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# McGRAW-EDISON

# **Operators Manual**

# 200 Portaweld®



DJB Welder

- Diesel Driven Welder
- Two Cylinder Air Cooled



967-0153 SPEC T 10-81 Printed in U.S.A.

# **Safety Precautions**

ALWAYS USE PRECAUTIONARY MEASURES DUR-ING ARC WELDING OPERATIONS TO ENSURE MAXIMUM PERSONAL SAFETY AND THE SAFETY OF NEARBY PERSONNEL.

WARNING

This symbol is used throughout this manual to warn of ,

possible serious personal injury.

CAUTION

# This symbol refers to possible equipment damage.

• Operate and Maintain The Machine And Its Equipment Properly.

Do not overload the cables. Do not use worn or poorly connecting cables. Do not allow the welding cables to contact hot metal, water, oil or grease. Prevent cables from becoming a stumbling hazard by keeping them in order and out of the way.

Use electrode holders that are completely insulated. Do not use holders with defective jaws.

Do not use the welder without grounding the frame or the case. Do not ground to pipelines carrying gases of flammable liquids. Be sure the conductors can safely carry the grounding current.

Keep all connections clean and tight.

Do not use an electric welder on an engine unless both the engine's battery cables and alternator wires are disconnected.

• Take Precautions Against Electric Shock.

NEVER work in a damp area without suitable insulation against shock.

NEVER stand in water or on a wet floor or use wet gloves when welding.

ALWAYS dry out the work pieces or bench if there is any evidence of moisture.

OPEN power circuits before inspecting machines.

ALWAYS turn off the machine when leaving the work.

#### • Do Not Weld Near Flammable Materials.

NEVER weld in or near EXPLOSIVE AT-MOSPHERES.

Clean any container that has held combustible or flammable materials by approved or prescribed methods. A very small amount of residual gas or liquid can cause a serious explosion. When the contacts of the container is unknown, use an explosimeter.

Use carbon dioxide or nitrogen to ventilate a container. NEVER USE OXYGEN.

When the container has held a gas or liquid that readily dissolves in water, perform the following:

- 1. Flush the container several times with water and a wetting agent (e.g., a low powered detergent). Then, fill with as much water as the work permits.
- 2. Provide a vent or opening in the container to allow the release of air pressure.

When the container has held a gas or liquid that does not readily dissolve in water, proceed as follows:

- 1. Clean the container with steam or a cleaning agent and purge all air with a gas such as carbon dioxide or nitrogen.
- 2. Use steam to clean out light material.
- 3. To clean out heavy grease or oil, use a strong caustic soda solution.
- 4. Before welding on the container, PURGE ALL AIR with a gas such as carbon dioxide or nitrogen.

Wear goggles and gloves when cleaning with steam or caustic soda.

Always clean the container in a well ventilated area, away from any open flame.

When scraping or hammering heavy sludge or scale, use a WET, spark resistant tool.

Always keep head and arms as far away from the work as possible.

- Never Weld On Hollow (Cored) Castings That Have Not Been Properly Vented.
- Never Pick Up Hot Metal With Bare Hands.
- Do Not Weld In Confined Areas Without Adequate Ventilation.
- Never Wear Frayed, Flammable Or Otherwise Inadequate Clothing When Welding. Keep Clothing Dry.

Avoid wearing light colored or open shirts that allow arc rays to penetrate and expose parts of the body to ultra-violet rays. Do not wear flammable cotton fabrics when arc welding. Wear heavy shoes, tightly laced.

To prevent severe burns from splatter and molten metal, wear leather or asbestos gloves at all times protecting the hand and wrists. When welding in vertical and overhead positions, wear ear shields under helmet and leather sleevelets, apron, and leggings.

# Use Eye Protection At All Times.

ALWAYS wear safety goggles under the welding helmet. Keep the helmet, hand shields, and face shield in good condition. Replace defective equipment.

All arc welding produces intense ultra-violet and infra-red radiation. When welding in open areas, provide portable nonreflecting screens to protect nearby personnel from arc rays.

- Do Not Work On This Equipment When Mentally Or Physically Fatigued.
- If the unit is mounted with wheels and is portable, chock the wheels before use to prevent movement from vibration.

WARNING

# ENGINE EXHAUST GAS (CARBON MONOXIDE) IS DEADLY!

Carbon monoxide is an odorless, colorless gas formed by incomplete combustion of hydrocarbon fuels. Carbon monoxide is a dangerous gas that can cause unconsciousness and is potentially lethal. Some of the symptoms or signs of carbon monoxide inhalation are:

- Dizziness
- Intense Headache
- Weakness and Sleepiness
- Vomiting
- Muscular Twitching
- Throbbing in Temples

If you experience any of the above symptoms, get out into fresh air immediately.

The best protection against carbon monoxide inhalation is proper installation and regular, frequent inspections of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired by a competent mechanic.

# Table of Contents

· · · ·			•	
TITLE	•		ΡΑ	GE
SAFETY PRECAUTIONS				
TABLE OF CONTENTS				1
GENERAL INFORMATION				2
About This Manual				2
When Service Is Needed				2
SPECIFICATIONS				3
INSTALLATION			•••••	4
OPERATION				5
Initial Start	•••••••••••••••••••••••••••••••••••••••	••••••••••••••••	•••••	5
Starting	• • • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • • •	•••••	· 5 E
Stanning	••••••••••••••••••	••••••••••••••••••••••••••••••••••••••	••••••••••••••	5
Wolder Operation	• • • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • •	•••••	0
	• • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • •	••••	6
	• • • • • • • • • • • • • • • • • • • •	•••••••••••••••••	•••••	9
General Operating Recommendations	* • • • • • • • • • • • • • • • •	••••••••••••••	•••••	. 9
	•••••••••••••••••	• • • • • • • • • • • • • • • • •	•••••	10
MAINTENANCE		• • • • • • • • • • • • • • • • • • •	•••••	11
Maintenance Table	• • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • • •	•••••	11
Lubrication System	• • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • •	12
Fuel Recommendations		••••••	• • • • • • • • • • • • • • •	12
Fuel Filters				13
Safe Operation Inspection	••••••		•••••	13
Battery				13
Fuel Pump Sediment Bowl		* • • * • • • • • • • • • • • • • • • •		13
Crankcase Breather				14
Air Cleaner				14
ADJUSTMENTS		••••••		15
Governor				15
Troubleshooting				16
-				

# **ABOUT THIS MANUAL**

This manual provides complete information for operating, maintaining, and making adjustments to your Onan welder. Study this manual carefully and observe all warnings and cautions. Using your welder properly and following a regular maintenance program can result in longer unit life, better performance, and safer operation.

# WHEN SERVICE IS NEEDED

When your welder requires servicing, contact your Onan dealer or distributor for assistance. Onan's factory trained Parts and Service representatives are located throughout the United States and Canada and are ready to handle all your service needs.

When contacting your Onan Dealer or Distributor, always supply the complete Model and Spec No. and Serial No. as shown on the set nameplate. This information is necessary to identify the welder from among the many types of sets manufactured by Onan. Electrical characteristics are shown on the lower portion of the nameplate.



WARNING

ONAN RECOMMENDS THAT ALL SERVICE INCLUDING INSTALLATION OF REPLACEMENT PARTS ONLY BE DONE BY PERSONS QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE. TO PREVENT POSSIBLE INJURY AND/OR EQUIPMENT DAMAGE IT IS IMPERATIVE THAT THE SERVICE PERSON BE QUALIFIED.



# **Specifications**

# **DJB 200 PORTAWELD**

GENERAL	
Height	
Width	
Length	
Weight	600 pounds (272 kg)
ENGINE DETAILS	
Number of Cylinders (Vertical Inline)	
Displacement	
Compression Ratio	19 to 1
Engine Speed	•
Welder Operation	2400 r/min
AC Operation (60 Hz)	
GENERATOR DETAILS	
Welding Range at 28 Volts	
AC Output	
50 Hz	
60 Hz	3.5 kW
CAPACITIES AND REQUIREMENTS	
Fuel	No. 2-D Diesel Fuel
Fuel Tank Capacity	
Oil Capacity (With Filter)	
Starting System Voltage	
Battery Requirements	· · · · · · · · · · · · · · · · · · ·
SAE Group	······
Amp Hour Cap (20 hour rate)	
Battery Voltage	
Quantity Required	

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# Installation

## GENERAL

The Onan 200 Portaweld welder is primarily designed for outdoor applications where the exhaust gases and engine waste heat can be discharged directly into the open air. Do not operate the welder near an open window, door, air intake, or any other place where exhaust gases may enter the interior of a building. If it is necessary to install the welder in an enclosure or a mobile application, refer to the following sections for general installation recommendations.

Proper installation increases welder life, decreases operating costs, and reduces the frequency of necessary repairs. Plan installations carefully to ensure best welder performance and safety.

### VENTILATION

Welders generate considerable heat during operation. If operating welder in any small enclosure, provide separate, unobstructed air inlet and outlet openings (minimum area of 3-1/2 square feet [3252 cm<sup>2</sup>] each). Locate the inlet opening as close to the front of the engine as possible and provide an outlet opening toward the generator end somewhat higher than the inlet opening.

### EXHAUST

Pipe all exhaust gases to the outside if installing the generator in an enclosure. When mounting an extension exhaust pipe to the engine, use a piece of flexible tubing between the extension and the engine. Fit the muffler to the outer end of the exhaust pipe.

**WARNING** Check exhaust system frequently for leaks. Be sure poisonous exhaust gases are piped to outside. Inhalation of exhaust gases can result in serious personal injury or death.

Never operate the welder inside a building or confined area without piping exhaust gases outside the enclosure.

# **MOBILE MOUNTING**

When the welder is mobile mounted, extra vehicle floor support may be necessary to prevent the welder mounting bolts from disengaging because of rough roads, turning sharp corners, etc. Use pipe clamps or U-bolts to secure the welder frame to the floor. For servicing convenience (especially when draining the oil), elevate the welder above the vehicle floor. Maximum operation angle of the unit is 15 degrees sideways, 30 degrees front-to-rear.

## **BATTERY CONNECTIONS**

Connect battery cable marked POS. to the battery positive (+) terminal (Figure 1). Connect unmarked cable to the battery negative (-) terminal. Always keep cable connections tight and clean.





# Operation

# **INITIAL START**

Fill the engine crankcase with oil and the fuel tank with fuel before attempting to operate the welder. Refer to the MAINTENANCE section for the lubricating oil and fuel recommendations. In addition. inspect new units for loose, missing, or damaged parts and correct as required.

After filling the fuel tank, prime the fuel system as follows:

1. Disconnect the fuel return line as shown in Figure 2.

DO NOT SMOKE while hand-WARNING ling fuel. Diesel fuel is flammable.

2. Operate the hand priming lever on the fuel transfer pump until there are no air bubbles in the fuel flowing from the return line fitting. When finished, return priming lever inward (disengaged position) to permit normal pump operation.

If priming lever does not engage pump, crank the engine one revolution to permit pump operation.

Reconnect the fuel return line.

The engine may produce heavy exhaust smoke when first started. This is normal and is caused by the rust inhibitor oil used by the factory.

WORK TRANSFER PUMP PRIMING LEVER UNTIL FUEL FLOWS FROM RETURN LINE FITTING OF INJECTION PUMP



FIGURE 2. BLEEDING FUEL SYSTEM

# STARTING

Preheating for 60 seconds is recommended for temperatures of 55°F (13°C) or lower, and 30 seconds for temperatures above 55°F (13°C). Remove all loads before starting.

Do not use ether as a cold weather WARNING starting aid. The heat from the glow plugs or manifold heater may cause a sudden ignition of the ether vapor. This can result in personal injury and damage to the engine.

- 1. Engage PREHEAT switch for recommended time interval (see Figure 3).
- 2. Engage START switch and hold until engine comes up to speed. Release START and PRE-HEAT switches after the engine starts.
- 3. If engine fails to start after 15-20 seconds, repeat steps 1 & 2 above. Absence of blue/white exhaust smoke during cranking indicates no fuel being delivered. Determine cause.
- 4. In extreme cold it may be necessary to maintain preheating up to 2 minutes AFTER the engine starts to obtain firing or to smooth out all cylinders, especially at no load or light loads.

Do not exceed the one minute pre-CAUTION heat period prior to cranking to prevent heater burn out and conserve the battery. Longer preheating time prior to cranking the engine can ruin the manifold heater and glow plugs because there is no incoming air flow to cool them. After start-up, additional operation of the preheaters is acceptable when used to prevent misfiring.



FIGURE 3. STARTING

## **Oil Pressure**

Check the engine oil pressure following start-up. Normal operating oil pressure is 20-35 psi (138-242 kPa). Pressure is higher until the engine warms up.

# STOPPING

Before stopping the engine, place the speed control lever in the POWER position and allow the engine to run at the lower speed for at least 30 seconds. If the engine speed control lever remains in the WELD position when the engine is stopped, restarting the engine may be difficult.

Disconnect any loads before stopping the unit. Hold the injection pump lever in the up position (see Figure 4) to stop.



FIGURE 4. WELDER STOP LEVER

# WELDER OPERATION

The following sections cover operation of the welder. The operator must be familiar with standard welding practices and procedures before attempting to use the welder.

#### **Duty Cycle**

If the welder is operated at current levels greater than 140 amperes, it must be run at no-load for short periods of time to allow for cooling. The amount of noload time required is dependent on the current being used. Figure 5 shows the percentage of no-load time required for each 10 minutes of operation at various current levels.



At 200 amperes rated load, the no-welding time must be at least one-half (50%) of each 10-minute operating period. As the welding load is reduced, longer welding time is permissible because less no-welding load time is required for the welder to cool. Any extreme ambient temperatures must also be taken into consideration. Continuous welding is permissible at 140 amperes or less.

#### Welding Cable Connections

Insert welding cables into the main current amperage jack receptacles (Figure 6) according to the welding requirements. Some welding jobs may require frequent polarity changing to permit using various types of welding rod.

**Straight Polarity Welding:** Connect the electrode cable to the negative (NEG.) jack receptacle. Connect the ground cable to the desired amperage jack receptacle.

**Reverse Polarity Welding:** Connect the ground cable at the negative (NEG.) jack receptacle. Connect the electrode cable to the desired amperage jack receptacle.



FIGURE 6. MAIN CURRENT WELDING JACK RECEPTACLES

#### Electrodes

All 1/16-inch through 5/32-inch electrodes can be used. Positive and negative 3/16-inch electrodes which do not exceed the welder capacity can also be used.

#### **Welders In Parallel**

Two welders can be connected in parallel if the welding amperage requirements are greater than those provided by one welder (see Figure 7).

- 1. Start both engines before connecting the cables to parallel the welders.
  - a. Adjust engines to same no-load speed. Use a tachometer or voltmeter for this adjustment.

CAUTION { If the welders are not adjusted to the same speed, the output will not double the current jack rating.

- After engines are operating at the same speed, connect the paralleling cables to the proper jacks.
- 2. Determine welding current requirements. Select IDENTICAL current jack receptacles on each welder which total the ampere requirement.

EXAMPLE: If 300 amperes are required, select the 160 ampere receptacle on each welder. It may be necessary to select currents which total slightly higher than the welding requirements to obtain proper welding characteristics. This is due to voltage and current differences which occur when welders are connected in parallel and not running at the same speed.

Proper current can be obtained using the fine current control adjustment. Adjust to approximately the same setting on both welders.



FIGURE 7. CONNECTIONS FOR WELDING IN PARALLEL

- 3. Large welding cables must be used because of the higher current. Consult your dealer, if in doubt, as to the welding cable size required.
  - a. Connect a cable between the preselected IDENTICAL current jack receptacles of the welders. This cable (Figure 7) must have some means of attaching a second cable by splicing, clamping, etc., which will ensure a tight connection.
  - b. Connect another cable (equal size and length) to the Negative jack receptacle of only one welder. DO NOT complete connection to NEG jack receptacle of second welder until both welders are running.

**CAUTION** CAUTION CONTROL DO not attempt to parallel the welder's AC output. Serious control and welder damage will result.

#### Welding Current Adjustment

Welders have an engine speed control lever and a fine current adjustment control (Figure 8).

When the engine speed control lever is in the WELD position, AC output is cut off and only welding current is available. When the lever is in the POWER position, welding current is by-passed and only AC output is available.

The jack receptacle type main current control connects various resistance units into the welding circuit, limiting the amount of current at each jack receptacle. The fine current control provides for further adjustment between the jack receptacles of the main control. CAUTION }

NEVER WELD WITH ENGINE AND CONTROL COVER REMOVED!

Considerable heat is generated by the resistance units inside the welder control box. Always keep the engine and control cover installed on the unit to properly direct cooling air to the control box.

- 1. Plug cables into proper jack receptacles to obtain the amperage recommended for the electrode used.
- Set fine current control at its approximate center position (midway between minimum and maximum). Try the welding characteristics, making fine current adjustments as necessary.

Fine current control range is greater than the current spread of the main current control jack receptacles. If perfect arc conditions are not obtained by normal procedure, try the next higher or lower jack receptacle connections and re-adjust the fine current control to compensate.

3. When operating welders in parallel (see WELDERS IN PARALLEL), always have both ends of the connection cables plugged into identical jack receptacles on each welder. If an amperage connection change is made on one welder, immediately connect the other end of the connecting cable to the same jack receptacle on the second welder.

If welding current cannot be adjusted satisfactorily, check for poor electrical contact of cable connections at welder, ground clamp, or electrode clamp.



FIGURE 8. WELDER CONTROL

### AC OPERATION

Move the speed control lever to the POWER position (1800 rpm on 60 hertz models or 1500 rpm on 50 hertz models). This bypasses welding current control and supplies 120 (or 240) volts to the output receptacles. Limit AC loads to not more than 3500 watts, 60 hertz, or 2500 watts, 50 hertz.

#### Grounding

For AC operation, the Onan 200 Portaweld welder has all non-current carrying metal parts electrically bonded and solidly connected to the generator neutral to meet National Electric Code requirements for AC generator sets. Local officials enforcing codes may require that the welder frame be electrically connected to a grounding electrode (water pipe, earth-driven grounding rod, etc.) during AC operation. Onan has provided a lug (Figure 8) for connecting the welder to a grounding electrode conductor if required.

**WARNING** A potentially lethal electric shock hazard exists if faulty electrical equipment is connected to the generator set. Check all electrical equipment for frayed cords or breaks in the insulation before using.

Properly maintain all AC equipment used with the Onan welder. As a minimum measure of protection, use only 3-wire or double insulated equipment. All 3-wire equipment must be used only with properly maintained 3-wire extension cords. Additional backup protection (in case of a faulty equipment grounding wire or flawed insulation) can be provided by Ground Fault Circuit Interrupters (GFCI's). Onan recommends that where moisture or faulty cord-andplug equipment may represent a hazard, GFCI's be used in addition to (but not instead of) the protection provided by 3-wire equipment or double insulation.

### **OPERATING RECOMMENDATIONS**

The following sections provide guidelines for breakin, severe environment operation, and extended storage.

#### Break-In

A disciplined break-in procedure using the proper oil and employing a routine maintenance schedule helps to ensure satisfactory welder service. Initial welder operation should be as follows:

- 1. One-half hour at 1/2 load (100 amps). .
- 2. One-half hour at 3/4 load (150 amps).
- 3. Change crankcase oil after the first 50 hours of operation.

The welder is designed to operate with a load applied. When possible, avoid running the welder for extended periods of time without a load, especially during the first 50 hours of operation.

The valve lash should be adjusted after the first 50 hours of operation on new engines. Contact an authorized service center for assistance.

#### **Exercise Periods**

Infrequent use results in hard starting. Operate welder for at least a half hour each week. Run longer if battery needs charging.

# High/Low Operating

#### Temperatures

The welder has been designed to operate satisfactorily in both high (above 100° F/38° C) and low (below 0° F/-18° C) temperatures. Use the oil recommended in the MAINTENANCE section for the expected temperature conditions.

#### High Temperatures:

- 1. See'that nothing obstructs air flow to and from the set.
- 2. Keep cooling fins clean. Cylinder air housings should be properly installed and undamaged.

#### Low Temperatures:

- 1. Use correct oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move the welder to a warm location or apply flameless heat externally until oil flows freely.
- Preheat for 1 minute if the temperature is 32 to 50°F (0 to 10°C). If engine fails to start after cranking for 1 minute, preheat for 1 minute more and re-attempt the start.
- 3. Use fresh fuel. Protect against moisture condensation.
- 4. Keep battery in a well charged condition.

### **Dusty or Dirty Conditions**

- 1. Keep welder clean. Keep cooling fins free of dirt, etc.
- 2. Service air cleaner as frequently as necessary.
- 3. Change crankcase oil every 50 operating hours or less.
- 4. Keep oil and fuel in approved dust-tight containers.
- 5. Keep governor linkage clean.

#### **High Altitude Operation**

Maximum power is reduced about 4 percent for each 1000 feet (310 m) above sea level after the first 1000 feet. Thus, at an altitude of 5000 feet (1550 m), the welder will deliver a maximum current of 160 amperes.

#### **Out-Of-Service Protection**

Protect a welder that will be out-of-service for more than 30 days as follows:

- 1. Run until thoroughly warm and then shut down.
- 2. Disconnect battery and follow standard battery storage procedure.
- 3. Drain oil from oil base while still warm. Refill and attach a tag stating oil viscosity used.
- 4. Remove glow plugs. Inject two squirts of rust inhibitor (or SAE 10 oil) into each cylinder. Crank engine over several times. Reinstall glow plugs.
- 5. Service air cleaner. See MAINTENANCE section.
- 6. Clean governor linkage and protect by wrapping with a clean cloth.
- Plug exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
- 8. Remove access panels and clean all cooling surfaces.
- 9. Wipe entire unit. Coat rustable parts with a light film of grease or oil.
- 10. Provide a suitable cover for the entire unit.

#### **Returning Unit To Service:**

- 1. Remove cover from unit and all protective wrapping.
- 2. Check tag on oil base and verify that oil viscosity is still correct for existing ambient temperatures.
- 3. Clean and check battery. Measure specific gravity (1.260 at 77°F [25°C] and verify level to be at split ring. If specific gravity is low, charge until correct value is obtained. If the level is low, add distilled water and charge until specific gravity is correct. DO NOT OVERCHARGE.

# **WARNING** Do not smoke while servicing batteries. Explosive gases are emitted from batteries in operation. Ignition of gases can cause severe personal injury.

- 4. Check that fuel filter and fuel lines are secure, with no leaks.
- 5. Connect battery. Connect ground lead last.
- 6. Be sure no load is connected to the welder.
- 7. Start engine.

# **MICRO SWITCH TROUBLESHOOTING**

The engine speed control lever governs micro switch . operation. If the micro switch becomes stuck or otherwise inoperative, welder operation is vitally affected. If the welder develops any of the following problems, the micro switch is probably defective and should be replaced. Contact an Onan Dealer or Distributor for service.

- If the micro switch DC contacts remain closed when the speed control lever is in the WELD position, welder voltage at no-load increases from a normal 60 volts (approximate) to 80 volts. At heavy welding load, speed drops excessively and appears to lack power.
- 2. If the micro switch DC contacts remain open when the speed control lever is in the POWER position, AC voltage is low, with similar low power performance.
- 3. If the micro switch AC contacts fail to close with the speed control lever in the POWER position, no AC output is available.
- 4. If the micro switch AC contacts remain closed with the speed control lever in the WELD position, AC output voltage is excessively high, and any AC load connected is damaged.

# Maintenance

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the welder. The time intervals shown in the *Periodic Maintenance Schedule* should be used as a guide for regular maintenance. However, actual operating conditions should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions or hot and cold temperature extremes, the maintenance time intervals must be reduced. Use the table to determine the maintenance required and then refer to the sections that follow for the correct service procedures.

# PERIODIC MAINTENANCE SCHEDULE

		·												
WARNING Always allow welder to cool	SERVICE TIME													
maintenance. Working on a hot unit could cause severe burns.	8 Hours	50 Hours	100 Hours	200 Hours	500 Hours	600 Hours	2000 Hours	3000 Hours						
SERVICE THESE ITEMS														
Inspect Welder	<b>X</b> <sup>1</sup>													
Check Fuel Level	X													
Check Oil Level	x													
Service Air Cleaner		X <sup>2</sup>												
Change Crankcase Oil			X <sup>2</sup>											
Clean Crankcase Breather Tube				X <sup>4</sup>										
Clean Crankcase Breather				x										
Change Oil Filter				×			•							
Check Battery Water Level				x										
Clean Sediment Bowl				X <sup>3</sup>										
Check Valve Lash					X4									
Clean Oil Holes In Valve Cover				-	X4									
Replace Primary Fuel Filter					•.	<b>X</b> .								
Check Nozzle Opening Pressure							X <sup>5</sup>							
Clean Welder							х							
Replace Secondary Fuel Filter								х						

1 - See Safe Operation Inspection section for procedure.

2 - Perform more often in extremely dusty conditions.

3 - Water or foreign material in fuel can ruin the injection system. If daily inspection shows water or excessive dirt in sediment bowl, fuel handling and storing facilities should be checked and situation corrected. Primary and secondary fuel filters can be replaced following correction of fuel contamination problem.

4 - This service should be performed by an Onan Dealer or Distributor.

5 - This service must be conducted by trained diesel injection equipment personnel with suitable test facilities. Omit this service until these conditions can be met.

# LUBRICATION SYSTEM

The following sections cover crankcase oil recommendations, checking the oil level, and changing the oil and oil filter.

#### **Crankcase Oil**

Use an oil with the API classification CD/SE (all grades) or CC/SE (10W-30, 10W-40, or 5W-30). However, to reduce oil consumption to a normal level in the shortest time possible on a new or rebuilt engine, use CC oil for the first fill only (50 hours). Refer to the chart below for the recommended viscosity.



Multi-grade oils should not be used when ambient temperatures are warmer than approximately  $32^{\circ}$  F (0° C). Use only specified single-grade oils (SAE 20W-20 is an exception and should be used).

When adding oil between oil changes, it is preferable to use the same brand, as various brands of oil may not be compatible together. Refer to the Periodic Maintenance Schedule for recommended oil change intervals.

#### Oil Level Check

Check the oil level indicator after every 8 hours of operation and maintain the oil level at the full mark (Figure 9). Refer to the *SPECIFICATIONS* section for crankcase and filter capacity.



### **Oil Change**

Stop the engine and drain the crankcase oil while the engine is still hot. Place a pan under the drain outlet and remove the oil drain plug or open the oil drain valve. After the oil is completely drained, replace the drain plug or close the drain valve. Refill with oil of the correct API designation and the appropriate SAE viscosity grade for the temperature conditions. **WARNING** Hot crankcase oil can cause burns if it is spilled or splashed on skin. Keep fingers and hands clear when removing the oil drain plug and wear protective clothing.



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FIGURE 9. OIL LEVEL INDICATOR

#### **Oil Filter Change**

Place pan under old filter and remove by turning counterclockwise. Clean filter mounting area. Install new filter, oil filter gasket and turn filter clockwise until gasket touches mounting base, then tighten 1/2 turn.

# FUEL RECOMMENDATIONS

Use ASTM 2-D or 1-D fuel with a minimum Cetane number of 45\*. Number 2 diesel fuel gives the best economy for most operating conditions; however, use ASTM 1-D fuel during the following conditions:

- 1. When ambient temperatures are below 32°F (0°C).
- 2. During long periods of light engine load; or no load.

\*NOTE: Fuels with Cetane numbers higher than 45 may be needed in higher altitudes or when extremely low ambient temperatures are encountered to prevent misfires and resultant excessive smoke.

WARNING

DO NOT SMOKE while handling fuel. Diesel fuel is flammable.

Use low sulfur content fuel having a pour point (ability to filter) of at least  $10^{\circ}$  F ( $6^{\circ}$  C) below the lowest expected temperature. Keep the fuel clean and protected from adverse weather. Leave some room for expansion when filling the fuel tank.

**CAUTION** Due to the precise tolerances of diesel injection systems, it is extremely important the fuel be kept clean. Dirt in the system can cause severe damage to both the injection pump and the injection nozzles.

# **FUEL FILTERS**

Change primary fuel filter after every 600 hours of operation. Change secondary fuel filter after every 3000 hours of operation. See Figure 10.

Drain plug on fuel filters can tolerate CAUTION only a limited amount of torque. Use two wrenches in combination for breaking plug loose and for final tightening.



#### FIGURE 10. FUEL FILTERS

# SAFE OPERATION INSPECTION

Be alert for mechanical problems that could create unsafe or hazardous conditions. The following sections cover several areas that should be frequently inspected to insure continued safe operation.

Exhaust System: With the welder operating, audibly and visually inspect the entire exhaust system including the exhaust manifold and muffler.

Check for leaks at all connections, welds, gaskets, and joints and also make sure that exhaust pipes are not heating surrounding areas excessively. If any leaks are detected, have them corrected immediately.

WARNING

Check exhaust system frequently for leaks. Be sure poisonous exhaust gases are piped to outside. Inhalation of exhaust gases can result in serious personal injury or death.

Fuel System: With the welder operating, inspect the fuel supply lines, return lines, filters, and fittings for leaks. Check any flexible sections for cuts, cracks and abrasions and make sure they are not rubbing against anything that could cause breakage. If any leaks are detected, have them corrected immediately.

DC Electrical System: Check the terminals on the battery for clean and tight connections. Loose or corroded connections create resistance which can hinder starting. Clean and reconnect the battery cables if loose. Always connect the negative battery cable last to reduce the possibility of arcing.

Batteries emit hydrogen, a highly WARNING explosive gas. Do not smoke or create electrical sparks while servicing a battery to prevent a possible explosion.

Mechanical: With the welder stopped, check for loose fittings, leaking gaskets, or any signs of mechanical damage. If any problems are found, have them corrected immediately. With the set running, listen for any unusual noises that may indicate mechanical problems and check the oil pressure frequently. Investigate anything that indicates possible mechanical problems.

## BATTERY

Check the condition of the starting battery at specified intervals. See that connections are clean and tight. A light coating of non-conductive grease will retard corrosion at terminals. Keep the electrolyte at the proper level above the plates by adding distilled water.

### FUEL PUMP SEDIMENT BOWL

After every 200 hours of operation, remove the sediment bowl from the fuel filter body, Figure 11. Clean out any contaminants from sediment bowl. When reinstalling the sediment bowl, make sure that gasket and screen are in place.



FIGURE 11. SEDIMENT BOWL

# **CRANKCASE BREATHER**

After every 200 hours of operation, remove hose clamp, breather hose, breather cap clamp and insulator halves to release breather cap and valve assembly, Figure 12. Wash cap, valve assembly and baffle in suitable solvent. Dry and re-install.

# AIR CLEANER

Allowing the filter element to become plugged with dirt restricts the intake of air and results in reduced engine life. Clean the element and retainer in a petroleum-base solvent, dry and oil as shown in Figure 13.



FIGURE 12. CRANKCASE BREATHER

FIGURE 13. SERVICING AIR CLEANER

# **Adjustments**

### GOVERNOR

The purpose of the engine governor is to maintain a constant engine speed during changes in power demands.

The manual governor control lever has two positions, WELD and POWER. Engine speed is 1800 rpm for POWER operation, 2400 rpm for WELD operation (approximately 1850 and 2450 rpm respectively for no-load operation).

- 1. Move the manual governor control lever to POWER. There should be some slack between the lever and the nuts on the governor adjusting stud. Otherwise, the adjustment for step 2 won't be properly made.
- 2. Engine speed should be approximately 1850 rpm for AC power at no load. If not, loosen the nuts on the end of the governor switch plate, turn clockwise (CW) to increase engine speed and counterclockwise (CCW) to decrease speed.

- 3. After the desired rpm is reached, tighten the two nuts together again.
- 4. Move the manual governor control lever to WELD.
- 5. Engine speed should be approximately 2450 rpm at no load. If not, loosen the two nuts on the end of the governor adjusting stud (or nuts holding end of the manual governor control lever). Turning the nuts CW increases speed, CCW decreases engine speed.
- 6. Check engine speed while welding at maximum current load. Speed should be approximately 100 rpm lower (2350 rpm) than no load.
- 7. For sensitivity adjustment, take a screwdriver and adjust as shown in Figure 14. Adjust the sensitiv-
- ity to attain the smoothest no load to full load operation without causing a hunting condition (engine alternately increases and decreases speed).



#### FIGURE 14. GOVERNOR ADJUSTMENTS

# DIESEL ENGINE TROUBLESHOOTING GUIDE LIQUID OR AIR COOLED

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