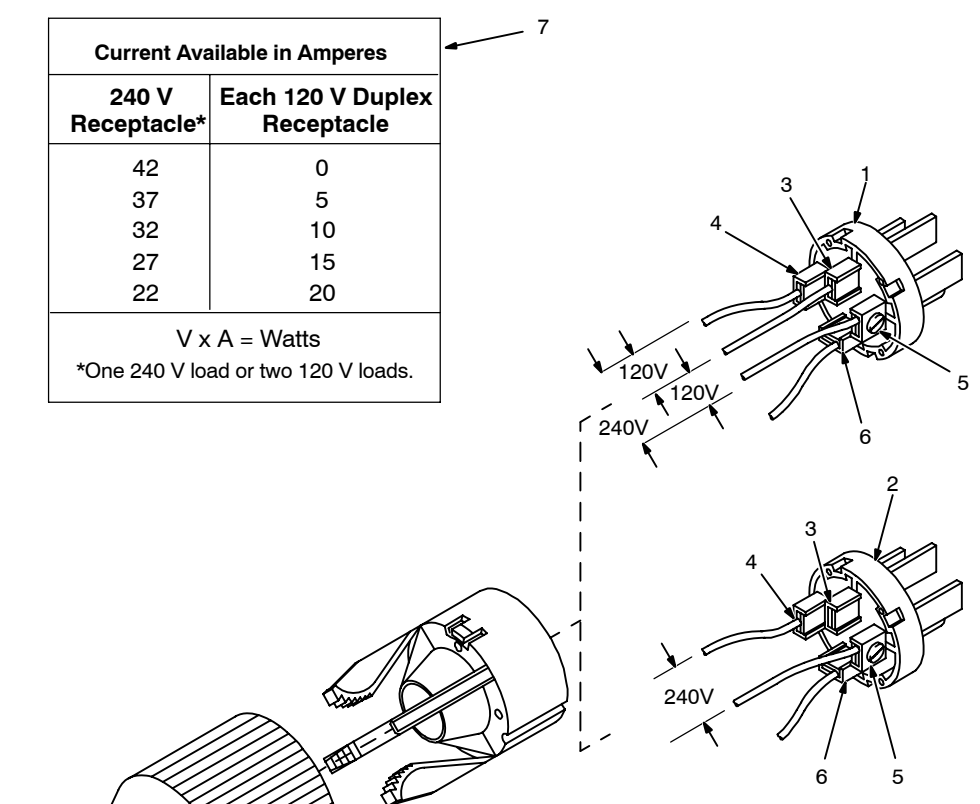
3 Neutral (Silver) Terminal
 4 Load 1 (Brass) Terminal
 5 Load 2 (Brass) Terminal
 6 Ground (Green) Terminal
 7 Amperes Available using 120/240 V Plug

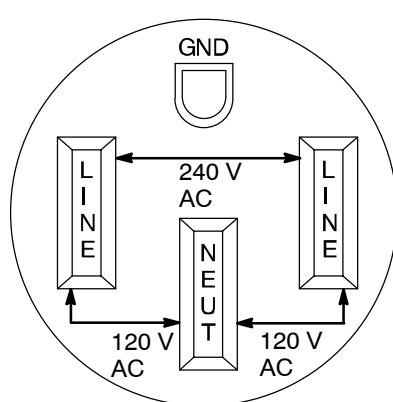
Tools Needed:



Current Available in Amperes	
240 V Receptacle*	Each 120 V Duplex Receptacle
42	0
37	5
32	10
27	15
22	20

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





plug1 11/03 - 120 813-D

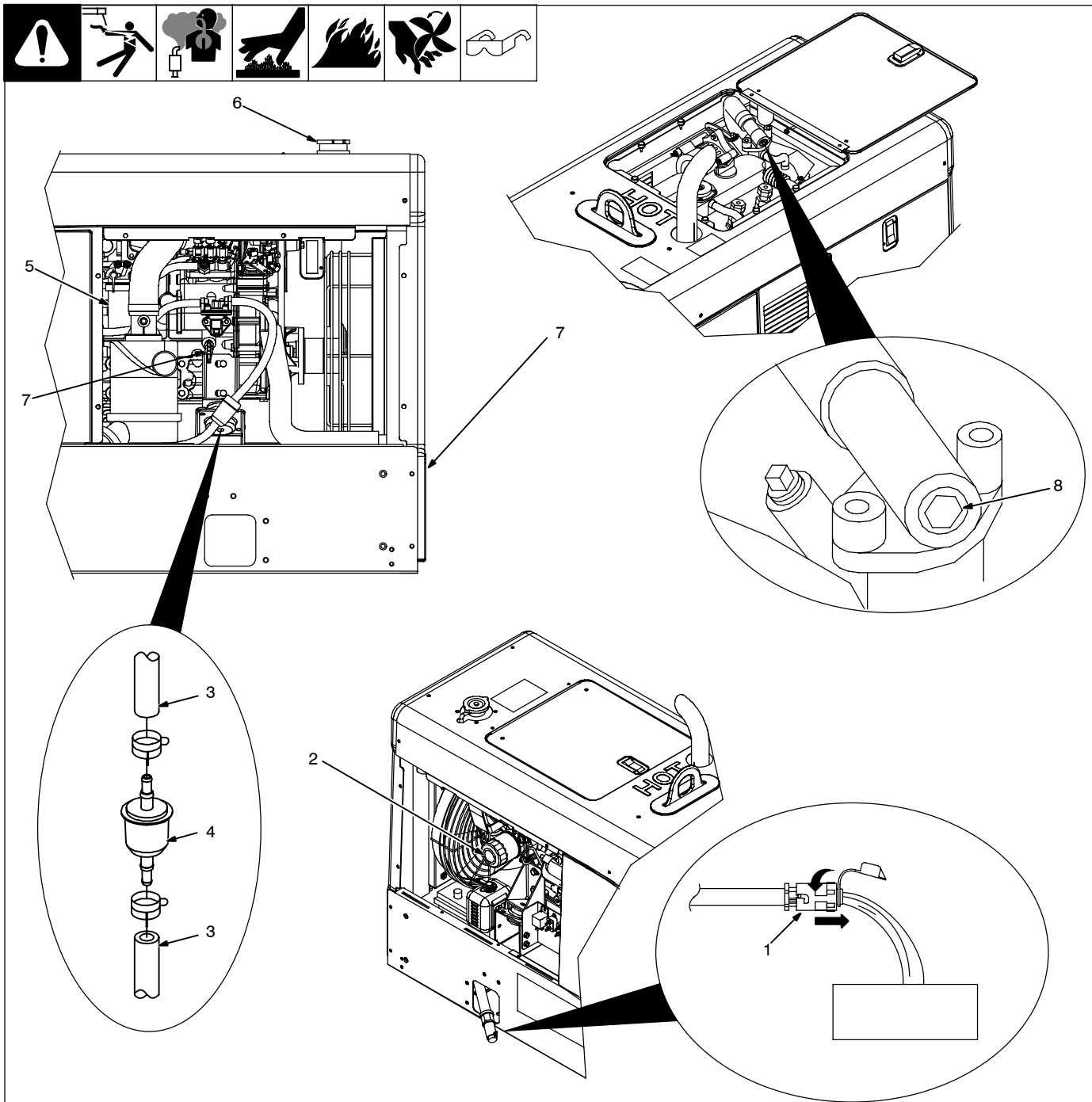
SECTION 7 – MAINTENANCE

7-1. Routine Maintenance

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

		✓ = Check ◇ = Change ● = Clean	☆ = Replace * To be done by Factory Authorized Service Agent		Reference								
Every 8 Hours		✓ Coolant Level		✓ Fuel Level		✓ Oil Level		● Oil, Fuel Spills	Section 4-6				
Every 50 Hours		✓ Fuel Connections		✓ Fuel Connections		● Weld Terminals							
Every 100 Hours		● Air Cleaner Element		✓ Air Cleaner Hoses		5/16 in. (8 mm) ✓ Belt Tension		● Battery Terminals	Section 7-2, 7-3, Engine Manual				
Every 200 Hours		◇ Oil Filter		✓ Radiator Hoses		☆ Unreadable Labels		◇ Inline Fuel Filter	Engine Manual, Section 7-4				
Every 500 Hours		◇ Fuel Filter		✓ Engine Speed		✓ Fan Belt		● Flush Radiator		✓ ☆ Weld Cables		✓ Slip Rings* ✓ Brushes* ☆ 1500 Hours*	Engine Manual, Section 7-2
Every 800 Hours		✓ Valve Clearance*		● Inside Unit					Section 7-2				
Every 2000 Hours		✓ ☆ Fuel Hoses		✓ ☆ Fuel Hoses		✓ ☆ Coolant & Hoses			Section 7-2				

7-2. Maintenance Label And Engine Maintenance Activities




▲ Stop engine and let cool.

Oil And Fuel

- 1 Oil Drain Valve
- 2 Oil Filter

Change engine oil and filter according to engine manual.

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

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

- 3 Fuel Lines

Replace fuel lines if cracked or worn.

- 4 Inline Fuel Strainer

Install new filter as shown.

- 5 Fuel Filter

Replace filter according to engine manual.

Wipe up any spilled fuel.

Start engine, and check for fuel leaks.

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

Coolant

- 6 Radiator Cap

- 7 Radiator Drain Cocks (One located on bottom of radiator)

Drain engine coolant according to procedure in engine manual.

Add engine coolant as follows:

- 8 Thermostat Housing Plug

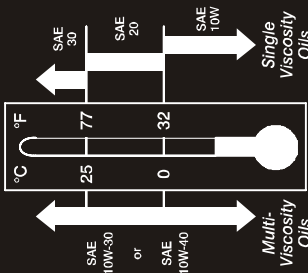
Remove thermostat housing plug. Add coolant to radiator until coolant is at bottom of filler neck and coolant trickles out of thermostat housing plug hole. This ensures all air is purged from the system.

Reinstall plug and radiator cap. Check coolant level in overflow bottle.

Engine coolant is a mixture of water and ethylene glycol base antifreeze. A solution of 50% antifreeze and 50% water must be used in this engine. Do not use 100% antifreeze or severe damage will occur.

TRAILBLAZER KUBOTA D722 ENGINE

See Engine Manual for complete engine care.
 Give Engine Specification and Serial Number when ordering parts.
 Vea el manual del motor para el cuidado completo del motor.
 De la especificación del motor y el número de serie cuando ordene partes o piezas.



Check daily.
Chequee
Diariamente.

Recommended Oil
 API Service Classification CC/CD/CE or better
 Oil Change 100 hours or less
 Oil Filter Change normal conditions – 200 hours or less

Acetite Recomendado
 Clasificación de Servicio API CC/CD/CE o mejor
 Cambio de aceite 100 horas o menos
 Cambio del filtro del aceite Condiciones normales – 200 horas o menos

Oil Filter MILLER 187443 Kubota 15853-99170
 Hastings LF402 Fram PH2649A

Oil Capacity 2.75 qt (2.6 L) or 3.0 qt (2.8 L) with filter change

Fuel Grade 2-D Cetane No. 45 min. (.5% max. Sulfur content)

Primary Fuel Filter MILLER 213858 Hastings GF160
 Change filter every 200 hours. / Cambie el filtro cada 200 horas.

Secondary Fuel Filter Element MILLER 187442 Kubota 15231-43560
 Fill filter with clean fuel before installing – read instructions on filter.

Llene el filtro con combustible limpio antes de instalar. Lea las instrucciones en el filtro.

Air Filter Service 100 hours or less – see Owner's Manual
Servicio del filtro de aire 100 horas o menos – vea el manual del dueño

Air Filter Element MILLER 187441 Baldwin RS3715
 Donaldson P82686 Wix 46449

Air Filter Element (Safety) Opt. MILLER 202102 Donaldson P835396

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

Valve Clearance – Cold
 Espacio de despeje de válvula fría
 .0057 – .0072 in.
 .145 – .185 mm

Engine RPM – No Load
Weld/Power 3700 +25
 Idle 2450 +0
 -75

Engine Cooling
 A solution of 50% anti-freeze and 50% water must be used in this engine. Do not use 100% anti-freeze, or severe damage will occur.

Enfriamiento del motor
 Se debe usar una solución de 50% anticongelante con 50% de agua en este motor. No use 100% de anticongelante, porque ocurrirá daño severo al motor.

Inspect brushes and slip rings every 500 hours and replace the brushes every 1500 hours.
Inspeccione las escobillas y anillos resbalizos cada 500 horas y reemplace las escobillas cada 1500 horas.

MAINTENANCE DISPLAYS

- **ENGINE HOURS:** With engine off, place Engine Control switch in SPEED LOCK position.
- **OIL CHANGE INDICATOR:** With engine off, place Engine Control switch into the RUN/IDLE position to see hours before next oil change.
 Oil hours start at 100 and count down to 0 (oil change due).
NOTE: Negative hours indicate when past recommended oil change interval.
TO RESET: Cycle Engine Control switch from the RUN/IDLE to SPEED LOCK position 3 times.
- **LOW FUEL SHUTDOWN:** Engine will shut off prior to running out of fuel to prevent loss of fuel in the system. Display will read: noFUEL. Turn the machine off, add fuel, and restart.
- **HIGH COOLANT TEMPERATURE SHUTDOWN:** Engine will shut off and display will read: HI H2O. See Owner's Manual for coolant information. Turn Engine Control switch OFF to reset shutdown.
- **LOW OIL PRESSURE SHUTDOWN:** Engine will shut off and display will read: LO OIL. Turn Engine Control switch OFF to reset shutdown.
- **ENGINE RPM's:** With engine running and the Process Selector switch in any Stick HOT position, cycle Engine Control switch from the RUN/IDLE to SPEED LOCK position 3 times and meters will display Engine RPM's. Use to check and set both idle and run speed RPM's. Accuracy is ±16 RPM's. Turn machine off to reset display.

PANTALLAS DE MANTENIMIENTO

- **HORAS DEL MOTOR:** Con el motor apagado, ponga el interruptor de control del motor en la posición "SPEED LOCK" (traba de velocidad).
- **INDICADOR DE CAMBIO DE ACEITE:** Con el motor apagado, ponga el interruptor de control del motor en la posición "RUN/IDLE" (marcha/ralentí) para ver las horas que faltan para el próximo cambio de aceite.
Las horas del aceite comienzan a 100 y disminuyen a 0 (momento del cambio de aceite).
NOTE: Horas negativas indican que el intervalo de cambio de aceite recomendado ha pasado.
- **PARA REARMAR:** Haga ciclos en el interruptor de control del motor desde la posición "RUN/IDLE" a "SPEED LOCK" 3 veces.
- **APAGAMIENTO POR RAZÓN DE COMBUSTIBLE BAJO:** El motor se apagará antes de quedarse sin combustible para prevenir que no haya combustible en el sistema. La pantalla indicará: noFUEL (no combustible). Apague el motor, añada combustible, y vuelva a arrancarlo.
- **APAGAMIENTO POR TEMPERATURA ALTA DEL REFRIGERANTE:** El motor se apagará y la pantalla indicará: HI H2O. Vea el Manual del Dueño para la información sobre el líquido refrigerante. Use el interruptor de control del motor para APAGARLO (OFF) para rearmar el apagamiento.
- **APAGAMIENTO POR PRESIÓN BAJA DE ACEITE:** El motor se apagará y la pantalla indicará: LO OIL (aceite bajo). Use el interruptor de control del motor para APAGARLO (OFF) y rearmar el apagamiento.
- **RPM DEL MOTOR:** Con el motor funcionando y el interruptor de selección de proceso en cualquier posición "Stick HOT" (soldadura convencional CALIENTE), haga ciclo al interruptor de control del motor de la posición "RUN/IDLE a SPEED LOCK" 3 veces y los medidores mostrarán el RPM del motor. Use para verificar el RPM de ralentí y de marcha. La precisión es de ±16 RPM. Apague la máquina para rearmar la pantalla.

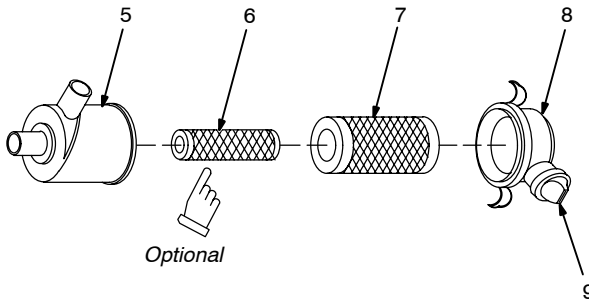
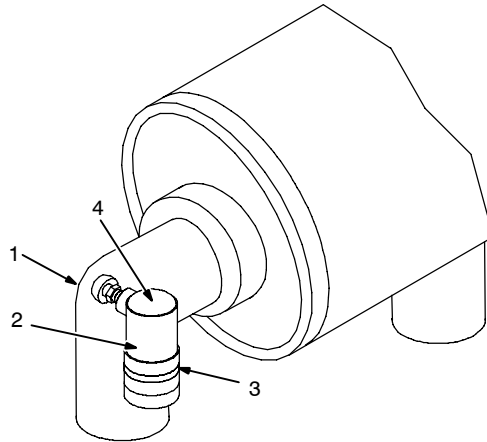
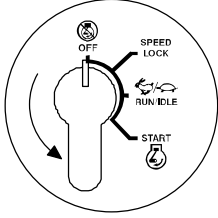
Bell MILLER 187459
 Kubota 15881-97011

Glow Plugs . . . MILLER 187820 Kubota 16851-65512
 Do not use ether for starting.
 Note: Operation not required when above 50° F (10° C) or when engine is warm.
 Never operate for more than 20 seconds continuous.

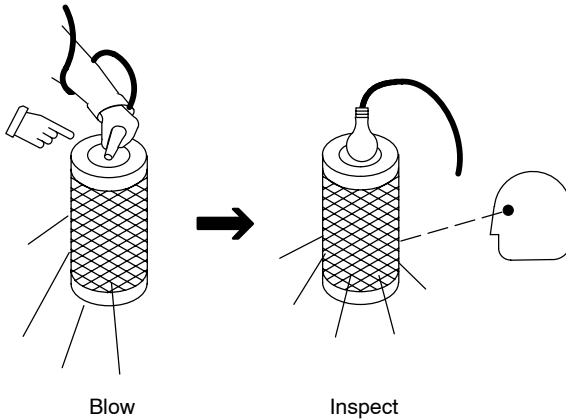
No use éter para arrancar.
 Note: No se requiere esta operación cuando esté arriba de 50° F (10° C), o cuando el motor esté caliente. Nunca las opere por más de 20 segundos continuamente.



7-3. Servicing Air Cleaner



Keep nozzle
2 in (51 mm)
from element.



▲ Stop engine.

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

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

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

- 1 Intake Manifold
- 2 Service Indicator (Optional)
- 3 Window
- 4 Reset Button

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

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

- 5 Housing
- 6 Safety Element (Optional)
- 7 Primary Element
- 8 Cover
- 9 Dust Ejector

To clean air filter:

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

▲ Do not clean housing with air hose.

Clean primary element with compressed air only.

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

Reinstall primary element and cover (dust ejector down).

7-4. Adjusting Engine Speed

NOTE

If the engine does not start and stop properly, verify the fuel solenoid is installed properly **before** adjusting engine speed (see Section A following).

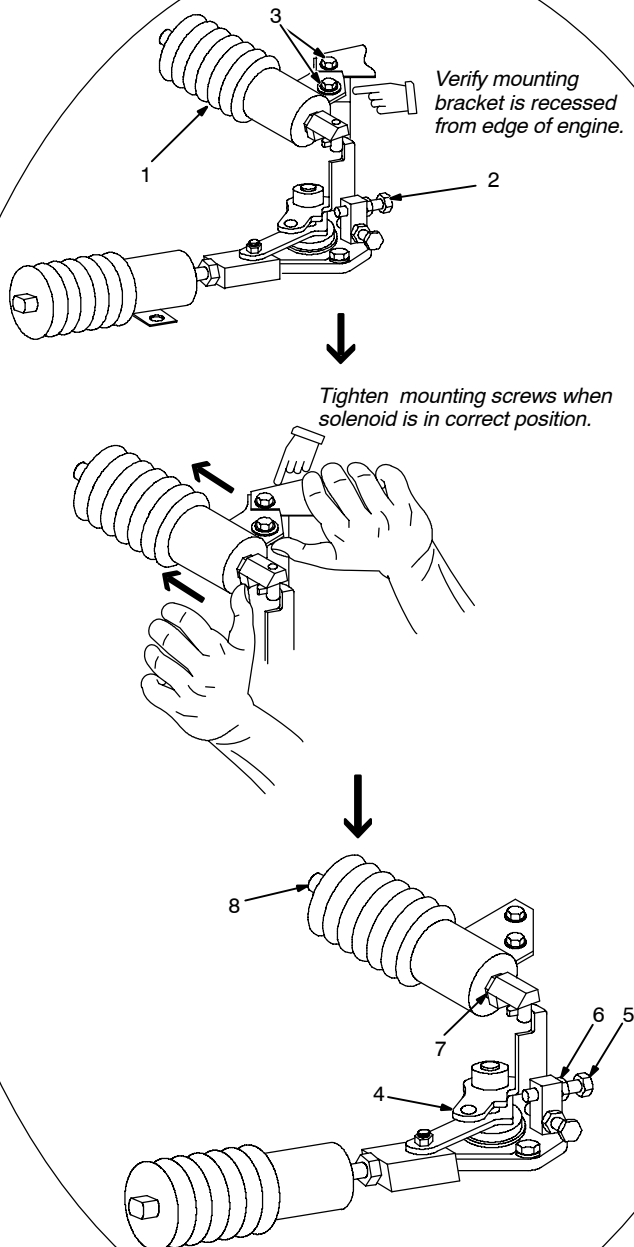
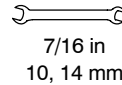
If the engine does not stay at idle speed, verify the throttle solenoid is installed and adjusted properly **before** adjusting engine speed (see Section B following).

If the engine runs properly but the speeds are incorrect, **do not** adjust the solenoids. Adjust the engine speed according to the instructions in Section C.

A. Checking Fuel Solenoid



Tools Needed:




▲ Stop engine.

If the engine does not start and stop when using the Engine Control switch, check the position of the fuel solenoid.

Adjusting Fuel Solenoid Position

- 1 Fuel Solenoid
- 2 Stop Screw
- 3 Fuel Solenoid Mounting Screws


 Stop screw is factory-set and should not be adjusted.

When properly adjusted, the solenoid bracket is slightly recessed from the edge of the engine block and the solenoid linkage easily travels between the stop screw and the fuel solenoid internal stop.

If adjustment is necessary, loosen the solenoid mounting screws and push the solenoid **bracket** back toward engine as far as possible.

Continue pushing on solenoid bracket in a clockwise direction while tightening mounting screws.

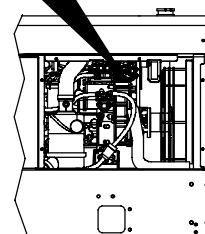
- 4 Shutdown Lever
- 5 Stop screw
- 6 Stop Screw Jam Nut
- 7 Fuel Solenoid Jam Nut
- 8 Plunger

 Stop screw is factory-set and should not be adjusted.

Hold throttle solenoid in idle (energized) position. If shutdown lever is touching or within 1/16 in. of stop screw, fuel solenoid is properly adjusted.

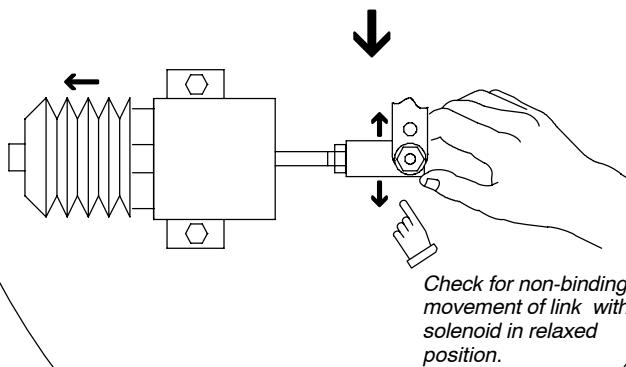
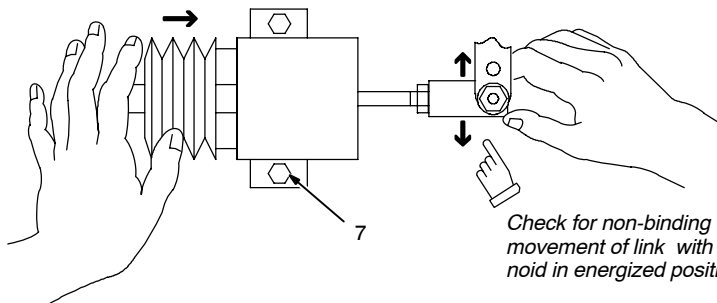
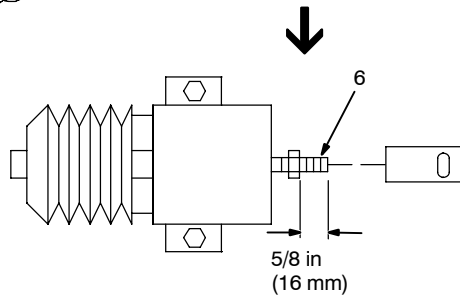
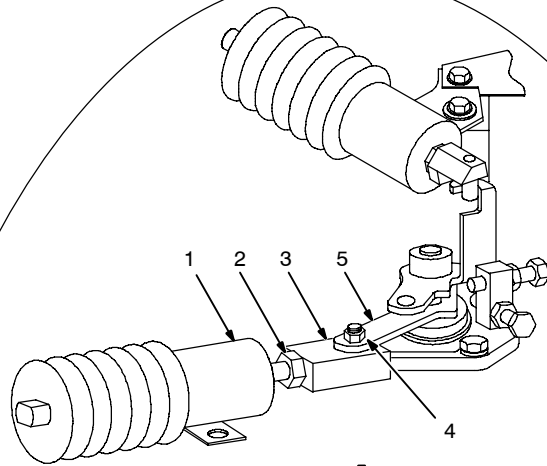
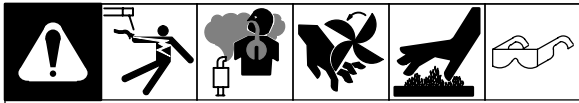
If lever is more than 1/16 in. from stop screw, check for clearance between jam nut and fuel solenoid. If there is clearance between jam nut and solenoid, loosen nut and turn plunger clockwise until lever touches stop screw. Retighten nut.

If there is no clearance between jam nut and solenoid, loosen the solenoid mounting screws and reposition the solenoid as described at the beginning of this section.



Ref. 804 197-A / 802 649

B. Checking Throttle Solenoid



▲ Stop engine.

If the engine does not stay at idle speed, verify the the throttle solenoid and linkage is installed properly.

Adjusting Throttle Solenoid

- 1 Throttle Solenoid
- 2 Jam Nut
- 3 Solenoid Link
- 4 Shoulder Bolt
- 5 Throttle Lever
- 6 Solenoid Rod
- 7 Throttle Solenoid Mounting Screw

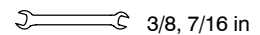
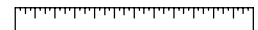
Loosen jam nut, remove shoulder bolt, and remove link from throttle lever. Install link 5/8 in (16 mm) on solenoid rod. Reconnect link to shoulder bolt and throttle lever.

Push solenoid rod into idle (energized) position and check for non-binding lateral movement of throttle link at throttle lever. If link binds, loosen solenoid mounting screws. Move the solenoid slightly until the link moves freely with solenoid in **relaxed and energized** positions. Tighten screws.

Tighten jam nut.

Go to Step C.

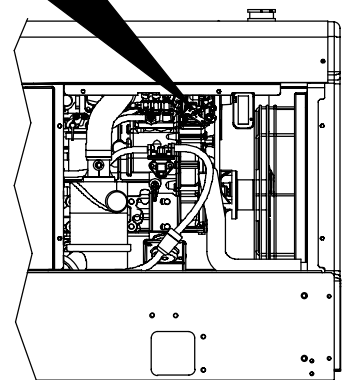
Tools Needed:



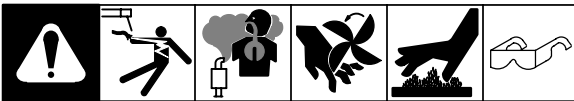
3/8, 7/16 in



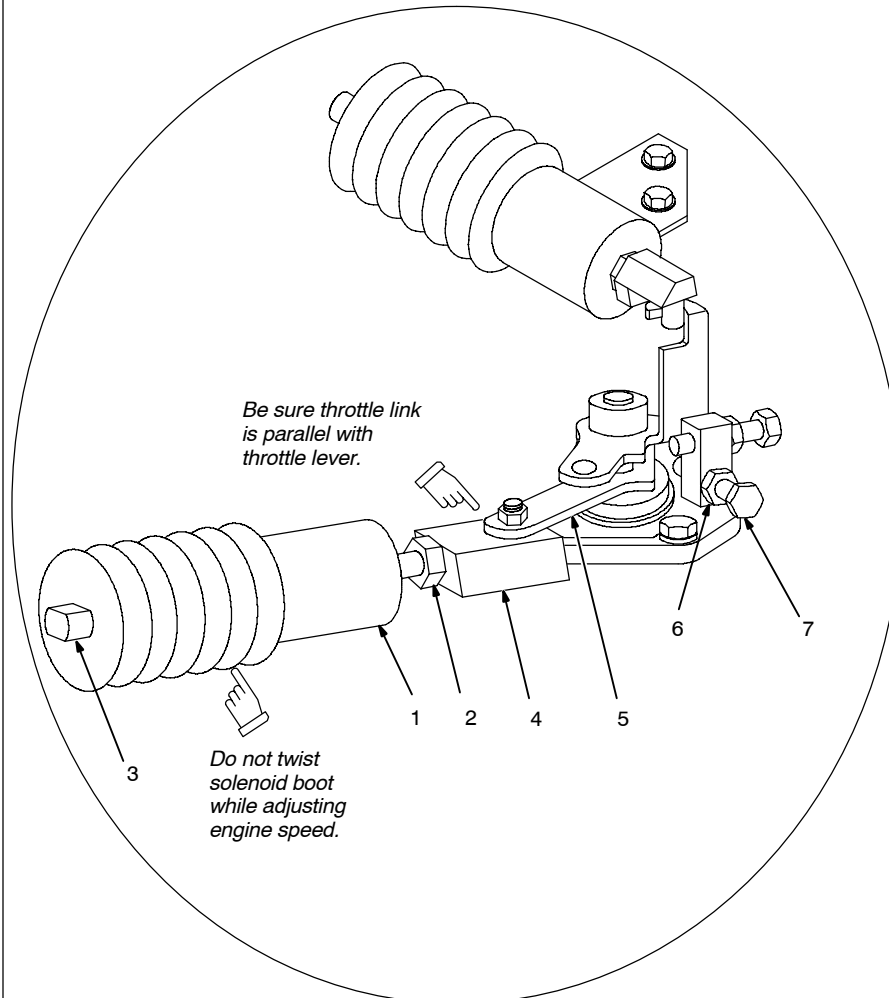
5/32 in



C. Making Engine Speed Adjustments

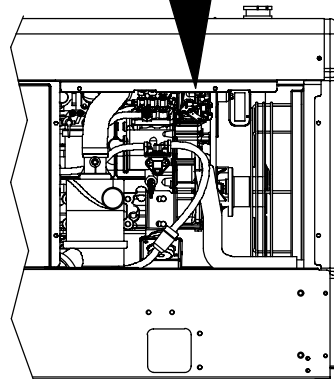


	2375–2450 rpm 39.6–40.8 Hz
	3675–3750 rpm 61.3–62.5 Hz



Be sure throttle link is parallel with throttle lever.

Do not twist solenoid boot while adjusting engine speed.



☞ Before adjusting engine speed, verify throttle solenoid is installed properly (see Section B on previous page).

Check engine speeds (see table) with a tachometer or use maintenance displays as follows: With engine running and the Process Selector switch in any Stick HOT position, cycle Engine Control switch from the Run/Idle to Speed Lock position 3 times and meters will display engine rpm's. Accuracy is ± 16 rpm's.

If necessary, adjust speeds as follows:

Start engine and run until warm. Turn V/A control to max.

Adjusting Idle Speed

Turn Engine Control switch to Run/Idle position.

- 1 Throttle Solenoid
- 2 Idle Speed Jam Nut
- 3 Plunger
- 4 Throttle Link
- 5 Throttle Lever

Loosen jam nut. While holding throttle link with a 3/8 in wrench, turn plunger clockwise to increase idle speed or counter-clockwise to decrease idle speed.

☞ After adjusting idle speed, verify the throttle link is parallel with the throttle lever. If necessary, loosen the idle speed jam nut and reposition the throttle link.

☞ Do not twist solenoid boot while adjusting engine speed.

Tighten jam nut.

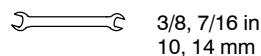
Adjusting Weld/Power Speed

Start engine and run until warm. Turn V/A control to max.

- 6 Weld Speed Jam Nut
- 7 Adjustment Screw

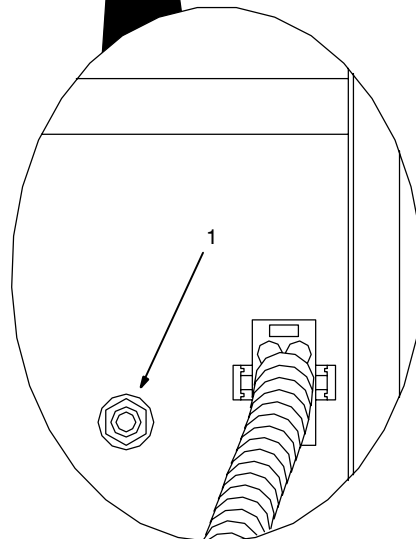
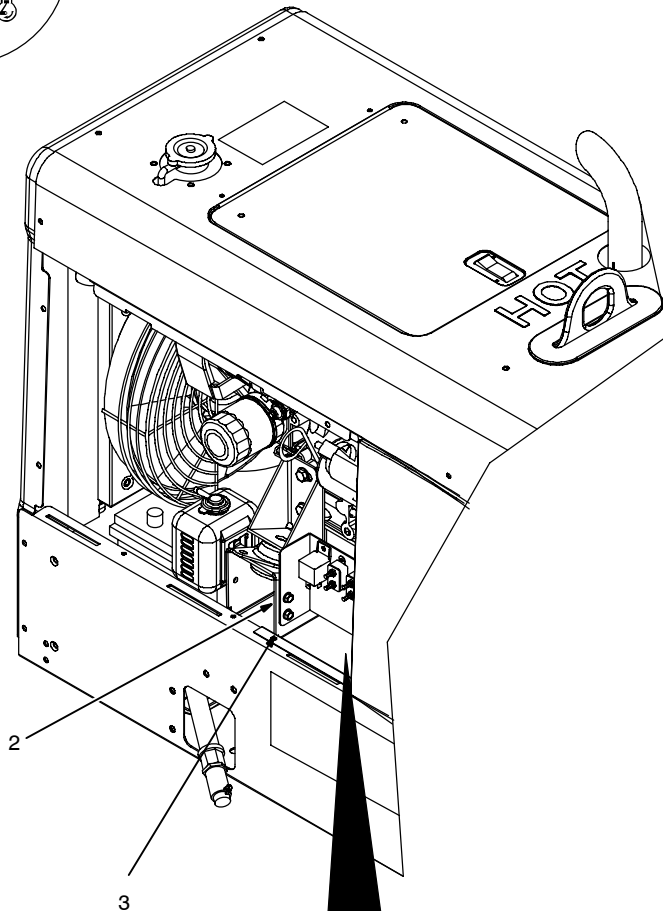
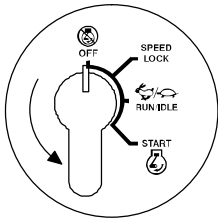
Turn Engine Control switch to Run position. Loosen nut and turn screw counter-clockwise to increase speed. Turn screw clockwise to decrease speed. Tighten nut.

Tools Needed:



Ref. 804 197-A / 801 963

7-5. Overload Protection



▲ Stop engine.

☞ When a circuit protector opens, it usually indicates a more serious problem exists.

- 1 Supplementary Protector CB4 (Located On Fuel Tank Cover)

CB4 protects the stator winding supplying 24 volt ac output to Remote receptacle RC4. If CB4 opens, 24 volt ac output to RC4 stops.

☞ Supplementary protectors CB1 and CB3 protect the stator winding supplying 115 volt ac output to Remote Receptacle RC4 (see Section 4-9).

Press button to reset.

- 2 Circuit Breaker CB7

CB7 protects the engine glow plug circuit. If CB7 opens, the glow plug does not heat. CB7 automatically resets when the fault is corrected.

- 3 Circuit Breaker CB8

CB8 protects the engine battery circuit. If CB8 opens, the engine will not crank. CB8 automatically resets when the fault is corrected.

SECTION 8 – THEORY OF OPERATION

1 Engine
Supplies force to turn revolving field.

2 Revolving Fields (Rotor)
Turn at 3700 rpm maximum for weld and power. The speed and excitation current of the field coils determine voltages in stator windings.

3 Stator Windings
Supply power to exciter, generator power, and weld circuits.

4 Rectifiers VR2, VR3
Changes ac output of exciter stator windings to dc to supply excitation current to the exciter revolving field.

5 Fuse F2
Protects exciter excitation winding from overload.

6 Power Board PC1
Adjusts weld output by changing revolving field current after comparing feedback to selected amperage/voltage setting of R1.

Controls engine speed. Without a signal from CT1 (fed through PC2), it lowers engine speed to idle (2200 rpm). Engine throttle solenoid TS1 is pull-to-idle.

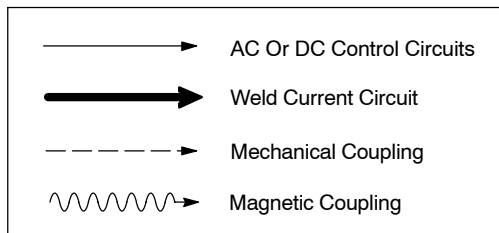
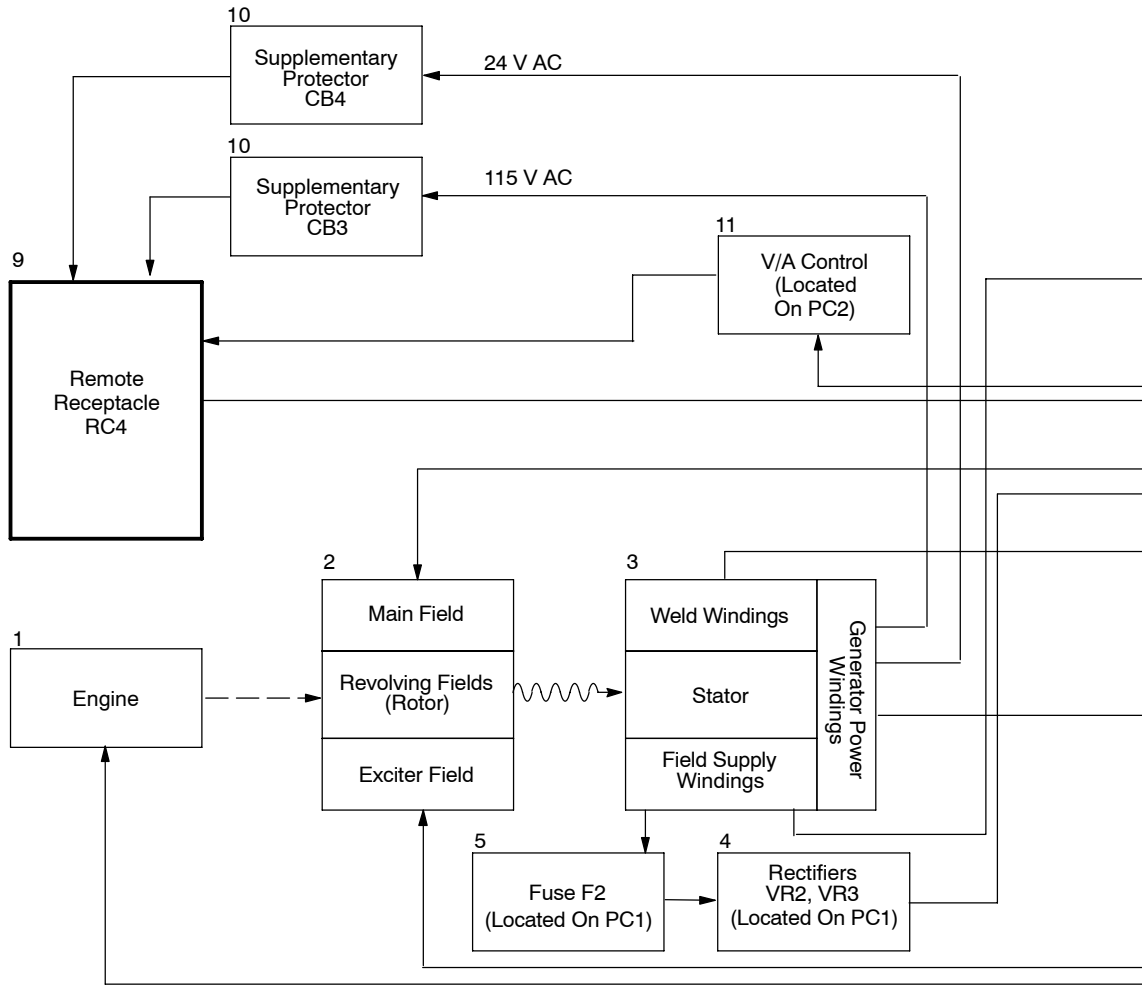
7 Control Board PC2
Works with PC1 to control engine idle and weld process and weld output on/off control functions. The Voltage/Amperage control and Process/Contactor switch are located on PC2

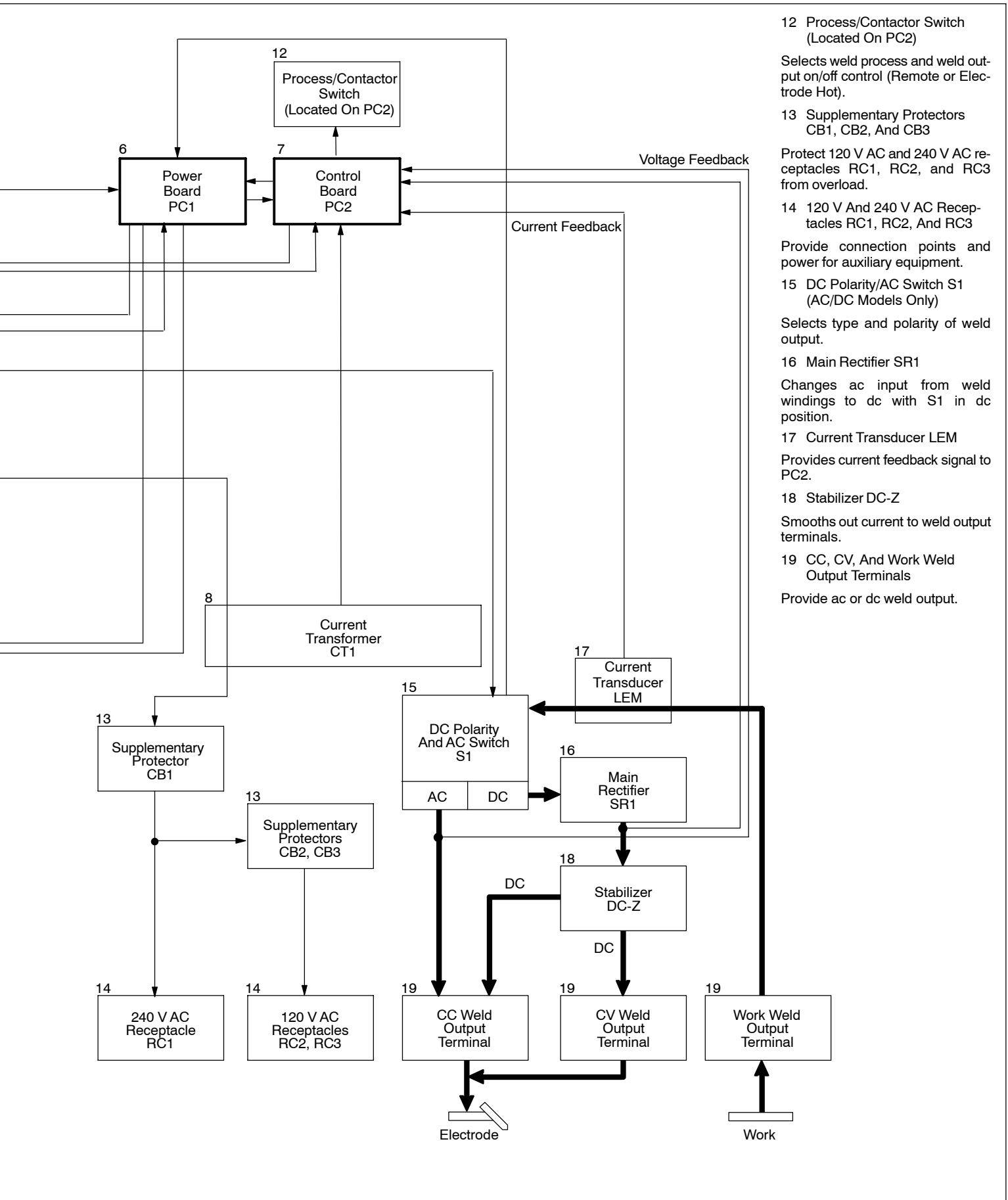
8 Current Transformer CT1
Senses output from either generator power windings, and signals PC1 and PC2 to increase to or maintain weld speed (3700 rpm).

9 Remote Receptacle RC4
Connects remote amperage/voltage and contactor control to unit.

10 Supplementary Protectors CB3, CB4
Protect Remote receptacle RC4 from overload.

11 V/A Control
Changes output of stator weld windings by adjusting field current level in revolving field.





- 12 Process/Contactor Switch (Located On PC2)
Selects weld process and weld output on/off control (Remote or Electrode Hot).
- 13 Supplementary Protectors CB1, CB2, And CB3
Protect 120 V AC and 240 V AC receptacles RC1, RC2, and RC3 from overload.
- 14 120 V And 240 V AC Receptacles RC1, RC2, And RC3
Provide connection points and power for auxiliary equipment.
- 15 DC Polarity/AC Switch S1 (AC/DC Models Only)
Selects type and polarity of weld output.
- 16 Main Rectifier SR1
Changes ac input from weld windings to dc with S1 in dc position.
- 17 Current Transducer LEM
Provides current feedback signal to PC2.
- 18 Stabilizer DC-Z
Smooths out current to weld output terminals.
- 19 CC, CV, And Work Weld Output Terminals
Provide ac or dc weld output.

SECTION 9 – TROUBLESHOOTING

9-1. Troubleshooting Tables



☞ See Sections 9-2 for test points and values and Section 14 and following for parts location.

☞ Use MILLER Testing Booklet (Part No. 150 853) when servicing this unit.

A. Welding Trouble

Trouble	Remedy
No weld output; generator power output okay at ac receptacles.	Check weld connections.
	Check control settings.
	Place Process/Contactor switch in Electrode Hot position, or move switch to Remote position and connect remote control to Remote receptacle RC4 (see Sections 4-9 and 5-3).
	Clean slip rings, and install new brushes if necessary (see Section 9-9).
	Disconnect leads 132 and 133 from brushes, and check continuity across slip rings. Replace rotor if necessary.
	Check main rectifier SR1, and replace if necessary.
	Check current transducer LEM, and replace if necessary.
	Disconnect stator weld excitation leads 101 and 102, and check continuity between leads. Replace stator if necessary.
	Check for open or shorted winding in weld stator, and replace if necessary.
	Check stabilizer DC-Z for signs of winding failure. Check continuity across windings, and check for proper connections. Replace DC-Z if necessary.
	Check power board PC1 and connections, and replace if necessary (see Section 9-5).
Check control board PC2 and connections, and replace if necessary (see Section 9-7).	
No weld output, or generator power output at ac receptacles.	Disconnect equipment from generator power receptacles during start-up.
	Check and reset supplementary protector CB4 (see Section 7-5).
	Clean slip rings, and install new brushes if necessary (see Section 9-9).
	Disconnect leads 132 and 133 from brushes, and check continuity across slip rings. Replace rotor if necessary.
	Disconnect field excitation leads 103 and 104, and check continuity between leads. Replace stator if necessary.
	Check power board PC1 and connections, and replace if necessary (see Section 9-5).
	Check control board PC2 and connections, and replace if necessary (see Section 9-7).
Low weld output.	Check control settings.
	Increase V/A control setting.
	Check weld connections.
	Clean air cleaner.
	Check engine speed, and adjust if necessary (see Section 7-4).
	Clean slip rings, and install new brushes if necessary (see Section 9-9).
	Disconnect stator leads 103 and 104, and check for continuity between leads. Replace stator if necessary.
	Disconnect leads 132 and 133 from brushes, and check continuity across slip rings. Replace rotor if necessary.
	Check main rectifier SR1, and replace if necessary.
	Check current transducer LEM, and replace if necessary.
Check remote receptacle RC4 for continuity and proper connections, and replace RC4 if necessary (see Section 4-9).	

Trouble	Remedy
Low weld output (continued).	Check power board PC1 and connections, and replace if necessary (see Section 9-5).
	Check control board PC2 and connections, and replace if necessary (see Section 9-7).
High weld output.	Decrease V/A control setting.
	Check engine speed, and adjust if necessary (see Section 7-4).
	Check for obstructed movement of throttle solenoid TS1 linkage (see Section 7-4).
	Check current transducer LEM, and replace if necessary.
	Check power board PC1 and connections, and replace if necessary (see Section 9-5).
	Check control board PC2 and connections, and replace if necessary (see Section 9-7).
Erratic weld output.	Check control settings.
	Be sure electrode is dry and proper type for SMAW and GTAW.
	Tighten and/or clean connections to electrode and workpiece.
	Use correct wire and gas.
	Check internal and external connections to weld output terminals.
	Check leads and connections at DC Polarity/AC switch S1 (AC/DC models only).
	Remove excessive coils from weld cables.
	Clean slip rings, and install new brushes if necessary (see Section 9-9).
	Check main rectifier SR1, and replace if necessary.
	Check stabilizer DC-Z for signs of failure. Check continuity across windings, and check for proper connections. Replace DC-Z if necessary.
	Check power board PC1 and connections, and replace if necessary (see Section 9-5).
	Check control board PC2 and connections, and replace if necessary (see Section 9-7).
Weld output cannot be adjusted.	Check position of Process/Contactor switch.
	Check current transducer LEM, and replace if necessary.
	Check control board PC2 and connections, and replace if necessary (see Section 9-7).
No remote fine amperage control.	Place Process/Contactor switch in correct position (see Section 5-3).
	Check and tighten connections to remote receptacle RC4 (see Section 4-9).
Remote contactor control does not activate contactor.	Place Process/Contactor switch in Remote position.
	Reset supplementary protector(s) CB3/CB4 (see Section 6-1 or 7-5).
	Check and tighten connections to remote receptacle RC4 (see Section 4-9).
	Check control board PC2 and connections, and replace if necessary (see Section 9-7).
No 24 volt ac power output at Remote Receptacle RC4.	Reset supplementary protector CB4 (see Section 7-5).
	Check internal and external connections to Remote receptacle RC4 (see Section 4-9).
	Disconnect stator leads 111 and 88, and check for continuity between leads. Replace stator if necessary.
No 115 volt ac power output at Remote Receptacle RC4.	Reset supplementary protector CB3 (see Section 6-1).
	Check internal and external connections to Remote receptacle RC4 (see Section 4-9).
Lack of high frequency; difficulty in establishing Gas Tungsten Arc Welding arc.	Use proper size tungsten for welding amperage.
	Reduce leakage of high frequency from torch or work cable (check grounding, remove excessive coils from weld cables, use shorter weld cables, etc.).
	Be sure torch cable is not close to any grounded metal.
	Check cables and torch for cracked insulation or bad connection. Repair or replace necessary parts.
Wandering arc – poor control of arc direction.	Use proper size tungsten.
	Properly prepare tungsten.
	Reduce gas flow rate.

Trouble	Remedy
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Check and tighten all gas fittings.
	Increase postflow time.
	Shield weld zone from drafts.
	Use clean filler rod or material.
	Replace torch parts if water has leaked into torch.

B. Generator Power Trouble

Trouble	Remedy
No generator power output at ac receptacles; weld output okay.	Reset supplementary protectors (see Section 6-1).
	Clean slip rings, and install new brushes if necessary (see Section 9-9).
	Disconnect stator leads 80 and 81, and leads 82 and 90 and check for continuity between leads. Replace stator if necessary.
No generator power output at ac receptacles, or weld output.	Disconnect equipment from generator power receptacles during start-up.
	Clean slip rings, and install new brushes if necessary (see Section 9-9).
	Disconnect leads 132 and 133 from brushes, and check continuity across slip rings. Replace rotor if necessary.
	Disconnect field excitation leads 103 and 104, and check continuity between leads. Replace stator if necessary.
	Check power board PC1 and connections, and replace if necessary (see Section 9-5).
	Check control board PC2 and connections, and replace if necessary (see Section 9-7).
Low generator power output at ac receptacles.	Check air cleaner and clean or replace as necessary.
	Check engine speed, and adjust if necessary (see Section 7-4).
	Check power board PC1 and connections, and replace if necessary (see Section 9-5).
High generator power output at ac receptacles.	Check engine speed, and adjust if necessary (see Section 7-4).
Erratic generator power output at ac receptacles.	Check fuel level.
	Check receptacle RC1, RC2, and RC3 wiring and connections.
	Clean slip rings, and install new brushes if necessary (see Section 9-9).
	Check governor according to engine manual.
	Tune engine according to engine manual.
No 24 volt generator power output at remote receptacle RC4.	Reset supplementary protector CB4 (see Section 7-5).
	Check internal and external connections to Remote receptacle RC4 (see Section 4-9).
	Disconnect stator leads 111 and 88, and check for continuity between leads. Replace stator if necessary.
No 115 volt ac power output at Remote Receptacle RC4.	Reset supplementary protector CB3 (see Section 6-1).
	Check internal and external connections to Remote receptacle RC4 (see Section 4-9).

C. Engine Trouble

Trouble	Remedy
Engine does not crank.	Check supplementary protector CB8. Clear fault and retry. (see Section 7-5).
	Check battery voltage.

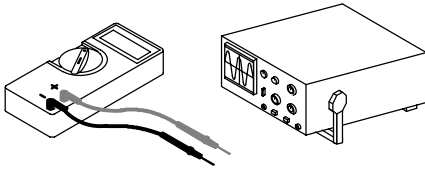
Trouble	Remedy
	<p>Check battery connections and tighten if necessary.</p> <p>Check plug PLG5 and plug PLG8 connections.</p> <p>Check continuity and connections of Engine Control switch S2. Repair or replace if necessary.</p> <p>Check engine charging and starting systems according to engine service manual.</p>
Engine cranks but does not start.	<p>Check fuel level.</p> <p>Open fuel valve (see Section 4-6).</p> <p>Service primary and secondary fuel filters (see Section 7-2).</p> <p>Check battery, and replace if necessary.</p> <p>Check plug PLG5 and plug PLG8 connections.</p> <p>Check continuity of Engine Control switch S2, and replace if necessary.</p> <p>Check engine charging system according to engine manual.</p> <p>Check fuel shutoff solenoid FS1 (see Section 9-2).</p> <p>Check continuity and connections of Glow Plug switch S6. Repair or replace if necessary.</p> <p>Check glow plug control relay CR3 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace CR3 if necessary.</p> <p>See engine manual.</p>
Engine starts, but stops when Engine Control switch S2 returns to Run/Idle position.	<p>Check oil level. Engine Low Oil Pressure light goes on and engine stops if oil pressure is too low.</p> <p>Check Low Oil Pressure Shutdown switch S5, and replace if necessary (see engine manual for location).</p> <p>Check coolant level and fan belt (see Section 4-6 and engine manual). Engine will not start if engine temperature is too high.</p> <p>Check plug PLG5 and plug PLG8 connections.</p> <p>Check and refill crankcase with proper viscosity oil for operating temperature, if necessary (see Section 4-6).</p> <p>Check continuity of Engine Control switch S2, and replace if necessary.</p> <p>Check engine temperature switch S4, and replace if necessary.</p>
Engine does not stop.	<p>Stop engine by closing fuel valve (see Section 4-6). Adjust fuel solenoid FS1 (see Section 7-4).</p>
Engine stops during normal operation.	<p>Check fuel level. Check fuel system components.</p> <p>Open fuel valve (see Section 4-6).</p> <p>Check plug PLG5 and plug PLG8 connections.</p> <p>Check oil level. Engine Low Oil Pressure light goes on and engine stops if oil pressure is too low.</p> <p>Check coolant level and fan belt (see Section 4-6 and engine manual). Engine High Temp light goes on and engine stops if engine temperature is too high.</p> <p>Check continuity of Engine Control switch S2, and replace if necessary.</p> <p>Make sure installation does not restrict air flow.</p> <p>Check low oil pressure shutdown switch S5, and replace if necessary.</p> <p>Check engine temperature switch S4, and replace if necessary.</p> <p>Check fuel shutoff solenoid FS1 (see Section 9-2).</p>
Battery discharges between uses.	<p>Turn Engine Control switch S2 to Off position when unit is not being used (see Section 5-1).</p> <p>Clean battery terminals and posts with baking soda solution; rinse with clear water.</p> <p>Recharge battery (approximately every three months).</p> <p>Check battery, and replace if necessary.</p> <p>Check voltage regulator according to engine manual.</p>
Unstable or sluggish engine speeds.	<p>Check fuel level. Check fuel system components.</p>

Trouble	Remedy
	<p>Check air cleaner element. Clean or replace element as necessary (See Section 7-3).</p> <p>Readjust throttle linkage if necessary (see Section 7-4).</p> <p>Tune engine according to engine manual.</p>
Engine idles but does not reach weld speed.	<p>Check solenoid linkage for obstructions, and readjust throttle linkage if necessary (see Section 7-4).</p> <p>Check continuity of Engine Control switch S2, and replace if necessary.</p> <p>Check current transformer CT1, and replace if necessary.</p> <p>Check plug PLG5 connection.</p> <p>Check power board PC1 and connections, and replace if necessary (see Section 9-6). LED5 and LED6 on PC1 light when PC1 is energized.</p> <p>Check control board PC2 and connections, and replace if necessary (see Section 9-8). LED3 on PC2 lights when PC2 is energized.</p>
Engine does not return to idle speed when load is removed with Engine Control switch in Run/Idle position.	<p>Remove all weld and generator power loads.</p> <p>Place Process/Contactor switch in Electrode Hot position or turn off remote contactor. The unit will not return to idle speed when Process/Contactor switch is in a remote position and the remote contactor is on.</p> <p>Turn off remote device connected to Remote 14 receptacle RC4 (see Section 4-9).</p> <p>Check throttle linkage for smooth non-binding operation (see Section 7-4).</p> <p>Check continuity of Engine Control switch S2, and replace if necessary.</p> <p>Check throttle solenoid control relay CR2 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace CR2 if necessary.</p> <p>Check throttle solenoid TS1 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace TS1 if necessary.</p> <p>Check current transformer CT1, and replace if necessary.</p> <p>Check power board PC1 and connections, and replace if necessary (see Section 9-6). LED5 and LED6 on PC1 light when PC1 is energized.</p> <p>Check control board PC2 and connections, and replace if necessary (see Section 9-8). LED3 on PC2 lights when PC2 is energized.</p>
Engine does not remain at weld/power speed when power or weld load is applied with Engine Control switch in Run/Idle position.	<p>Insufficient load; place Engine Control switch S2 in the Run position.</p> <p>Check for obstructed movement of solenoid linkage (see Section 7-4).</p> <p>Check throttle solenoid control relay CR2 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace CR2 if necessary.</p> <p>Check throttle solenoid TS1 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace TS1 if necessary.</p> <p>Check current transformer CT1, and replace if necessary.</p> <p>Check power board PC1 and connections, and replace if necessary (see Section 9-6). LED5 and LED6 on PC1 light when PC1 is energized.</p> <p>Check control board PC2 and connections, and replace if necessary (see Section 9-8). LED3 on PC2 lights when PC2 is energized.</p>
Engine does not remain at idle speed with Engine Control switch in Speed Lock position and Speed Lock switch in Idle position.	<p>Check for obstructed movement of solenoid linkage (see Section 7-4).</p> <p>Check throttle solenoid control relay CR2 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace CR2 if necessary.</p> <p>Check continuity of Speed Lock switch S7, and replace if necessary.</p>

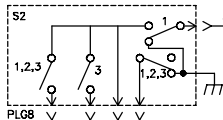
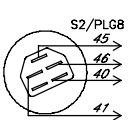
Trouble	Remedy
	Check throttle solenoid TS1 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace TS1 if necessary.
	Check power board PC1 and connections, and replace if necessary (see Section 9-6). LED5 and LED6 on PC1 light when PC1 is energized.
	Check control board PC2 and connections, and replace if necessary (see Section 9-8). LED3 on PC2 lights when PC2 is energized.
Engine does not remain at weld/power speed with Engine Control switch in Speed Lock position and Speed Lock switch in Run position.	Check for obstructed movement of solenoid linkage (see Section 7-4).
	Check throttle solenoid control relay CR2 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace CR2 if necessary.
	Check continuity of Speed Lock switch S7, and replace if necessary.
	Check throttle solenoid TS1 for proper coil voltage and connections. Check continuity of coil and condition of contacts. Replace TS1 if necessary.
	Check power board PC1 and connections, and replace if necessary (see Section 9-6). LED5 and LED6 on PC1 light when PC1 is energized.
	Check control board PC2 and connections, and replace if necessary (see Section 9-8). LED3 on PC2 lights when PC2 is energized.
Engine uses oil during run-in period; wetstacking occurs.	Dry engine (see Section 12 and engine manual).

9-2. Troubleshooting Circuit Diagram For Welding Generator (Use With Section 9-3)

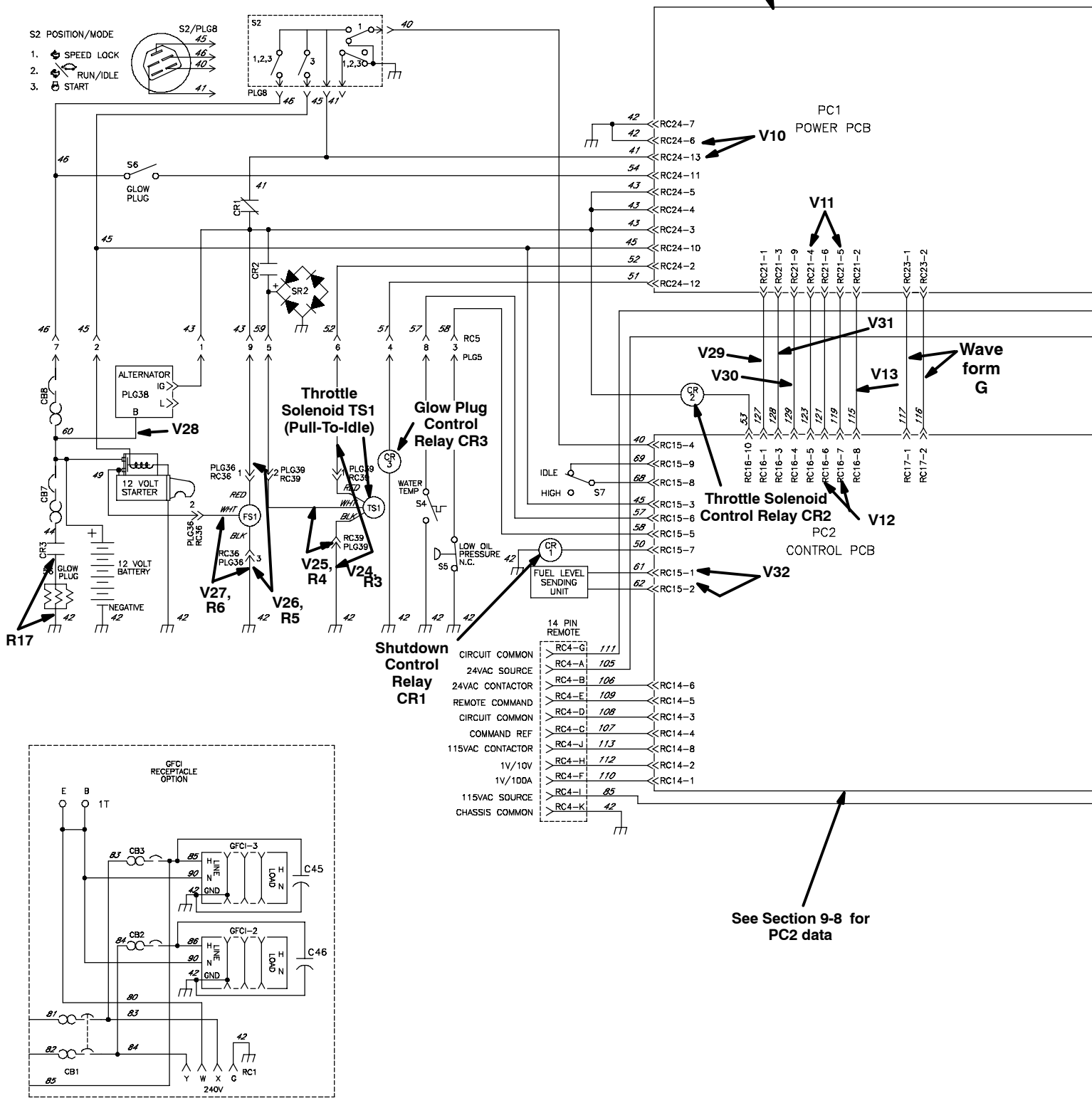
Test Equipment Needed:



- S2 POSITION/MODE
1. SPEED LOCK
 2. RUN/IDLE
 3. START



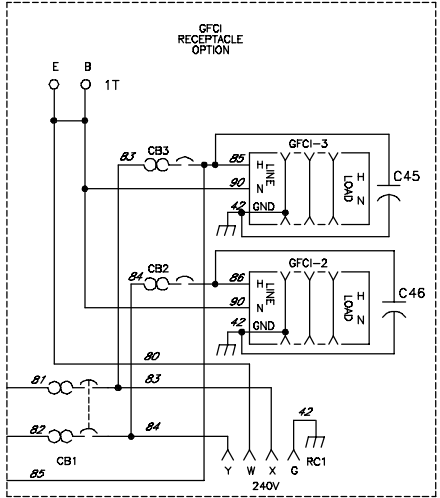
See Section 9-6 for PC1 data

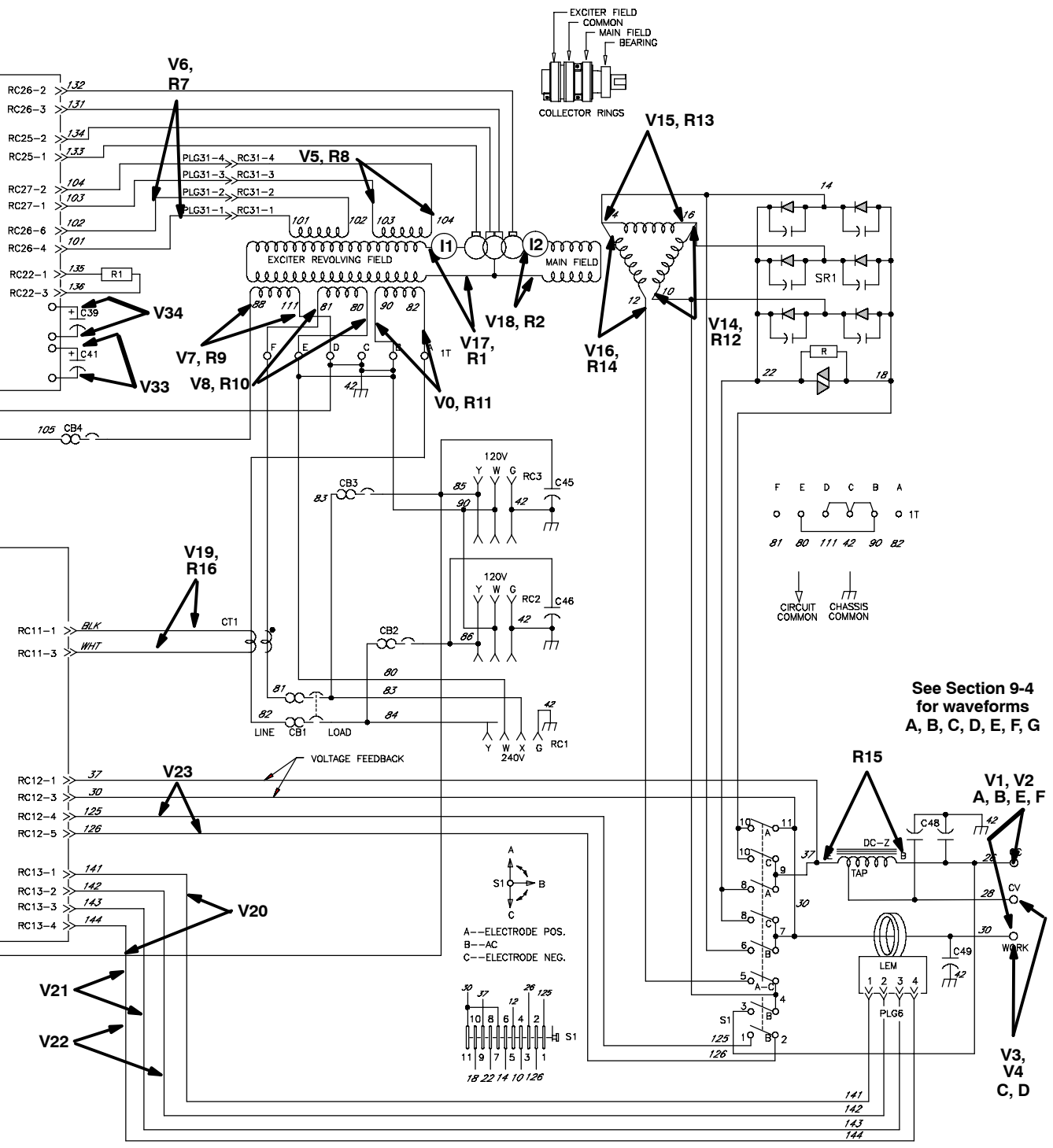


Wave form G

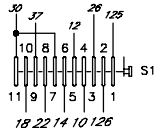
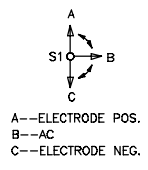
See Section 9-8 for PC2 data

14 PIN REMOTE	
CIRCUIT COMMON	> RC4-G 111
24VAC SOURCE	> RC4-A 105
24VAC CONTACTOR	> RC4-B 106
REMOTE COMMAND	> RC4-E 109
CIRCUIT COMMON	> RC4-D 108
COMMAND REF	> RC4-C 107
115VAC CONTACTOR	> RC4-J 113
1V/10V	> RC4-H 112
1V/10DA	> RC4-F 110
115VAC SOURCE	> RC4-I 85
CHASSIS COMMON	> RC4-K 42





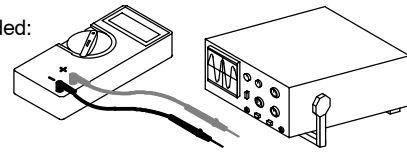
See Section 9-4
for waveforms
A, B, C, D, E, F, G



9-3. Troubleshooting Values For Circuit Diagram (Use With Section 9-2)



Test Equipment Needed:



Voltage Readings

- a) Tolerance – $\pm 10\%$ unless specified
- b) Condition – 70°F (21°C); cold machine (no warm-up); Electrode Hot-Stick mode; no load; weld/power rpm unless noted
- c) Reference – single arrow: reference to circuit common (lead 42); double arrow: reference to points indicated
- d) Wiring Diagram – see Section 11

V1	CC/DC OCV: Stick mode: +46.5 volts dc (idle rpm), +45 volts dc (weld/power rpm); TIG mode: +10 volts dc (idle rpm), +10 volts dc (weld/power rpm)
V2	CC/AC OCV: Stick mode: 45 volts ac (idle rpm), 57 volts ac (weld/power rpm); TIG mode: 0 volts ac (not active)
V3	CV/DC OCV w/R1 at min: OCV: +13 volts dc (idle rpm), +13 volts dc (weld/power rpm)
V4	CV/DC OCV w/R1 at max: +35 volts dc (idle rpm), +35 volts dc (weld/power rpm)
V5	Exciter Winding: 18 volts ac (idle rpm), 29 volts ac (weld/power rpm)
V6	Weld Exciter Winding: 115 volts ac (idle rpm), 186 volts ac (weld/power rpm)
V7	24 V AC Winding: 18 volts ac (idle rpm), 24 volts ac (weld/power rpm)
V8, V9	Aux. Winding: 79 volts ac (idle rpm), 130 volts ac (weld/power rpm)
V10	Battery Input: +14 volts dc at all speeds and when engine is off and Engine Control switch S2 is on
V11	Circuit Board Power: +15 volts dc (idle rpm), +15 volts dc (weld/power rpm) Reference Lead No. 119 to Gnd
V12	Circuit Board Power: -15 volts dc (idle rpm), -15 volts dc (weld/power rpm) Reference Lead No. 119 to Gnd
V13	Engine Speed Control: 0.5 volts dc (idle rpm), 14 volts dc (weld/power rpm)
V14, V15, V16	Weld Windings: Stick mode: 35.5 volts ac (idle rpm), 35.5 volts ac (weld/power rpm); MIG mode w/R1 at max: 27 volts ac (idle rpm), 27 volts ac (weld/power rpm); TIG mode: 8.6 volts ac (idle rpm), 9.8 volts ac (weld/power rpm)
V17	Exciter Rotor: +17.5 volts dc (idle rpm), +29.5 volts dc (weld/power rpm)
V18	Weld Rotor: Stick mode: +45 volts dc (idle rpm), +18-29 volts dc (weld/power rpm); MIG mode w/R1 at max: +32.2 volts dc (idle rpm), +17.4 volts dc (weld/power rpm); TIG mode: +8.8 volts dc (idle rpm), +4.6 volts dc (weld/power rpm)
V19	Current Transformer: 0 volts ac (no load), 2.5 volts ac with 100 watt generator power load
V20	LEM Power: +15 volts dc (idle rpm), +15 volts dc (weld/power rpm) Reference Lead No. 144 = Gnd
V21	LEM Power: -15 volts dc (idle rpm), -15 volts dc (weld/power rpm) Reference Lead No. 144 = Gnd
V22	Current Feedback: 1 volt dc per 100 amps dc weld load (polarity dependent); 1 volt ac per 100 amps ac weld output
V23	Weld Voltage Feedback: Same as voltage across weld output terminals
V24	Throttle Solenoid Hold Coil: +14 volts dc (idle rpm), 0 volts dc (weld/power rpm)
V25	Throttle Solenoid Pull Coil: battery voltage for less than one second when TS1 is initially energized to bring engine to idle.
V26	Fuel Solenoid Hold Coil: +14 volts dc (idle rpm), 14 volts dc (weld/power rpm)
V27	Fuel Solenoid Pull Coil: battery voltage when starter is engaged
V28	Alternator Output: approximately +14 volts dc at all speeds
V29	Generator Shutoff Signal (originates on PC2): 0 volts dc during normal operation, +15 volts dc during a fault condition
V30	Zero Cross Signal (originates on PC1): +7.4 volts dc (2450 rpm), +7.75 volts dc (3750 rpm)
V31	Battery voltage supplied to Control Board PC2 when Engine Control switch S2 is on (engine does not have to be running). Supplies 5 volt regulator on PC2.
V32	Fuel Level Sender: +0.6 volts dc when tank is full, approximately +5 volts dc when tank is empty
V33	Weld Capacitor: +140 volts dc (idle rpm), +245 volts dc (weld/power rpm)
V34	Exciter Capacitor: +17 volts dc (idle rpm), +30 volts dc (weld/power rpm)

Amperage Readings

- a) Tolerance – $\pm 5\%$ unless specified
- b) Condition – 70°F (21°C); cold machine (no warm-up); no load unless specified
- c) Process/Contactor switch in Electrode Hot – Stick mode

I1	Rotor Exciter Current: 4.35 amps dc (no load, idle rpm), 7.9 amps dc (no load weld/power rpm) 7.5 amps dc (25 volt, 200 amp stick weld load at weld/power rpm) 8.3 amps dc (5 kW generator power load at weld/power rpm)
I2	Rotor Weld Current: 1.6 amps dc (stick, stiff, idle rpm) 0.9 amps dc (stick, stiff, weld/power rpm) 2.0 amps dc (stick, stiff, 25 volt, 200 amp weld load)

Resistance Values

- a) Tolerance – $\pm 10\%$ unless specified
- b) Condition – 70°F (21°C); cold machine (no warm-up)
- c) Wiring Diagram – see Section 11
- d) Stop engine before checking resistance


R1	Exciter Rotor: 3.5 ohms
R2	Weld Rotor: 33 ohms
R3	Throttle Solenoid TS1: 12 ohms (hold)
R4	Throttle Solenoid TS1: Less than 1 ohm (pull)
R5	Fuel Solenoid FS1: 12 ohms (hold)
R6	Fuel Solenoid FS1: Less than 1 ohm (pull)
R7 thru R17	Less than 1 ohm

Open Circuit Voltages

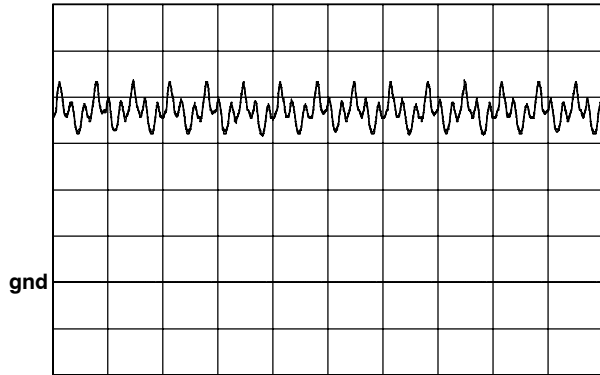
Process Switch S1 in a Remote position and a remote contactor is energized

Remote Stick DC	+47.5 volts dc (idle rpm), +47.5 volts dc (weld/power rpm)
Remote Stick AC	+43 volts dc (idle rpm), +51 volts dc (weld/power rpm)
Remote Tig DC	+43 volts dc (idle rpm), +44 volts dc (weld/power rpm)
Remote Tig AC	+45 volts dc (idle rpm), +54 volts dc (weld/power rpm)
Remote Mig Minimum	+13.3 volts dc (weld/power rpm)
Remote Mig Maximum	+34.8 volts dc (weld/power rpm)

9-4. Waveforms For Section 9-2

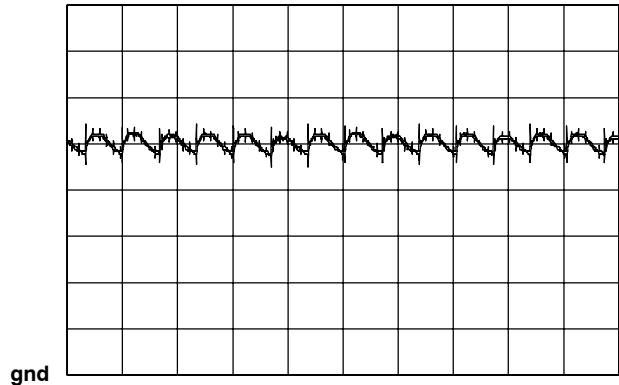
 The waveforms represent the output of the welding power source. When operating properly, the power source waveforms match those shown here.

2 ms 20 V



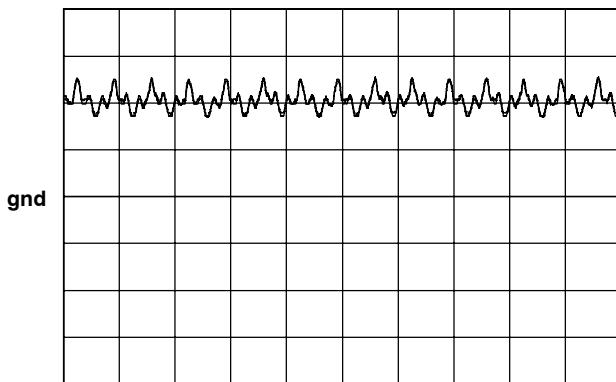
A. DC/CC Mode, DC Open-Circuit Voltage

2 ms 5 V



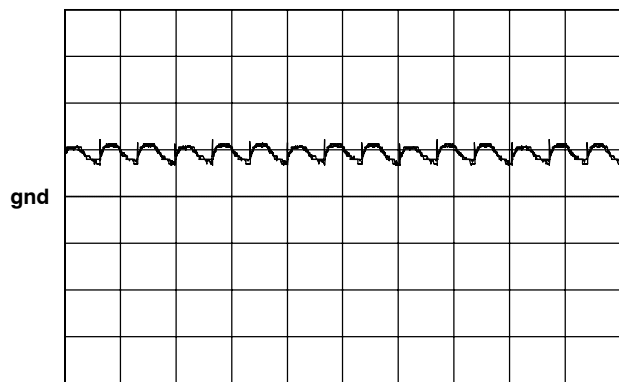
B. DC/CC Mode, 25 Volts DC, 175 Amperes, (Resistive Load)

2 ms 20 V

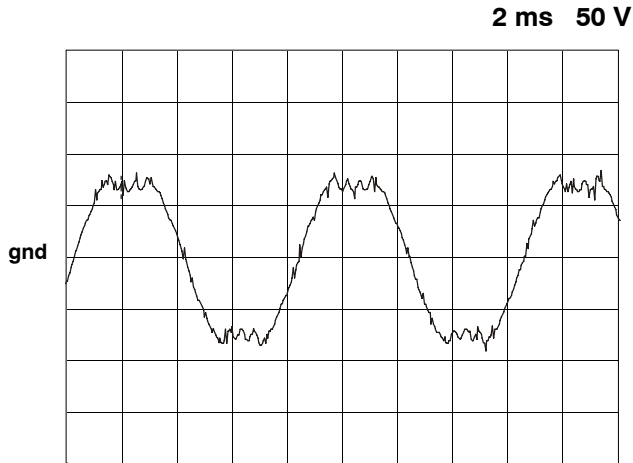


C. DC/CV Mode, DC Open-Circuit Voltage, V/A Control In Max Position

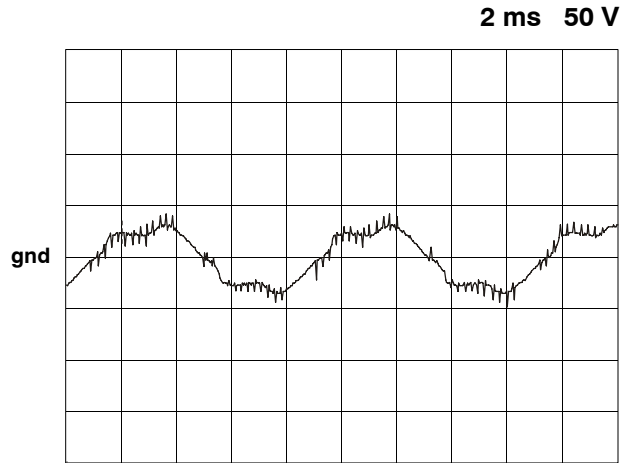
2 ms 20 V



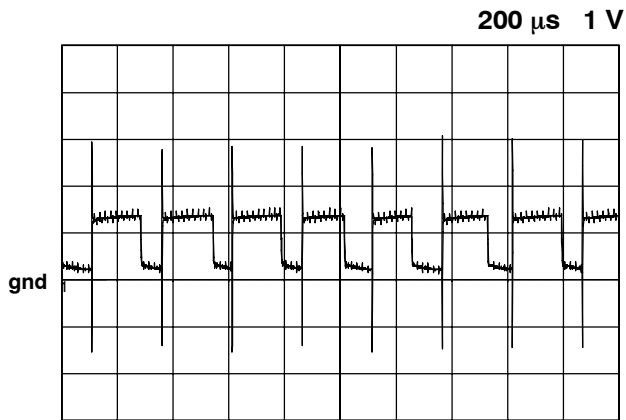
D. DC/CV Mode, 20 Volts DC, 170 Amperes, (Resistive Load)



E. AC/CC Mode, AC Open-Circuit Voltage,



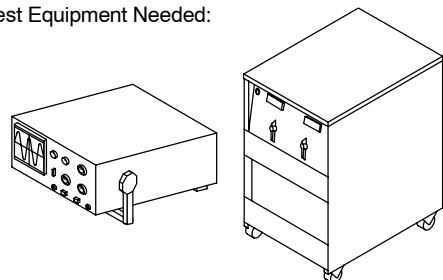
F. AC/CC Mode, 25 Volts AC, 175 Amperes, (Resistive Load)



D. Pulse Width Modulation Signal Between Power Board PC1 And Control Board PC2



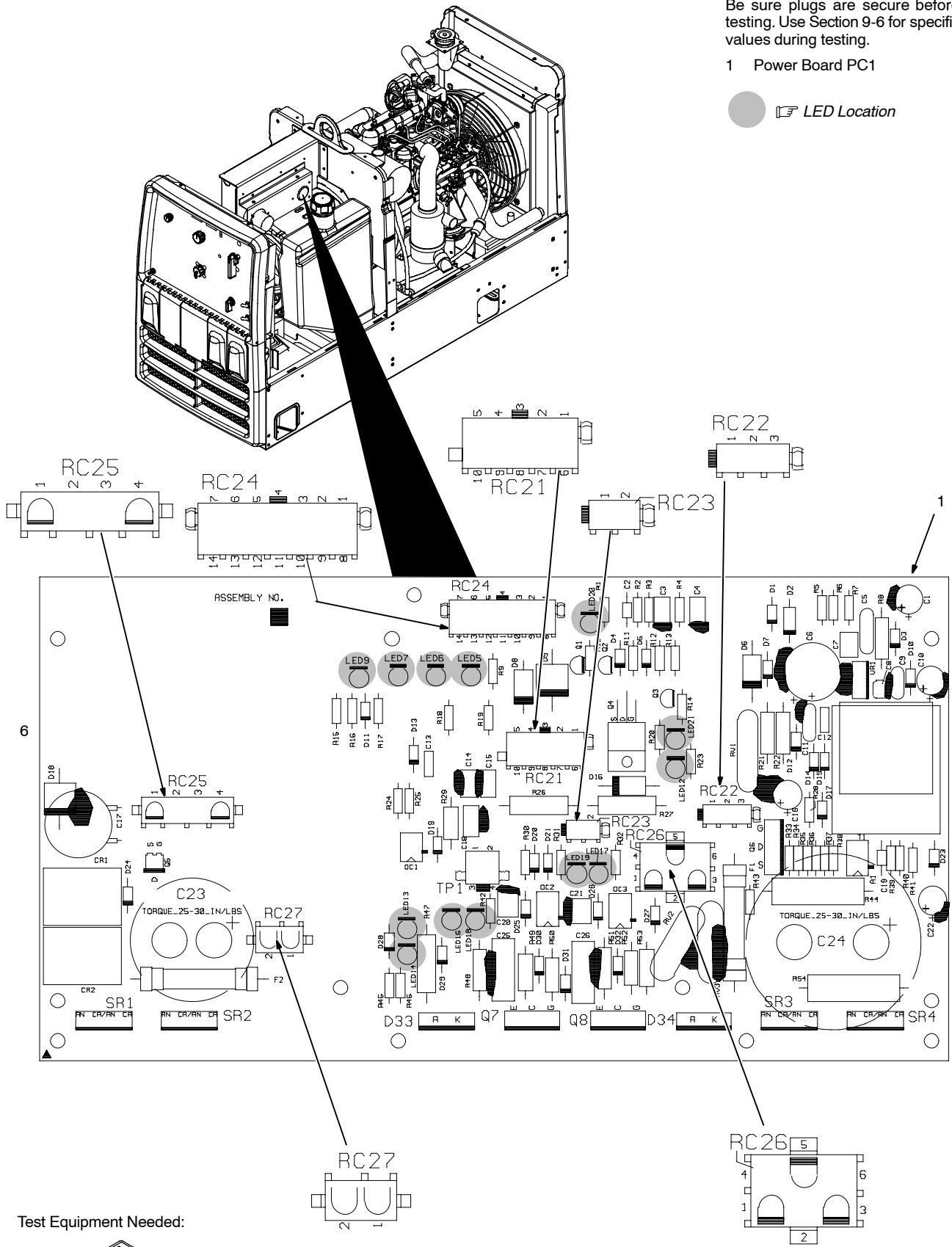
Test Equipment Needed:



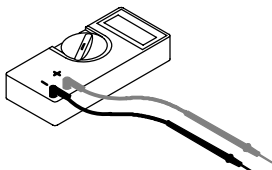
9-5. Power Board PC1 Testing Information

Be sure plugs are secure before testing. Use Section 9-6 for specific values during testing.


- 1 Power Board PC1



Test Equipment Needed:



9-6. Power Board PC1 Test Point Values

			Unless otherwise noted: a) Tolerance – ±10% b) Reference – to circuit common (chassis) c) Readings taken at no load
Voltage Readings			
Receptacle	Pin	Value	
RC21	1	Generator Shutoff Signal (originates on PC1): 0 volts dc during normal operation, +15 volts dc during a fault condition	
	2	Engine Speed Control: 0 volts dc (idle rpm), +14 volts dc (weld/power rpm)	
	3	Battery voltage supplied to Control Board PC2 when Engine Control Switch S2 is on (engine does not need to be running). Supply 5 volt regulator on PC2.	
	4	Control Board PC2 power supply: +15 volts dc	
	5	Circuit Common for PC2 power supplies	
	6	Control Board PC2 power supply: –15 volts dc	
	7 & 8	Not used	
	9	Zero Cross Signal: 7.4 volts dc (2450 rpm), 7.75 volts dc (3750 rpm)	
	10	Not used	
RC22	1	0 (zero) volts dc during normal operation with respect to RC22–3	
	2	Not used	
	3	0 (zero) volts dc during normal operation with respect to RC22–1	
RC23	1	Pulse Width Modulation signal; see waveform G	
	2	Circuit common	
RC24	1	Not used	
	2	Throttle Solenoid Hold Coil Signal: 0 (zero) volts dc (weld/power rpm), +14 volts dc (idle rpm)	
	3 thru 5	Battery voltage when Engine Control switch S2 is in START except after an engine fault or when engine is running	
	6 & 7	Circuit common	
	8 & 9	Not used	
	10	Starter Crank Signal: battery voltage when Engine Control switch S2 is in Start position	
	11	Glow Plug Signal: battery voltage when Glow Plug switch S6 is On or when Engine Control switch S2 is in Start	
	12	Glow Plug Contactor Output: battery voltage when Glow Plug switch S6 is On or when Engine Control switch S2 is in Start	
	13	Battery voltage when Engine Control switch S2 is on, engine does not need to be running	
14	Not used		
RC25	1	Circuit common	
	2	Exciter Rotor: 17.5 volts dc (idle rpm), 29.5 volts dc (weld/power rpm)	
	3 & 4	Not used	

Receptacle	Pin	Value
RC26	1	Not used
	2	Reference for RC26–3 values
	3	Electrode Hot Stick mode (all settings): +45 volts dc (idle rpm), +18–29 volts dc (weld/power rpm) Electrode Hot Tig mode: +8.8 volts dc (idle rpm), +4.6 volts dc (weld/power rpm) Electrode Hot Mig mode, weld/power rpm: +17.4 volts dc maximum Voltage/Amperage control setting +3.7 volts dc minimum Voltage/Amperage control setting Electrode Hot Mig mode, idle rpm: +32.2 volts dc maximum Voltage/Amperage control setting +10.8 volts dc minimum Voltage/Amperage control setting
	4	Weld Exciter Winding: +115 volts ac (idle rpm), +186 volts ac (weld/power rpm)
	5	Not used
	6	Reference for RC26–4 values
RC27	1	Exciter Winding: +18 volts ac (idle rpm), +29 volts ac (weld/power rpm)
	2	Reference for RC27–1 values

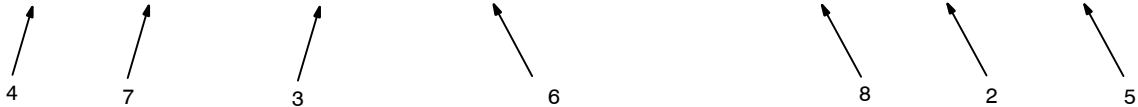
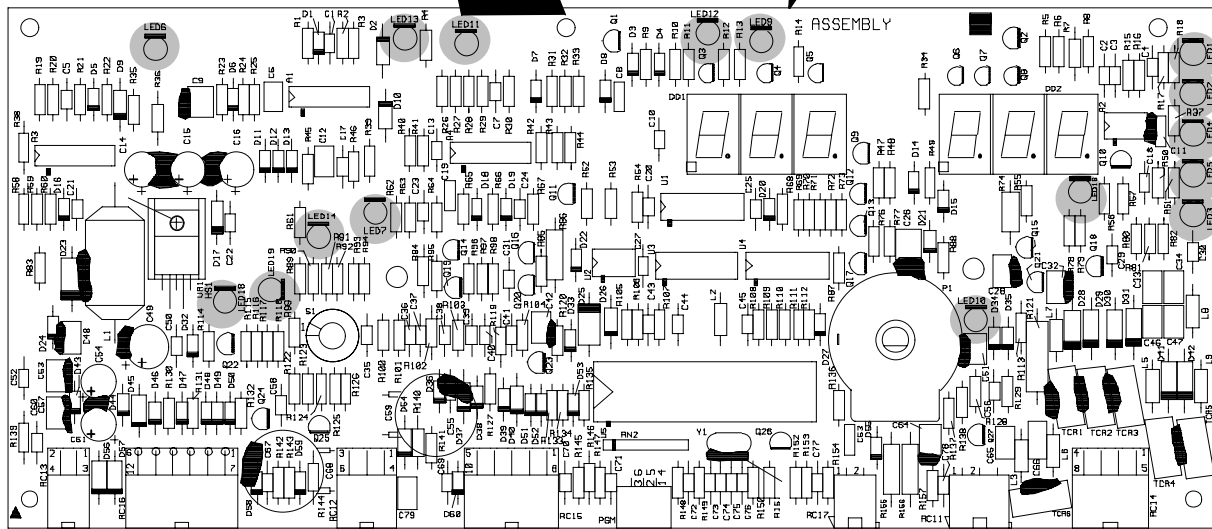
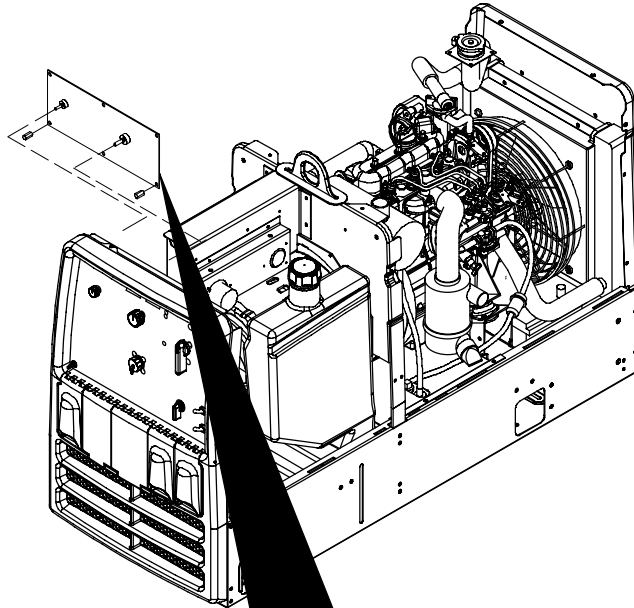
LED Indicators	
LED	Description
LED5	–15 volts dc indicator: lit when –15 volts dc power supply is present
LED6	+15 volts dc indicator: lit when +15 volts dc power supply is present
LED7	Weld generator shutoff indicator: off during normal operation, on when shutoff signal is present
LED9	+12 volts dc indicator: lit when +12 volts dc is present
LED12	+12 volts dc indicator: lit when +12 volts dc is present
LED13	Exciter voltage indicator: lit when exciter voltage is present
LED14	Flash voltage indicator: lit when flash voltage (12 volts dc) is present. Also lit when excitation voltage is present
LED16	Weld bus voltage indicator: flashes when weld bus voltage is present
LED17	Low side IGBT gate pulse indicator: lit when low side IGBT has a gate signal present
LED18	Hi com +15 volt power supply indicator: lit when hi com +15 volt power supply is present
LED19	+D15 volt power supply indicator; lit when +D15 volt power supply is present
LED20	Throttle solenoid hold coil indicator: lit when throttle solenoid hold coil is not energized (weld/power rpm), off when hold coil is energized (idle rpm)
LED21	Zero cross indicator: lit when zero cross (frequency monitoring) circuit is working


9-7. Control Board PC2 Testing Information

Be sure plugs are secure before testing. Use Section 9-8 for specific values during testing.

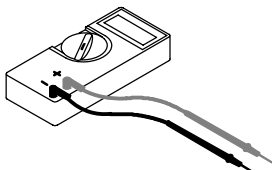
- 1 Control Board PC2
- 2 Receptacle RC11
- 3 Receptacle RC12
- 4 Receptacle RC13
- 5 Receptacle RC14
- 6 Receptacle RC15
- 7 Receptacle RC16
- 8 Receptacle RC17

 LED Location

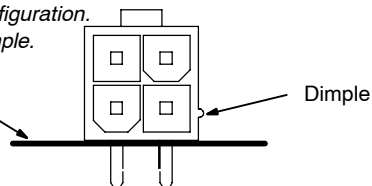


 Typical receptacle configuration.
Pin 1 is denoted by dimple.

Test Equipment Needed:



PC Board Surface



Dimple

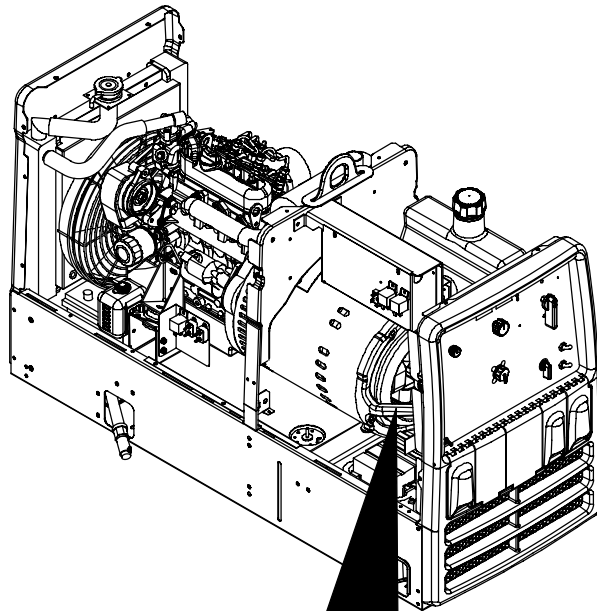
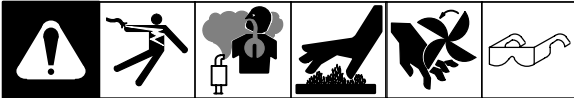
9-8. Control Board PC2 Test Point Values

			Unless otherwise noted: a) Tolerance – ±10% b) Reference – to circuit common (chassis) c) Readings taken at no load
Voltage Readings			
Receptacle	Pin	Value	
RC11	1	Current transformer: 0 (zero) volts ac with no auxiliary power load, +3.6 volts ac with 100 watt light bulb plugged in	
	2	Not used	
	3	Reference for values at RC11-1	
RC12	1	Weld voltage feedback: same voltages as on weld output terminals	
	2	Not used	
	3	Reference for values at RC12-1	
	4	+12 volts dc when DC Polarity/AC switch S1 is in either DC position, 0 (zero) volts dc when S1 is in AC position	
	5	Circuit common	
	6	Not used	
RC13	1	LEM power supply: +15 volts dc with respect to RC13-4	
	2	Current feedback: 1 volt dc per 100 amperes dc weld output (polarity dependent), 1 volt ac per 100 amperes ac weld output	
	3	LEM power supply: -15 volts dc with respect to RC13-4	
	4	Circuit common	
RC14	1	Remote current feedback: 1 volt dc per 100 amperes weld output	
	2	Remote voltage feedback: 1 volt dc per 10 volts at weld output terminals	
	3	Circuit common	
	4	+10 volts dc	
	5	+13 volts dc with no remote plugged into Remote receptacle RC4, 0 (zero) to 10 volts dc minimum to maximum of remote control plugged into RC4 (for all processes)	
	6	Remote contactor: 0 (zero) volts ac with remote contactor open, +16 volts ac with remote contactor closed (idle rpm), +28 volts ac with remote contactor closed (weld/power rpm)	
	7	Not used	
	8	Remote contactor: 0 (zero) volts ac with remote 115 volt contactor open, +80 volts ac with remote 115 volt contactor closed (idle rpm), +130 volts ac with remote 115 volt contactor closed (weld/power rpm)	
RC15	1	Fuel sender: +5 volts dc when fuel tank is empty, +0.5 volts dc when fuel tank is full	
	2	Circuit common	
	3	Battery voltage only when Engine Control switch S2 is in START, 0 (zero) volts in all other conditions	
	4	Battery voltage when Engine Control switch S2 is in RUN, 0 (zero) volts in all other conditions	
	5	+13 volts dc during normal operation, 0 volts dc when oil pressure switch S5 is closed (low oil pressure condition)	
	6	Water temperature sensor input: +13 volts dc when water temperature switch S4 is open (normal operation), 0 volts dc when S4 is closed (high water temperature)	
	7	Shutdown relay output: +13 volts dc during normal operation, 0 volts dc when oil pressure switch S5 is closed (low oil pressure) or water temperature switch S4 is closed (high water temperature) after a fault	

Receptacle	Pin	Value
RC15 (continued)	8	Speed lock input: 0 volts dc when Speed Lock switch S7 is in idle, +5 volts dc when S7 is in weld/power
	9	Circuit common
	10	Not used
RC16	1	Generator shutoff (origin): 0 (zero) volts dc during normal operations, +15 volts dc during fault
	2	Not used
	3	Battery voltage when Engine Control switch S2 is on (engine does not have to be running)
	4	Zero cross signal (originates on Power Board PC1): +7.4 volts dc (idle rpm), +7.75 volts dc (weld/power rpm)
	5	+15 volts dc
	6	-15 volts dc
	7	Circuit common
	8	Engine speed control: +0.5 volts dc (idle rpm), +14 volts dc (weld/power rpm)
	9	Not used
	10	Throttle solenoid pull coil relay: +14 volts dc at weld/power rpm; will go to 0 volts dc for less than one second then return to 14 volts dc when engine goes to idle
RC17	11 & 12	Not used
	1	Pulse Width Modulation signal; see waveform G
RC17	2	Circuit common

LED Indicators	
LED	Description
LEDs 1 thru 5	Fuel level indicators
LED6	+5 volt dc power supply indicator: lit when +5 volts dc power supply is present
LED7	Crank signal indicator: lit when Engine Control switch S2 is in START
LED9	Remote contactor indicator: lit when remote contactor is off, off when a remote contactor is used and the contact is closed
LED10	Generator power detect signal: lit when no generator power is being drawn from unit, off or flashing when generator power is being used
LED11	Current feedback indicator: lit when current feedback is present (brighter with more feedback), off with no load.
LED12	Fuel Sender indicator: lit brightly when tank is empty, dims as tank is filled
LED13	Voltage feedback: lit when voltage feedback is present (brighter with more feedback)
LED14	Polarity switch indicator: lit when DC Polarity/AC Switch S1 is in either DC position, off when S1 is in AC
LED16	Pulse Width Modulation indicator: lit when PWM is present
LED18	Throttle solenoid pull coil indicator: lit when pull coil relay CR2 is off, on when CR2 is energized
LED19	Overvoltage shutdown indicator: lit during a fault condition, off during normal operation

9-9. Replacing Brushes And Cleaning Slip Rings



▲ Stop engine and let cool.

- 1 Endbell
- 2 Brush Holder Assemblies

Remove brush holder assemblies. Keep hardware for reinstallation.

Do not remove brushes from holder. Replace brush holder assembly if brushes are damaged, or at or near minimum length.

- 3 Slip Rings

Inspect slip rings. Under normal use, rings turn dark brown.

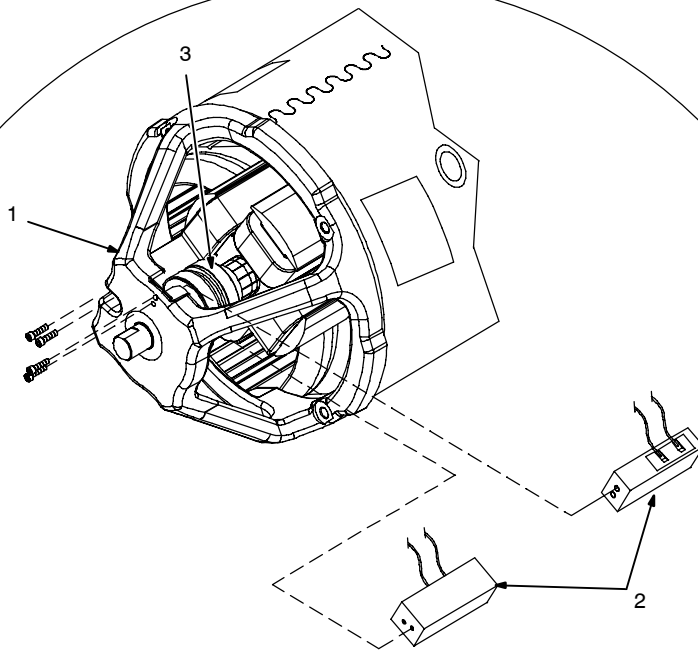
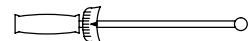
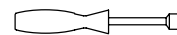
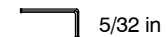
If slip rings are corroded or surface is uneven, insulate brush leads, start engine and clean rings with a commutator stone. Remove as little material as possible.

▲ Stop engine.

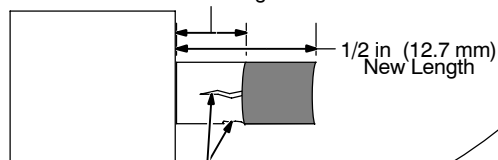
Install brush holder assemblies and remaining generator parts (see Section 10-2 for torque values).

Reinstall side panels and cover.

Tools Needed:

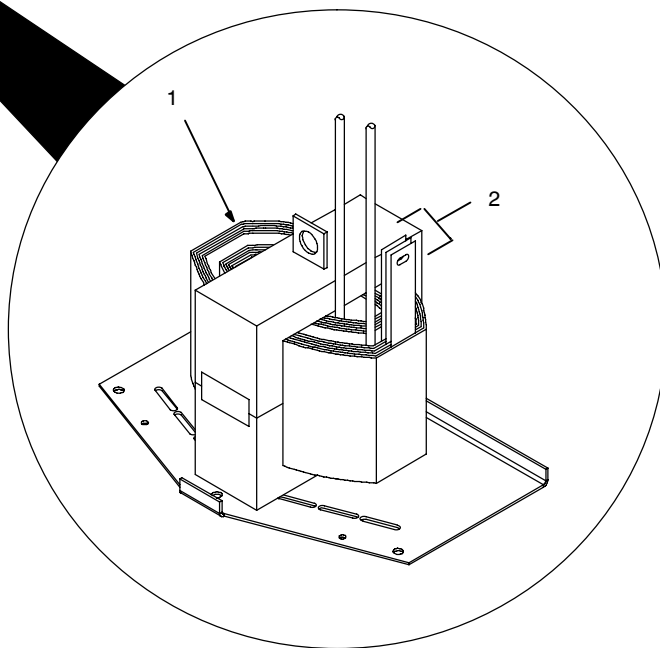
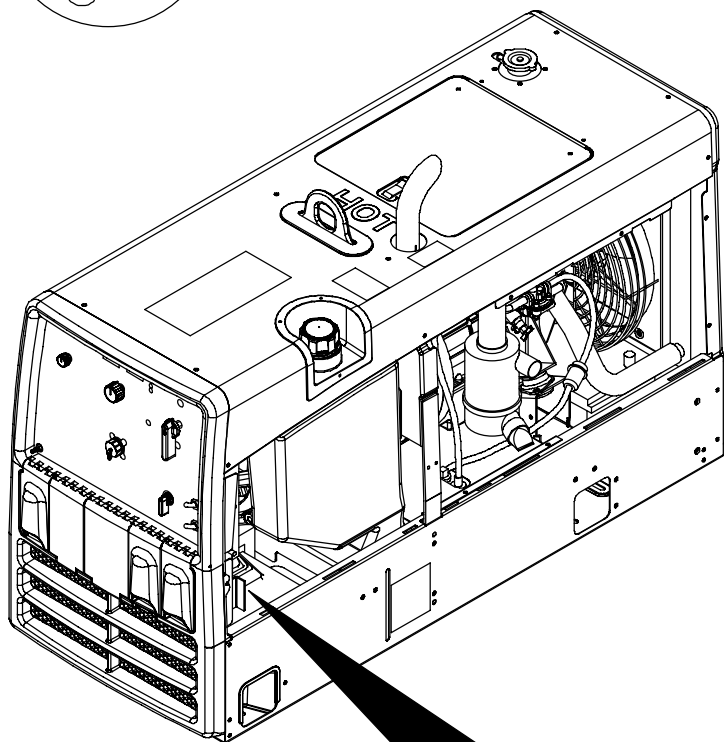
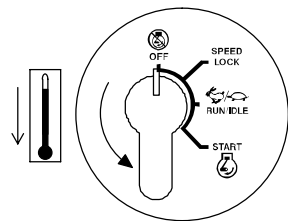


1/4 in (6.4 mm)
Minimum Length



Replace
Damaged Brushes

9-10. Adjusting Wire (MIG) Weld Puddle Consistency (Units With Stabilizer Tabs)



Tools Needed:



3/8, 7/16 in

▲ Stop engine and let cool.

Stabilizer DC-Z is factory connected to suit most Wire (MIG) welding applications.

To change Wire (MIG) weld puddle consistency, proceed as follows:

Remove right side panels.

- 1 Stabilizer DC-Z
- 2 Stabilizer Tabs 1, 2, and 3

Tab 3 – provides stiffest weld puddle (for aluminum and mild steel)

Tab 2 – provides wetter weld puddle (for mild steel)

Tab 1 – provides wettest weld puddle (for stainless steel)

Lead 28 is connected between the Wire/CV weld output terminal and Tab 3 at the factory.

For wetter weld puddle (for mild steel):

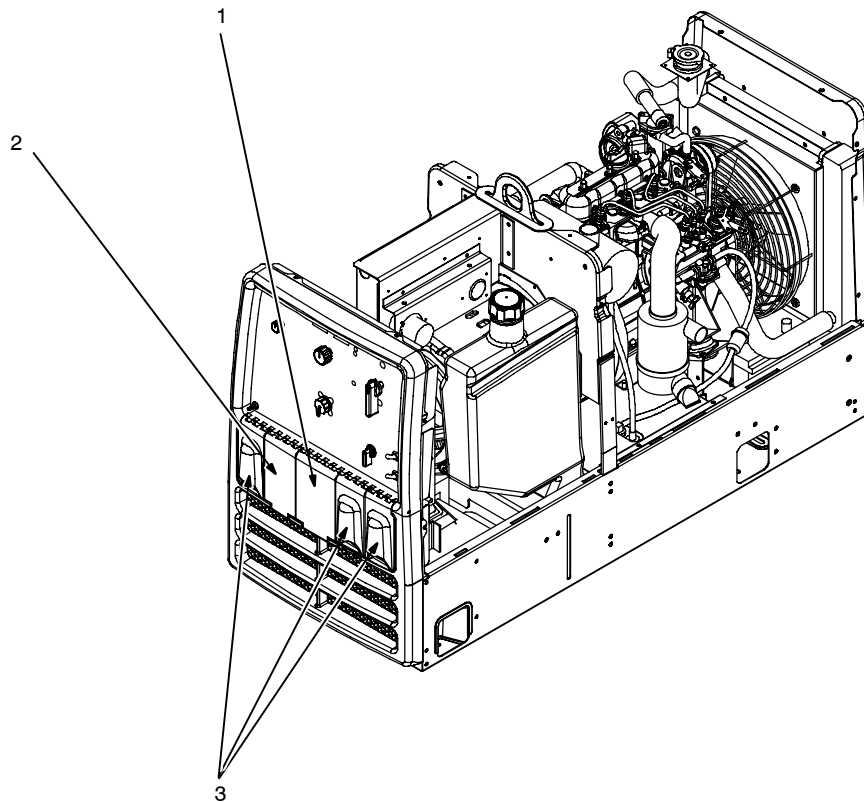
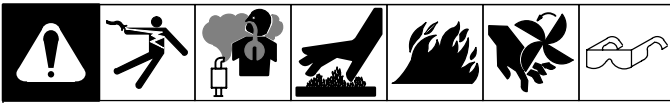
Remove insulated sleeving from Tab 2. Disconnect Lead 28 from Tab 3. Connect lead 28 to Tab 2, reusing hardware. Insulate Tab 3 with sleeving removed from Tab 2. Secure sleeving with cable ties.

For wettest weld puddle (for stainless steel):

Remove insulated sleeving from Tab 1. Disconnect Lead 28 from Tab 3. Connect lead 28 to Tab 1, reusing hardware. Insulate Tab 3 with sleeving removed from Tab 1. Secure sleeving with cable ties.

Reinstall side panel.

9-11. Checking Unit Output After Servicing



☞ Also use output waveforms to check unit output after servicing (see Section 9-4).

Check engine speeds, and adjust if necessary (see Section 7-4).

1 120 Volt AC Receptacles RC2 And RC3

2 240 Volt AC Receptacle RC1

Check voltage at receptacles. With no load applied, there should be 125 – 132 volts ac present at RC2 and RC3, and 228 – 264 volts present at RC1.

3 Weld Output Terminals

Check open-circuit voltages between terminals according to Section 9-2 (voltages V1, V2, V3, and V4).

If correct voltages are not present, repeat troubleshooting procedures in Section 9-1.

▲ **Stop engine and let cool.**

Complete pre-operational checks in table. Reinstall cover and side panels.

Pre-Operational Check

Wipe engine surfaces clean.

Check labels; replace labels that are unreadable or damaged (see Parts List).

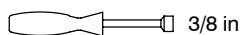
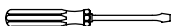
Check fuel and oil (see Section 4-6).

Check and correct any fluid leaks.

Clean weld output and battery terminals. Tighten connections.

Clean outside of entire unit.

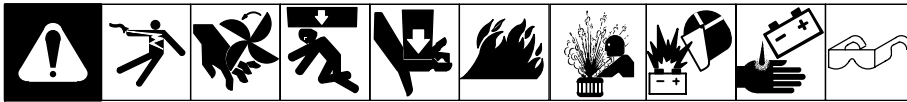
Tools Needed:



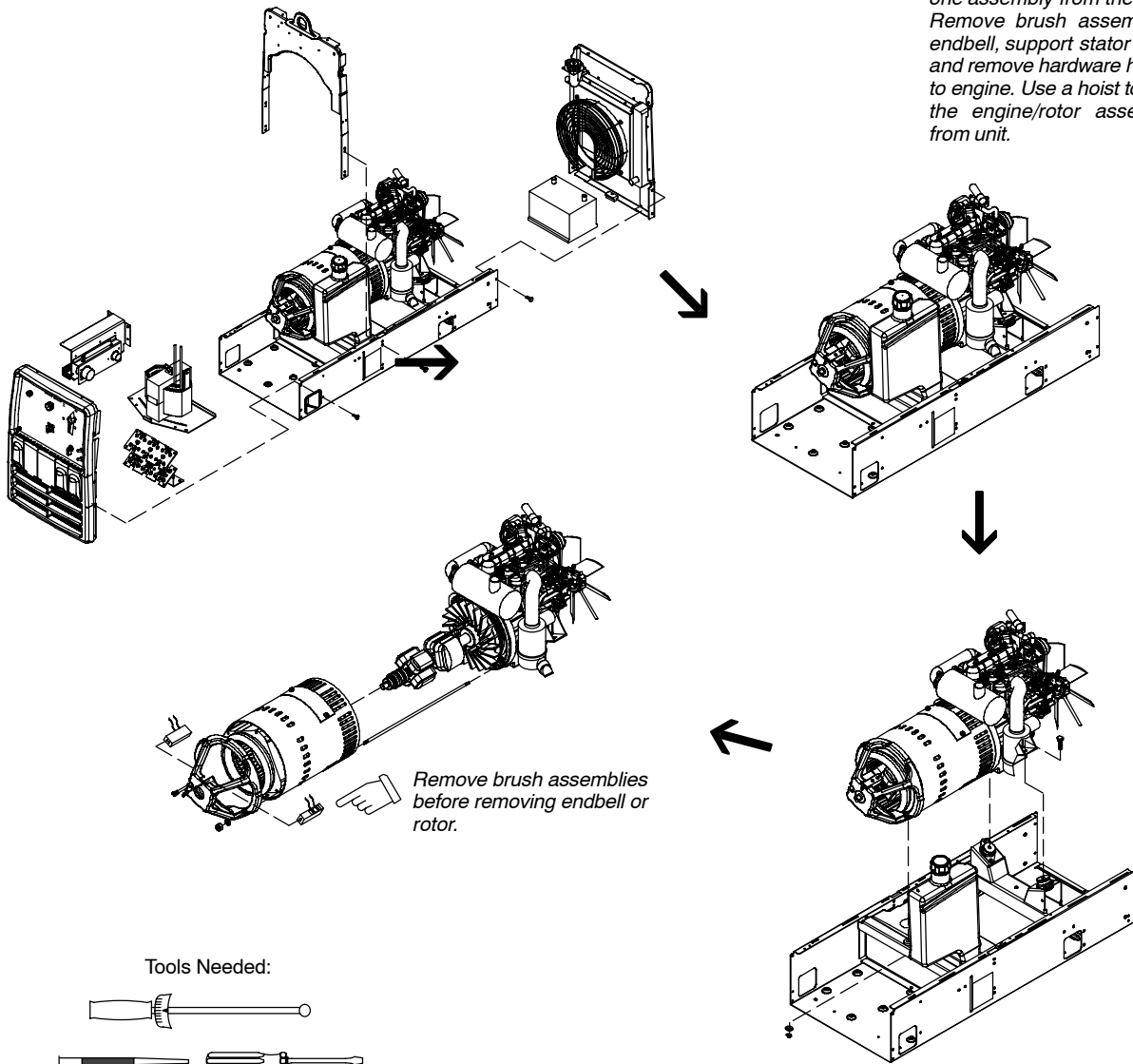
804 198-A

SECTION 10 – DISASSEMBLY AND REASSEMBLY

10-1. Disassembly Of Unit

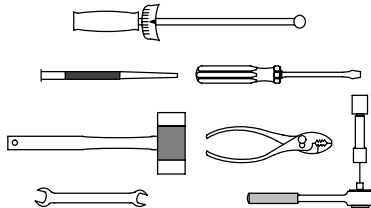


☞ As an alternative to the complete disassembly procedure shown, the engine and rotor can be removed as one assembly from the engine end. Remove brush assemblies from endbell, support stator with blocks, and remove hardware holding stator to engine. Use a hoist to carefully lift the engine/rotor assembly away from unit.



Remove brush assemblies before removing endbell or rotor.

Tools Needed:



▲ **Stop engine and let cool. Disconnect battery, negative cable first.**

▲ **Do not damage rotor or stator.**

Disassembly

Remove battery cables, exhaust pipe, fuel cap, cover, and doors. Reinstall fuel cap. Disconnect base ground cable. Retain all hardware removed during disassembly.

☞ To aid in reassembly, mark electrical leads before disconnecting. See lead list summary in Section 11 for connection information.

Mark and disconnect leads from DC Polarity/AC Switch S1.

Remove engine and rotor by removing nuts from studs and separating stator from engine adapter.

▲ **Use hoist and lifting strap to carefully remove engine/generator assembly.**

Reassembly

Reassemble unit in reverse order of disassembly.

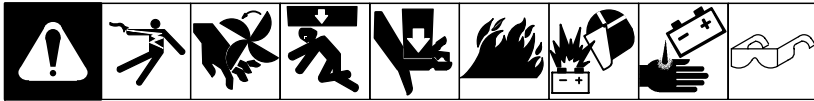
Torque hardware as specified in Section 10-2.

Reconnect stator leads as marked. Use cable ties to keep leads from sharp edges, and hot or moving parts.

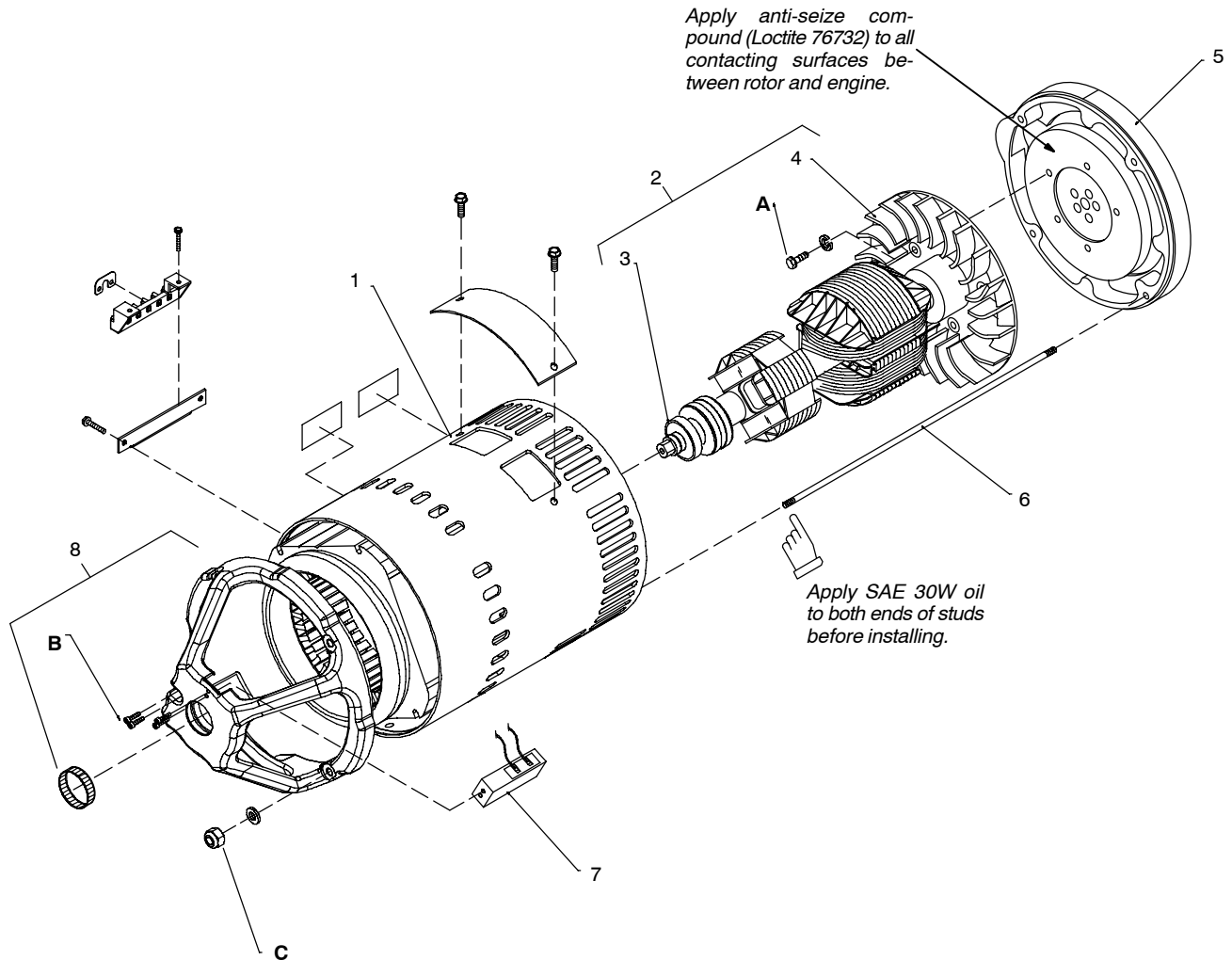
Reconnect fuel line and base ground cable. Reinstall battery and tray, panels, and cover. Reconnect battery cables.

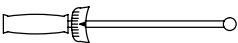
804 199-A

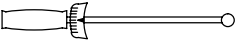
10-2. Disassembly Of Generator



- 1 Stator
- 2 Rotor Assembly
- 3 Bearing
- 4 Rotor Fan
- 5 Engine Adapter
- 6 Stud
- 7 Brush Holder Assembly
(One Of Two Assemblies Shown)
- 8 Endbell




Torques:	
	
A	20 ft lb (27 N·m)
B	25 in lb (3 N·m)
C	10 ft lb (14 N·m)

Torques:	
	
Stabilizer Mounting Plate	14 ft lb (19 N·m)
Center Upright	18 in lb (24 N·m)
Engine and Generator Mounting	25 ft lb (34 N·m)

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SECTION 11 – ELECTRICAL DIAGRAMS

 The circuits in this manual can be used for troubleshooting, but there might be minor circuit differences from your machine. Use circuit inside machine case or contact distributor for more information.

The following is a list of all diagrams for models covered by this manual.

Model	Serial Or Style Number	Circuit Diagram	Wiring Diagram
Trailblazer 302 D	Eff w/LF314257 thru LG095180	215 259-C	
	Eff w/LG095181 and following	231 579-A	See Table 11-1

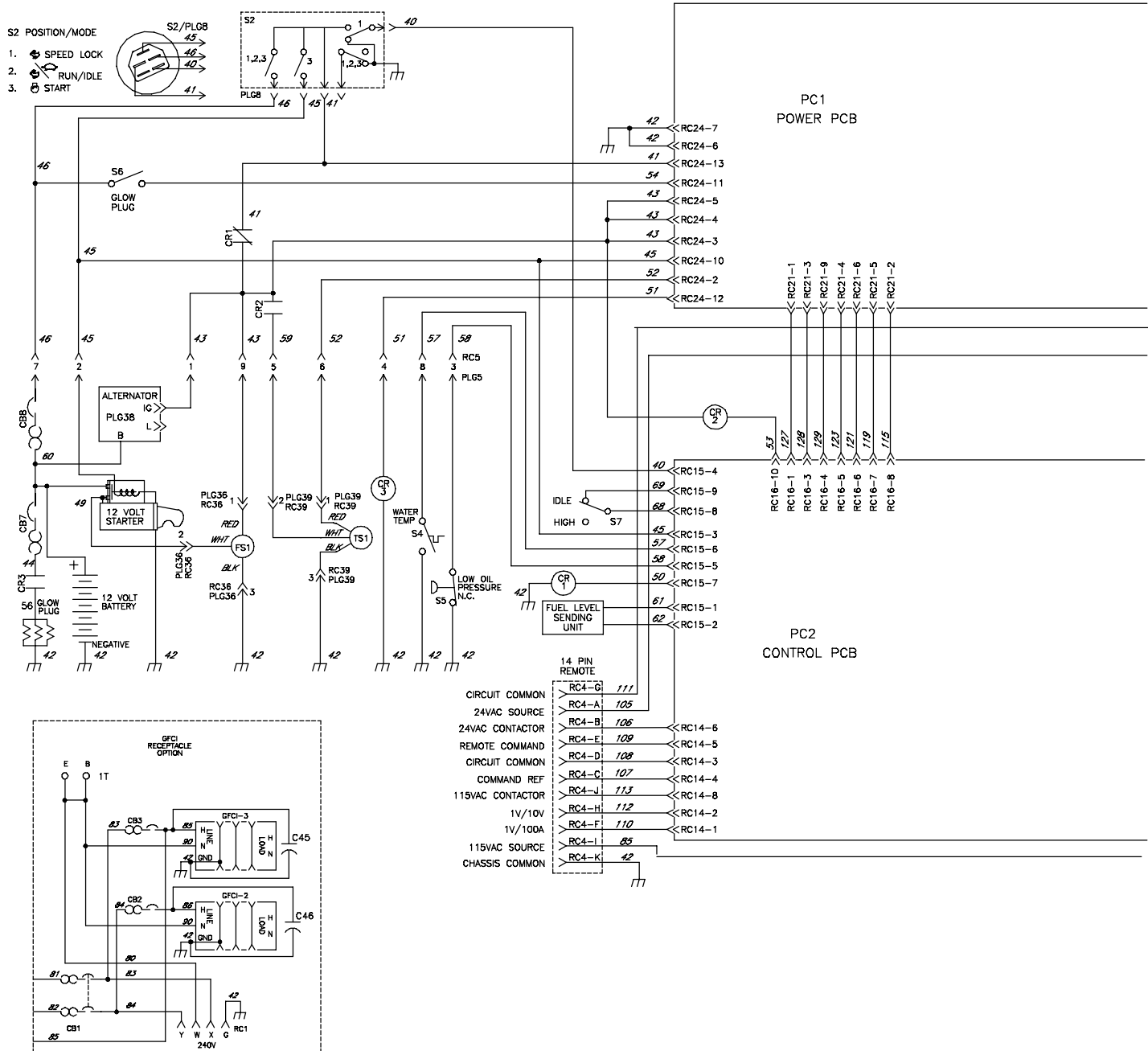

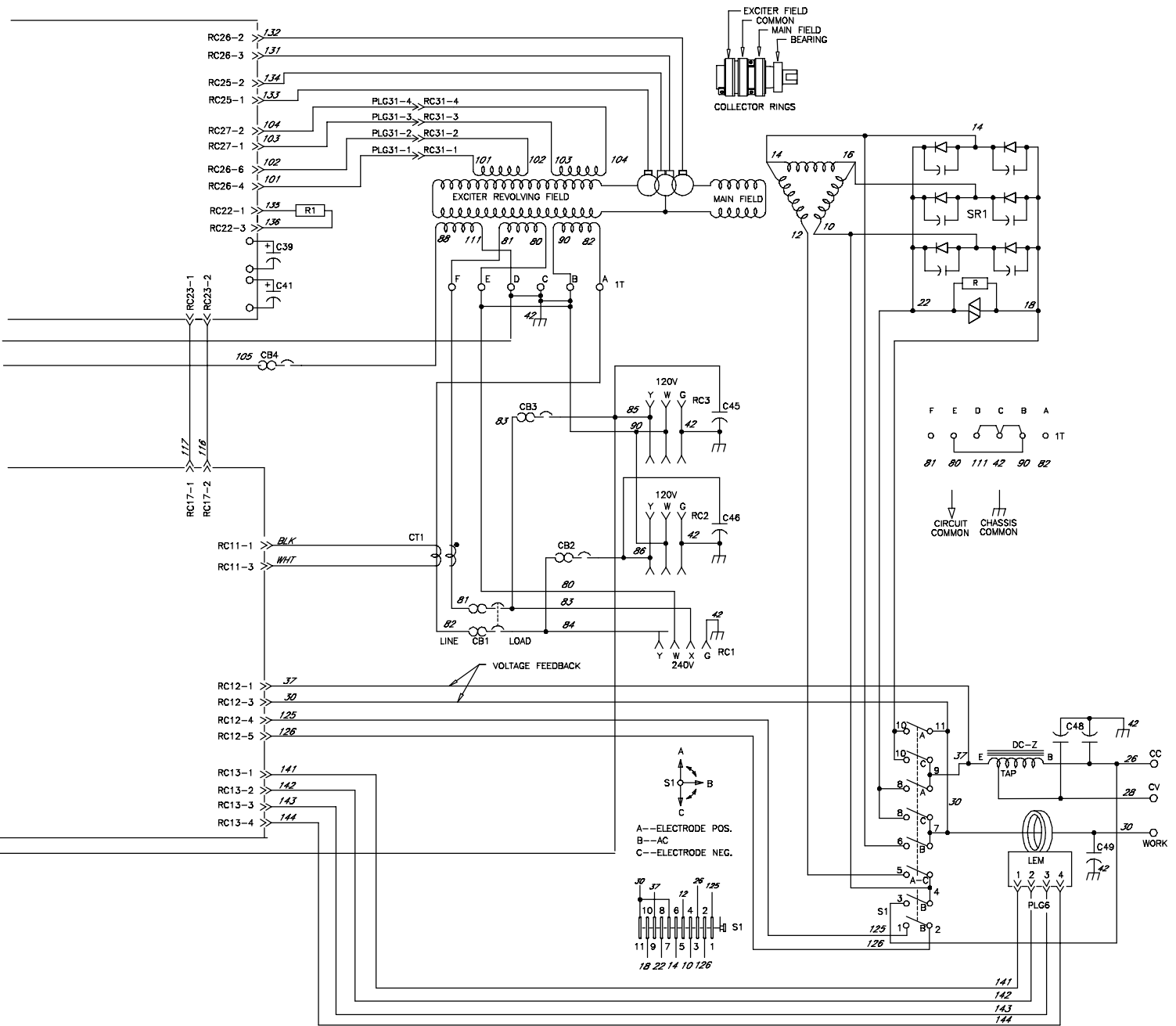


Figure 11-1. Circuit Diagram For Welding Generator Eff w/LF314257 Thru LG095180

 ELECTRIC SHOCK HAZARD	WARNING
	<ul style="list-style-type: none"> 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.



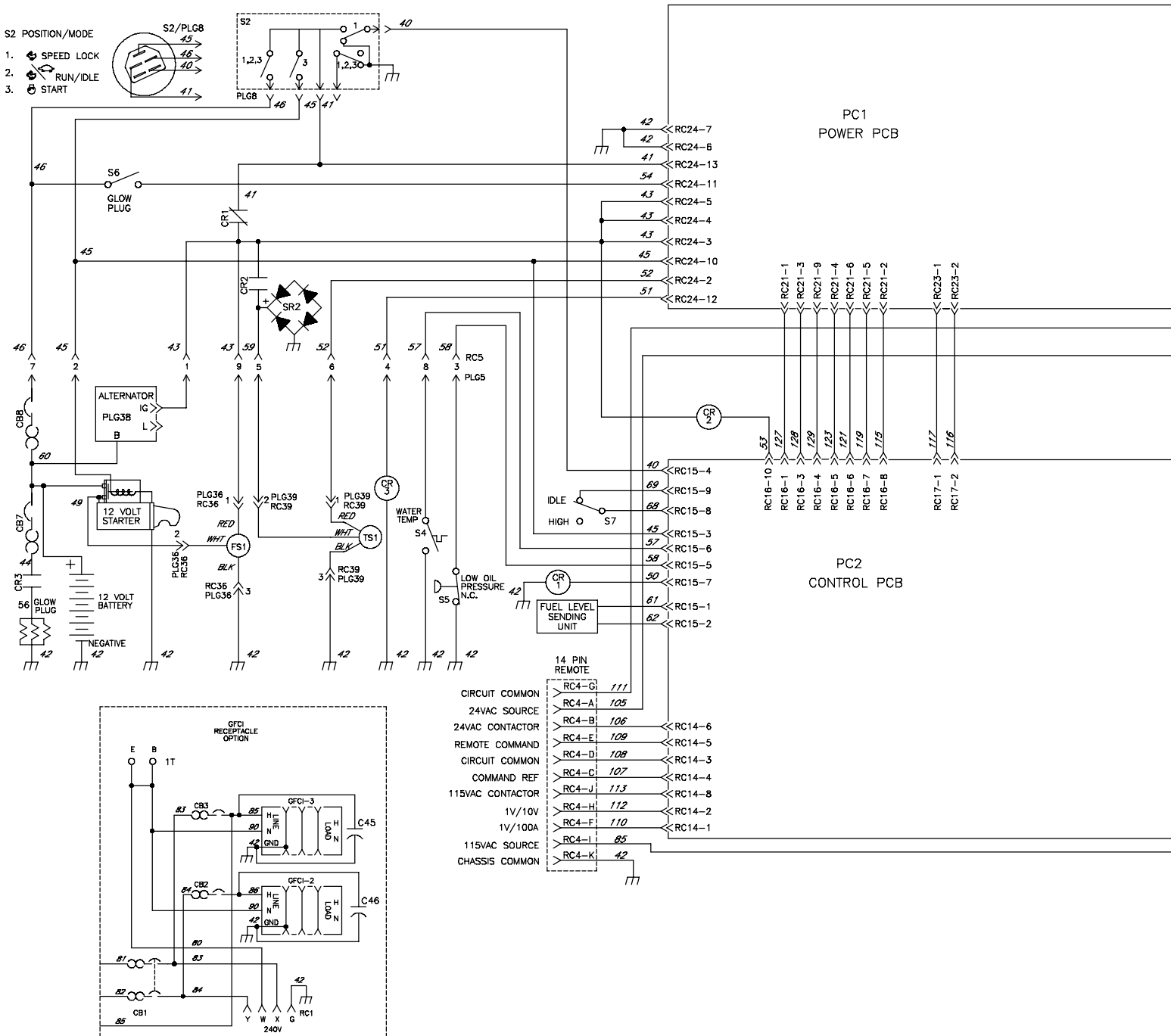


Figure 11-2. Circuit Diagram For Welding Generator Eff w/LG095181 And Following



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

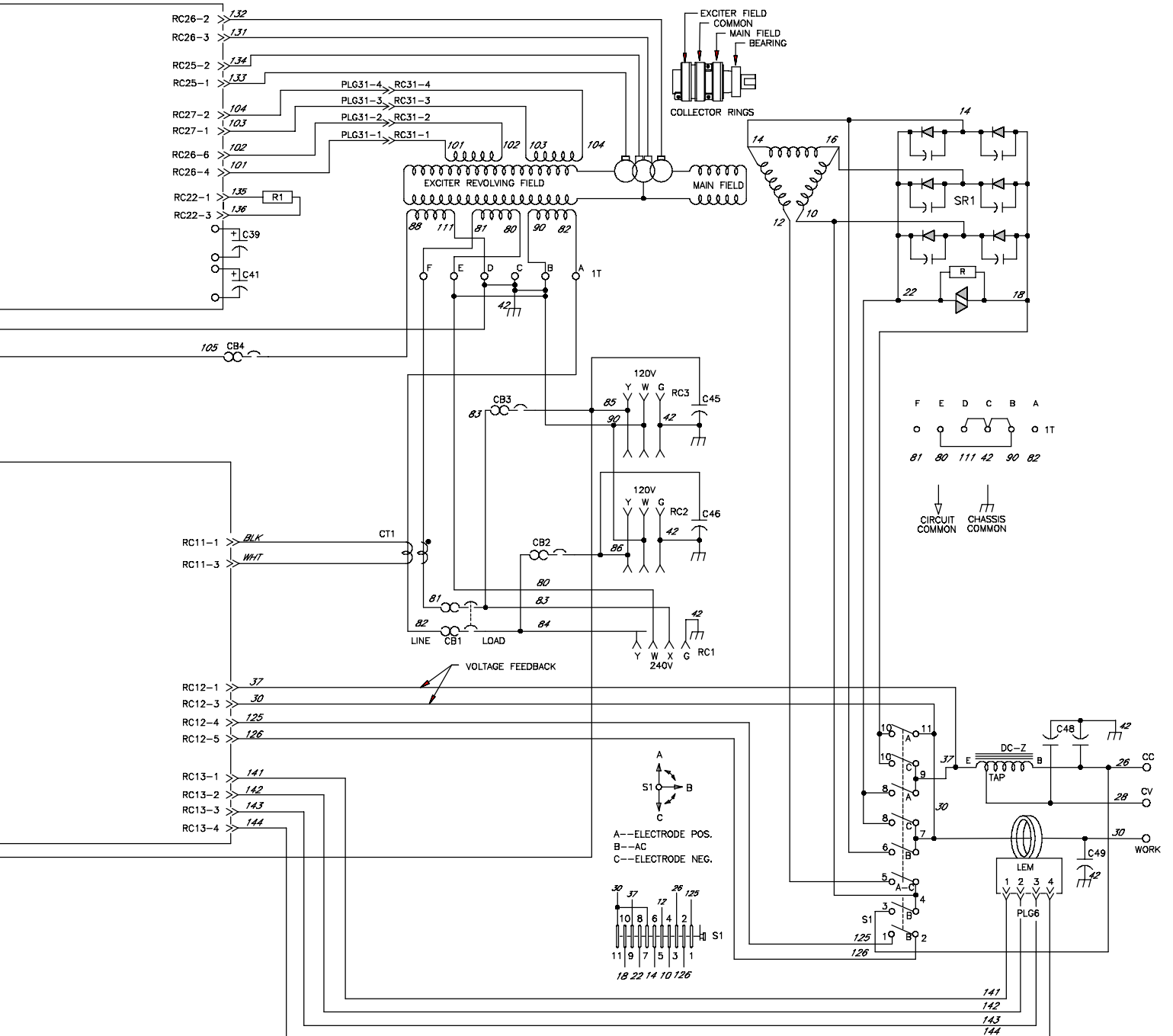




Table 11-1. Lead List Summary For Trailblazer 302 D Models Eff w/LG095181 And Following

 Table shows physical lead connections and should be used with circuit diagram (table replaces wiring diagram).

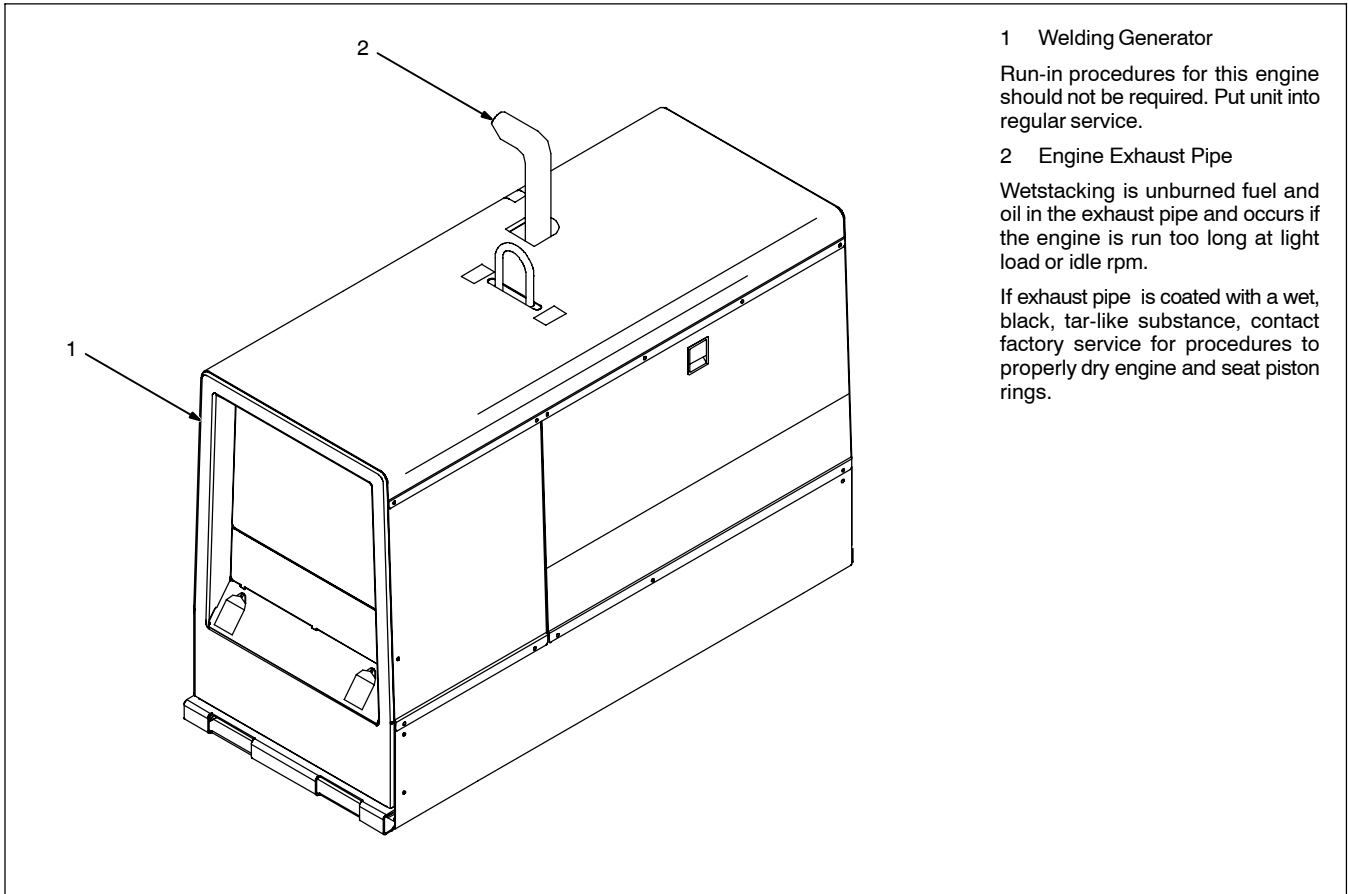
 Apply small amount of dielectric grade, nonconductive electric grease (Part No. 146 557) to connectors where factory-applied grease had been present.

Lead	Connections	Lead	Connections
NEG	ENGINE TO GROUND	60D	CB7 (BAT) TO ALT (B)
10A	STATOR TO SR1 (AC)	61A	FUEL SENDER TO PLG15 (1)
10B	S1 (4) TO SR1 (AC)	62A	FUEL SENDER TO PLG15 (2)
12A	STATOR TO AC/DC-S1 (5) OR DC-SR1 (AC W/10)	68A	S7 (WIPER) TO PLG15 (8)
14A	STATOR TO SR1 (AC)	69A	S7 (IDLE) TO PLG15 (9)
14B	S1 (6) TO SR1 (AC)	80A	STATOR TO 1T (E)
16A	STATOR TO SR1 (AC)	80C	RC1 (W) TO 1T (E)
18A	S1 (10) TO SR1 (NEG)	81A	STATOR TO 1T (F)
22A	S1 (8) TO SR1 (POS)	81B	CB1 (LINE) TO 1T (F)
26A	STAB (BEG) TO ELECT (CC)	82A	STATOR TO 1T (A)
26B	S1 (3) TO ELECT (CC)	82C	CB1 (LINE) TO 1T (A)
28A	STAB TAP TO CV STUD-ADD DASH TO WIRE	83B	CB3 TO CB1 (LOAD)
30A	S1 (11) TO WORK	83C	RC1 (X) TO CB1 (LOAD)
30D	PLG12 (3) TO S1 (11)	84B	CB2 TO CB1 (LOAD)
37A	STAB (END) TO S6 (9) OR SR1 (POS)	84C	RC1 (Y) TO CB1 (LOAD)
37C	PLG12 (1) TO S1 (9)	85A	RC3 (Y) TO CB3
40A	PLG8 TO PLG15 (4)	85C	RC4 (I) TO CB3
41A	PLG24 (13) TO CR1 (87A)	86A	RC2 (Y) TO CB2
41B	PLG8 TO CR1 (87A)	88A	STATOR TO CB4
42A	CR1 (85) TO COM. GND.	90A	STATOR TO 1T (B)
42B	PLG24 (6) TO COM. GND.	90B	RC2 (W) TO RC3 (W)
42C	RC1 (GR) TO GRD STUD	90C	RC2 (W) TO 1T (B)
42D	SR2 (AC) TO CR1 (85)	101A	STATOR TO TRAILBLAZER & LEGEND RC31 (1)
42E	RC2 TO GND STUD	101B	PLG31 (1) TO PLG26 (4)
42F	RC4 (K) TO GROUND 1T (C)	102A	STATOR TO TRAILBLAZER & LEGEND RC31 (2)
42H	GRD. TO GRD.	102B	PLG31 (2) TO PLG26 (6)
42J	RC3 TO GND STUD	103A	STATOR TO TRAILBLAZER & LEGEND RC31 (3)
42R	PLG36 (3) TO GND	103B	PLG31 (3) TO PLG27 (1)
42S	PLG39 (3) TO GND	104A	STATOR TO TRAILBLAZER & LEGEND RC31 (4)
42T	CR3 (86) TO GND	104B	PLG31 (4) TO PLG27 (2)
42Y	1T (C) TO CHASSIS GRD.	105A	RC4 (A) TO CB4
43A	RC5 (1) TO PLG24 (5)	106A	RC4 (B) TO PLG14 (6)
43B	CR2 (87) TO CR2 (85)	107A	RC4 (C) TO PLG14 (4)
43C	CR2 (85) TO PLG24 (3)	108A	RC4 (D) TO PLG14 (3)
43D	RC5 (9) TO CR1 (30)	109A	RC4 (E) TO PLG14 (5)
43E	PLG24 (4) TO CR1 (30)	10A	RC4 (F) TO PLG14 (1)
43G	PLG5 (1) TO PLG 38 (IG)	111A	STATOR TO 1T (D)
43H	PLG36 (1) TO PLG5 (9)	111B	RC4 (G) TO 1T (D)
44B	CB7 (AUX) TO CR3 (30)	112A	RC4 (H) TO PLG14 (2)
45A	PLG24 (10) TO SPLICE	113A	RC4 (J) TO PLG14 (8)
45B	PLG8 TO SPLICE	15A	PLG21 (2) TO PLG16 (8)
45C	RC5 (2) TO SPLICE	116A	PLG23 (2) TO PLG17 (2)
45D	PLG15 (3) TO SPLICE	117A	PLG23 (1) TO PLG17 (1)
45E	STARTER SOL TO PLG5 (2)	119A	PLG21 (5) TO PLG16 (7)
46A	PLG8 TO S6 (GP)	121A	PLG21 (6) TO PLG16 (6)
46B	RC5 (7) TO S6 (GP)	123A	PLG21 (4) TO PLG16 (5)
46E	PLG5 (7) TO CB8 (AUX)	125A	PLG12 (4) TO S1 (1)
49A	PLG36 (2) TO STARTER	126A	PLG12 (5) TO S1 (2)
50A	CR1 (86) TO PLG15 (7)	127A	PLG21 (1) TO PLG16 (1)
51A	CR3 (85) TO PLG5 (4)	128A	PLG21 (3) TO PLG16 (3)
51B	RC5 (4) TO PLG24 (12)	129A	PLG21 (9) TO PLG16 (4)
52A	PLG5 (6) TO PLG39 (1)	131A	RING ASSY TO ROTOR COILS
52B	RC5 (6) TO PLG24 (2)	131B	MAIN FIELD COM. BRUSH TO PLG26 (3)
53A	CR2 (86) TO PLG16 (10)	132A	RING ASSY TO ROTOR COILS
54A	S6 (GP) TO PLG24 (11)	132B	MAIN FIELD FRONT BRUSH TO PLG26 (2)
56A	GLOW PLUG TO CR3 (87)	133A	EXCITER FIELD BACK BRUSH TO PLG25 (1)
57A	S4 TO PLG5 (8)	133B	RING ASSY TO ROTOR COILS
57B	RC5 (8) TO PLG15 (6)	134A	EXCITER FIELD COM. BRUSH TO PLG25 (2)
58A	S5 TO PLG5 (3)	135A	R1 TO RC22 (1)
58B	RC5 (3) TO PLG15 (5)	136A	R1 TO RC22 (3)
59A	PLG5 (5) TO PLG39 (2)	141A	PLG6 (1) TO PLG13 (1)
59B	RC5 (5) TO CR2 (30)	142A	PLG6 (2) TO PLG13 (2)
59C	SR2 (+) TO CR2 (30)	143A	PLG6 (3) TO PLG13 (3)
60B	STARTER TO CB8 (BAT)	144A	PLG6 (4) TO PLG13 (4)
60C	CB7 (BAT) TO CB8 (BAT)	JUMPA	JUMPER 1T (B TO E)

SECTION 12 – RUN-IN AND WETSTACKING

run_in_D722 9/05

12-1. Run-In And Wetstacking



1 Welding Generator

Run-in procedures for this engine should not be required. Put unit into regular service.

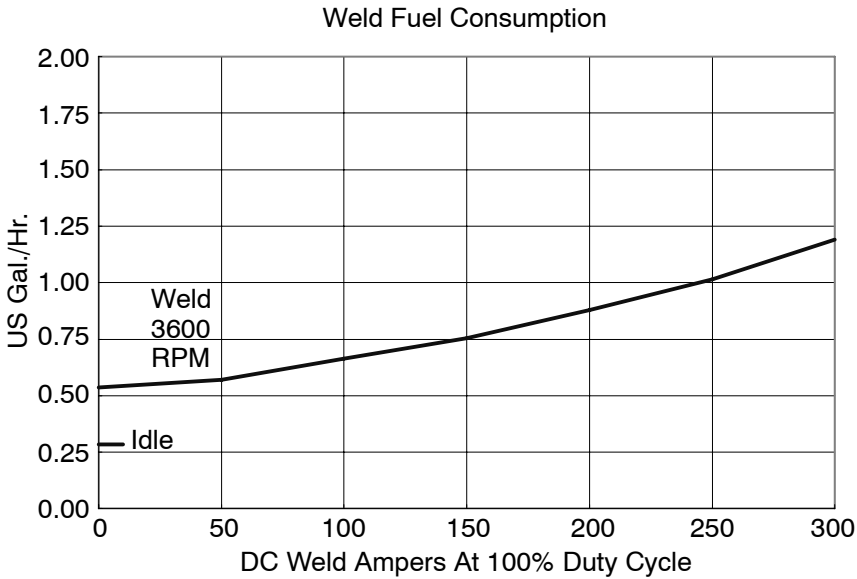
2 Engine Exhaust Pipe

Wetstacking is unburned fuel and oil in the exhaust pipe and occurs if the engine is run too long at light load or idle rpm.

If exhaust pipe is coated with a wet, black, tar-like substance, contact factory service for procedures to properly dry engine and seat piston rings.

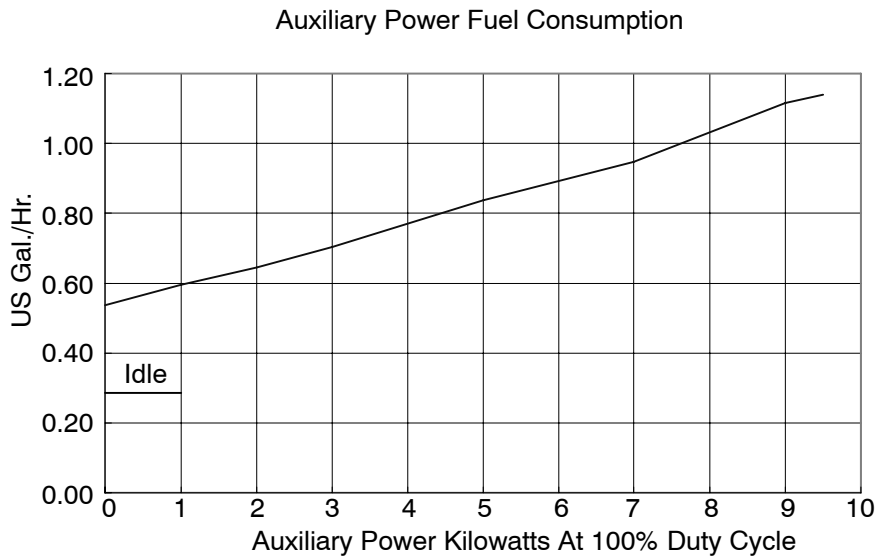
SECTION 13 – PERFORMANCE DATA

13-1. Fuel Consumption Curves



On a typical job using 1/8 in 7018 electrodes (125 amps, 20% duty cycle), expect about 24 hours of operation.

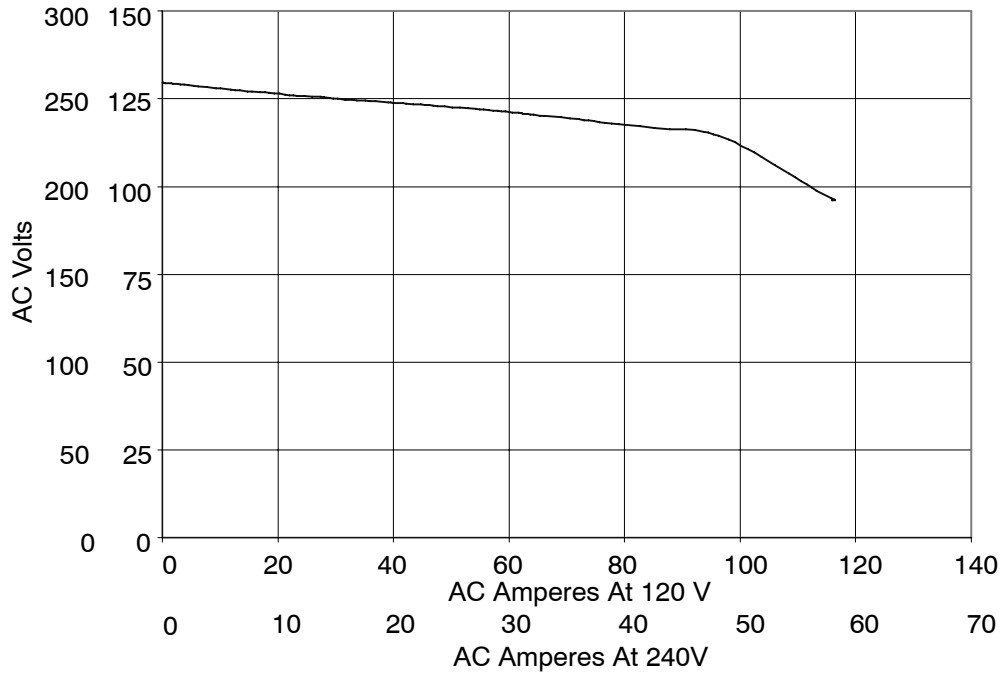
Welding at 150 amps at 40% duty cycle uses approximately 1/2 gallon per hour, or about 22 hours of operation.



207 922-A / 207 923-A

13-2. Generator Power Curve

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

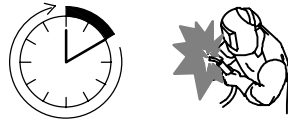


226 760-A

13-3. Duty Cycle



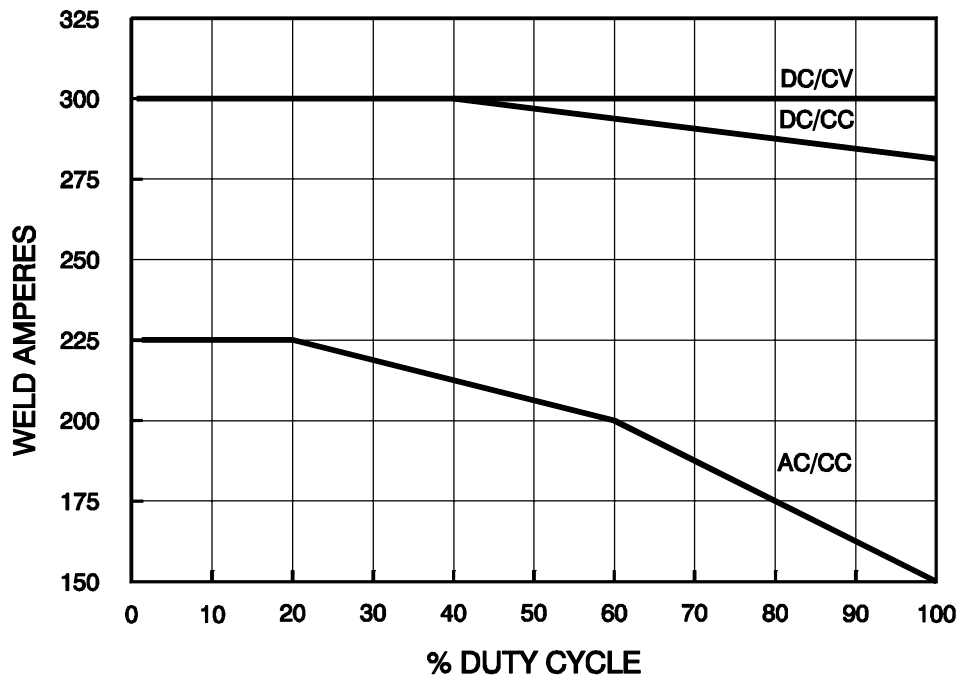
100% Duty Cycle at 280 Amperes DC



Continuous Welding

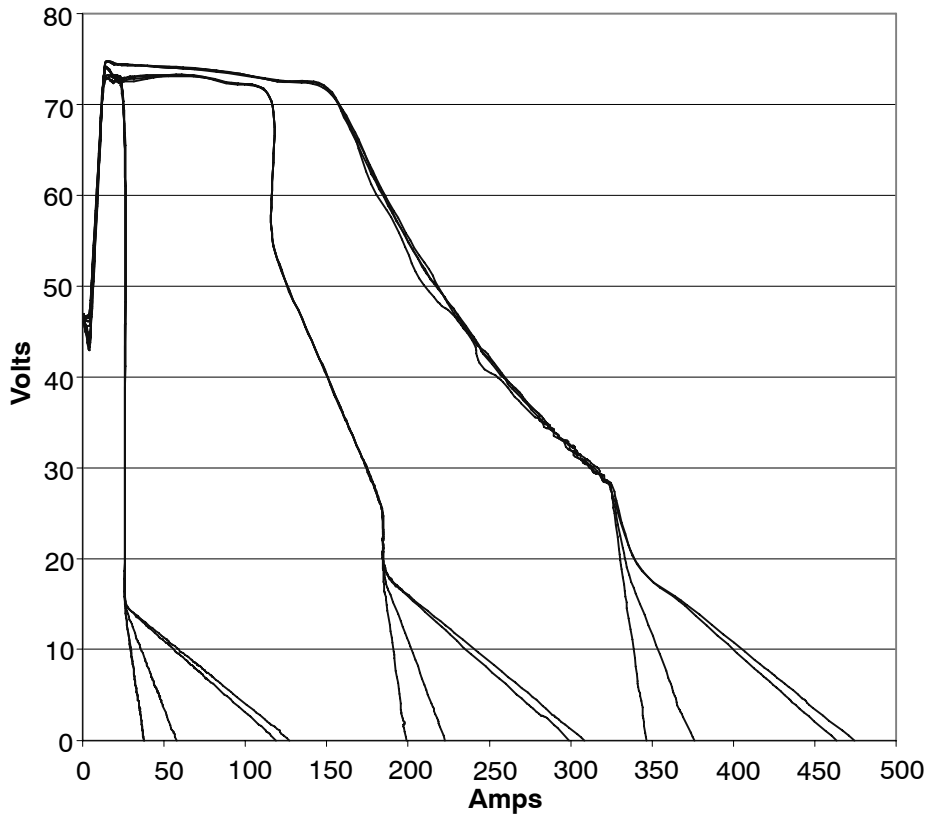
Duty cycle is the percentage of 10 minutes that unit can weld at rated load without overheating.

▲ Exceeding duty cycle can damage unit and void warranty.



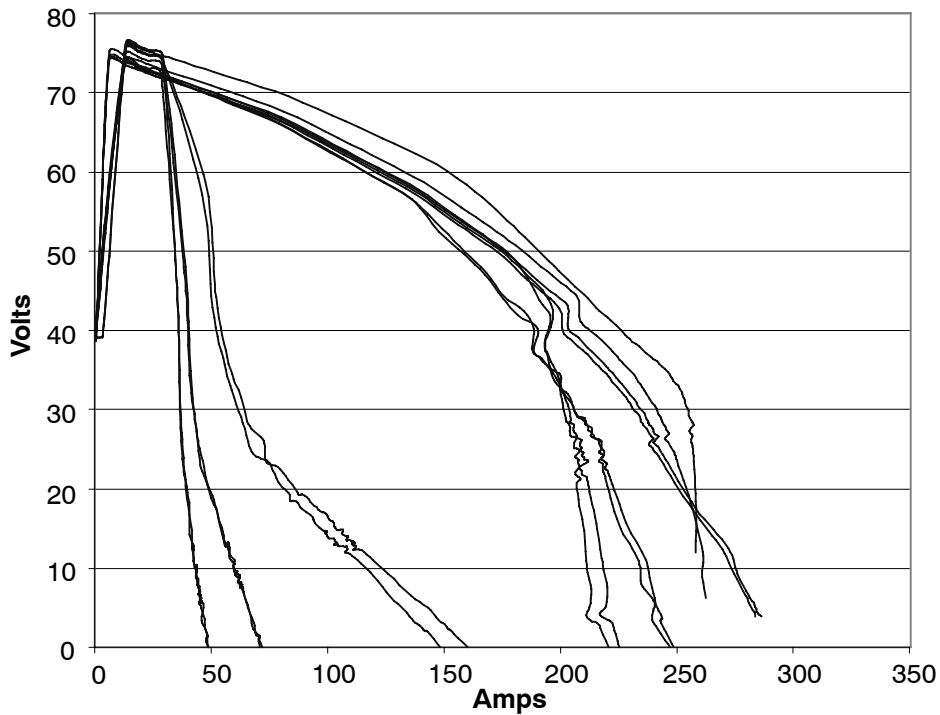
13-4. Stick Mode Volt-Ampere Curves

A. CC/DC Stick Mode



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

C. CC/AC STICK Mode

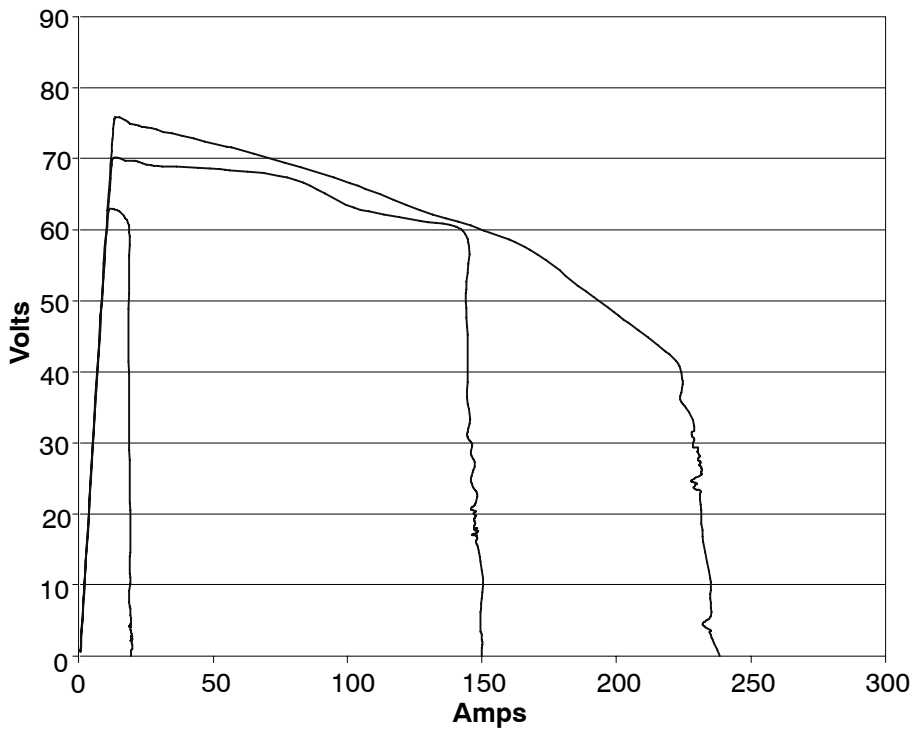


226 756-A / 223 761-A

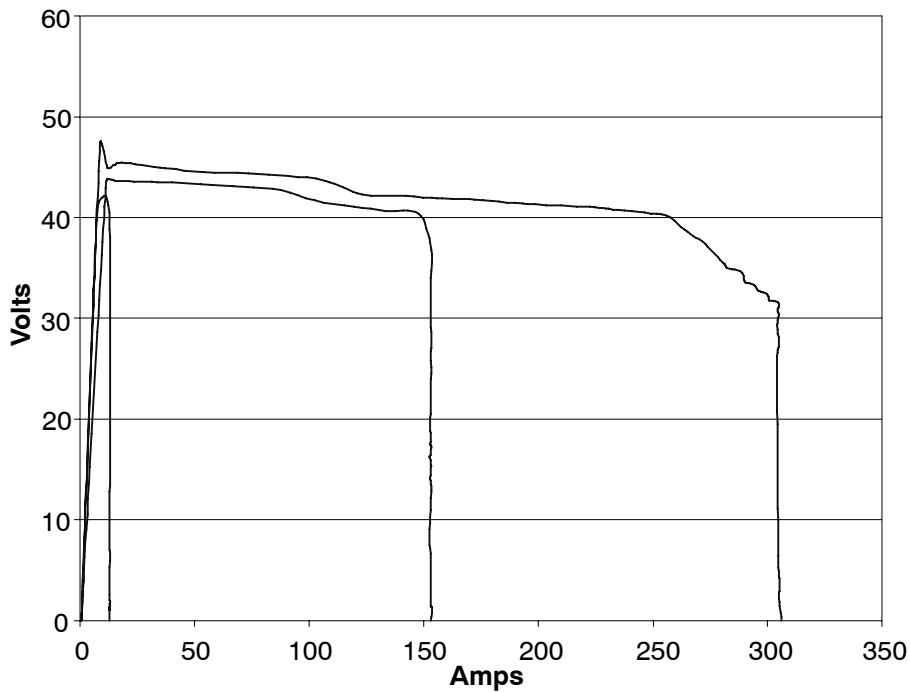
13-5. TIG Mode Volt-Ampere Curves

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

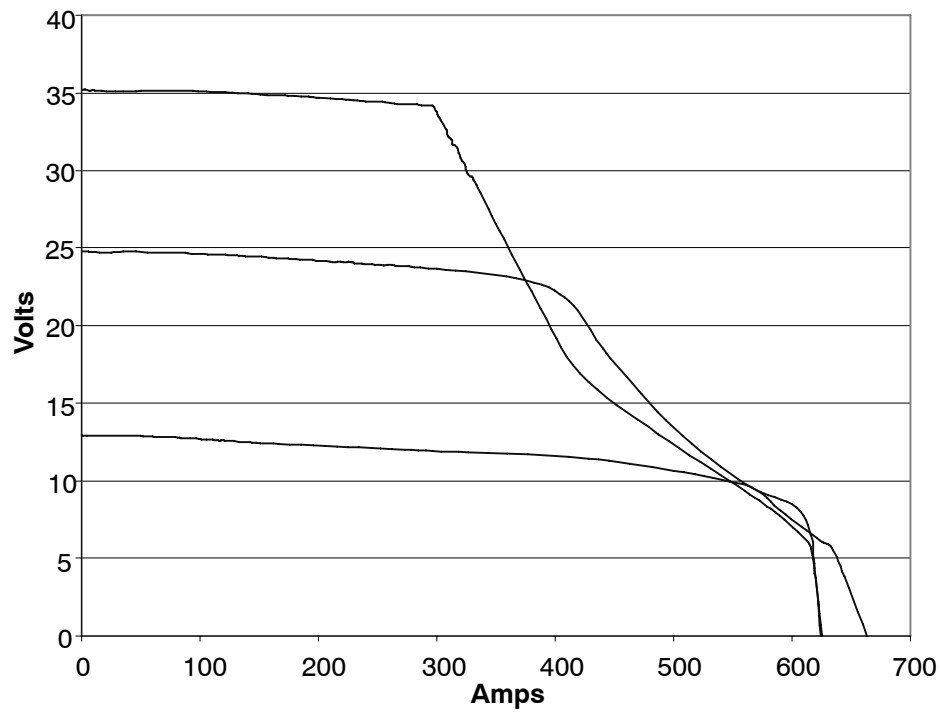
A. CC/AC TIG Mode



B. CC/DC TIG Mode



13-6. MIG Mode Volt-Ampere Curve



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

226 757-A



TM-217 454G

2006-11

Processes



Stick (SMAW) Welding



MIG (GMAW) Welding
Flux Cored (FCAW) Welding



TIG (GTAW) Welding

Description



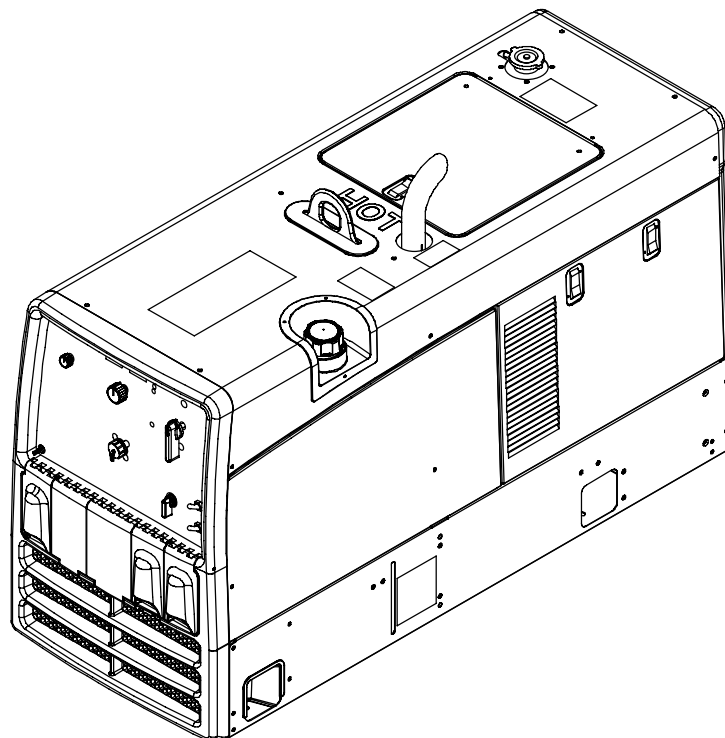
Engine Driven Welding Generator

TrailblazerTM 302 Diesel

PARTS LIST

Eff w/LF314257 And Following


For OM-217 454 Revisions A Thru G

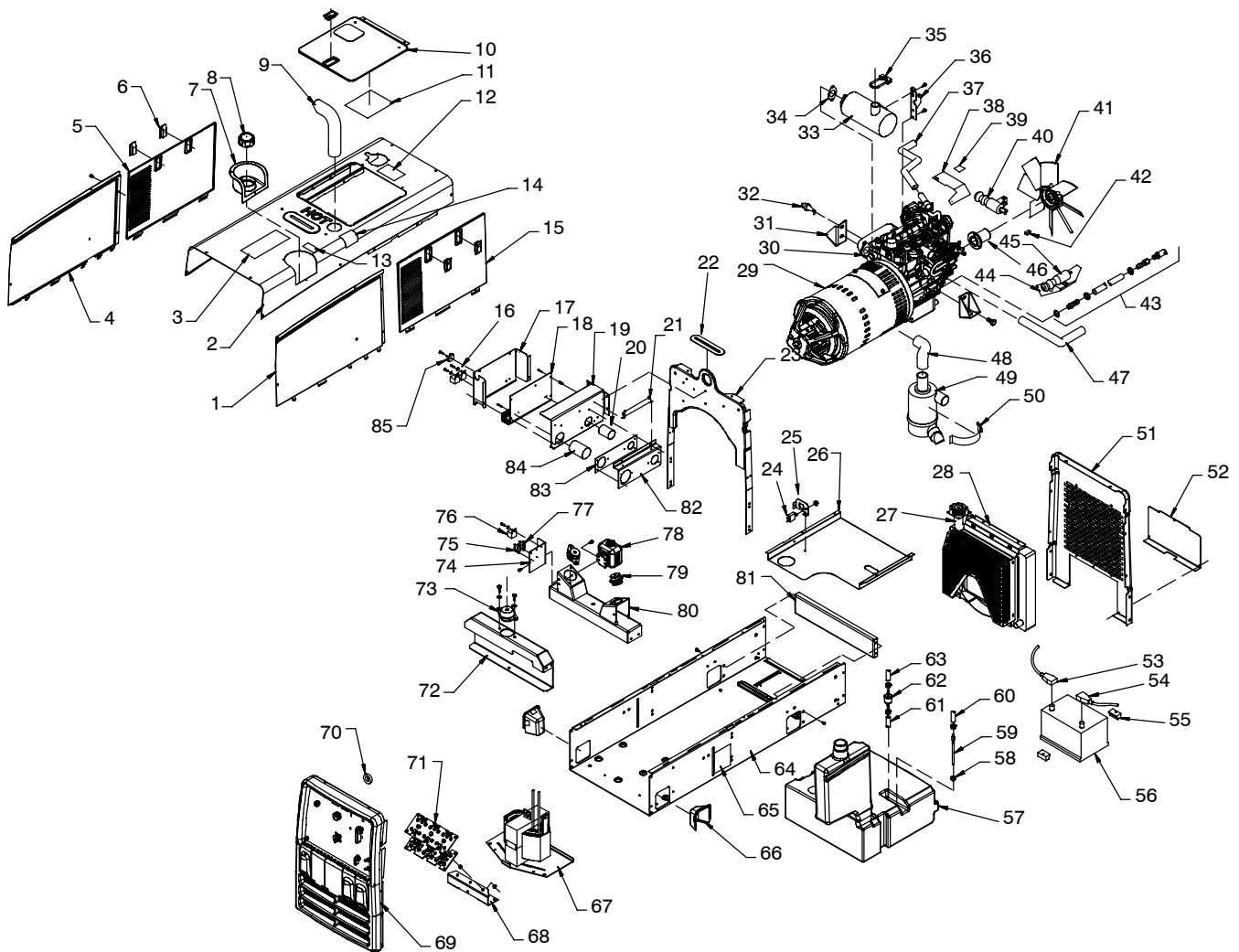


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SECTION 14 – PARTS EFF W/LF314257 AND FOLLOWING

 Hardware is common and not available unless listed.



804 201-E

Figure 14-1. Main Assembly

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

Figure 14-1. Main Assembly

...	1	211366	Panel, Side RH	1
...	2	228434	Cover, Top Service Assy Trailblazer 302 Diesel (Includes)	1
.....		+230531	Cover Assy, Top Diesel	1
...	3	227726	Label, Warning General Precautionary Csa	1
...	4	211365	Panel, Side LH	1
.....		217395	Bumper, Rubber Press-in	11

Eff w/LF314257 And Following

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 14-1. Main Assembly (Continued)				
5		221986	Door, Access Engine Side LH	1
		220371	Seal, Rubber W/Adhesive .370 X .750 X 14.500	2
6		211370	Latch, Door	5
7		211398	Grommet, Plastic Neck Filler Fuel	1
8		220711	Cap, Tank Screw-on W/Vent	1
9		225759	Pipe, Exhaust Elbow Stainless	1
10		211369	Door Assy, Access Engine Top	1
		225747	Strip, Rbr Adh Back .062 X 4.000 X 4.500 60 Duro	1
11		227727	Label, Engine Maintenance Kubota D722	1
12		227730	Label, Warning Steam And Hot Coolant Can Burn	1
13		227728	Label, Use Diesel Fuel Only	1
14		227729	Label, Caution Exhaust Direction	1
15		213810	Door, Access Engine Side RH	1
16	CR1,CR2	173069	Relay, Encl 12vdc Spdt 30a/20a 5pin Flange Mtg	2
17		227004	Cover, PC Board Bracket	1
18	PC1	223912	Circuit Card Assy, Power	1
19		215797	Bracket, Mtg Pc Board	1
20	C39	210639	Capacitor, Elctlt 1500 Uf 75 Vdc Can 1.40 Dia	1
21	R1	188067	Resistor, Ww Fxd 100 W 200 Ohm W/Clips	1
22		205734	Seal, Weather Lift Eye	1
23		211360	Upright, Base	1
24	CB4	083432	Supplementary Pro, Man Reset 1p 10a 250vac Frict	1
25		224691	Bracket, Mtg Connector	1
26		224648	Cover, Tank Fuel	1
27		223559	Hose, Radiator Upper Fill	1
28		216588	Radiator Assy, 2 Row Core W/14# Cap Shroud & Guard	1
		229079	Label, Warning Pinch Points And Moving Parts	1
29	Figure 14-2		Generator Assembly	1
30		225047	Engine, Kubota Dsl Elec D722eb-25 W/Components (includes)	1
31		206550	Bracket, Mtg Engine	2
32		208754	Switch, Pressure Oil 7psi Nc Cont Frict Term	1
33		223787	Muffler, Exhaust Engine	1
34		189766	Muffler Gasket	2
35		209057	Clamp, Muffler 1.625 Dia U Pld	1
36		224856	Bracket, Mtg Fuel Filter	1
37		223531	Hose, Radiator Upper	1
38		225248	Guard, Belt Fan	1
39		187890	Label, Warning Moving Parts (Wordless)	3
40	FS1	208106	Solenoid, Fuel	1
41		222960	Fan, Engine Cooling 13.000 Pusher	1
42		198018	Linkage, Throttle Solenoid	1
43		199507	Hose Assy, Oil Drain 20.000 Lg (includes)	1
		165271	Valve, Oil Drain 3/8-18 Nptf	1
		113854	Hose, Sae .500 Id X .780 Od Xcoil	1.66ft.
		176529	Ftg, Hose Brs Barbed Fem 1/2 Tbg X 3/8 Npt	1
44		226743	Bracket, Mounting Throttle Solenoid	1
45	TS1	208454	Solenoid, Throttle	1
46		221833	Spacer, Fan	1
47		223532	Hose, Radiator Lower	1
		187432	Bracket, Mtg Air Cleaner	1
48		187434	Hose, Air Cleaner	1
49		187431	Air Cleaner, Intake Dry Straight Outlet Type	1
50		187640	Clamp, Air Cleaner W/Latch	1
		227731	Label, Caution Do Not Use Ether (Bilingual)	1
		206421	Tune-up & Filter Kit (includes)	0
		187441	Element, Air Cleaner	0
		187442	Element, Fuel Filter	0
		187443	Oil Filter,	0
		213858	Filter, Fuel In-line 5/16x5/16 Mic 125 -175	0

Eff w/LF314257 And Following

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 14-1. Main Assembly (Continued)				
51		212975	Panel, Rear	1
		220753	Label, Weld Output & Generator Power Output	1
52		216595	Cover, Battery	1
		227913	Label, Warning Battery Explosion Can Blind	1
53		187616	Cable, Bat Pos 32.000 No 4 Awg W/Clamp & .343 Rng	1
54		167730	Cable, Bat Neg 29.000 No 4 Awg W/Clamp & .406 Rng	1
		114923	Boot, Insulator Term Post Red 1	1
55		182935	Hold Down, Battery	2
56		167677	Battery, Stor 12v 430 Crk 75 Rsv Gp 58 Maint Free	1
57		215041	Tank, Fuel 12.0 Gal W/Sender (Includes)	1
		216308	Sender, Fuel Gauge 7.875 Deep Tank (Includes)	1
		228054	Gasket, Fuel Sender/Fuel Tank	1
58		124253	Bushing	1
59		223777	Ftg, Stand Pipe .187 X 6.125 Lg	1
60		125474	Hose, Sae .187 Id X .410 Od X 19.000	1
		229130	Ftg, Stand Pipe 370 X 6.910 Lg	1
61		171803	Hose, Sae .312 Id X .560 Od X 17.000 Carb Approved	1
62		213858	Filter, Fuel In-line 5/16x5/16 Mic 125 -175	1
63		226071	Hose, Sae .312 Id X .560 Od X 13.500	1
		226765	Hose, Sae .312 Id X .560 Od X 5.000 Carb Approved	1
		230014	Hose, Sae .312 Id X .560 Od X 10.000 Carb Approved	1
64		212746	Pan, Base	1
65		227912	Label, Warning Do Not Weld On Base/Fuel Level	2
66		211355	Cover, Base	2
67	DC-Z	212699	Stabilizer Assy, (Includes)	1
		214824	Plate, Mtg Stabilizer	1
68		222071	Bracket, Mtg Rectifier (Prior to LG076391)	1
68		228087	Bracket, Mtg Rectifier (Eff w/LG076391)	1
69		Figure 14-3	Panel, Front w/Components	1
70	CT1	224247	Xfmr, Current	1
71	SR1	223178	Rectifier, Si 3ph 300 Amp 400 Piv 100% Duty Cycle (Prior to LG076391)	1
71	SR1	225516	Rectifier, Si 3ph 300 Amp 400 Piv 100% Duty Cycle (Eff w/LG076391)	1
72		212747	Bracket, Mtg Generator	1
73		187551	Mount, Generator	1
74		223563	Bracket, Mounting Components	1
75	CB7	190374	Circuit Breaker, Auto Reset 12vdc 40 Amp	1
76	CR3	197325	Relay, Encl 12vdc Spst 70a 4pin Flange Mtg	1
77	CB8	226372	Supplementary Protector, Auto Reset 12vdc 20 Amp	1
78		224368	Bottle, Coolant Overflow & Bracket	1
		229080	Label, Coolant Level (Bilingual)	1
		225447	Hose, Sae .312 Id X .560 Od X 32.000	1
79		187550	Mount, Engine	2
80		212625	Bracket, Mtg Engine	1
81		225374	Support, Base Cross	1
82		215798	Bracket, Capacitor Support	1
83		215800	Gasket, Capacitor Support	1
84	C41	217632	Capacitor, Elctlt 1200 Uf 300 Vdc Can 2.00 Dia	1
85	SR2	035704	Rectifier, Integ Bridge 40. Amp 800v (Eff w/LG095181)	1
		225842	Filler, Front (Prior to LF353359)	1
		226046	Gusset, Base(Prior to LF353359)	2


*Recommended Spare Parts.

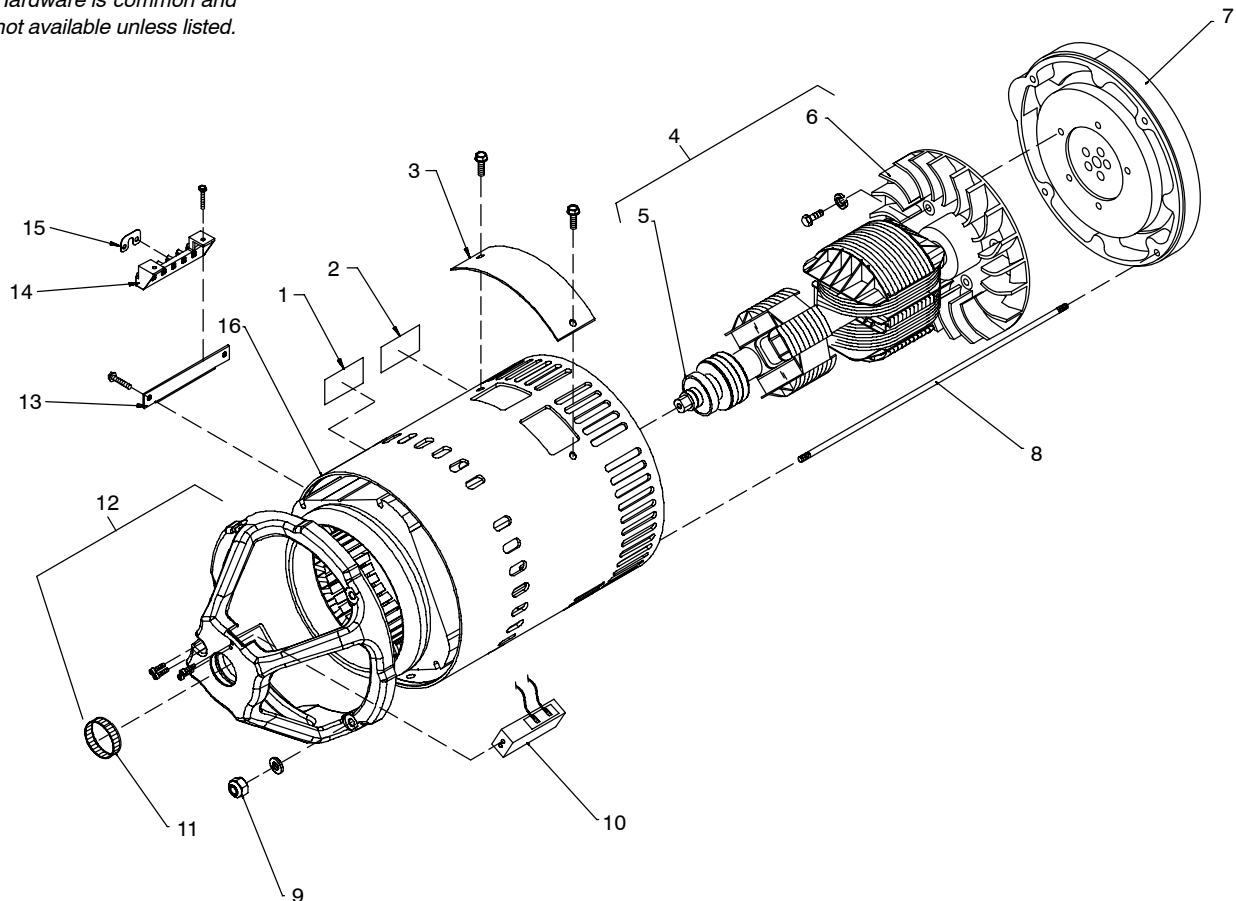
+ When ordering a component originally displaying a precautionary label, the label should also be ordered. Order label individually or as part of Label Kit 219947.

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.

Eff w/LF314257 And Following

Item No.	Part No.	Description	Quantity
Figure 14-2. Generator (Figure 14-1 Item 29)			
1	227724	Label, Warning Moving Parts Can Cause Serious Etc	1
2	227732	Label, Warning Electric Shock Hazard	1
3	223998	Cover, Air Bypass	1
4	204274	Rotor, Generator (includes)	1
5	181143	Bearing, Ball Rdl Sgl Row .984 X 2.047 X .591	1
6	187493	Fan, Rotor Gen	1
7	186365	Adapter, Engine	1
	142156	Screw, 375-16x1.75 Hexwhd.81d Gr8 Pld	4
8	170861	Stud, Stl .375-16 X 17.375	4
9	010909	Nut, 375-16 .56hex .46h Stl Pld Elastic Stop Nut	4
	010910	Washer, Flat .406idx0.812odx.065t Stl Pld Ansi.375	4
10	205725	Brushholder Assy, Generator	2
	136343	Screw, K50x 20 Pan Hd-phl Stl Pld Pt Thread Forming	4
11	217046	Endbell (includes)	1
12	216532	Tolerance Ring,	1
13	214017	Bracket, Terminal Strip	1
14	172661	Block, Stud Connection 6 Position	1
15	173734	Link, Jumper	2
16	+212720	Stator, Generator	1

 Hardware is common and not available unless listed.




804 203-A

Figure 14-2. Generator

+ When ordering a component originally displaying a precautionary label, the label should also be ordered. Order label individually or as part of Label Kit 219947.

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.

Eff w/LF314257 And Following

 Hardware is common and not available unless listed.

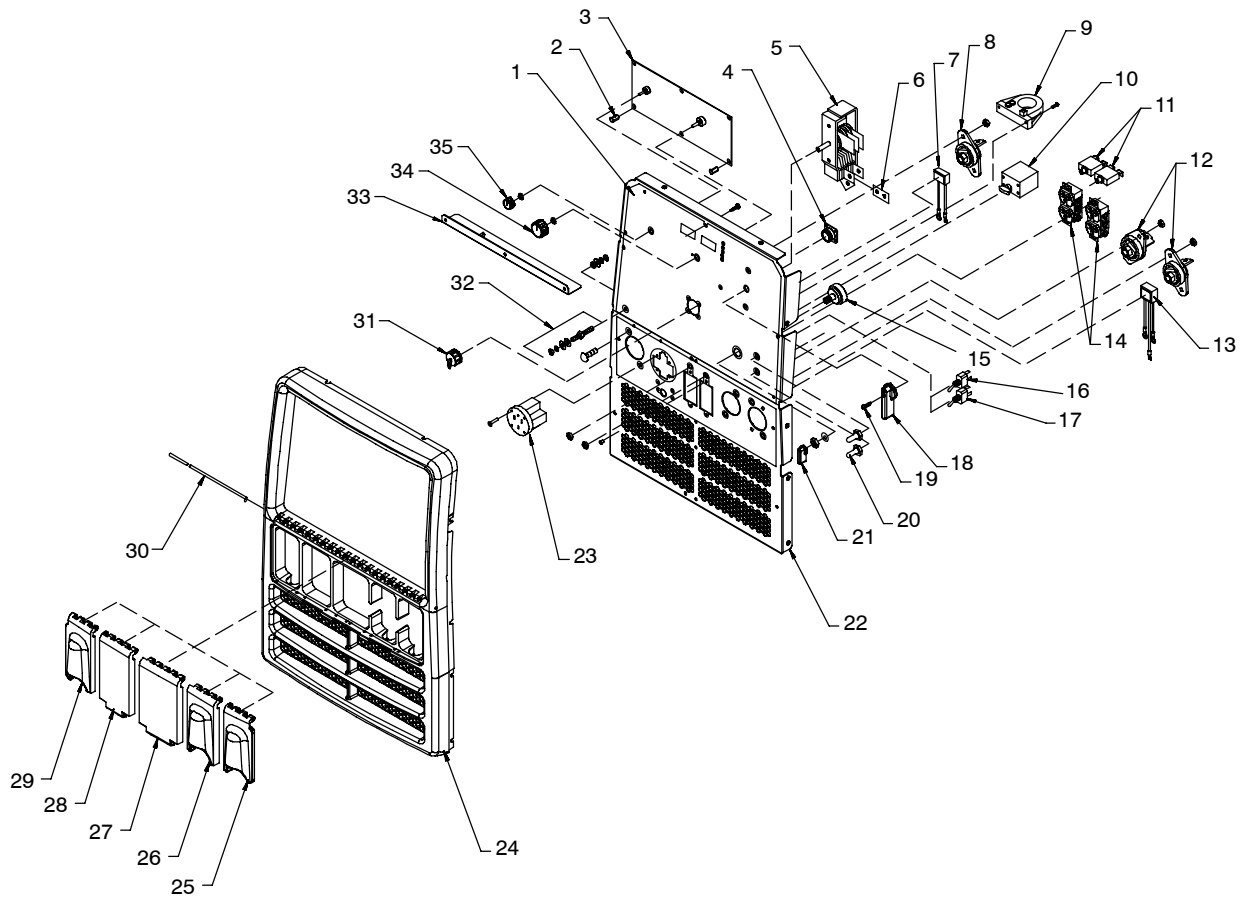


Figure 14-3. Panel, Front w/Components

804 202-A

Eff w/LF314257 And Following

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 14-3. Panel, Front w/Components (Figure 14-1 Item 69)				
1			Nameplate (Order By Model & Serial Number)	1
2		190512	Stand-off, No 6-32 X .640 Lg .250 Hex Al Fem	2
3	PC2	223904	Circuit Card Assy, Control (includes)	1
		221479	Shield, PCB Protective Anti Static 4.813x12.750	1
4	RC4	134735	Conn, Circ Ms/Cpc 14skt Size 20 Rcpt Panel Pushin	1
5	S1	224230	Switch, Changeover	1
6		086075	Bus Bar	1
7	C49	222064	Capacitor, Polye Met Film .1 Uf 500 Vdc 10%	1
8	WORK	099255	Terminal, Pwr Output Neutral	1
9	LEM	168829	Transducer, Current 1000a Module Max Open Loop	1
10	CB1	218591	Supplementary Protector, Man Reset 2p 50a 240vac	1
11	CB2, CB3	093996	Supplementary Pro, Man Reset 1p 20a 250vac Frict	2
12	CC, CV	099255	Terminal, Pwr Output Neutral	2
13	C48	222065	Capacitor Module, Polye Met Film .1 Uf 500 Vdc 10%	1
14	RC2, RC3	222091	Rcpt, Str Dx Grd 2p3w 20a 125v *5-20r	2
14	GFCI2, GFCI3	222093	Rcpt, Str Dx Grd 2p3w 20a 125v GFCI	2
	C45, C46	222074	Capacitor, Cer Disc .0047 Uf 3000 Vdc W/Terms	2
15	S2	217680	Switch, Ignition 4 Position W/Out Handle	1
16	S7	011609	Switch, Tgl Spdt 15a 125vac On-none-on Spd Term Chr	1
17	S6	021467	Switch, Tgl Spst 3a 250v Off-none-(On) Spd Term	1
18		218606	Handle, Switch Range	1
19		220804	Screw, 010-32x .50 Btn Hd-soc Stl Pld Patch	1
20		021385	Boot, Toggle Switch Lever	2
21		207073	Lever, Ignition Switch	1
22		212977	Panel, Front	1
23	RC1	182954	Rcpt, Str 3p4w 50a 125/250v Flush Mtg *14-50	1
		215987	Bezel Assy (Includes)	1
24		211416	Bezel,	1
25		216775	Cover, Output Stud Wire	1
26		213914	Cover, Output Stud Stick/Tig	1
27		216773	Cover, Receptacle Duplex 120v	1
28		216774	Cover, Receptacle Full Kva 120/240v	1
29		216772	Cover, Output Stud Work	1
30		211405	Pin, Hinge	1
31		170391	Conn, Circ Ms Protective Cap Size 20 Nylon	1
32		197203	Grounding Stud Assy, Brass (includes)	1
		083030	Stud, Brs .250-20 X 1.750 W/Hex Collar	1
		010915	Washer, Flat .257idx0.640odx.031t Brs	1
		602208	Washer, Tooth .256idx0.510odx.028t Stl Pld Ext.250 A	1
		163167	Washer, Lock .254idx0.489odx.062t Sst Split.250	1
		601836	Nut, 250-20 .50hex .19h Brs	2
33		223197	Baffle, Stab	1
34		207075	Knob, Pointer 1.625 Dia.	1
35		207080	Knob, Pointer 1.125 Dia.	1

◆ Optional

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

Eff w/LF314257 And Following

Note

Some wiring harness components (switches, relays, circuit breakers) are also referenced elsewhere in this parts list. Purchase components separately or as part of the associated wiring harness.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Wiring Harnesses				
		223562	Harness, Wrg Engine (includes)	1
	CR3	197325	Relay, Encl 12vdc Spst 70a 4pin Flange Mtg	1
	CB7	190374	Circuit Breaker, Auto Reset 12vdc 40 Amp	1
	CB8	205927	Circuit Breaker, Auto Reset 12vdc 12 Amp	1
	PLG36	092670	Conn, Rect Univ 084 3p/S 1row Plug Cable Lkg	2
	PLG39	092670	Conn, Rect Univ 084 3p/S 1row Plug Cable Lkg	2
		192167	Seal, Wire Univ 3p/S 1row	2
	PLG5	135134	Conn, Rect Univ 084 9p/S 3row Plug Cable Lkg	1
		187651	Seal, Wire Univ 9p/S 3row	1
	PLG38	192170	Conn, Rect 250 2skt 2row Plug Cable Lkg	1
		224070	Harness, Remote Control 14Pin (includes)	1
	RC 4	134735	Conn, Circ Ms/Cpc 14skt Size 20 Rcpt Panel Pushin	1
	PLG 14	224085	Conn, Rect Mini 045 8skt 2row Plug Cable Lkg+Skts (Service Kit)	1
	CB 4	083432	Supplementary Pro, Man Reset 1p 10a 250vac Frict	1
		227089	Harness, Wrg Unit (includes)	1
	PLG 27	176121	Conn, Rect Univ 084 2p/S 1row Plug Cable Lkg	1
	PLG 25	114063	Conn, Rect Univ 084 4p/S 1row Plug Cable Lkg	1
	PLG 31	114063	Conn, Rect Univ 084 4p/S 1row Plug Cable Lkg	1
	PLG 26	066104	Conn, Rect Univ 084 6p/S 3row Plug Cable Lkg	1
	PLG17, PLG23	224089	Conn, Rect Univ 039 2p/S 1row Plug Cable & Sec Lkg+Skts (Service Kit)	2
	PLG 21	224086	Conn, Rect Univ 039 10p/S 2row Plug Cable & Sec Lkg+Skts (Service Kit)	1
	PLG 16	224087	Conn, Rect Univ 039 12p/S 2row Plug Cable & Sec Lkg+Skts (Service Kit)	1
	PLG22	224090	Conn, Rect Univ 039 3p/S 1row Plug Cable & Sec Lkg+Skts (Service Kit)	1
	CR1	173069	Relay, Encl 12vdc Spdt 30a/20a 5pin Flange Mtg	2
	CR2	173069	Relay, Encl 12vdc Spdt 30a/20a 5pin Flange Mtg	2
	SR2	035704	Rectifier, Integ Bridge 40. Amp 800v (Eff w/LG095181)	1
	RC5	135133	Conn, Rect Univ 084 9p/S 3row Rcpt Cable/Panel Lkg	1
	S6	021467	Switch, Tgl Spst 3a 250v Off-none-(On) Spd Term	1
	S7	011609	Switch, Tgl Spdt 15a 125vac On-none-on Spd Term Chr	1
	PLG24	223589	Conn, Rect Univ 039 14p/S 2row Plug Cable & Sec Lkg	1
	PLG15	223587	Conn, Rect Univ 039 10p/S 2row Plug Cable & Sec Lkg	1
		202660	Conn, Push 4 Wire 12-16strnd 12-18sld 16-22tinstrnd	1
	PLG8	177859	Conn, Body 5 Terminal	1
		187651	Seal, Wire Univ 9p/S 3row	1
		224088	Housing Plug+Skts, (Service Kit)	0
		224086	Housing Plug+Skts, (Service Kit)	0
		168071	Housing Plug Pins+Skts, (Service Kit)	0
		224209	Plugs, w/Leads (includes)	1
	PLG 6	113750	Conn, Rect Mini 045 4skt 2row Plug Cable Lkg	1
	PLG13	223592	Conn, Rect Univ 039 4p/S 2row Plug Cable & Sec Lkg	1
	PLG5	135556	Plug, Engine	1

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