



# Installation Manual

## Marine Generator Set

MDKAV (Spec A–C)  
MDKAW (Spec A–C)  
MDKAZ (Spec A–C)  
MDKBD (Spec A–B)  
MDKBE (Spec A–B)  
MDKBF (Spec A–B)  
MDKBG (Spec A–C)



# Table of Contents

---

SECTION	PAGE
TABLE OF CONTENTS .....	I
SAFETY PRECAUTIONS .....	III
GENERAL PRECAUTIONS .....	iii
GENERATOR VOLTAGE IS DEADLY .....	iii
ENGINE EXHAUST IS DEADLY .....	iv
Diesel fuel is combustible .....	iv
BATTERY GAS IS EXPLOSIVE .....	iv
MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY or death .....	iv
SPECIFICATIONS .....	V
INTRODUCTION .....	1
Standards for Safety .....	1
Outline Drawings .....	1
LOCATION AND MOUNTING .....	3
Location .....	3
Mounting .....	3
VENTILATION .....	5
Ventilation .....	5
Carbon Monoxide .....	5
FUEL SUPPLY .....	7
ENGINE COOLING .....	9
Cooling System Overview .....	9
System Components .....	9
Raw Water Pickup Test .....	12
ENGINE EXHAUST .....	13
Wet Exhaust Systems .....	13
Exhaust Water Separator Backflow Test .....	13
Dry Exhaust Systems .....	16
ELECTRICAL CONNECTIONS .....	17
Generator .....	17
Remote Control .....	18

Battery .....	19
DC Grounding .....	19
Fire Suppression System .....	19
FREQUENCY AND VOLTAGE ADJUSTMENTS .....	21
Frequency Adjustments .....	21
Voltage Adjustments .....	21
INSTALLATION CHECKS AND STARTUP .....	23
<b>INSTALLATION REFERENCE DRAWINGS</b>	<b>PAGE</b>
WIRING DIAGRAM .....	A-1
RECONNECTION DIAGRAMS .....	A-2
MDKAV OUTLINE DRAWING (WITH ENCLOSURE) .....	A-3
MDKAV OUTLINE DRAWING (WITHOUT ENCLOSURE) .....	A-4
MDKAW & MDKAZ OUTLINE DRAWING (WITH ENCLOSURE) .....	A-5
MDKAW & MDKAZ OUTLINE DRAWING (WITHOUT ENCLOSURE) .....	A-6
MDKBD & MDKBE OUTLINE DRAWING (WITH ENCLOSURE) .....	A-7
MDKBD & MDKBE OUTLINE DRAWING (WITHOUT ENCLOSURE) .....	A-8
MDKBD & MDKBE OUTLINE DRAWING (WITH PTO) .....	A-9
MDKBF OUTLINE DRAWING (WITH ENCLOSURE) .....	A-10
MDKBF OUTLINE DRAWING (WITHOUT ENCLOSURE) .....	A-11
MDKBF OUTLINE DRAWING (WITH PTO) .....	A-12
MDKBG OUTLINE DRAWING (WITHOUT ENCLOSURE) .....	A-13

# Safety Precautions

---

Thoroughly read the **OPERATOR'S MANUAL** before operating the genset. Safe operation and top performance can only be attained when equipment is operated and maintained properly.

The following symbols in this manual alert you to potential hazards to operators, service personnel and equipment.

**⚠ DANGER** alerts you to an immediate hazard that will result in severe personal injury or death.

**⚠ WARNING** alerts you to a hazard or unsafe practice that can result in severe personal injury or death.

**⚠ CAUTION** alerts you to a hazard or unsafe practice that can result in personal injury or equipment damage.

Electricity, fuel, exhaust, hot engine coolant, moving parts and batteries present hazards which can result in severe personal injury or death.

## GENERAL PRECAUTIONS

- Keep children away from the genset.
- Do not step on the genset when entering or leaving the generator room. Parts can bend or break leading to electrical shorts or to fuel, coolant or exhaust leaks.
- To prevent accidental or remote starting while working on the genset, disconnect the negative (–) battery cable at the battery.
- Let the engine cool down before removing the coolant pressure cap or opening the coolant drain. Hot coolant under pressure can spray and cause severe burns.
- Do not use evaporative starting fluids. They are highly explosive.
- Keep the genset, drip pan and compartment clean. Oily rags can catch fire. Gear stowed in the compartment can restrict cooling.

- Make sure all fasteners are secure and properly torqued.
- Do not work on the genset when mentally or physically fatigued or after having consumed alcohol or drugs.
- You must be trained and experienced to make adjustments while the genset is running—hot, moving or electrically live parts can cause severe personal injury or death.
- Used engine oil has been identified by some U. S. state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Ethylene glycol, used as engine antifreeze, is toxic to humans and animals. Clean up spills and dispose of used engine coolant in accordance with local environmental regulations.
- Keep multi-class ABC fire extinguishers handy. Class A fires involve ordinary combustible materials such as wood and cloth; Class B fires, combustible and flammable liquid fuels and gaseous fuels; Class C fires, live electrical equipment. (ref. NFPA No. 10)
- Genset installation and operation must comply with all applicable local, state and federal codes and regulations.

## GENERATOR VOLTAGE IS DEADLY

- Generator electrical output connections must be made by a trained and experienced electrician in accordance with applicable codes.
- The genset must not be connected to shore power or to any other source of electrical power. Back-feed to shore power can cause electric shock resulting in severe personal injury or death and damage to equipment. An approved switching device must be used to prevent interconnections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry, stand on a dry wooden platform or rubber insulating mat and use tools with insulated handles.

### ENGINE EXHAUST IS DEADLY

- Never sleep in the boat while the genset is running unless the boat is equipped with properly working carbon monoxide detectors.
- The exhaust system must be installed in accordance with the genset Installation Manual and be free of leaks.
- Make sure the bilge is adequately ventilated with a power exhauster.
- Inspect for exhaust leaks every startup and after every eight hours of operation.
- For more information about carbon monoxide see American Boat and Yacht Council (ABYC) publication TH-22—*Educational Information About Carbon Monoxide*.

### DIESEL FUEL IS COMBUSTIBLE

- Do not smoke or turn electrical switches ON or OFF where fuel fumes are present or in areas sharing ventilation with fuel tanks or equipment. Keep flames, sparks, pilot lights, arc-producing equipment and all other sources of ignition well away.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.

### BATTERY GAS IS EXPLOSIVE

- Wear safety glasses while servicing batteries and do not smoke.
- To reduce arcing when disconnecting or reconnecting battery cables, always disconnect the negative (-) battery cable first and reconnect it last.

### MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, and other moving parts.

### FLAMMABLE VAPOR ENVIRONMENT

Flammable vapor can cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury or death. ***Do not operate a diesel-powered genset in a flammable vapor environment created by fuel spill, leak, etc.*** The owners and operators of the genset are solely responsible for operating the genset safely.

**POST THESE SUGGESTIONS IN POTENTIAL HAZARD AREAS OF THE BOAT**

# Specifications

	MDKAV	MDKBG	MDKAU	MDKAZ
<b>ALTERNATOR:</b> Single-Bearing, Brushless 4-Pole Rotating Field with Digital Electronic Regulation. See Genset Nameplate for Rating.				
Alternator Cooling Air Flow: 60 Hz 50 Hz	275 cfm (0.85 m <sup>3</sup> /min) 230 cfm (0.71 m <sup>3</sup> /min)	275 cfm (0.85 m <sup>3</sup> /min) 230 cfm (0.71 m <sup>3</sup> /min)	275 cfm (0.85 m <sup>3</sup> /min) 230 cfm (0.71 m <sup>3</sup> /min)	275 cfm (0.85 m <sup>3</sup> /min) 230 cfm (0.71 m <sup>3</sup> /min)
<b>FUEL CONSUMPTION:</b>				
60 Hz: Full Load Half Load	0.8 gph (3.0 liter/hr) 0.5 gph (1.9 liter/hr)	0.8 gph (3.0 liter/hr) 0.5 gph (1.9 liter/hr)	1.0 gph (3.8 liter/hr) 0.6 gph (2.3 liter/hr)	1.2 gph (4.5 liter/hr) 0.7 gph (2.7 liter/hr)
50 Hz: Full Load Half Load	0.7 gph (2.7 liter/hr) 0.4 gph (1.5 liter/hr)	0.7 gph (2.7 liter/hr) 0.4 gph (1.5 liter/hr)	0.8 gph (3.0 liter/hr) 0.5 gph (1.9 liter/hr)	0.9 gph (3.4 liter/hr) 0.5 gph (1.9 liter/hr)
<b>ENGINE:</b> Kubota 4-Stroke Cycle, Indirect Injection, Water Cooled Diesel with Digital Electronic Governing				
Model	D1105	D1105	V1305	V1505
Number of Cylinders	3	3	4	4
Displacement	68.58 in <sup>3</sup> (1124 cm <sup>3</sup> )	68.58 in <sup>3</sup> (1124 cm <sup>3</sup> )	81.47 in <sup>3</sup> (1335 cm <sup>3</sup> )	91.44 in <sup>3</sup> (1499 cm <sup>3</sup> )
Bore	3.07 in (78 mm)	3.07 in (78 mm)	2.99 in (76 mm)	3.07 in (78 mm)
Stroke	3.09 in (78.4 mm)	3.09 in (78.4 mm)	2.90 in (73.6 mm)	3.09 in (78.4 mm)
Compression Ratio	22:1	22:1	22:1	22:1
Firing Order (Clockwise Rotation)	1-2-3	1-2-3	1-2-4-3	1-2-4-3
Fuel Injection Timing	15.5°□ 17.5° BTDC	15.5°□ 17.5° BTDC	15.5°□ 17.5° BTDC	15.5°□ 17.5° BTDC
Valve Lash (cold)	0.0071 – 0.0087 in (0.18 – 0.22 mm)	0.0071 – 0.0087 in (0.18 – 0.22 mm)	0.0071 – 0.0087 in (0.18 – 0.22 mm)	0.0071 – 0.0087 in (0.18 – 0.22 mm)
Lube Oil Capacity	4.2 quart (4.0 liter)	4.2 quart (4.0 liter)	4.5 quart (4.3 liter)	4.5 quart (4.3 liter)
Lube Oil Drain Connection	3/8 NPT	3/8 NPT	3/8 NPT	3/8 NPT
Coolant Capacity	4.2 quart (4.0 liter)	4.2 quart (4.0 liter)	5.3 quart (5.0 liter)	5.3 quart (5.0 liter)
Coolant Flow Rate: 60 Hz 50 Hz	5.0 gpm (18.9 liter/min) 4.2 gpm (15.9 liter/min)	5.0 gpm (18.9 liter/min) 4.2 gpm (15.9 liter/min)	5.0 gpm (18.9 liter/min) 4.2 gpm (15.9 liter/min)	5.0 gpm (18.9 liter/min) 4.2 gpm (15.9 liter/min)
Raw Water Flow Rate: 60 Hz 50 Hz	6.0 gpm (22.7 liter/min) 5.0 gpm (18.9 liter/min)	6.0 gpm (22.7 liter/min) 5.0 gpm (18.9 liter/min)	6.0 gpm (22.7 liter/min) 5.0 gpm (18.9 liter/min)	6.0 gpm (22.7 liter/min) 5.0 gpm (18.9 liter/min)
Combustion Air Flow: 60 Hz 50 Hz	30 cfm (0.85 m <sup>3</sup> /min) 25 cfm (0.71 m <sup>3</sup> /min)	30 cfm (0.85 m <sup>3</sup> /min) 25 cfm (0.71 m <sup>3</sup> /min)	36 cfm (1.02 m <sup>3</sup> /min) 30 cfm (0.85 m <sup>3</sup> /min)	41 cfm (1.16 m <sup>3</sup> /min) 34 cfm (0.96 m <sup>3</sup> /min)
Heat Rejection to Ambient: 60 Hz 50 Hz	200 Btu/min (50 kcal/min) 179 Btu/min (45 kcal/min)	200 Btu/min (50 kcal/min) 179 Btu/min (45 kcal/min)	230 Btu/min (58 kcal/min) 190 Btu/min (48 kcal/min)	280 Btu/min (71 kcal/min) 210 Btu/min (53 kcal/min)
<b>CONNECTIONS:</b>				
Max Fuel Pump Lift	4 ft (1.2 m)	4 ft (1.2 m)	4 ft (1.2 m)	4 ft (1.2 m)
Fuel Supply	1/4 NPT female	1/4 NPT female	1/4 NPT female	1/4 NPT female
Fuel Return	1/4 NPT female	1/4 NPT female	1/4 NPT female	1/4 NPT female
Max Raw Water Pump Lift	4 ft (1.22 m)	4 ft (1.22 m)	4 ft (1.22 m)	4 ft (1.22 m)
Raw Water Inlet	1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose
Wet Exhaust Outlet	2 in (50.8 mm) ID Hose	2 in (50.8 mm) ID Hose	2 in (50.8 mm) ID Hose	2 in (50.8 mm) ID Hose
Max Exhaust Back Pressure	3 in (76 mm) Hg	3 in (76 mm) Hg	3 in (76 mm) Hg	3 in (76 mm) Hg
<b>KEEL COOLING AND DRY EXHAUST:</b>				
Coolant Inlet & Outlet	1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose
Max Coolant Friction Head	1 psi (6.9 kPa)	1 psi (6.9 kPa)	1 psi (6.9 kPa)	1 psi (6.9 kPa)
Heat Rejection to Coolant: 60 Hz 50 Hz	950 Btu/min (239 kcal/min) 780 Btu/min (197 kcal/min)	950 Btu/min (239 kcal/min) 780 Btu/min (197 kcal/min)	1220 Btu/min (307 kcal/min) 980 Btu/min (247 kcal/min)	1420 Btu/min (358 kcal/min) 1160 Btu/min (292 kcal/min)
Dry Exhaust Outlet	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT
Max Exhaust Back Pressure	3 in (76 mm) Hg	3 in (76 mm) Hg	3 in (76 mm) Hg	3 in (76 mm) Hg
<b>BATTERIES:</b>				
Nominal Battery Voltage	12 volts*	12 volts*	12 volts*	12 volts*
Min CCA Rating – SAE @ 32°F (0°C)	360 amps	360 amps	500 amps	500 amps
Battery Charging	5 amps	5 amps	5 amps	5 amps
<b>SIZE, WEIGHT, NOISE:</b>				
Without Enclosure Dry Weight Dimensions: L x W x H	555 lbs (252 kg) 35.9 x 22.3 x 23.0 in (911 x 566 x 585 mm)	525 lbs (238 kg) 32.4 x 18.9 x 22.1 in (479.1 x 822.6 x 560.9 mm)	640 lbs (290 kg) 40.7 x 22.3 x 23.0 in (1033 x 566 x 585 mm)	640 lbs (290 kg) 40.7 x 22.3 x 23.0 in (1033 x 566 x 585 mm)
With Enclosure Noise Dry Weight Dimensions: L x W x H	66 dB(A) @ 60HZ 600 lbs (272 kg) 35.9 x 22.3 x 23.4 in (911 x 566 x 593 mm)	–	66 dB(A) @ 60HZ 695 lbs (315 kg) 40.7 x 22.3 x 23.4 in (1033 x 566 x 593 mm)	66 dB(A) @ 60HZ 695 lbs (315 kg) 40.7 x 22.3 x 23.4 in (1033 x 566 x 593 mm)

\* - 24 volts optional

		MDKBD	MDKBE	MDKBF
<b>ALTERNATOR:</b> Single-Bearing, Brushless 4-Pole Rotating Field with Digital Electronic Regulation. See Genset Nameplate for Rating.				
Alternator Cooling Air Flow: 60 Hz 50 Hz		275 cfm (0.85 m <sup>3</sup> /min) 230 cfm (0.71 m <sup>3</sup> /min)	275 cfm (0.85 m <sup>3</sup> /min) 230 cfm (0.71 m <sup>3</sup> /min)	275 cfm (0.85 m <sup>3</sup> /min) 230 cfm (0.71 m <sup>3</sup> /min)
<b>FUEL CONSUMPTION:</b>				
60 Hz:	Full Load	1.3 gph (4.9 liter/hr)	1.9 gph (7.2 liter/hr)	2.5 gph (9.5 liter/hr)
	Half Load	0.8 gph (3.0 liter/hr)	1.1 gph (4.2 liter/hr)	1.5 gph (5.7 liter/hr)
50 Hz:	Full Load	1.1 gph (4.2 liter/hr)	1.6 gph (6.1 liter/hr)	2.1 gph (8.0 liter/hr)
	Half Load	0.7 gph (2.7 liter/hr)	0.9 gph (3.4 liter/hr)	1.3 gph (4.9 liter/hr)
<b>ENGINE:</b> Kubota 4-Stroke Cycle, Indirect Injection, Water Cooled Diesel with Digital Electronic Governing				
Model		V1903B	V2203B	V2803B
Number of Cylinders		4	4	5
Displacement		113.37 in <sup>3</sup> (1857 cm <sup>3</sup> )	134.07 in <sup>3</sup> (2197cm <sup>3</sup> )	167.57 in <sup>3</sup> (2748 cm <sup>3</sup> )
Bore		3.15 in (80 mm)	3.43 in (87 mm)	3.43 in (87 mm)
Stroke		3.64 in (92.4 mm)	3.64 in (92.4 mm)	3.64 in (92.4 mm)
Compression Ratio		23:1	23:1	23:1
Firing Order (Clockwise Rotation)		1-3-4-2	1-3-4-2	1-3-5-4-2
Fuel Injection Timing		15.5°[-] 17.5° BTDC	15.5°[-] 17.5° BTDC	15.5°[-] 17.5° BTDC
Valve Lash (cold)		0.0071 – 0.0087 in (0.18 – 0.22 mm)	0.0071 – 0.0087 in (0.18 – 0.22 mm)	0.0071 – 0.0087 in (0.18 – 0.22 mm)
Lube Oil Capacity		8 quart (7.6 liter)	8 quart (7.6 liter)	12.7 quart (12 liter)
Lube Oil Drain Connection		3/8 NPT	3/8 NPT	3/8 NPT
Coolant Capacity		8 quart (7.6 liter)	8 quart (7.6 liter)	8 quart (7.6 liter)
Coolant Flow Rate:	60 Hz	14.0 gpm (53.0 liter/min)	14.0 gpm (53.0 liter/min)	14.0 gpm (53.0 liter/min)
	50 Hz	10.0 gpm (37.9 liter/min)	10.0 gpm (37.9 liter/min))	10.0 gpm (37.9 liter/min)
Raw Water Flow Rate:	60 Hz	9.0 gpm (34.1 liter/min)	9.0 gpm (34.1 liter/min)	9.0 gpm (34.1 liter/min)
	50 Hz	7.0 gpm (26.5 liter/min)	7.0 gpm (26.5 liter/min)	7.0 gpm (26.5 liter/min)
Combustion Air Flow:	60 Hz	52 cfm (1.45 m <sup>3</sup> /min)	60 cfm (1.72 m <sup>3</sup> /min)	41 cfm (1.16 m <sup>3</sup> /min)
	50 Hz	42 cfm (1.21 m <sup>3</sup> /min)	50 cfm (1.43 m <sup>3</sup> /min))	34 cfm (0.96 m <sup>3</sup> /min)
Heat Rejection to Ambient:	60 Hz	Btu/min ( kcal/min)	Btu/min (kcal/min)	Btu/min (kcal/min)
	50 Hz	Btu/min ( kcal/min)	Btu/min (kcal/min)	Btu/min (kcal/min)
<b>CONNECTIONS:</b>				
Max Fuel Pump Lift		4 ft (1.2 m)	4 ft (1.2 m)	4 ft (1.2 m)
Fuel Supply		1/4 NPT female	1/4 NPT female	1/4 NPT female
Fuel Return		1/4 NPT female	1/4 NPT female	1/4 NPT female
Max Raw Water Pump Lift		4 ft (1.22 m)	4 ft (1.22 m)	4 ft (1.22 m)
Raw Water Inlet		1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose
Wet Exhaust Outlet		2 in (50.8 mm) ID Hose	2 in (50.8 mm) ID Hose	2 in (50.8 mm) ID Hose
Max Exhaust Back Pressure		3 in (76 mm) Hg	3 in (76 mm) Hg	3 in (76 mm) Hg
<b>KEEL COOLING AND DRY EXHAUST:</b>				
Coolant Inlet & Outlet		1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose	1 in (25.4 mm) ID Hose
Max Coolant Friction Head		1 psi (6.9 kPa)	1 psi (6.9 kPa)	1 psi (6.9 kPa)
Heat Rejection to Coolant:	60 Hz	Btu/min ( kcal/min)	Btu/min (kcal/min)	Btu/min (kcal/min)
	50 Hz	Btu/min ( kcal/min)	Btu/min (kcal/min)	Btu/min (kcal/min)
Dry Exhaust Outlet		1-1/2 NPT	1-1/2 NPT	1-1/2 NPT
Max Exhaust Back Pressure		3 in (76 mm) Hg	3 in (76 mm) Hg	3 in (76 mm) Hg
<b>BATTERIES:</b>				
Nominal Battery Voltage		12 volts*	12 volts*	12 volts*
Min CCA Rating – SAE @ 32°F (0°C)		500 amps	625 amps	625 amps
Battery Charging		5 amps	5 amps	5 amps
<b>SIZE, WEIGHT, NOISE:</b>				
Without Enclosure Dry Weight Dimensions: L x W x H		830 lbs (377 kg) 44.4 x 23.7 x 26.1 in (1127 x 602 x 663 mm)	870 lbs (375 kg) 44.4 x 23.7 x 26.1 in (1127 x 602 x 663 mm)	1090 lbs (494 kg) 53.5 x 23.7 x 28.8 in (1358 x 602 x 732 mm)
With Enclosure Noise Dry Weight Dimensions: L x W x H		67/64 dB(A) @ 60/50 HZ 890 lbs (404 kg) 44.4 x 23.7 x 27.5 in (1127 x 602 x 698 mm)	67/64 dB(A) @ 60/50 HZ 930 lbs (422 kg) 44.4 x 23.7 x 27.5 in (1127 x 602 x 698 mm)	67/66 dB(A) @ 60/50 HZ 1175 lbs (533 kg) 53.5 x 23.7 x 30.0 in (1358 x 602 x 763 mm)
* - 24 volts optional				



# Introduction

---

A generator set (genset) must be installed properly to attain safe, reliable and quiet operation. Read through this manual completely before starting the installation. It is a guide only. You must decide how to address the particular concerns of the installation.

Decisions you have to make will concern:

- Location and mounting
- Engine exhaust discharge and silencing
- Engine cooling
- Genset room ventilation
- Fuel connections
- Batteries
- Electrical connections
- Bonding for grounding
- Accessibility for operation and maintenance
- Noise and vibration.

See the Operator's Manual for operation and maintenance and the Service Manual for service.

**Note:** Manuals are updated from time-to-time to reflect changes in the equipment and its specifications. For this reason, only the copy of the installation manual supplied with the genset should be used as a guide for the installation.

## STANDARDS FOR SAFETY

You must find out which standards for safety are applicable. The American Boat and Yacht Council (ABYC) and the National Fire Protection Association (NFPA) are typical of agencies that publish safety standards for the installation of marine equipment. The United States Coast Guard (USCG) is a

typical regulatory agency. It is suggested that you obtain the following standards:

- *Standards and Recommended Practices For Small Craft,*

American Boat and Yacht Council, Inc.  
P.O. Box 747  
Millersville, MD 21108

- NFPA No. 302, *Pleasure and Commercial Motor Craft,*

National Fire Protection Association  
Batterymarch Park  
Quincy, MA 02269

- USCG regulations are under Titles 33 and 46 of the Code of Federal Regulations (CFR),

U.S. Government Printing Office  
Washington, D.C. 20404.

Boats used in U. S. waters must comply with ABYC P-1, *Installation of Exhaust Systems for Propulsion and Auxiliary Machinery*; ABYC E-8, *Alternating Current (AC) Electrical Systems on Boats*; and ABYC E-9, *Direct Current (DC) Electrical Systems on Boats*.

## OUTLINE DRAWINGS

See the applicable OUTLINE DRAWING (beginning Page A-3) for installation details: mounting bolt hole locations, connection points (fuel, battery, raw water, exhaust, remote control and AC output), sizes and types of fittings, weight, overall dimensions, etc. See your Onan® dealer for a large-scale copy of the applicable drawing.

**⚠ WARNING** *Improper installation can result in severe personal injury or death and damage to equipment. The installer must be trained and experienced in the installation of electrical, mechanical, fuel and exhaust equipment.*



**This page is intended to be blank.**



# Location and Mounting

---

The genset has a single lifting eye which is accessible through an access cover if the genset has an enclosure. See *Specifications* (Page v) regarding the weight of the genset and make provisions accordingly for safe handling.

## LOCATION

See the other sections titled *Ventilation*, *Fuel Supply*, *Engine Cooling* and *Engine Exhaust* for additional considerations that bear on location.

The genset is not “ignition protected” and therefore not permitted under USCG regulation 33CFR183 to be located in a gasoline fuel environment. If the boat has gasoline-fueled propulsion engines, the genset will have to be located where it can be isolated from the gasoline fuel system by approved methods.

**⚠WARNING** *The genset can ignite gasoline fumes causing severe personal injury or death. Approved methods must be used to isolate the genset from a gasoline fuel environment.*

Because of noise, vibration and fumes, the generator compartment should be located as far from living quarters as practical.

Locate the genset where there will be enough room to perform periodic maintenance and service. Non-service sides should have at least 2 inches (50 mm) of clearance. The front should have at least 4 inches

(100 mm) of clearance for air flow in and the right side at least 2 inches (50 mm) for air flow out (OUTLINE DRAWINGS, beginning Page A-3).

Make sure there is access for:

- Starting and stopping the genset
- Resetting the line circuit breakers
- Checking, filling and draining engine oil
- Changing the engine oil filter
- Checking, filling and draining engine coolant
- Changing the fuel filter
- Making fuel connections
- Making battery and ground connections
- Replacing coolant and exhaust hoses
- Replacing the raw water pump impeller
- Adjusting the V-belt

## MOUNTING

The genset has integral vibration isolators. The supporting structure underneath should be level and able to support the weight of the genset. Floor or frame stiffness should be greatest under the vibration isolators. Secure the genset with four bolts. See the appropriate OUTLINE DRAWING (beginning Page A-3) for the mounting bolt hole locations.



**This page is intended to be blank.**



# Ventilation

**⚠️WARNING** ***EXHAUST GAS IS DEADLY—FUEL VAPORS ARE EXPLOSIVE! Failure to provide proper ventilation can result in asphyxiation, fire and explosion. The ventilation system must meet applicable standards and regulations, including ABYC, NFPA and USCG (Page 1).***

## VENTILATION

Ventilation is required to prevent dangerous concentrations of fuel vapors and exhaust fumes, hold down compartment temperatures and provide combustion air. See Table 1 for minimum U.S. Coast Guard requirements for ventilating fuel and exhaust fumes in passenger boats.

**TABLE 1. MINIMUM USCG AIR EXCHANGE RATES FOR VENTILATING FUEL AND EXHAUST FUMES**

COMPARTMENT SIZE Cubic Feet (m <sup>3</sup> )	MAXIMUM TIME TO EXCHANGE TOTAL AIR VOLUME (Minutes)
Less than 500 (14)	2
500 to 1000 (14 to 29)	3
1000 to 1500 (28 to 42)	4
1500 and Up (42 and Up)	5

To promote natural convective flow, good air exchange and fresh air for combustion and generator cooling, ventilating air should enter near the bottom of the compartment at the front near the air inlet and exit near the top at the right side (OUTLINE DRAWINGS, beginning Page A-3). The free-air area of the inlet air cowl should be at least twice that of the duct.

Use 40 in<sup>2</sup> (258 cm<sup>2</sup>) as the basis for calculations for inlet and outlet air duct sizes and free-air areas of screens and louvers. Do not use flush air inlets or louvered transom outlets, which are easily blocked.

The USCG requires power exhausters, which may also be necessary for genset cooling, especially just after the boat has been under way. Operating a genset in ambient temperatures above 104° F (40° C) will result in noticeable loss of power. Operating a genset in ambient temperatures higher than 122° F (50° C) will reduce the life of electrical components, generator windings, rubber and other construction materials.

## CARBON MONOXIDE

All openings and feed-through holes for wiring, conduit, pipe and hose must be sealed to prevent exhaust gases from entering the rest of the boat. Wiring conduit must be sealed inside as well as outside.

Cabin plumbing drains must have approved traps to prevent the entrance of exhaust gases from outside.

Carbon monoxide (CO) detectors, listed for marine applications, should be installed in the living quarters of the boat. Wind shifts, boat motion, exhaust from other boats at dockside and other conditions can cause exposure to harmful concentrations of carbon monoxide even when proper ventilation is provided and living quarters are sealed off from engine rooms.



**This page is intended to be blank.**



# Fuel Supply

**⚠ WARNING** *Diesel fuel is combustible and can cause severe personal injury or death due to fire or explosion. Fuel tank construction, location, installation, bonding for grounding, ventilation, piping, inspection and leak testing must be in accordance with applicable standards and regulations, including ABYC, NFPA and USCG (Page 1).*

**Fuel:** See the Operator's Manual for recommended fuel.

**Fuel Filters:** The genset is equipped with a water separator type of fuel filter accessible for periodic draining of water and sediment and replacement. The fuel supply system should also be equipped with a fuel filter and water separator ahead of the connections at the genset. *Keep out dirt and debris when making fuel connections.*

**Fuel Fittings:** Two 1/4 NPT fittings for fuel supply and return connections are mounted on one end of the genset or the other. See the appropriate OUT-LINE DRAWING (beginning Page A-3). To connect fuel hose, use hose adapter fittings at the 1/4 NPT fittings on the genset. These are available from Onan.

**Fuel Lines and Hoses:** Use USCG TYPE A1 or ISO 7840-A1 fuel hose. The recommended inside diameter for fuel lines and hoses is 5/16 inch (8 mm). Larger diameter fuel lines take longer to prime and drain down more readily, allowing air to enter. Smaller diameter fuel lines may restrict flow enough to affect engine performance.

To avoid starving the genset for fuel, do not have it share fuel lines with the propulsion engines or con-

nect it to a large distribution manifold that the genset lift pump would have to prime.

Use non-conductive fuel lines for connections at the genset to prevent the fuel lines from carrying cranking currents back through the fuel tank. Fuel tanks are required to be bonded to the common negative (-) grounding system of the boat.

**⚠ WARNING** *Fuel lines must not carry cranking currents, which can cause fire resulting in severe personal injury or death. Use non-conductive fuel lines for connections at the genset.*

**Fuel Pickup:** The recommended inside diameter for the fuel pickup tube is 5/16 inch (8 mm). A larger diameter tube will drain down more readily.

In a common fuel supply tank, the genset pickup tube should be shorter than those for the propulsion engines so that the genset cannot empty the fuel tank. Make sure the fuel tanks are large enough to cool the returning fuel.

**Fuel Lift:** The fuel lift pump mounted in the genset can handle up to 4 feet (1.2 m) of fuel suction head (combination of lift height and line friction) in 5/16 inch fuel line.

If the highest level of fuel in the fuel supply tank is higher than the fuel injectors, an approved method must be used to prevent flow when the engine is not running.

**⚠ CAUTION** *Do not use galvanized fuel tanks, fittings and pipes. Sulfur in diesel fuel attacks the galvanized (zinc) coat causing debris that can clog fuel filters, pumps and injectors.*



**This page is intended to be blank.**





# Engine Cooling

## COOLING SYSTEM OVERVIEW

The engine is cooled by a pressurized, closed-loop liquid cooling system (Figure 1 or 2). Coolant is pumped through passages in the engine block, head and exhaust manifold by a belt-driven pump and is cooled in a heat exchanger mounted on the base pan or in a keel cooler.

If the genset has a heat exchanger and/or exhaust-water mixer, the engine is equipped with a gear-driven raw water pump. The raw water cools the heat exchanger and/or exhaust gases and exits the boat through the exhaust system.

## SYSTEM COMPONENTS

**Raw water Pump:** The raw water pump can handle up to 4 feet (1.2 m) of suction head (combination of lift height and hose friction) in 1 inch (25.4 mm) hose. The pump impeller must be wetted with water to establish initial pump lubrication and suction. See the Operator's Manual.

**Raw Water Hose:** The 1 inch (25.4 mm) hose barb for raw water pickup is mounted on one end of the genset or the other. See the appropriate OUTLINE DRAWING (beginning Page A-3). Use SAE 20R3 or equivalent hose to supply raw water to the genset. The hose must be able to resist a slight vacuum.

**Sea Water Strainer:** The sea water strainer should have a 1 inch (25.4 mm) inlet. It should be located below the raw water pump and as close as possible. The basket must be removeable for cleaning.

**Sea Cock:** Install a bronze, full-flow sea cock on the through-hull fitting.

**Through-Hull Fitting and Strainer:** The through-hull fitting should have a 1 inch (25.4 mm) inlet and be as close to the genset as possible. The slots in the strainer on the fitting must be parallel to the keel

for best flow when the boat is under way. Also, stagger the through-hull fittings along the keel so that downstream fittings are not starved.

**⚠ CAUTION** *Do not use a scoop-type through-hull fitting. A forward-facing scoop can develop enough ram pressure to flood the engine. A rear-facing scoop can develop enough suction to impede flow.*

**Siphon-Break:** Conduct the RAW WATER PICKUP TEST and install a siphon-break device (Figure 4) between the engine heat exchanger and exhaust-water mixer (Figure 1 or 2) if required. The top panel of an enclosed genset has knockouts for the hoses to pass through. See the appropriate OUTLINE DRAWING (beginning Page A-3).

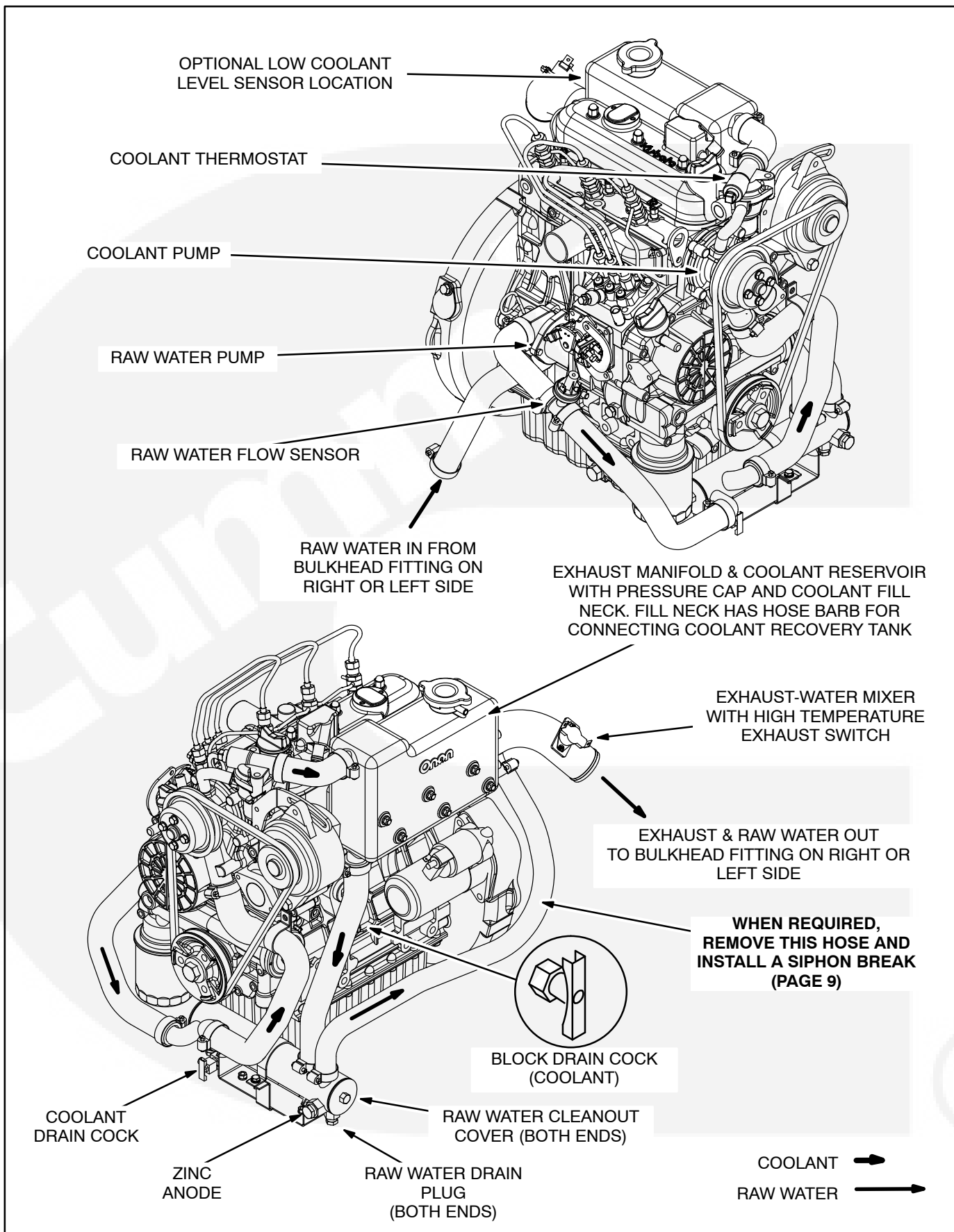
A siphon-break kit is available from Onan. The kit has hole grommets.

**⚠ CAUTION** *Failure to install a siphon-break device, when required, can cause major engine damage if the cylinders become flooded.*

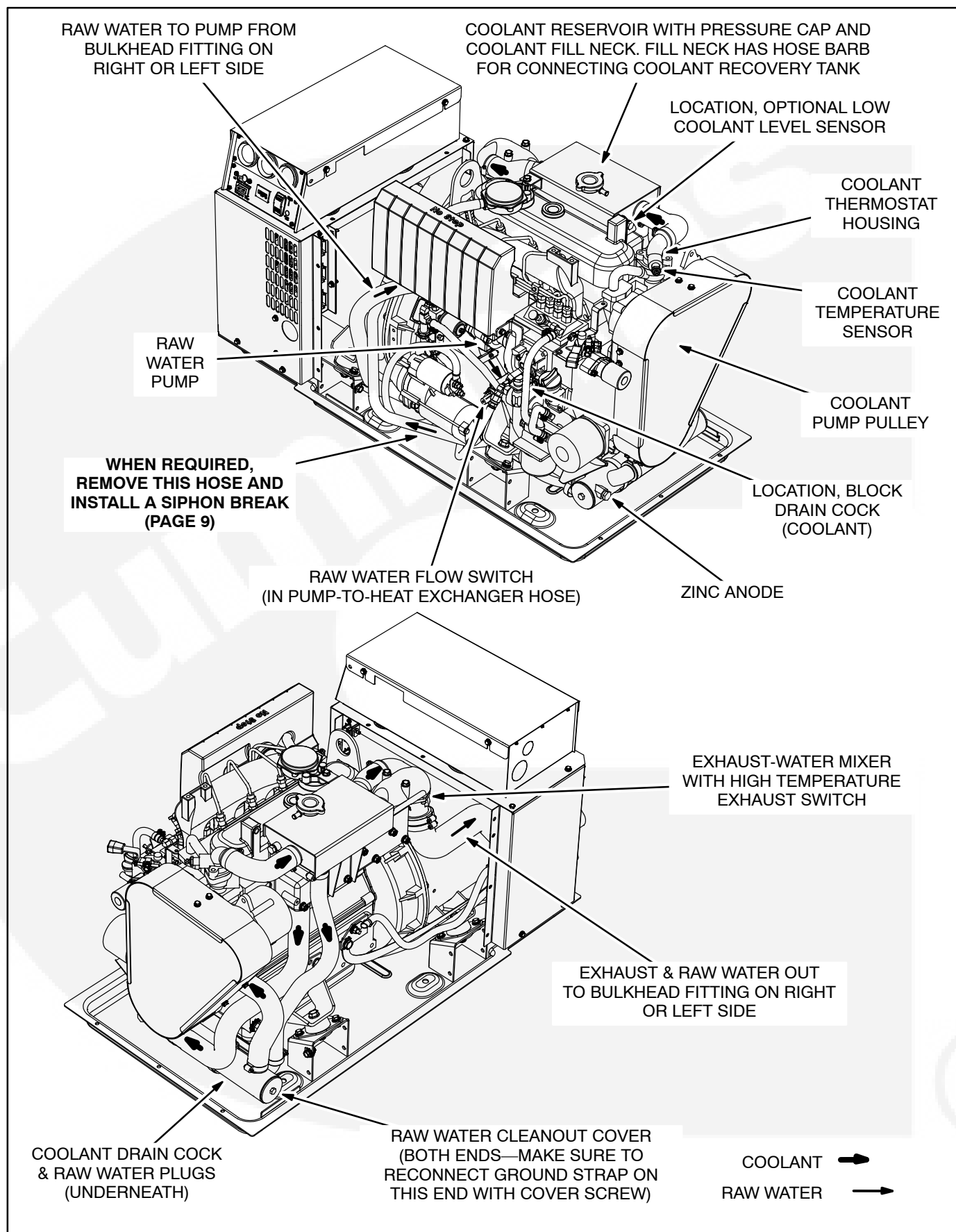
**Coolant Recovery Tank:** The genset is shipped with a coolant recovery tank kit. Follow the instructions in the kit. **The tank must be accessible for daily inspection and refilling.** Clamp the recovery hose to the hose barb on the coolant fill neck (Page 10). Route hose through the hole in the right end of the enclosure. The end panel on an enclosed genset has holes for mounting the recovery tank. See the appropriate OUTLINE DRAWING (beginning Page A-3). Fill the tank in accordance with the Operator's Manual.

**Initial Coolant Fill:** The genset is normally shipped from the factory with coolant, unless prohibited by shipping regulations. Fill the system, if necessary, in accordance with the Operator's Manual.

**⚠ CAUTION** *Running the genset without coolant will severely damage the engine.*



**FIGURE 1. ENGINE COOLING SYSTEM—MDKAV, MDKBG, MDKAW, MDKAZ**



**FIGURE 2. ENGINE COOLING SYSTEM—MDKBD, MDKBE, MDKBF**

## RAW WATER PICKUP TEST

**Objective:** To determine the elevation of the water line relative to the genset under all operating conditions.

**Method:** Load the boat fully for the sea trials, shut down the genset and disconnect the raw water pickup hose from the genset bulkhead fitting (OUTLINE DRAWING beginning Page A-3). (Be ready to close the sea cock, if necessary, and to catch water that spills.) Raise and lower the end of the hose. *The water line is at the level where water just begins to spill as the end of the hose is slowly lowered.* (Alternatively, for this test only, connect a clear plastic hose to the through-hull fitting or strainer so that you can see the water level rise and fall inside the hose.) Mark on the genset the highest water line observed

while operating the boat throughout its speed range. Also mark the water line while the boat is docked.

**Requirement:** If either water line (docked or under way) is within 6 inches (152 mm) of the engine exhaust-water mixer:

1. Install a siphon-break device, or
2. If the water line while docked is 6 inches (152 mm) or more below the exhaust-water mixer but the water line under way is above, it may be possible to take steps to lower the latter. For example, a forward-facing scoop-type through-hull fitting might be causing the difference. If so, replace it with a through-hull fitting that does not create ram pressure when the boat is under way.

# Engine Exhaust

## WET EXHAUST SYSTEMS

**⚠ WARNING** ***EXHAUST GAS IS DEADLY! The exhaust system must be leak-free and convey all exhaust outside, away from windows, doors and vents.***

Figure 3 illustrates a typical exhaust system where the exhaust-water mixer is above the load water line and Figure 4 where it is below. See *Engine Cooling* (Page 9) regarding raw water connections. The installation must comply with applicable standards and regulations, including ABYC and USCG (Page 1).

Kits are available from Onan consisting of an approved muffler, a water separator or a resonator, or a combination of muffler and water separator or muffler and resonator. Muffler kits include a strainer for the through-hull fitting. A siphon break kit is also available.

**Exhaust Hose:** Use hose that has been approved for wet exhaust systems. Approved hose and 90 degree elbows of stainless steel tubing are available from Onan. Except where hose rises vertically from the muffler, hose must slope down at least 1/2 inch per foot (42 mm/meter) and be supported such that there are no sags. *The entire run of hose must be accessible for regular, visual inspections and replacement.*

**Hose Clamps:** Use two 1/2 inch (12.7 mm) wide stainless steel hose clamps to clamp each end of each exhaust hose.

**Fitting and Hose Diameters:** *No fitting or hose section in the exhaust system may have a smaller inside diameter than the engine outlet.* If the total run of exhaust hose is more than 20 feet (6 meters), measure exhaust back pressure and use larger diameter hose if back pressure exceeds *Specifications* (Page v).

**Muffler:** Install an approved muffler as close a practical to the engine. For optimum silencing, the length of hose between the engine and muffler should not exceed 6 feet (2 meter). The muffler inlet should be a minimum of 1 foot (305 mm) below the exhaust-water mixer and the outlet should be vertical.

The base of the muffler should not be more than 54 inches (1.4 meter) below the water separator (Figure 3) or 48 inches (1.2 meter) below the crest in the piping (Figure 4).

Mount the muffler such that air can circulate underneath to prevent condensation and mold.

**Exhaust Water Separator:** When an exhaust water separator is used (Figure 3), *the muffler outlet and water separator inlet diameters must be the same size.* The water separator should be installed directly above the muffler to maintain a vertical lift. The through-hull fitting for the drain hose should be below the load water line and must have a sea cock. An EXHAUST WATER SEPARATOR BACKFLOW TEST must be conducted during the sea trials to determine that there is no backflow.

**Exhaust Through-Hull Fitting:** The exhaust through-hull fitting must be above the load water line. To reduce wave wash-in, the highest point in the exhaust system must crest at least 12 inches (305 mm) above the through-hull fitting (Figure 4). The top of a water separator (Figure 3) must be at least 18 inches (450 mm) *above the load water line.*

**⚠ CAUTION** ***Backflow can cause major engine damage if the cylinders become flooded. The sea trials must verify that there is no backflow through either the exhaust hull fitting or the water separator drain hose fitting.***

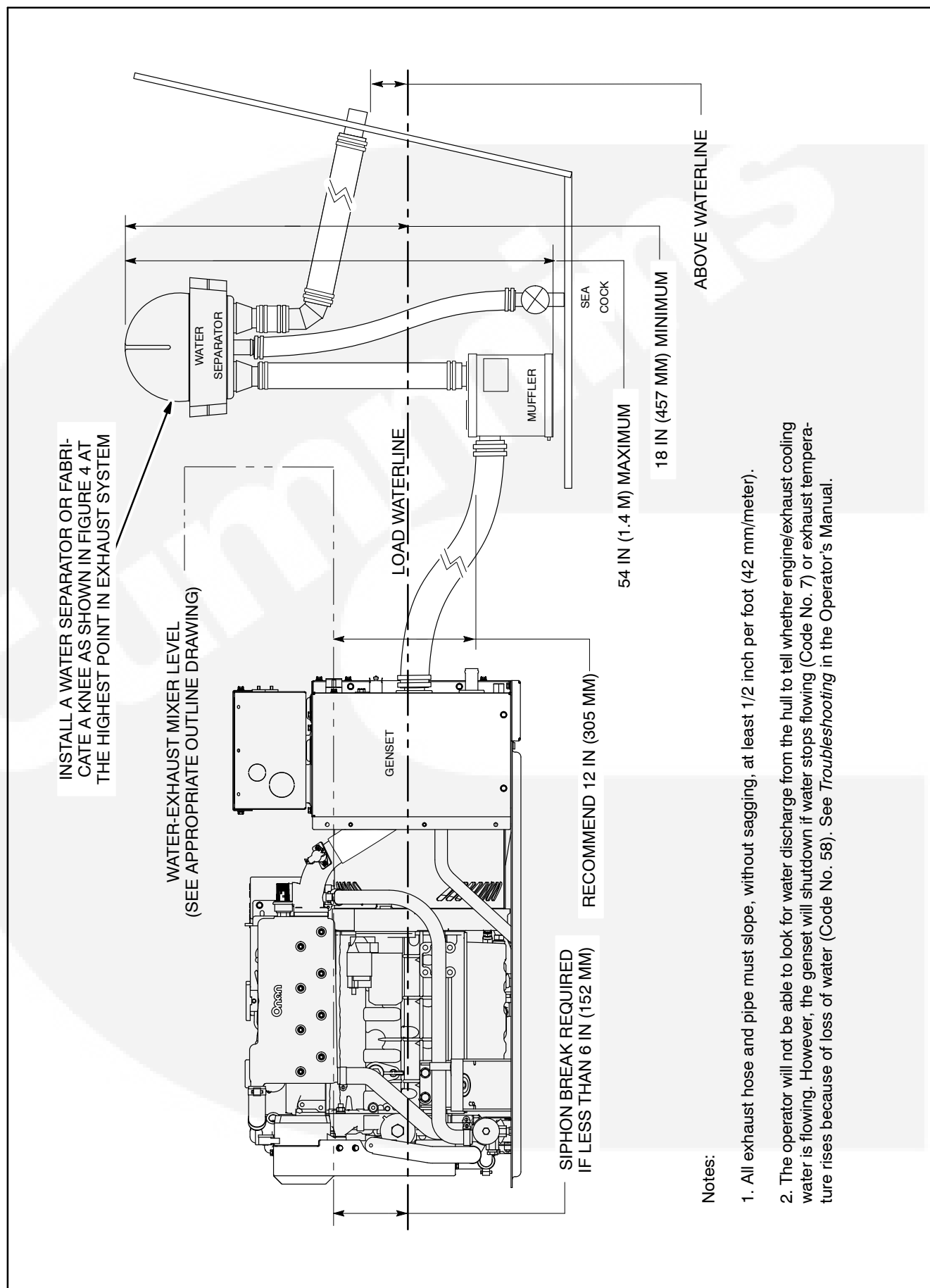
**Siphon-Break:** See Page 9.

## EXHAUST WATER SEPARATOR BACKFLOW TEST

**Objective:** To determine that there is no backflow through the exhaust water separator under any operating condition (Figure 3).

**Method:** Conduct this test during the sea trials in conjunction with the RAW WATER PICKUP TEST. Prepare by closing the drain hose sea cock and disconnecting the hose from the water separator. Conduct the test by opening the sea cock while keeping the hose raised to its fitting on the water separator.

**Requirement:** There must not be any back flow while operating the boat throughout its speed range. If there is, relocate the through-hull fitting.

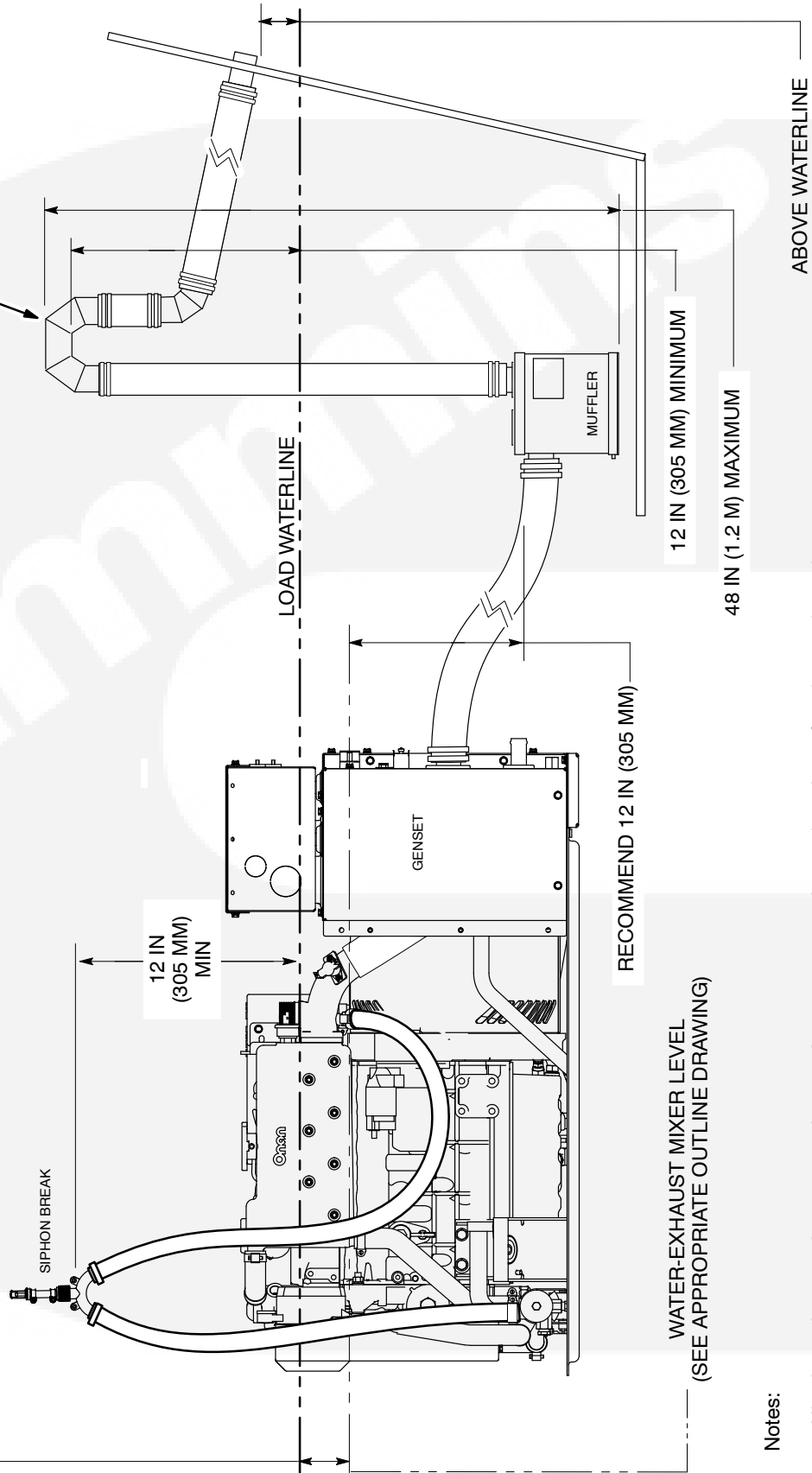


Notes:

1. All exhaust hose and pipe must slope, without sagging, at least 1/2 inch per foot (42 mm/meter).
2. The operator will not be able to look for water discharge from the hull to tell whether engine/exhaust cooling water is flowing. However, the genset will shutdown if water stops flowing (Code No. 7) or exhaust temperature rises because of loss of water (Code No. 58). See *Troubleshooting* in the Operator's Manual.

FIGURE 3. TYPICAL INSTALLATION ABOVE LOAD WATERLINE—WITH A WATER SEPARATOR

**A SIPHON BREAK IS REQUIRED IF THE WATER-EXHAUST MIXER IS BELOW, OR IS LESS THAN 6 IN (152 MM) ABOVE, THE LOAD WATER LINE**



Notes:

1. All exhaust hose and pipe must slope, without sagging, at least 1/2 inch per foot (42 mm/meter).

**FIGURE 4. TYPICAL INSTALLATION BELOW LOAD WATERLINE—WITH A SIPHON BREAK**

## DRY EXHAUST SYSTEMS

Figure 5 shows a typical dry exhaust system. A separate exhaust system must be provided for each engine. Soot, corrosive condensate and high gas temperatures can damage idle engines served by a common exhaust system.

***Consult the factory about exhaust pipe routing if the genset is equipped with a sound shield.***

The exhaust system must be supported independently of the engine. Weight on the engine exhaust outlet can crack the exhaust manifold.

A flexible, bellows-type stainless steel section at least 18 inches (300 mm) long must be connected at the engine exhaust outlet to take up thermal expansion and engine movement.

Long runs of exhaust pipe (vertical or horizontal) should include a flexible, bellows-type stainless steel section to take up thermal expansion. Flexible exhaust sections must not be used to compensate for misaligned piping or for forming bends.

Horizontal runs of exhaust piping should slope downwards from the engine to a drain trap and plug,

which should be located where the piping turns to rise vertically.

Exhaust piping must be routed at least 9 inches (229 mm) away from combustible construction. Where a 9 inch clearance cannot be maintained, the pipe may be insulated with material rated to withstand at least 1000°F (538°C). The surface temperature of the insulation must not exceed 160°F (71°C).

Exhaust piping and mufflers must be shielded or insulated to prevent burns if accidental contact is likely. The surface of the shield or insulation must not exceed 200°F (93°C).

The entire exhaust system must be accessible for regular, visual inspection and repair.

See *Specifications* for maximum allowable exhaust back pressure. Application Manual T-030 has example exhaust back pressure calculations.

**⚠ CAUTION** *Excessive exhaust back pressure reduces the air-fuel ratio, resulting in reduced power, excessive smoke, high exhaust temperature and reduced engine life.*

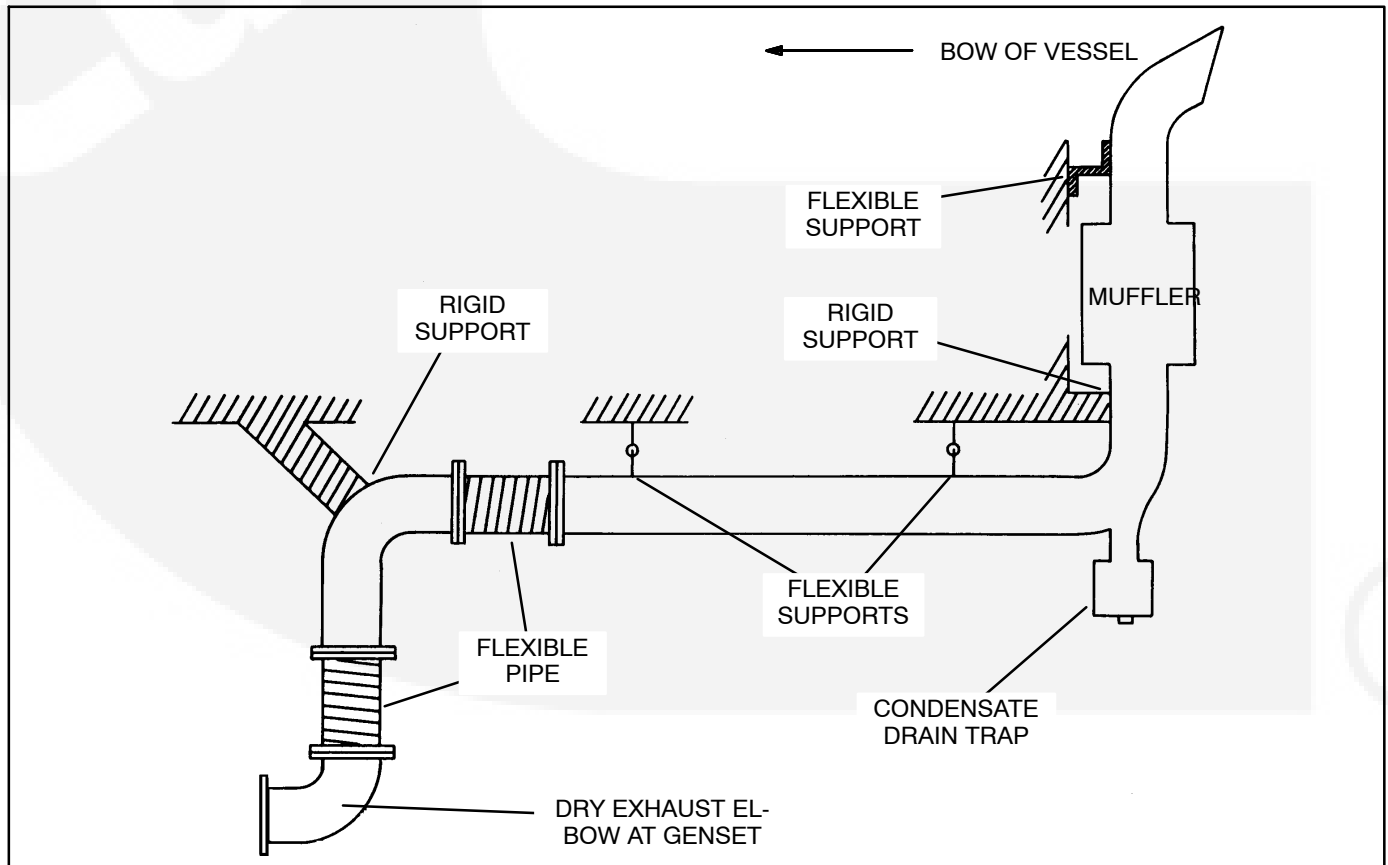


FIGURE 5. SCHEMATIC OF TYPICAL DRY EXHAUST SYSTEM



# Electrical Connections

**⚠️WARNING** *Accidental or remote starting can cause severe personal injury or death. To prevent accidental starting, disconnect the negative (-) battery cable from the battery before working on the genset.*

**⚠️WARNING** **HAZARDOUS VOLTAGE!** *Touching uninsulated live parts inside the genset and connected equipment can result in severe personal injury or death. For your protection, stand on a dry wooden platform or rubber insulating mat, make sure your clothing and shoes are dry, remove jewelry from your hands and use tools with insulated handles.*

**⚠️WARNING** *Improper wiring can cause fire or electric shock resulting in severe personal injury or death.*

## GENERATOR

**Wiring Methods:** All wiring methods, connections, wire ampacities, equipment grounding and materials must be inspected and comply with applicable regulations. Use flexible conduit and stranded conductors for load wiring to take up movement and vibration. See the appropriate OUTLINE DRAWING (beginning Page A-3) for the location of the AC box and its conduit knockouts.

**Generator Connections:** Make generator connections and reconnections as required in the AC box (Figure 6) in accordance with the appropriate reconnection diagram (Page A-2). The circuit breakers may need to be replaced to obtain full genset power if reconnections are made. Voltage and frequency may also need to be readjusted (*Frequency and Voltage Adjustments*, Page 21).

**Grounding:** The genset, power supply wiring and all connected electrical equipment must be bonded to the common grounding system of the boat in accordance with applicable regulations.

**⚠️WARNING** *Faulty grounding of electrical equipment can lead to fire or electric shock resulting in severe personal injury or death.*

**Transfer Switch:** Use an approved transfer switch if provision is made for connecting the boat to shore power.

**⚠️WARNING** *Backfeed to shore power can cause electric shock resulting in severe personal injury or death and damage to equipment. Use an approved device to prevent the genset from being interconnected with shore power.*

**Load Balancing:** The currents in the legs of a 2-phase or 3-phase generator should be balanced within 10 percent. Redistribute the loads as necessary.

Make sure to secure the clear protective cover over the AC connections before securing the outer access cover. Make sure the outer cover is turned the right way so that the opening above the circuit breakers is closed off.

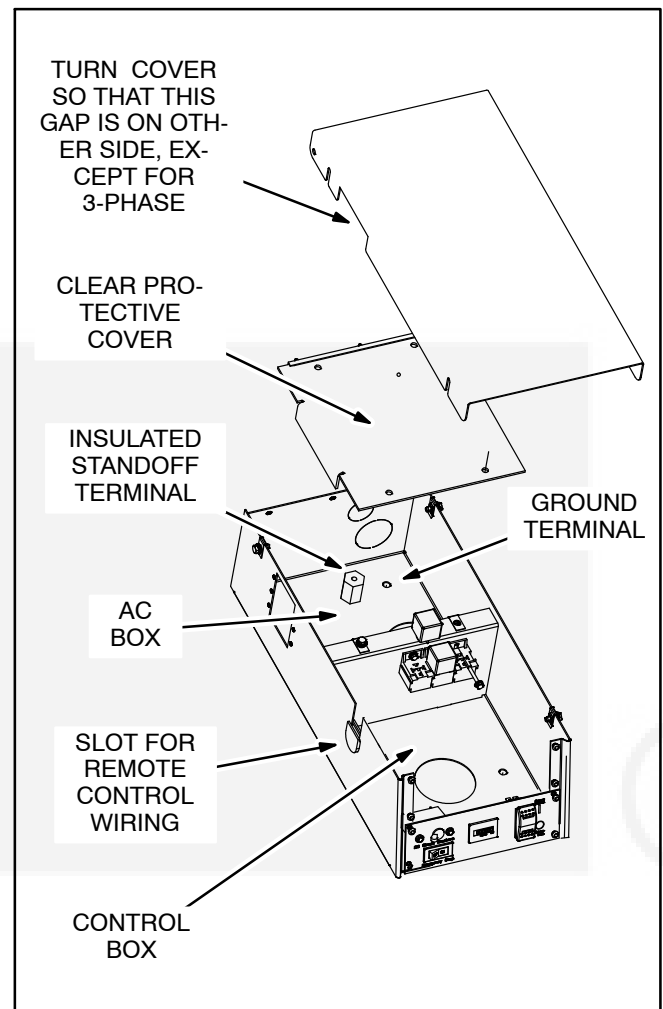


FIGURE 6. TYPICAL AC / CONTROL BOX

## REMOTE CONTROL

**Remote Control Panels:** Various remote control panels and lengths of plug-in wiring harness are available from Onan (Marine Genset Accessories & Service Support Catalog). Follow the instructions in the kits. “Y” harnesses are also available for applications requiring two remote stations.

**Remote Control Connector:** The sealed 8-pin Deutsch® connector for remote connections is stowed inside the genset control box. Remove the access cover and the rubber plug in the grommet slot. See the appropriate OUTLINE DRAWING (beginning Page A-3). Pull the connector out, fit the grommet into the slot and secure the access cover

(4 screws). Join the connector and its mate from the remote control panel.

**Wiring Remote Control Panel and Connector:** Use Figure 7 as a guide for wiring a remote control panel to its connector (mate to the genset connector) when not using a panel available from Onan. Check the remote connections against the genset wiring diagram (Page A-1).

Both positions of the Start/Stop switch must be of the momentary-contact type. Call the factory regarding engine gauge specifications.

Use 16 AWG wires and sealed 8-pin Deutsch® connectors for the wiring harness. Use 14 AWG wires for connector pins 2, 3 and 4 if harness length is 45 to 150 feet (14 to 46 meters).

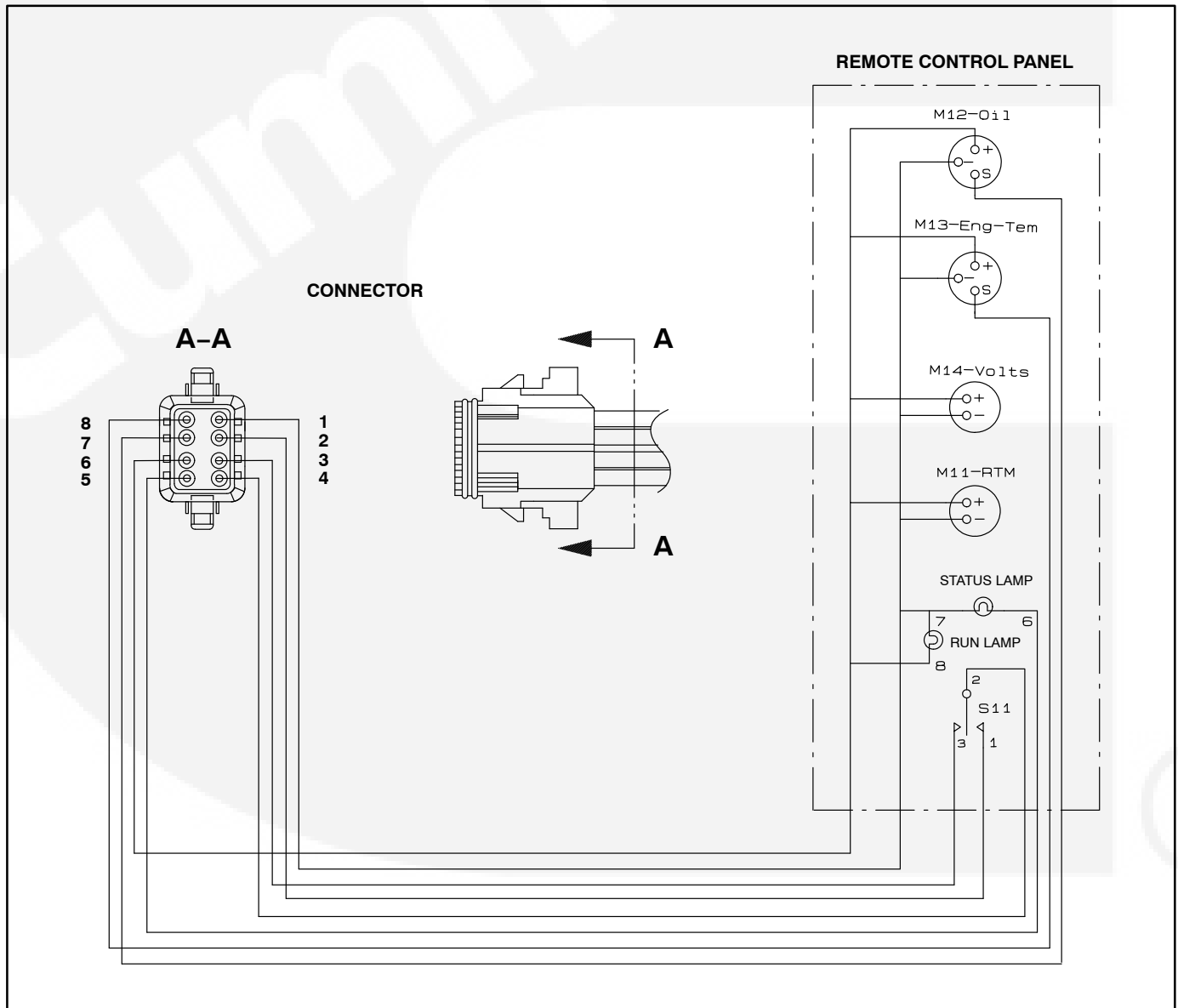


FIGURE 7. CONNECTIONS BETWEEN REMOTE PANEL AND ITS 8-PIN CONNECTOR

## BATTERY

The genset control and cranking circuits are negative (–) grounded and require a 12 or 24 volt battery. A kit is available for isolated DC ground systems.

To prevent accidental starting of the genset during installation, do not connect the battery cables at the battery until it is time to start up the genset.

**⚠WARNING** *Accidental or remote starting of the genset can cause severe personal injury or death. Do not connect the starting battery until it is time to start up the genset.*

**Batteries:** See *Specifications* for minimum battery requirements.

**Battery Recharging:** The genset provides battery recharging. See *Specifications* for charging rate.

**Battery Location and Mounting:** Locate the battery where spills and leaks will not drip acid on fuel lines, wiring or other equipment and where ventilation is adequate to prevent the accumulation of explosive gases. Secure the battery so that it cannot shift and provide a boot over the positive (+) terminal to protect against accidental contact.

**⚠WARNING** *Arcing can ignite the explosive hydrogen gas given off by the battery, causing severe personal injury. The battery compartment must be ventilated and isolated from spark-producing equipment.*

**Battery Cables:** Size battery cables according to Table . Total cable length is the sum of the lengths of the positive (+) and negative (–) cables. In other words, total cable length will be approximately twice the distance between the battery and the genset.

TABLE . BATTERY CABLE SIZES

TOTAL CABLE LENGTH, FEET (METERS)	CABLE SIZE, AWG
10 (3)	4
14 (4.3)	3
18 (5.5)	2
22 (6.7)	1
30 (9.1)	1/0

**⚠WARNING** *Sparks can ignite fuel leading to severe personal injury or death. Do not run battery cables and fuel lines together. Separate cables and fuel lines with conduit or tubing if run through the same opening. Do not tie together.*

Connect the cables from the battery to the genset at the genset battery terminals mounted on one side of the genset or the other. See the appropriate OUTLINE DRAWING (beginning Page A-3). Provide a boot over the positive (+) terminal to protect against accidental contact. Boots are available from Onan.

## DC GROUNDING

The genset must be bonded to the common grounding system of the boat in accordance with applicable regulations. Connect the bonding cable to the grounding lug beside battery terminals. See the appropriate OUTLINE DRAWING (beginning Page A-3).

**⚠WARNING** *Faulty bonding of the genset to the common grounding system of the boat can result in severe personal injury or death.*

## FIRE SUPPRESSION SYSTEM

The genset wiring harness has leads terminating in quick-connects for connection to a fire suppression system or other control to shut down the genset in the event of fire. See the genset wiring diagram (Page A-1). The emergency system must close a set of isolated contacts across **J6** and **J7** to cause genset shutdown. **J7** is Switched B+ and can be used to energize devices rated not more than 0.5 amps.

The connectors are accessible inside the control box (Page 17). The wiring can exit through the 1/2 inch conduit knockout on the side of the box. Secure the access cover (4 screws) when wiring and conduit connections have been made.

The status indicator light will blink **Code No. 61—Emergency Shutdown** if shutdown occurs. See *Troubleshooting* (Operator's Manual).



**This page is intended to be blank.**



# Frequency and Voltage Adjustments

## FREQUENCY ADJUSTMENTS

If it is necessary to change the output frequency for the application, remove the access cover on the left end of the genset (Page A-3). Find the leads marked **J8 HZ**, **60 HZ** and **50 HZ** in the wiring harness (Page A-1). Connect **60 HZ** or **50 HZ** to **J8 HZ**, as appropriate, and secure the access cover (4 screws).

## VOLTAGE ADJUSTMENTS

Output voltage may need to be readjusted for the application, especially if it was necessary to change the frequency and/or reconnect the generator (Page 15). Recheck generator reconnections and reconsider whether frequency needs to be changed before attempting voltage adjustments.

Voltage is adjusted by means of the control switch. Rapidly pressing the switch to **START** 6 times *during the first minute after startup* puts the genset controller into *voltage set mode*. The *amber* status indicator lamp will begin blinking once every second to confirm voltage set mode. The *green* status indicator lamp will remain on. The controller resumes normal operating mode 20 seconds after the last adjustment.

**Note:** If a fault shutdown occurs or the control switch is pressed to **STOP** during voltage set mode, voltage adjustments will not be stored in controller memory.

To adjust voltage:

1. Make sure that proper fuel, exhaust, raw water and battery connections have been made and

that the engine has the proper levels of oil and coolant. See the Operator's Manual. Complete *Installation Checks and Startup* (Page 23) as far as possible.

2. Disconnect all generator loads and connect accurate meters to measure AC volts and frequency.

**⚠ WARNING** **HAZARDOUS VOLTAGE!**  
*Touching uninsulated live parts inside the genset or connected equipment can result in severe personal injury or death. For your protection, stand on a dry wooden platform or rubber insulating mat, make sure your clothing and shoes are dry, remove jewelry from your hands and use tools with insulated handles.*

3. Start the genset and let voltage and frequency stabilize for 5 to 10 seconds.
4. Rapidly press the control switch to **START** 6 times within 10 seconds.
5. **To adjust voltage up**, press the control switch to **START** and release quickly. Each time the switch is released, voltage will rise approximately 0.6 volt.
6. **To adjust voltage down**, press the control switch to **START** and release in approximately 2 seconds. Each time the switch is released, voltage will drop approximately 0.6 volt.
7. Normal operation will resume in 20 seconds after the last adjustment.



**This page is intended to be blank.**



# Installation Checks and Startup

**Before starting the genset**, review the installation checklist below for those items that do not require the genset to be actually running. Make necessary reconnections, modifications and repairs. Then start and operate the genset in accordance with the Operator's Manual, observing all of its instructions and precautions. Continue working through the installation checklist with the genset running, making necessary reconnections, modifications and repairs. Check off (✓) each item that can be answered positively. Do not place the genset in service until each item has been checked off.

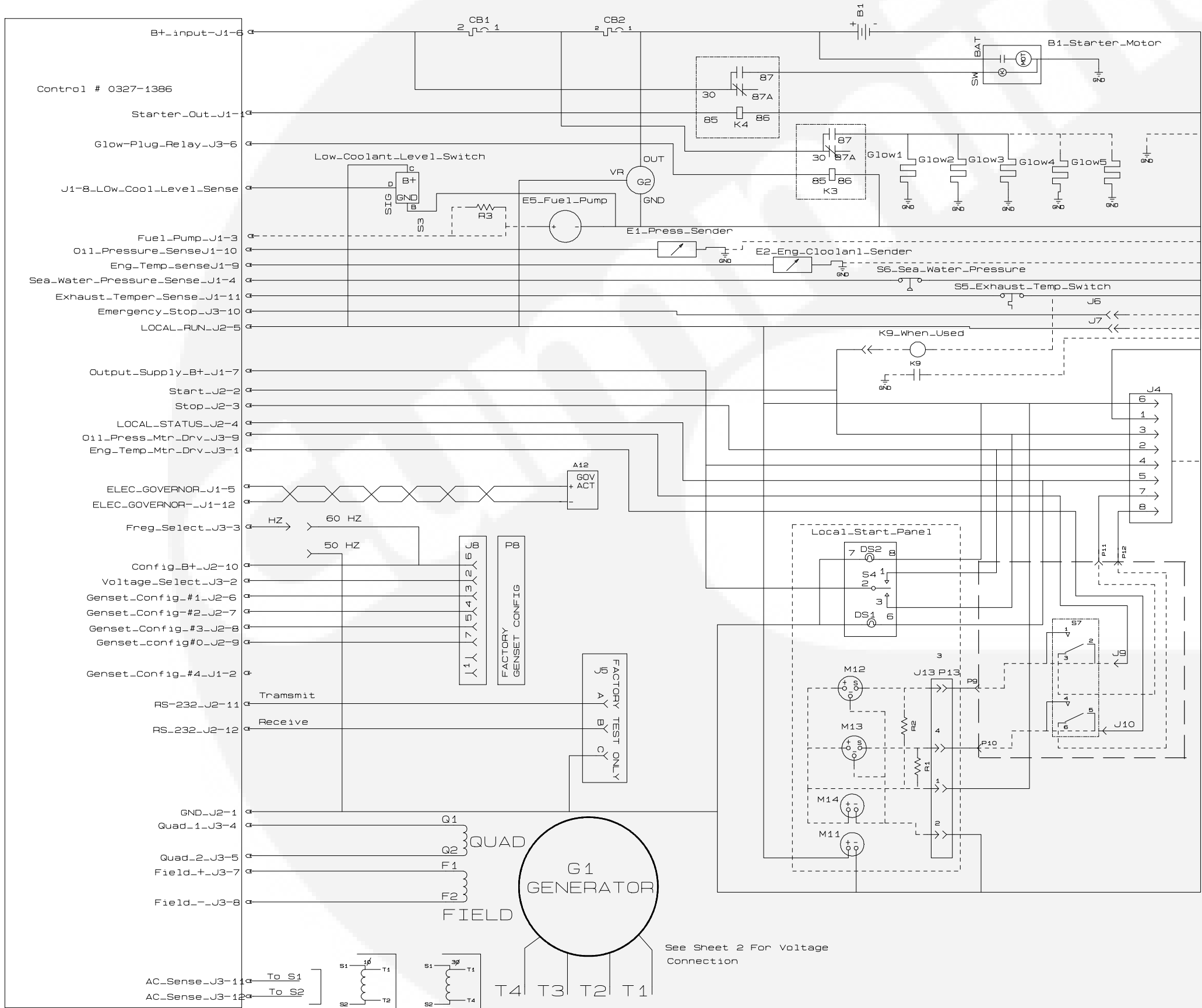
- ☐ The RAW WATER PICKUP TEST was conducted during the sea trials to establish the water line and a siphon break was installed, if found necessary.
- ☐ The sea trials established that at all boat speeds enough raw water is picked up for genset engine and exhaust cooling.
- ☐ The sea trials established that there is no back-flow through the exhaust through-hull fitting or water separator drain hose when the boat is under way, forward or reverse.
- ☐ Genset compartment ventilation meets regulations and the sea trials established that ventilation is sufficient to maintain acceptable genset compartment temperatures, even while "heat soaking" after docking.
- ☐ The genset is securely mounted.
- ☐ There is adequate clearance for conducting all maintenance specified in the Operator's Manual.
- ☐ The coolant recovery tank is mounted properly and is accessible for inspection and filling.
- ☐ The entire exhaust system is accessible for inspection and replacement.
- ☐ Fuel tanks, piping, hoses and filters comply with regulations and are accessible for inspection and replacement.
- ☐ The genset is bonded to the boat grounding system in accordance with regulations.
- ☐ If required, the kit for isolated DC ground was installed.
- ☐ An approved transfer switch prevents interconnections with shore power.
- ☐ AC wiring methods, materials and bonding for grounding meet regulations.
- ☐ A properly sized battery has been installed, serviced and charged. The battery is securely mounted in an adequately ventilated space and the positive (+) terminal is shielded from accidental contact.
- ☐ The remote control panel functions as intended.
- ☐ The fire suppression system or other external emergency system has been tested and shuts down the genset as intended.
- ☐ The genset is properly sized for the application, the voltage and frequency are correct and the loads across a multi-phase generator are balanced.
- ☐ Exhaust back pressure is acceptable.
- ☐ The exhaust system is leak-free and conveys all engine exhaust outside, away from windows, doors and vents.
- ☐ The fuel supply system is leak-free and airtight.
- ☐ The engine coolant and raw water systems are leak-free.
- ☐ The engine has the proper levels of oil and coolant.
- ☐ The raw water pump has been primed and the sea cock is open.
- ☐ All operators have been thoroughly briefed on the Operator's Manual and its safety precautions—especially concerning the danger of carbon monoxide gas—and can demonstrate how to operate, maintain and troubleshoot the genset as explained therein.

**This page is intended to be blank.**



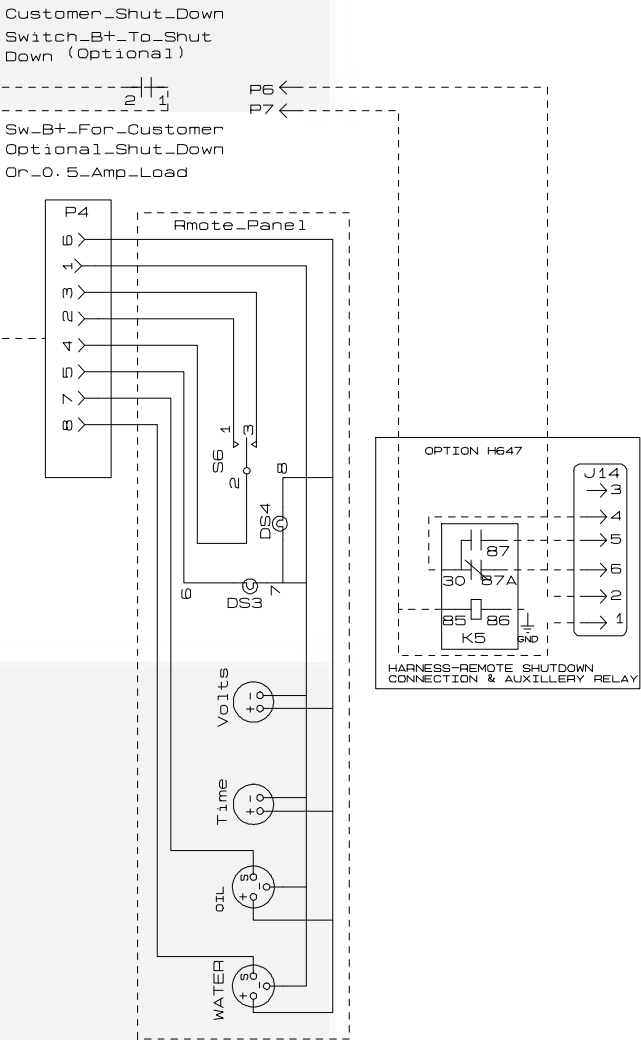


WIRING DIAGRAM



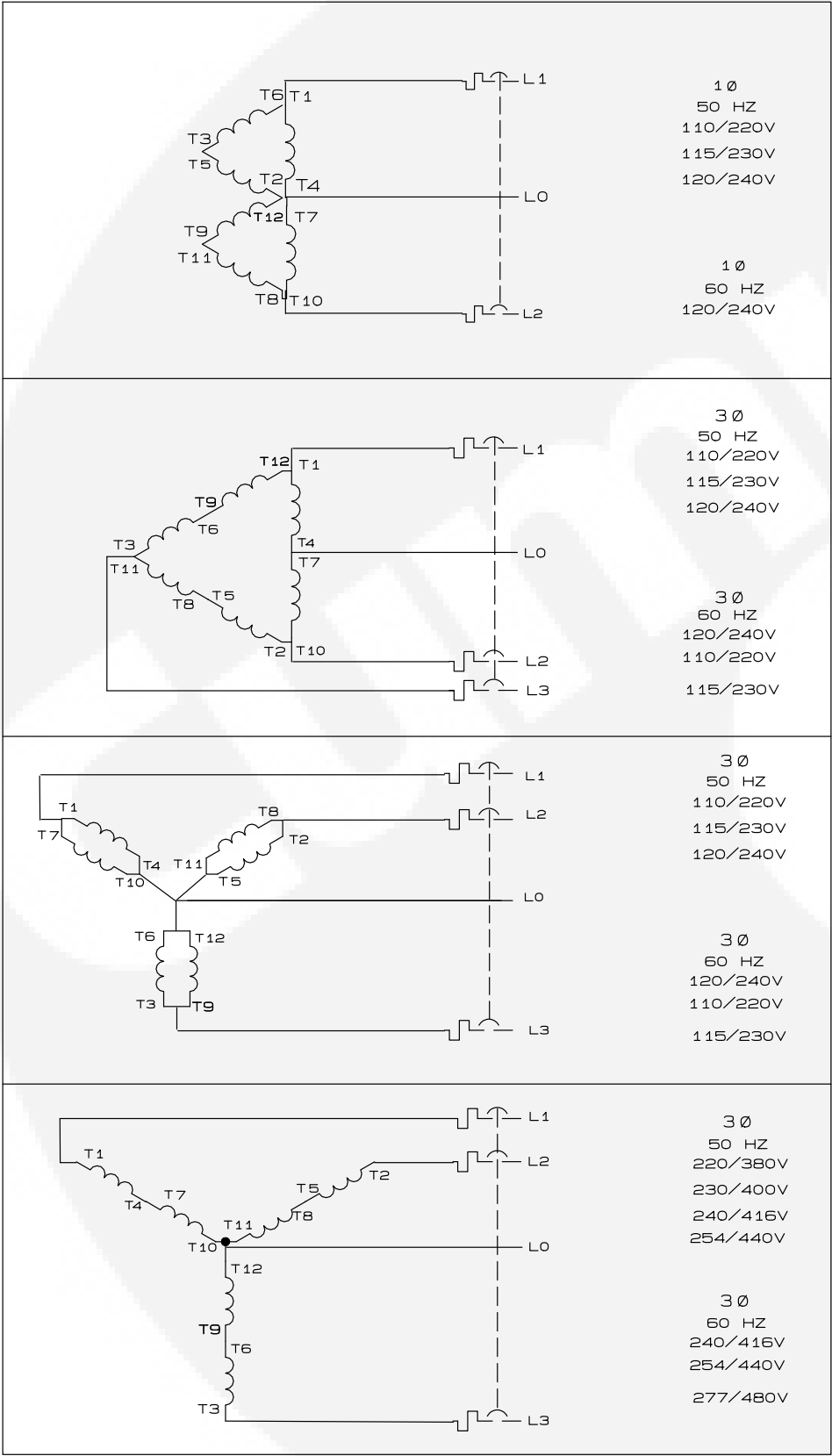
NOTES:

1. When neither local nor remote gauges are provided, plug resistor R1/R2 assembly into P13 and J9 to P9 and J10 to P10.
2. When local gauges only are provided, plug the gauge assembly into P13 and J9 to P9 and J10 to P10.
3. When local and remote gauges are provided, connect selector switch S7 as shown. S7, if installed, will be at the local panel. See instruction sheet C605 for further details.
4. When remote gauges only are provided, connect J9 to P11 and J10 to P12.
5. K9 is used for Isolated ground.
6. 24 volt sets have resistor R3 in Fuel Pump (E5) circuit. Gauge circuits also have resistors (not shown).



RECONNECTION DIAGRAMS

612-6757 (2)



3 Ø Generator Reconnection

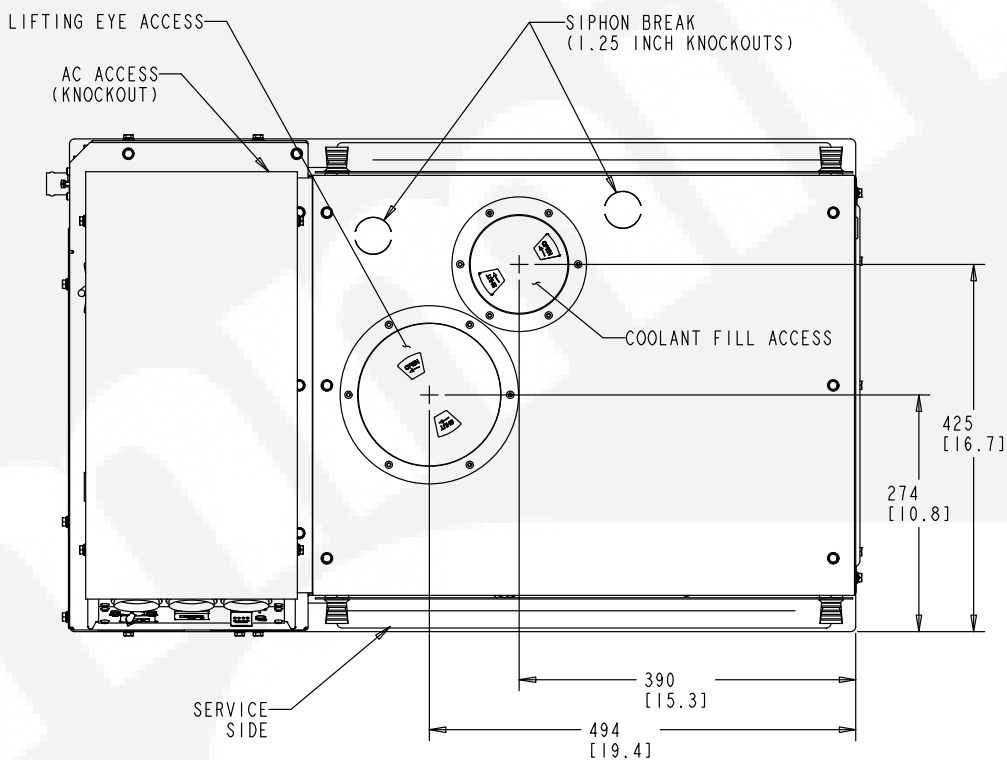
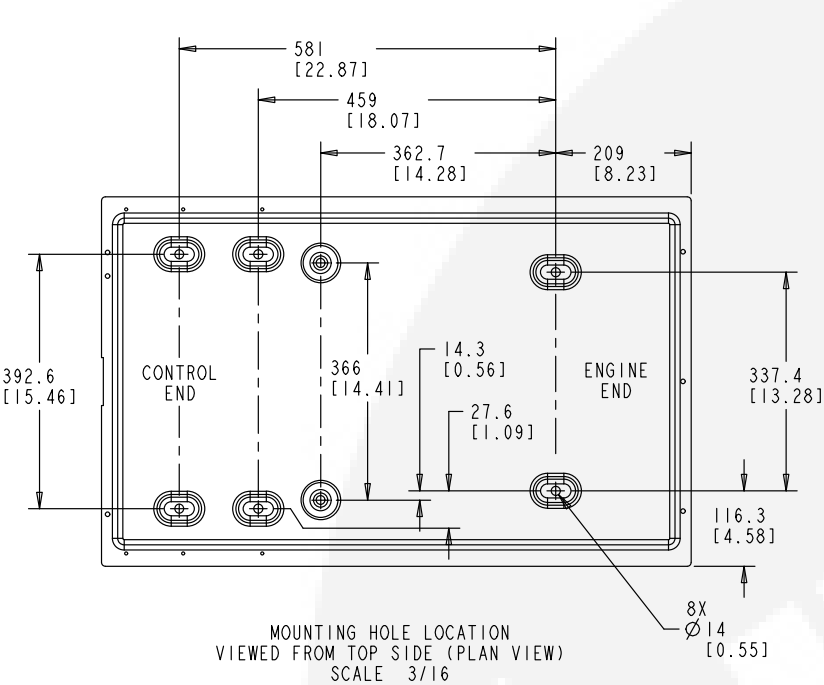
VOLTAGE	A	B	C	HZ
	100 120	200 240	100/200 120/240	60
SCHEMATIC	110 115	220 230	110/220 115/230	50
DIAGRAM				

1 Ø Generator Reconnection



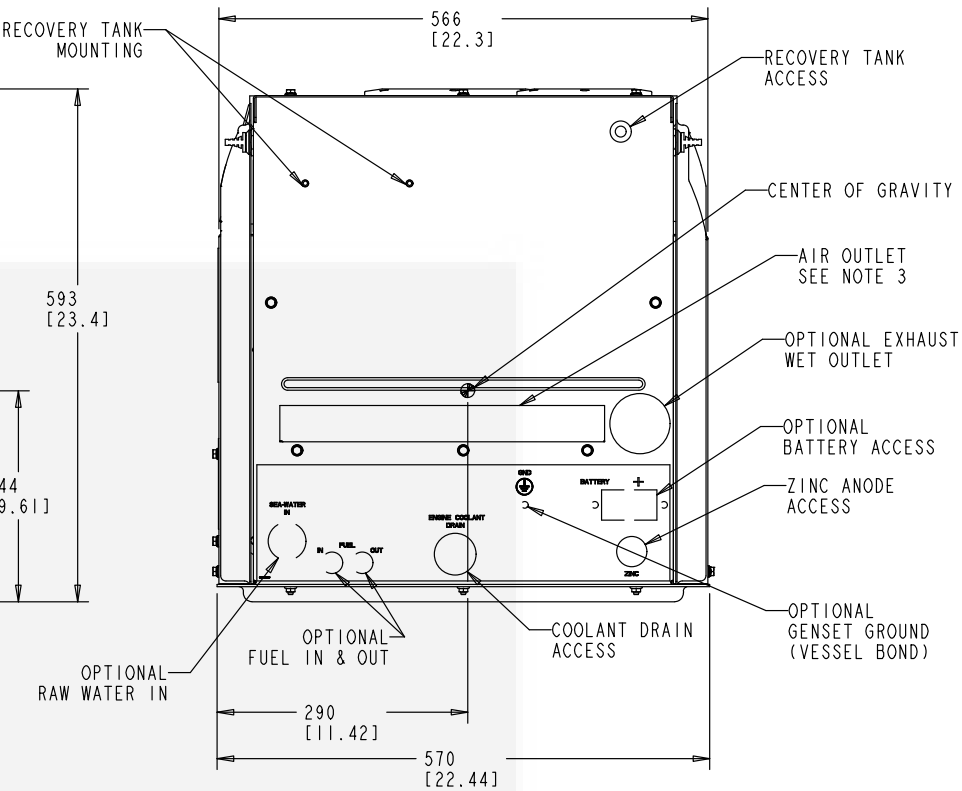
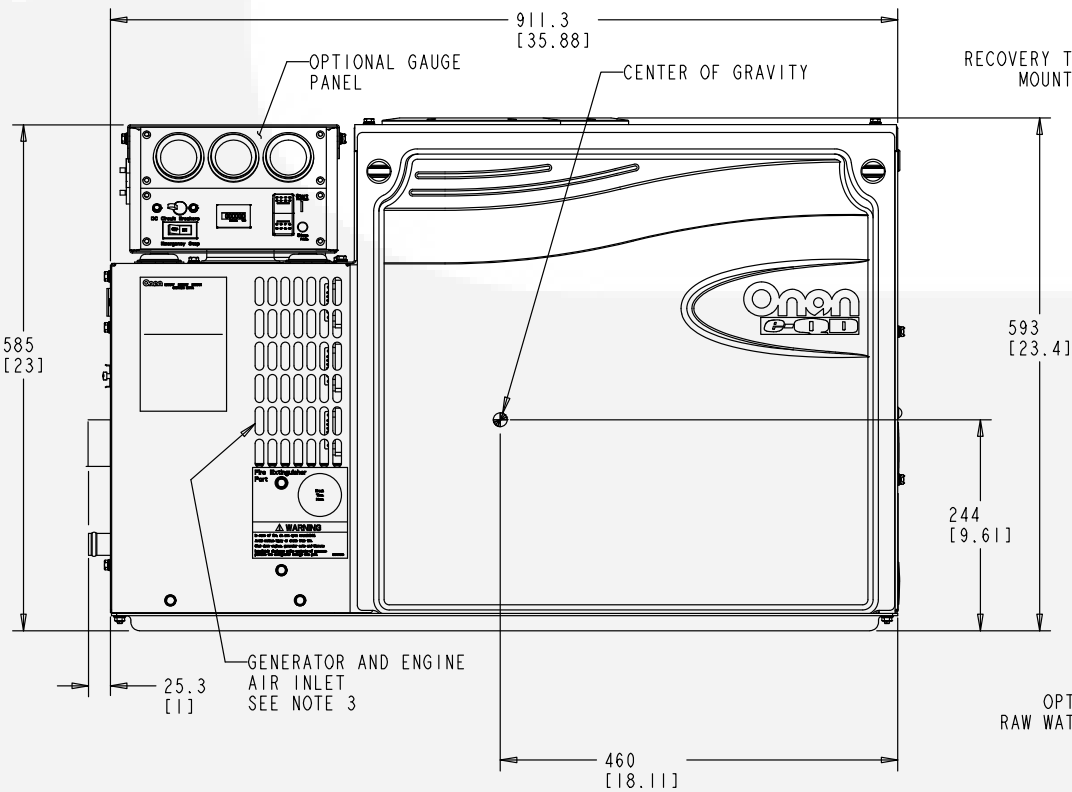
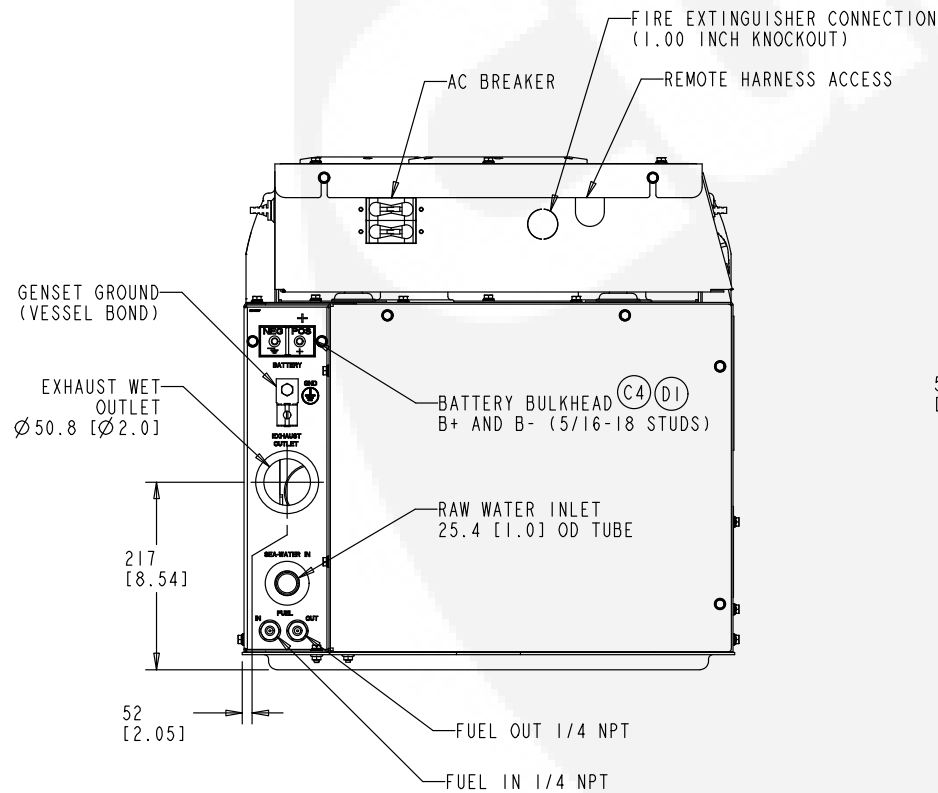
MDKAV OUTLINE DRAWING (WITH ENCLOSURE)

500-3367(1)



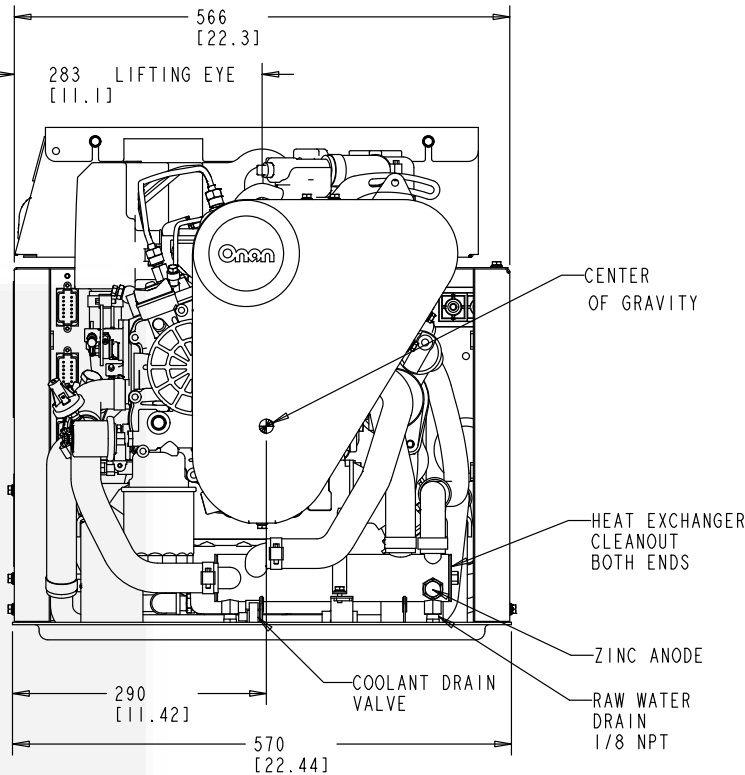
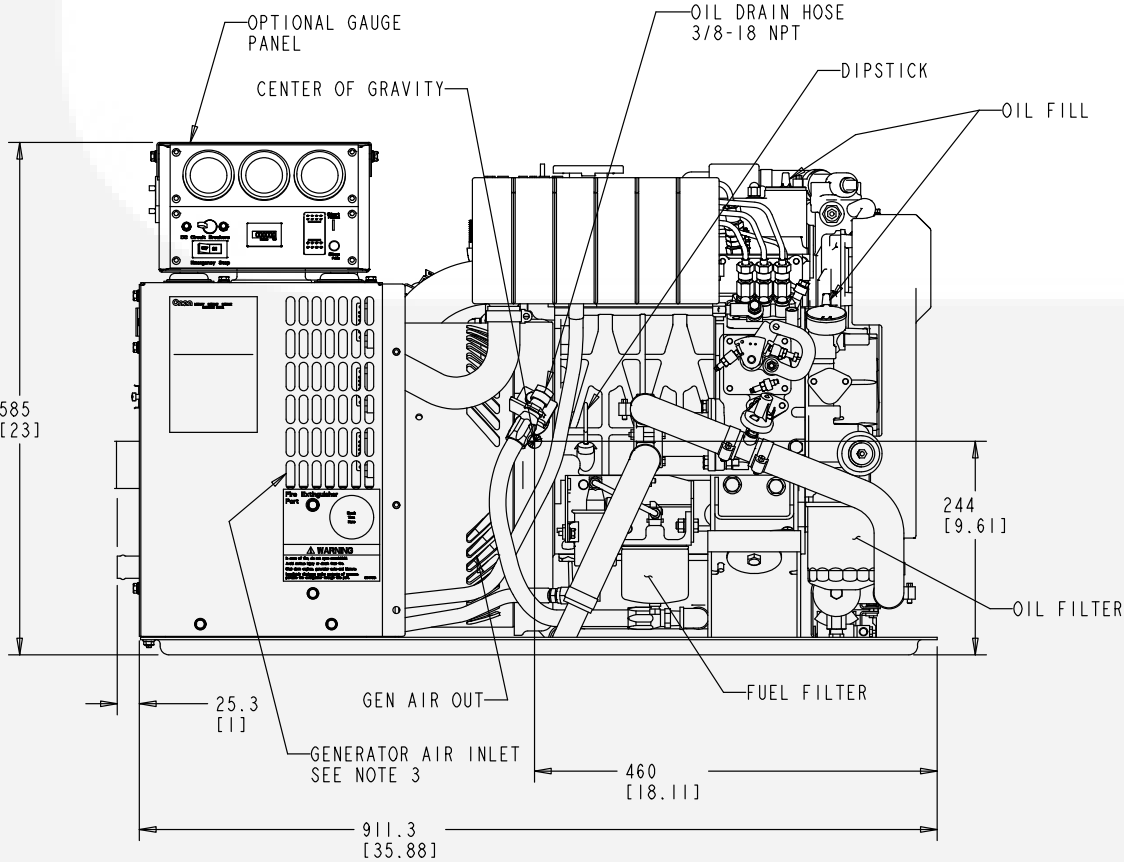
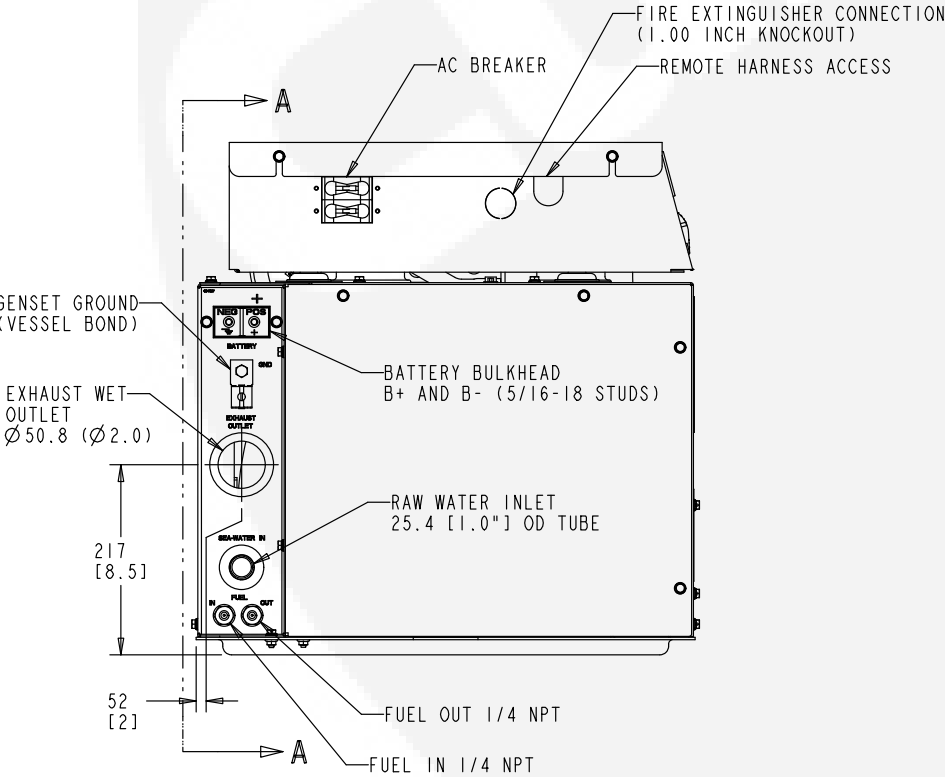
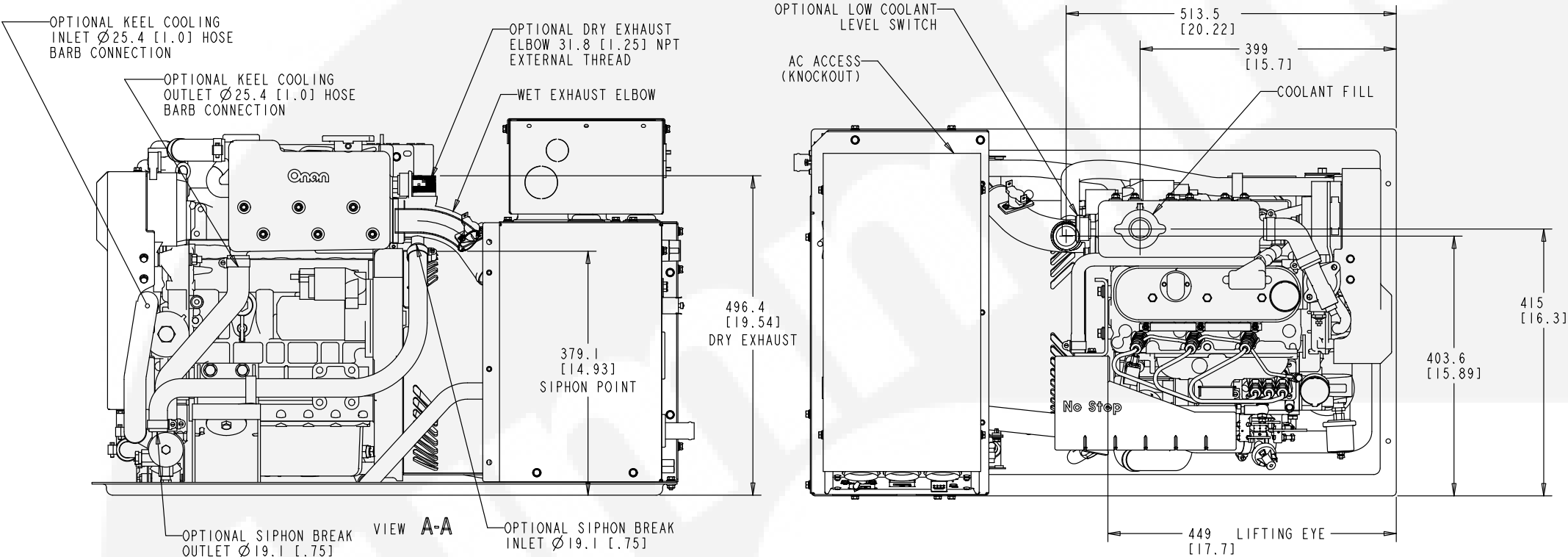
- NOTES:
1. DIMENSIONS IN [ ] ARE INCHES.
  2. THRU HOLES FOR HOSE ROUTING INCLUDE RUBBER GROMMETS FOR ABRASION PROTECTION.
  3. 100 [4.0] MIN CLEARANCE REQUIRED FOR AIR FLOW AT INLET AND 50 [2.0] AT OUTLET.

TABULATION		
MODEL	WET WEIGHT	DRY WEIGHT
HOUSED	279KG 615LB	272KG 600LB
UNHOUSED	259KG 570LB	252KG 555LB



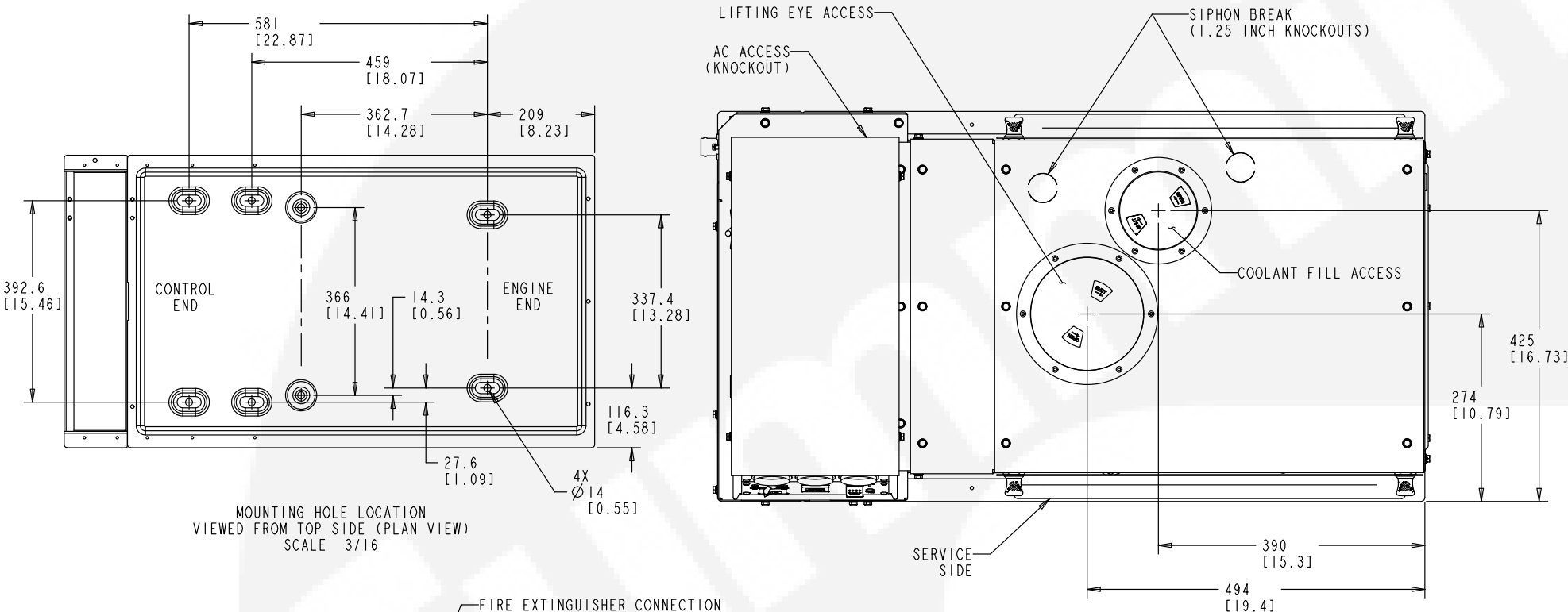
MDKAV OUTLINE DRAWING (WITHOUT ENCLOSURE)

500-3367(2)



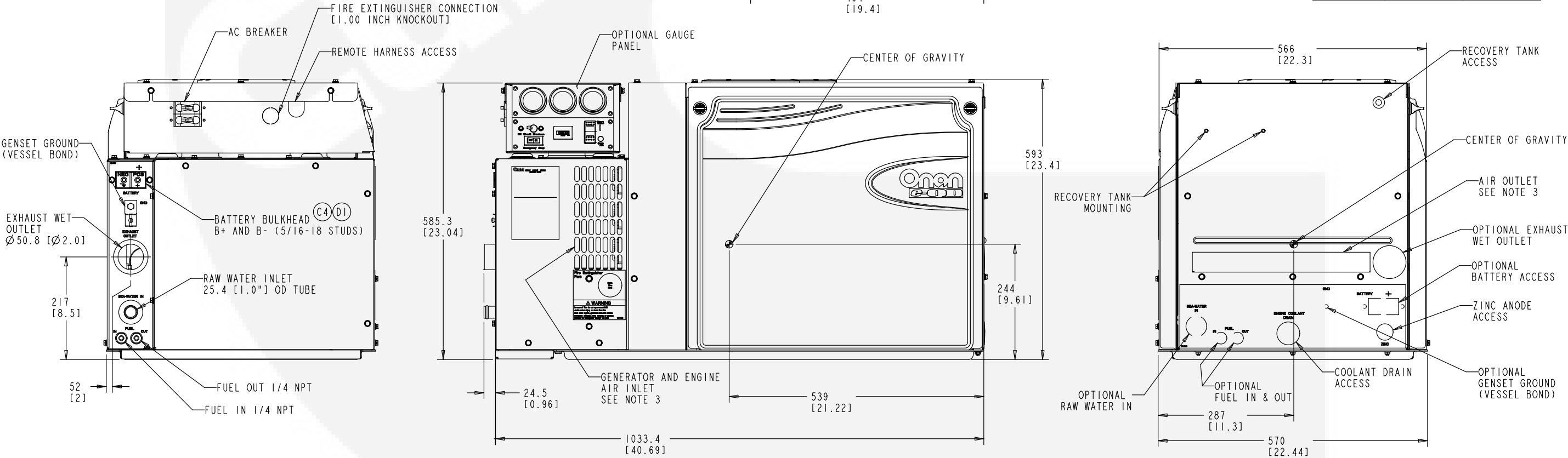
MDKAW & MDKAZ OUTLINE DRAWING (WITH ENCLOSURE)

500-3368(1)



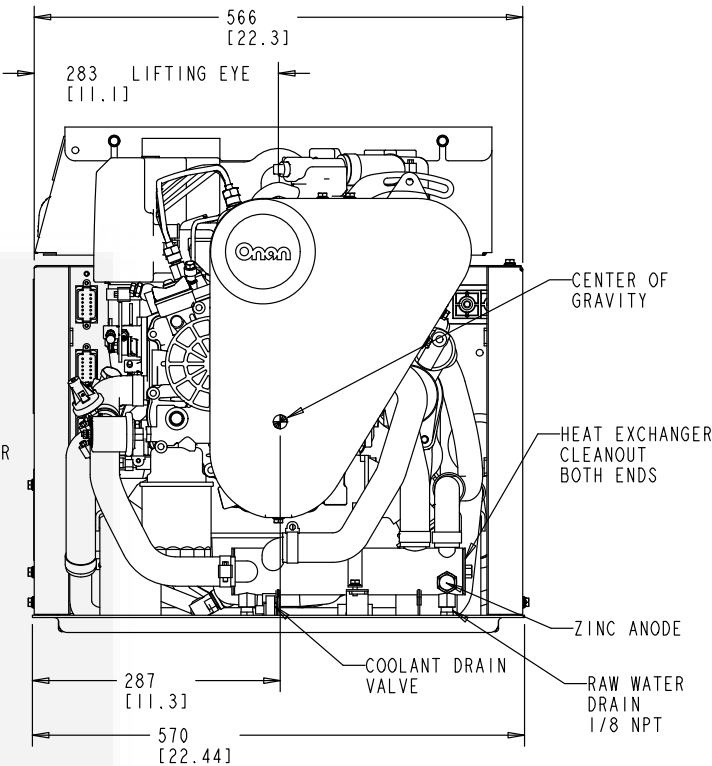
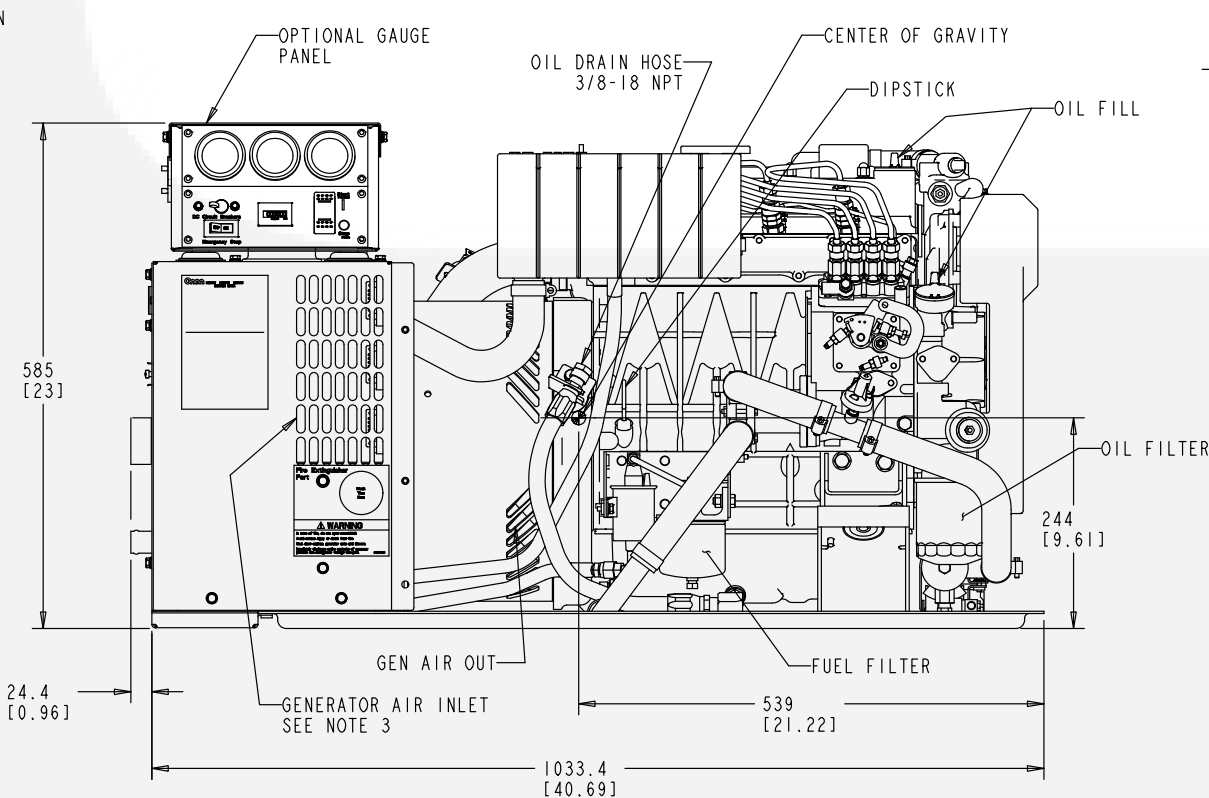
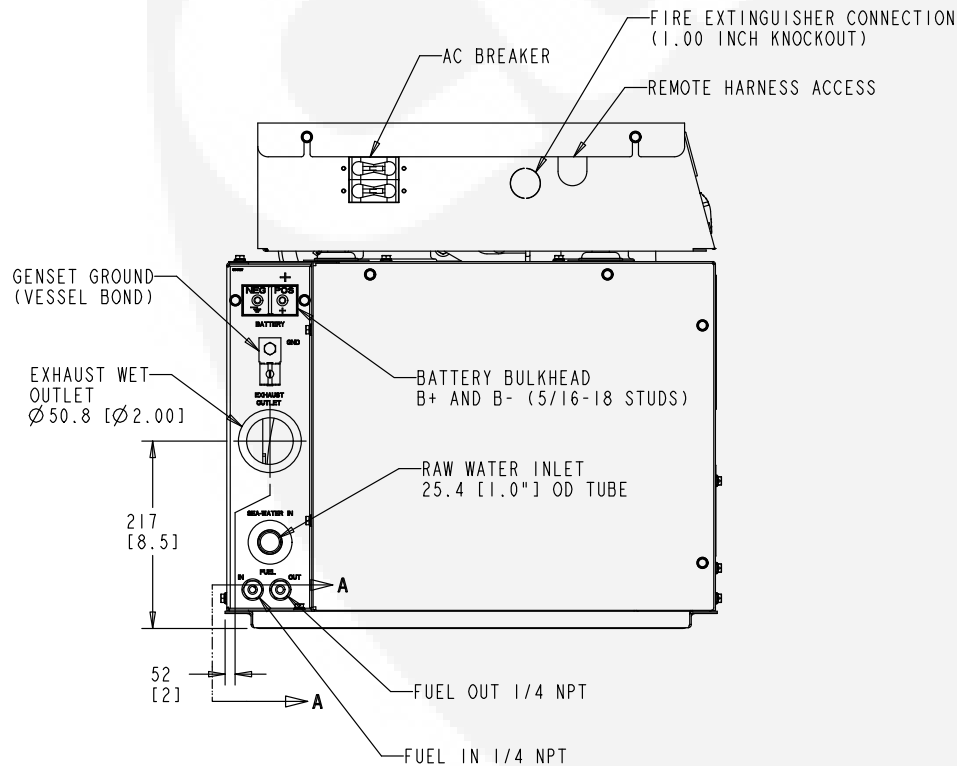
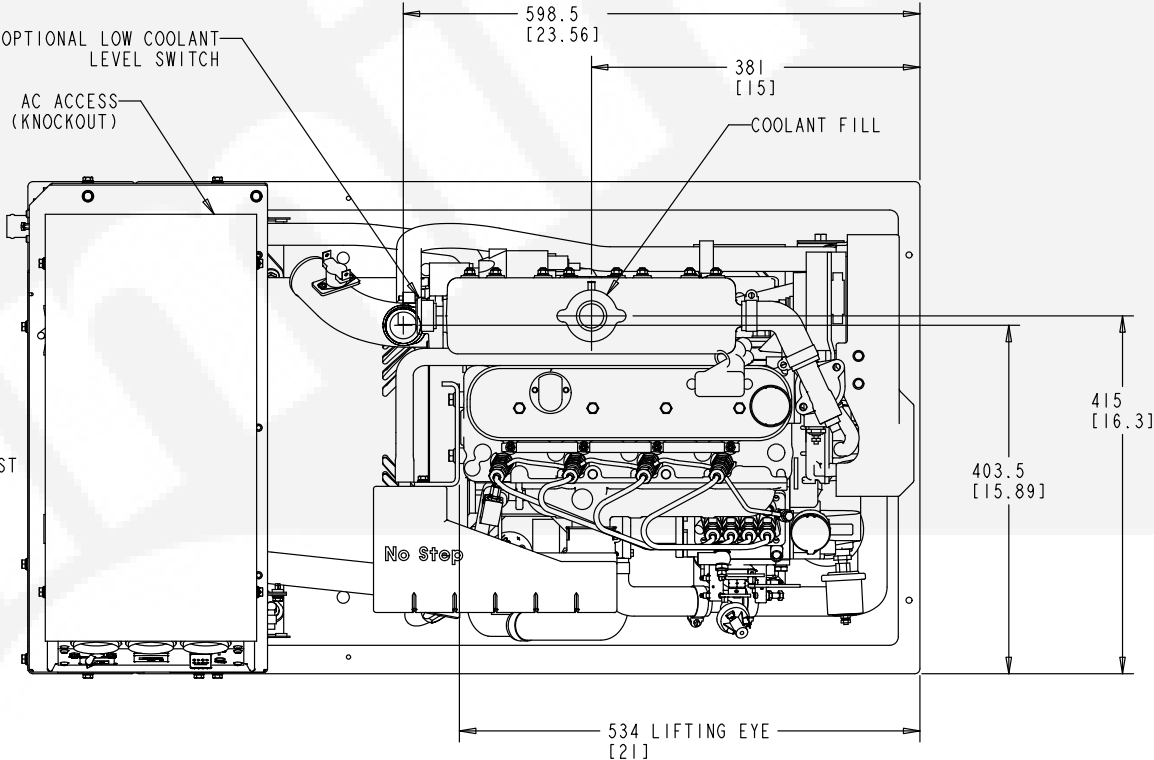
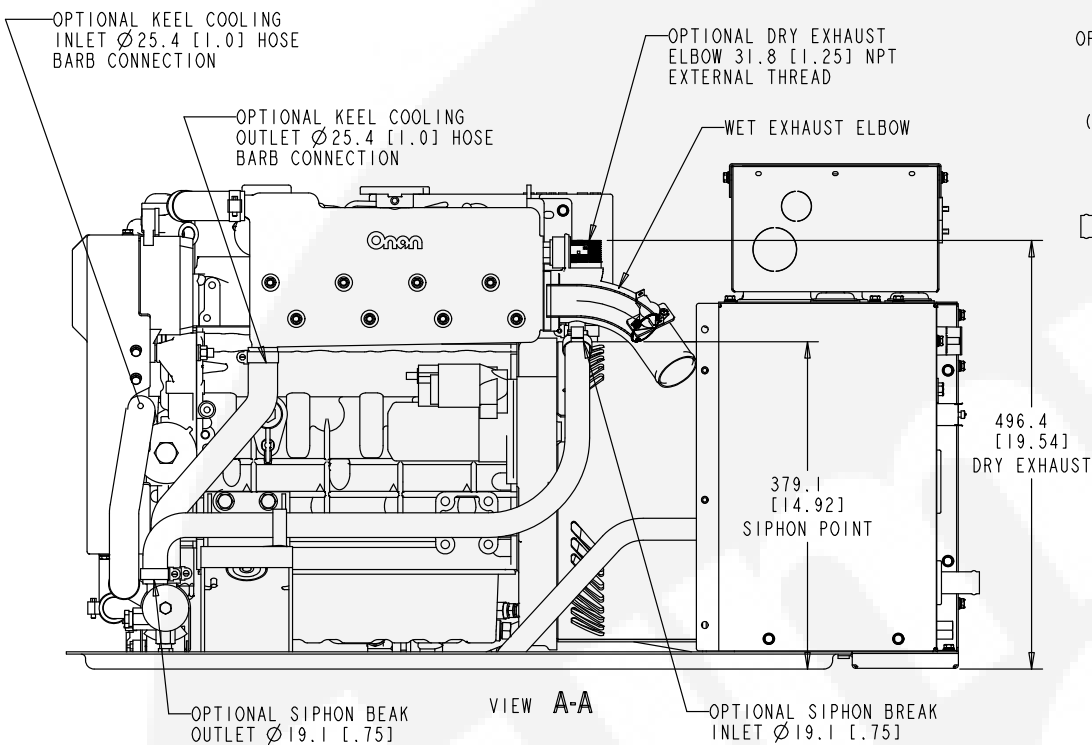
- NOTES:
1. DIMENSIONS IN [ ] ARE INCHES.
  2. THRU HOLES FOR HOSE ROUTING INCLUDE RUBBER GROMMETS FOR ABRASION PROTECTION.
  3. 100 [4.0] MIN CLEARANCE REQUIRED FOR AIR FLOW AT INLET AND 50 [2.0] AT OUTLET.

TABULATION		
MODEL	WET WEIGHT	DRY WEIGHT
HOUSED	324KG 715LB	315KG 695LB
UNHOUSED	299KG 660LB	290KG 640LB



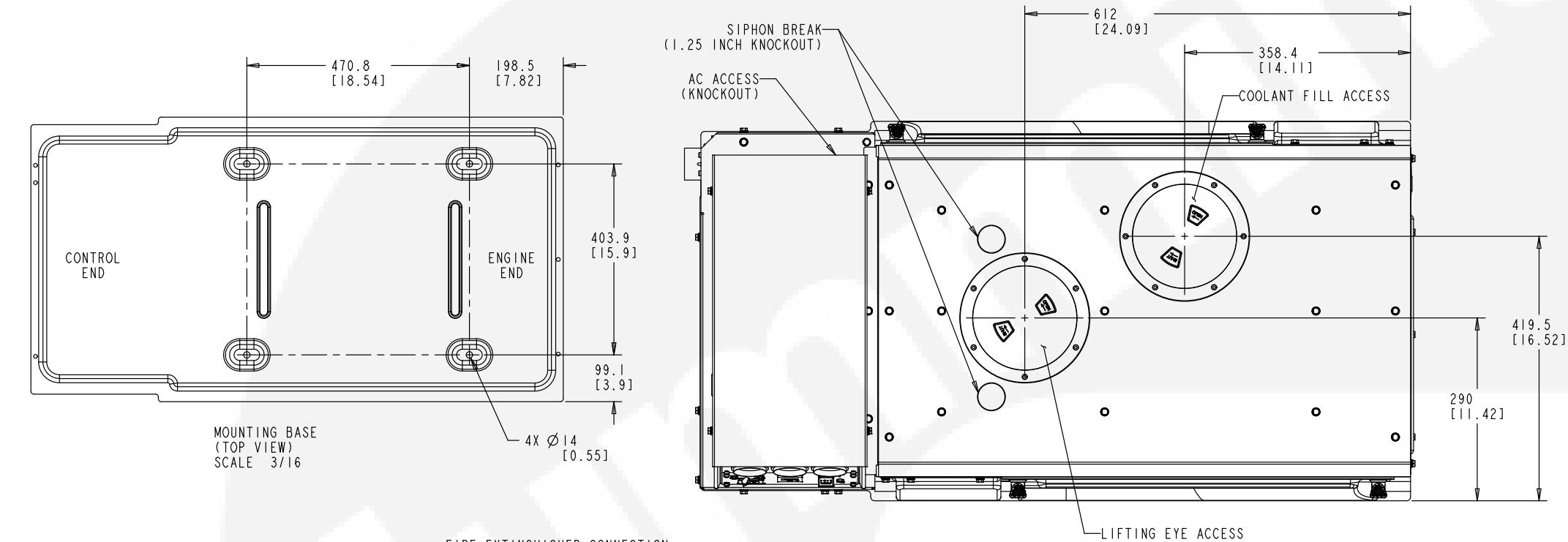
MDKAW & MDKAZ OUTLINE DRAWING (WITHOUT ENCLOSURE)

500-3368(2)



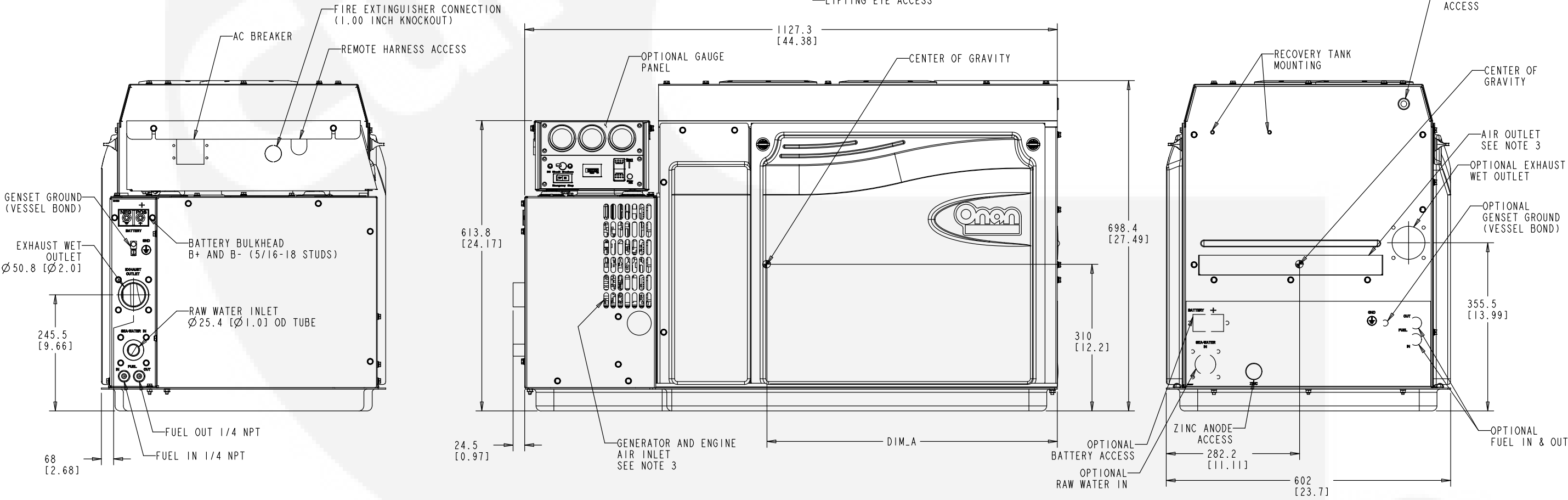
MDKBD & MDKBE OUTLINE DRAWING (WITH ENCLOSURE)

500-3377(1)



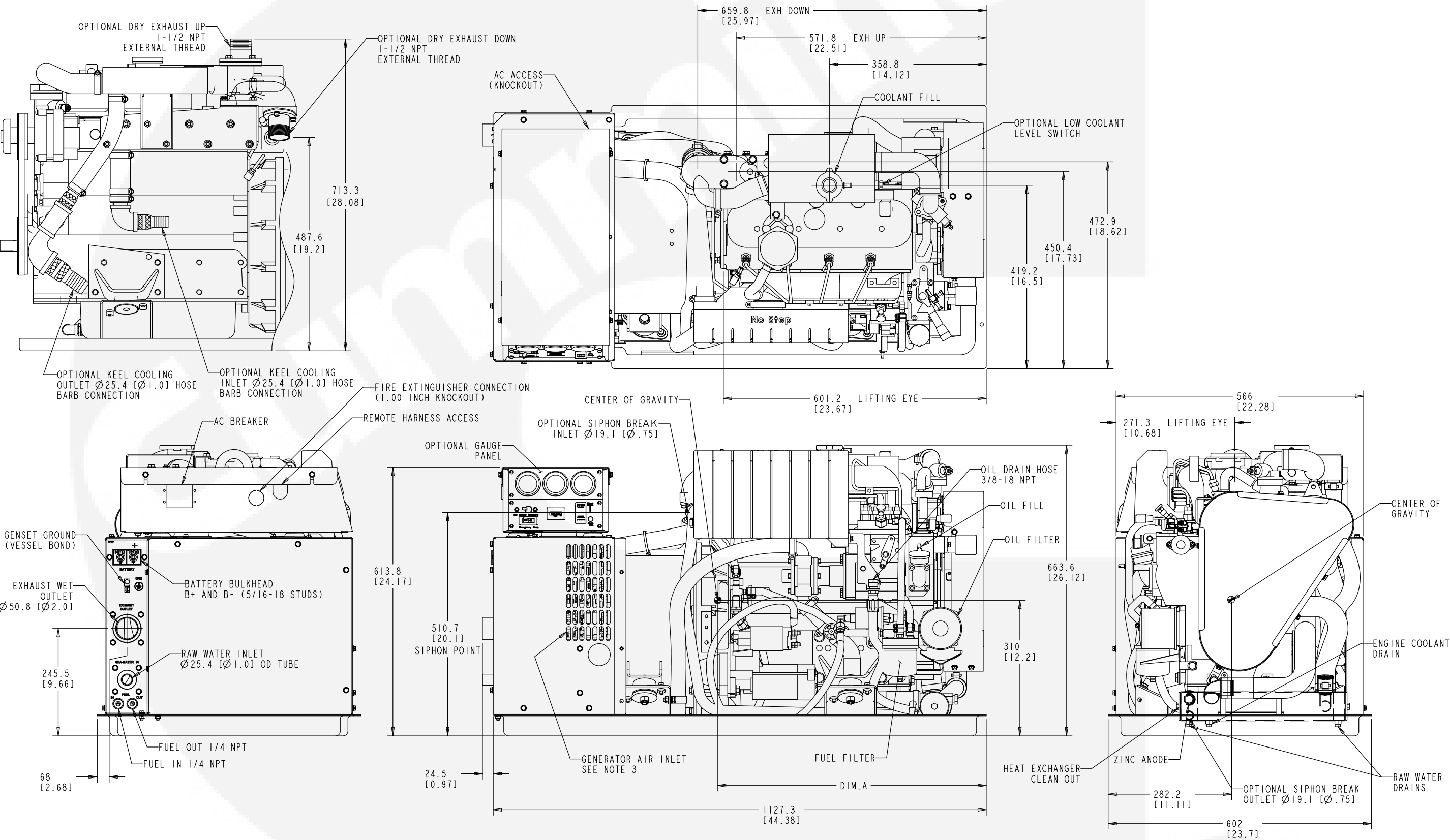
- NOTES:
1. DIMENSIONS IN [ ] ARE INCHES.
  2. THRU HOLES FOR HOSE ROUTING INCLUDE RUBBER GROMMETS FOR ABRASION PROTECTION.
  3. 100 [4.0] MIN CLEARANCE REQUIRED FOR AIR FLOW AT INLET AND 50 [2.0] AT OUTLET.

TABULATION				
MODEL	OPTION	DIM_A	WET WEIGHT	DRY WEIGHT
MDKBD	HOUSED	584.2 [23]	424KG 935LB	411KG 905LB
MDKBD	UNHOUSED	584.2 [23]	365KG 805LB	352KG 775LB
MDKBE	HOUSED	614.6 [24.2]	447KG 985LB	433KG 955LB
MDKBE	UNHOUSED	614.6 [24.2]	388KG 855LB	374KG 825LB



MDKBD & MDKBE OUTLINE DRAWING (WITHOUT ENCLOSURE)

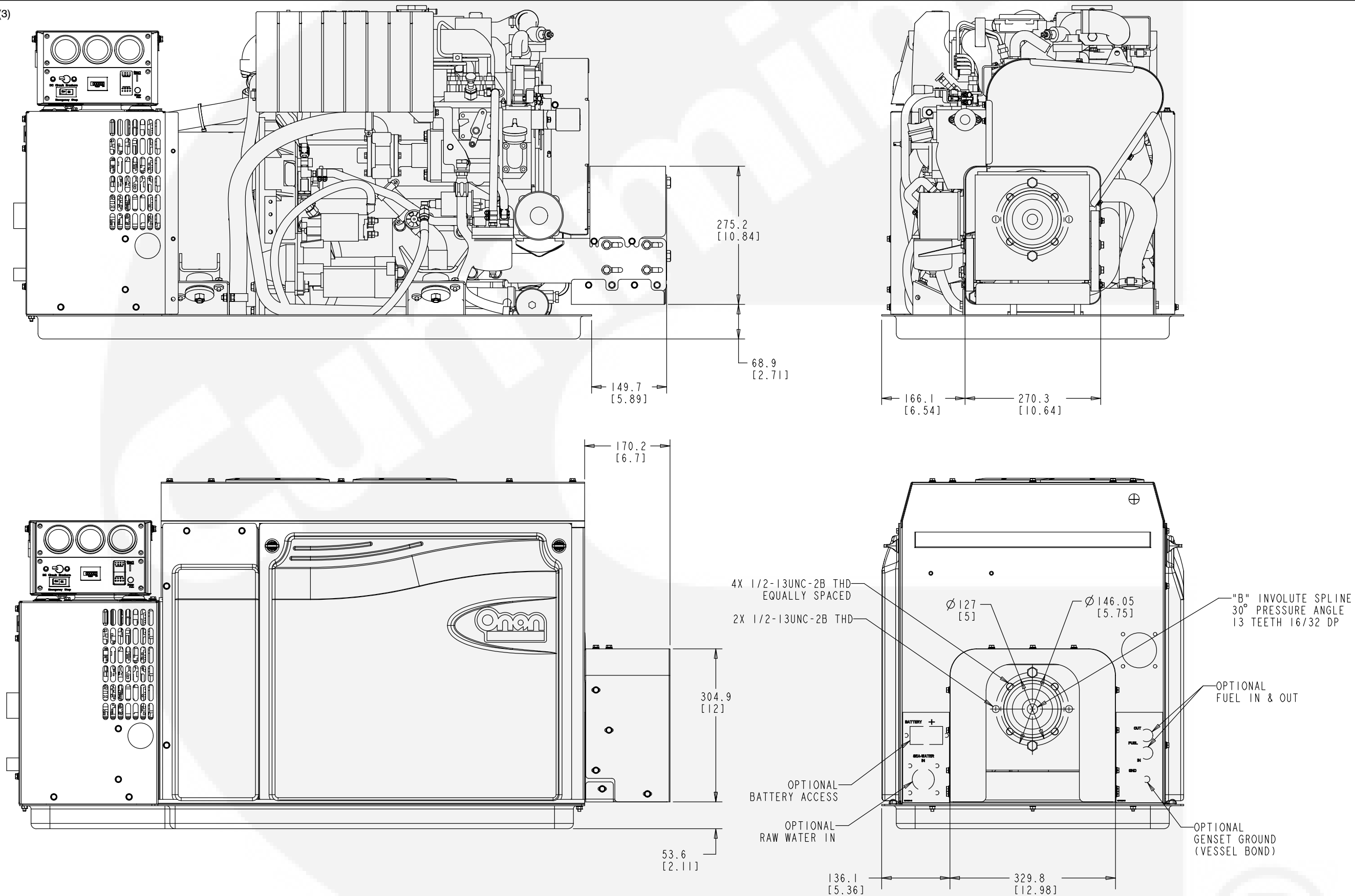
500-3377(2)





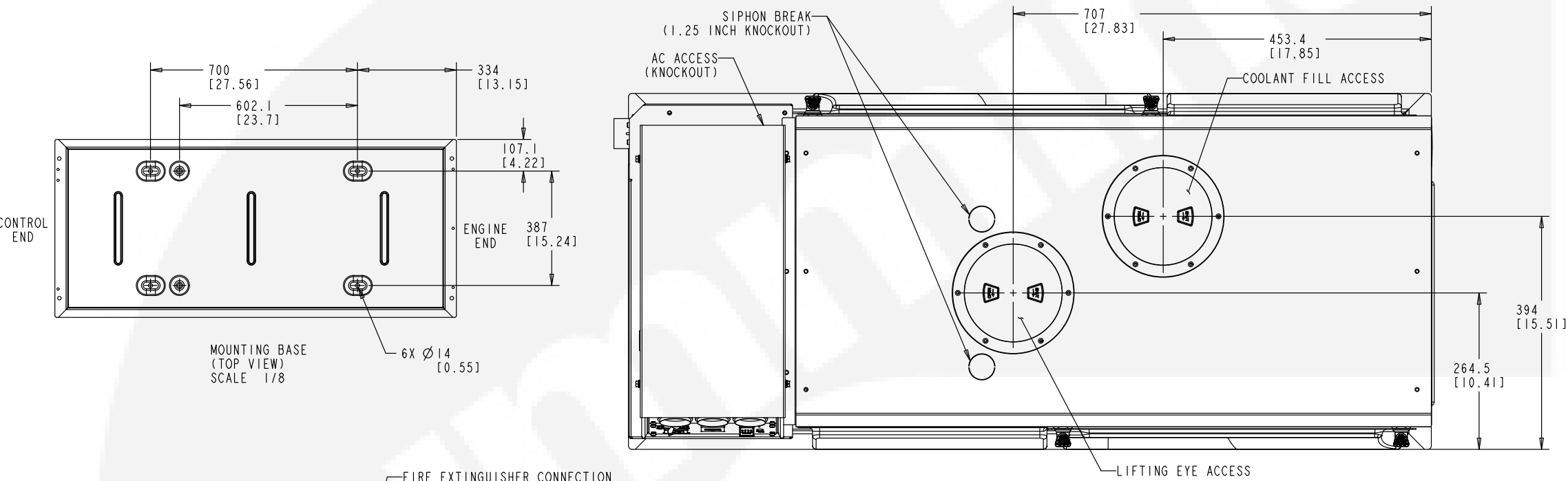
MDKBD & MDKBE OUTLINE DRAWING (WITH PTO)

500-3377(3)



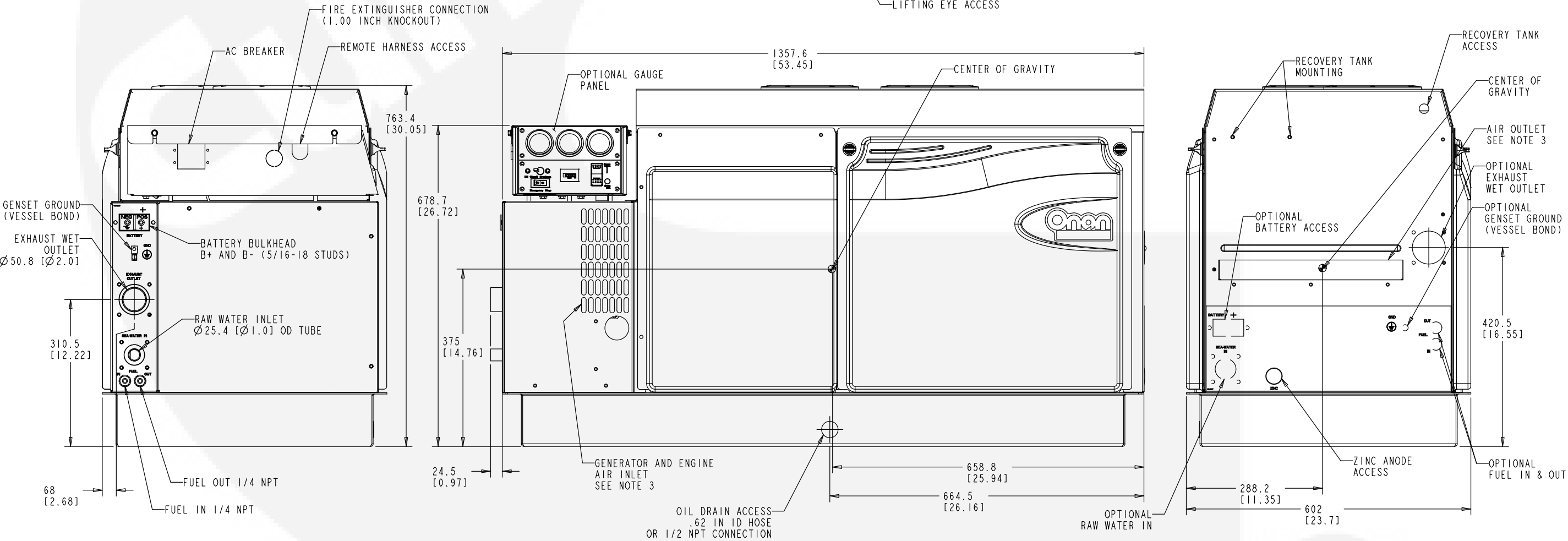
MDKBF OUTLINE DRAWING (WITH ENCLOSURE)

500-3378(1)



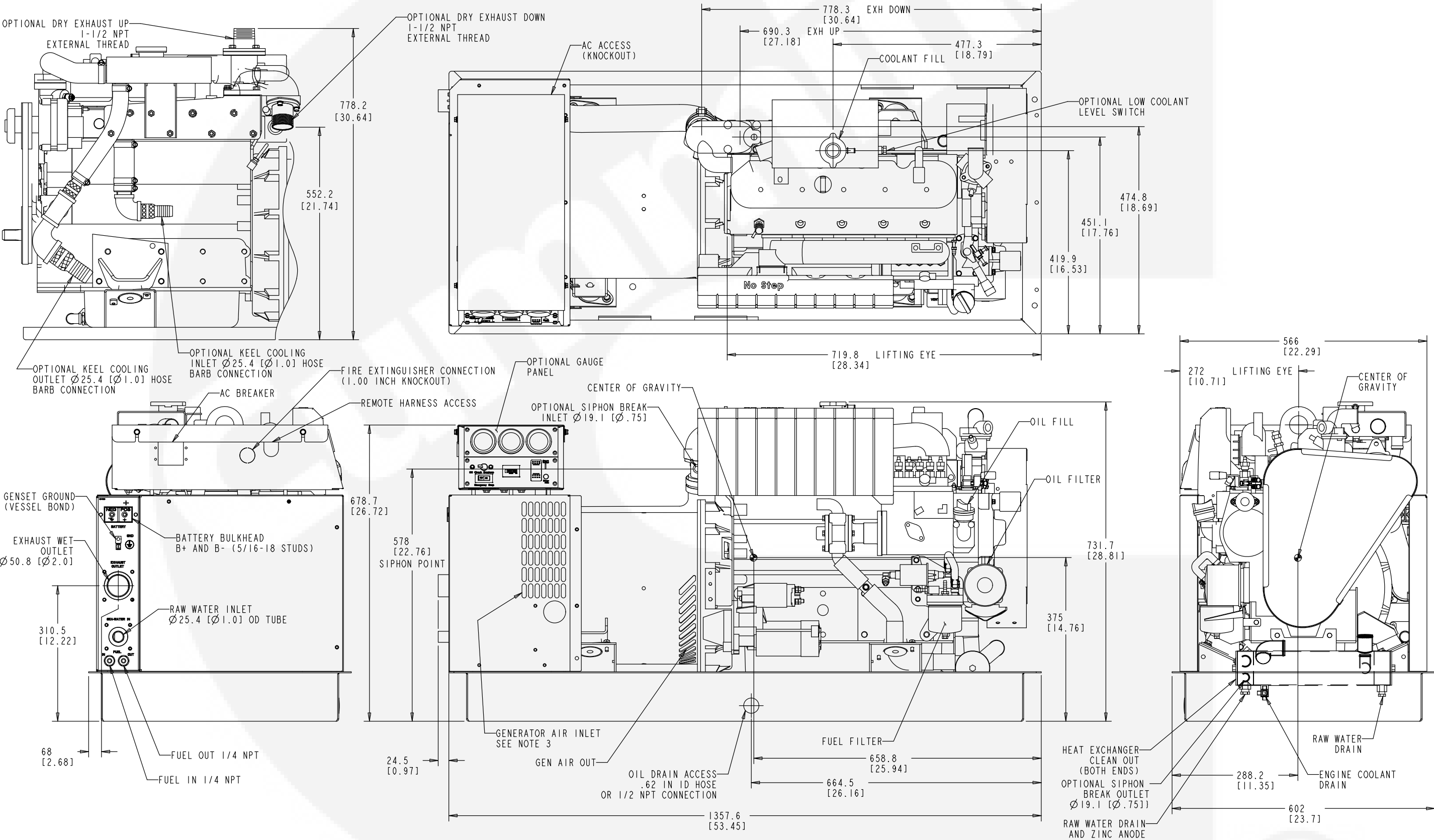
- NOTES:
1. DIMENSIONS IN [ ] ARE INCHES.
  2. THRU HOLES FOR HOSE ROUTING INCLUDE RUBBER GROMMETS FOR ABRASION PROTECTION.
  3. 100 [4.0] MIN CLEARANCE REQUIRED FOR AIR FLOW AT INLET AND 50 [2.0] AT OUTLET

TABULATION			
OPTION	WET WEIGHT	DRY WEIGHT	
HOUSED	551KG 1215LB	533KG	1175LB
UNHOUSED	485KG 1070LB	467KG	1030LB



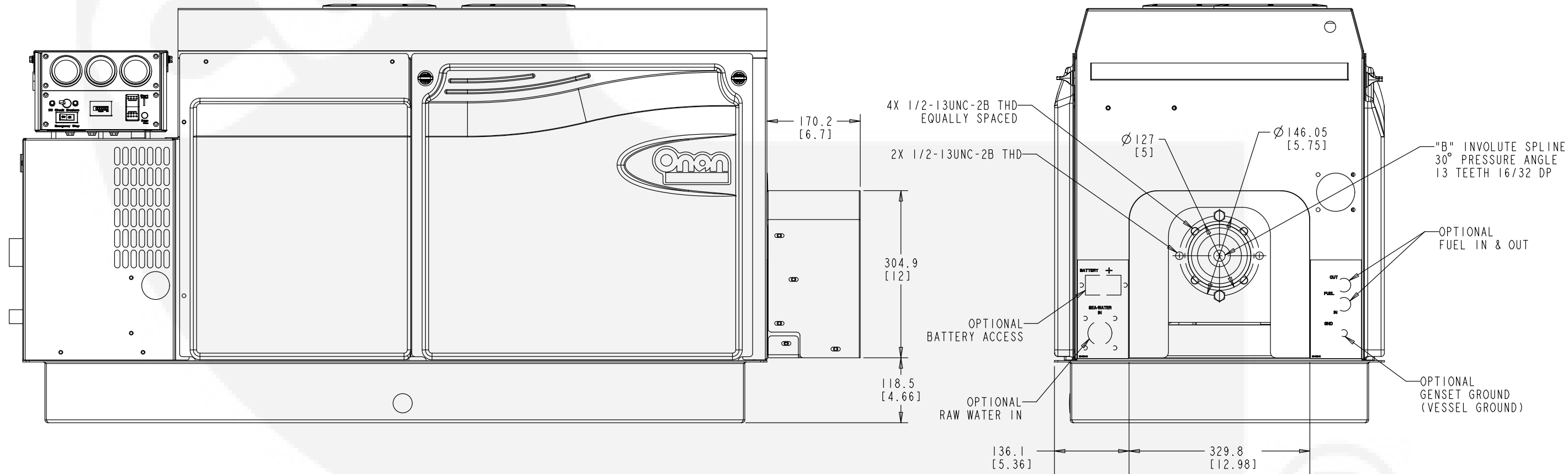
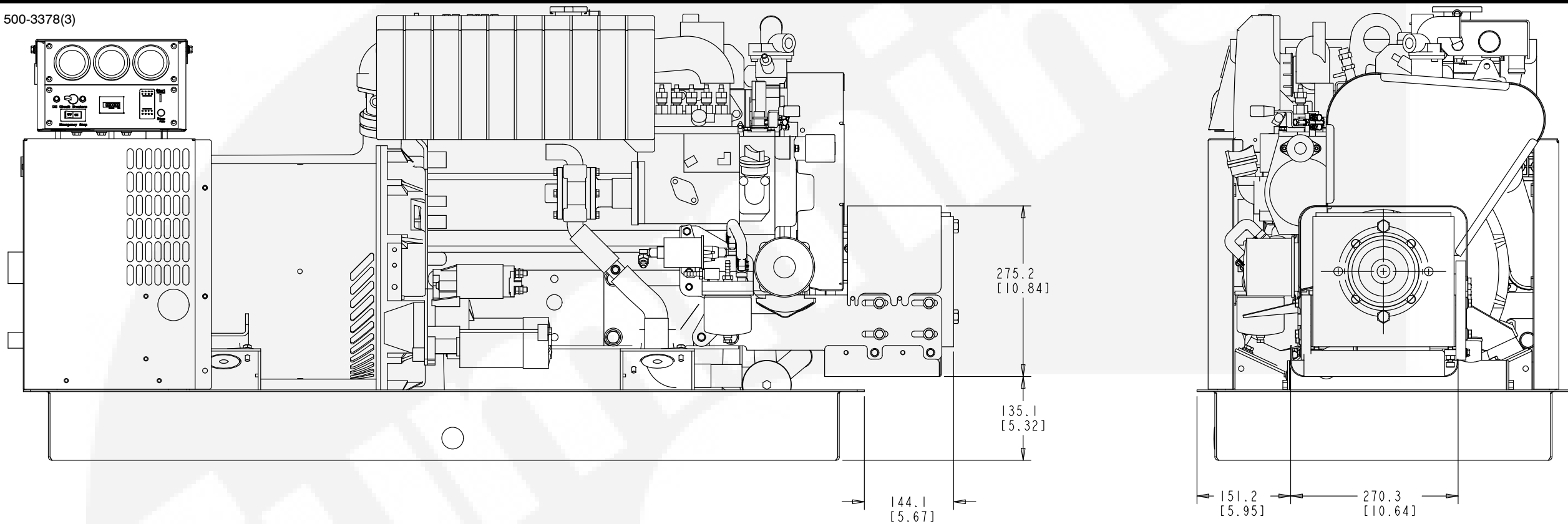
MDKBF OUTLINE DRAWING (WITHOUT ENCLOSURE)

500-3378(2)



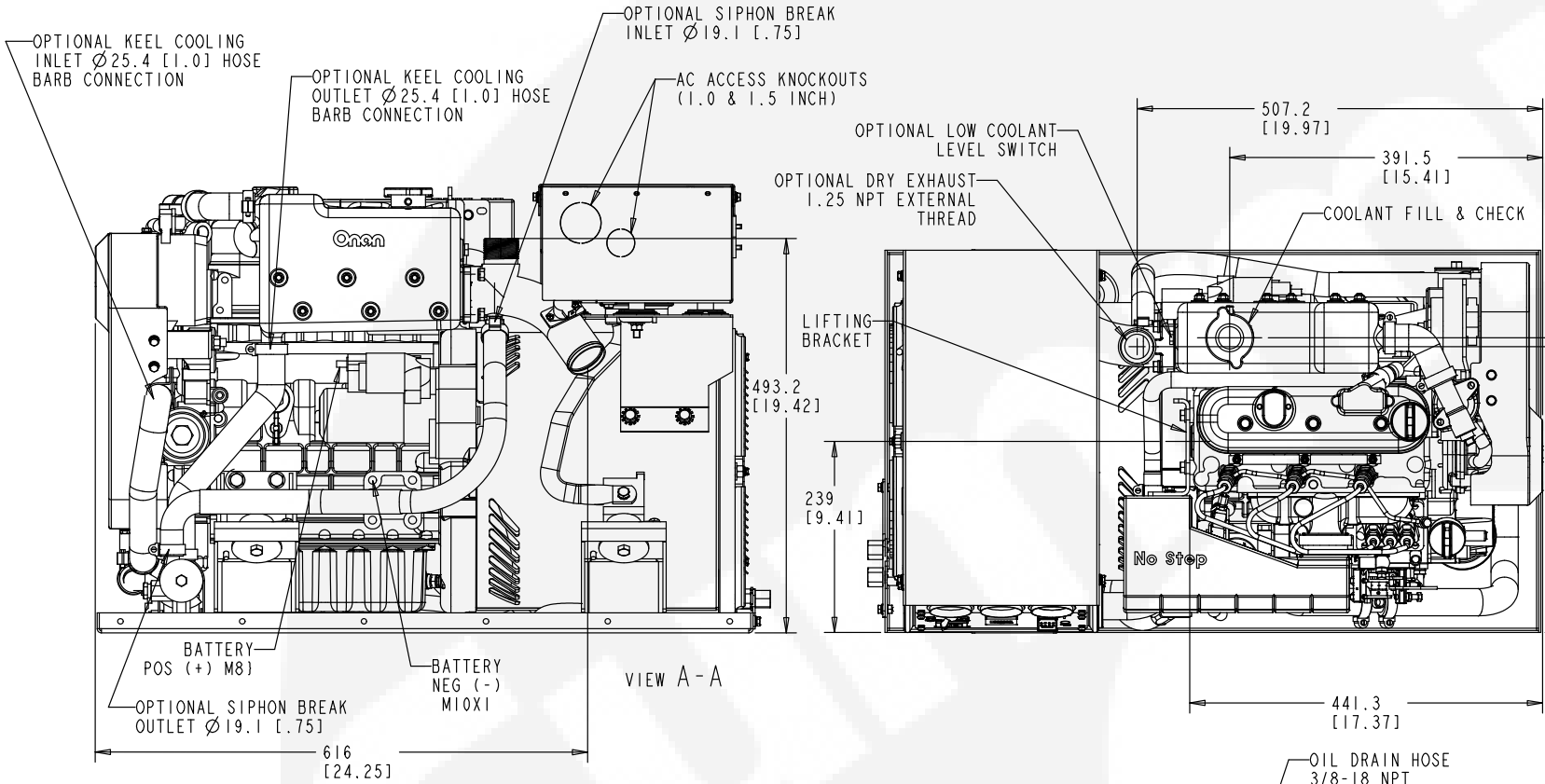
MDKBF OUTLINE DRAWING (WITH PTO)

500-3378(3)



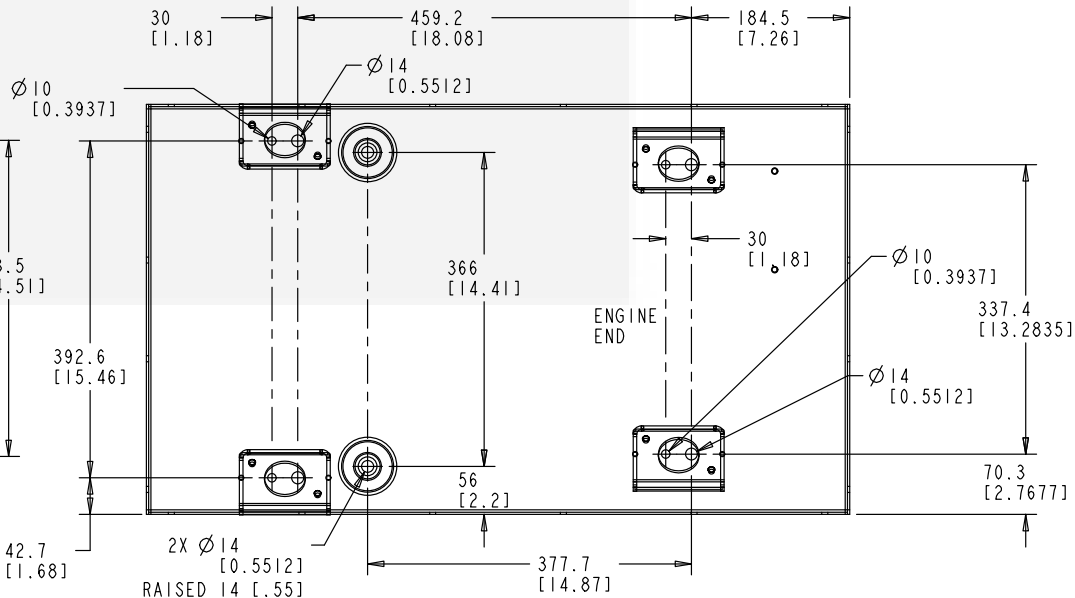
MDKBG OUTLINE DRAWING (WITHOUT ENCLOSURE)

500-3592

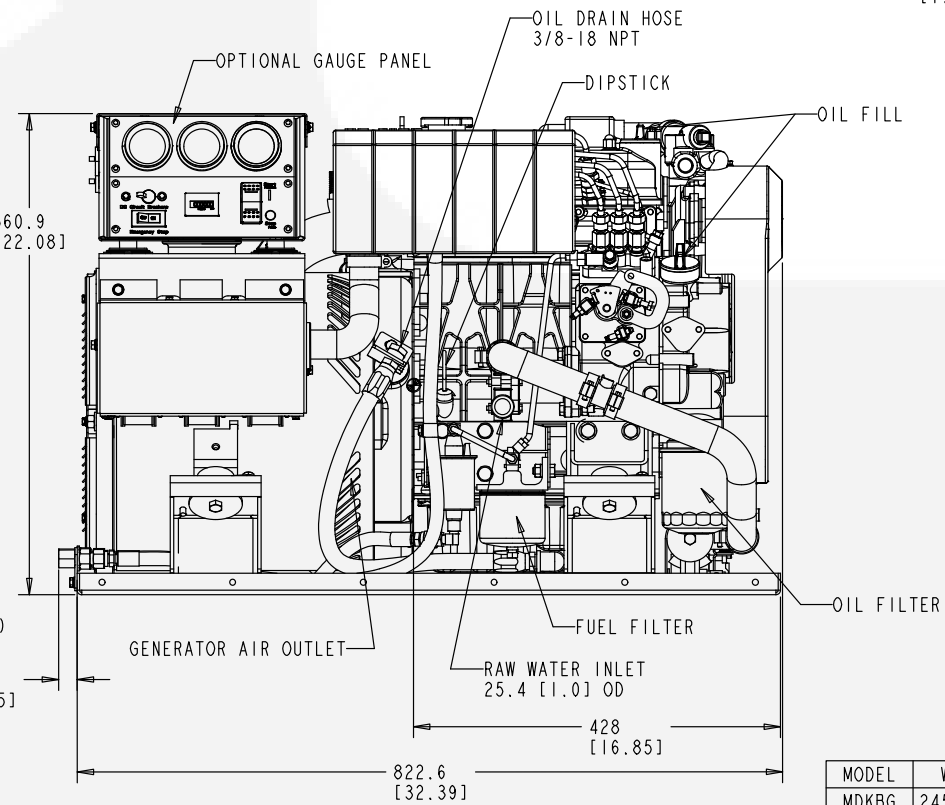
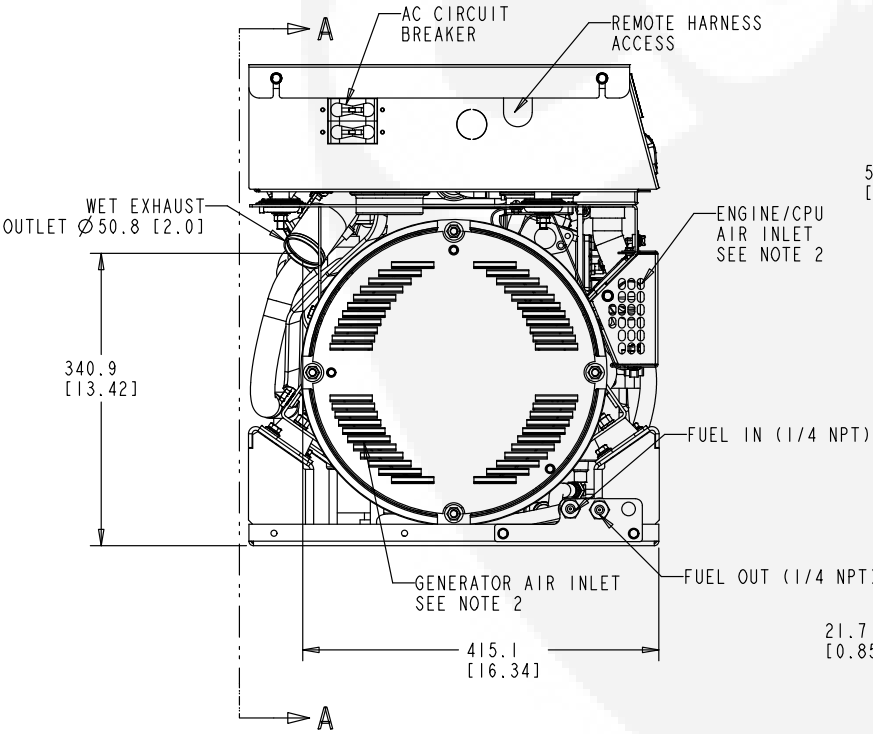


NOTES:

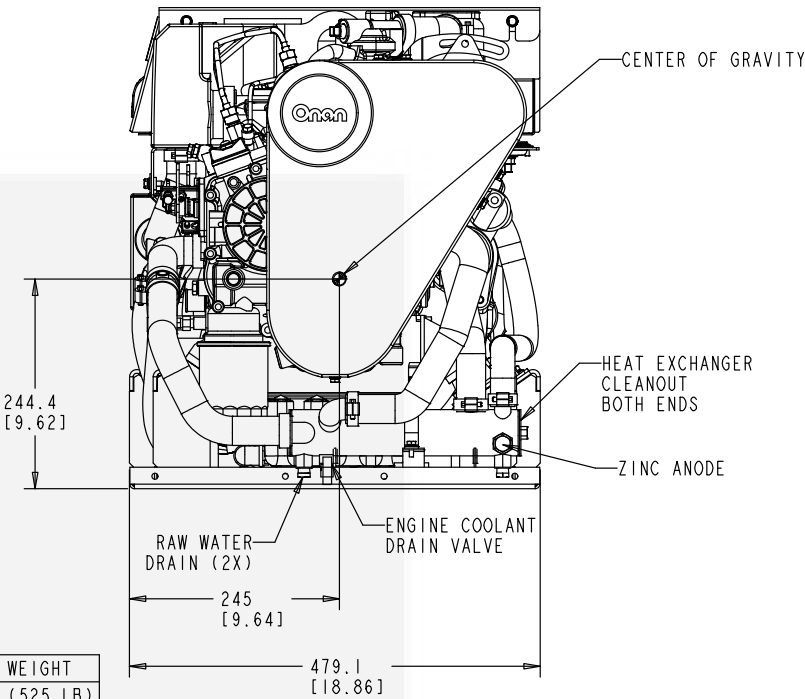
1. DIMENSIONS IN [ ] ARE INCHES
2. 25.4 [1.0] MIN CLEARANCE REQUIRED FOR AIR INLET TO GENERATOR AND ENGINE/CPU



MOUNTING HOLE LOCATIONS  
VIEWED FORM TOP



MODEL	WET WEIGHT	DRY WEIGHT
MDKBG	245KG (540 LB)	238KG (525 LB)





**This page is intended to be blank.**





# Cummins **Onan**

## **Cummins Power Generation**

1400 73rd Ave. NE  
Minneapolis, MN 55432 USA

Phone 1 763 574 5000

Toll-free 1 800 888 6626

Fax 1 763 574 5298

Email [www.cumminsonan.com/contact](http://www.cumminsonan.com/contact)

[www.cumminsonan.com](http://www.cumminsonan.com)

Cummins®, Onan®, the "C" logo, and "Performance you rely on." are trademarks of Cummins Inc.

©2013 Cummins Power Generation, Inc. All rights reserved.

